UMATILLA HATCHERY MASTER PLAN 90-15

NORTHWEST POWER PLANNING COUNCIL

September 11, 1990

NORTHWEST POWER PLANNING COUNCIL

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September 11, 1990

To Interested Parties:

On October 11, 1989, the Northwest Power Planning Council approved the Umatilla Hatchery Master Plan. The project is currently in the final design and construction phase. There continue to be requests from the public and fishery managers in the Columbia Basin for copies of the "approved" master plan for the Umatilla Hatchery. The appended materials were assembled to fill those requests.

The approved plan consists of three documents:

(1) The plan submitted to the Council by the fishery managers, the Confederated Tribes of the Umatilla Indian Reservation and the Oregon Department of Fish and Wildlife.

(2) The issue paper prepared by the Council's staff to describe key elements of the master plan for the proposed hatchery and discuss some of the potential uncertainties and benefits associated with the project.

(3) The decision letter and attachments from the Council approving the plan and allowing final design and construction to begin. The letter also describes a number of activities that should be completed concurrent with hatchery construction.

The above documents reviewed together will give the reader a more complete understanding of the Umatilla Hatchery Master Plan.

Sincerely,

Dulcy Mahar, Director
Public Involvement Division

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C. Council letter and attachment to relevant parties, October 25, 1989.

UMATILLA HATCHERY MASTER PLAN

for the

Northwest Power Planning Council

January 1989

Prepared by

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the Umatilla Indian Reservation
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EXECUTIVE SUMMARY

Introduction

The Council's 1987 Fish and Wildlife Program authorized construction of a hatchery to produce 290,000 lbs of salmon and steelhead for release in the Umatilla River to partially mitigate for fish losses attributable to hydroelectric dams on the Columbia River.

Over 70 years ago prior to hydroelectric and irrigation development, the Umatilla had large runs of spring and fall chinook and coho salmon and steelhead which supported productive Indian and non-Indian fisheries.

Prior to construction of the hatchery, Measure 703 (f)(1)(a) called for a facility Master Plan to be approved by the Council. The Master Plan, which required 20 months to complete (May 1987-January 1989), was jointly prepared by ODFW and CTUIR in cooperation with CRITFC, the Council, and BPA.

Fishery Management and Hatchery Practices Policies

In its 1987 amendments, the Council adopted a management framework and system policies to guide achievement of a goal to increase adult run sizes in the Columbia Basin from 2.5 to 5.0 million annually. The Umatilla Hatchery is being designed to increase runs in the Columbia by over 91,000 adults. The Council's System Policies of adaptive management, genetic risk assessment, and escapement will be followed to guide achievement of Umatilla Basin production goals.

ODFW/CTUIR policies governing hatchery practices including broodstock selection and spawning practices, outplanting, and disease control are discussed.

Production Profile

The CTUIR and ODFW have established the following fishery rehabilitation goals for the Umatilla River:

1. Reestablish runs of chinook and coho salmon into the Umatilla River basin.

2. Enhance production of summer steelhead through supplementation of naturally producing populations in the basin.

3. Provide sustainable Indian and non-Indian harvest of salmon and steelhead.

4. Maintain the genetic character of naturally producing populations of salmonids native to and reestablished in the Umatilla River basin.

5. Achieve the following goals for adult returns to Three Mile Dam:

	Run Size Goals		
	Natural	Hatchery	Total
Spring Chinook	1,000	10,000	11,000
Fall Chinook	11,000	10,000	21,000
Summer Steelhead	4,000	5,670	9,670
Coho	Undetermined	6,000	6,000
	16,000	31,670	47,670

Achievement of these run size goals will be accomplished by release of smolts produced at the Umatilla and other hatcheries in the Columbia Basin.

The initial smolt production profile (below) represents a "balance" between the smolt requirement to achieve run size goals and that needed for the monitoring and evaluation program.

Initial Smolt Production Profile

	Umatilla/Irrigon		Carson/Bonneville		Other Hatcheries	
	Number	Pounds	Number	Pounds	Number	Pounds
Spring Chinook	1,290,000	114,000	450,000	37,500	589,000	58,900
Fall Chinook	5,940,000	99,000	1,060,000	22,600	--	--
Summer Steelhead	210,000	42,000	--	--	--	--
Coho	--	--	--	--	1,000,000	83,300
TOTAL	7,440,000	255,000	1,510,000	60,100	1,589,000	142,200

Initially, fish will be reared at both Umatilla and Irrigon hatcheries (420,000 Wallowa stock summer steelhead will be reared at Umatilla Hatchery for release in the Grande Ronde River in exchange for 210,000 yearling spring chinook and 210,000 Umatilla stock summer steelhead reared at Irrigon Hatchery for release in the Umatilla River) to test the effectiveness of O_2 supplementation and maintain a species profile consistent with long-term objectives.

Initially, 100% of the summer steelhead and 85% of the fall chinook smolt production required for adult return goals will be produced at Umatilla and Irrigon hatcheries with 15% of the fall chinook smolts reared at Bonneville Hatchery. All summer steelhead and fall chinook will be released in the spring as yearling and subyearling smolts, respectively. For spring chinook, only 34% of the required number of smolts will be produced at Umatilla and Irrigon hatcheries with the remainder (66%) produced at Bonneville, Carson, and other hatcheries for release in the Umatilla. The water source for Umatilla and Irrigon hatcheries is too warm to produce a typical 16 month yearling spring chinook smolt. Because the rearing water at these hatcheries is warm, we will experiment with two atypical rearing schemes for spring chinook: 1) yearling spring-released smolts whose growth is initially retarded with chilled water during incubation, and 2) subyearling spring released smolts whose growth is advanced with the elevated ambient temperatures.

All yearling coho (1,000,000) will be produced at Cascade Hatchery for a spring release in the Umatilla.

Facilities Needed to Implement Plan

The Umatilla Hatchery production and design has changed considerably from adoption of Measure 704(i)(1) in 1984 which included production of 40,000 lbs. of summer steelhead under standard rearing. In 1986 Measure 704(i)(1) was amended to authorize construction to produce 160,000 lbs. of salmon and steelhead with full development of the water supply and a 2 pass water re-use system. In 1987, the Measure was amended (now 703-f-1-a) to allow testing of an oxygen supplementation system which would boost production to 290,000 lbs. The use of supplemental oxygen at the Umatilla Hatchery is attractive for three reasons: (1) the increased production would more fully meet smolt requirements for Umatilla River adult return goals, (2) the cost efficiency of producing smolts at the hatchery would be greatly increased, and (3) it would provide an opportunity to thoroughly test the oxygen system which would have systemwide (Columbia Basin) application of results.

The proposed hatchery, located adjacent to Irrigon Hatchery, includes 6 banks of 4 (24 total) Michigan-type raceways which would introduce pure oxygen and 2 banks of 3 and 2 banks of 2 (10 total) standard raceways.

Irrigon Hatchery will serve two important functions in Umatilla Hatchery production and evaluation programs. First, Irrigon's No. 2 well will supply backup water for incubation of eggs at Umatilla Hatchery which provides a safeguard measure in the event of failure of backup pumps at the Umatilla well site. Second, several rearing ponds at Irrigon Hatchery will be used a minimum of four years to conduct the proposed evaluation of O_2 supplementation at the Umatilla Hatchery. It is not possible to make comparisons of O_2 supplemented and standard (Irrigon type) rearing at the Umatilla Hatchery due to shortage of standard rearing ponds and maintain species composition consistent with management objectives.

The two existing acclimation and broodstock collection and adult holding facilities, Bonifer and Minthorn, are being used to test acclimation of

steelhead, subyearling fall chinook, and subyearling and yearling spring chinook. The cool water temperatures of these facilities allows for off-site rearing to meet time/size objectives of yearling spring chinook and steelhead. Broodstock can be collected at Bonifer and Minthorn and the new trapping facility on the east ladder of Three Mile Dam. Holding capacities for Minthorn and Bonifer are estimated at 1,200 and 576 pounds, respectively. No adults can be held at the Three Mile Dam trap.

We do not have sufficient holding and spawning facilities to accommodate anticipated production. Additional holding and spawning facilities will be needed to hold and spawn at least 1,200 spring and 4,600 fall chinook for Umatilla hatchery production alone. Additional capacity will be required for the existing and future spring and fall chinook contributed from other hatcheries. New acclimation facilities may be needed to accommodate the large number of spring and fall chinook smolts programmed for the Umatilla Hatchery program. It is anticipated that at least one additional "dual purpose" satellite designed to acclimate smolts and hold/spawn adults may be needed. Planning for the new satellite should begin upon approval of the Master Plan.

Total capital cost of the hatchery and new satellite is estimated at $14.0 million, and $1.15 million in annual operation and maintenance costs. Improvements at existing and new release sites will cost approximately $145,000.

Monitoring and Evaluation Plan

The Monitoring and Evaluation Plan uses adaptive management to increase knowledge about uncertainties inherent in the Umatilla Fisheries Rehabilitation Program. The Monitoring and Evaluation Plan goals are:

1. Provide information and recommendations for hatchery rearing and fish release strategies, harvest regulations, and natural escapement that will lead to the accomplishment of long term natural and hatchery production goals in the Umatilla River basin in a manner consistent with provisions of the Council's Fish and Wildlife Program.

2. Determine if Umatilla River Basin fishery management objectives are being met.

The monitoring and evaluation uncertainties and objectives are categorized into two general areas of study, hatchery effectiveness and natural production and supplementation. The priorities were established based on their effect on achievement of program goals and the systemwide application of results. A substantial proportion of the production at Umatilla Hatchery will be produced in the "Michigan Type" oxygen supplementation system. This rearing system has not been thoroughly evaluated to determine the effects on smolt-to-adult survival. In addition, the rearing strategies proposed for spring chinook salmon are somewhat different than the normal rearing strategies for spring chinook. The constant water temperature will provide growth conditions that will allow production of subyearling smolts at 15-20 fish/lb. Production of yearling smolts will require an unusually extensive period of incubation in chilled well water. The initial hatchery effectiveness experiments will focus on evaluating and comparing the effectiveness of producing summer steelhead, spring chinook, and fall chinook in the oxygen supplementation system with production in the standard Oregon system and evaluating survival of subyearling and yearling spring chinook smolts. Long range plans include evaluation of the benefits of acclimation and determining the affects of rearing density on smolt-to-adult survival.

There are no naturally spawning fall or spring chinook salmon reproducing in the basin. However, there is a stable population of summer steelhead. One of the primary goals for the basin is to reestablish naturally producing populations of fall and spring chinook and to supplement the native steelhead population. The success of fall and spring chinook natural production is critical to achievement of adult return goals in the basin, therefore high priority has been given to evaluating the natural production success and to determining if the natural production goals can be achieved. We plan to determine the success of steelhead supplementation and to monitor changes in genetic diversity and life history characteristics that result from steelhead supplementation. During the initial phases of evaluation, we will develop baseline data for life history and genetic characteristics, and determine if adequate streams are available to conduct supplementation studies.

The experimental plan including uncertainties, experimental design, ponding allocations, monitoring sites, objectives, hypotheses, budget, and schedule are detailed in the monitoring and evaluation plan.

Fishery Benefits

Based on a model developed under U.S./Canada we estimate a total of 88,878 adult spring and fall chinook and summer steelhead will be contributed toward the Council's doubling goal (escapement to Bonneville plus prior fisheries) including 7,836 spring chinook, 74,957 fall chinook, and 8,589 summer steelhead. In addition, a total of 55,691 adults will be contributed to ocean and Columbia River fisheries, including 2,958 spring chinook, 51,312 fall chinook, and 1,421 summer steelhead.

Harvest Plans

Guidelines for developing annual harvest plans for spring and fall chinook and summer steelhead by CTUIR and ODFW are presented. The purpose of these guidelines is to explain how harvest management will support and integrate with the salmon and steelhead program for the Umatilla River basin.

Coordination and Documentation of the Development of the Master Plan

The Master Plan was jointly developed by ODFW and CTUIR and was reviewed by the Master Plan Technical Work Group which is comprised of technical staff of ODFW, CTUIR, CRITFC, the Council, and BPA. The policy level Umatilla Steering Committee, represented by ODFW and CTUIR, provided planning oversight. Drafts of the Master Plan were reviewed by agencies and interests represented on the Umatilla Coordination Committee, other government agencies and tribes in the Columbia Basin, and appropriate Council and Authority committees.

Recommendations

The following recommendations are made:

1. Construct the Umatilla Hatchery to allow testing of an oxygen supplementation system using one half of the water supply and one half using standard (non-oxygenated) rearing techniques.

2. Initially rear 255,000 pounds of salmon and steelhead smolts at Umatilla and Irrigon hatcheries for release in the Umatilla River including 1,290,000 spring chinook (114,000 pounds), 5,940,000 fall chinook (99,000 pounds), and 210,000 summer steelhead (42,000 pounds).

3. Rear 420,000 Wallowa stock summer steelhead at the Umatilla Hatchery in exchange for 210,000 yearling spring chinook and 210,000 Umatilla stock summer steelhead reared at Irrigon Hatchery to allow testing oxygen supplementation and maintain a species profile consistent with long-term objectives.

4. Continue to develop the summer steelhead hatchery program from naturally produced adults returning to the Umatilla River and give priority to use of naturally produced fish for all future broodstock.

5. Develop the initial spring chinook hatchery stock from Carson spring chinook reared at Lookingglass or Carson National Fish hatcheries (or other suitable and available stocks). Develop fall chinook stock from Upper River Bright fall chinook stock from Bonneville or Priest Rapids hatcheries. As runs increase, give priority to use of naturally produced adults returning to the Umatilla for broodstock.

6. Release 420,000 summer steelhead produced at Umatilla Hatchery at Wallowa Hatchery on the Grande Ronde River. Release 210,000 steelhead produced at Irrigon Hatchery at Bonifer, Minthorn and in the Umatilla River. Release spring chinook produced at Umatilla (1,080,000 advanced subyearlings released in the spring) and Irrigon (210,000 yearlings) in the upper Umatilla River. Release production of fall chinook (5,940,000 subyearlings released in the spring) reared at Umatilla Hatchery in the mainstem Umatilla River.

7. Implement fish passage, habitat improvement, and flow enhancement projects proposed for the Umatilla.

8. Determine most effective use of available water at Minthorn and Bonifer facilities, and identify modifications necessary to maximize efficiency in collecting, holding, and spawning adult broodstock.

9. Locate, design, and construct new facilities in the Umatilla Basin to acclimate smolts and collect, hold, and spawn adult fish.

10. Modify existing and plan new release locations that will provide adequate dispersal of fish.

11. Form a Umatilla Experimental Design Work Group to more fully develop experimental designs of specific research for hatchery effectiveness and natural production/supplementation studies.

12. Integrate the Master Plan with the Subbasin Plan being developed for the Umatilla Basin.

13. Using harvest plan guidelines in the Master Plan, develop annual harvest plans for each species which will provide specific allocation of Indian and non-Indian fisheries in the Umatilla Basin.

14. Continue to coordinate with the Umatilla Steering and Coordination Committees, the appropriate Council and Authority System Planning and TWG's, and fish and wildlife agencies and tribes and BPA to integrate the Umatilla Hatchery Program with other fish enhancement programs in the Columbia River basin.

INTRODUCTION

In the Northwest Power Planning Council's (Council) 1984 amendment to their Fish and Wildlife Program (NPPC 1984), Measure 704(d)(1) lists actions necessary to rehabilitate steelhead and salmon in the Umatilla River to partially mitigate for losses caused by the Federal Columbia River Hydropower System. The Umatilla River once supported large runs of spring and fall chinook and coho salmon and summer steelhead which provided productive fisheries for both Indians and non-Indians. However, salmon were effectively eliminated from the Umatilla River over 70 years ago, and today only a run of 2,000 summer steelhead exist, a fraction of historical levels.

The dramatic decline of summer steelhead and elimination of salmon in the Umatilla River is largely attributed to construction of Columbia River hydroelectric dams and hydroelectric and irrigation diversions on the Umatilla River. Hermiston Power and Light Hydroelectric Project (Rm 10) and Three Mile Dam (Rm 3) (Figure 1) built on the Umatilla River in 1910 and 1914, respectively, are believed to have caused the largest decline of salmon and steelhead in the Umatilla Basin. Additional fish losses in the basin resulted from habitat degradation and loss of streamflows through diversion of already naturally low flows.

In early 1986 the Oregon Department of Fish and Wildlife (ODFW), in cooperation with the Confederated Tribes of the Umatilla Indian Reservation (CTUIR) and other fishery agencies, completed the Comprehensive Plan for Rehabilitation of Anadromous Stocks in the Umatilla River Basin (ODFW 1986). The plan established state and tribal fishery production objectives, identified

and estimated potential benefits of stream rehabilitation and flow enhancement projects, and developed a plan to set priorities, implement rehabilitation projects, and evaluate the projects. The ODFW and CTUIR recognized that intensive reintroduction and supplementation using hatchery fish, except steelhead, would be required to achieve natural and hatchery production goals. Therefore, implementation of a hatchery production program including, construction of a major hatchery and associated facilities, received highest priority.

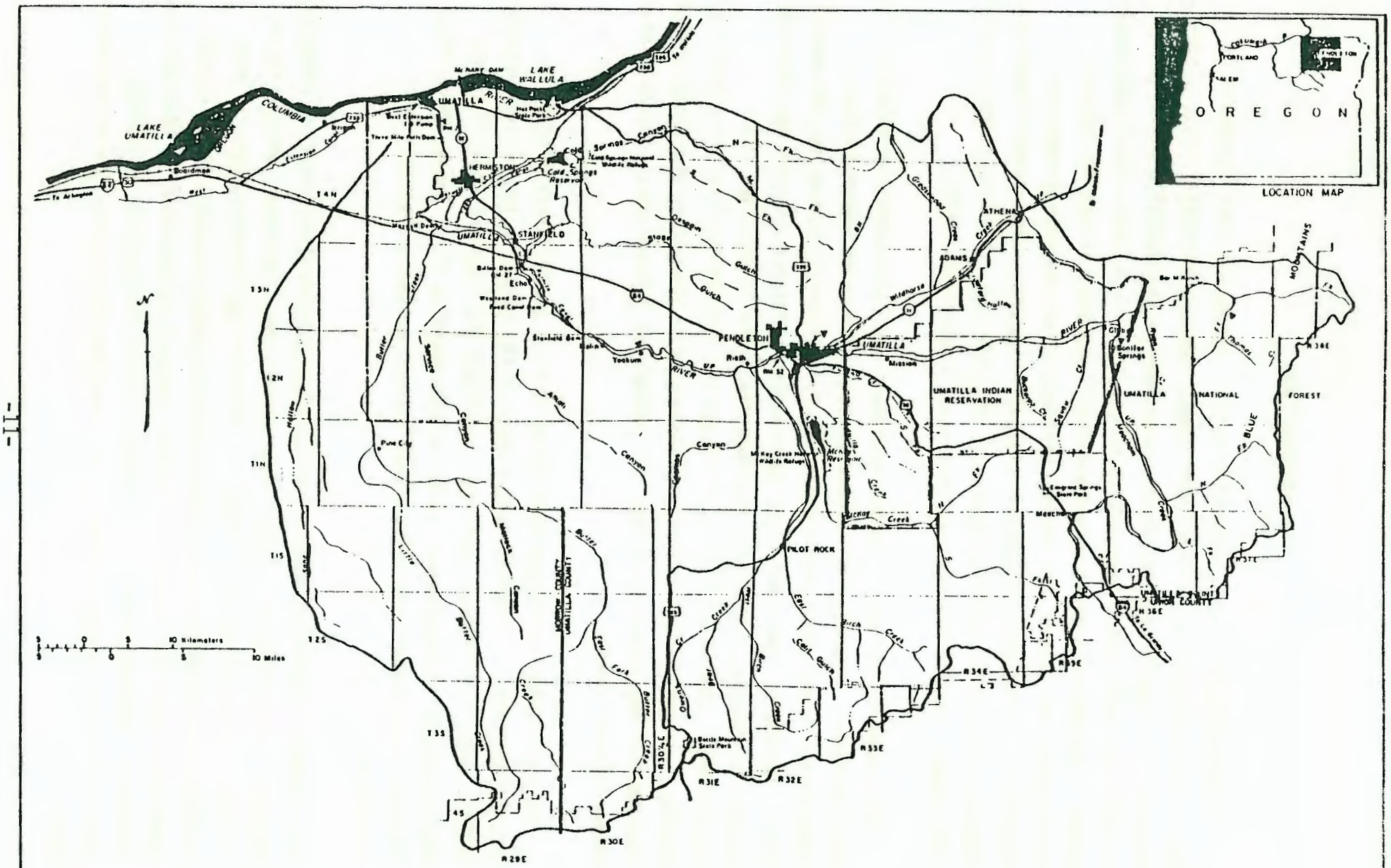

Figure 1. Location map, Umatilla Basin.

One of the measures originally recommended for the Council's Fish and Wildlife program by the CTUIR and ODFW was the proposed construction of hatchery and juvenile release/adult collection facilities in the Umatilla River basin. In 1982, the Council adopted Measure 704(i)(1) to construct juvenile release/adult collection facilities on CTUIR land. Construction of Bonifer and Minthorn Springs facilities on CTUIR land was completed in 1983 and 1985, respectively. In 1984, Measure 704(i)(1) was amended to include construction of a hatchery to produce 200,000 summer steelhead smolts for transfer to these acclimation ponds and subsequent release in the Umatilla River. In 1986, it was noted that full development of the available water supply at the proposed hatchery site would increase production from 40,000 lbs (200,000 summer steelhead @ 5/lb) to 160,000 lbs. Measure 704 (i)(1) was then amended to authorize construction to produce 160,000 pounds of steelhead and salmon. In 1987 the measure, (now 703-f-1-a) (NPPC 1987), was adopted to allow testing of an oxygen supplementation system at the Umatilla Hatchery which would increase the production from 160,000 lbs to 290,000 lbs by rearing fish in oxygenated water.

Prior to construction of the Umatilla Hatchery, the Council required the ODFW and CTUIR to develop a facility Master Plan for their approval (Measure 703-f-1-a). The Master Plan was to include, for each species, discussion of the following:

1. Rearing and release schedules and sites where hatchery fish will be released.

2. A detailed production profile that includes the broodstock source, numbers of fish to be released, and expected adult returns.

3. A description of related harvest plans.

4. Proposed management policies and hatchery practices to insure that hatchery releases protect the genetic integrity of native stocks, are disease free, and are coordinated with other fish and wildlife agencies and tribes in the Columbia River basin.

5. A proposal for biological monitoring and evaluation studies to assess: the effectiveness of outplanting facilities in supplementing natural production in a biologically sound manner; the effects of outplanting on resident fish populations; and the effectiveness of oxygen supplementation techniques.

6. Evidence of coordination with System Planning described in Section 205 of the Council's Fish and Wildlife Program.

This Umatilla Hatchery Master Plan was developed jointly by the ODFW and CTUIR in cooperation with CRITFC (Columbia River Intertribal Fish Commission), the Council, and the Bonneville Power Administration (BPA). When completed, the plan will have been reviewed by the Washington Department of Fisheries, Washington Department of Wildlife, Idaho Department of Fish and Game, National Marine Fisheries Service (NMFS), U.S. Fish and Wildlife Service (USFWS), U.S. Forest Service (USFS), and the Warm Springs, Yakima, and Nez Perce tribes. ODFW and CTUIR will continue to work with the appropriate Council and Authority System Planning and technical committees and other fish and wildlife agencies and tribes to integrate this program with other hatchery production and monitoring and evaluation programs within the Columbia Basin.

FISHERIES MANAGEMENT AND HATCHERY PRACTICES POLICIES

The following fishery management and hatchery practices policies have been established to ensure Umatilla River Fishery Rehabilitation Program goals are achieved in a manner consistent with the Council's programs for increasing natural and hatchery production in the Columbia River basin. Management and production goals expressed are for the Umatilla River basin, including production from donor hatcheries in addition to the Umatilla Hatchery. As natural production increases in the Umatilla River basin, production from these hatcheries could be released in other basins.

System Policies for Doubling Runs

In its 1987 amendments to the Columbia Basin Fish and Wildlife Program, the Council approved a framework for rebuilding runs of salmon and steelhead. This framework includes a goal and system policies to guide achievement of that goal. The current goal of the Council's program is to double average adult runs (escapement to the mouth of the Columbia plus contribution to prior fisheries) from 2.5 to 5.0 million annually. The Umatilla Hatchery is being designed to increase adult salmon and steelhead runs in the Columbia Basin by nearly 89,000 (88,878) adults. The following System Policies will guide achievement of Umatilla Basin production goals.

Adaptive Management

The adaptive management principle (Section 204-g of the Council's Fish and Wildlife Program), will be followed to guide planning and implementation of the Umatilla River program. Application of the adaptive management principle will involve the following five steps.

Step 1. Formulation of Management and Production Goals for the Umatilla River Basin.

These rehabilitation goals have been established by CTUIR and ODFW:

A. Reestablish runs of chinook and coho salmon into the Umatilla River basin.

B. Enhance production of summer steelhead through supplementation of naturally producing populations in the basin.

C. Provide sustainable Indian and non-Indian harvest of salmon and steelhead.

D. Maintain the genetic character of naturally producing populations of salmonids native to and reestablished in the Umatilla River basin.

E. Achieve the following goals for adult returns to Three Mile Dam:

	Hatchery Production	Natural Production	Total
Spring chinook salmon	10,000	1,000	11,000
Fall Chinook salmon	10,000	11,000	21,000
Summer steelhead	5,670	4,000	9,670
Coho	6,000	Undetermined	6,000

These goals are consistent with the Council's system production policies and will be refined during system planning, integration, and evaluation.

Step 2. Identification of Critical Areas of Scientific Uncertainty Affecting Achievement of Umatilla River Program Goals.

Critical areas of uncertainty regarding achievement of program goals are:

A. To what extent can we use O_2 supplementation during rearing to increase the efficiency of producing fall chinook and summer steelhead adults for hatchery and natural production.

B. Will releases of subyearling and yearling spring chinook smolts produced at the Umatilla Hatchery achieve the desired level of production.

C. To what extent can we use O_2 supplementation during rearing to increase the efficiency of producing spring chinook adults for hatchery and natural production.

D. Whether natural production potential of fall chinook and spring chinook is less than, equal to, or greater than natural production goals.

E. To what extent will acclimation of spring chinook, fall chinook, and summer steelhead smolts enhance smolt-to-adult survival and homing.

F. To what extent will supplementation enhance natural production of summer steelhead.

G. To what extent will supplementation alter the genetic diversity and life history characteristics of the native steelhead population.

H. To what extent will rearing density influence the efficiency of producing spring chinook, fall chinook, and summer steelhead adults in the O_2 and standard rearing systems.

I. To what extent will large releases of hatchery reared chinook affect native steelhead populations.

J. To what extent will release strategies (size, time, location) affect supplementation success.

These areas of scientific uncertainty form the basis for the proposed monitoring and evaluation plan which is described in detail in the Monitoring and Evaluation Plan section of this document.

Step 3. Hypothesis formulation.

As an important foundation for evaluation and monitoring, statistically testable hypotheses for hatchery effectiveness and natural production/supplementation research have been formulated by the Umatilla Hatchery Master Plan Technical Work Group.

Experiments testing these hypothesis will assess progress toward achieving state and tribal management objectives for the Umatilla River and the Council's system program for doubling runs in the Columbia River basin.

Step 4. Taking Action to Test the Uncertainties

A proposal to test uncertainties is presented in the Monitoring and Evaluation Plan. The experimental design has been reviewed by the Council's Monitoring and Evaluation Group (MEG).

Step 5. Measure Results at an Acceptable Level of Precision and Accuracy.

Monitoring and evaluation is being designed to provide levels of precision necessary to evaluate progress towards doubling runs in the Columbia River. Achievement of Umatilla Basin goals while maintaining reasonable costs is emphasized.

Step 6. Management Response to Monitoring and Evaluation Results.

A review process will be developed to incorporate results of monitoring and evaluation into the management decision process (i.e., adjustment of stocks and rearing, release, and outplanting strategies).

Genetic Risk Assessment

Genetic concerns are raised when imported stocks are mixed with locally adapted native stocks or when hatchery spawning practices alter normal genetic exchange. It is the policy of the CTUIR and ODFW to maintain the genetic integrity of the native summer steelhead population. Procedures for broodstock development and formulation of outplanting strategies and evaluations will be proposed to address genetic concerns about native steelhead and will be coordinated with the Council's genetic conservation programs as they are developed. Due to the absence of salmon in the Umatilla River basin, the initial genetic concern for salmon is selection of appropriate donor stocks to begin the program. Future production programs involving salmon will be managed to support rebuilding of natural runs.

Escapement

Development of the Umatilla River program assumes in-river and terminal harvests will be controlled to ensure that sufficient numbers of adults escape to support broodstock needs, natural spawning, and monitoring and evaluation programs.

Hatchery Practices

Broodstock Selection

Hatching programs can affect genetics by initial broodstock selection and spawning practices. For the Umatilla River program, broodstock selection will be determined by the following considerations in order of priority:

A. Numbers of each stock available in the Umatilla River basin.

B. Available stocks from other sources which have genetic characteristics that are suitable for the basin.

C. Available stocks from the closest hatchery.

Specific criteria regarding broodstock selection for each species and race are detailed in the Production Profile section of this document.

Whenever practicable, first generation (F1) returns of summer steelhead from a hatchery year class, as identified by fin marks, will not be used for broodstock. This guideline attempts to minimize any detrimental effect hatchery rearing may have on the genetic character of native steelhead in the Umatilla Basin.

Spawning Practices

Spawning will be guided by the following principles:

A. Eggs will be used from broodstock collected throughout the run to provide and maintain genetic variability of life history traits such as run timing, body size, age composition, and fecundity.

B. Matings will be random, with male to female ratios and gamete crosses appropriate for breeding population sizes.

C. Adults returning to the Umatilla River will be used for broodstock as soon as they become available.

The hatchery production program seeks to maintain the genetic character of the native summer steelhead population using accepted spawning, rearing, and release procedures. Changes in hatchery production may be implemented in the future when the Council's Gene Resource Conservation policy is completed. Until this policy is completed, production practices are designed to minimize genetic drift and inbreeding depression[1] through stock selection, collection of adequate numbers of broodstock, and spawning procedures that will randomize fertilization (Kapusinski and Jacobson 1987). When possible, naturally produced fish will be used as broodstock and more than 60 fish will be spawned (Kincaid 1983; Kapuscinski and Lannan 1986). Male to female ratios will be 1:1 if the number of broodstock is between 60 - 250 and 2:3 when the number of broodstock is greater than 250 fish (Gharret and Shirley 1985). If severe shortages of males or constraints in the adult holding facilities results in the need to collect more females than the above ratios, a gamete split-cross fertilization scheme (personal interview August 1987, with Al Hemmingson ODFW Technical Services Section, Corvallis, Oregon) will be followed[2]. This will avoid the situation whereby a highly viable male dominates egg fertilization.

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[1] Genetic drift and inbreeding depression are deleterious effects on the genetic character of populations. This occurs when a large diverse gene pool (heterozygosity) is lost due to the use of only a few individuals in the breeding population.

[2] A method to maximize genotypes (increase heterozygosity) when artificially breeding small populations of fish. Eggs from each female are split into two equal groups and each group is fertilized by a different male. Each male fertilizes only two groups of eggs, each of which is from a different female.

Outplanting Strategies

It is the goal of the monitoring and evaluation program to identify and develop rearing and release strategies which avoid the creation of adverse interactions between hatchery and naturally produced stocks. Potential interactions include inter- and intra-specific competition for food and space, predation, interbreeding of stocks, and disease transmission. Accordingly, hatchery produced smolts will be released in a manner intended to reduce adverse interactions and to provide information necessary to determine the most effective hatchery release strategies (size, time, age of release) and locations. Initially, no instream releases of steelhead will be made (except for acclimation studies) until programs to evaluate supplementation and genetic impacts have been developed by the Council.

Disease Control

Control of disease in hatchery fish will receive a high priority in the Umatilla River program. Guidelines of the Pacific Northwest Fish Health Protection Committee (Wold et al. 1987) provide a basis for the fish health regulations under which the hatchery will operate. Regulations will be jointly developed by CTUIR and ODFW.

PRODUCTION PROFILE

Introduction

Fish culture is an important tool fisheries managers will use to accomplish the objectives of the Umatilla River program. Hatchery produced smolts will be released in the Umatilla River to reintroduce runs of spring and fall chinook and coho salmon and to enhance the existing run of naturally produced summer steelhead. Resultant adult returns will allow Indians and non-Indians the opportunity to harvest substantial numbers of fish in the Umatilla River and throughout the Columbia Basin. All fish produced at the facility will be released off-station in various suitable locations within the Umatilla and other basins if mutually decided by ODFW and CTUIR.

This section discusses the plans for producing fish at the Umatilla Hatchery, strategies for releasing hatchery reared fish in the Umatilla Basin, and inbasin constraints affecting survival of released fish. As the program develops and evaluation determines the best rearing and release methods, managers will have the opportunity to modify hatchery smolt production and releases to take advantage of the most efficient strategies. This plan outlines the initial phase of a dynamically evolving program and is not the final long-term production program. Models and parameters used to determine hatchery smolt capacities and basin production goals are estimates at this time and are acknowledged as areas of uncertainty. Experimental design, including hypotheses to be tested and marking and sampling programs to address those uncertainties, are discussed in the Monitoring and Evaluation Plan section. Natural production will be maximized by protecting and enhancing habitat, promoting instream flow enhancement projects, selectively releasing hatchery reared smolts, and managing harvest.

Species, Numbers, and Pounds of Fish Required to Achieve

Run Size Goals

The CTUIR and ODFW have established run size goals (in terms of adult returns to Three Mile Dam) of 11,000 naturally and hatchery produced spring

chinook, 21,000 fall chinook, and 9,670 summer steelhead (Table 1) (see Appendix A for methods to derive run size and escapement goals). Achievement of these goals for adult return will be accomplished by release of smolts produced at Umatilla Hatchery as well as other hatcheries in the Columbia Basin. We believe that the run size goal for summer steelhead will be achieved 5 years following completion of the Umatilla Hatchery (Table 1). The buildup rate for summer steelhead will be fairly rapid because a successful hatchery program for this species has already been developed and we will be releasing the entire number of smolts required for the run size goal in 1991 one year after the estimated completion of the Umatilla Hatchery.

Table 1. CTUIR/ODFW run size goals and anticipated adult returns from hatchery releases of spring and fall chinook and summer steelhead in the Umatilla River.

	Run Size Goals[1]			Adult Returns[1]			
Species	Natural	Hatchery	Total	Existing	5 Year[2]	10 Year[2]	15 Year[2]
Spring chinook	1,000	10,000	11,000	<100	3,600	7,200	11,000
Fall chinook	11,000	10,000	21,000	<1,000	10,500	21,000	21,000
Summer steelhead	4,000	5,670	9,670	2,500	9,670	9,670	9,670
Total	16,000	25,670	41,670	<3,600	23,770	37,870	41,670

[1] Adult returns to Three Mile Dam.
[2] Number of years after the anticipated completion of the Umatilla Hatchery (1990).

The build-up rates for spring and fall chinook will be comparatively slow since the hatchery programs for these species need to be developed. We estimate that the fall chinook run size goal will not be met until year 10, and spring chinook year 15 after completion of the Umatilla Hatchery (Table 1). Chinook broodstock programs need to be developed and proper rearing and release strategies need to be assessed based on results of the monitoring and evaluation program. Broodstock needs for the chinook programs are extremely large, 4,603 fall and 1,220 spring chinook adults for the initial production at the Umatilla Hatchery alone, which may require several years to achieve. We may not be able to obtain enough broodstock from outside hatcheries to meet initial needs for the Umatilla Hatchery.

The spring chinook hatchery development program will be further limited by the number of smolts released in the basin. As will be discussed, we will initially release the entire smolt requirement to achieve run size goals for summer steelhead and fall chinook. In contrast, we will be releasing only 60% of the required number of smolts for the spring chinook run size goal from production at Umatilla, Carson, and Bonneville hatcheries. Other to-be-identified hatchery facilities will be required to produce the remainder of the spring chinook requirement. The proposed Northeast Oregon Hatchery facilities (1995 estimated completion) may meet this need.

Initially, in order to conduct the planned monitoring and evaluation studies, fish will be reared at both Umatilla and Irrigon hatcheries.[3] These two hatcheries will produce all of the summer steelhead and 85% of the fall chinook smolt production required for adult return goals (Table 2). The remainder of the fall chinook smolts (15%) will be produced at Bonneville Hatchery. Only 34% of the required number of spring chinook smolts will be produced at Umatilla and Irrigon hatcheries, with the remainder (66%) produced at Bonneville, Carson, and other hatcheries for release in the Umatilla (Table B1, Appendix B).

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[3] To test the effectiveness of O_2 supplementation and maintain a species profile consistent with long-term objectives, 420,000 Wallowa stock summer steelhead will be reared at Umatilla Hatchery under O_2 supplemented and standard conditions for release at Wallowa Hatchery in exchange for 210,000 yearling spring chinook and 210,000 Umatilla stock summer steelhead reared at Irrigon Hatchery under standard conditions for release in the Umatilla River (see Monitoring and Evaluation Plan Section for further discussion).

Table 2. Initial smolt production profile for the Umatilla River program.

Species	Number of Smolts[1]					
	Umatilla/Irrigon[2]		Carson/Bonneville		Other Hatcheries	
	Number	Pounds	Number	Ponds	Number	Pounds
Spring Chinook	1,290,000	114,000	450,000	37,500	589,000	58,900
Fall Chinook	5,940,000	99,000	1,060,000	22,600	--	--
Summer Steelhead	210,000	42,000	--	--	--	--
Total	7,440,000	255,000	1,510,000	60,100	589,000	58,900

[1] Criteria used to determine number of smolts is presented in Appendix C.
[2] This is the initial number of smolts to be reared based on requirements of the monitoring and evaluation program. Future production at the hatchery will vary dependent on results and subsequent priorities of the monitoring and evaluation program.

It should be emphasized that the production profiles in Table 2 and described herein are the initial profiles based on estimated smolt release and adult return requirements of the proposed hatchery evaluation plan. These profiles will change in the future depending on the results and subsequent priorities of the hatchery monitoring and evaluation program or priorities established by ODFW and CTUIR.

A summary of salmon and steelhead smolt production and releases into the Umatilla Basin following completion of the Umatilla Hatchery is presented in Table B1 of Appendix B.

The approximate theoretical loading density of large (5/lb) smolts at Umatilla Hatchery is 290,000 lbs (Appendix C). Because a large proportion of the evaluation requirement is production of subyearlings which cannot be ponded at a high density, we have initially programmed hatchery production at 255,000 lbs (Table 2).

The production profiles presented emphasize spring chinook, fall chinook, and summer steelhead, the species that will initially be reared at Umatilla Hatchery. Coho salmon are presently being released in the Umatilla from Cascade Hatchery (1,000,000/year under U.S. v. Oregon) to provide immediate

returns for harvest in the Umatilla River. However, since coho are not currently proposed to be reared at the Umatilla and Irrigon hatcheries, we have not included a production profile for this species in the Master Plan.

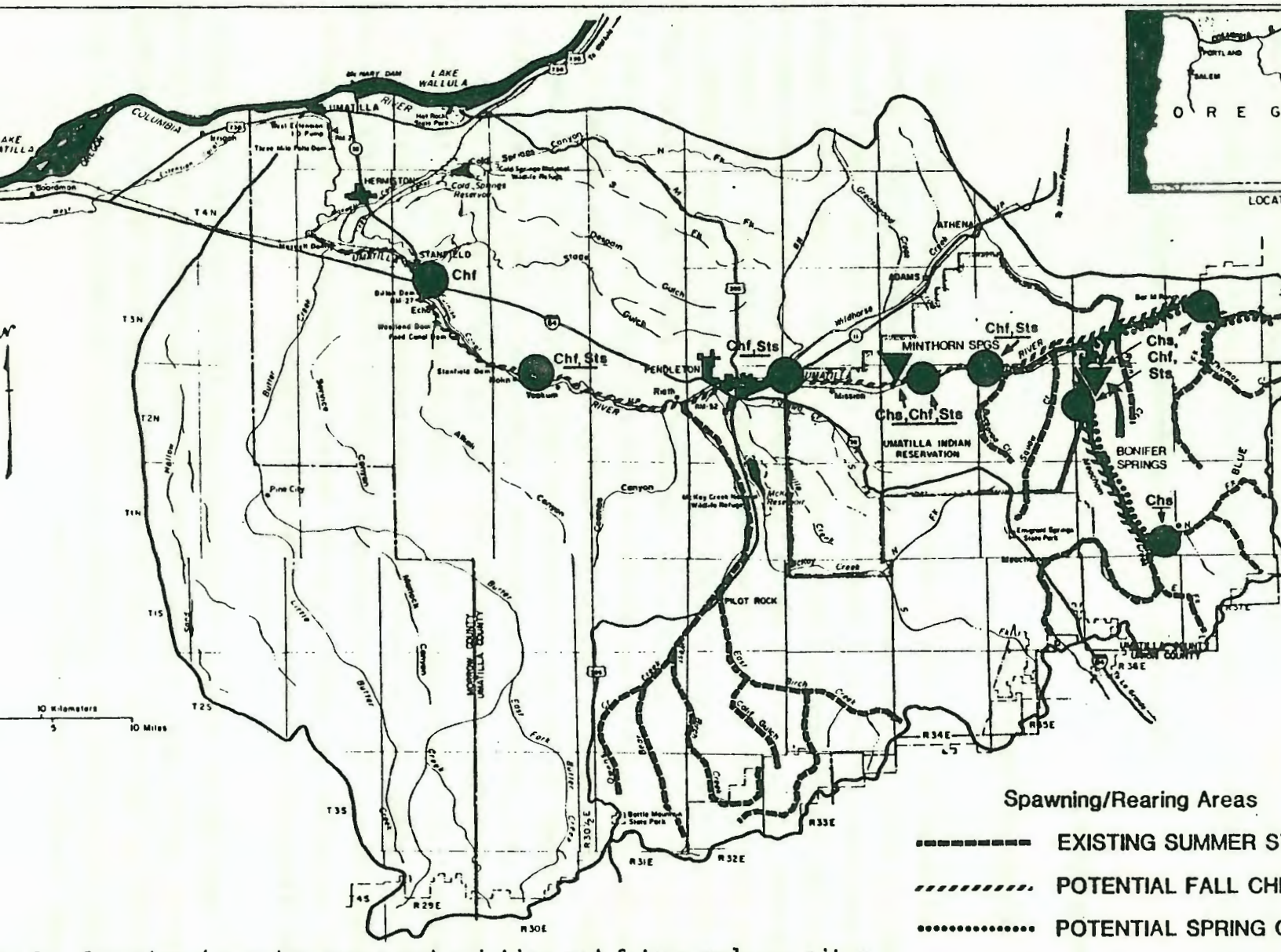
Production Profiles and Release Strategies

Spring Chinook

Historical Perspective

Although once abundant, spring chinook have not been present in the Umatilla River for many years. Historically, the Lewis and Clark journals document the presence of a large village at the mouth of the Umatilla River where 700 Indians were anxiously awaiting the arrival of the spring chinook (Thwaites 1905). This was one of the largest villages seen between The Dalles area and the mouth of the Snake River in the spring of 1806. The largest run of chinook within memory of white men was recorded in 1914 when Indians and non-Indians caught "thousands upon thousands of salmon from spring to fall" at the site of Three Mile and Hermiston Power and Light dams (Van Cleve and Ting 1960). These records indicate that spring, summer, and fall chinook salmon were abundant in the Umatilla River and that construction of these dams created areas where fish congregated. These authors state that noticeable declines in salmon and steelhead runs were reported in the years after construction of these dams. The last recorded sport harvest of 41 spring chinook salmon from the Umatilla River was reported by the Oregon Game Commission in 1956. Extensive water withdrawals from the Umatilla River basin for irrigation and domestic use and habitat degradation also contributed to the elimination of chinook from the Umatilla River.

There are an estimated 41 miles of spring chinook spawning and rearing habitat in the Umatilla Basin (Figure 2) including Meacham Creek to the Forks (15 miles), North Fork Meacham (5 miles), upper mainstem Umatilla from Meacham Creek to the North and South Forks (11 miles), and the North (5 miles) and South (5 miles) Fork Umatilla River.



re 2. Spawning / rearing areas and existing and future release sites for spring and fall chinook and summer steelhead in the Umatilla Basin.

Hatchery Production

The CTUIR and ODFW have begun restoring spring chinook by releasing 475,000 hatchery juveniles in 1986, 300,000 in 1987, and 450,000 in 1988. Some adults returned from these releases in 1988 (Table 25).

Because no indigenous spring chinook stocks exist, broodstock will be selected from available stocks that have been used successfully in other hatchery programs above Bonneville Dam. The broodstock will be selected for early (March-May) time of upstream migration because the Umatilla River often experiences low water flows as early as May. Sources of broodstock being considered for initial use include the Carson National Fish Hatchery in Washington and the Lookingglass Hatchery in Oregon from which Carson or Rapid River stock fish are expected to be available. Additional broodstock may become available from the John Day in Oregon, Yakima River in Washington, or from the Rapid River Hatchery in Idaho. As adult fish begin returning to the Umatilla River, broodstock will be taken from those returns. This will require managers to balance the needs of broodstock collection, harvest, and natural escapement. Eventually the entire hatchery egg take will be obtained from fish returning to the Umatilla River.

We estimated smolt production requirement using survival and fecundity information obtained from ODFW hatchery records and from the U.S. v. Oregon proceedings (Table 3). Initially we plan to annually produce 1,290,000 smolts at Umatilla Hatchery (Table 4). Another 450,000 smolts will be produced annually at the Carson and Bonneville hatcheries for release in the Umatilla River. An additional 589,000 smolts will still be needed annually to achieve the full spring chinook production objective.

Table 3. Survival and fecundity estimates used for spring chinook production needs for the Umatilla River program.

Life history stage	Estimated Survival	Source
Adult prespawning	0.80	ODFW
Egg-to-smolt	0.56	ODFW
Smolt-to-returning adult		
Subyearling (spring release)	0.0020	Estimate
Subyearling (fall release)	0.0040	Estimate
yearling	0.0075	U.S. v. Oregon
Fecundity ..... 4,000 eggs/female		U.S. v. Oregon

Table 4. Spring chinook production profile for the Umatilla River program.

	Umatilla/Irrigon	Carson/Bonneville	Other Hatcheries
Number of smolts	1,290,000	450,000	589,000
Number of eggs	2,303,571	803,571	1,051,786
Number of female spawners	720	271	329
Number of male spawners	480	181	219

Rearing Strategies

Based on priorities established for the monitoring and evaluation program, we will rear 1,080,000 subyearling and 210,000 yearling spring chinook at the Umatilla and Irrigon hatcheries (Table 4) to test the effectiveness of O_2 supplementation, to evaluate differences in survival between passes in the hatchery ponds, and to evaluate the relative effectiveness of yearling and subyearling spring chinook smolt releases. The subyearlings will be reared at the Umatilla Hatchery using both O_2 supplemented and standard rearing, and the yearlings will be reared at Irrigon Hatchery under standard rearing only.

We currently do not know the optimum size and time for release of spring chinook juveniles in the Umatilla River. Temperature of the well water at the Umatilla/Irrigon complex is ideal for rapid fish growth and has the capability to grow subyearling spring chinook smolts large enough for release during

their first spring or fall. Due to the limited hatchery space, initially we will evaluate releases of large subyearlings in April since it is felt that this (spring time) is the normal migration period for spring chinook and should result in the highest survival. Growth analyses indicate these subyearlings will average 15/lb by late spring when they are released.

In order to rear the full-term (yearling) smolts at Irrigon Hatchery, it will be necessary to delay hatching of eggs by chilling the incubation water supply for several (9-10) months. At release in the spring, these delayed-growth yearlings will average 5/lb.

To achieve the remainder of the spring chinook smolt requirement, 100,000 yearlings (20/lb) will be reared at Carson National Fish Hatchery and 350,000 (10 and 12/lb) at Bonneville Hatchery for release in the Umatilla River (Table 5). An additional 589,000 yearlings (10/lb) will be reared at other hatcheries for release in the Umatilla River, probably at the proposed Northeast Oregon Hatchery facilities.

Outplanting and Broodstock Collection

Release sites for spring chinook (Table 6) were selected to support the planned monitoring and evaluation studies and to achieve production (including hatchery broodstock needs), harvest, and natural escapement goals established by the ODFW and CTUIR. Spring chinook subyearling and yearlings (1,080,000 and 210,000, respectively) reared at the Umatilla Hatchery will be released in the

Table 5. Rearing and time of release schedule for spring chinook produced at the Umatilla/Irrigon and other hatcheries.

Umatilla/Irrigon

Hatchery	Smolt Production: Number	Size (fish/ lb)	Weight (lbs)	Standard or O_2 reared	Release information: Age	Season	Expected adult return	% of run size goal
Umatilla	720,000	15	48,000	O_2	0+	Spring	1,440	13
Umatilla	360,000	15	24,000	Standard	0+	Spring	720	7
Irrigon	210,000	5	42,000	Standard	1+	Spring	1,575	14
Total	1,290,000		114,000				3,735	34

Other Hatcheries

Hatchery	Smolt Production: Number	Size (fish/ lb)	Weight (lbs)	Release information: Age	Season	Expected adult return	% of run size goal
Carson	100,000	20	5,000	1+	Spring	750	7
Bonneville	200,000	10	20,000	1+	Spring	1,500	14
Bonneville	150,000	12	12,500	0+	Fall	600	5
Other	589,000	10	58,900			4,415	40
Total	939,000		91,400			6,515	66

Table 6. Release locations for spring chinook produced at the Umatilla/Irrigon and other hatcheries.

Hatchery	Release location	Number	Age	Season	Purpose(s)
Umatilla/ Irrigon	Upper Umatilla mainstem and tributaries	1,080,000	0+	Spring	0_2 and survival studies/hatchery production
Umatilla/ Irrigon	Upper Umatilla mainstem and tributaries	210,000	1+	Spring	0_2 and survival studies/hatchery production
Carson	Upper Umatilla mainstem and tributaries	100,000	1+	Spring	Natural production
Bonneville	Bonifer/Meacham Cr. near Bonifer	150,000	0+	Fall	Acclimation studies/hatchery production
Bonneville	Bonifer/Meacham Cr. near Bonifer	200,000	1+	Spring	Acclimation studies/hatchery production
Other	Upper Umatilla mainstem	589,000	1+	Spring	Hatchery production

upper mainstem (Figure 2) for the 0^2 and survival studies and to contribute towards hatchery production, harvest, and escapement goals.

Spring chinook yearlings reared at Carson (100,000) will be released in natural spawning areas in the upper mainstem and tributaries for natural production, harvest, and escapement. Additional spring chinook yearlings (350,000) from Bonneville will be released at Bonifer (1/2 in the pond and 1/2 nearby in the Umatilla River) for spring and fall acclimation studies and hatchery production and harvest. Spring chinook yearlings (589,000), which will be reared at other facilities, will be released in the upper Umatilla River for hatchery production and harvest purposes.

We will collect spring chinook broodstock at the Three Mile Dam, Bonifer, and Minthorn facilities. Construction of new facilities plus possible modification of the existing Bonifer and Minthorn sites will be necessary to collect, hold, and spawn spring chinook broodstock (see Facilities section).

Fall Chinook

Historical Perspective

Van Cleave and Ting (1960) document an abundance of fall chinook in the Umatilla River in 1914. The runs of fall chinook were eliminated in the early 1900s. Recent interest in reestablishing runs in the Umatilla River has resulted in releases of hatchery smolts during 1982-88 (Table 7).

Table 7. Releases of fall chinook into the Umatilla River, 1982-88.

Brood Year	Release Year	Hatchery of Origin	Number of Smolts	Size (fish/lb)	Stock Source
1981	1982	Bonneville	3,828,500	79-130	Tule[1]
1982	1983	Bonneville	100,000	5.9	URB
1983	1984	Bonneville	223,600	9.0	URB
1983	1984	Bonneville	637,200	86	URB
1984	1985	Bonneville	3,222,000	85	URB
1984	1985	Bonneville	198,100	7.5	URB
1984	1985	Bonneville	50,000	16	URB
1985	1986	Irrigon	190,900	4.9	URB
1985	1986	Irrigon	35,600	12	URB
1985	1986	Irrigon	2,030,000	86	URB
1986	1987	Irrigon	1,475,190	53-69	URB
1986	1987	Irrigon	108,657	7.9	URB
1986	1987	Irrigon	102,280	8.0	URB
1986	1988	Bonneville	100,792	8.8	URB
1986	1988	Bonneville	99,550	10.2	URB
1987	1988	Irrigon	1,900,000	60	URB
1987	1988	Irrigon	1,400,000	90	URB
1987	1988	Irrigon	14,000	9.8	URB
1987	1988	Irrigon	75,000	8.6	URB

[1] Upper River Bright

We estimate 103 miles of fall chinook spawning and rearing habitat remain in the Umatilla River, including the mainstem Umatilla River to the Forks (88 miles) and Meacham Creek to the Forks (15 miles) (Figure 2). About 85% of the fall chinook spawning gravel in the mainstem Umatilla is above Pendleton (Rm 55-88).

Hatchery Production

The Upper River Bright (Hanford) stock is the only available and appropriate stock of fall chinook in the upper Columbia Basin for the Umatilla River program. Broodstock may be obtained either at Bonneville Hatchery on the lower Columbia River or Priest Rapids Hatchery on the mid-Columbia River. As adults begin returning to the Umatilla River, broodstock will be taken at Three Mile Dam and at the acclimation facilities. Eventually all broodstock will be taken from fish returning to the Umatilla River.

We estimated smolt production requirements using survival and fecundity estimates from ODFW hatchery records and the Comprehensive Plan (Table 8). Initially, we plan to annually produce 5,940,000 subyearling smolts (85% of the fall chinook smolt requirement) at the Umatilla/Irrigon Hatchery (Table 9). Another 1,060,000 smolts (15% of the fall chinook smolt requirement) will be produced annually at Bonneville Hatchery for transport and release in the Umatilla River.

Table 8. Survival and fecundity estimates used for production needs of fall chinook salmon for the Umatilla River Program.

Life Stage	Estimated survival	Source
Adult prespawning	0.80	ODFW
Egg-to-smolt[1]	0.64	ODFW
Smolt-to-adult	0.003	Comprehensive Plan
Fecundity .....4,200 eggs per female		ODFW

[1] Subyearling (spring release)

Table 9. Fall chinook production profile for the Umatilla River program.

	Umatilla	Bonneville Hatchery
Number of smolts	5,940,000	1,060,000
Number of eggs	9,281,250	1,892,857
Number of female spawners	2,762	563
Number of male spawners	1,841	376

Rearing Strategies

For the proposed monitoring and evaluation program, we will initially rear 5,940,000 subyearling fall chinook at the Umatilla Hatchery (Table 10) to test the effectiveness of O_2 supplementation and survival between passes in the hatchery ponds.

We do not know the optimum time and size of release for hatchery reared fall chinook in the Umatilla River. Experience at some hatcheries, and observations of timing of natural downstream migrants suggests that Upper River Bright fall chinook may survive best if released in the Umatilla River in late spring-early summer. However, results of studies at Bonneville Hatchery indicate survival may be enhanced if smolts are released in the fall when they would be larger (Hanson and Johnson 1986).

Table 10. Rearing and time of release schedule for fall chinook produced at the Umatilla and Bonneville hatcheries.

Hatchery	Smolt Production			Standard or O_2 Reared	Release information		Expected adult return	% of run size goal
	Number	Size (fish/lb)	Weight (lbs)		Age	Season		
Umatilla	4,320,000	60	72,000	O_2	0+	Spring	12,960	62
Umatilla	1,620,000	60	27,000	Standard	0+	Spring	4,860	23
Bonneville	910,000	90	10,100	Standard	0+	Spring	2,730	13
Bonneville	150,000	12	12,500	Standard	0+	Fall	450	2
Total	7,000,000		121,600				21,000	100

Table 11. Release locations for fall chinook produced at Umatilla and Bonneville hatcheries.

Hatchery	Release location	Number	Age	Season	Purpose(s)
Umatilla	Upper Umatilla mainstem	5,940,000	0+	Spring	O_2 survival studies/natural and hatchery production
Bonneville	Minthorn/Umatilla mainstem near Minthorn	910,000	0+	Spring	Acclimation studies/natural and hatchery production
Bonneville	Minthorn/Umatilla mainstem near Minthorn	150,000	0+	Fall	Acclimation studies/natural and hatchery production

There is inadequate hatchery space to hold over large numbers of fish for a fall release. Consequently we will initially emphasize spring releases of subyearlings.

Because temperatures of the Umatilla Hatchery water supply is optimum for fall chinook growth, most fall chinook salmon will be reared to at least 60 fish/lb for release in the late spring.

The remainder of the fall chinook smolt production (1,060,000) will be reared at Bonneville Hatchery. Since water temperatures at Bonneville are cooler, fall chinook reared at Bonneville Hatchery (910,000) will be reared to 90/lb for a late spring release. Fall release subyearlings from Bonneville (150,000) will be reared to 12/lb.

Outplanting and Broodstock Collection

Release sites for fall chinook (Table 11) were selected to support evaluation programs and to meet production (including hatchery production needs), harvest, and natural escapement goals of ODFW and CTUIR. Fall chinook reared at the Umatilla Hatchery (5,940;000) will be released in natural spawning areas in the mainstem Umatilla River and Minthorn acclimation facility (Figure 2) for the O_2, survival, and acclimation studies and to contribute towards natural and hatchery production, harvest, and escapement. Fall chinook from Bonneville Hatchery (1,060,000) will be released in the mainstem Umatilla River for natural and hatchery production, harvest, and natural escapement.

Broodstock collection of fall chinook will occur at Three Mile Dam and Minthorn trapping facilities. Construction of new facilities will be necessary to collect, hold, and spawn fall chinook broodstock (see Facilities section).

Summer Steelhead

Historical Perspective

The Umatilla summer steelhead population is a composite of native fish supplemented by hatchery production. We estimate 100 miles of summer steelhead spawning and rearing habitat remain in the basin in Meacham Creek (40 miles), North and South Forks (27 miles), the upper mainstem Umatilla River (10 miles), and in Squaw, Birch and other small tributaries (23 miles) (ODFW 1986) (Figure 2).

Native steelhead rear for two years in headwaters before migrating downstream in the spring. Peak juvenile migration occurs in May as snow melt begins to diminish.

Counts of adult summer steelhead passing Three Mile Dam have averaged 2,091, and sport harvest averaged 533 during the last 21 years (Table 12). Recent spawning escapements have ranged 1,000-1,500 (personal interview in August 1987 with Jim Phelps, ODFW, Pendleton, Oregon and Gary James, CTUIR, Mission, Oregon). The steelhead run begins in October and peaks in February or March. Peak spawning occurs in April and May. Production has been supplemented annually since 1981 with from 1,500 to 67,000 hatchery reared smolts raised at Oak Springs hatchery (Table 13). Some previous releases of foreign stocks occurred but releases since 1981 have all originated from native broodstock trapped at Three Mile Dam.

Hatchery Production Program

The genetic character of the existing summer steelhead population will be maintained by continuing to take broodstock from unmarked adults returning to the Umatilla River and rearing these fish to yearling smolts (5/lb) at Umatilla Hatchery for release into the Umatilla River.

Page 12/1/87 Ambiguous language

Table 12. Estimates of adult summer steelhead migrating past Three Mile Dam and sport harvest, 1966-67 to 1986-87.

Migration season	Three Mile Dam Count[1]	Sport Harvest[2]
1966-67	1,778	--
1967-68	930	--
1968-69	1,917	--
1969-70	2,298	--
1970-71	NA	--
1971-72	NA	735
1972-73	2,057	1,913
1973-74	2,340	326
1974-75	2,171	338
1975-76	2,534	379
1976-77	1,258	116
1977-78	3,080	866
1978-79	NA	280
1979-80	2,367	878
1980-81	1,298	630
1981-82	768	495
1982-83	1,264	175
1983-84	2,062	196
1984-85	3,436	133
1985-86	2,959	--
1986-87	3,124	--
Average	2,091	533

[1] Counts may be incomplete.

[2] Punch card estimates corrected for non-response bias.

Detrimental shifts in the genetic character of the native stock will be avoided by marking all hatchery fish and regulating harvest of unmarked (naturally produced) steelhead. Unmarked adult summer steelhead returning to the Umatilla River will be chosen first for broodstock to assure that naturally produced fish contribute to the gene pool of the hatchery product.

Table 13. Release of hatchery reared summer steelhead into the Umatilla River basin, 1967 - 1988. Releases prior to 1981 are unverified and may be incomplete.

Release year	Hatchery	Number released	Size (fish/lb)	Stock Source
1967	Gnat Creek	109,800	75.0	Skamania
1967	Oak Springs	272,900	117.0	Idaho (Oxbow)
1967	Wallowa	142,200	240.0	Idaho (Oxbow)
1968	Gnat Creek	23,100	66.0	Skamania
1968	Gnat Creek	150,000	eggs	Skamania
1969	Oak Springs	174,300	145.0	Skamania
1970	Carson	23,400	9.0	Skamania
1970	Carson	24,800	8.0	Skamania
1975	Wizard Falls	11,094	9.0	Umatilla River
1981	Oak Springs	17,600	6.9	Umatilla River
1981	Oak Springs	9,400	145.0	Umatilla River
1982	Oak Springs	59,500	7.8	Umatilla River
1982	Oak Springs	68,000	124.0	Umatilla River
1983	Oak Springs	60,500	11.0	Umatilla River
1983	Oak Springs	52,700	62.0	Umatilla River
1984	Oak Springs	58,000	6.5	Umatilla River
1984	Oak Springs	22,000	135.0	Umatilla River
1985	Oak Springs	53,900	7.0	Umatilla River
1985	Oak Springs	39,100	150.0	Umatilla River
1986	Oak Springs	54,100	8.4	Umatilla River
1987	Oak Springs	1,485	5.5	Umatilla River
1988	Oak Springs	61,306	7.0	Umatilla River
1988	Oak Springs	33,984	10.3	Umatilla River
1988	Oak Springs	24,618	fry	Umatilla River
1988	Oak Springs	8,000	60.0	Umatilla River

We estimated steelhead smolt production requirements for the Umatilla program using survival and fecundity data from ODFW hatchery records and U.S. v. Oregon (Table 14). For the initial program, we plan to produce 210,000 smolts (100% of the hatchery production goal) for release in the Umatilla Basin (Table 15).

Table 14. Survival and fecundity estimates used for production needs of summer steelhead for the Umatilla River program.

Life Stage	Estimated Survival	Source
Adult prespawning	0.75	ODFW
Egg-to-smolt	0.53	ODFW
Smolt-to-adult	0.027	U.S. v. Oregon
Fecundity .....5,000 eggs per female		U.S. v. Oregon

Table 15. Summer steelhead production profile for the Umatilla River program reared at Irrigon Hatchery.

Number of smolts	210,000
Number of eggs	396,226
Number of female spawners	106
Number of male spawners	106

Rearing Strategies

Based on ODFW and CTUIR priorities for the Umatilla monitoring and evaluation program, we plan to initially rear a total of 630,000 (126,000 lb @ 5/lb) summer steelhead smolts at Umatilla and Irrigon hatcheries to test the efficacy of O_2 supplementation and to evaluate potential differences in survival between passes in the hatchery ponds (Table 16). Of these smolts, 210,000 (42,000 lb) will be reared at Irrigon Hatchery under standard rearing for release in the Umatilla and 420,000 (84,000 lb) will be reared at Umatilla Hatchery under O_2 supplemented and standard rearing for release at Wallowa Hatchery on the Grande Ronde River.

Table 16. Rearing and time of release schedule for summer steelhead produced at Umatilla/Irrigon and Irrigon hatcheries

Hatchery	Stock	Number	Size (fish/ lb)	Weight (lbs)	Standard or O_2 Reared	Release information Age	Release information Season	Expected adult return	% of hatchery run size goal
Irrigon	Umatilla	210,000	5	42,000	Standard	1+	Spring	5,670	100
Umatilla	Wallowa	420,000[a]	5	84,000	O_2	1+	Spring	N/A	N/A
Total		630,000		126,000					

[a] These fish will be released at Wallowa Hatchery on the Grande Ronde River.

Table 17. Release locations for summer steelhead produced at Umatilla and Irrigon hatcheries

Hatchery	Release location	Number	Age	Season	Purpose(s)
Irrigon	Minthorn/Umatilla mainstem near Minthorn and Bonifer/Meacham Creek near Bonifer	210,000	1+	Spring	Acclimation studies/ hatchery production
Umatilla	Wallowa Hatchery (Grande Ronde River)	420,000	1+	Spring	O_2 studies/hatchery production

All hatchery reared summer steelhead will be released as yearlings. Based on experience at other facilities, yearling summer steelhead emigrate rapidly upon release, survive well, and will likely return to spawn in the supplemented streams.

Growth projections dictate incubation water will have to be chilled to prolong early development of summer steelhead or oversize smolts will result. Summer steelhead smolts will be reared to about 5 fish/lb to assure high survival to adult fish (Wade and Buchanan, 1983).

Outplanting and Broodstock Selection

Release sites for summer steelhead have been selected to (1) evaluate O_2 supplementation and benefits of acclimation and 2) achieve production (including hatchery broodstock needs), harvest, and natural escapement goals (Table 17). Summer steelhead reared at Irrigon Hatchery (210,000) will be released at Bonifer and Minthorn facilities and in the mainstem Umatilla River and Meacham Creek for the O_2 acclimation studies and to achieve hatchery production and harvest goals (Table 17). Summer steelhead reared at Umatilla Hatchery (420,000) will be released at Wallowa Hatchery on the Grande Ronde River for the O_2 supplementation and survival between passes studies and hatchery production.

In the future, summer steelhead may be released at downriver sites (see Figure 2 and Table 20.) for fisheries as agreed to by ODFW and CTUIR

Summer steelhead broodstock will be collected at Three Mile Dam and Minthorn trapping facilities. Unmarked adult steelhead will be selected first for broodstock to help maintain the genetic integrity of the hatchery population.

Inbasin Constraints and Solution to Problems

Restricted juvenile and adult passage at irrigation diversions in the lower river, low flow during much of the year, and poor habitat conditions in upper headwater areas have been identified as the chief factors limiting

production of anadromous salmonids in the Umatilla Basin (ODFW 1986). As part of the ODFW and CTUIR's Umatilla Fishery Rehabilitation Program being implemented under the Council's Program [Section 1403 (4.2, 4.6)], passage, flow, and habitat conditions are being improved to support the planned Umatilla Hatchery production program.

Fish Passage Improvement

By 1992, screens and fishways at the five major diversions in the lower Umatilla (Three Mile Dam, Rm 3; Maxwell, Rm 15; Westland, Rm 27; Cold Springs, Rm 29; and Stanfield, Rm 32) will be reconstructed to improve downstream and upstream survival of salmon and steelhead. A smolt and adult trapping facility will also be constructed at Three Mile Dam and a smolt trapping facility at Westland, to transport smolts and adults around lower river diversions during periods of low flow.

Flow Enhancement

The ODFW, CTUIR, and the Bureau of Reclamation have designed both interim- and long-term projects to address flow problems in the Umatilla Basin. The ODFW and CTUIR have developed a 6-year interim flow enhancement project to increase flows in the Umatilla. These plans include use of West Extension Irrigation District and Mikami Brother's Farms pumps to improve flow below Three Mile and Cold Springs diversions, respectively, and purchase of stored water from McKay Reservoir to improve flow below McKay Creek (Rm 51). This interim project is designed to increase flows up to 150 cfs during periods of below-average flows until the Umatilla Basin Project becomes operational. During the droughts of 1987 and 1988, the ODFW contracted with BPA to use the West Extension pumps to provide for juvenile and adult fish passage below Three Mile Dam.

Plans for the Umatilla Basin Project were developed by the Bureau of Reclamation in conjunction with the CTUIR, ODFW, and other fishery agencies. The final environmental statement was completed in February 1988 (BR 1988) and authorized by Congressional action in October 1988. The Umatilla Basin Project has been developed to achieve long-term fishery goals and resolve

water use conflicts in the Umatilla Basin. Project features are designed to meet streamflow objectives of 250-300 cfs during migration periods throughout the lower 51 miles of the mainstem Umatilla River. The Columbia River Pumping Plan (Recommended Plan) features a Columbia River pumping complex to deliver water to the Hermiston and Stanfield Irrigation Districts, a pumping facility to exchange water with the West Extension Irrigation District, and a small pumping facility to exchange water with Westland Irrigation District. Additional details can be found in the final environmental statement for the Umatilla Basin Project (BR 1988).

Habitat Improvement

The ODFW, CTUIR, and the Forest Service have completed a 5-year habitat implementation plan for the Umatilla River and tributaries (ODFW et al. 1988). By 1993, riparian and instream habitat improvements will be completed on 68 miles of private, federal, and reservation lands in the Umatilla Basin. Habitat improvements were planned to improve spawning and rearing habitat for naturally spawning summer steelhead and spring chinook. Additional habitat improvement needs beyond 1992 will be identified following completion of the Umatilla Subbasin Plan currently being developed under the Council's System Planning effort.

FACILITIES NEEDED TO IMPLEMENT PLAN

Introduction

The Umatilla Basin program, with release of about 9.5 million smolts, will require substantial facilities to hold and spawn broodstock, incubate eggs, and rear and acclimate juvenile fish. Presently, about 5 million smolts are being released annually into the Umatilla River basin from Bonneville, Irrigon, Carson, Cascade, and Oak Springs hatcheries. The Bonifer and Minthorn Springs acclimation facilities are in operation and receive smolts for acclimation prior to their release into the river. This section will discuss (1) the Umatilla Hatchery which will be specifically designed to provide much of the smolt production for this program, (2) the capabilities of present juvenile/adult facilities and, (3) needs for additional juvenile/adult facilities.

Umatilla Hatchery

Background

As discussed in the introduction, the Umatilla Hatchery production and design has changed considerably from adoption of Measure (704)(i)(1) in 1984, which included production of 40,000 lbs. of summer steelhead under standard rearing. In 1986 Measure (704)(i)(1) was amended to authorize construction to produce 160,000 lbs. of salmon and steelhead with full development of the water supply and use of a two pass water re-use system. Preliminary cost estimates for development of the well indicated that it would be more cost effective to fully develop the well (7,500 to 15,000 gpm capacity) rather than partially. As shown in Table 18, the construction cost/lb. would decrease from $62.50(7,500 gpm and two pass option) to $48.45 for $2.5 million in additional construction costs (to fully develop the well and additional ponds). Further, it was estimated that it would cost 1.5 to 2.0 times more to fully develop the well at a later time and would result in a one year loss in production (from the hatchery being shut down for well construction).

Table 18. Cost/lb. of 40,000-560,000 lb. rearing options at the Umatilla Hatchery

Smolt Capacity (lb. x 1000)	Cost[1] (millions)	Water Requirement (gpm[2])	Cost/lb.
40	$ 4.25	5,000 (1 pass)	$106.25
80	$ 5.0	7,500 (2 pass)	$ 62.50
160	$ 7.75	15,000 (2 pass)	$ 48.45
290	$10.0	15,000 (2 pass & 0_2 suppl.)	$ 34.50
(160)	($10.0)	15,000 (revert to standard)	$ 62.50
560	$12.3	15,000 (100% 0_2 suppl.)	$ 22.00

[1] Estimated capital cost for the hatchery excluding satellites.
[2] Gallons per minute.

In 1987, the measure was amended (now 703f-1-a)00 to allow testing of an oxygen supplementation system which would increase production to 290,000 lbs. The use of supplemental oxygen at the Umatilla Hatchery was attractive for three reasons. First, the increased production would more fully meet Umatilla River smolt requirements for adult return goals. With production increased to 290,000 lbs., all of the summer steelhead and 85% of the fall chinook and 34% of the spring chinook smolt requirement for adult return goals would be produced at the hatchery.

Second, the cost-efficiency of the hatchery would be greatly increased. As shown in Table 18, the cost/lb. would be decreased from $48.45 (for the 160,000 lb standard rearing option) to $34.50 for $1 million additional capital cost.

Third, it would provide an opportunity to thoroughly test the oxygen system. Use of supplemental oxygen is an accepted and useful rearing technology used throughout the world. The concept of using it at the Umatilla site was desirable because of the high quality and quantity of water available. Oxygen supplementation has been demonstrated to increase fish production to the smolt stage. What is unknown and what will be tested at the Umatilla Hatchery is how well fish reared under supplemental oxygen survive to the adult stage compared to standard reared fish (see Monitoring and Evaluation Plan).

Approximately half of the water supply (7,500 gpm) would be used in oxygen supplemented rearing ponds and half in standard rearing ponds. In the event that the oxygen supplementation system does not improve the production efficiency of the hatchery, the oxygen ponds would be reverted to standard rearing at a cost of $25,000. With the approximately $1,000,000 invested in the oxygen rearing ponds and decrease of production from 290,000 to 160,000 lb, cost/lb would be $62.50. If the oxygen system proves to be successful, the hatchery would be converted to 100% Michigan system which would boost production to 560,000 lbs. Cost of the conversion would be $2.3 million ($O_2$ system and additional ponds) and cost/lb. would be reduced to $22.00.

Hatchery Site and Design

The proposed site for the Umatilla Hatchery is near the Irrigon Hatchery at Irrigon, Oregon (Figure 3). This site provides ample water from a reliable aquifer with favorable water temperature for production of steelhead and fall chinook.

The wells for the hatchery are being designed to deliver 15,000 gpm. Irrigon's No. 2 well will provide backup water for incubation of eggs at Umatilla Hatchery which provides a safety measure in the event of failure of backup pumps at the Umatilla well site.

The hatchery would be built to include standard rearing ponds and those which have the option to introduce pure oxygen. The pond configuration for the hatchery includes 2 banks of 3 and 2 banks of 2 standard (Irrigon type) raceways and 6 banks of 4 Michigan type raceways which would introduce pure oxygen (Figure 4). Approximately half of the well's water supply (7,500 of 15,000 gpm capacity) would be used in the oxygen supplemented rearing ponds and half in the standard rearing ponds. The standard pond rearing system, in terms of water usage, would be used sequentially in pairs (double pass) or as individual ponds (single pass). The Michigan type rearing system utilizes oxygen supplementation and a series of baffles in each pond designed to transport pond wastes as a means to maintain water quality through multiple uses. Water will be passed sequentially through three Michigan type ponds. Further information on this hatchery can be found in the Environmental Assessment Report (BPA 1987).

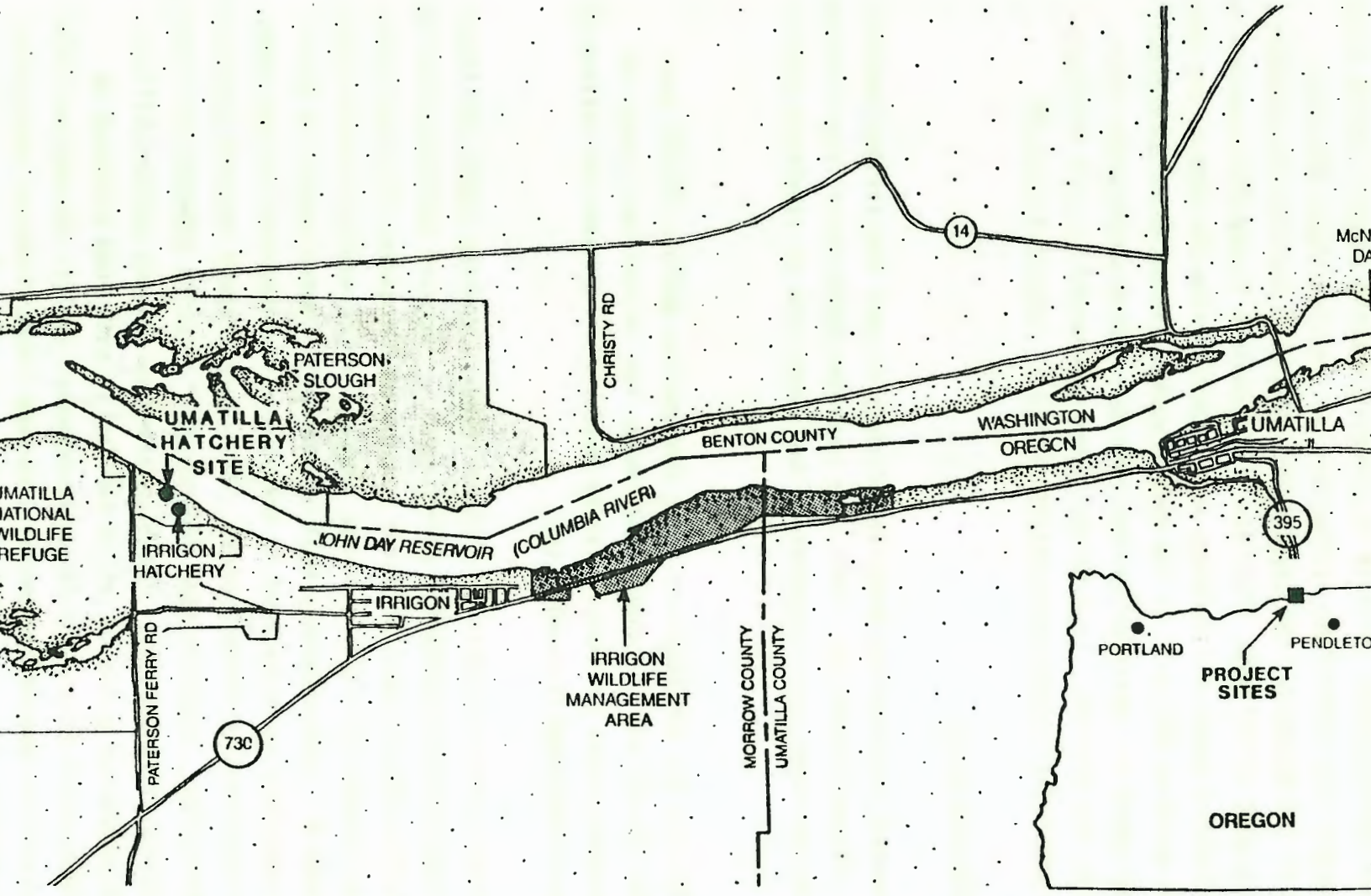


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Figure 3
Location of BPA Umatilla
Fish Hatchery, near Irrigon, O

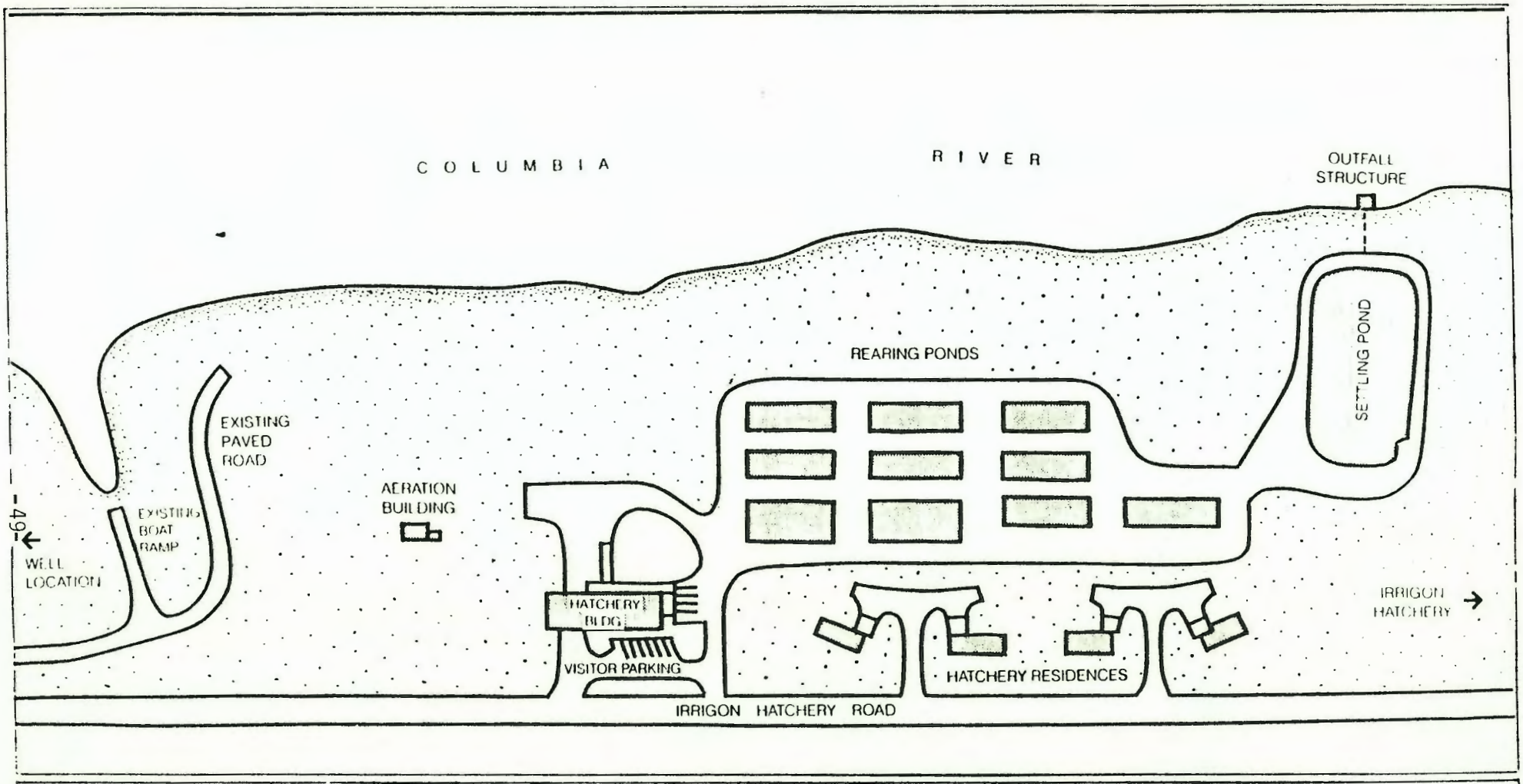


Figure 4

UMATILLA HATCHERY
Site Plan

Existing Smolt Release Facilities

Rearing/Acclimation Facilities

Two juvenile acclimation/adult holding facilities currently exist in the basin. One is located at Minthorn Springs, four miles east of Mission, Oregon and the other at Bonifer Springs on lower Meacham Creek (Figure 5). These facilities were developed as part of the Council's Fish and Wildlife Program. Bonifer was completed in 1983, and Minthorn Springs in 1985. The CTUIR operates the two facilities in cooperation with ODFW.

The Bonifer facility consists of a one-acre, spring-fed, earthen pond with a concrete fishway at the pond outlet. The concrete fishway empties into the lowest portion of Boston Canyon Creek, 100 yards upstream from its confluence with Meacham Creek. Two concrete raceways (120 ft long by 12 ft wide by 4 ft deep) have been installed at Minthorn Springs as a smolt acclimation facility. Water is pumped from Minthorn Springs pond at 800 gpm to each raceway. Water flowing through each raceway can discharge either into the intake pond (recirculated), to the facility outlet (single pass), or a combination of both.

It is estimated that the Bonifer facility can hold up to 10,000 pounds of yearling-sized smolts (5/lb) while the Minthorn Springs facility can hold up to 13,000 pounds. The CTUIR is evaluating the capacity of the Bonifer facility to rear and acclimate smolts.

Use of Facilities

Presently, Umatilla stock summer steelhead smolts reared at Oak Springs Hatchery are transferred to and acclimated at the Bonifer and Minthorn facilities. Yearling fall chinook are also released annually at both facilities. In addition, the Minthorn facility is used for subyearling fall chinook releases and Bonifer facility for subyearling and yearling spring chinook releases (Table 19). These facilities are now being used to evaluate the effectiveness of acclimating salmon and steelhead smolts. This evaluation is projected to continue at least 3 years after the Umatilla Hatchery begins operation (see Monitoring and Evaluation Plan section).

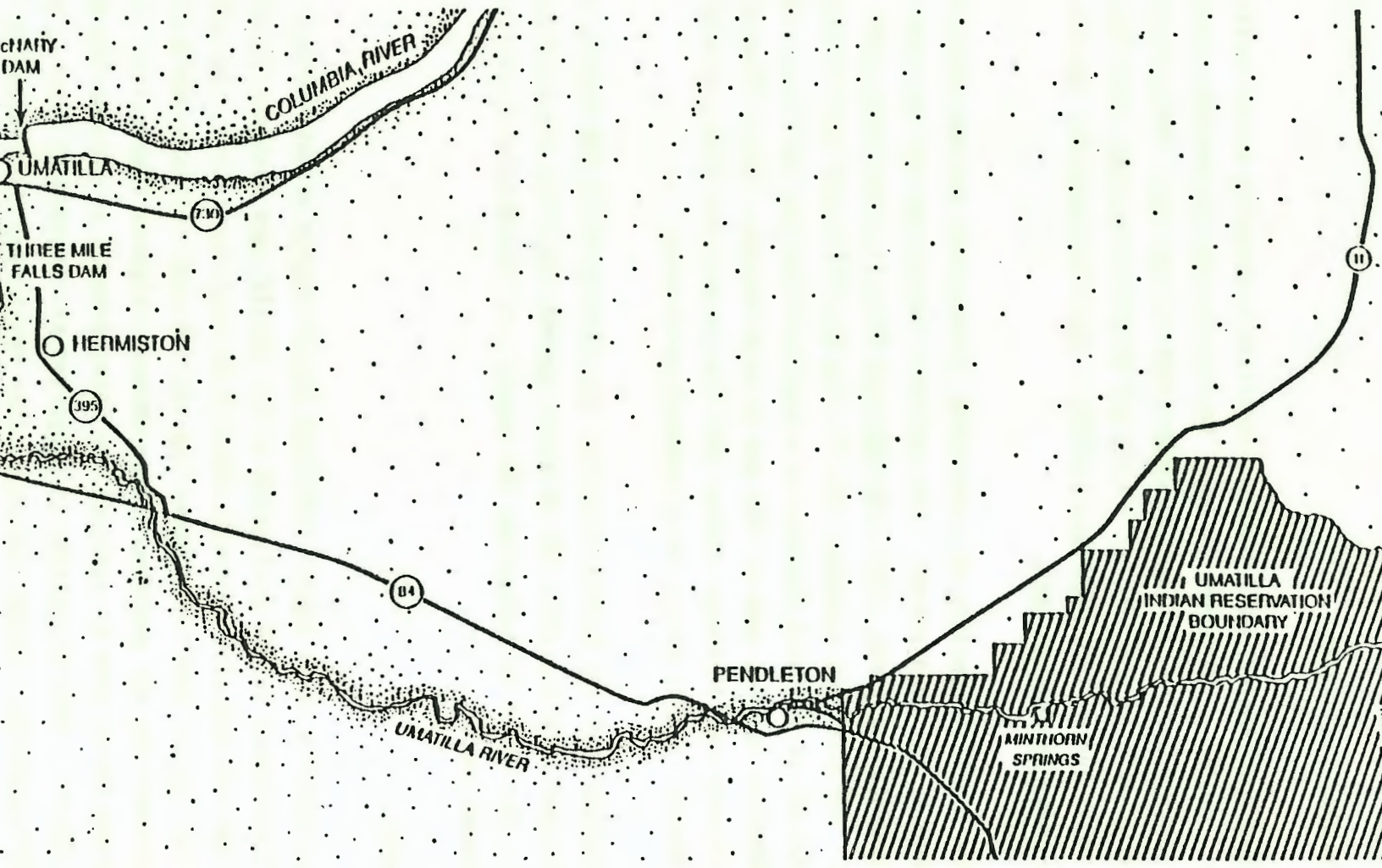


Figure 5.
Location of Three Mile Falls Dar
Minthorn Springs and Bonifer S
Umatilla River System, Oregon.

Off-station extended rearing is possible at the existing Bonifer and Minthorn facilities to supplement Umatilla Hatchery production, if needed.

Table 19. Projected acclimation/rearing schedule of Bonifer and Minthorn facilities for 1988-1991.

Facility	Stock/Species	Number (lbs)	Duration
Bonifer	Bonn. URB[1]/ChF	100,000 (12,500)	March (3 weeks)
Bonifer	Carson/ChS	100,000 (10,000)	April (3 weeks)
Bonifer	Carson/ChS	75,000 (6,250)	Sept-Oct (4 weeks)
Bonifer	Umatilla/StS	30,000 (3,750)	Apr-May (3 weeks)
Minthorn	Bonn. URB/ChF	100,000 (12,500)	March (3 weeks)
Minthorn	Umatilla/StS	30,000 (3,750)	Apr-May (4 weeks)
Minthorn	Bonn. URB/ChF	75,000 (6,250)	Sept-Oct (4 weeks)
Total Releases		480,000 (51,250)	

[1] Upper River Brights

Cooler water temperatures at these facilities may help retard growth of spring chinook or steelhead yearlings in order to meet time and size release objectives. The facilities are available from late September-early May to provide acclimation or additional offsite rearing in conjunction with the Umatilla Hatchery. We may find additional capability for off-station rearing at proposed adult collection facilities scheduled for future construction in the basin.

Outplanting Sites

Concurrent with transferring fish into the acclimation facilities, hatchery smolts will be released directly into the Umatilla River and selected tributaries. We can manage fish releases to avoid many of the potentially harmful interactions between hatchery and natural stocks only if we have the flexibility to choose among a variety of safe and effective release sites at several locations along the length of the Umatilla River. We advocate improvement of existing release sites and development of new ones at critical locations. Table 20 identifies the improvements needed and costs at existing and new release sites.

Outplanting Schedule/Coordination

An outplanting schedule of summer steelhead and fall and spring chinook from Umatilla, Irrigon, Bonneville, Cascade, and Carson hatcheries is presented in Table 21. Smolts will be trucked with the program's 5,000 and 3,000 gallon fish liberation trucks. Based on data presented in Table 21, it is estimated that it will require 60 man days (66 trips with the 5,000 gallon unit and 21 with the 3,000 gallon unit) to truck smolts to release sites.

Table 20. Improvements needed and costs of existing and new outplanting sites in the Umatilla Basin.[1]

Species	Location	River Mile	Ownership	Needs[3]	Cost
StS,ChS,ChF	Corporation	RM 89 Umatilla	National Forest	CGR	$15,000
StS,ChS	N. Fk. Meacham	RM 3 N.Fk.Meacham Cr.	Private	LPE,CGR	15,000
StS,ChS,ChF	Meacham Cr.[2]	RM 2 Meacham Cr.	Private	LPE,CGR	15,000
StS,ChS	Bonifer[2]	RM 2 Meacham Cr.	Private	NONE	--
StS,ChF	Thorn Hollow[2]	RM 72 Umatilla R.	Private	LPE,CPR	25,000
StS,ChS,ChF	Minthorn[2]	RM 64 Umatilla R.	Private	NONE	--
StS,ChF	Pendleton	RM 56 Umatilla R.	Private	LPE,CPR	25,000
StS,ChF	Nolin	RM 33 Umatilla R.	Private	LPE,CPR	25,000
ChF	Stanfield	RM 23 Umatilla R.	Private	LPE,CPR	25,000
					$145,000

[1] Higher priority will be given to upper release sites.

[2] Existing juvenile acclimation and release facilities. All initial releases of steelhead will occur at or nearby these facilities for acclimation studies.

[3] Needs for development at site to accomodate fish releases from liberation trucks: CGR-Construct gravel ramps; LPE-Land purchase or easement; CPR-Construct paved ramp.

As is presently done, during periods of low flow, a trap and haul program will be utilized to transport juvenile and adult salmon and steelhead around de-watered sections of the lower 30 miles of the river. Smolts will be captured either at the Westland or West Extension smolt trapping facilities and transported to the river mouth. Adults will be collected at the Three Mile adult trap and transported above the low flow area. Juvenile and adults will be transported with either the 3,000 gallon truck or 365 gallon trailer units.

Trap and haul activities are currently and will continue to be coordinated with the Umatilla River Operations Group which includes representatives from the Stanfield/Westland, Hermiston, and West Extension Irrigation Department,

Table 21. Outplanting schedule in the Umatilla Basin from Umatilla, Bonneville, Cascade, and Carson hatcheries.

	March	April	May	Sept.	Oct/Nov.	Total
Steelhead						
No.	105,000	105,000	--	--	--	210,000
Lbs.	15,000	21,000	--	--	--	36,000
Fall Chinook						
No.		3,425,000	3,425,000	75,000	75,000	7,000,000
Lbs.		54,050	54,550	5,300	6,250	120,150
Spring Chinook						
No.	210,000	740,000	640,000	75,000	75,000	1,740,000
Lbs.	42,000	49,300	46,000	5,300	6,250	148,850
Coho[1]						
No.	500,000	500,000	--	--	--	1,000,000
Lbs.	38,500	38,500	--	--	--	77,000
Total						
No.	815,000	4,770,000	4,065,000	150,000	150,000	9,950,000
Lbs.	95,500	162,850	100,550	10,600	12,500	382,000

[1] Numbers according to 1987 and 1988 releases.

ODFW, and CTUIR. The group coordinates irrigation diversions, water releases from McKay and Cold Springs Reservoirs, and flow enhancement activities with releases and migrations of salmon and steelhead. Increased coordination will be necessary upon completion of the Umatilla Hatchery.

Existing Broodstock Collection, Holding, and Spawning Facilities

Broodstock Collection and Holding Facilities

As part of the Comprehensive Plan (ODFW 1986), fish passage facilities at Three Mile Dam are being upgraded to improve upstream and downstream migration of fish. Modern fish trapping facilities were installed on the east bank fishway in the summer of 1988. As a result, adults returning to the Umatilla River can be collected for broodstock at Three Mile Dam. Collection of adults at Bonifer and Minthorn facilities is also possible if needed.

The Minthorn Springs facility has a concrete raceway outlet and holding area (25 ft. long x 8 ft. wide x 3 ft. deep) designed to serve as an adult trap and holding pond. Broodstock held in this pond can be isolated from the effluent water of the acclimation ponds and receive a separate water supply directly from the spring water source. The adult steelhead holding capacity of Minthorn is reduced due to water limitations during the operation of the juvenile acclimation ponds (February-May). The Minthorn facility has an estimated adult holding capacity of 1,200 pounds or 171 steelhead at 7 lbs/fish (Table 22). With some modification, this facility can potentially hold additional summer steelhead broodstock for Umatilla Hatchery production requirements.

Table 22. Estimated adult holding capacity of the Bonifer and Minthorn Springs facilities.

Facility	Existing Holding Volume	Estimated Available Water Supply	Maximum Holding Capacity[1]
Bonifer	288 ft.^{3}	2.0 cfs	576 lbs.[2]
Minthorn	600 ft.^{3}	0.5-1.5 cfs	1,200 lbs.

[1] Based on adult holding criteria of 15 lbs. of fish/gpm and 2 lbs. of fish/3 cu. ft. of holding area given 50 F water temperature (Senn et al. 1984).

[2] Capacity assuming problems associated with pond effluent and water level fluctuations during smolt releases can be corrected.

The Bonifer Springs facility has a concrete raceway outlet which is used to trap and hold returning adults. Holding capacity at Bonifer is estimated at 576 pounds of adult broodstock (or 82 steelhead at 7 lbs/fish) (Table 22). Although the raceway outlet has been used to hold steelhead broodstock, it has created problems relating to juvenile operations at the facility. Pond effluent travels directly through this raceway and when smolts are flushed out of the pond the water level in the adult holding area drops. The CTUIR is conducting structural and operational evaluations at Bonifer Springs facility to increase operational efficiency of the facility. The adult holding area may need to be expanded or modified. With the improvements, the Bonifer facility could provide additional adult steelhead holding if necessary.

Broodstock Processing and Spawning Facilities

The Umatilla Hatchery is not designed with adult holding, processing, or spawning facilities on site. Water temperatures at the hatchery are unsuitable for these purposes. Initially, those hatcheries designated to provide the broodstock for spring and fall chinook will conduct the spawning activities. However, as adult returns to the Umatilla River basin build, we will need adult holding and spawning capabilities within the Umatilla Basin.

Additional Facilities Needed

Broodstock Holding, Processing, and Spawning Facilities

Planning and development of new facilities needed in the Umatilla River basin to hold, process, and spawn chinook broodstock should begin immediately. These holding/spawning facilities need to be sized to hold and spawn at least 1,200 spring chinook and 4,603 fall chinook required for the Umatilla Hatchery production. Eventually, when adult returns increase so that broodstock requirements for the Umatilla Hatchery are met, additional broodstock holding and spawning facilities will be required. Collection, holding, and spawning of broodstock for spring and fall chinook production contributed from other hatcheries (939 fall chinook at Bonneville and 900 spring chinook at other stations) (Tables 23-24) will need to be accomplished at new facilities within the Umatilla River basin.

Table 23. Number of adult broodstock required to achieve spring chinook, fall chinook, and summer steelhead production for the Umatilla Basin artificial production program.

Species	Rearing Facility			
	Umatilla	Bonneville	Other hatcheries	Total
Spring chinook	1,220	0	900	2,120
Fall chinook	4,603	939	0	5,542
Summer steelhead	212	0	0	212

Table 24. Broodstock and holding requirements for the Umatilla Hatchery program.

Species	Number of Broodstock	Holding Period	Site	Water Flow Requirement[1]	Spatial Requirement[2]
Spring chinook	1,220	Apr-Sept.	New facility	1,301 gpm	9,760 ft^3
Fall chinook	4,603	Oct-Dec.	New facility	5,524 gpm	41,427 ft^3
Summer steelhead	212	Oct-May	Minthorn	99 gpm	742 ft^3

[1] Based on water flow criteria of 15 lbs. of fish/gpm at 50 F (Senn et al. 1984) and average weight of spring chinook (16 lbs), fall chinook (18 lbs), and steelhead (7 lbs)

[2] Based on spatial criteria of 2 lbs. of fish/ft^3 (Senn et al. 1984) and average weights stated above.

The present chinook reestablishment effort of the CTUIR and ODFW is already returning fall and spring chinook adults to the Umatilla River for the initial broodstock program (Table 25). The stocks of fish being used are consistent with the broodstock program being proposed for Umatilla production as outlined in the Production Profile section. Carson stock of spring chinook, Umatilla stock of summer steelhead, and Bonneville Upriver Bright stock of fall chinook are presently used for Umatilla Basin production.

Chinook broodstock development for the Umatilla program should begin as soon as additional holding, processing, and spawning facilities are developed. Siting, design, construction, and operation of these facilities should be

completed by the first year operation (1991) of the Umatilla Hatchery. By then we expect adult chinook returns to the Umatilla River will have increased to provide sufficient numbers of broodstock.

Table 25. Spring chinook, fall chinook, and summer steelhead adult returns to Three Mile Dam, Umatilla River, 1985-1988.

Year	Spring Chinook		Fall Chinook		Summer Steelhead
	Adults	Jacks	Adults	Jacks[1]	Adults
1985	-	-	6	79	2,500
1986	-	-	28	407	3,000[3]
1987	-	-	125	348	2,781[3]
1988	13[2]	0	94	1,466	N/A[4]

[1] Includes age 2 and 3 fish.
[2] 1988 returns represent first adult returns from 100,000 yearling smolts released in 1986.
[3] Includes Three Mile Dam counts plus sport harvest below Three Mile Dam (the first year actual counts and creel surveys were conducted).
[4] Not available.

The planning and development of adult holding/spawning facilities should incorporate, where possible, capability to also rear and acclimate smolts prior to release.

Additional Facilities Needed to Acclimate/Rear Smolts

We will use Bonifer and Minthorn facilities to hold adult steelhead and acclimate and release smolts imported from hatcheries outside the basin. More acclimation facilities may be needed to accommodate the large number of spring and fall chinook releases that are programmed for Umatilla Hatchery production. The size and number of facilities will be based on availability of suitable water sources within the Umatilla Basin and requirements for monitoring and evaluation of the hatchery program. The additional facilities will also serve as optional satellite stations, permitting more flexible production profiles.

Planning and development for the acclimation/extended rearing facility should be integrated with the development of adult holding and spawning

facilities for "dual purpose" operations. The period for acclimation/extended rearing operations for juveniles (January-April) would fall between the holding/spawning period for adult spring chinook (April-September), and fall chinook (September-December). It is anticipated that at least one additional dual purpose satellite may be needed. Planning for this new satellite should begin immediately pending results of the ongoing acclimation study at Bonifer and Minthorn facilities.

Costs and Schedules

Construction cost of the hatchery is estimated at $10,000,000, which includes design, construction, contingencies, administrative overhead, well system (including new wells), and furnishing/equipment. Cost of the oxygen rearing equipment is approximately $1.0 million.

Operation and maintenance costs for the first year of full production of the hatchery is estimated at approximately $900,000 which includes all costs associated with the operation of the hatchery (excluding satellites) to produce 290,000 lbs. of fish, and truck and release fish in the Umatilla Basin. This does not include costs of collecting broodstock which will be covered under a separate contract (trap and haul). Construction contract procurement will require 4 months after the Master Plan has been approved by the Council and construction time is estimated at 18 months.

Construction cost of a new satellite(s) based on costs of newly completed Lower Snake River Compensation Plan facilities is estimated at $4.0 million (including siting, design, construction, and furnishing/equipment) and $250,000 for annual operation and maintenance. These costs are provisional and subject to change as siting and preliminary designs are completed. Two years will be required for siting, design, and construction.

Amortized annual cost/lb for the hatchery and satellite (based on $14 million capital investment amortized over 20 years and $1.15 million operation and maintenance) is $6.38.

Improvements needed at existing and new release sites are estimated at $145,000. Planning for these improvements should be initiated immediately.

COMPREHENSIVE PLAN FOR MONITORING AND EVALUATION OF UMATILLA HATCHERY

Introduction

The purpose of this section is to summarize the monitoring and evaluation plan for the restoration and enhancement of spring chinook, fall chinook, and summer steelhead in the Umatilla Basin. Monitoring and evaluation are necessary to increase the level of knowledge associated with the scientific uncertainties inherent in fisheries restoration and enhancement efforts. The monitoring phase will consist of observation and measurement of performances associated with restoration and enhancement strategies. Evaluation is the process of analysis, summarization, and review of the measured performances to provide the information essential for assessing and comparing effectiveness. The knowledge generated from the evaluation process is an integral and critical component of the adaptive management process (Lee and Lawrence 1986). The proposed monitoring and evaluation program will provide the information necessary for managers to effectively implement actions to meet program goals.

The proposed monitoring and evaluation will compliment the Council's System Monitoring and Evaluation Program by using the adaptive management process to attain the goals of the Umatilla Basin Comprehensive Plan (ODFW 1986).

The Monitoring and Evaluation goals are:

1. Provide information and recommendations for culture and release of hatchery fish, harvest regulations, and natural escapement that will lead to the accomplishment of long term natural and hatchery production goals in the Umatilla River basin in a manner consistent with provisions of the Council's Fish and Wildlife Program.

2. Assess the success of achieving the management objectives in the Umatilla River basin that are presented in the Master Plan and the Comprehensive Rehabilitation Plan.

Mobrand (1987) discusses the purpose, scope, and utility of monitoring and evaluation programs for fisheries enhancement. He states, "The basic question asked of the evaluation process is which of several potential treatments are best. Treatments consist of different ways of utilizing the outplanting facilities and the biological resources available. The comparison of alternative treatments technically amounts to a formal hypothesis testing procedure. Treatments are administered as experiments designed to resolve with prescribed certainty whether two or more treatments produce results that differ by some predetermined amount." Monitoring activities are designed to measure the results of these experiments and conditions that may affect the outcome of the experiments (hatchery and release operations, environmental conditions, etc.). The final products of the evaluation process are (1) assessment of the results of program actions and experimental procedures, (2) assessment of success toward attaining program goals, and (3) recommendations for actions necessary to achieve or refine program goals.

A salmon and steelhead enhancement program for the Yakima River basin (Fish Management Consultants 1987) is being developed concurrent with the Umatilla River Program. Evaluation of both programs will be part of the Council's Systems Monitoring and Evaluation Program. Although several aspects of the Yakima and Umatilla programs are similar, there are some major differences in the goals of each program which create differences in the priorities of evaluation. The Yakima River basin presently has naturally producing populations of steelhead, chinook, and sockeye. The Yakima River Program is being designed with emphasis on enhancement of the natural production of salmon and steelhead.

In contrast, only summer steelhead naturally produce in the Umatilla River basin. Fall and spring chinook must be reestablished using imported stocks. Highest priority has been given to reestablishment of spring and fall chinook. Plans for evaluation of the Umatilla Hatchery and the restoration and enhancement effort will continue to be coordinated with the appropriate Council committees including the Hatchery Effectiveness and Supplementation Technical Work Groups and the Monitoring and Evaluation Group.

Priority of Critical Uncertainties

There are a great number of uncertainties associated with production at Umatilla Hatchery and the restoration and enhancement of anadromous fish in the Umatilla Basin. It is important to understand that major differences exist in the natural production potential, past and present population status, and management objectives among spring chinook, fall chinook, and summer steelhead. These differences, which have been highlighted in the Comprehensive Plan (ODFW 1986) and the Master Plan, create differences in the critical uncertainties associated with each species.

The opportunity to adequately study all of the uncertainties does not exist at the Umatilla Hatchery or in the Umatilla Basin. The facility design and capability, desired species production profile, and availability of suitable streams for treatment, control, and spatial replication are all factors that limit experimental opportunity. We have developed a priority list of uncertainties and identified those that can be adequately addressed in the Umatilla Basin. The uncertainties can be categorized into two general areas: 1) Hatchery Effectiveness, and 2) Natural Production and Supplementation. We have chosen to characterize the uncertainties in each area as critical or secondary, and then to develop an overall priority list of all the uncertainties. The priorities were established based primarily on two criteria:

1. The effect on achievement of Umatilla program goals that will result from effective learning and understanding the uncertainty.

2. The systemwide (Columbia Basin) application of the results of evaluating the uncertainty.

Background information and Table 26 are provided as a rationale for establishing priorities and to identify those uncertainties that can be studied in the Umatilla Basin and those that should be studied elsewhere in the Columbia Basin.

e 26. Summary of Products and criteria for establishing priority of uncertainties associated with Umatilla River Production, toration, and Enhancement program.

ertainty umber iority)	Products of Evaluation	CRITERIA FOR PRIORITIZATION					
		Adequately studied at Umatilla Hatchery/Basin	Important Systemwide Application	Important Contribution to Optimization of Hatchery Production	Important Contribution to Meeting Goals		
					Broodstock Development	Natural Production	Hatchery
1	Comparison of production for CHF AND STS IN O_2 and standard systems. Smolt-adult survival rates for ChF and StS reared in O_2 and standard systems	yes	yes	yes	yes	yes	yes
2	Comparison of production for 0^+ and 1^+ ChS smolts. Smolt survival rates of 0^+ and 1^+ ChS smolts.	yes	yes	yes	yes	yes	yes
3	Comparison of production for ChS in O_2 and standard systems. Smolt-adult survival rates for ChS reared in O_2 and standard systems.	yes	yes	yes	yes	yes	yes
4	Estimation of natural production capacity for ChS and CHF. Estimation of natural production success of ChS and CHF.	yes	no	no	no	yes	yes

Table 26. Continued.

Uncertainty Number (Priority)	Products of Evaluation	CRITERIA FOR PRIORITIZATION: Adequately studied at Umatilla Hatchery/Basin	Important Systemwide Application	Important Contribution to Optimization of Hatchery Production	Important Contribution to Meeting Goals: Broodstock Development	Natural Production	Hatchery
5	Comparison of smolt-adult survival rates of fish that are acclimated with fish needed for ChF that are not acclimated.	StS-yes. Additional facilities for ChF and ChS.	yes	no	yes	no	yes
6	Comparison of adult StS production from streams that are supplemented with streams that are not supplemented.	yes	yes	no	no	yes	yes
7	Assessment of changes in genetic and life history characteristics of wild StS as a result of supplementation.	yes	yes	no	no	yes	no
8	Comparison of smolt-adult survival of fish reared at different densities in the O_2 and standard systems.	yes	no	yes	no	no	no
9	Assessment of changes in natural production resulting from chinook releases.	no	no	no	no	no	no
10	Measurement and comparison of natural production success of different release strategies.	No-there are not adequate streams for replication.	no	no	no	no	no

Hatchery Effectiveness Uncertainties

Critical

1. To what extent can we use O_2 supplementation during rearing to increase the efficiency of producing summer steelhead and fall chinook for hatchery and natural production.

2. Will releases of subyearling and yearling spring chinook smolts produced at Umatilla Hatchery achieve the desired level of adult production.

3. To what extent can we use O_2 supplementation during rearing to increase the efficiency of producing spring chinook adults for hatchery and natural production.

Secondary

1. To what extent will acclimation of summer steelhead, fall chinook, and spring chinook smolts enhance smolt-to-adult survival and homing.

2. To what extent will rearing density influence efficiency of producing spring chinook, fall chinook, and steelhead adults in the standard and O_2 supplementation systems.

Background:

The "Michigan Type" rearing system appears to offer more efficient use of hatchery water and will result in an increase in pounds of fish produced per unit of rearing area and per volume of water. This type of rearing system has been used in the northeast United States, but has not been evaluated to determine the effects on smolt-to-adult survival. About 72% of the production at the Umatilla Hatchery will be produced in the Michigan type system. If the system is determined to be an efficient and economical means of producing smolts and returning adults, it will have application in construction of new or retrofit of existing hatcheries throughout the Columbia River Basin. Therefore, we have given highest priority to evaluation of the success of the

Michigan type system. The Umatilla Hatchery, supplied with fairly constant warm water, provides conditions that are ideal for production of yearling steelhead smolts and subyearling fall chinook smolts. These species will be given highest priority for testing of the O_2 system.

The standard rearing-release strategies that are proposed for fall chinook and summer steelhead have been demonstrated to be successful in other rivers in the Columbia River Basin. In contrast, the rearing programs proposed for spring chinook are experimental and have not been demonstrated to be successful. In the Columbia Basin, spring chinook are typically reared for 16 months and released at 8-20 fish/lb. The constant temperature water at the Umatilla Hatchery will provide for growth conditions that will allow production of a subyearling smolt at 15-20 fish/lb. An evaluation of survival of a six-month subyearling spring chinook smolt of this size has not been completed, but is underway at Irrigon Hatchery with Rapid River stock. In 1986 and 1987 Rapid River smolts released at Lookingglass Hatchery appeared to effectively migrate downstream to Lower Granite Dam. Survival of subyearling spring chinook released from 1978-83 into the Deschutes River from Round Butte Hatchery was poor. Fish were released in late May and early June at 19-32 fish/lb. Mean total survival from four complete brood years was 0.03%. Poor survival may have been caused by C. shasta, which is normally infectious beginning in early June in the Deschutes River. Production of yearling smolts at 5 fish/lb will require an extensive period of incubation in cold water, which has not been tested on a production basis.

A thorough evaluation of the benefits of acclimation for fall and spring chinook salmon and summer steelhead has not been conducted. Intuitively, fish should survive better if allowed to recover from stresses of hauling prior to release. The existing acclimation facilities in the Umatilla Basin, Bonifer and Minthorn, were originally designed for acclimation of summer steelhead. Steelhead smolts will be held from mid-February until mid-April at these facilities. These facilities were not designed to accommodate the large numbers of chinook salmon that will be produced at the Umatilla Hatchery. Additional facilities will be needed to conduct acclimation experiments with spring and fall chinook. The evaluation of acclimation has been given lower priority than studies of O_2 vs. standard rearing and spring chinook size-time release experiments.

The major difference between the standard and O_2 supplementation rearing systems are 1) water exchange rate, 2) O_2 content, and 3) stocking density. Density has been shown to affect smolt-to-adult survival. Ideally, we should evaluate the performance of smolts reared at different densities in the standard and O_2 supplementation systems after we have completed an evaluation of the standard densities that are used in these rearing systems. Pond space for density studies will not be available until experiments of higher priority are completed. Density studies could be initiated after five years of hatchery operation.

In the overall priority, most hatchery effectiveness uncertainties have been given higher priority than supplementation and natural production uncertainties. We feel it is critical to first develop a hatchery program that will ensure that adults are returned to the basin in an efficient and effective manner.

Natural Production and Supplementation Uncertainties

Critical:

1. Whether natural production potential of fall chinook and spring chinook is less than, equal to, or greater than natural production goals.

2. To what extent will supplementation enhance natural production of summer steelhead.

3. To what extent will supplementation alter the genetic diversity and life history characteristics of the native steelhead population.

Secondary:

1. To what extent will release strategies (size, time, location) affect supplementation success.

2. To what extent will large releases of hatchery reared chinook salmon affect native steelhead populations.

Background:

There are no naturally spawning populations of spring or fall chinook salmon in the Umatilla Basin. Chinook have been virtually eliminated from the basin for over 70 years. The spring chinook natural production capacity is estimated to be low (600-800), however, spring chinook are a fish of important cultural significance to the Umatilla Tribes. When hatchery and natural spring chinook production goals are achieved, naturally produced fish will comprise only 5.7% of the spring chinook return. Naturally produced fish will not be separable from hatchery fish unless all hatchery fish are marked. The success or failure of restoring a natural population will have little effect on escapement or harvestable surplus.

The estimated natural production potential for fall chinook is high (11,000) which comprises over 52% of the escapement goal. The natural production success of fall chinook is critical to achievement of program goals for this species.

A critical aspect of supplementation studies is adequate opportunity for spatial replication. Because there are not enough similar streams in the Umatilla Basin to establish as control and treatment areas for chinook salmon, we will not be able to conduct multiple treatments to test success of supplementation. Assessment of reestablishment of natural production will consist of documenting the level of natural production success of fish that are passed above Three Mile Dam.

Unlike some hatchery programs in the Columbia Basin, the Umatilla steelhead program uses only native stock for broodfish. To date, all smolts have been released at acclimation/adult recapture facilities. The basin appears ideal for evaluating supplementation success and impacts, however, we are unsure of the number of streams in the basin that are similar enough to be used as control and treatment streams. We must evaluate the availability of suitable streams for spatial replication. If adequate streams are identified, and the basin is identified as a top priority, steelhead supplementation studies could be conducted. The results of such a study would have systemwide application.

Overall Priority of Uncertainties

1. To what extent can we use O_2 supplementation during rearing to increase the efficiency of producing fall chinook and summer steelhead adults for hatchery and natural production.

2. Will releases of subyearling and yearling spring chinook smolts produced at Umatilla Hatchery achieve the desired level of adult production.

3. To what extent can we use O_2 supplementation during rearing to increase the efficiency of producing spring chinook adults for hatchery and natural production.

4. Whether natural production potential of fall chinook and spring chinook is less than, equal to, or greater than natural production goals.

5. To what extent will acclimation of spring chinook, fall chinook, and summer steelhead smolts enhance smolt-to-adult survival and homing.

6. To what extent will supplementation enhance natural production of summer steelhead.

7. To what extent will supplementation alter the genetic diversity and life history characteristics of the native steelhead population.

8. To what extent will rearing density influence the efficiency of producing spring chinook, fall chinook, and summer steelhead adults in the O_2 and standard rearing systems.

9. To what extent will large releases of hatchery reared chinook affect native steelhead populations.

10. To what extent will release strategies (size, time, location) affect supplementation success.

Experimental Approach

As mentioned earlier, experimental opportunity is limited by factors such as hatchery design and capability, desired species production profile, and availability of suitable streams for treatment, control, and spatial replication. To identify the initial experimental design and ponding allocation for the hatchery we established a set of criteria that were based on a desired level of statistical precision and fish cultural and production needs.

These criteria are:

1. Uncertainties should be evaluated in priority order.

2. Each treatment must be replicated twice within a year, preferably, three or four times.

3. Each treatment should be replicated for four years to ensure that performances are observed under a variety of environmental conditions. This should allow us to distinguish a 50% difference among treatments with 95% certainty.

4. At least one treatment (rearing and release strategy) for each species must be used as the standard control and maintained through time.

5. To minimize variation we require 35 observed mark recoveries per test group. This should give a coefficient of variation for smolt-to-adult survival rate of .25 (de Libero 1986; Mobrand 1987).

6. Like species must be reared in a pond series where water is reused and each pass must be considered a separate treatment because of potential differences in water quality as modified by degree of water reuse.

7. The experimental ponding plan should match the desired species production profile (Table 2) as closely as possible, given the above criteria.

Mobrand (1987) highlights the need in fisheries studies to maximize learning opportunity within year to minimize the influence of year-to-year environmental variation. We need to mark sufficient numbers of fish with sufficient replication of treatments to allow for valid within-year statistical comparisons between treatments. We are always in a hurry to discover what treatments are "best." The scope of inference for studies which are conducted for one year is narrow and results apply only to the set of environmental conditions that existed during the study year. It is probably more important to assure that treatments are replicated over a number of years to allow observation of performances over a wider range of environmental conditions. In many cases, what we are truly interested in is whether one treatment is better than another (treatment difference) consistently through time. As we learn from our initial experiments, we plan to adopt the staircase approach (Walters et al. 1987) to introduce new treatments in a systematic manner over time.

In general, we will be applying two statistical techniques for data analysis. Hypothesis testing with analysis of variance will be used to test for differences in performance parameters of treatment and control groups that are released for hatchery effectiveness studies. In addition we will make interval estimates of the differences in performance parameters. Performance parameters that will be estimated are discussed further under each specific objective. Supplementation and natural production studies principally involve the use of interval estimation of population parameters. The Council's Systems Planning Model and the Cohort Reconstruction Model will be useful tools for estimating and modeling a number of population parameters (see Mobrand 1987).

Releases and recoveries of coded-wire tagged adults and other fish marks applied to juvenile fish (freezebrand, Visible Implant Tag [VIT], Passive Integrated Transponder Tag [PIT]) will provide the information needed to estimate performance parameters for hatchery effectiveness studies. Smolt-to-adult survival estimates will be based on total fishery contribution (ocean and Columbia and Umatilla rivers) and escapement. A critical component of the experimental design is the number of coded-wire tagged fish needed per release group to achieve the desired 35 observed recoveries. We have a

limited database to estimate tag group size for fish released in the Umatilla River. We developed a set of assumptions for each species (survival, exploitation, fishery sampling, and inriver recovery rates) from which to estimate minimum acceptable replicate group size (Table 27). Because of the uncertainty associated with our assumptions, particularly the survival rates, the actual size of tag groups be will be two times larger than the calculated minimum acceptable number where possible. Prior to start of the hatchery evaluation, we should have refined estimation of survival based on recoveries of marked groups that were released in 1987 and 1988. We assumed that we could recover 50% of the tagged fish that return to the Umatilla River. These recoveries can come from broodstock collections, spawning surveys, and from fisheries.

Monitoring Sites

Monitoring stations throughout the Umatilla River basin will be needed to trap, handle, and count juvenile and adult anadromous fish. Three Mile Dam will serve as the primary monitoring and collection site for marked adult salmonids. Traps and video cameras will be operated on the west and east bank ladders. Although not part of the original facility design, an automatic mechanical sorter that is capable of counting, sorting, and trapping coded-wire tagged adults should be installed in the future. A sorter will allow counting all upstream migrants without the added stress of handling.

A juvenile sampler was constructed in 1988 on the west bank ladder at Three Mile Dam as part of the passage facility. This sampler will allow trapping, handling, and counting of marked experimental and production groups of fish. Trapping and holding facilities for juvenile fish at the Westland Dam will be upgraded in 1989 to provide a means of intercepting downstream migrant salmonids for transport by truck to the Columbia River at times when flows are inadequate for outmigration below Westland. We will have adequate sampling capability at Three Mile and Westland to allow development of methods to quantify the number of juvenile migrants passing.

Adult salmon and steelhead returning to the Minthorn Springs and Bonifer Springs facilities will be collected and counted to compare returns from

ble 27. Minimum acceptable and recommended number of coded wire tags needed per replicate for fall an
ring chinook and summer steelhead produced at the Umatilla Hatchery and released into the Umatilla Riv

ecies ease Strategy	Assumptions	Minimum Number of tags/replicate	Recommended number of tags/replicat
ring Chinook	50% Umatilla recovery rate-no outsystem recovery		
0^+ spring	0.2% return rate	35,000	70,000
0^+ fall	0.4% return rate	17,500	35,000
1^+ spring	0.75% return rate	9,350	18,700
l chinook[2]	55% Columbia River exploitation	14,700	29,400
0^+ spring	25% Columbia River sample rate 50% Umatilla recovery rate 0.3% smolt-adult return rate[3]		
mmer Steelhead[4]	50% Umatilla recovery rate-no outsystem recoveries		
1^+ spring	2.7% return rate	2,600	5,200

Calculated as 2.0 times the minimum acceptable level. May be increased if survival of fish released i
1987 and 1988 are lower than expected.

Exploitation and sample rates from Oregon Department of Fish and Wildlife and Washington Department of
Fisheries.

All survival rates are from the Master Plan.

Umatilla steelhead are caught in Columbia River sport and commercial fisheries but exploitation rates
unknown. Numbers will be adjusted as exploitation rates are determined.

experimental and production releases from these facilities. The Minthorn Springs facility is more developed than the Bonifer facility and smolts can be accurately counted upon release into the river. However, the Bonifer facility is an earthen pond and cannot be completely drained, making it impossible to accurately estimate in-pond mortality or the number of smolts released. Therefore, we suggest that a system be installed at the Bonifer facility that will accurately count the smolts as they leave the pond. Smolt counting equipment is being tested as part of the ongoing Bonifer and Minthorn acclimation studies by CTUIR.

Objectives and Hypotheses

We have provided an overview and approach with each objective which details the experimental design and performance parameters that will be statistically tested. The objectives are categorized as Hatchery Effectiveness or Supplementation and Natural Production studies. Detailed tasks necessary to accomplish each objective will be completed later after BPA Work Statements are developed. Some objectives involve primarily monitoring activities and will not involve statistical assessment. The priority of objectives parallels that of the critical uncertainties. In the Overview and Approach sections, we indicate which uncertainty the objective addresses and in which year the objective will be studied. Uncertainties 1-7 are addressed in this study plan since they have been given highest priority. Uncertainties 8-10 will be addressed at a later time.

Clearly, the desired species production profile and the hatchery design (particularly the number of standard ponds) place extreme limitations on experimental opportunity. A major increase in production of summer steelhead above the desired level would be necessary to provide adequate number (600,000) of fish to evaluate Michigan type rearing. In addition, if Umatilla stock steelhead were used to evaluate Michigan type rearing, there would be no standard Oregon rearing ponds available to produce spring chinook. To alleviate these problems without major facility redesign, we propose exchange of rearing space in six Michigan type rearing ponds at Umatilla Hatchery with rearing space in eight standard Oregon ponds at Irrigon Hatchery. This exchange will facilitate the necessary evaluations with less deviation from

the desired species production profile and will not affect the number of smolts produced for lower Snake River Compensation. We propose use of Wallowa stock summer steelhead for the Michigan type rearing evaluation. Currently, 1,350,000 Wallowa stock summer steelhead are being reared at Irrigon Hatchery. There are several ponding-plan possibilities, however the plan we advocate in Figure 6 provides for the greatest experimental opportunity with the least deviation from the long range desired production profile. We plan to initiate the O_2 evaluation with summer steelhead after a one year rearing trial in the O_2 system with 210,000 Umatilla stock summer steelhead.

Hatchery Effectiveness Objectives

Objective 1: Determine to what extent the efficiency of producing adult fall chinook, spring chinook, and summer steelhead can be increased through the use of oxygen supplementation with the Michigan method of rearing.

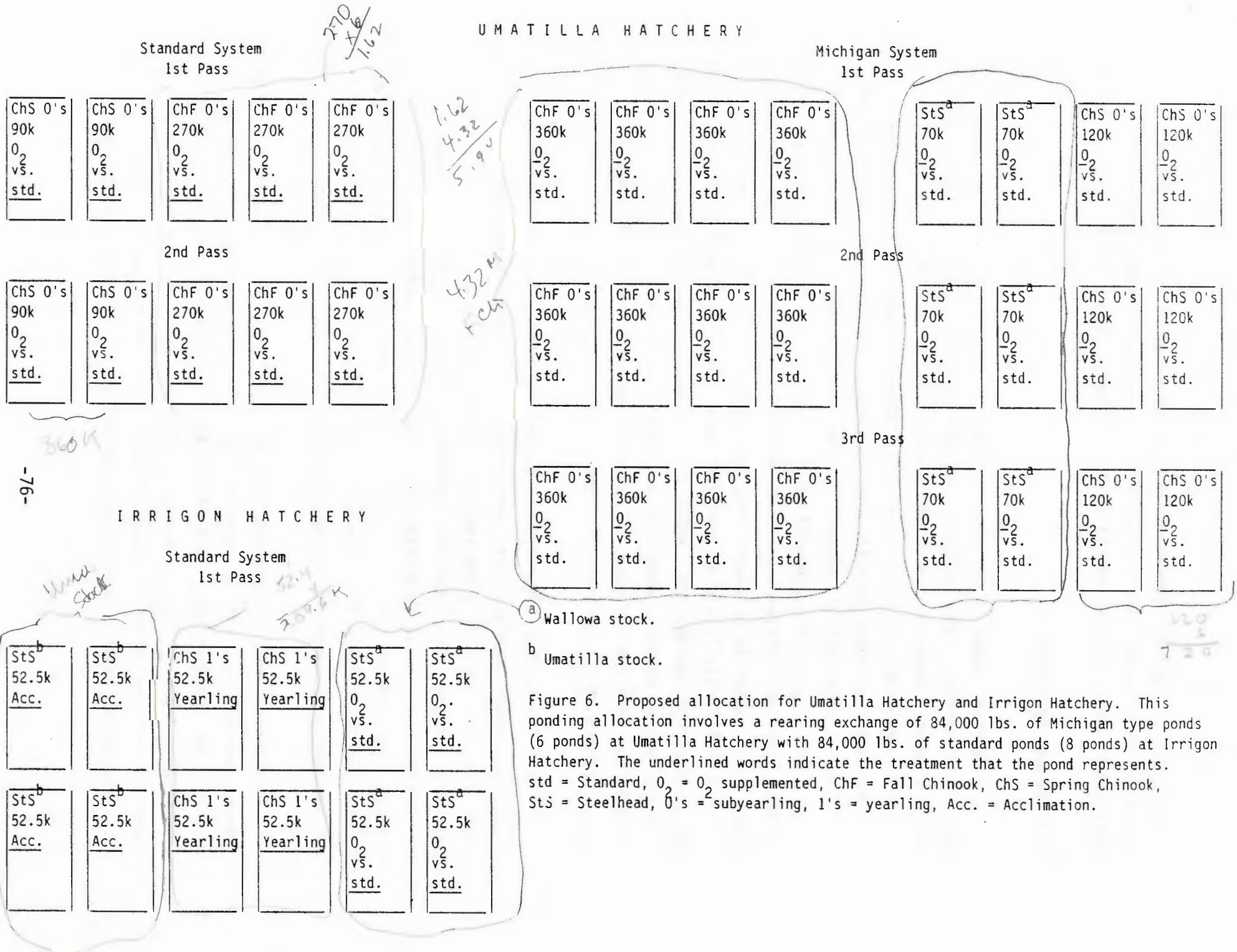
Hypothesis 1.1: Survival of fall chinook reared in the Michigan type rearing system will be no different than survival of fall chinook smolts reared in the standard Oregon system.

Hypothesis 1.2: Survival of summer steelhead reared in the Michigan type system will be no different than survival of summer steelhead reared in the standard Oregon system.

Hypothesis 1.3: Survival of subyearling spring chinook reared in the Michigan type system and subyearling spring chinook reared in the standard Oregon system will be equal to or greater than 0.2%.

Hypothesis 1.4: Out migration survival of fall chinook reared in the Michigan type rearing system will be no different than survival of fall chinook reared in the standard Oregon system.

Hypothesis 1.5: Out migration survival of summer steelhead reared in the Michigan type system will be no different than survival of summer steelhead reared in the standard Oregon system.



[a] Wallowa stock.

[b] Umatilla stock.

Figure 6. Proposed allocation for Umatilla Hatchery and Irrigon Hatchery. This ponding allocation involves a rearing exchange of 84,000 lbs. of Michigan type ponds (6 ponds) at Umatilla Hatchery with 84,000 lbs. of standard ponds (8 ponds) at Irrigon Hatchery. The underlined words indicate the treatment that the pond represents. std = Standard, O_2 = O_2 supplemented, ChF = Fall Chinook, ChS = Spring Chinook, StS = Steelhead, 0's = subyearling, 1's = yearling, Acc. = Acclimation.

Hypothesis 1.6: Out migration survival of subyearling spring chinook reared in the Michigan type system will be no different than survival of subyearling spring chinook reared in the standard Oregon system.

Overview and Approach:

Supplemental oxygen is currently being used to increase the carrying capacity of hatchery water supplies in state-operated hatcheries in Michigan (Westers 1986). Under the "Michigan Method" oxygen generators are used to strip nitrogen from well water by forcibly adding oxygen. Effluent water is collected after a single pass through a raceway, re-oxygenated to saturation and passed through another raceway. At the Umatilla Hatchery, it is planned to use a triple pass of oxygenated water. This system incorporates high water exchange rates and baffles located at regular intervals across the raceway to permit solid wastes to be swept along the bottom of the ponds. Fish are reared at substantially higher densities under the "Michigan Method" than with the standard rearing methods. While this rearing system appears to offer more efficient use of hatchery water and may result in an increase in ponds of fish produced per unit rearing area, it has not been evaluated to determine the effects on quality of juvenile fish and survival to adult.

We will compare the effectiveness of rearing spring and fall chinook salmon and summer steelhead with and without oxygen supplementation. Comparisons will be made using rearing densities that are considered standard for these systems. This objective addresses critical uncertainties numbers one and three. We plan to monitor and compare the estimated quality of rearing juveniles and smolts at release, out migration performance as measured by survival to Columbia River dams, and smolt-to-adult survival. ODFW has similar studies planned for spring chinook at Willamette hatcheries.

Table 28 outlines the proposed groups of fall chinook, spring chinook, and summer steelhead that will be used for evaluating the Michigan type rearing systems. The minimum number of fish needed per replicate group was previously presented in Table 27. Out migration performance will be assessed by comparing relative recapture rates of downstream migrant smolts. Umatilla River recoveries will be made at Westland and Three Mile Dams, and Columbia

River recoveries will be made at John Day, the Dalles, and Bonneville dams. The type and extent of monitoring that will occur in the future at the Columbia River dams is under discussion and will be determined later. As sampling plans are developed for these mainstem sites, we will be better able to determine smolt marking requirements to assure adequate recoveries. We propose to replicate treatments for all three species for four years.

Table 28. Proposed release groups and replicates of spring and fall chinook and summer steelhead for evaluation of the Michigan-type O_2 supplementation rearing system.

Species (Stock)	Method of Rearing	Replicates (ponds) Per Pass	Size at Release	Release Location
Spring Chinook	Standard Oregon	2	15	Umatilla
(Carson)	Michigan Type	2	15	Umatilla
Fall Chinook	Standard Oregon	3	60	Umatilla
(Upper River Bright)	Michigan Type	4	60	Umatilla
Summer Steelhead-	Standard Oregon	2	5	Wallowa
(Wallowa)	Michigan Type	2	5	Wallowa

[a] Coded wire tagged groups will also be used in Objective 2 for evaluating subyearling spring chinook production.

We propose using Wallowa stock steelhead for the evaluation of rearing in Michigan type ponds. This will involve rearing six Michigan type ponds (two series) of Wallowa stock steelhead at Irrigon in exchange for rearing four standard ponds of yearling chinook and four standard ponds of Umatilla summer steelhead at Irrigon Hatchery. The O_2 study with steelhead will begin after completion of a one year rearing trial with Umatilla stock steelhead in the O_2 system.

In addition to smolt-to-adult survival and outmigration performance, there are a number of other performance parameters that we will estimate for each treatment, including but not limited to: "smolt quality" differences; age at maturity; exploitation rates; sex ratios; catch distribution and contribution; adults produced per pond of smolts; etc. These performance parameters will be used with smolt-to-adult survival rates to develop recommendations for

effective hatchery operation. The long-term production profile will depend on what managers wish to maximize with regard to this facility.

Objective 2: Determine smolt-to-returning adult survival and outmigration preformance of subyearling and yearling spring chinook smolts released from Umatilla Hatchery and Bonneville Hatchery and released into the Umatilla River and compare to expected survival.

Hypothesis 2.1: Smolt-to-returning adult survival of spring chinook yearlings reared in the standard Oregon ponds and released at 5 fish/lb will be equal to or greater than 0.75%.

Hypothesis 2.2: Smolt-to-returning adult survival of subyearling spring chinook reared in standard Oregon ponds and released at 15 fish/lb will be equal to or greater than 0.2%.

Hypothesis 2.3: Smolt-to-returning adult survival of spring chinook yearlings rearing at Bonneville Hatchery and released at 10 fish/lb will be equal to or greater than 0.75%.

Hypothesis 2.4: Smolt-to-returning adult survival of subyearling spring chinook smolts reared at Bonneville Hatchery for release in the fall at 12 fish/lb will be equal to or greater than 0.4%.

Hypothesis 2.5: Smolt-to-returning adult survival of spring chinook subyearlings produced at Umatilla Hatchery will be no different than survival of yearling smolts produced at Bonneville Hatchery.

Overview and Approach:

Three rearing and release strategies were originally proposed for spring chinook production at Umatilla Hatchery (spring and fall release subyearling and spring release yearlings). There is not sufficient pond space initially to test all three strategies with adequate replication and accomplish other higher priority evaluations. The spring releases were identified as higher priority than fall releases because of the problems associated with passage

through mainstem Columbia River dams in the fall. This objective addresses uncertainty priority number two.

Spring chinook yearlings will be reared in four standard ponds (two upper and two lower ponds) at Irrigon Hatchery (Figure 6). The number of coded wire tagged fish needed for each replicate was provided in the experimental design section (Table 27). Subyearling spring chinook smolts are scheduled to be produced in the Michigan type system (six ponds) and in the standard system (four ponds) for the Michigan type rearing evaluation. Each of these ponds will contain coded wire tagged groups. The fish reared in the standard system will be used to evaluate the effectiveness of subyearling spring chinook smolts.

In addition to the spring chinook production from Umatilla Hatchery, there will be spring chinook produced at Bonneville Hatchery for release in the Umatilla River. Survival of spring chinook produced at Bonneville will be used as a basis for comparison of survival for subyearling and yearling smolts from Umatilla Hatchery. Our ponding and marking plan will enable us to test for significant differences in survival and effectiveness between each of the spring chinook rearing and release strategies. The exact ponding scenario at Bonneville has not been determined. There are 150,000 spring chinook from Bonneville programmed for release in the fall as part of CTUIR's Bonifer and Minthorn Evaluation. The remainder from Bonneville are scheduled for release in the spring at approximately 10 fish/lb. The marking program proposed by CTUIR for fall releases will provide the information needed to evaluate the effectiveness of fall releases. We should also tag adequate numbers and replicates of the yearlings released from Bonneville as standards to provide for valid statistical comparisons of this standard production scenario with the two experimental scenarios proposed for Umatilla Hatchery.

Each group of yearling (Umatilla and Bonneville production) and subyearling smolts will be marked (freeze brand, PIT or VIT) to provide outmigration performance estimates. In addition to smolt-to-adult survival, we will estimate a number of other performance parameters (see Objective 1 Overview and Approach) that will be essential for evaluating the success of spring chinook production at Umatilla Hatchery. We plan to replicate these rearing treatments for four years.

Objective 3: Determine the effectiveness of acclimating summer steelhead smolts prior to release.

Hypothesis 3.1: Summer steelhead that are acclimated prior to release will survive no differently than fish that are hauled directly from Umatilla Hatchery and released into the stream.

Overview and Approach:

The CTUIR initiated a study with 1987 brood Umatilla steelhead to evaluate the effectiveness of acclimating smolts at Minthorn Springs prior to release. Three release years for this experiment will be completed by the time the first steelhead are released from the Umatilla/Irrigon Hatchery. It will be necessary to continue the study for two years when Umatilla/Irrigon Hatchery production is available. This will insure that the desired four years of replication are achieved and that steelhead produced at Umatilla/Irrigon Hatchery will respond to acclimation similarly to steelhead produced at Oak Springs (where Umatilla steelhead are currently reared).

The proposed initial evaluation involves rearing all of the Umatilla steelhead at Irrigon Hatchery in four standard ponds (two pond series). In order to replicate releases, the acclimated fish will have to be marked after they are transferred to Minthorn. A total of four marked groups will be released each year for both the acclimated and direct stream releases (two groups from upper ponds and two groups from lower ponds). Recoveries from fisheries and returns to the Umatilla will provide the information necessary to test the hypothesis. This objective addresses, in part, critical uncertainty number five.

Additional objectives of the CTUIR study involve evaluating the benefits of acclimating subyearling fall chinook releases from Minthorn in the fall, subyearling spring chinook releases from Bonifer in the fall, and yearling spring chinook releases from Bonifer in the spring. When full production of summer steelhead is reached at Umatilla Hatchery, both Bonifer and Minthorn facilities will be needed exclusively for summer steelhead acclimation from February until April 15. This requires chinook acclimation experiments to be

conducted at other times. The ongoing acclimation studies for spring and fall chinook released in the fall under the CTUIR project evaluation program should continue for a minimum of four years so that adequate between-year replication is achieved.

As discussed earlier, additional acclimation facilities will need to be constructed to accommodate the large numbers of spring and fall chinook that are programmed for production at Umatilla Hatchery. Spring and fall chinook from Umatilla Hatchery could be available for acclimation studies at study year five, after we have completed higher priority objectives.

Objective 4: Document fish cultural and hatchery operational practices at Umatilla Hatchery and adult recapture/juvenile release facilities.

Hypothesis: None.

Overview and Approach:

The collection, storage, transfer, and summarization of information from a monitoring and evaluation program of this magnitude will be an immense effort. Accurate documentation of fish culture operations from egg-take through rearing and release is critical to an effective monitoring and evaluation program. ODFW has a hatchery information system and database that is used statewide to document aspects of culture activities. We plan to work with the hatchery personnel and data managers to make sure that the data collected meet the needs of the evaluation as well as the needs that are identified for the Council's Coordinated Information System being developed by the Council's Monitoring and Evaluation Group (MEG). We plan to work with the Council's Hatchery Effectiveness and Supplementation TWG and MEG to insure consistency of data collection and reporting with basinwide programs. This objective is an integral part of all other objectives but does not relate specifically to one uncertainty.

Objective 5: Determine annual harvest of chinook salmon and summer steelhead in the Umatilla River including estimates of total catch by marked group.

Hypothesis: None.

Overview and Approach:

One of the goals of the ODFW/CTUIR Umatilla River Fisheries Rehabilitation Program is to provide sustainable Indian and non-Indian harvest of salmon and steelhead. Monitoring catch will inform managers of the extent that harvest objectives for each species are being attained. Harvest estimates are also essential for determining survival of Ad+CWT marked test groups of salmon and steelhead. Obtaining adequate estimates of these diverse harvests will require coordination of harvest survey efforts between state and tribal authorities. Statistical creel programs will be designed to estimate catch by mark. Creel programs will be designed to provide catch estimates with confidence intervals no greater than ±25%.

Natural Production and Supplementation Objectives

Objective 6: Determine the success of reestablishing natural production of spring chinook and fall chinook in the Umatilla basin.

Hypothesis: None.

Overview and Approach:

Various changes in the aquatic habitat have occurred over the past 70 years since chinook were last known to successfully reproduce in abundance in the basin. At present, we believe that the existing habitat can provide the essential elements for reestablishing natural spring and fall chinook production. With planned future improvements in the habitat and passage conditions in the basin, we believe that long-term natural production goals of 1,000 spring chinook and 11,000 fall chinook can be achieved.

Since the time that chinook were eliminated from the basin, native summer steelhead and trout may have increased their range to include rearing areas formerly used by chinook. This program proposes to reestablish naturally producing populations of spring and fall chinook in the Umatilla Basin, and

may thus potentially displace some summer steelhead and trout. For this reason, ODFW and CTUIR understood during the planning of the Umatilla River Fisheries Rehabilitation Program that there would be some risks to the native summer steelhead and trout populations. ODFW and CTUIR are willing to accept the risks and consequences because of the importance of reestablishing fall and spring chinook in the basin.

Because the Umatilla basin has no natural populations of chinook, it would appear to be an ideal basin to test major question number one from the Council's Supplementation TWG 1988 Work Plan: "What are the best techniques for supplementing wild and natural stocks with each life stage of salmonid of interest?". However, experimental opportunities are very limited in the Umatilla River because we expect chinook spawning will occur primarily in the mainstem and lower tributaries, eliminating the possibility of establishing areas of streams that can be used for different treatments and controls. The experimental opportunity is limited to evaluating the success of reintroducing non-endemic fall and spring chinook stocks into an environment that has not supported production for many years. An evaluation of this type may not have wide application outside the Umatilla basin, but will answer the specific question of whether the basin is capable of supporting natural production at an acceptable level. Results will also help identify environmental factors which may be limiting natural production success. This objective addresses uncertainty number six.

Work on this objective will primarily involve assessing environmental conditions and estimating (statistical interval estimation) population performance parameters (prespawning mortality, spawning success, egg deposition, egg-to-fry survivals, fry-to-smolt survivals, outmigration timing, smolt-to-adult survival) of spring chinook and fall chinook that spawn naturally. The major uncertainty is whether the natural escapement goals we have established are greater than or less than the actual natural production capability of the environment. This question may not be answerable because of the environmental changes that will accompany the flow enhancement and habitat improvement projects and the difficulty in adequately determining habitat capacity. However, with the estimates of important population parameters and the system planning model we can generate a better understanding of the basins

natural production capacity for spring and fall chinook and later refine our natural escapement goals.

Objective 7: Determine if the Umatilla basin has adequate streams to meet the experimental requirements for treatment, control, and spatial replication of a steelhead supplementation study. If so, then proceed to objective number 8.

Objective 8: Determine if streams stocked with hatchery reared summer steelhead smolts show significant increases in natural production through time.

Hypothesis 8.1: Streams that are stocked with hatchery reared smolts will have no difference in adult escapement and natural production than unstocked streams.

Overview and Approach:

Although the uncertainties of success and potential impacts of supplementation of summer steelhead were not given high priority (priority 6), supplementation strategies and research have recently been given a great deal of attention by the Council's Supplementation TWG (Work Plan 1988). Supplementation studies on summer steelhead in the mid-Columbia were given fifth priority in the work plan behind upriver spring/summer chinook and upriver steelhead supplementation studies.

One of the most critical needs for an adequate experimental design is sufficient streams to administer treatments and maintain controls. Two tributaries, Meacham and Birch, support a majority of the natural production in the basin. The first phase of this study will determine if it is feasible to use one subbasin as a control and the other as a treatment. We must determine if it will be feasible to develop juvenile and adult trapping facilities in these subbasins.

We will first determine smolt and adult production in treatment and control streams to establish baseline data. We will stock smolts into

treatment streams and maintain control streams as unstocked streams. We will estimate egg deposition, fry production, and smolt production in treatment and control streams. Returning adults will be counted and classified as hatchery or wild. Treatment should be applied for a minimum of four years. The earliest that a supplementation study could be initiated would be three years following completion of the hatchery because steelhead reared in the first two years will be used in acclimation tests. We will not outplant steelhead smolts into potential treatment and control streams until we determine if a supplementation study will be conducted. If the Umatilla is scheduled for supplementation research, a detailed evaluation plan will be developed and submitted to the Supplementation TWG for review.

Objective 9: Determine if hatchery supplementation of the wild native steelhead population alters the genotypic variation and life history characteristics of the native summer steelhead population.

Overview and Approach:

This uncertainty was given low priority (priority 7) for evaluation in the Umatilla Basin; however, it has been identified as a major question in the Council's Supplementation TWG Work Plan (1988). Riggs (1987) discusses the techniques available for monitoring genetic change. At present, there are no clear guidelines or standard methods for evaluating changes in the genetic character of fish populations that are subjected to large scale hatchery supplementation. The most widely used technique (isozyme techniques to assess allelic variation) is probably the most applicable to address the genetic aspects of this objective. Baseline data describing the existing genetic variation in the wild population should be developed as soon as possible. This work could be contracted to any of the laboratories with the appropriate analytical techniques and equipment.

The Genetics Technical Committee of the Council's MEG plans to develop guidelines which will give further direction for the most appropriate techniques and strategies for assessing genetic variation and genetic changes in fish populations. We will be working with this group to insure that their recommendations for monitoring are implemented in the Umatilla basin. Details

of the sampling and monitoring plan for this objective will be developed with a work statement at a later date.

Budget and Schedule

Budget estimates for year 1 (FY 1990), 2 (FY 1991), and 3-10 (FY 1992-99) are provided in Tables 29, 30, and 31, respectively. These budgets are preliminary and will be updated by the ODFW and CTUIR when Work Statements are developed. This budget scenario assumes that the hatchery will be completed by Fall 1990 (FY 1991). Budgets for 1992-1996 were estimated with annual incremental increases of 5% from the 1991 budget. We decreased budget estimates below 1996 level for 1997-1979 because we will have completed four years of replication for a majority of the initial evaluation priority releases.

Objectives 1-8 will each require 8 years including 4 years (reps) of marked groups and 4 years of adult recoveries (Figure 7). Work in FY 1990 will focus primarily on Objectives 5, 7, and 9, purchasing and testing essential field equipment (adult CWT sorter, juvenile trapping and sampling equipment, etc.), and planning. Actual implementation of hatchery effectiveness studies is planned for FY 1991. As mentioned, the O_2 studies with steelhead will be delayed for one year following a one year rearing trial with Umatilla stock steelhead in the O_2 system.

Table 29. Estimated FY 1990 (October 1, 1989 - September 30, 1990) budget (Year 1) for the Umatilla Hatchery monitoring and evaluation program.

Personal Services

Position	Months	Rate	Amount	Total	
Project Leader	2	$2,750	$5,500		
Asst. Project Leader	12	2,260	27,120		
Statistician	1	2,610	2,610		
		OPE (38%)	13,387		
		Subtotal PS	$48,617	$ 48,617	
Services and Supplies					
Vehicle rental, mileage, travel			$8,000		
Office rental, utilities, office supplies			3,513		
Communications and printing			3,000		
Field supplies			2,000		
Tagging supplies (tags for Year 2, 1,235,000 @ $45/1000			55,575		
		Subtotal SS	$72,088	$ 72,088	
Administrative overhead (25% of PS and SS)				$ 30,018	$150,723
Capital Outlay					
Office equipment			$1,000		
Electronic balance			820		
Microcomputer and software			6,000		
Adult counting equipment (Three Mile Dam)			25,000		
			$32,820	$ 3,820	
		Total Budget		$183,543	

Table 30. Estimated FY 1991 (October 1, 1990 - September 30, 1991) budget (Year 2) for the Umatilla Hatchery monitoring and evaluation program.

Personal Services				
Position	Months	Rate	Amount	Total
Project Leader	1	3,150	$ 3,150	
Project Leader	12	2,890	34,680	
Asst. Project Leader	18	2,370	42,660	
Statistician and Editor	2	2,740	5,480	
Clerical Assistant	3	1,320	3,960	
Tagging Supervisor	6	2,160	12,960	
Fish Markers	30	1,080	32,400	
		OPE (38%)	51,410	
		Subtotal PS	$186,700	$186,700
Services and Supplies				
Vehicle rental, mileage, travel			$8,400	
Office rental, utilities, office supplies			3,700	
Communications and printing			3,200	
Field supplies			70,000	
		Subtotal SS	$87,400	$ 87,400
Administrative overhead (25% of PS and SS)				$ 68,525
		Total Budget		$342,625

Table 31. Estimated FY 1992-1999 budgets for the Umatilla Hatchery monitoring and evaluation program.

Fiscal Year	Estimated Budget
1992	$359,800
1993	$377,800
1994	$396,700
1995	$416,500
1996	$437,300
1997	$300,000
1998	$215,000
1999	$330,800

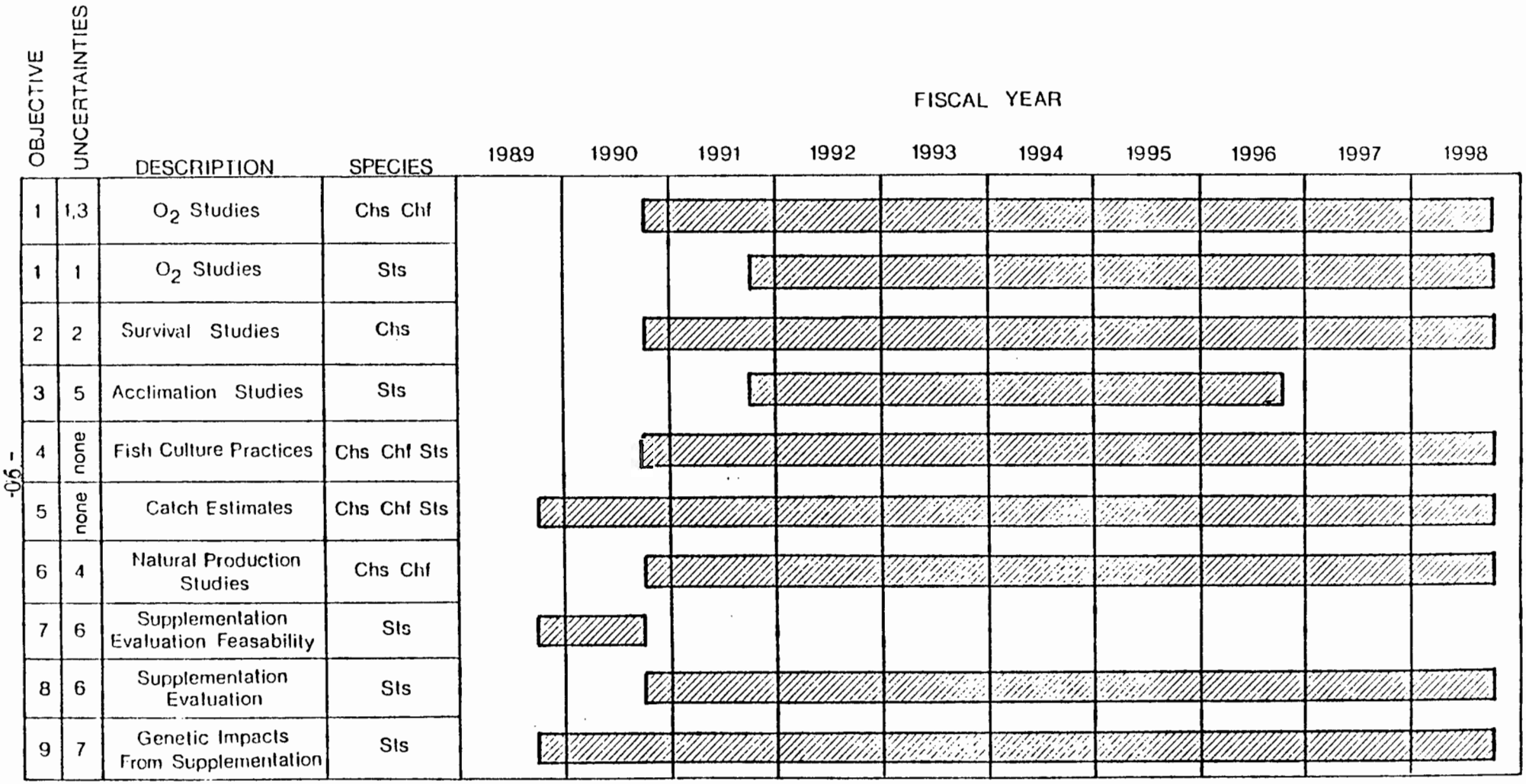


Figure 7. Schedule for the Umatilla Hatchery monitoring and evaluation program by objective.

FISHERY BENEFITS

Contribution toward the Council's doubling goal and to ocean and Columbia River fisheries was assessed using a model developed under the U.S./Canada Pacific Salmon Treaty negotiations (Tables 32-35). Model parameters and values are recent (1983-87) averages, and were developed by the state and tribal Technical Advisory Committee (TAC 1984). The ocean harvest rates were developed by the Pacific Salmon Commission Chinook Technical Team (PSC 1987).

The model input value (RELEASE) is the number of smolts or juveniles released from the Umatilla Basin. The subsequent survival rates (DOWNSTREAM DAM PASSAGE) include outmigrant survival through John Day, The Dalles, and Bonneville dams. Early ocean survival (EARLY OCEAN SURVIVAL) was estimated by back-calculating from estimated smolt-to-adult survival rates developed for each species used in the Umatilla Hatchery Master Plan. Survival through ocean fisheries (OCEAN FISHERIES) represents present ocean harvest rates of each species. A survival rate is assumed for the adult transfer from ocean fisheries to the mouth of the Columbia River (TRANSFER TO RIVER). Lower river fisheries are commercial and sport harvest rates in Zones 1-5 in the Columbia River (LOWER RIVER FISHING). Upstream adult dam passage survival was estimated at Bonneville (BONNEVILLE DAM PASSAGE), John Day, and The Dalles (UPSTREAM DAM PASSAGE) for each species. Treaty fishing is for commercial, subsistence, and ceremonial harvest (TREATY FISHING) in Zone 6 of the Columbia River. Additional adult straying and natural mortality is estimated to occur between the final dam passed and the mouth of the Umatilla River. Escapement (ESCAPEMENT) is the estimated adult return to the mouth of the Umatilla River. The numbers lost column indicates the actual number of adults or juveniles lost to each mortality factor. The escapement equivalents are the number of adults which would have returned to the mouth of the Umatilla absent the respective mortality factor.

Tables 32-35 display model results for hatchery releases of spring and fall chinook and summer steelhead from the Umatilla Hatchery. A total of 91,382 adult spring and fall chinook and summer steelhead will be contributed toward the doubling goal including 7,836 spring chinook (from both subyearling and yearling releases), 74,957 fall chinook, and 8,589 summer steelhead. The

Table 32. Umatilla spring chinook subyearling smolt survival rates for various events from time of release to adult escapement to the Umatilla River mouth.

Event	Survival Rate	Numbers Remaining	Numbers Lost	Escapement Equivalents
Release		1,080,000		
Downstream Dam Passage	0.614	663,255	416,745	1,362
Early Ocean Survival	0.008	5,306	657,949	268,847
Ocean Fisheries	0.730	3,873	1,433	802
Transfer to River	0.800	3,099	775	542
Lower River Fishing	0.975	3,021	77	56
Bonneville Dam Passage	0.950	2,870	151	114
Treaty Fishing	0.930	2,669	201	163
Upstream Dam Passage	0.903	2,409	260	234
Escapement	0.900	2,168	241	

Table 33. Umatilla spring chinook yearling smolt survival rates for various events from time of release to adult escapement to the Umatilla River mouth.

Event	Survival Rate	Numbers Remaining	Numbers Lost	Escapement Equivalents
Release		210,000		
Downstream Dam Passage	0.614	128,966	81,034	993
Early Ocean Survival	0.030	3,869	125,097	51,117
Ocean Fisheries	0.730	2,824	1,045	585
Transfer to River	0.800	2,259	565	395
Lower River Fishing	0.975	2,203	56	41
Bonneville Dam Passage	0.950	2,093	110	83
Treaty Fishing	0.930	1,946	146	119
Upstream Dam Passage	0.903	1,757	190	171
Escapement	0.900	1,581	176	

Table 34. Umatilla fall chinook smolt survival rates for various events from time of release to adult escapement to the Umatilla River mouth.

Event	Survival Rate	Numbers Remaining	Numbers Lost	Escapement Equivalents
Release		5,940,000		
Downstream Dam Passage	0.614	3,647,902	2,292,098	11,100
Early Ocean Survival	0.022	80,254	3,567,649	785,351
Ocean Fisheries	0.660	52,968	27,286	9,101
Transfer to River	0.900	47,671	5,297	1,963
Lower River Fishing	0.800	38,137	9,534	4,417
Bonneville Dam Passage	0.950	36,230	1,907	930
Treaty Fishing	0.600	21,738	14,492	11,778
Upstream Dam Passage	0.903	19,629	2,109	1,898
Escapement	0.900	17,666	1,963	

Table 35. Umatilla summer steelhead yearling smolt survival rates for various events from time of release to adult escapement to the Umatilla River mouth.

Event	Survival Rate	Numbers Remaining	Numbers Lost	Escapement Equivalents
Release		210,000		
Downstream Dam Passage	0.614	128,966	81,034	3,563
Early Ocean Survival	0.074	9,544	119,423	70,957
Ocean Fisheries	1.000	9,544	0	0
Transfer to River	0.900	8,589	954	630
Lower River Fishing	0.975	8,374	215	145
Bonneville Dam Passage	0.960	8,039	335	236
Treaty Fishing	0.850	6,834	1,206	1,001
Upstream Dam Passage	0.922	6,301	533	480
Escapement	0.900	5,670	630	

<1>

Council goal is measured as returns to the mouth of the Columbia River plus prior fisheries. To derive this number from the tables, we added numbers lost in OCEAN FISHERIES and numbers remaining upon TRANSFER TO RIVER which is escapement to the mouth of the Columbia River.

A total of 55,691 adults will be contributed to ocean and Columbia River fisheries including 2,958 spring chinook, 51,312 fall chinook, and 1,421 summer steelhead. This was determined by adding numbers lost to OCEAN FISHERIES, LOWER RIVER FISHING, AND TREATY FISHING.

HARVEST PLANS

Introduction

The primary purpose of the Umatilla River basin anadromous fish enhancement program is to increase the number of salmon and steelhead available for harvest in the Umatilla Basin while rebuilding and maintaining adequate hatchery and natural production. In addition, an extensive evaluation and monitoring plan has been developed to guide and assess the success of the enhancement program.

The purpose of these harvest plans is to explain how harvest management will support and integrate with the salmon and steelhead enhancement program for the Umatilla River basin. The proposed harvest plan guidelines are designed to 1) support the rebuilding of salmon and steelhead populations in the Umatilla River basin; 2) support the proposed monitoring and evaluation program for the Umatilla River basin; 3) be consistent with Indian treaty fishing rights, the U.S./Canada Pacific Salmon Treaty, and the U.S. v. Oregon Agreement; and 4) be consistent with the Northwest Power Planning Council's Fish and Wildlife Program Measures 204(b), (d), and (e). Harvest management within the Umatilla River basin must also address and consider the natural and hatchery production objectives developed by the CTUIR and ODFW.

CTUIR and ODFW desire to provide productive Indian and non-Indian fisheries in the Umatilla Basin for all species currently being enhanced. The harvest plan guidelines (Tables 36-38) represent the first step of harvest planning. The CTUIR and ODFW will later develop annual harvest plans which will identify specific allocation of harvestable surplus and location of Indian and non-Indian fisheries in the Umatilla Basin. As actual smolt-to-adult return rates become known in the Umatilla Basin, the CTUIR and ODFW will more accurately develop adult return forecasts which will be the basis for annual agreements regarding allocation of harvestable surpluses.

Umatilla fall chinook will be harvested in mixed stock ocean fisheries from Oregon to Southeast Alaska and in the Columbia River. Management of these fisheries will be governed by the Pacific Salmon Commission and Pacific

Fisheries Management Council under the U.S./Canada Pacific Salmon Treaty and the states and tribes under the U.S. v. Oregon Management Plan.

Umatilla spring chinook will also be harvested in the ocean and inriver mixed stock fisheries. Information to date shows that few spring chinook originating above Bonneville Dam are harvested in these fisheries. Increased production in the Umatilla River basin in conjunction with enhancement efforts in other basins such as the Yakima and Klickitat should begin to reverse this trend and allow for more harvest by both Indian and non-Indian fisheries. As with fall chinook, regulations will be under numerous jurisdictions with the Pacific Salmon Commission and the states and tribes under U.S. v. Oregon as the main governing bodies.

Steelhead will mainly be harvested in Columbia River mixed stock fisheries under U.S. v. Oregon. Recent history has shown that natural runs can increase even with increases in mixed stock harvests of other stocks that co-mingle with steelhead (principally fall chinook). Prospects for increasing natural runs of steelhead is good as more fish are produced and released into the habitat.

Harvest Plan Guidelines

The CTUIR and ODFW have established natural production and hatchery production goals for salmon and steelhead populations in the Umatilla River basin. The Comprehensive Plan for Rehabilitation of Anadromous Stocks in the Umatilla River Basin (ODFW 1986) was used to determine the interim spawning escapement goals for spring and fall chinook (see Appendix A).

The CTUIR and ODFW have developed Umatilla River adult salmon and steelhead harvest plan guidelines (Tables 36-38) which outline the catch apportionment of adults returning to the Umatilla River at various run sizes. The CTUIR and ODFW have identified hatchery broodstock, spawning escapement, and evaluation requirements as having high priority. However, it is the intent of the CTUIR and ODFW to provide a level of harvest which is compatible with the respective natural and hatchery run size and rebuilding goals for each species. The CTUIR and ODFW will use Tables 36-38 as guidelines to

Table 36. Harvest plan guidelines for summer steelhead.[1]

Broodstock Collection Goal = 210
Run Size Goal (to mouth) = 9,670 (4,000 natural, 5,670 hatchery)

Interim Spawning Escapement Goal = 3,000

Total Run Size[2]	Umatilla Hatchery Broodstock[3]	Spawning Escapement	Research Needs[5]	In-River Harvest
1,000	210	690	140	Based on
2,000	210	1,690	280	available
3,000	210	2,190	280	surplus[6]
4,000	210	2,590	280	
5,000	210	3,000[4]	280	
6,000	210	3,000	280	
7,000	210	3,000	280	
8,000	210	3,000	280	
9,000	210	3,000		
10,000				

[1] Schedule will be the basis for development of annual harvest plans.

[2] Includes wild/natural (unclipped) and hatchery returns (clipped) to the mouth of the Umatilla River.

[3] Wild/natural (unclipped) steelhead will be first priority for broodstock; however, no more than 20% of the unclipped population will be used for broodstock. A maximum of 210 broodstock are needed for the Umatilla Hatchery.

[4] Interim spawning escapement goal achieved.

[5] O_2 and acclimation studies (need 140 tags each). Samples would be collected from harvest, spawning surveys, broodstock, and returns to acclimation facilities.

[6] Available surplus is fish available for harvest after hatchery broodstock, spawning escapement, and research needs are met at the various total run sizes as evaluated and agreed to by CTUIR and ODFW.

Table 37. Harvest plan guidelines for spring chinook salmon.[1]

Broodstock Collection Goal = 1,200
Run Size Goal (to mouth) = 11,000 (1,000 natural, 10,000 hatchery)

Interim Spawning Escapement Goal = 600

Total Run Size [2]	Umatilla Hatchery Broodstock[3]	Spawning Escapement	Research Needs[5]	In-River Harvest
250	100	50	105	
500	200	100	280	
750	300	200	350	
1,000	400	300	350	Based on available surplus[6]
2,000	600	400	490	
3,000	1,000[7]	500	490	
4,000	1,200[7]	>600	490	
5,000	1,200	>600	490	
6,000	1,200	>600	490	
7,000	1,200	>600	490	
8,000	1,200	>600	490	
9,000	1,200	>600	490	
10,000	1,200	>600	490	
11,000	1,200	>600	490	

[1] Schedule will be the basis for development of annual harvest plans.

[2] Includes hatchery and natural returns to the mouth of the Umatilla River.

[3] Broodstock requirement for the Umatilla Hatchery only; does not include production at other hatcheries.

[4] Spawning escapement at returns above 5,000 based upon natural production success, available habitat, and other considerations as agreed to by CTUIR and ODFW.

[5] Samples (tags) collected from harvest, spawning surveys, broodstock, and returns to acclimation facilities.

[6] Available surplus is fish available for harvest after broodstock (Umatilla returns or other stocks), spawning escapement, and research needs are met at the various total run sizes as evaluated and agreed to by CTUIR and ODFW.

[7] Broodstock collection goal achieved.

Table 38. Harvest plan guidelines for fall chinook salmon.[1]

Broodstock Collection Goal = 4,600
Run Size Goal (to mouth) = 21,000 (11,000 natural, 10,000 hatchery)

Interim Spawning Escapement Goal = 5,200

Total Run Size[2]	Umatilla Hatchery Broodstock[3]	Spawning Escapement	Research Needs[5]	In-River Harvest[6]
500	100	250	70	
1,000	500	250	140	
2,000	1,000	500	280	Based on
4,000	1,500	1,000	450	available
6,000	2,000	1,500	450	surplus
9,000	3,000	2,500	450	
12,000	4,000[7]	3,500[8]	450	
15,000	4,600[7]	5,000[8]	450	
18,000	4,600[7]	5,200[8]	450	
21,000	4,600[7]	5,200[8]	450	

[1] Schedule will be the basis for development of annual harvest plans.

[2] Includes hatchery and natural returns to the mouth of the Umatilla River.

[3] Broodstock requirement for the Umatilla Hatchery only; does not include broodstock requirements for other hatcheries.

[4] Spawning escapement at returns above 5,000 based upon natural production success, available habitat, and other considerations as agreed to by CTUIR and ODFW.

[5] Samples (tags) collected from harvest, spawning surveys, broodstock, and returns to acclimation facilities.

[6] Available surplus is fish available for harvest after broodstock (Umatilla returns or other stocks), spawning escapement, and research needs are met at the various total run sizes as evaluated and agreed to by CTUIR and ODFW.

[7] Broodstock collection goal achieved.

[8] Spawning escapement goal achieved.

develop annual harvest plans which will specify allowable catch and allocation and location of Indian and non-Indian fisheries in the Umatilla River.

The anadromous fish production profile for the Umatilla Hatchery provided the basis for the broodstock goals. The number of hatchery broodstock needed for steelhead (210) is expected to be achieved with current runs (Table 36). However, a broodstock build-up period will be necessary for spring and fall chinook. The number of spring and fall chinook broodstock collected increases with the corresponding run size until the hatchery broodstock goal is gradually achieved (Tables 37-38). The schedule is designed to support the continuous building of the hatchery broodstock program while concurrently increasing natural production and harvestable surplus.

The harvest plan guidelines also address the needs of the evaluation and monitoring program for the Umatilla River basin. The monitoring and evaluation program will provide critically important information to guide managers of the Umatilla River Fisheries Rehabilitation Program to achieve broodstock, spawning, research, and harvest goals.

The monitoring and evaluation program has identified a minimum number of observed recoveries (tags or marks) per experimental replicate for each species. The research needs (Tables 36-38) represent the minimum number of observed recoveries required for the various evaluation studies. The collection of samples (tags or marks) for each study will occur in the order of priority outlined in the Monitoring and Evaluation Plan section. There must be evaluation funding commitments so CTUIR and ODFW can recover the required number of tags from broodstock, spawning surveys, and various harvests.

COORDINATION and DOCUMENTATION of the DEVELOPMENT AND REVIEW

of the MASTER PLAN

The Umatilla Hatchery Master Plan was developed by ODFW and CTUIR in cooperation with other agencies. Development of the plan was the responsibility of the Umatilla Hatchery Master Plan Technical Working Group (TWG). The TWG is composed of technical staff from ODFW, CTUIR, NPPC, and BPA. The Umatilla Steering Committee, a policy level group, represented by ODFW, CTUIR, and CRITFC, periodically reviewed progress of work including preliminary results and plan drafts, and provided oversight to the planning project.

Drafts of the Master Plan were sent for review to agencies and interests represented on the Umatilla Coordination Committee, and other government agencies and tribes in the Columbia River basin as well as to appropriate Council and Columbia Basin Fish and Wildlife Authority (Authority) work groups (see list following).

List of Agencies and Committees Involved in Development and Review of the

Umatilla Hatchery Master Plan

1. Umatilla Steering Committee - CTUIR and ODFW.

2. Umatilla Hatchery Master Plan TWG - CTUIR, CRITFC, ODFW, NPPC, and BPA.

3. Umatilla Coordination Committee - CTUIR, CRITFC, ODFW, NPPC, BPA, NMFS, USFWS, USFS, CBFWA, Pacific Northwest Utilities Conference Committee, Bureau of Indian Affairs, Bureau of Reclamation, Army Corps of Engineers, Oregon Department of Water Resources, Umatilla Project Steering Committee, Westland-Stanfield Irrigation District, West Extension Irrigation District, West Extension Irrigation District, and Hermiston Irrigon District.

4. Other Government Agencies and Indian Tribes - Confederated Tribes of the Warm Springs Indian Reservation, Nez Perce Tribe, Yakima Indian Nation, Washington Department of Fisheries, Washington Department of Wildlife, and Idaho Department of Fish and Game.

5. Council and Authority System planning and TWG's - Council System Planning Group, Council Monitoring and Evaluation Group (MEG), Council Supplementation TWG, Council Hatchery Effectiveness TWG, and Authority Artificial Production Committee.

Reviews of the Monitoring and Evaluation Plan by the Hatchery Effectiveness TWG, the Supplementation TWG, and MEG are included in Appendix D. The Supplementation TWG and MEG had no adverse comments relative to the proposed Monitoring and Evaluation Plan. Both groups suggested that the experimental design of specific research needed to be more fully developed and done so in conjunction with the Supplementation TWG and MEG. The MEG suggested that this be accomplished through formation of an Experimental Design Work Group, similar to a group formed for the Yakima program. The ODFW and CTUIR are in agreement with this approach (formation of a Umatilla Experimental Design work Group) which would coordinate closely with the Hatchery Effectiveness TWG, the Supplementation TWG, MEG, and other appropriate committees and fish and wildlife agencies and tribes to integrate the Umatilla with other hatchery production and evaluation programs in the Columbia River.

The Hatchery Effectiveness TWG did not have committee consensus as to the adequacy of the proposed study to evaluate oxygen supplementation at the Umatilla Hatchery. In a letter to the Hatchery Effectiveness TWG (Attachment D), BPA expressed concerns that the planned studies would only indirectly evaluate the oxygen supplementation system due to variation caused by trucking smolts (from the hatchery to release sites in the Umatilla Basin). BPA proposed that a portion of releases be made at the Umatilla Hatchery (into the Columbia River) to provide a more direct evaluation of the oxygen system. Other members of the Hatchery Effectiveness TWG felt that the planned evaluation was adequate although smolts would be trucked to the Umatilla River. Currently, members of the Umatilla Hatchery Master Plan TWG are

meeting to resolve this issue. If necessary, changes will be made in the Monitoring and Evaluation Plan to include direct releases at the hatchery as part of the oxygen supplementation evaluation.

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APPENDIX A

Methods to Establish Run Size and Escapement Goals

In this section we will present a brief excerpt from the Comprehensive Plan (ODFW 1986) which forms the basis to establish run size goals for naturally and hatchery produced adults and escapement goals for naturally produced adults. For further information, please refer to that document.

Run Size Goals

As presented in the Production Profile section, the CTUIR and ODFW have established the following goals for adult returns to the mouth of the Umatilla River:

	Natural	Hatchery
Spring Chinook	1,000	10,000
Fall Chinook	11,000	10,000
Summer Steelhead	4,000	5,670
Coho	Undetermined	6,000

Natural production run size goals represent the sum of the escapement goal determined for each species (see below for derivation of escapement goals) plus the anticipated inriver harvest.

Harvested production run size goals for spring and fall chinook correspond to adult production goals established by the CTUIR and ODFW (CTUIR 1984). The hatchery steelhead run size goal (5,670) is based on number of adults expected to return from a release of 210,000 smolts, assuming a 2.7% smolt-to-adult survival.

Escapement Goals

As presented in the Harvest Plans section, the CTUIR and ODFW have established the following natural spawning escapement goals:

Spring Chinook	600
Fall Chinook	5,200
Summer Steelhead	3,000
Coho	Undetermined

The methods used to determine these estimates are discussed below:

Escapement goals were based on a life cycle model of natural production (see Rehabilitation Objectives and Potential Fishery Benefits in the Comprehensive Plan). The life cycle model (Figure A1 and Table A1) estimated sustained run sizes of each species assuming implementation of all Fish and Wildlife Program passage, artificial transport, and habitat improvement projects planned for the Umatilla Basin. Sustained escapement levels were estimated under current and enhanced flows of the Bureau of Reclamation's Columbia River Pumping (CRP) (Recommended Strategy of the Umatilla Basin Project) Plan. Run size and escapement goals used in the Master Plan are for current flows. If the Umatilla Basin Project comes on-line, run size and escapement goals will be re-evaluated by the CTUIR and ODFW.

The life cycle model is initiated with the number of adult spawners needed for maximum smolt production at the mouth of the Umatilla (Figure A1 and Table A1). The number of adult spawners for maximum smolt production and method to derive estimates is as follows (see Comprehensive Plan for details):

	Spawners	Methods
Spring Chinook	582	Smolt yield model
Fall Chinook	11,097	Spawning area/Instream flow model
Summer Steelhead	1,881	Instream flow/Standing crop model and Smolt production/Flow regression

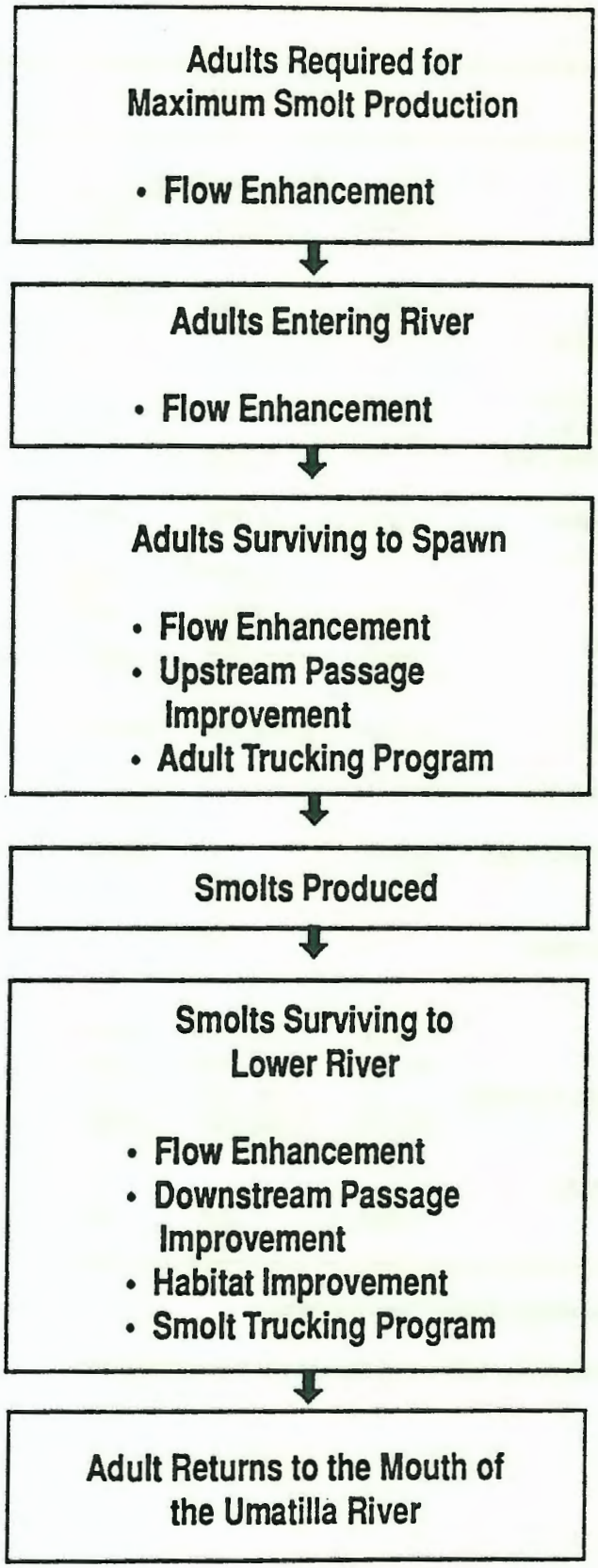


Figure A1. Life history model used to determine sustained run size of naturally produced fish in the Umatilla Basin.

Table A1. Calculation of sustained natural production run sizes used to establish escapement goals (from Table E1, ODFW 1986).

	Existing Flows			CRP Plan[a]		
	StS	ChF	ChS	StS	ChF	ChS
1. Number of adults required for maximum smolt production	1,881	11,097	582	1,881	10,890	582
2. Number of adults surviving to spawn. Loss due to delay in upstream migration (25% for ChF)	--	-2,774	--	--	0	--
Upstream passage improvement	-356	-7,000	-406	-130	-2,047	-127
Adult trucking (ChF & ChS)						
Loss if not trucked	--	(-3987)[b]	(-108)[b]	--	(-1,938)[b]	(-87)[b]
Number trucked	--	3,987	108	--	1,938	87
Trucking mortality (5%)	--	-199	-5	--	-96	-4
	1,525	5,110	279	1,751	10,683	538
3. Number of smolts produced	41,175	1,073,100	20,925	47,277	2,243,430	40,350
4. Number of smolts surviving to lower river						
Habitat improvement (StS and ChS)	32,940	--	16,740	37,822	--	32,280
Downstream passage improvement	0	0	0	0	0	0
Smolt trucking						
Loss if not trucked	-10376	-321,330	-1,674	0	0	0
Number trucked	10,376	321,330	1,674	0	0	0
Trucking mortality (10% for ChF)	--	-32,133	--	--	0	0
	74,115	1,040,967	37,665	85,099	2,243,430	72,630
5. Adult returns to Three Mile Falls Dam	2,965	5,204	603	3,404	11,217	1,162

[a] Bureau of Reclamation's Columbia Riuver Pumping Plan.

[b] Loss of adults between Three Mile Falls and Stanfield Diversion Dam.

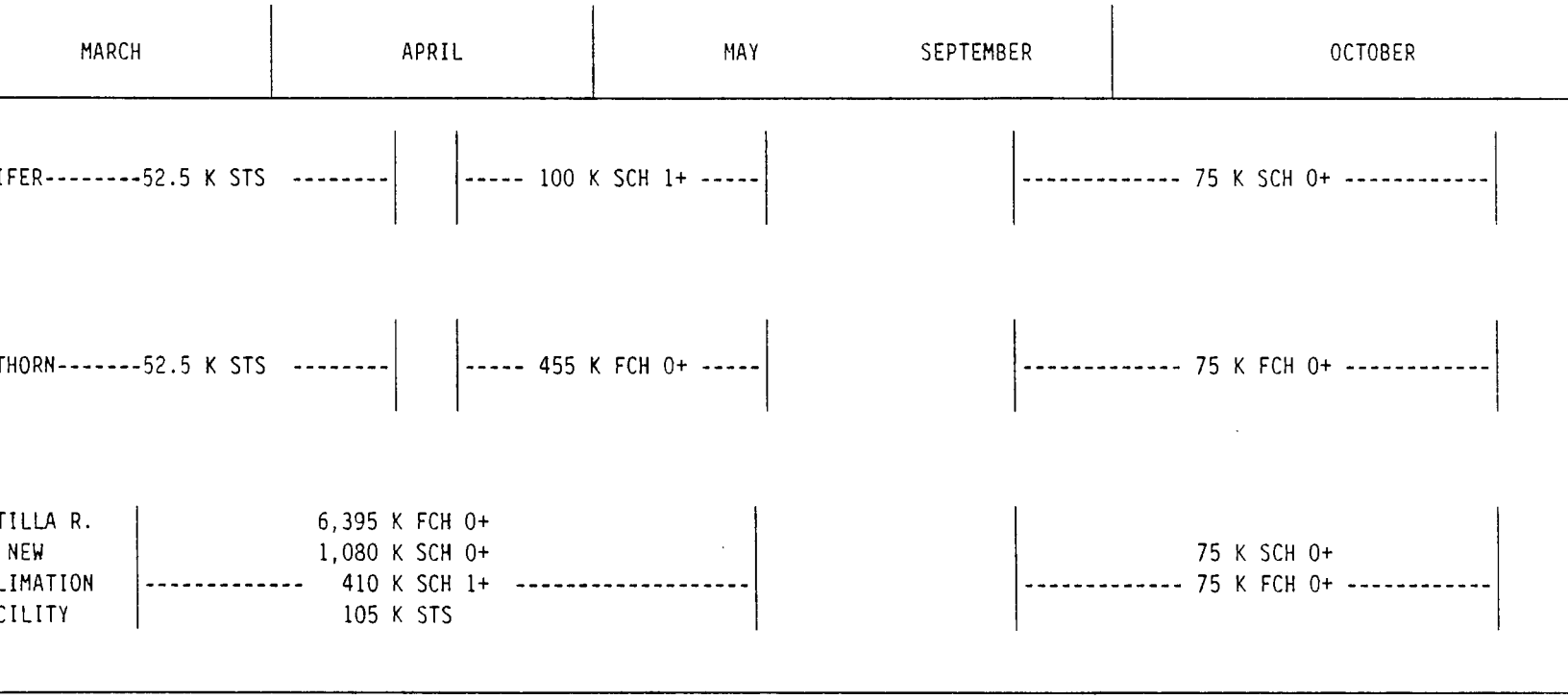
The number of adults surviving to spawn, the number of smolts produced and surviving to the lower Umatilla, and subsequent adult returns to the mouth of the Umatilla are then calculated, thus completing the life cycle. The adult returns shown on Line 5 of Table A1 are the sustained run sizes used as the basis for our escapement goals.

Table B1. Summary of salmon and steelhead smolt production and releases into the Umatilla Basin following completion of the Umatilla Hatchery.

Species	Stock	Hatchery	Rearing Type[1]	Number	Pounds	Fish/lb	Age	Release Location	Release Time	Adult Returns[4]
Umatilla/Irrigon Hatchery										
CHS	Carson	Umatilla	O_2	720,000	48,000	15	0+	Umatilla River[2]	Spring	1,440
CHS	Carson	Umatilla	Standard	360,000	24,000	15	0+	Umatilla River[2]	Spring	720
CHS	Carson	Irrigon	Standard	210,000	42,000	5	1+	Umatilla River[2]	Spring	1,575
CHF	Upper River Brights	Umatilla	O_2	4,320,000	54,000	60	0+	Umatilla River[2]	Spring	12,960
CHF	Upper River Brights	Umatilla	Standard	1,620,000	27,000	60	0+	Umatilla River[2]	Spring	4,860
		CHF Subtotal		5,940,000	99,000					
STS	Umatilla	Irrigon	Standard	105,000	21,000	5	1+	Bonifer/Meacham[3]	Spring	2,835
STS	Umatilla	Irrigon	Standard	105,000	21,000	5	1+	Minthorn/Umatilla[3]	Spring	2,835
		STS Subtotal		210,000	42,000					
		Umatilla/Irrigon Total		7,440,000	255,000					
Carson/Bonneville Hatcheries										
CHS	Carson	Carson	Standard	100,000	5,000	20	1+	Umatilla River[2]	Spring	750
CHS	Carson	Bonneville	Standard	200,000	20,000	10	1+	Bonifer/Meacham[3]	Spring	1,500
CHS	Carson	Bonneville	Standard	150,000	12,500	12	0+	Bonifer/Meacham[3]	Fall	600
CHF	Upper River Brights	Bonneville	Standard	150,000	12,500	12	0+	Minthorn/Umatilla[3]	Fall	450
CHF	Upper River Brights	Bonneville	Standard	910,000	10,100	90	0+	Minthorn/Umatilla[3]	Spring	2,730
		Carson/Bonneville Total		1,510,000	60,100					

[1] O_2 = Oxygen supplemented. Standard = Standard rearing.
[2] Some of these releases may occur at a new adult holding/juvenile release facility in the Umatilla Basin.
[3] Bonifer and Minthorn facility acclimation sstuutudies - half released from facility and half in stream nearby.
[4] Returns to the mouth of the Umatilla River. Smolt-to-adult survivals assumed: CHS (0+ spring release) = 0.2%; CHS (0+ fall release) = 0.4%; CHF (0+ spring and fall release) = 0.3%; STS = 2.7%. total Expected Returns: CHS = 6,585 (60% of run size goal); CHF = 21,000 (100% of run size goal); STS = 5,670 (100% of run size goal).

ure B1. Umatilla Basin salmon and steelhead release schedule following Umatilla Hatchery completion.



APPENDIX C

Umatilla Hatchery Ponding Criteria

Ponding criteria, or volumes of fish to rear in each pond, were developed using the following assumptions:

Maximum water flows through traditional (Irrigon-type) raceways approximate 1,500 GPM. Comparable maximums for oxygen-supplemented (Michigan-type) raceways approximate 940 GPM. Flows can be restricted to reduce velocities for smaller fish and to better apportion available water among various in-hatchery water requirements

We expect water temperatures at Umatilla Hatchery to be similar to those experienced during the last three years of operation of Irrigon Hatchery (Table C1). Water for the Umatilla facility is drawn from the same aquifer as Irrigon, and design of the wells is comparable.

The oxygen content of the ground water at Irrigon prior to aeration is 5.0 ppm and the nitrogen level is 120% saturation.

All fish propagation waters at the Umatilla Hatchery will receive a preliminary aeration treatment. We assumed all first-pass water would be at normal expected saturation for that elevation (280 ft.) and water temperature, or about 11 ppm. Each Michigan raceway contains designed capability to supplement inflow water with pure oxygen. For design criteria purposes we assumed that inflow water to each pass would be at saturation. Experience has shown that traditional, or Irrigon-type, raceways receiving second pass water absorb an increase of 10 to 11% oxygen from the first-pass pond outflow. Operational loadings for both the traditional Irrigon and Michigan type raceways will derive from information collected during the initial rearing of the completed Umatilla facility.

Assumed flows and oxygen levels were then applied to standard loading densities using Piper's (1970) and Wester's (1986) loading formulae. These estimates of loading density were referenced against practical experience gained at Irrigon Hatchery over the past three years.

Table C1. Average water temperatures (°F) for Irrigon Hatchery during 1985-87.

Jan. - 52	Jul. - 60
Feb. - 50	Aug. - 60
Mar. - 51	Sep. - 61
Apr. - 52	Oct. - 60
May - 54	Nov. - 57
Jun. - 58	Dec. - 54

Rearing models for each species projected anticipated growth over time. Recommended loadings at monthly intervals were developed for each pond type considering biomass, maximum available water, and oxygen requirements.

In general, pond loadings increase with fish size, lower water temperature, increased flows, reduced feed, and addition of oxygen. The approximate maximum theoretical capacity for 5/lb. smolts for the Umatilla Hatchery approximates 290,000 lbs. When operating the facility with multiple species under constraints imposed by an evaluation program, that production potential is somewhat reduced, particularly if a substantial subyearling program is required. Since subyearlings comprise a large proportion of the initial production profile for Umatilla Hatchery, we estimate the initial hatchery capacity at 255,000 lbs. With experience, refined production schedules, and the use of oxygen-supersaturated water, the facility is capable of producing more than the 290,000 pounds.

APPENDIX D

Reviews of the Master Plan

Following are reviews of the Monitoring and Evaluation Plan section of the Master Plan by the Hatchery Effectiveness TWG, the Supplementation TWG, and the Monitoring and Evaluation Group.

CURT SMITCH
Director

STATE OF WASHINGTON
DEPARTMENT OF WILDLIFE

September 15, 1988

Mr. Rich Carmichael
Oregon Department of Fish and Wildlife
P. O. Box 59
Portland, OR 97207

Dear Mr. Carmichael.

The Hatchery Effectiveness Technical Workgroup has discussed the evaluation plan for the Umatilla hatchery following your presentation at our July meeting. We appreciate having had the opportunity to review your plans and have only a few comments.

We definitely do not have a committee consensus as to the adequacy of your planned activities to evaluate the effects of rearing fish in oxygen enriched water vs. standard rearing procedures. You have received a copy of a letter from Dr. Gerald Bouck, the B.P.A. representative to our TWG. In his letter he has expressed his concerns that the planned evaluation will not adequately evaluate the efficiency of rearing fish with supplemental oxygen and the effects of such rearing on adult returns. Other members of the TWG have expressed opinions that the planned evaluation scheme will provide the necessary information even though the smolts will be trucked to the Umatilla River. Some members have expressed concern that the "Bouck Plan" would require construction of an adult return collection facility at the hatchery. This may not be necessary if experimental and control groups can be Pitt tagged and if Pitt tag reading equipment is installed at Bonneville before the first returns come back from a tagged Umatilla hatchery release.

The Hatchery Effectiveness Technical Workgroup does not wish to impede progress on the Umatilla Hatchery. We suggest that the evaluation plan workgroup consider Dr. Bouck's suggestions and if they feel that they are workable, and that the fish production program can be accomplished without significant impact due to a direct hatchery release of experimental and control groups in statistically valid numbers, then they should use their own best judgement as to how to proceed.

SEP 23 [illegible]

The planned activities at Umatilla are consistent with our research workplan section 1.3. We wish the project much success both in the production phase and evaluation phase.

Sincerely,

Jim Gearheard, Chairman
HETWG

cc: Willa Nehlsen, NWPPC
Ron Eggers, NWPPC
Harry Wagner, ODFW
HETWG Members (see below)
Steve Huffaker, Chairman STWG
Larry Korn, CBFWA

HETWG

Bill Hutchinson, IDF&G
Ed LaMotte, USFWS
Bill Hopley, WDF
Mike Erho, Douglas County PUD
Mike Cuenco, CRITFC
Jerry Bouck, BPA
Gary Johnson, COE
Bob Smith, NMFS
Ed Cummings, ODFW

Department of Energy
Bonneville Power Administration
P.O. Box 3621
Portland, Oregon 97208-3621

AUG 12 1988

In reply refer to: PJSR

Mr. James Gearheard, Chairman
Hatchery Effectiveness Technical Work Group
c/o Washington Department of Wildlife
600 North Capitol Way GJ-11
Olympia, WA 98504-0091

Dear Mr. Gearheard:

At your request, I have reviewed the Hatchery Monitoring and Evaluation concept in the Umatilla Master Plan with the assistance of other fishery biologists and a biometrician. I also coordinated my concerns with Max Smith and Rick Carmichael of the Oregon Department of Fish and Wildlife. We concluded that the present plan would not and cannot provide a satisfactory direct evaluation of the hatchery. Consider the following:

The Umatilla Hatchery represents the "flagship" of a whole new generation of aquaculture facilities which will utilize oxygen supplementation, as well as a variety of other new technologies, and this alone merits a specific evaluation as a hatchery. The estimated cost of constructing this "experimental" facility will exceed 8 million dollars. While the new technology will work it's likely to need some modifications, and ultimately these should be incorporated into other facilities. Before this can be done, a wide variety of bioengineering evaluations must be accomplished via the Umatilla facility and preferably verified elsewhere.

The supplementation aspects should be reviewed by the Supplementation Technical Work Group or await the development of critical concepts and standards to be provided by the Columbia Basin-wide plan of the Council.

As currently proposed, the evaluation and monitoring plan would assess the Umatilla Hatchery only indirectly and only subsequent to an array of additional physical and biological impacts which may increase the "noise" level. The current approach (supplementation) is not acceptable in hatchery evaluation not only because it will increase the "background noise" level, but also because it is based on the untested assumption that the outplanting process has no significant effect on total contribution. Obviously, this assumption must be tested, and to do this one needs a marked control group(s) liberated directly from the hatchery.

Frankly, a direct release from the hatchery is needed to provide a control group, both for the hatchery evaluation and for the supplementation evaluation. Without this overall control group, one can not measure the success of the basic rearing program, and certainly one could not quantify the superimposed supplementation impacts. The latter will probably be beneficial, but a scientific evaluation is critical and should be divorced from other considerations.

Sincerely,

Gerald R. Bouck
Chief, Biological Research Section

cc:
Willa Nehlsen - Northwest Power Planning Council
Ron Eggers - Northwest Power Planning Council
Harry Wagner - Oregon Department of Fish and Wildlife
Rich Carmichael - Oregon Department of Fish and Wildlife
Doug Dompier - Columbia River Inter-Tribal Fish Commission
Hatchery Effectiveness Technical Work Group
Supplementation Technical Work Group

IDAHO FISH & GAME
600 South Walnut / Box 25
Boise, Idaho 83707

September 30, 1988

Mr. Ron Boyce
Oregon Department of Fish and Wildlife
P.O. Box 59
Portland, OR 97207

Dear Ron:

To date I have received no comments from other supplementation TWG members. Carl Richards has indicated he will be providing me with comments in the near future. I will forward his comments, any any others I receive, as they are received. Therefore, comments contained herein are my own.

As I understand the Umatilla plan, supplementation research would determine: 1) whether fall and spring chinook can be successfully reestablished in Umatilla basin, 2) whether natural steelhead populations can be increased by outplanting juvenile steelhead, and 3) genetic and life history changes resulting in the natural steelhead population as a result of the outplanting program. I will limit my comments to these areas, even though O_2 supplementation and other "Hatchery Effectiveness" kinds of things have the potential to significantly effect "supplementation" results.

Research priorities as determined by the Supplementation TWG for Mid-Columbia steelhead with endemic stock, Mid-Columbia spring chinook with similar stock, and Mid-Columbia with similar stock are 5, 9, and 19 respectively (Supplementation Research Proposed Five-Year Work Plan, March 14, 1988, p.25). From that standpoint, steelhead research is most important regarding the Umatilla Hatchery Master Plan. From the TWG standpoint, upper basin research with endemic spring and summer chinook and steelhead stocks has higher priority than Mid-Columbia endemic steelhead research.

Supplementation research addressing 1) and 2) above, should be designed to address TWG work plan "specific questions":

2) What are the most efficient densities for planting salmonids of different species and life stages into various types of habitat?

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3) What is the most efficient size and time of release for outplanting various species and life stages?

4) What are the best techniques for releasing fish into the habitat?

5) What are the effects of intra- and interspecific predation and competition for food and space between outplanted fish and endemic populations in the supplemented reach and areas downstream?

6) What are the immediate effects of reproduction of outplanted fish on indigenous stocks and interbreeding of outplanted fish on indigenous stocks?

Additional research addressing 3) above should be designed to answer TWG specific question 7.

7) what are the genetic characteristics of indigenous stocks, and what effect does a change in genetic characteristics have on stock productivity?

Without specific research proposals, it is difficult to comment specifically on Umatilla Supplementation Research.

I like your experimental design guidelines, i.e.,

-2-4 replicates per year;
-4 consecutive year replication;
-minimum of one control per treatment;
-minimum of 35 coded wire tag recoveries per mark group.

This type of experimental design should provide some of the answers we are seeking relative to supplementation research.

In summary:

1) Steelhead supplementation in the Umatilla basin is high enough priority that it should be done, if an adequate number of treatment and control streams within the best exist. Supplementation research using Upper Columbia steelhead, and spring and summer chinook endemic stocks should take precedence over Umatilla basin fall and spring chinook introduced stocks, if dollars do not exist to accomplish both.

2) The experimental design looks sound. Specific projects need to be submitted for additional comments on experimental design.

Regards,

Steven P. Yundt
Anadromous Fisheries Coordinator

cc: to members of TWG

SPY:mw

October 20, 1988

Mr. Ron Boyce
Oregon Department of Fish and Wildlife
P.O. Box 59
Portland, OR 97207

Dear Mr. Boyce:

Enclosed are copies of responses I received recently from Supplementation TWG members regarding the Umatilla Hatchery Master Plan.

In general, supplementation research for endemic steelhead is more important than nonendemic chinook and overall less important than upriver steelhead supplementation research. There are no adverse comments relative to proposed experimental design, although the consensus (of three) seems to be that specific research proposals need to be developed for examination by the TWG to determine soundness of experimental design.

Regards,

Steven P. Yundt /s/
Anadromous Fisheries Coordinator

Enclosures

cc: Carl Richards
Rich Lincoln
Larry Korn
Willa Nehlson

SPY:blm

JOSEPH R. BLUM
Director

SEP 3 0 1988

STATE OF WASHINGTON
DEPARTMENT OF FISHERIES
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September 27, 1988

Mr. Steven P. Yundt
Idaho Department of Fish and Game
600 South Walnut, Box 25
Boise, ID 83707

Dear Steve:

This letter is in response to your recent request for review and comments on supplementation aspects of the Umatilla Hatchery Master Plan. The draft you sent was the first I had seen of the plan so my comments may reflect a lack of history behind its evolution.

The primary emphasis of the Umatilla plan's evaluation priorities is obviously hatchery effectiveness assessment. A number of constraints are identified with facility design, etc. which are used as a basis for establishing lower priorities for supplementation research. But especially given the steelhead harvest/production goals, I believe the system-wide questions of whether hatchery and natural production can be integrated suggest a different perspective/approach be used to evaluate experimental options in the Umatilla. The question I would ask is how can the facility and production plans be modified to create rather than constrain opportunities. The Council's policy of adaptive management really is directing us to use operational programs like the Umatilla as an iterative experiment on the supplementation theory as a basis for doubling runs. In fact the whole premise of proceding ahead with major supplementation programs before the hatchery/natural impact questions were answered through more conventional research was that adaptive experimentation would be thoroughly sewn into the fabric of these programs. A more global assessment would weigh the costs of gearing up to address questions within the Umatilla vs. the expense of creating entirely new opportunities elsewhere. From a policy perspective it may satisfy ODFW and CTUIR to accept risks as stated in the plan and live with assumed constraints to evaluating them, but I think this is sidestepping a central issue in the Council's Fish and Wildlife Plan.

Either within the Master Plan, or in a specifically defined process subsequent to it, supplementation questions relating to summer steelhead, in particular, should be explicity addressed from an experimental design standpoint. The intent stated on p. 26 to wait for NPPC to develop programs

to evaluate supplementation and genetic impacts begs the issue. My perception is that the Council is waiting for the Umatilla Master Plan to develop these same programs as part of the design process. The question obviously is "who's going to do it?" and "when?". This may be where my ignorance about the process prevents me from recognizing a clear approach in the plan.

At a minimum the stock characteristics that will be monitored as part of the baseline studies should be drafted and potential sources of stock impacts from the hatchery rearing program should be identified. For example, will the size of steelhead smolts at release change the maturation rates and age-at-adult return compared to the existing, naturally spawning population? This is a fairly simple question which could be easily measured and might have significant consequences given the anticipated proportion of hatchery and natural fish in the production plan. Similar questions exist for fall chinook and spring chinook although their answers may have more system-wide than Umatilla importance. Also if hatchery returns are destined to return, mix and spawn in the long-term production goals, questions about distribution of spawners with respect to release sites have obvious significance. And the concept of test and control systems to compare productivity of supplemented and non-supplemented stocks should be a high priority from the adaptive management standpoint.

The soundness of experimental design question in your letter seems premature. The framework of the plan is generally sound but there seemed to be more operational than experimental design. I believe the supplementation questions haven't been developed enough to evaluate this aspect of the proposed work. I would comment that CWTs may not be the most cost-effective evaluation tools for spring chinook and steelhead, given that a very high percentage of the expected returns will be in-river, not in mixed-stock fisheries where CWTs are about the only way to collect information. Scale or otolith marking may be a very good alternative. I would be happy to elaborate on this further based on some recent work we have done.

I'm sorry that my comments couldn't have been more extensive but nevertheless I hope they are of some help.

Sincerely,

Rich

Rich Lincoln
Salmon Research Manager

cc: Tom Vogel

The SHOSHONE-BANNOCK TRIBES

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FISHERIES DEPARTMENT
P. O. BOX 306
FORT HALL, IDAHO 83203

October 10, 1988

Idaho Department of Fish and Game
Attn: Steve Yundt
600 S. Walnut, Box 25
Boise, ID 83707

Dear Steve:

I have reviewed the Umatilla Hatchery Master Plan and have provided a few comments on the plan in relation to the NWPPC Supplementation Work Plan.

The Umatilla plan would undoubtedly provide some very useful information on some aspects of supplementation research particularly as it pertains to restoring naturally spawning chinook populations to a mid-Columbia drainage and supplementation of an existing steelhead population through hatchery rearing.

Under the guidelines adopted within the supplementation research work plan, endemic steelhead in the Umatilla would be of most interest to supplementation research. I would strongly encourage the agencies and tribes to initiate a genetic monitoring program in the basin before supplementation begins. This program should consist of both morphometric and electrophoretic analysis of the existing stock. If guidelines for this type of monitoring have not been developed by the NWPPC prior to initial stocking, the evaluation/monitoring program for the Umatilla plan may have to provide a lead in these efforts. Due to the non-endemic origin of chinook stocks to be used in the Umatilla, this aspect of the plan would be of lower priority. That is not to say that interesting and useful information could not be obtain through a well designed evaluation and monitoring program.

Given the decision to emphasize hatchery effectiveness research priorities in the operation plans, it may be difficult to answer some detailed questions of interest to supplementation research. Chinook will be reared under a variety of hatchery conditions, from a series of hatcheries, and possibly from several stocks. The number of streams required to compare natural spawning success of fish reared under all of these treatment combinations would be prohibitively large. However, some interesting comparisons can undoubtedly be made that will have basin wide importance.

It is difficult at this time to fully analyze the adequacy of design of studies aimed at answering supplementation questions. Apparently, studies are proposed to determine the extent of suitable sites for replicable treatments and experimental designs will not be developed until work plans are written at a future date. I look forward to reviewing detailed evaluation/monitoring plans and goals as they are developed.

Sincerely,

Carl Richards
Fisheries Biologist

CR\lgn

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January 18, 1988

Ron Boyce
Oregon Department of Fish and Wildlife
P.O. Box 59
Portland, OR 97207

Dear Ron:

Enclosed are the comments of the Monitoring and Evaluation Group on the Umatilla experimental design. We hope that our comments are helpful, and look forward to working with you and the Umatilla planners on the project.

Please let me know if the Monitoring and Evaluation Group can be of further assistance.

Sincerely,

Chip McConnaha
Systems Ecologist

A1:CM/cmBB8

MEG REVIEW OF UMATILLA HATCHERY EXPERIMENTAL DESIGN

1/20/89

The following is a summary of Monitoring and Evaluation Group (MEG) comments on the section of the Umatilla Hatchery Plan titled "Monitoring and Evaluation of the Artificial Propagation Program." The purpose of that section is "... to summarize the monitoring and evaluation plan for the restoration and enhancement of spring chinook, fall chinook and summer steelhead in the Umatilla Basin."

This review is from the perspective of MEG and the draft System Monitoring and Evaluation Program (SMEP). Because the Umatilla project is on a faster decision schedule and must be reviewed prior to complete development of SMEP, this review is within the context of SMEP as developed to date by MEG. The following review focuses on major factors common to the alternative approaches to long-term monitoring and evaluation. Specifics about particular topics would be addressed most appropriately by the Hatchery Effectiveness and Supplementation Technical Work Groups (TWG).

The Umatilla project, like the proposed Yakima Hatchery project, is also being developed out of direct context with projects developed through system planning. We suggest the development of a procedure to ensure coordination between the two processes and to check for applicability of the Umatilla project to the Umatilla subbasin plan. This review will focus on the following major questions:

Does the study design identify and address the critical uncertainties associated with the production strategy used?

The major thrust of the evaluation work described in the Work Plan is to evaluate systematically the potential benefits of supplemental oxygen. This topic was one of the top priorities (#3) identified in the Hatchery Effectiveness Work Plan. The results of this effort could be applicable across a wide range of production facilities. MEG has focused on critical uncertainties associated with natural production, including supplementation. As is pointed out in the Work Plan, improving hatchery production is an important component of production in general and of potential supplementation efforts in particular.

From the perspective of MEG, identifying and pursuing critical uncertainties associated with natural production potential and supplementation is a high priority, and the investigation of oxygen supplementation is a potentially important component. MEG and the Supplementation Research TWG both have recommended a systematic modeling approach to identify critical uncertainties and to design experiments to address them. While the Umatilla study design contains the elements necessary for this approach, no mechanism is presented to organize the elements around a model of the biological/physical system. MEG recommends that this be done and is prepared to assist either

directly through MEG or through a separate Umatilla experimental design group.

Outplanting of fall and spring chinook with the express purpose of creating a naturally spawning component is a major feature in the proposed Umatilla program. No experimental design is proposed because of the lack of opportunities to maintain individual treatment and control tributaries within the system. However, provisions are made for monitoring the returns from the supplementation program. Based on the information provided in the study design document, it is not possible to judge the potential for developing alternative evaluation designs that would not be dependent on spatially discrete release programs.

Does the study design conflict with the draft plan proposed in SMEP?

No, assuming the elements described with respect to specific questions below. SMEP will require two basic elements: a plan of action that identifies and addresses critical uncertainties (key hypotheses) in a systematic manner and a statistically sound design for evaluating production responses from project actions. As SMEP is developed, it will be necessary to incorporate the elements of the Umatilla plan into the systemwide experimental design. Because of the lengthy process necessary to develop SMEP fully, and because

of the importance of monitoring the implementation of the Umatilla program, we encourage the Umatilla planners to develop and implement a monitoring program without waiting for full development of SMEP. This has been done successfully in the Yakima. MEG is prepared to assist with development of a monitoring program to ensure its compatibility with SMEP as it is completed.

Does the study design address the desirability of collecting and compiling information in support of effective application of adaptive management techniques?

While many of the features of a good adaptive approach are present, the specifics of management feedback are lacking. The study design specifies the hatchery plan developers will "...work with the hatchery personnel and data managers to make sure that the hatchery monitoring, documentation and data base meet the needs of the evaluation as well as the needs that are identified for a coordinated Columbia River fisheries information system." It is imperative that this element be followed through and an effective management structure be developed to facilitate the feedback of information from monitoring to management as information needs for SMEP are identified and the coordinated information system concept is fleshed out.

Does the study design provide for generating information to estimate the contribution of production from the facility to the doubling goal?

The SMEP report identifies a range of alternative measures of doubling: measuring smolt production, measuring adult returns to the basin or to the system, measuring adult equivalent production, and measuring increases in terms of potential production (MSY or MSY run). The Umatilla Plan, along with basic data obtained through the system planning, would provide information necessary to generate these indices of progress.

Does the study design address genetic risk assessment in an appropriate manner?

The proposal identifies a potential opportunity (wild steelhead) to monitor the genetic changes resulting from hatchery supplementation of existing steelhead populations. The need to identify baseline data requirements as soon as possible is highlighted. The draft refers to a Council Genetics TWG -- presumably this represents the MEG effort to develop genetics assessment guidelines. A realistic plan for conducting this study should include a preliminary investigation to define the degree of difference between the existing indigenous and hatchery stocks. Full implementation

of the study will require a detailed study design based on results of the preliminary investigation.

Does the study design consider ongoing or proposed efforts outside the Umatilla that could produce information useful in addressing the critical uncertainties?

The Umatilla study design identifies the current lack of quantitative information about the effectiveness of oxygen supplementation, natural production dynamics, genetic impacts and natural stock supplementation techniques. It does not address the possibility of coordinating the program in the Umatilla with potential efforts to address these uncertainties outside that program itself. The Supplementation Research Plan developed by the TWG stated that both the Umatilla and Yakima hatchery programs could benefit from ongoing research in the intervening years before construction and full implementation. The Umatilla study plan could benefit from an explicit discussion of the concept that sufficient flexibility would be planned in at this stage to take advantage of advances and opportunities at the appropriate time.

Faced with problems similar to those described here, the Yakima design committee formed the Experimental Design Work Group. This group is composed of technical biologists from several agencies with close contacts to MEG. It is already proving to be useful in coordinating genetic monitoring

and other data collection efforts in the Yakima. We recommend formation of a similar group in the Umatilla.

A1:FW/mccAG7

SBS: Hatcheries/N. 6 Oreg.

DEPARTMENT OF NATURAL RESOURCES

92 12 01 18

Tribal Fisheries Program

CONFEDERATED TRIBES

of the

Umatilla Indian Reservation

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RA
HW

MEMO

TO: NEOH Core Group

FROM: Gary James, Fisheries Program Manager/DNR

DATE: December 23, 1992

SUBJECT: Umatilla NEOH Master Plan Supplement Final Draft

The Umatilla NEOH Master Plan Supplement has been updated to accurately reflect current projects and planning efforts. Please review and provide me with any comments or concerns you may have by the next NEOH Core Group Meeting on January 20, 1993.

Distribution:

Roy Sampsel
Harry Wagner
Jay Marcotte
Jerry Bauer
Don Bryson
Ed Larson
Patty O'Toole
Jim Griggs
Kirk Beiningen

DEC 28 1992

NORTHEAST OREGON HATCHERY PROJECT

UMATILLA HATCHERY SUPPLEMENTAL MASTER PLAN

FINAL DRAFT

December, 1992

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EXECUTIVE SUMMARY

Introduction

The Northwest Power Planning Council's (NPPC) 1987 Columbia River Fish and Wildlife Program (Fish and Wildlife Program), Measure 703 (f)(5) authorizes the planning, design, construction, operation, maintenance and evaluation of artificial production facilities to raise chinook salmon and steelhead for enhancement and restoration of fish runs in the Hood, Umatilla, Walla Walla, Grande Ronde and Imnaha rivers and elsewhere. The measure, known as the Northeast Oregon Hatchery (NEOH) Project, further states that prior to design of the facilities, a master plan will be developed by the tribes and fish agencies for review and approval by the NPPC.

Prior to the Northeast Oregon Hatchery project, a similar measure known as the Umatilla Hatchery Master Plan was completed. The original concept of the Umatilla Hatchery was to provide 40,000 lbs of summer steelhead production for the Umatilla River. However, this measure was amended to include fall and spring chinook. The final measure authorized construction of a hatchery to produce 290,000 lbs of fall and spring chinook, and summer steelhead for release in the Umatilla River to help mitigate for fish losses attributable to hydroelectric dams on the Columbia River.

The Umatilla Master Plan, which required 20 months to complete, was jointly prepared by Oregon Department of Fish and Wildlife (ODFW) and the Confederated Tribes of the Umatilla Indian Reservation (CTUIR) in cooperation with Columbia River Intertribal Fish Commission (CRITFC), the NPPC, and Bonneville Power Administration (BPA). The Umatilla Master Plan was approved by the NPPC in October, 1989. Construction of the Umatilla Hatchery (central production facility) commenced in April of 1990 and was completed in 1991. Umatilla Hatchery satellite facilities for adult holding/spawning and juvenile acclimation/release are scheduled to be completed in 1994.

The Umatilla Master Plan identified the need for spring chinook production above that to be produced at Umatilla Hatchery. An additional 589,000 spring chinook smolts are needed to achieve program goals for the Umatilla River Basin. The CTUIR and ODFW recognized that this production should be included in the Northeast Oregon Hatchery Project.

The master plan for the Northeast Oregon Hatchery project is now being developed to include the additional spring chinook production required for the Umatilla River Basin. The Umatilla component of the Northeast Oregon Hatchery Master Plan is designed as a supplement to the Umatilla Master Plan and will only deal with spring chinook production needed for the Umatilla River Basin.

Fisheries Management Policies

The NPPC has established the goal of increasing the Columbia Basin salmon and steelhead run size to five million adults annually. In achieving this goal, Fish and Wildlife Program projects will integrate NPPC system policies which include adaptive management, genetic risk assessment, harvest management, and coordination.

The CTUIR and ODFW have developed an annual adult spring chinook run size goal of 1,000 naturally produced and 10,000 hatchery origin fish returning to the Umatilla River. Within the framework of the Umatilla Hatchery Master Plan (ODFW/CTUIR 1989), the state and tribe have also developed fish management policies pertaining to hatchery practices and fish health management, wild fish management, in-basin harvest, and Umatilla Basin fisheries project implementation and operations framework.

Production Profile

An additional 589,000 spring chinook smolts are needed in the Umatilla Basin to achieve the adult run size goal for spring chinook. Fish will be reared to a size of 10 fish per pound and acclimated for up to 30 days in-basin prior to release. Releases will occur from March through May 15 in the upper Umatilla Basin (RM 72 - 89) and Meacham Creek, (RM 2, Bonifer facility).

Facilities Needed to Implement Program

Production space is needed to incubate 818,055 eggs and rear 589,000 smolts to 10 fish per pound. Current alternatives include: 1) a central incubation and rearing facility for all NEOH Project spring chinook production (including the Grande Ronde, Imnaha, and Walla Walla rivers); 2) individual incubation and rearing facilities in each of the four subbasins; and 3) an incubation and rearing facility in the South Fork Walla Walla River to provide for 589,000 and 600,000 spring chinook smolts annually for the Umatilla and Walla Walla rivers, respectively, with other NEOH production occurring in their own subbasins. The latter, has been identified as the preferred alternative for Umatilla and Walla Walla NEOH production.

Acclimation facilities located in the upper Umatilla Basin are needed for all 589,000 smolts. Current siting plans identify three locations as potential acclimation facility sites. From 100,000 to 400,000 smolts could be acclimated and released at each site.

Monitoring and Evaluation Plan

The monitoring and evaluation section identifies four major areas of uncertainty relative to achieving spring chinook goals in the Umatilla Basin.

A) Will proposed spring chinook smolt release methods and strategies reestablish natural production of spring chinook.

B) To what extent will acclimation of spring chinook enhance smolt-to-adult survival.

C) What impacts will releases of hatchery reared chinook have on the native steelhead population and resident trout population.

D) To what extent will initial or subsequent selection of spring chinook broodstock impact reestablishment and enhancement success.

These uncertainties will be addressed by monitoring and evaluation projects that are ongoing in the Umatilla Basin. The ODFW started Umatilla Hatchery artificial production research in 1991 and CTUIR started evaluating the success of reestablishing naturally produced salmon populations in the Umatilla Basin in 1991.

Fishery Benefits

Utilizing a model developed as part of the US/Canada Pacific Salmon Treaty, an estimated 6,336 spring chinook will be contributed toward the NPPC's doubling goal (escapement to Bonneville Dam plus prior in-river fisheries). A total of 3,498 adults are estimated to be contributed to ocean and Columbia River fisheries. Adult spring chinook returns to the Umatilla River is estimated at 4,434 adults.

Harvest Plans

Harvest plan guidelines including broodstock, spawning escapement, and research needs have been developed by the CTUIR and ODFW under varying adult spring chinook return levels. These have been changed slightly since the Umatilla Hatchery Master Plan (ODFW and CTUIR, 1989) in order to allow more escapement at lower adult return levels. Specific harvest regulations will be developed annually between the CTUIR and ODFW.

Coordination and Documentation of the Development of the Master Plan

A management structure for the Umatilla River Basin is designed to coordinate proposed hatchery and natural production, harvest, monitoring and evaluation, habitat enhancement and protection, and fisheries management. The CTUIR, ODFW, BPA, and NPPC are currently implementing and fine tuning the management structure for the Umatilla Basin.

RECOMMENDATIONS

The CTUIR and ODFW recommend implementing the following actions for the Umatilla production component of the NEOH Project.

1. Construct an incubation and rearing facility on the South Fork Walla Walla River to produce 589,000 spring chinook smolts at 10 fish per pound. This facility will also produce 600,000 spring chinook smolts at 10 fish per pound for the Walla Walla component of NEOH.

2. At the same South Fork Walla Walla site, construct adult spring chinook holding and spawning facilities for approximately 2,120 fish. The Umatilla Satellite facility is being planned in coordination with the NEOH Project.

3. Acclimation facilities will be constructed in the upper Umatilla Basin as part of the Umatilla Hatchery Satellite Facilities project to provide for up to 30 days acclimation for all 589,000 spring chinook smolts prior to release.

4. Utilize Carson stock spring chinook from Carson National Fish Hatchery as the initial broodstock for the Umatilla component of the NEOH Project. As spring chinook adult returns to the Umatilla River increase, collect appropriate levels of broodstock from Umatilla returns.

5. Manage the Umatilla Hatchery, the Bonifer and Minthorn Facilities, new Umatilla Hatchery satellite adult holding/spawning and juvenile acclimation/release facilities, and the Umatilla component of the Northeast Oregon Hatchery facilities as an integrated production unit.

6. Integrate appropriate Umatilla NEOH spring chinook research needs into the ongoing Umatilla Hatchery monitoring and evaluation projects being done by ODFW and CTUIR.

7. The CTUIR and ODFW should continue coordination with the NPPC, BPA, and appropriate fishery interests, regarding the integration and evaluation of the entire Umatilla Basin production program with other projects in the Columbia River basin.

INTRODUCTION

The Umatilla River once supported large runs of spring and fall chinook, coho, and summer steelhead which provided productive fisheries for both Indians and non-Indians. Runs of chinook and coho salmon were effectively eliminated from the Umatilla River over 65 years ago and summer steelhead runs have declined from historical levels. Today, an average of 2,500 summer steelhead return annually to the Umatilla River. In recent years spring chinook, fall chinook, and coho salmon have begun to return but only at a fraction of historical levels.

The decline of summer steelhead and elimination of other salmon species in the Umatilla River was largely attributed to construction of Columbia River hydroelectric dams and hydroelectric and irrigation diversions on the Umatilla River. Hermiston Power and Light Hydroelectric Project (Rm 10) and Three Mile Dam (Rm 3) built on the Umatilla River in 1910 and 1914, respectively, are believed to have caused the largest decline of salmon and steelhead in the Umatilla Basin. Additional fish losses in the basin resulted from habitat degradation and depletion of streamflows through irrigation.

A. Historical Perspective

Although once abundant, viable runs of spring chinook have not been present in the Umatilla River for over 70 years (mid-late teens through late 1980's). Historically, the Lewis and Clark journals document the presence of a large village at the mouth of the Umatilla River where 700 Indians were anxiously awaiting the arrival of the spring chinook (Thwaites 1905 as cited in ODFW/CTUIR 1989). This was one of the largest villages seen between The Dalles area and the mouth of the Snake River in the spring of 1806. The largest run of chinook within memory of white men was recorded in 1914 when Indians and non-Indians caught "thousands upon thousands of salmon from spring to fall" at the site of Three Mile and Hermiston Power and Light dams (Van Cleve and Ting 1960). These records indicate that spring, summer, and fall chinook were abundant in the Umatilla River and that construction of these dams created areas where fish congregated. These authors state that noticeable declines in salmon and steelhead runs were reported in the years after construction of these dams. The last recorded sport harvest of 41 spring chinook salmon from the Umatilla River was reported by the Oregon Game Commission in 1956. Extensive water withdrawals from the Umatilla River basin for irrigation and domestic use and habitat degradation also contributed to the elimination of chinook from the Umatilla River.

Today, there are an estimated 43 miles of spring chinook spawning and rearing habitat in the Umatilla Basin including Meacham Creek to the Forks (15 miles), North Fork Meacham (5 miles), upper mainstem Umatilla from Squaw Creek to the North and South Forks (13 miles), and the North (5 miles) and South (5 miles) Fork Umatilla River (pers. comm. Paul Kissner, CTUIR, 1992). The best habitat exists in the North Fork Umatilla and upper mainstem Umatilla River. The other areas have marginal spring chinook habitat.

B. In-basin Environmental Problems

Restricted juvenile and adult passage at irrigation diversions in the lower river, low flow during much of the year, and poor habitat conditions in upper headwater areas have been identified as the chief factors limiting production of anadromous salmonids in the Umatilla Basin (ODFW 1986).

C. Present Rehabilitation Efforts

As part of the CTUIR and ODFW Umatilla Fishery Rehabilitation Program being implemented under the NPPC's Fish and Wildlife Program [Section 1403 (4.2, 4.6)], passage, flow, and habitat conditions are being improved. These projects are designed to support the hatchery supplementation program and enhance existing and future natural production in the subbasin.

Fish Passage Improvement

By 1993, screens and fishways at the five major diversions in the lower Umatilla (Three Mile Dam, Rm 3; Maxwell, Rm 15; Westland, Rm 27; Cold Springs, Rm 29; and Stanfield, Rm 32) will be reconstructed to improve downstream and upstream survival of salmon and steelhead. A smolt and adult trapping facility has been constructed at Three Mile Dam and a smolt trapping facility at Westland, to collect and transport smolts and adults around lower river diversions during periods of low flow.

Flow Enhancement

The CTUIR, ODFW, and the Bureau of Reclamation have designed both interim and longterm projects to address flow problems in the Umatilla Basin. The CTUIR and ODFW have developed an interim flow enhancement project to increase flows in the Umatilla River prior to implementation of the Bureau of Reclamation Umatilla Basin Project. These plans have included use of West Extension Irrigation District pumps to improve flow below Three Mile and use of stored water from McKay Reservoir to improve flow below McKay Creek (Rm 51). The success of these interim efforts have varied because of limited water availability during recent drought years.

The Umatilla Basin Project was developed by the Bureau of Reclamation in conjunction with the CTUIR, ODFW, and local agricultural, irrigation, and civic organizations. The Umatilla Basin Project is designed to achieve long term fishery goals and alleviate water use conflicts in the Umatilla Basin. Project features are designed to meet streamflow objectives of 250 to 300 cfs during migration periods throughout the lower 51 miles of the mainstem Umatilla River. The Project includes two phases of implementation. Phase I provides a pumping facility to exchange water with the West Extension Irrigation District and increase flows below Threemile Dam. Phase II is a larger Columbia River pumping complex designed to deliver water to the Hermiston and Stanfield Irrigation Districts (via Cold Springs Reservoir) and increase flows below McKay Creek during critical fish migration periods. Phase I was completed in the Fall of 1992 and is expected to be used in the Spring of 1993. Phase II is expected to be completed and operational by 1995 or 1996. These completion dates are dependent upon congressional funding appropriations for the Project. Phase II final design is currently underway.

Habitat Improvement

The CTUIR, ODFW, and the Forest Service are currently implementing a habitat enhancement plan for the Umatilla River and tributaries (ODFW et al. 1988). By 1993, riparian and instream habitat improvements will be completed on 68 miles of private, federal, and reservation lands in the Umatilla River Basin. Habitat improvements are planned to improve spawning and rearing habitat for naturally spawning summer steelhead and spring chinook. Additional habitat improvement needs beyond 1992 have been identified in the Umatilla River Subbasin Salmon and Steelhead Plan (Umatilla Subbasin Plan) and proposed for implementation in the NPPC's Integrated System Plan (1991).

Subbasin Planning and Integrated System Plan

The 1987 Fish and Wildlife Program calls for long-term, coordinated planning of salmon and steelhead production in the Columbia River Basin. The primary goal of this planning process is to develop strategies for doubling salmon and steelhead production in the Columbia River. As part of this planning process, the CTUIR, in cooperation with ODFW and other fishery interests, prepared the Umatilla Subbasin Plan. The Umatilla Subbasin Plan summarizes the CTUIR and ODFW fishery management goals and objectives; documents current management efforts; identifies problems and opportunities associated with increasing salmon and steelhead populations; and presents alternative management strategies, identifying preferred approaches where appropriate. Most importantly, the Umatilla Subbasin Plan outlines natural and hatchery production goals for salmon and steelhead in the subbasin.

The Umatilla Subbasin Plan is one of the 31 subbasin plans that comprise the Columbia Basin system planning effort. The Columbia Basin Fish and Wildlife Authority, the fish and wildlife agencies and Indian tribes compiled and analyzed all 31 subbasin plans in the Integrated System Plan (1991). The Integrated System Plan summarizes the overall Columbia Basin system goals and policies, individual subbasin plan information and strategies, and fish and wildlife agencies' and tribes' recommendations to the NPPC. The Integrated System Plan is expected to provide the framework for implementing fish enhancement projects in the Fish and Wildlife Program.

D. Northeast Oregon Hatchery Master Plan Background

Prior to the subbasin and system planning process, the tribes and state fishery agencies identified the need for additional hatchery production in the Umatilla River and other rivers in northeast Oregon. The 1987 Fish and Wildlife Program was amended to include a measure to develop artificial production facilities which would produce between 2.4 and 3.0 million chinook and steelhead smolts designated for release into the Hood, Umatilla, Walla Walla, Grande Ronde, and Imnaha river subbasins and elsewhere. The number of smolts needed to supplement production in these subbasins was originally based upon production capacity reports (ODFW 1987) and other information compiled and analyzed in the U.S. v Oregon proceedings. During the development of the Umatilla Master Plan and Subbasin Plan, the CTUIR and ODFW identified the need for an additional 589,000 spring chinook smolts to achieve the spring chinook adult return goals for the Umatilla River. Due to spring chinook production limitations at Umatilla Hatchery, the CTUIR and ODFW proposed the Northeast Oregon Hatchery Project address the additional spring chinook production needed.

The Northeast Oregon Hatchery facilities were originally proposed to address only spring chinook and steelhead production. However, the NPPC, ODFW, and the Tribes agreed that the facilities need not be limited to spring chinook and steelhead if other stocks would benefit from hatchery supplementation. Potential stocks considered include fall and summer chinook, coho, and sockeye salmon.

The Fish and Wildlife Program measure, 703(f) (5) (A), known as the Northeast Oregon Hatchery Project, requires that prior to design of the facilities, a master plan shall be developed by the tribes and state fishery agencies which includes the following:

1. A description of release sites in northeast Oregon that will benefit from hatchery supplementation and discussion of the management history of each stock to be supplemented.

2. A detailed production profile that identifies the source of broodstock, number of smolts to be released and estimated adult returns.

3. A description of related harvest plans.

4. A conceptual design for integrated facilities at one or more locations that include all necessary elements for salmon and steelhead propagation, such as satellite acclimation ponds, adult traps or transportation facilities, and an evaluation of low-capital or small-scale facilities to meet production objectives.

5. Proposed management policies and procedures for streams receiving the fish from the facilities in order to ensure that hatchery releases are consistent with the system policies and plans adopted by the NPPC, as described in Section 200: Salmon and Steelhead Framework.

6. An evaluation of sites to verify suitability for outplanting facilities, including low-capital and small-scale applications. Evaluations shall include recommendations for using sites as efficiently as possible.

7. A proposal for biological monitoring and evaluation studies to assess the effectiveness of outplanting facilities in supplementing natural production in a biologically sound manner and the effects of the outplanting on resident fish populations.

8. Preliminary cost estimates for implementation of the measure.

The master plan is being developed in phases. Existing information for each subbasin was summarized under Phase I, and additional information needs identified. Under Phase II, information needed to complete planning tasks for each subbasin was gathered and subbasin specific plans completed. Phase III of the NEOH Project's Umatilla Supplemental Master Plan is the integration of items 1, 2, 3, 5, and 7 above with production facility siting analysis, conceptual design, and cost estimates (items 4,6, and 8 above). This document represents completion of Phase II planning of the NEOH Project Umatilla Supplemental Master Plan.

Upon completion of Phase III, the final NEOH Project Umatilla Supplemental Master Plan will be submitted to the NPPC for review. Once the NPPC approves the master plan, Bonneville will fund the detailed design, engineering, construction, operation and maintenance, and evaluation and monitoring of the facilities.

FISHERIES MANAGEMENT POLICIES

A. Systemwide Goals and Policies

The original Fish and Wildlife Program established many important measures that began to address detrimental impacts the hydropower system has had on salmon and steelhead runs in the Columbia Basin. However, it did not clearly identify a systemwide goal for increasing Columbia Basin salmon and steelhead runs. A systemwide goal was needed in order to appropriately measure the progress of the various fishery enhancement measures of the Fish and Wildlife Program.

The original program also lacked adequate guidance on how each of these measures were interrelated. Additionally, procedures to monitor and evaluate the effectiveness of these measures was needed. A comprehensive, systemwide strategy was required to account for the total impacts of the hydropower system and the realized benefits of the program measures being implemented. Therefore, systemwide goals and policies were developed to guide the planning, implementation, and evaluation of fishery enhancement efforts under the Fish and Wildlife Program.

The Northwest Power Planning Council has set doubling Columbia Basin salmon and steelhead runs as a reasonable interim goal. This will require increasing the current run size of about 2.5 million adult fish to a run size of about 5 million adult fish. Doubling the salmon runs of the Columbia Basin requires a coordinated approach to effectively achieve improvements in production, passage and harvest management. The following policies were adopted by the NPPC to guide program planning, implementation, measurement, and evaluation. Every attempt has been made to follow these policies throughout the development of this master plan. The key system policies integrated into the master plan include 1) adaptive management, 2) genetic risk assessment, 3) harvest management and 4) coordination.

B. Subbasin Goals and Policies

1. Adaptive Management

The NPPC adopted policies which recognize a process fundamental to acquiring and increasing our knowledge of fisheries resources in the Columbia River basin. This policy is known as "adaptive management". Adaptive management is a "scientific" policy which employs monitoring, evaluation, and research throughout the Columbia River Basin to produce information that can effectively guide the Fish and Wildlife Program in achieving its goals. Application of the adaptive management policy to the salmon and steelhead rehabilitation program in the Umatilla River Basin involves a six step process.

Step 1. Formulation of Management and Production Goals for the Umatilla River Basin.

These rehabilitation goals have been established by CTUIR and ODFW for the Umatilla River Basin:

A. Reestablish runs of spring and fall chinook and coho salmon.

B. Enhance production of summer steelhead through supplementation of naturally producing populations.

C. Provide sustainable Indian and non-Indian harvest of salmon and steelhead.

D. Maintain the genetic character of indigenous populations of salmonids in the Umatilla River Basin, and maintain the genetic viability of re-established populations.

E. Achieve the following goals for adult returns to the Umatilla River:

	Hatchery Production	Natural Production	Total
Spring Chinook Salmon	10,000	1,000	11,000
Fall Chinook Salmon	10,000	11,000	21,000
Summer Steelhead	5,670	4,000	9,670
Coho	6,000	*Undetermined	6,000+

*A coho natural production evaluation is now being conducted by the CTUIR. The results of this evaluation will provide the basis for any changes that may occur in the juvenile release program (stocks or numbers) and development of a natural production goal.

These goals are consistent with the NPPC's system production policies and will be refined during system planning, integration, and evaluation.

Step 2. Identification of Critical Areas of Scientific Uncertainty Affecting Achievement of Umatilla River Program Goals.

Critical areas of uncertainty regarding achievement of program goals for spring chinook are:

A) Will proposed spring chinook smolt release methods and strategies reestablish natural production of spring chinook.

B) To what extent will acclimation of spring chinook enhance smolt-to-adult survival.

C) What impacts will releases of hatchery reared chinook have on the native steelhead population and resident trout population.

D. To what extent will initial or subsequent selection of spring chinook broodstock impact reestablishment and enhancement success.

These areas of scientific uncertainty form the basis for the proposed monitoring and evaluation plan which is described in the Monitoring and Evaluation Plan section of this document.

Step 3. Hypothesis formulation.

As an important foundation for evaluation and monitoring, statistically testable hypotheses for hatchery effectiveness and natural production/supplementation research have been formulated by the Umatilla Hatchery Master Plan Technical Work Group. Experiments testing these hypothesis will assess progress toward achieving state and tribal management objectives for the Umatilla River and the NPPC's system program for doubling runs in the Columbia River basin.

Step 4. Taking Action to Test the Uncertainties

A proposal to test uncertainties is presented in the Monitoring and Evaluation Plan. The experimental design will be reviewed by the Council's Monitoring and Evaluation Group (MEG).

Step 5. Measure Results at an Acceptable Level of Precision and Accuracy.

Monitoring and evaluation is being designed to provide levels of precision necessary to evaluate progress towards doubling runs in the Columbia River. Achieving Umatilla Basin goals while maintaining reasonable costs is emphasized.

Step 6. Management Response to Monitoring and Evaluation Results.

A review process has been developed between the CTUIR, ODFW, and other appropriate entities to incorporate results of monitoring and evaluation into the management decision process (i.e., adjustment of stocks and rearing, release, and outplanting strategies). The next key system policy adopted by the NPPC addresses genetic resource conservation.

2. Genetic Risk Assessment

The reestablishment of spring chinook runs in the Umatilla River will require introduction of a hatchery reared, non-native stock of spring chinook. The potential impact of the proposed hatchery supplementation strategies on the genetic resources of the spring chinook and steelhead populations need to be addressed. A management goal of the tribe and state is to protect the genetic resource of the existing summer steelhead population (ODFW and CTUIR 1989) . Additionally, reestablishing a spring chinook population that can successfully reproduce naturally is also important in achieving production goals.

The selection of a donor brood stock for reestablishing spring chinook will have the greatest initial impact relative to achieving Umatilla Basin goals. General criteria for broodstock selection are identified below. The result of the ongoing and proposed evaluation studies in the Umatilla Basin should provide new information regarding the performance of the stock in achieving program goals.

The NPPC Supplementation Technical Work Group's Work Plan (1988) has identified some general guidelines to reduce potential genetic impacts due to hatchery supplementation procedures.

1. In streams where protection of wild stocks is a primary concern, supplementation should be considered as a last resort.

2. Use of locally adapted or similar stocks and indigenous species may provide the best potential for consistent success.

3. Use hatchery practices that will promote maintenance of genetic variation.

    a. Collect eggs from throughout the spawning run.
    b. Where practical, use one male for each female spawned.
    c. Use all ages of returning fish for egg taking and fertilization.

Other hatchery practices which promote genetic resource conservation are discussed in the hatchery practices section.

Monitoring the life history characteristics, meristic characters, and genetic change and performance of the reintroduced spring chinook population is important for proper long term genetic resource management. The CTUIR in coordination with ODFW and Oregon State University are currently implementing a genetics and natural production monitoring and evaluation program as part of the existing Umatilla Hatchery project. This genetics program will be serve as the guideline for the NEOH Project's Umatilla Basin spring chinook program.

3. Harvest Management

Another key system policy adopted by the NPPC, calls upon the tribal, state, and federal fishery managers to regulate harvest consistent with and supportive of the interim salmon rebuilding goal. Combined harvest management, fish passage, and production will determine the level and rate at which Columbia River Basin salmon runs will increase. Indian and non-Indian harvest in the Umatilla Basin is being designed to achieve natural production goals, broodstock needs and monitoring and evaluation studies. Guidelines for developing annual harvest plans for spring chinook by the CTUIR and ODFW are presented in the Harvest Plan section of this report.

4. Hatchery Practices

A. Broodstock Selection

When artificial propagation is used to rebuild depressed salmon runs, the use of native, indigenous broodstock is recommended. However, in rivers where salmon are severely depressed or non-existent, other sources of broodstock must be relied upon.For the Umatilla River program, broodstock selection will be determined by the following considerations in order of priority:

1. Numbers of each stock available in the Umatilla River basin.

2. Available stocks from other sources which have genetic characteristics that are suitable for the basin.

3. Available stocks from the closest hatchery.

Specific criteria regarding broodstock selection are detailed in the Production Profile section of this document.

B. Spawning Practices

Spawning will be guided by the following principles:

1. Eggs will be used from broodstock collected throughout the run to provide and maintain genetic variability of life history traits such as run timing, body size, age composition, and fecundity.

2. Matings will be random, with male to female ratios and gamete crosses appropriate for breeding population sizes.

3. Use all ages of returning fish for egg taking and fertilization

4. Adults returning to the Umatilla River will be a priority and used as soon as they become available and facilities for holding and spawning are completed.

The CTUIR and ODFW will use the following documents as guidelines for operation and management of the proposed spring chinook production facilities. The Oregon Administrative Rules for Salmon Management and Hatchery Operations require protection of genetic variability and provide for supplementation of depressed stocks. The Washington Department of Fisheries developed extensive guidelines for selecting brood stock for its hatchery operations. Hershberger and Iwamoto (1981) developed WDF procedures in the "Genetics Manual and Guidelines for the Pacific Salmon Hatcheries in Washington". This report identifies potential genetic implications of hatchery practices and provides an overview of basic genetic principles and techniques available for measuring and analyzing genetic variability. Seidel (1983) prepared a supplement titled "Spawning Guidelines for Washington Department of Fisheries Hatcheries". This report examines genetic considerations associated with spawning techniques and recommends techniques for preserving genetic diversity. Changes in hatchery practices may be implemented in the future when the NPPC's Gene Resource Conservation policy is completed. Until the NPPC's policy is completed, production practices are designed to minimize genetic drift and inbreeding depression through stock selection, collection of adequate numbers of broodstock, and spawning procedures that will randomize fertilization (Kapusinski and Jacobson 1987 as cited in ODFW and CTUIR 1989). When possible, naturally produced fish will be used as broodstock and more than 60 fish will be spawned (Kincaid 1983; Kapuscinski and Lannan 1986 as cited in ODFW and CTUIR 1989). Male to female ratios will be 1:1 if the number of broodstock is 60 to 250 and 2:3 when the number of broodstock is greater than 250 fish (Gharret and Shirley 1985 as cited in ODFW and CTUIR 1989). If severe shortages of males result in the need to collect a higher percentage of females than the above ratios, a gamete split cross fertilization scheme (personal interview August 1987, with Al Hemmingson ODFW Technical Services Section, Corvallis, Oregon as cited in ODFW and CTUIR 1989) will be followed. This will avoid the situation whereby a highly viable male dominates fertilization.

5. Fish Health Management

The use of hatcheries as an effective management tool is often limited due to concerns with fish disease. Today, fish health management is receiving more attention and becoming a major factor influencing hatchery practices. The prevention and control of disease in hatchery fish will be an important consideration in the production program for the Umatilla Basin. The following is an excerpt from, "Disease Control in Fish Hatcheries", prepared by Brian Earp (1987) for the Yakima Central Outplanting Facility Master Plan and provides a general overview for disease control

measures for consideration prior to hatchery construction and during hatchery operation. The CTUIR and ODFW will use the follow measures throughout the hatchery facility siting, design, and operations.

"First, consideration for the hatchery would be given to the selection of the water supply with first preference going to a spring rising on the hatchery property and containing no resident fish population. Next in order of preference would be a spring with a resident population that could be eliminated or strictly controlled. Other water sources are less desirable but may have to be considered. Wells that tap suitable aquifers are excellent from the standpoint of disease control but have the disadvantages associated with mechanical pumping systems. The basins consideration is the elimination of possible contamination from fish populations associated with the water supply that have the potential to be a reservoir of disease. Going down the list of possible sites, the least desirable are those with resident fish populations that cannot be controlled and which have the potential for contamination from various sources such as groundwater, aquatic birds, and wild animals.

In worse case scenarios, there have been limited attempts to sterilize, or at least sanitize, the water supply. Chlorination, ultraviolet light, and ozone injection have all been employed. The obvious drawback is the added cost involved for these systems and they are not widely used. Supersaturation of some water sources with inert gasses can sometimes be a problem but will not be covered in this report. Supersaturated water can be made acceptable by adequate aeration. Average water temperatures should also be within acceptable levels.

A very real potential for contamination exists at a new hatchery because it must be stocked either with fish or eggs. Careful consideration must be given to the source of these fish and eggs. Interhatchery and stream contamination should be considered. Particular attention must be given to virus diseases because they are untreatable and only those fish or eggs that have been thoroughly screened for viruses should be considered. Early isolation may be required. Brood fish should be free from virus contamination. Eggs should come from isolated hatchings of small lots of females (four or five females per lot) with the eggs water-hardened in a sanitizing solution. Ovarian fluids from each batch should be tested for the presence of viral disease, and freedom from virus infection should be positively established before the eggs are taken into the new hatchery. Plainly stated, the best way to avoid viral contamination in a hatchery is to simply make sure that none is introduced inadvertently with fish, eggs, or water.

The spread of infectious disease organisms by the hatchery must be addressed. Certification policies must be followed. Isolation of incubation water as required should be designed. Various systems have been developed specially for the isolation of small batches of hatching eggs. Most of these systems have been privately designed and constructed, however, commercial units are now coming onto the market. The spread of diseases within a system must be considered.

Quite similar rules also govern the avoidance of bacterial and parasitic contamination, although the testing procedures vary somewhat and treatments are available should outbreaks occur. Brood stocks from which stocking eggs are to be taken should undergo thorough examination by qualified fisheries pathologists. All eggs should be water-hardened in an appropriate sanitizing solution. We know, for instance, that such diseases as bacterial gill disease and costiasis have been transferred into virgin hatcheries on eggs. The more known about the stocks to be transferred the better.

Many bacterial and parasitic infestations can be avoided or controlled by good management practices. Adequate water supply and flow for any given population goes a long way toward ensuring minimum occurrences of many diseases such as bacterial gill disease.

Bacterial kidney disease is probably one of the more difficult infections to control since it appears to be vertically transmitted form infected females to the young and does not respond very well to medication. Careful screening of brood stock for the presence of the bacterium and the elimination of infected individuals can go a long way toward controlling the disease."

In addition to these disease control measures, specific fish health management policies are being developed by the CTUIR in coordination with ODFW. The ODFW has Oregon Administrative Rules and hatchery practices guidelines which will be incorporated into the proposed fish health management policies. The Pacific Northwest Fish Health Management Guidelines will also aid in the development of these policies.

6. Coordination

The Northeast Oregon Hatchery Project Master Plan is being developed in coordination with four principal entities with fisheries management authority and responsibility in the five northeast Oregon river basins. These entities are the Umatilla, Warm Spring, and Nez Perce Tribes and the Oregon Department of Fish and Wildlife. As the master plan is being developed, the NPPC, BPA, other tribes, fishery agencies and interested parties will have the opportunity to review and provide input to the master plan.

A management structure for the Umatilla River basin (Appendix A) is designed to coordinate proposed hatchery and natural production, harvest, monitoring and evaluation, habitat enhancement and protection, and fisheries management. The CTUIR, ODFW, BPA, and NPPC are currently implementing and fine tuning the management structure for the Umatilla Basin. The planning, implementation, and evaluation of proposed fishery projects will also be coordinated at the systemwide level. This will insure all interested and affected parties have an opportunity to provide input and are kept aware of the activities in the subbasin.

PRODUCTION PROFILE

A. Introduction

Hatchery supplementation is the primary tool fisheries managers will use to accomplish the objectives of the Umatilla Basin fish restoration program. Achieving spring chinook goals and objectives will require the use of hatchery production facilities proposed as part of the Northeast Oregon Hatchery Project in addition to the Umatilla Hatchery and other production facilities. The Northeast Oregon Hatchery facilities will be used to supplement presently under utilized spring chinook habitat in the Umatilla Basin to develop natural runs and produce spring chinook adults for harvest. All fish produced at the facilities will be released off station in various upriver locations within the Umatilla River. Fish may be released into other subbasins if mutually agreed upon by ODFW and CTUIR. The intent of the hatchery program is to annually supplement streams with hatchery reared juvenile fish in order to achieve Umatilla Basin spring chinook hatchery and natural adult return goals. It is expected that this process will take many years and findings from monitoring and evaluation may call for adjustments and changes to the approach developed in this plan.

This section describes plans for the use of the Northeast Oregon Hatchery production to achieve the desired spring chinook adult return goals in the Umatilla Basin. An examination of the production history, detailed production profiles, rearing and supplementation strategies, and broodstock management is presented in following sections. As the Northeast Oregon Hatchery and Umatilla Hatchery programs develop and evaluation studies determine the best rearing and release methods; managers will have the opportunity to modify hatchery production and releases to take advantage of the most effective strategies. This plan identifies the initial phase of an evolutionary program and may not reflect final long-term production. The survival rates used to determine the hatchery production level required to achieve the natural and hatchery adult run size goals are best estimates. They are recognized as areas of uncertainty and are addressed in the monitoring and evaluation plan. As better information is gained from the monitoring and evaluation studies, these survival parameters will be adjusted. This in turn may require appropriate changes in the hatchery production plans developed in this document.

A discussion of the Umatilla River Basin's hatchery production program follows to provide a reference to spring chinook production proposed as part of the Northeast Oregon Hatchery Project.

The CTUIR and ODFW have established run size goals (in terms of adult returns to the Umatilla River) of 11,000 naturally and hatchery produced spring chinook (Table 1). Achievement of these goals will be accomplished primarily by the release of smolts produced at Umatilla Hatchery, Northeast Oregon Hatchery facilities, and other hatcheries in the Columbia Basin.

Table 1. CTUIR/ODFW run size goals and anticipated adult returns from hatchery releases of spring chinook in the Umatilla River.[1]

Run Size Goals[2]			Adult Returns[3]			
Natural	Hatchery	Total	Existing	5 Yr	10 Yr	15 Yr
1,000	10,000	11,000	500-2000	3,600	7,200	11,000

1/ Source: ODFW/CTUIR 1989 Umatilla Master Plan.
2/ Adult returns to the Umatilla River mouth.
3/ Number of years after completion of the Umatilla Hatchery (1991) and achieving 100% of the entire Umatilla Basin spring chinook release program.

The spring chinook run size goal is estimated to be met 15 years after completion of the Umatilla Hatchery. Chinook broodstock programs, including holding and spawning facilities, are currently being developed. Broodstock needs for spring chinook are 1200 for Umatilla Hatchery, 452 for Carson and Bonneville hatcheries, and 548 for the Umatilla component of the Northeast Oregon Hatchery facilities.

The spring chinook hatchery development program will be further limited by the number of smolts released in the basin. Only 60% of the required number of smolts for the spring chinook run size goal will be released from production at Umatilla, Carson, and Bonneville hatcheries. The Northeast Oregon Hatchery facilities will be needed to produce the remainder (589,000 smolts) of the spring chinook requirement (Table 2).

Table 2. Initial spring chinook smolt production profile for the Umatilla River program.[1]

Umatilla/Irrigon		Carson/Bonneville		Northeast Oregon	
Number	Pounds	Number	Pounds	Number	Pounds
1,290,000	114,000	450,000	375,000	589,000	58,900

1/ Source: Modified from ODFW/CTUIR 1989 Umatilla Master Plan

It should be emphasized that the production profiles in Table 2 and described herein are the initial profiles based on estimated smolt release and adult return requirements of the proposed hatchery evaluation plan. These profiles will change in the future depending on the results and subsequent priorities of the hatchery monitoring and evaluation program or priorities established by ODFW and CTUIR.

B. Spring Chinook Production

1. Hatchery Production

a. Production History

Although once abundant, spring chinook have not been present in the Umatilla River for many years. The CTUIR and ODFW have begun restoring spring chinook by releasing hatchery juveniles starting in 1986 (Table 3). Returns from these releases were 13, 164, 2190, 1330, and 464 spring chinook in 1988 through 1992, respectively.

b. Production Profile

Smolt production requirements were estimated from survival and fecundity information obtained from the Umatilla Satellite and Release Sites Project Draft Siting Report, April 22, 1991 and from the U.S. v. Oregon proceedings (Table 4). Initially we plan to annually produce 1,290,000 spring chinook smolts at Umatilla Hatchery. Another 450,000 smolts will be produced annually at the Carson and Bonneville hatcheries for release in the Umatilla River. The Northeast Oregon Hatchery facilities will produce 589,000 smolts for the Umatilla Basin (Table 5).

Table 3. Hatchery releases of spring chinook in the Umatilla River.

Year of Release	Hatchery	No. Released	No./lb.	Stock
1986	Carson	99,970	22.8	Carson
1986	Irrigon	300,438	87.0	Carson
1986	Carson	75,000	15.0	Carson
1987	Carson	99,897	10.4	Carson
1987	Oxbow	169,100	199.0	Carson
1988	Bonneville	1,196	21.4	Carson
1988	Carson	99,895	20.6	Carson
1988	Bonneville	297,377	803-10.3	Carson
1988	Bonneville	75,767	11.1	Carson
1989	Bonneville	160,917	10.6	Carson
1989	Bonneville	164,603	12.0	Carson
1990	Carson	99,775	18.6	Carson
1990	Bonneville	231,772	9.0-9.6	Carson
1990	Bonneville	80,438	11.5	Carson
1990	Bonneville	77,998	13.4	Carson
1991	Carson	90,796	20.6	Carson
1991	Carson	5,937	16.9	Carson
1991	Bonneville	100,505	10.1	Lookingglass
1991	Bonneville	96,152	11.8	Lookingglass
1991	Bonneville	81,114	16.5	Carson
1991	Bonneville	78,480	16.8	Carson
1992	Carson	96,254	18.7	Carson
1992	Bonneville	109,101	9.2	Lookingglass
1992	Bonneville	98,928	8.5	Lookingglass
1992	Umatilla	506,535	35.0	Carson
1992	Umatilla	449,217	35.9	Carson
1992	Irrigon	294,458	32.5	Carson
1992	Bonneville	132,154	11.5	Carson
1992	Umatilla	101,416	19.4	Carson

Table 4. Survival and fecundity estimates used for spring chinook production needs for the Umatilla component of the Northeast Oregon Hatchery program.[1]		
Life History Stage	Estimated Survival	Source
Adult prespawning	0.75	Umatilla Siting Report, 1992
Egg-smolt	0.72	Umatilla Siting Report, 1992
Smolt-adult	0.0075	U.S. v Oregon
Fecundity	4,200 eggs/female	U.S. v Oregon

1/ Source: ODFW and CTUIR 1989 Umatilla Master Plan as modified by Umatilla Satellite and Release Sites Project, Draft Siting Report, April 22, 1991.

Table 5. Spring chinock production profile for the Umatilla component of the Northeast Oregon, Umatilla/Irrigon, and Carson/Bonneville hatcheries			
	Umatilla/Irrigon Hatcheries	Carson/Bonneville Hatcheries	N.E. Oregon Facilities
No. of smolts	1,290,000	450,000	589,000
No. of eggs	1,791,667	625,000	818,055
No. female brood	720	271	260
No. male brood	480	181	173

1/ Source: Modified from ODFW/CTUIR 1989 Umatilla Master Plan.

c. Rearing Strategies

The proposed rearing strategy for the 589,000 spring chinook smolts is as follows. Incubation will occur from August through December. Estimated weight at initial feeding is 1100 fish per pound. Early rearing (feeding to 200 fish/lb.) will occur from November through February. Smolt transport to acclimation facilities will occur the following year in March and April. Acclimation will occur from April through early May. Acclimation (holding fish in ponds or raceways adjacent to the release site) is expected to occur for a period from 1 to 4 weeks. Final release size will be 10 fish per pound. Specific fish propagation criteria for the Umatilla Basin can be found in the Umatilla Satellite and Release Sites Project Draft Siting Report dated April 22, 1991.

The preferred rearing approach is to site and design a facility on the South Fork Walla Walla River that will produce 589,000 and 600,000 smolts for the Umatilla and Walla Walla basins, respectively. The South Fork Walla Walla site may also be used for incubation and rearing for Grande Ronde and Imnaha NEOH production depending on water quality and quantity investigations in the NEOH Project siting analysis.

d. Supplementation Strategies

Proposed release locations for spring chinook were selected to support the planned monitoring and evaluation studies and to achieve production (including hatchery broodstock needs), harvest, and natural escapement goals established by the ODFW and CTUIR.

All 589,000 spring chinook produced as part of the Umatilla NEOH component will be acclimated in-basin. Currently proposed acclimation sites for spring chinook are the Fred Gray site (RM 80), the Thornhollow site (RM 72) and Meacham Creek (RM 2) at the Bonifer facility. Each of these sites are located in areas which will support natural production of spring chinook.

e. Broodstock Management

Because no indigenous spring chinook stocks existed in the Umatilla Basin, the available Carson stock was selected as one which has been used successfully in other hatchery programs above Bonneville Dam. The source of broodstock for the initial Umatilla program has been Carson stock collected at Carson National Fish Hatchery in Washington and Bonneville and Lookingglass Hatcheries in Oregon. Plans are now being developed by the CTUIR, ODFW, and USFWS for near term availability of Carson stock spring chinook for the Umatilla component of the NEOH Project. Alternative broodstock sources identified for use in the Umatilla program include Rapid River and John Day River spring chinook stocks.

Long term plans are to utilize adult fish returning to the Umatilla River. This will require managers to balance the needs of broodstock collection, harvest, and natural escapement. Eventually the entire hatchery egg take will be obtained from fish returning to the Umatilla River. We expect to collect spring chinook broodstock at the Three Mile Dam adult trap in the lower Umatilla river. Construction of the new Umatilla satellite facilities will be necessary to hold, and spawn spring chinook broodstock (see Facilities section). Siting and preliminary design is now underway for an adult holding and spawning facility on the South Fork Walla Walla River. This facility will be designed to provide adult spring chinook broodstock holding and spawning requirements for the entire Umatilla Basin spring chinook program.

2. Natural Production

a. Production History

There are no historical records of spring chinook natural production levels in the Umatilla basin.

b. Production Profile

There are an estimated (43 stream miles) of spring chinook spawning and rearing habitat in the Umatilla basin, this includes Meacham Creek to the Forks, upper mainstem Umatilla (from Squaw Creek confluence to the North and South Forks Umatilla rivers), and the North and South Forks Umatilla rivers (pers. comm. P. Kissner, CTUIR, 1992).

Based on the NPPC Smolt Production Model (1989), the estimated spring chinook smolt production capacity of the Umatilla basin under exiting habitat conditions is 176,600 smolts (CTUIR 1987).

The US v. Oregon Production Report (ODFW 1987) estimated the current spring chinook natural production capacity at 43,500 smolts and 870 adults. CTUIR and ODFW believe these estimates to be conservative considering the ongoing habitat and passage improvement program in the Umatilla Basin.

FACILITIES NEEDED TO IMPLEMENT PLAN

A. Introduction

The Umatilla Basin program, with release of about 9.5 million salmon and steelhead smolts, will require substantial facilities to hold and spawn broodstock, incubate eggs, and rear and acclimate juvenile fish. Presently, about 5 million smolts are being released annually into the Umatilla River basin from Bonneville, Umatilla/Irrigon, Carson, and Cascade, hatcheries. The Bonifer and Minthorn Springs acclimation facilities are in operation and receive smolts for acclimation prior to their release into the river. This section will discuss (1) the Northeast Oregon Hatchery facilities which will be specifically designed to provide 589,000 spring chinook smolt production for this program, (2) the capabilities of present juvenile/adult facilities and, (3) needs for additional juvenile/adult facilities.

B. Existing Facilities

Umatilla Hatchery

In 1987, the Umatilla Hatchery measure was amended (now 703f-1-a) to allow testing of an oxygen supplementation system which would increase production to 290,000 lbs. The increased production would more fully meet Umatilla River smolt requirements for adult return goals. With production increased to 290,000 lbs., all of the summer steelhead, 85% of the fall chinook, and 34% of the spring chinook smolt requirement for adult return goals would be produced at the hatchery.

Umatilla Hatchery located next to the Irrigon Hatchery at Irrigon, Oregon began operation in 1991. The wells for the hatchery were designed to deliver 15,000 gpm. but have provided only 9,000 gpm during the first year of operation. Efforts are underway to provide for the total planned water quantity. Irrigon's No. 2 well is expected to provide backup water for incubation of eggs at Umatilla Hatchery which provides a safety measure in the event of failure of backup pumps at the Umatilla well site.

Umatilla Hatchery includes standard rearing ponds and those which have the option to introduce pure oxygen. The pond configuration for the hatchery includes 2 banks of 3 and 2 banks of 2 standard (Oregon type) raceways and 6 banks of 4 Michigan type raceways which would introduce pure oxygen. Approximately half of the planned total water supply (7,500 of 15,000 gpm capacity) will be used in the oxygen supplemented rearing ponds and half in the standard rearing ponds. The standard pond rearing system, in terms of water usage, occurs sequentially in pairs (double pass) or as individual ponds (single pass). The Michigan type rearing system

utilizes oxygen supplementation and a series of baffles in each pond designed to transport pond wastes as a means to maintain water quality through multiple uses. Water is passed sequentially through three Michigan type ponds.

Juvenile Acclimation/Release Facilities

Two juvenile acclimation facilities currently exist in the subbasin. One is located at Minthorn Springs, four miles east of Mission, Oregon and the other at Bonifer Springs on lower Meacham Creek. These facilities were developed as part of the Council's Fish and Wildlife Program. Bonifer was completed in 1983, and Minthorn Springs in 1985. The CTUIR operates the two facilities in cooperation with ODFW.

The Bonifer facility consists of a one acre, spring fed, earthen pond with a concrete fishway at the pond outlet. The concrete fishway empties into the lower portion of Boston Canyon Creek, 100 feet upstream from its confluence with Meacham Creek. The Minthorn Springs facility includes two concrete raceways (120 ft long by 12 ft wide by 4 ft deep) for acclimation and release of smolts. Water is pumped from Minthorn Springs Creek at 1600 gpm (800 gpm/raceway). Water flowing through the raceways can discharge into the intake pond (recirculated), to the facility outlet (single pass), or a combination of both.

It is estimated that the Bonifer facility juvenile holding capacity is 10,000 pounds while the Minthorn Springs facility can hold up to 13,000 pounds.

Presently, the Bonifer facility is used to acclimate summer steelhead and spring chinook smolts. The Minthorn facility is used to acclimate summer steelhead. These facilities are now being used to evaluate the effectiveness of acclimating salmon and steelhead smolts. This evaluation is projected to continue with fish produced at the new Umatilla Hatchery (see Monitoring and Evaluation Plan section).

Release Sites

Concurrent with transferring fish into the acclimation facilities, hatchery smolts can be released directly into the Umatilla River and selected tributaries. We can manage fish releases to avoid many of the potentially harmful interactions between hatchery and natural stocks only if we have the flexibility to choose among a variety of safe and effective release sites at several locations along the length of the Umatilla River. We recommend improvement of existing release sites and development of new ones at critical locations (Table 6).

Table 6. Location of existing and new outplanting sites for spring chinook in the Umatilla Basin.[1]		
Species	Location	River Mile
Spring chinook	Corporation[2]	RM 89
Spring chinook	Fred Grey Site	RM 80
Spring chinook	Thornhollow	RM 72
Spring chinook	Bonifer[3]	RM 2 Meacham Cr.

1/ Source: ODFW and CTUIR 1989 Umatilla Master Plan as modified by the Umatilla Satellite and Release Sites Project Draft Siting Report, April 22, 1991.
2/ Release site only, no anticipated acclimation.
3/ Existing juvenile acclimation and release facility.

Juvenile and Adult Transportation Facilities and Equipment

As is presently done during periods of low flow, a trap and haul program will be utilized to transport juvenile and adult salmon and steelhead around de-watered sections of the lower 30 miles of the river. Smolts will be captured either at the Westland or West Extension smolt trapping facilities and transported to the river mouth. Adults will be collected at the Three Mile adult trap and transported above the low flow area. Juvenile and adults will be transported with either a 3,000 gallon truck or 370 gallon trailer unit. However, additional transportation units will be needed as part of the Northeast Oregon Hatchery program.

Trap and haul activities will continue to be coordinated with the Umatilla River Operations Group which includes representatives from the Stanfield/Westland, Hermiston, and West Extension Irrigation Districts, ODFW, and CTUIR. The group coordinates irrigation diversions, water releases from McKay Reservoir, and flow enhancement activities with releases and migrations of salmon and steelhead. Increased coordination will be necessary when Umatilla Hatchery and the Northeast Oregon Hatchery facilities reach full production.

Broodstock Collection, Holding, and Spawning Facilities

As part of the Comprehensive Plan (ODFW 1986), fish passage facilities at Three Mile Dam have been upgraded to improve upstream and downstream migration of fish. Modern fish trapping facilities were installed at the east bank fishway in the summer of 1988. As a result, adults returning to the Umatilla River can be collected for broodstock at Three Mile Dam. In addition, collection of adult steelhead is expected at the Bonifer and Minthorn facilities and

the proposed new outplanting facilities in the Umatilla Basin but spring chinook collection at these locations is not anticipated to be needed.

The Minthorn Springs facility has a concrete raceway outlet and holding area (25 ft. long x 8 ft. wide x 3 ft. deep) designed to serve as an adult trap and holding pond for summer steelhead adults. Broodstock held in this pond can be isolated from the effluent water of the acclimation ponds and receive a separate water supply directly from the spring water source. The adult steelhead holding capacity of Minthorn is reduced due to water limitations during the operation of the juvenile acclimation ponds (March-May). The Minthorn facility has an estimated adult holding capacity of 1,200 pounds or 171 steelhead at labs/fish (Table 7). With planned modifications, this facility will hold all summer steelhead broodstock for Umatilla Hatchery production requirements. The design of the Minthorn facility and summer water conditions will not be suitable for holding of adult spring chinook. The juvenile raceways, however have been used to hold adult fall chinook during the interim period prior to completion of the Umatilla Hatchery satellite fall chinook holding facility at Threemile Dam.

Table 7. Estimated adult holding capacity of the Bonifer & Minthorn Springs Facilities[2/]

Facility	Existing Holding Volume	Estimated Available Water Supply	Maximum Holding Capacity[2/]
Bonifer	288 cu. ft.	900 gpm	576 lbs.[3/]
Minthorn	600 cu. ft.	225-675 gpm	1,200 lbs.

1/ Source: ODFW/CTUIR 1989 Umatilla Master Plan; facilities intended for steelhead only

2/ Based on adult holding criteria of 15 lbs. of fish/gpm and 2 lbs. of fish/cu. ft. of holding area given 50F water temperature (Senn et al. 1984).

3/ Capacity assuming problems associated with pond effluent and water level fluctuations during smolt releases can be corrected.

The Bonifer Springs facility has a concrete raceway outlet which can be used to trap and hold returning adult steelhead. Holding capacity at Bonifer is estimated at 576 pounds of adult broodstock (or 82 steelhead at labs/fish). Although the raceway outlet has been used to hold steelhead broodstock, it has created problems relating to juvenile operations at the facility. Pond effluent

travels directly through this raceway and when smolts are flushed out of the pond the water level in the adult holding area drops. The facility can function as a back-up adult steelhead holding facility from late fall through spring but summer water temperatures limit its use for holding of adult spring chinook.

The Umatilla Hatchery does not have adult holding or spawning facilities on site. Water temperatures at the hatchery are unsuitable for broodstock holding. Initially, those hatcheries designated to provide the broodstock for spring and fall chinook will conduct the spawning activities.

Starting in 1993 or 1994, the new Umatilla Hatchery Satellite facility will be operational. This facility is expected to accommodate all spring chinook broodstock holding and spawning operations for the Umatilla Basin hatchery program. This includes 1200 for Umatilla Hatchery, 452 for Carson/Bonneville hatcheries, and 520 for the Umatilla basin component of the Northeast Oregon program (total 2172).

The present chinook reestablishment effort of the CTUIR and ODFW is already returning spring chinook adults to the Umatilla River which could be used as a part of the broodstock program. The Carson spring chinook stock currently being used for the Umatilla Basin production is consistent with the broodstock program being proposed for the Umatilla Basin component of the Northeast Oregon Hatchery program.

Spring chinook broodstock development for the Umatilla Basin component of the Northeast Oregon Hatchery program will begin as soon as the Umatilla Satellite broodstock holding and spawning facility is developed. Design and construction of this facility on the South Fork Walla Walla River is scheduled for 1993 and 1994. It is expected that broodstock taken from adult chinook returns to the Umatilla River will be transported to the Walla Walla facility beginning in the Spring of 1994.

C. Broodstock Collection Facilities

No new broodstock collection facilities are needed for the Umatilla component of the Northeast Oregon Hatchery facilities. There will be an additional need for broodstock transportation equipment which may include another small tanker-trailer unit.

D. Adult Holding and Spawning Facilities

No new adult holding and spawning facilities are needed for the Umatilla component of the Northeast Oregon Hatchery facilities The Umatilla Hatchery Satellite facility being designed for the South Fork Walla Walla River site will also hold and spawn the 548 broodstock identified for Northeast Oregon Hatchery production.

E. Incubation and Rearing Facilities

Incubation and rearing facilities for the Umatilla component of the Northeast Oregon Hatchery program should accommodate incubation of 818,055 eggs and rearing space for 589,000 smolts at 10 fish/lb (58,900lbs). See Umatilla Satellite and Release Sites Project Draft Siting Report, April 22, 1991 and Northeast Oregon Hatchery Project Working Papers, May 23, 1991.

F. Acclimation and/or Release Sites

More acclimation facilities are needed to accommodate the large number of spring chinook juveniles that are programmed for release in the Umatilla Basin. Current plans are to provide acclimation facilities for all 589,000 spring chinook smolts planned as part of the NEOH Project Umatilla Basin production. It is not known at this time what the smolt acclimation capacity will be at the new Umatilla Satellite facilities. The size and number of facilities will be based on availability of suitable water sources within the Umatilla Basin and requirements for monitoring and evaluation of the hatchery program.

Planning and development of the Umatilla Satellite facility for adult holding and spawning is being integrated with the development of acclimation facilities and the NEOH Project.

G. Costs and Schedules

The design for the Umatilla Hatchery spring chinook adult holding/spawning facility at the South Fork Walla Walla River site is scheduled for completion in 1993 and facility construction completed by the spring of 1994. This project will also include the site layout for the rearing and incubation facilities needed for the Umatilla and Walla Walla components of NEOH. Site planning and construction (water intake system, plumbing, etc.) for the Umatilla adult spring chinook satellite facility on the South Fork Walla Walla River will consider later facility additions necessary for the NEOH components. NEOH costs and schedules will be determined as a part of the continuing planning process.

MONITORING AND EVALUATION PLAN

A. Introduction

The purpose of this section is to summarize the monitoring and evaluation plan for spring chinook as part of the Umatilla component of the Northeast Oregon Hatchery project. The basis for the goals, objectives, critical uncertainties, and experimental approach were previously developed in the Umatilla Master Plan. Monitoring and evaluation are necessary to increase the level of knowledge associated with these scientific uncertainties inherent in fisheries restoration and enhancement efforts. The monitoring phase will consist of observation and measurement of performances associated with restoration and enhancement strategies. Evaluation is the process of analysis, summarization, and review of the measured performances to provide the information essential for assessing and comparing effectiveness. The knowledge generated from the evaluation process is an integral and critical component of the adaptive management process (Lee and Lawrence 1986 as cited in ODFW and CTUIR 1989). The proposed monitoring and evaluation program will provide the information necessary for managers to effectively implement actions to meet program goals.

The proposed monitoring and evaluation will compliment the Council's System Monitoring and Evaluation Program by using the adaptive management process to attain the goals of the Umatilla Basin Comprehensive Plan (ODFW 1986).

The Monitoring and Evaluation goals are:

1. Provide information and recommendations for culture and release of hatchery fish, harvest regulations, and natural escapement that will lead to the accomplishment of long term natural and hatchery production goals in the Umatilla River basin in a manner consistent with provisions of the Council's Fish and Wildlife Program.

2. Assess the success of achieving the management objectives in the Umatilla River basin that are presented in the Master Plan and the Comprehensive Rehabilitation Plan.

Mobrand (1987 as cited in ODFW/CTUIR 1989) discusses the purpose, scope, and utility of monitoring and evaluation programs for fisheries enhancement. He states, "The basic question asked of the evaluation process is which of several potential treatments are best. Treatments consist of different ways of utilizing the outplanting facilities and the biological resources available. The comparison of alternative treatments technically amounts to a formal hypothesis testing procedure. Treatments are administered as experiments designed to resolve with prescribed certainty whether two or more treatments produce results that differ by some predetermined amount." Monitoring activities are designed to

measure the results of these experiments and conditions that may affect the outcome of the experiments (hatchery and release operations, environmental conditions, etc.). The final products of the evaluation process are (1) assessment of the results of program actions and experimental procedures, (2) assessment of success toward attaining program goals, and (3) recommendations for actions necessary to achieve or refine program goals.

A salmon and steelhead enhancement program for the Yakima River basin (Fish Management Consultants 1987) was developed concurrent with the Umatilla River Program. Evaluation of both programs will be part of the Council's Systems Monitoring and Evaluation Program. Although several aspects of the Yakima and Umatilla programs are similar, there are some major differences in the goals of each program which create differences in the priorities of evaluation. The Yakima River basin presently has naturally producing populations of steelhead, chinook, and sockeye. The Yakima River Program is being designed with emphasis on enhancement of the natural production of salmon and steelhead. In contrast, only summer steelhead naturally produce in the Umatilla River basin. Fall and spring chinook and coho salmon must be reestablished using imported stocks.

The Umatilla Hatchery monitoring and evaluation program for artificial and natural production is currently being implemented by ODFW and CTUIR respectively. These research plans were coordinated with the appropriate NPPC committees including the Hatchery Effectiveness and Supplementation Technical Work Groups and the Monitoring and Evaluation Group. These studies involve spring chinook production already taking place at Umatilla, Bonneville and Carson Hatcheries. Additional spring chinook studies to address the Umatilla Basin component of the Northeast Oregon Hatchery program are expected to fit under the existing ODFW and CTUIR monitoring and evaluation projects.

B. Priority of Critical Uncertainties

There are a great number of uncertainties associated with spring chinook production at the Northeast Oregon Hatchery facilities and the restoration and enhancement of anadromous fish in the Umatilla Basin. It is important to understand that major differences exist in the natural production potential, past and present population status, and management objectives among spring chinook, fall chinook, and summer steelhead. These differences, which have been highlighted in the Comprehensive Plan (ODFW 1986) and the Master Plan, create differences in the critical uncertainties associated with each species.

Critical areas of uncertainty in the Umatilla Basin for spring chinook are identified below in order of priority under hatchery effectiveness and natural production/supplementation as presented in the Umatilla Hatchery Master Plan (ODFW/CTUIR 1989). These will also apply to spring chinook production under the Umatilla component of the Northeast Oregon Hatchery program.

Hatchery Effectiveness Uncertainties

1. Will releases of spring chinook smolts produced at Umatilla Hatchery achieve the desired level of adult production.

2. To what extent will acclimation of spring chinook smolts enhance smolt-to-adult survival and homing.

Natural Production and Supplementation Uncertainties

1. Whether natural production potential of fall chinook and spring chinook is less than, equal to, or greater than natural production goals.

2. To what extent will large releases of hatchery reared chinook salmon affect native steelhead populations.

C. Experimental Approach

As mentioned earlier, experimental opportunity is limited by factors such as hatchery design and capability, desired species production profile, and availability of suitable streams for treatment, control, and spatial replication. To identify the initial experimental design and ponding allocation for the hatchery, we established a set of criteria that were based on a desired level of statistical precision and fish cultural and production needs.

These criteria are:

1. Uncertainties should be evaluated in priority order.

2. Each treatment must be replicated twice within a year, preferably, three or four times.

3. Each treatment should be replicated for four years to ensure that performances are observed under a variety of environmental conditions. This should allow us to distinguish a 50% difference among treatments with 95% certainty.

4. At least one treatment (rearing and release strategy) for each species must be used as the standard control and maintained through time.

5. To minimize variation we require 35 observed mark recoveries per test group. This should give a coefficient of variation for smolt-to-adult survival rate of .25 (deLibero 1986; Mobrand 1987 as cited in ODFW and CTUIR 1989).

6. The experimental ponding plan should match the desired species production profile as closely as possible, given the above criteria.

Mobrand (1987 as cited in ODFW and CTUIR 1989) highlights the need in fisheries studies to maximize learning opportunity within year to minimize the influence of year to year environmental variation. We need to mark sufficient numbers of fish with sufficient replication of treatments to allow for valid within-year statistical comparisons between treatments. We are always in a hurry to discover what treatments are "best". The scope of inference for studies which are conducted for one year is narrow and results apply only to the set of environmental conditions that existed during the study year. It is probably more important to assure that treatments are replicated over a number of years to allow observation of performances over a wider range of environmental conditions. In many cases, what we are truly interested in is whether one treatment is better than another (treatment difference) consistently through time. As we learn from our initial experiments, we plan to adopt the staircase approach (Walters et al. 1987 as cited in ODFW and CTUIR 1989) to introduce new treatments in a systematic manner over time.

In general, we will be applying two statistical techniques for data analysis. Hypothesis testing with analysis of variance will be used to test for differences in performance parameters of treatment and control groups that are released for hatchery effectiveness studies. In addition we will make interval estimates of the differences in performance parameters. Performance parameters that will be estimated are discussed further under each specific objective. Supplementation and natural production studies principally involve the use of interval estimation of population parameters. The Council's Systems Planning Model and the Cohort Reconstruction Model will be useful tools for estimating and modeling a number of population parameters (see Mobrand 1987 as cited in ODFW and CTUIR 1989).

Releases and recoveries of coded wire tagged adults and other fish marks applied to juvenile fish (freezebrand, Visible Implant Tag [VIT], Passive Integrated Transponder Tag [PIT]) will provide the information needed to estimate performance parameters for hatchery effectiveness studies. Smolt to adult survival estimates will be based on total fishery contribution (ocean, Columbia and Umatilla rivers) and escapement. A critical component of the experimental design is the number of coded wire tagged fish needed per release group to achieve the desired 35 observed recoveries. We have a

limited database to estimate tag group size for fish released in the Umatilla River. We developed a set of assumptions for each species (survival, exploitation, fishery sampling, and inriver recovery rates) from which to estimate minimum acceptable replicate group size. Because of the uncertainty associated with our assumptions, particularly the survival rates, the actual size of tag groups be will be two times larger than the calculated minimum acceptable number where possible. Prior to start of the hatchery evaluation, we should have refined estimation of survival based on recoveries of marked groups that were released in 1987 and 1988. We assumed that we could recover 50% of the tagged fish that return to the Umatilla River. These recoveries can come from broodstock collections, spawning surveys, and from fisheries.

D. Monitoring Sites

The monitoring sites for the Umatilla component of Northeast Oregon Hatchery are expected to be the same as those discussed in the following excerpt from the Umatilla Hatchery Master Plan (ODFW/CTUIR 1989). Monitoring stations throughout the Umatilla River basin will be needed to trap, handle, and count juvenile and adult anadromous fish. Three Mile Dam will serve as the primary monitoring and collection site for marked adult salmonids. Traps and video cameras will be operated on the west and east bank ladders. A juvenile sampler was constructed in 1988 at the west bank diversion canal screen at Three Mile Dam as part of the passage facility. This sampler will allow trapping, handling, and counting of marked experimental and production groups of fish. Trapping and holding facilities for juvenile fish at the Westland Dam were upgraded in 1990 and provide a means of intercepting downstream migrant salmonids for transport by truck to the Columbia River at times when flows are inadequate for outmigration below Westland. We will have adequate sampling capability at Three Mile and Westland to allow development of methods to quantify the number of juvenile migrants passing.

In addition to Threemile Dam, some adult salmonids returning to Umatilla Hatchery satellite facilities may also be collected and counted to compare returns from experimental and production releases from these facilities. Other adult recoveries will occur from sampling of fisheries and spawning grounds.

E. Objectives and Hypotheses

Monitoring and evaluation of spring chinook for the Umatilla component of the Northeast Oregon Hatchery program is expected to fall under the spring chinook objectives and hypotheses that were identified in the Umatilla Hatchery Master Plan (ODFW/CTUIR 1989). These objectives, which are a part of ongoing studies, would be modified (new language underlined) as follows to reflect NEOH production:

Hatchery Effectiveness Objectives

Objective 1: Determine smolt-to-returning adult survival and outmigration performance of subyearling and yearling spring chinook smolts released from Umatilla and Bonneville Hatcheries, and the Umatilla component of NEOH and released into the Umatilla River and compare to expected survival.

Objective 2: Determine the effectiveness of acclimating summer steelhead and spring chinook smolts prior to release.

Objective 3: Document fish cultural and hatchery operational practices at Umatilla Hatchery, the Umatilla component of NEOH, and adult recapture/ juvenile release facilities.

Objective 4: Determine annual harvest of chinook salmon and summer steelhead in the Umatilla River including estimates of total catch by marked group.

Natural Production and Supplementation Objectives

Objective 5: Determine the success of reestablishing natural production of spring and fall chinook in the Umatilla Basin.

F. Costs and Schedules

Costs and schedules for implementing the monitoring and evaluation plan for spring chinook will be identified in extensions or modifications of the existing BPA funded Umatilla Hatchery monitoring and evaluation studies for hatchery effectiveness (ODFW) and natural production (CTUIR). Other than cost increases for coded wire tagging of new production, existing study activities may cover most of the research needs for the Umatilla component of the Northeast Oregon Hatchery program.

B. Harvest Plan Guidelines

The CTUIR and ODFW have established natural production and hatchery production goals for spring chinook populations in the Umatilla River basin. The CTUIR and ODFW have also developed Umatilla River adult salmon and steelhead harvest plan guidelines in the Umatilla Master Plan (ODFW/CTUIR 1989) which outline the catch apportionment of adults returning to the Umatilla River at various run sizes. The CTUIR and ODFW have identified hatchery broodstock, spawning escapement, and evaluation requirements as having high priority. However, it is the intent of the CTUIR and ODFW to provide a level of harvest which is compatible with the respective natural and hatchery run size and rebuilding goals for each species.

The CTUIR and ODFW will use Table 9 as a guideline to develop annual harvest plans which will specify allowable catch and allocation and location of Indian and non-Indian fisheries in the Umatilla River. Table 9 is different from the initial spring chinook harvest guidelines in the Umatilla Hatchery Master Plan (ODFW/CTUIR 1989) in that it provides more emphasis for broodstock and spawning escapement at low run sizes. It is also consistent with the harvest management regulations that ODFW and CTUIR have implemented in the last three years.

The anadromous fish production profile for the Umatilla Hatchery provided the basis for the broodstock goals. A broodstock buildup period will be necessary for spring chinook. The number of spring chinook broodstock collected increases with the corresponding run size until the hatchery broodstock goal is gradually achieved. The schedule is designed to support the continuous building of the hatchery broodstock program while concurrently increasing natural production and harvestable surplus.

The harvest plan guidelines also address the needs of the evaluation and monitoring program for the Umatilla River basin. The monitoring and evaluation program will provide critically important information to guide managers of the Umatilla River Fisheries Rehabilitation Program to achieve broodstock, spawning, research, and harvest goals.

The monitoring and evaluation program has identified a minimum number of observed recoveries (tags or marks) per experimental replicate for each species. The research needs represent the minimum number of observed recoveries required for the various evaluation studies. The collection of samples (tags or marks) for each study will occur in the order of priority outlined in the Monitoring and Evaluation Plan section. There must be evaluation funding commitments so CTUIR and ODFW can recover the required number of tags from broodstock, spawning surveys, and various harvests.

Table 9. Harvest Plan Guidelines for Spring Chinook[1/]	
Run size goal (to mouth of Umatilla) =	11,000 (1,000 natural 10,000 hatchery)
Broodstock collection goal for N.E. Oregon production only =	520
Broodstock collection goal for entire Umatilla Basin spring chinook production =	2,170

Total Run Size[2/]	Umatilla Basin Broodstock[3/]	Spawning Escapement	Research Needs[5/]	In-River Harvest
250	150	100	105	Based on available surplus[6/]
500	200	200	280	
750	300	300	350	
1000	400	400	350	
1500	600	600	490	
2000	800	800	490	
2500	1000	1000	490	
3000	1400	1000+[4/]	490+	
4000	2170[7/]	1000	490+	
5000	2170	1000	490+	
6000	2170	1000	490+	
7000	2170	1000	490+	
8000	2170	1000	490+	
9000	2170	1000	490+	
10,000	2170	1000	490+	
11,000	2170	1000	490+	

1/ Schedule will be the basis for development of annual harvest plans.

2/ Includes hatchery and natural returns to the mouth of the Umatilla River.

3/ Broodstock contributed toward the entire Umatilla spring chinook production, including the Umatilla NEOH component.
4/ Natural spawning escapement goal reached. Number may be adjusted upward based upon natural production success, available habitat, and other considerations as agreed to by the Tribe and ODFW.
5/ Samples (tags) collected from harvest, spawning surveys, broodstock, and sacrifices at Threemile Dam, if necessary.
6/ Available surplus is fish available for harvest after broodstock (Umatilla returns or other stocks), spawning escapement, and research needs are met.
7/ Broodstock collection goal achieved.

COORDINATION AND DOCUMENTATION OF THE DEVELOPMENT AND REVIEW OF THE MASTER PLAN

The NEOH Project Umatilla Supplemental Master Plan was developed by the CTUIR and ODFW in coordination with the Nez Perce Tribe, Confederated Tribes of the Warm Springs, Northwest Power Planning Council, Bonneville Power Administration and other agencies. This document will be integrated with the Umatilla Satellite and Release Sites Project Final Siting Report and the Final Northeast Oregon Hatchery Project Final Siting Report being prepared by James M. Montgomery Consulting Engineers under contract with BPA. The final integrated NEOH Project Umatilla Supplemental Master Plan will be reviewed by the Northeast Oregon Hatchery Project Technical Work Group and Policy Group prior to submittal to the NPPC for review.

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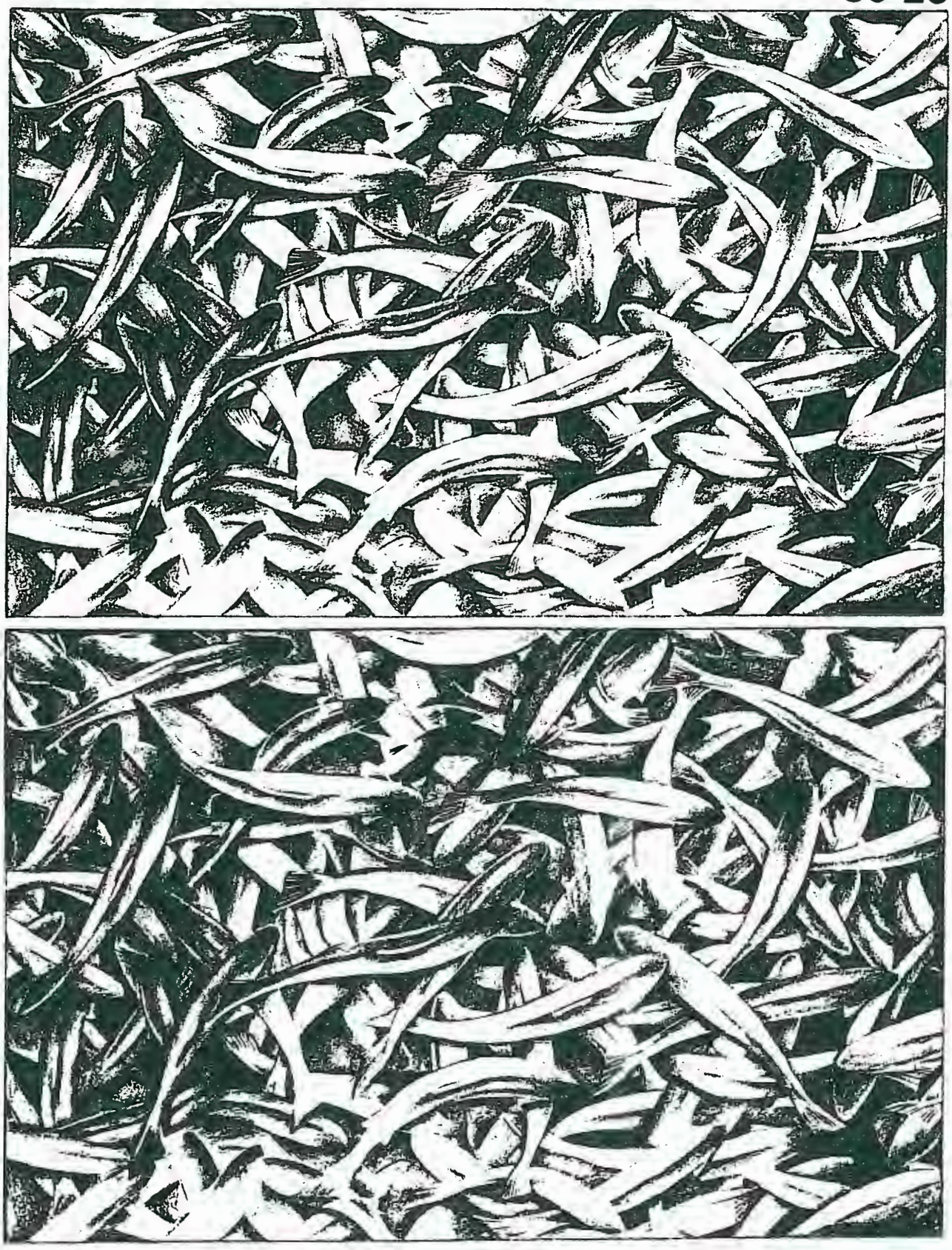
Staff Issue Paper

UMATILLA HATCHERY MASTER PLAN

89-25



July 13, 1989

NORTHWEST POWER PLANNING COUNCIL

851 S.W. SIXTH AVENUE • SUITE 1100
PORTLAND, OREGON 97204-1348 • (503) 222-5161

Toll free number for Idaho, Montana & Washington: 1-800-222-3355
Toll free number for Oregon: 1-800-452-2324

July 14, 1989

To Interested Parties:

At its July meeting, the Northwest Power Planning Council voted to release an issue paper on the Umatilla Hatchery Master Plan for public comment. The issue paper is attached. If the master plan is approved, hatchery construction will be initiated to produce up to 290,000 pounds of salmon and steelhead for release in the Umatilla River.

The hatchery program is designed to re-establish salmon and rebuild steelhead runs in the Umatilla River Basin. It will also demonstrate the use of oxygen supplementation to enhance hatchery production of Pacific salmon and steelhead. Oxygen supplementation reaerates oxygen-depleted water so that the same volume of water can be used up to three times. This can be critically important in areas, such as the Umatilla Basin, where there are many competing uses for a limited water supply. Knowledge gained through this demonstration may apply throughout the Pacific Northwest.

The Council is requesting public comment on the issue paper through August 11. Oral public comment will be taken at the August 9-10 Council meeting in Portland. The schedule for this meeting will be published once an agenda has been established. Council action on the proposed master plan for the Umatilla Hatchery is tentatively scheduled for the Council's September 13-14 meeting.

Sincerely,

Dulcy Mahar

Dulcy Mahar, Director
Public Involvement

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JULY 13, 1989

ISSUE PAPER

UMATILLA HATCHERY MASTER PLAN

INTRODUCTION

The Umatilla hatchery is a key component of current efforts to reintroduce salmon and rebuild steelhead runs in the Umatilla River Basin. It is central to an overall plan developed by the Oregon Department of Fish and Wildlife, the Confederated Tribes of the Umatilla Indian Reservation and others to bring the Umatilla back to its full fish producing potential. Other aspects of Umatilla River Basin fisheries rehabilitation efforts, all of which are part of the Columbia River Basin Fish and Wildlife Program, include enhancing habitat, improving passage, operating acclimation sites, and providing water flows to support increased fish populations.

The Council's fish and wildlife program calls for construction of the Umatilla hatchery to produce up to 290,000 pounds of salmon and steelhead for release into the basin. The Council required completion and Council approval of a hatchery master plan before building the hatchery.

The Umatilla hatchery has the potential to provide substantial benefits to the region. In addition to returning opportunities to catch, view and study fish in the Umatilla River, it could have systemwide benefits. The facility is planned to demonstrate the oxygen supplementation technique, and lessons learned from that demonstration may be applicable in other parts of the basin as well. Oxygen supplementation reaerates oxygen-depleted water so that the same volume of water can be used up to three times, thus permitting enhanced fish production with a given water supply. If successful, oxygen supplementation could contribute to the Council's goal to increase Columbia River Basin salmon and steelhead runs by 2.5 million fish annually.

Implementation of the hatchery project involves some important uncertainties. First, the oxygen supplementation technique, while used successfully in Michigan and by private hatcheries in the Northwest, has not been tested in the Columbia River Basin for salmon and steelhead. Second, large releases of new hatchery fish into the Umatilla may result in genetic impacts on the approximately 2,000 naturally spawning summer steelhead in the basin. Third, proposed rearing practices for the majority of spring chinook produced at the facility are considered experimental. The master plan and this issue paper address these and other issues.

The decision before the Council is whether to approve the master plan and, authorizes construction of the Umatilla Hatchery.[1] The fish and wildlife program identifies six areas to be addressed in the master plan (703(f)(1)(a)):

1. Rearing schedule and release sites and schedules;

2. A detailed production profile that includes the broodstock source, numbers of fish to be released, and the expected annual adult returns;

3. A description of related harvest plans;

4. Proposed management policies and hatchery practices to ensure that hatchery releases protect genetic integrity of native stocks, are disease-free, and are coordinated with those of other fish and wildlife agencies and tribes in the Columbia River Basin;

5. A proposal for biological monitoring and evaluation studies to assess the effectiveness of outplanting facilities in supplementing natural production in a biologically sound manner and to assess the effects of the outplanting on resident fish populations; and

6. Evidence of coordination with system planning.

The program also requires the master plan to be consistent with program policies designed to double salmon and steelhead runs. Policies particularly relevant to this hatchery address genetic risks, harvest management, and adaptive management.[2]

This issue paper reviews Council decisions leading to completion of the hatchery master plan. It describes key elements of the master plan for the proposed hatchery and discusses some of the potential uncertainties and benefits associated with the project. It also presents alternative actions the Council might consider. It seeks public comment on the master plan and the issues raised by the facility.

Oral public comment will be taken at the August 9-10 Council meeting in Portland, Oregon. Written comment is due by 5 p.m., August 11. Council action on the hatchery master plan is tentatively scheduled for the September 13-14 Council meeting.

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1 Umatilla Hatchery Master Plan, prepared by Oregon Department of Fish and Wildlife and Confederated Tribes of the Umatilla Indian Reservation, Jan. 1989. Copy available on request.

2 Three of the fish and wildlife program system policies for doubling runs (204(b)(e)(g)) are that: genetic risks must be assessed, harvest management must support rebuilding, and adaptive management should guide action and improve knowledge.

HISTORY OF THE PROPOSED PROJECT

Historically, the salmon and steelhead runs in the Umatilla River Basin were abundant and vital to residents in and around the Umatilla Basin. In particular, the tribes that now make up the Confederated Tribes of the Umatilla Indian Reservation relied on this fishery from time immemorial for subsistence, economic, religious and cultural purposes.

The Umatilla River is one of the hardest hit tributaries in the Columbia River system in terms of fishery losses. Fish populations were seriously depleted in the early 1900s by irrigation development, which transformed this once dusty plain into a highly productive agricultural area. Since then, Umatilla summer steelhead populations have declined dramatically. Spring and fall chinook and coho runs have been completely eliminated. The key causes for fish losses in Umatilla River and its tributaries have been decreased streamflows, inadequate passage and degradation and loss of habitat. In addition, construction and operation of the hydroelectric dams on the mainstem Columbia River has contributed to losses and is keeping these runs from rebuilding. Umatilla River fish must pass three major hydroelectric dams going to and returning from the Pacific Ocean. Only one of those projects (John Day Dam) is fully screened to reduce hydroelectric turbine mortality.

The Umatilla hatchery is one of the key elements identified in the Comprehensive Plan for Rehabilitation of Anadromous Fish Stocks in the Umatilla River Basin.[3] The comprehensive plan, completed in early 1986, was prepared by the Oregon Department of Fish and Wildlife in cooperation with the Confederated Tribes of the Umatilla Indian Reservation, National Marine Fisheries Service, the Fish and Wildlife Service, Bureau of Reclamation, and the Forest Service. The plan establishes fisheries rehabilitation objectives for naturally and hatchery produced salmon and steelhead in the Umatilla Basin.

The Umatilla hatchery, unlike the Yakima artificial production facilities which are being planned, is not designed with emphasis on enhancement of the natural production of salmon and steelhead. The Umatilla basin contains relatively limited habitat for spring chinook. It also lacks native chinook runs to rebuild. As a result, spring chinook production in the Umatilla will be largely maintained by hatchery facilities. The emphasis in the Umatilla program is to reestablish spring and fall chinook using imported stocks. Those efforts to recreate natural chinook runs will be concentrated in particular areas with high quality habitat.

Conceptually, the Umatilla hatchery program has undergone a number of changes since adoption of the first program in 1982. Council actions, taken

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3 A Comprehensive Plan for Rehabilitation of Anadromous Fish Stocks in the Umatilla River Basin, Oregon Department of Fish and Wildlife, Jan. 1986. Copy available on request.

with strong encouragement of the fish and wildlife agencies and tribes, reflect these changes:

1. In 1982, measures in the program approved construction of two acclimation and adult holding facilities for chinook and steelhead. Numerous passage and habitat improvement projects in the upper and lower Umatilla River and tributaries were also undertaken.

2. In 1984, the Council amended the program to call for construction of a hatchery to produce 40,000 pounds of steelhead. Approval was given to allow rebuilding of naturally producing summer steelhead runs and to benefit the Umatilla River sport and Indian fisheries.

3. In 1986, the program was again amended increasing the hatchery capacity to 160,000 pounds of fish. The production objectives also were expanded to include salmon. The decision was made after preliminary engineering studies showed the water supply for the hatchery (the Irrigon well) could provide sufficient water for up to 200,000 pounds of salmon and steelhead. The original hatchery concept would have used only a small portion of the available water supply. It was felt by the agencies and tribes that full development of the water supply would bring production much closer to goals for re-establishing salmon and steelhead runs in the basin. Further, economies of scale were projected if these facilities were developed at the higher production levels.

4. In 1987, the latest program amendment was adopted by the Council. This amendment called for the hatchery to demonstrate the effectiveness of oxygen supplementation to increase rearing capacities at the hatchery from 160,000 pounds to 290,000 pounds of juvenile salmon and steelhead annually. The Council amended the program to allow this large-scale testing for basically three reasons: a) the increased production would more fully meet production goals, b) the cost efficiency of producing smolts at the hatchery would increase, and c) the results from demonstrating the use of oxygen rearing systems for production of Pacific salmon could have systemwide applications. The amendment was supported by fish and wildlife agencies, the Umatilla tribes, utilities and Bonneville.

Since 1987, the Oregon Department of Fish and Wildlife and the Umatilla tribes have worked together to prepare the facility master plan, as required by the Council. The plan took nearly 21 months to complete and was reviewed by Bonneville, Council staff, agency and tribal biologists, the hatchery effectiveness and supplementation research technical working groups, utilities and other technical experts.

DESCRIPTION OF PROPOSED UMATILLA HATCHERY

The master plan describes an artificial production program designed to reestablish salmon and rebuild steelhead runs in the Umatilla River Basin. In particular, the plan discusses the production, release and monitoring features of the program which are proposed to make the Umatilla hatchery successful in meeting its goals.

The Umatilla hatchery program project is expected to cost a total of $16.15 million for construction of the hatchery and satellite facilities and improvements at release sites. In addition, an estimated $1.55 million will be required annually to operate and maintain the facilities and conduct monitoring and evaluation studies.

The proposed hatchery will be located adjacent to the existing Irrigon Hatchery at Irrigon, Oregon near the Columbia River (Figure 1). The existing Irrigon hatchery, operated by the Oregon Department of Fish and Wildlife and built under the Lower Snake Compensation Agreement. Both facilities will use the same water supply and reduce costs by operating as a single complex. The site is located approximately ten miles west of the Umatilla River.

Final design for the Umatilla hatchery was completed in June 1988 by the U.S. Army Corps of Engineers, Walla Walla District at a cost of approximately $897,000. Particular features of the hatchery master plan are discussed below.

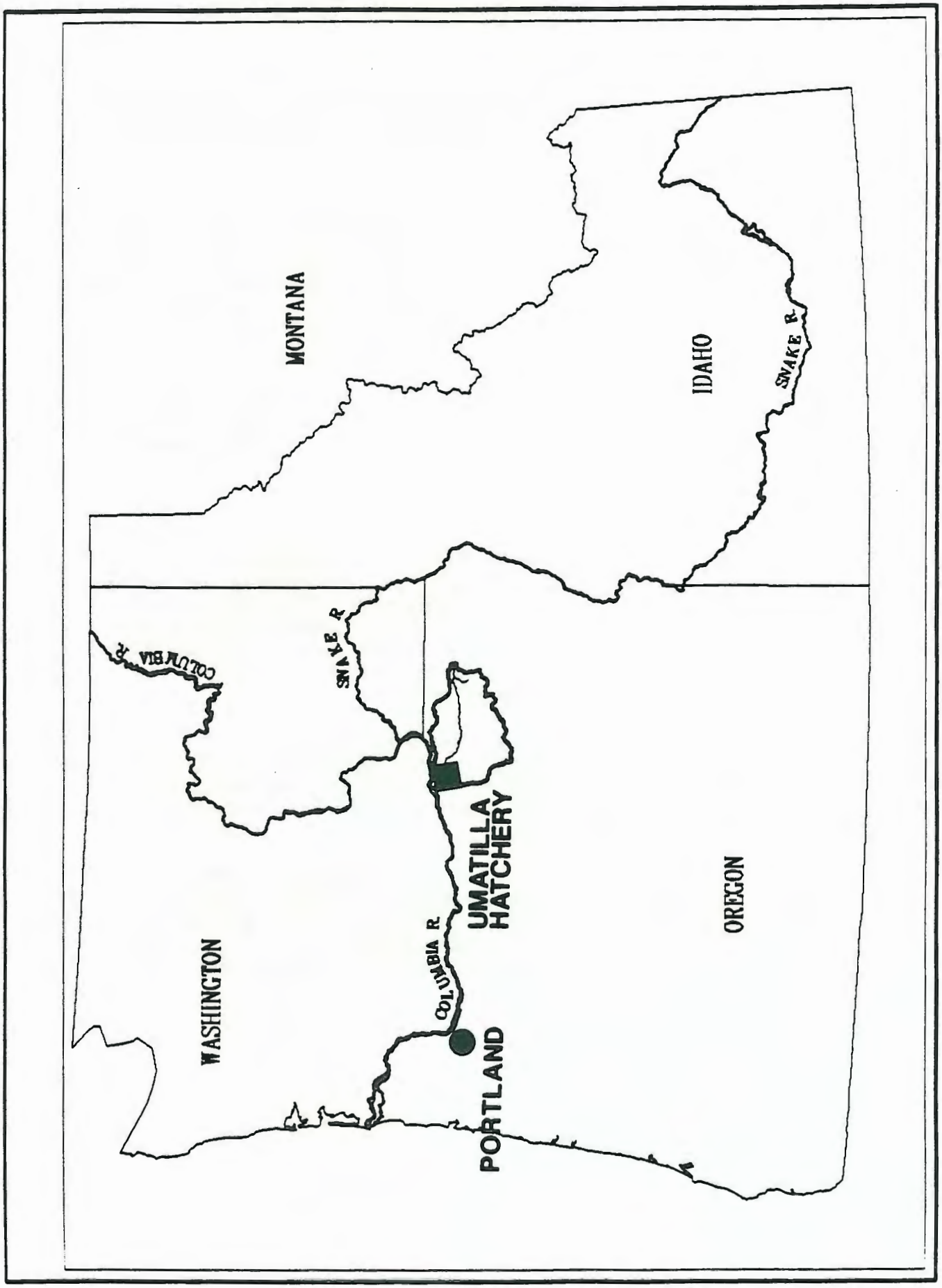
Hatchery Design

The design involves the construction of 24 raceways, which will be operated under the "Michigan" system with added oxygen, and 10 standard or non-oxygen supplemented raceways (Figure 2). The Michigan system uses oxygen supplementation and a series of baffles in each pond to maintain good water quality while raising more fish in a given area. Michigan raceways are designed to achieve over two and a half times the production capability for the same volume of water as standard raceways.

The design also calls for the construction of wells at the Umatilla Hatchery to deliver 15,000 gallons of water per minute. The water supply will be split about evenly between the the two types of raceways. An Irrigon Hatchery pump will supply backup water as a safety measure against pump failure at the Umatilla well.

The design also permits conversion of the standard raceways to use of full oxygen supplementation (producing 500,000 pounds) upon a successful demonstration and Council approval. Conversion of the Michigan raceways to a standard facility (producing 160,000 pounds) is also anticipated in the design, should oxygen supplementation prove to be unsuccessful.

FIGURE 1


MONTANA
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COLUMBIA R.
UMATILLA HATCHERY
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HATCHERY RACEWAY DESIGNS

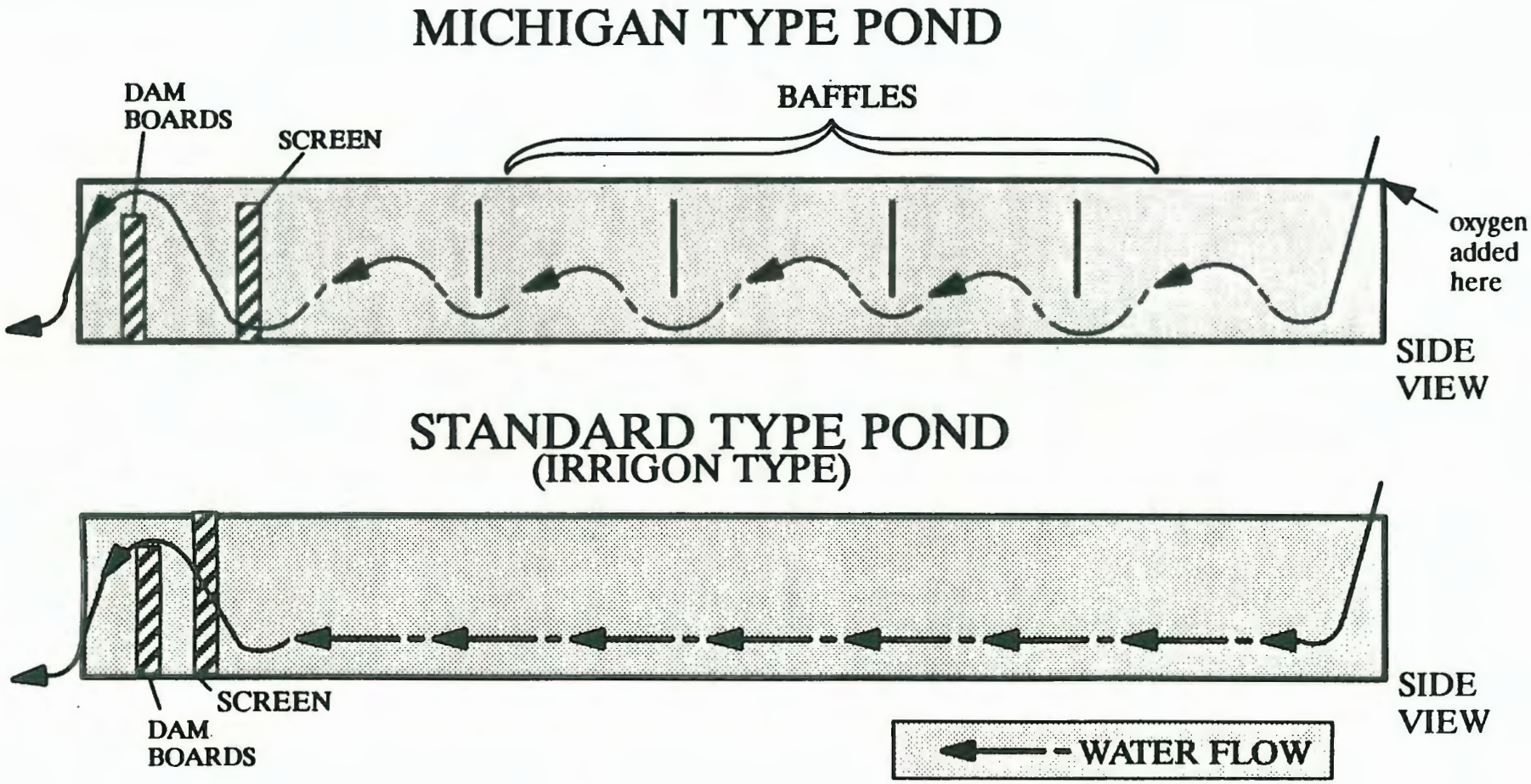

FIGURE 2

Production

Some 1,290,000 spring chinook smolts (1,080,000 for unconventional subyearling release and 210,000 for standard yearling release) will be produced under the proposed plan. The temperature of ground water supplies precludes the usual one year rearing period for spring chinook. Consequently, an experimental plan for raising spring chinook is proposed. It involves the release of spring chinook a year early at a smaller size. Broodstock will be selected from available stocks that have been used successfully in other hatchery programs above Bonneville Dam. Releases from the hatchery are expected to contribute about 7,836 spring chinook adults towards the Council's doubling goal (returns to the mouth of the Columbia river plus prior fisheries). An estimated 3,735 of these adults should return to the Umatilla basin, with the remainder being either harvested in the ocean and in-river fisheries or lost migrating past Columbia River dams.

As proposed, 5,940,000 subyearling fall chinook smolts also will be produced using upper river bright broodstock. Hatchery releases will contribute an estimated 74,957 adult fall chinook towards meeting the Council's doubling goal. Of these, 17,820 are expected to return to the Umatilla River.

Last, 210,000 steelhead smolts will be produced under the proposed plan. Unmarked (naturally spawning) adults returning to the Umatilla River will be preferred as priority broodstock for the hatchery. Releases from the hatchery are expected to contribute 8,589 adult summer steelhead towards the Council's doubling goal. An estimated 5,670 of these adults will return to the Umatilla River.

Outplanting and Satellite Facilities

The plan explains that release sites were chosen for each species to support the planned monitoring and evaluation studies and to achieve production, harvest and natural escapement goals. These goals were established by Oregon Department of Fish and Wildlife and the Confederated Tribes of the Umatilla Indian Reservation.

All fish produced at the hatchery and destined for the Umatilla basin will be trucked to outplanting locations for release. The two existing acclimation facilities in the basin, Bonifer and Minthorn, will be used for acclimation. In addition, at least one other satellite facility designed to hold/spawn adults will be needed about five years after project construction. Planning for the new satellite is proposed to begin in the early 1990s. Its cost, based on costs of newly completed Lower Snake River Compensation Plan facilities, is included in the above-cited estimates (approximately $4 million).

Each species will be outplanted at sites selected to achieve production, harvest and natural escapement goals by the Oregon Department of Fish and Wildlife and Umatilla tribes. Spring chinook subyearlings and yearlings will be released in the upper Umatilla River and tributaries and at the Bonifer acclimation facility. Fall chinook will be released in natural spawning areas

in the Umatilla River above Maxwell Dam and at the Minthorn acclimation facility. Summer steelhead will be released at Bonifer and Minthorn facilities and at river sites adjacent to the facilities. The plan indicates that initially no other instream releases of steelhead will be made. Other release sites may be selected after programs to evaluate supplementation and genetic impacts are developed in coordination with the System Monitoring and Evaluation Program and Council technical work groups.

Monitoring and Evaluation Plan

The goals of the monitoring and evaluation plan are to: 1) provide information and recommendations for culture and release of hatchery fish, harvest regulations, and natural escapement that will lead to the accomplishment of long term natural and hatchery production goals in the Umatilla River Basin in a manner consistent with provisions of the fish and wildlife program and 2) assess the success of achieving the basin management objectives that are presented in the Master Plan and the comprehensive plan.

In order to conduct proper monitoring and evaluation studies, production from both Umatilla and several Irrigon rearing ponds will be compared. Using both facilities, it will be possible to evaluate adult production achieved using oxygen supplementation against that achieved using standard rearing practices. Studies will be conducted a minimum of four years to ensure that performance is observed under a variety of environmental conditions.

In addition, an experimental design work group will be formed to refine experimental designs needed to provide information and recommendations for evaluating hatchery effectiveness and natural production and supplementation impacts. Initially, experimental goals are to evaluate: 1) oxygen supplementation, 2) supplementation of native steelhead runs, and 3) subyearling spring chinook.

MAJOR ISSUES

The fish and wildlife program reflects the Council's commitment to a systemwide approach for rebuilding salmon and steelhead runs by coordinating production, harvest management, and passage improvements. Further, it recognizes that while hatcheries play a crucial role in fish restoration, important questions remain concerning such issues as stock selection, genetic risk and disease control. Because of this, the program states that hatchery propagation objectives must be integrated fully with natural propagation objectives, and that other potential problems with hatcheries must be addressed. To ensure integration, it requires completion and approval of master plans before new hatcheries are built.

The program requires such a facility master plan for the Umatilla hatchery. The program also identifies several elements to be included in the master plan. Elements for testing oxygen supplementation are also to be discussed in the master plan as a result of the Council's 1987 program amendment. The following discusses how these elements are addressed in the

plan. The Council is seeking public comment on whether these matters are adequately addressed in the master plan.

1. Rearing schedule and release sites and schedules.

a) Rearing. The plan describes rearing strategies and schedules for spring and fall chinook and summer steelhead. Initially, nearly three-fourths of the production at the Umatilla hatchery will be produced using the Michigan system. If this system proves successful, it would be possible to meet all production goals for fall chinook and steelhead using the method.

While conditions at the hatchery are suitable for raising steelhead and fall chinook, they are not as suitable for raising spring chinook. The temperature of the available water supply is too high to permit application of standard rearing practices for this stock. Under standard practices, spring chinook in the Columbia basin are reared for 16 months before being released. At the Umatilla hatchery, 85% of the spring chinook will be released experimentally when they are approximately six months old (subyearlings). The remaining 15% will be retained at the facility for the typical 16 month rearing period by using chilled water to retard growth. This method could be applied to all spring chinook production. However, it is expensive and the agency and tribes believe that potential cost savings warrant testing of subyearling releases.

Release of subyearling smolts has been tried before in the Columbia basin with limited success. The authors of the master plan indicate that survival in the Umatilla basin should be higher than that from other programs because the subyearlings from the Umatilla hatchery are expected to be larger when released due to fairly constant warm water available at the facilities. In addition, the fish will be released during the typical migration season for spring chinook.

b) Release. Hatchery releases are planned at the existing Bonifer and Minthorn acclimation/adult holding facilities in the basin and at other sites in the Umatilla River and selected tributaries. A number of these release sites, located in the upper basin, are identified in the master plan. The plan states that these sites were chosen to avoid potentially harmful interactions between hatchery and natural stocks.

Site selection was also critical from a habitat standpoint. While the Umatilla Basin contains some very good habitat (particularly in the upper reaches), fish production in much of the basin is limited by low flows, high summer water temperatures, and poor habitat conditions. Thus, the plan states that habitat improvements will be needed at selected release sites. Further, studies may be necessary when other release sites are selected to determine if additional habitat improvements are needed to support desired releases.

The master plan also states that releases are consistent with present assumptions concerning current habitat conditions (water quality and quantity, instream structure, etc.). It references the comprehensive plan which describes studies conducted to determine the basin's production capacity. The authors

indicate that, during development of the comprehensive plan, estimates of spring chinook natural production potential were based on current stream flow in the Umatilla (or similar eastside streams) during late summer and early fall. The flows during this period were assumed to limit rearing conditions and production of these species. Production estimates for fall chinook were based on Umatilla flows during the spawning period (November), since flows during spawning were assumed to limit fall chinook production.

The master plan states that with planned future improvements, long term spring and fall chinook production can be achieved in the basin. However, it also states that since the elimination of chinook in the basin, summer steelhead and resident trout stocks may have increased their range to include former chinook habitat. As a result, when chinook populations begin to rebuild, they could potentially displace some summer steelhead and trout. Oregon Department of Fish and Wildlife and the Umatilla tribes indicate that these risks are acceptable because of the importance of reestablishing spring and fall chinook.

c) Additional rearing and release sites. In addition to the two existing acclimation sites, the plan finds that additional capacity will be needed to accommodate anticipated adult holding needs. Planning for one additional facility, primarily for holding adult salmon, is proposed; its cost estimates are included in the master plan. The authors believe that the capacity at existing acclimation facilities will be adequate to handle production in the first few years while chinook production is building. If the master plan is approved, a site survey will be needed to identify appropriate sites for adult holding facilities.

2. Production profile including the broodstock source, number of fish to be released, and the expected adult returns.

a) Broodstock selection. As noted above, since spring and fall chinook salmon broodstock were eliminated in the Umatilla River Basin, stocks from elsewhere in the Columbia River Basin have been used to begin the hatchery production program. Fall chinook releases began in 1982 and spring chinook releases in 1986. The master plan states that chinook runs will probably increase slowly. The plan states further that chinook broodstock programs need to be developed and that procedures for development of the program will be coordinated with the Council's program. Furthermore, it states that broodstock will be selected from available stocks that have been used successfully in other hatchery programs above Bonneville Dam. The plan recognizes that it may not be possible to obtain enough broodstock from outside hatcheries to meet initial needs for the Umatilla hatchery. Eventually all broodstock will be taken from fish returning to the Umatilla River.

Carson stock spring chinook has been used as the broodstock for the Umatilla basin to date. The Oregon Department of Fish and Wildlife made this choice after reviewing possible stocks. According to the master plan authors, Carson stock is used at most Columbia basin hatcheries above Bonneville Dam, including Carson and Little White Salmon hatcheries downstream from the Umatilla River, and at Leavenworth, Entiat and Winthrop hatcheries above the Umatilla River. The plan also lists spring

chinook stocks from the John Day and Yakima rivers and Rapid River Hatchery as potential sources for broodstock.

Upriver bright broodstock from the Bonneville Hatchery has been used for all fall chinook since releases were begun in the Umatilla River. As proposed in the plan, this broodstock, received from either Bonneville or Priest Rapids hatcheries, will continue to be used.

Broodstock selection plans for steelhead differ from those for chinook. While various steelhead stocks have been released in the Umatilla River since 1967, all releases since 1981 have been the progeny of adult steelhead trapped at Three Mile Dam in the lower Umatilla River. The plan proposes a continuation of this supplementation program, thus taking broodstock to the extent possible from naturally returning adults in the Umatilla River. All fish released from the hatchery will be marked to distinguish them from the native stocks. The plan projects that the entire number of smolts required to meet the run size goal will be released one year after the completion of the hatchery.

3. A description of related harvest management plans.

The plan indicates that the agency and tribes will develop annual harvest management plans to support and integrate harvest with the rebuilding of salmon and steelhead runs in the Umatilla River basin. The plan states that it is the intent of the Umatilla tribe to provide a level of harvest which is compatible with the respective natural and hatchery run size and rebuilding goals for each species.

As a first step to harvest planning, harvest plan guidelines have been developed in the master plan. These guidelines outline the catch allotment of adults returning to the Umatilla River at various run sizes. Briefly, these guidelines are designed to assist the rebuilding effort; support the monitoring and evaluation program; and be consistent with Indian treaty rights, U.S. v. Oregon, the U.S./Canada Pacific Salmon Treaty, and the Council's fish and wildlife program. Using the guidelines, the Oregon Department of Fish and Wildlife and Umatilla tribes will develop annual harvest plans specifying allowable catch and allocation and location of Indian and non-Indian fisheries in the Umatilla River. Their desire is to provide productive Indian and non-Indian fisheries in the Umatilla basin for all species being enhanced.

The plan estimates that a total of 55,691 hatchery adults (2,958 spring chinook, 51,312 fall chinook, and 1,421 steelhead) will also contribute to ocean and Columbia River fisheries. While regulation of these fisheries will be under numerous jurisdictions, the Pacific Salmon Commission, states and tribes will act as the main governing bodies, as defined under U.S. v. Oregon. More detailed harvest management programs for the basin will be provided as part of the system planning process.

4. Management policies and hatchery practices to ensure that hatchery releases protect genetic diversity of native stocks, are disease free, and are coordinated with other fish and wildlife agencies and tribes in the Columbia River Basin.

a) Protection of genetic diversity of native stocks. The agency and tribal fishery rehabilitation goal for the Umatilla River states that the genetic character of naturally producing and reestablished salmon and steelhead populations will be maintained. Consistent with this goal, the master plan proposes maintaining the genetic character of the existing summer steelhead populations by: 1) selecting broodstock from native steelhead first (when possible, first generation steelhead returns will not be used as broodstock), 2) using broodstock collection and mating techniques designed to maintain the genetic variability of the run, 3) releasing hatchery fish as yearlings, 4) restricting initial hatchery releases to avoid natural spawning areas, and 5) developing long-range outplanting strategies based on systemwide genetic conservation and risk assessment programs. The plan also indicates the opportunity to monitor the genetic changes resulting from hatchery supplementation of the existing steelhead populations. The plan does not identify specifically what genetic risks could exist for the summer steelhead population.

b) Disease control. The plan states that the control of disease in the hatchery is a high priority. Authors of the study believe disease risks will be reduced by using: 1) guidelines of the Pacific Northwest Fish Health Protection Committee[4] to monitor and treat fish, 2) a clean water source for hatchery incubation and rearing, 3) accepted and prudent procedures for handling of adults and broodstock prior to and after being received at the hatchery, 4) additional fish observation and health monitoring beyond the above-mentioned as part of the oxygen supplementation monitoring program, 5) disease carrier controls, such as net coverings which exclude birds, 6) a pond design which minimizes cross-contamination, and 7) pure oxygen. According to the authors, should a disease outbreak occur, the hatchery design would allow it to be isolated to a single pond or group of connected ponds. In addition, treatment is facilitated because of the pathogen-free hatchery water source. Experience at the Irrigon hatchery, which uses the same water supply, suggests that very low disease levels may be achievable.

The authors indicate that disease potential may be lower in the Michigan raceways than in standard raceways. Studies at Michigan facilities suggest that disease risks are reduced because the ponds stay cleaner, require less human handling and allow fish to extract oxygen with less expended energy.

c) Coordination. In developing the master plan, the Oregon Department of Fish and Wildlife and Confederated Tribes of the Umatilla Indian Reservation sought and incorporated input from the other fish management agencies and tribes, Bonneville Power Administration, Pacific Northwest Utilities Conference Committee, the Council staff, the Monitoring and Evaluation Group, the hatchery effectiveness and supplementation research technical work groups and others. The plan states that the hatchery plan will be coordinated with hatchery personnel, data managers, and others to

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4 The guidelines of the Pacific Northwest Fish Health Protection Committee (Wold et al., 1987) recommend model operating procedures for disease prevention and control. The committee is composed of representatives from fishery agencies and tribes and private aquaculture.

ensure that information gained from hatchery operations meets the needs of the oxygen supplementation evaluation, as well as needs identified for a coordinated fisheries information system in the region.

The authors indicate that the state and tribal fishery agencies and Bonneville have established a comprehensive project management structure to oversee hatchery program development, implementation and coordination. The structure includes:

- A policy/technical working group comprised of Oregon Department of Fish and Wildlife, Confederated Tribes of the Umatilla Indian Reservation and Bonneville representatives. The group serves as an umbrella, managing all aspects of program planning, implementation and evaluation, with each entity performing the functions appropriate to its management jurisdiction. A Steering Committee, formed by the Oregon Department of Fish and Wildlife and the Confederated Tribes of the Umatilla Indian Reservation, is a policy-level group that oversees implementation of all aspects of the fishery programs in the Umatilla Basin including the hatchery program. By contract, Bonneville enables the working group to plan for the hatchery program, provide input to facility design and establish the sideboards for program operation. As the program becomes operational, fishery managers will develop annual operation plans for the hatchery and satellite facilities. The annual plans will specify actions and costs for production, releases and operation. They will be subject to Bonneville and Council review and approval. Linked to this central policy/technical working group are several committees charged with planning, managing and communicating results of all basin fishery programs as described below.

- The Umatilla Hatchery, Passage and Habitat technical work groups include representatives of the Oregon Department of Fish and Wildlife, the Confederated Tribes of the Umatilla Indian Reservation, Bonneville, the Council, the Pacific Northwest Utilities Conference Committee and the Bureau of Reclamation. These technical level groups coordinate implementation of the hatchery, passage, flow, transport and habitat projects. They also keep decision makers informed of progress and identify matters requiring policy-level guidance.

- The Umatilla Coordination Committee includes representatives from the Oregon Department of Fish and Wildlife, Confederated Tribes of the Umatilla Indian Reservation, Bonneville, the Council, Pacific Northwest Utilities Conference Committee, Bureau of Indian Affairs, Columbia River Inter-Tribal Fish Commission, Bureau of Reclamation, National Marine Fisheries Service, U.S. Fish and Wildlife Service, Columbia Basin Fish and Wildlife Authority, Corps of Engineers, Oregon Department of Water Resources, Umatilla Project Steering committee and irrigations districts. The committee provides interagency coordination and information exchange among all entities involved in fishery enhancement in the Umatilla Basin.

- The Umatilla Research Coordination Committee includes representatives from the Oregon Department of Fish and Wildlife, Confederated Tribes of

the Umatilla Indian Reservation, Bonneville, the Council and Bureau of Reclamation. The committee will coordinate all hatchery and natural production and passage research activities in the basin. In addition, it will maintain experimental design standards, coordinate research activities with systemwide programs and facilitate integration of results into management planning and implementation. It will also make recommendations regarding the refining of project goals and yearly production plans for review by the policy-technical working group.

- An Experimental Design Work Group to be formed by the Council with representation from Oregon Department of Fish and Wildlife, Confederated Tribes of the Umatilla Indian Reservation and Bonneville. The group will refine the hatchery monitoring and evaluation experimental design and ensure consistency with systemwide monitoring programs.

5. Biological monitoring and evaluation studies to assess the effectiveness of outplanting facilities in supplementing natural production in a biologically sound manner; the effects of the outplanting on resident fish populations; and the effectiveness of oxygen supplementation.

The plan identifies two general categories of project uncertainties: 1) hatchery effectiveness and 2) natural production and supplementation. Within these general categories, individual uncertainties were characterized as either critical or secondary and listed in order of priority for monitoring and evaluation. The plan explains that priorities for evaluation were selected recognizing that, while there are many uncertainties associated with the project, opportunities to adequately study all the uncertainties do not exist. Opportunities for study are limited by factors such as hatchery design and capability, and the availability of suitable study streams.

a) Hatchery effectiveness. The plan states that the highest priority for monitoring and evaluation at the Umatilla hatchery is to determine the success of the Michigan system. This decision was made recognizing that information on the use of oxygen supplementation could have systemwide implications for meeting the Council's doubling goal. More specifically, the first priority for monitoring and evaluation in the plan is to determine the extent to which oxygen supplementation is effective for producing adult fall chinook and summer steelhead. The plan indicates that studies to evaluate the effectiveness of oxygen for producing spring chinook are a lower priority because of uncertainties regarding the proposed subyearling release programs.

b) Natural production and supplementation. The master plan identifies the risk of altering the genetic diversity and life history characteristics of the natural steelhead population through supplementation as a critical uncertainty. However, it does not describe a program to address genetic concerns. This reflects the authors' decision to initially make oxygen supplementation the highest priority for evaluation, and the fact that the scale of the effort limits the number of questions that can be studied at one time. The plan does, however, state that the basin appears ideal for evaluating supplementation success and impacts. The plan indicates that genetic concerns related to natural production and supplementation issues can be addressed by the proposed Umatilla Experimental Design Work Group. The authors see the

need to coordinate these issues with the System Monitoring and Evaluation Program and efforts of other research technical work groups.

Another critical uncertainty identified in the plan is whether the established natural production goals for spring and fall chinook are greater or less than the natural production capability of the Umatilla basin environment. Numerous habitat changes have taken place since chinook natural production last occurred in the basin. However, the plan indicates that the existing habitat can provide the essential elements for reestablishing natural spring and fall chinook runs. Further, it states that with planned habitat and passage improvements the long-term natural production goals for these species should be attainable. Proposed studies involve assessing environmental conditions and estimating population performance (prespawning mortality, spawning success, egg-to-fry survival, etc.) in the basin. The plan anticipates that a better understanding of the basin's natural production capacity will be generated through the system planning process.

c) Effects on resident fish. The management agencies concluded that achieving plan goals for salmon and steelhead is a higher priority than potentially negative impacts on resident fish populations. As a result, the plan does not describe what could happen to resident populations or propose to monitor these effects.

d) Hatchery conversion. The Council approved the demonstration of oxygen supplementation at the hatchery with the understanding that if the test was not successful, the facility would be converted into a standard production facility. According to the plan authors, the question of conversion potential has been raised throughout the planning process to guard against design of a system which was dependent on the oxygen system to work. While an explicit contingency plan is not included in the master plan, the management agencies have identified several facility features that make conversion possible: 1) the units which introduce pure oxygen to oncoming water can be modified or bypassed, 2) the pond elevations are such that water may flow between them by gravity if the pumps are not used, and 3) pond baffles used for fish distribution under oxygen supplementation can be removed or adjusted.

e) The experimental design focuses on oxygen supplementation for the first four years. The plan indicates that other evaluations, such as steelhead supplementation studies, would be initiated after this time. In addition, the authors anticipate that some of the uncertainties identified, including passage survival and changes in basin productivity due to habitat improvements, will be addressed in other program measures and through system planning.

6. Evidence of coordination with system planning.

The master plan contains a recommendation that it be integrated with the subbasin plan being developed for the Umatilla Basin. While it does not identify how the project contributes to meeting objectives for salmon and steelhead identified in the draft Umatilla subbasin plan, the comprehensive plan has been used to develop both the Umatilla Hatchery Master Plan and the subbasin plan.

More broadly, the master plan does not describe how its development has been coordinated with systemwide planning actions. The authors propose, however, to link the hatchery with system planning by involving a number of key groups in Umatilla activities. The Umatilla Research Coordination Committee will identify needed project refinements and modifications and develop recommendations for review by the policy/technical working group and the Council. As part of this process they will coordinate research activities with systemwide programs. In addition, the master plan anticipates that the Council will form a Umatilla Experimental Design Work Group to refine the hatchery monitoring and evaluation experimental design and ensure consistency with the Systemwide Monitoring and Evaluation Program. The authors indicate that these and other groups constitute a project management structure capable of integrating the Umatilla project with other activities in the Columbia River system.

7. Protecting the ratepayers investment.

In 1987 when the fish and wildlife program was amended for construction of a hatchery to produce up to 290,000 pounds of salmon and steelhead, the anticipated costs for the project were approximately $8.5 million. Since then the estimated costs have increased and are now anticipated at $11.5 million for construction of the hatchery, $500,000 for training the Umatilla tribe to operate the hatchery, $4 million for construction of a new satellite(s) facility, and $145,000 for improvements at new and existing release sites. In addition, annual costs of $1.15 million for operation and maintenance, and $400,000 for monitoring and evaluation studies are also expected. The Council's Fish and Wildlife Committee has expressed concern about this increase and asked that project cost increases be discussed in the issue paper.

According to the Bonneville project manager, the cost increases are deemed to be justified. The agency conducted an extensive analysis when the anticipated cost increases became apparent. This analysis showed that the original cost estimates were made with very limited information. As the full hatchery design was developed, more reliable cost estimates could be made. Bonneville identifies four main causes for the cost increases: 1) design changes as the hatchery progressed from concept to final design ($1.3 million), 2) administrative factors such as budgeting of contingencies, adding inflation factors and increases in project management costs that rise as overall costs increase or delays occur ($2.2 million), 3) changing site conditions for the water supply ($0.6 million), and 4) equipping the hatchery ($0.4 million).

Bonneville has concluded that cost estimates for the Umatilla hatchery compare favorably to costs for other regional hatcheries, particularly Lower Snake River Compensation Plan facilities, which represent almost all recent hatchery construction in the Pacific Northwest. This decision was made after comparing the estimated costs for the Umatilla hatchery with costs for other hatcheries (Figure 3). The study found that on a cost per pound of production basis, the Umatilla hatchery costs are expected to be 30% lower than those for the average Lower Snake hatchery. The Umatilla Hatchery is expected to cost $6.85/lb/yr compared with $9.85/lb/yr for the average Lower Snake hatchery.

In addition, Bonneville found that even with the recent cost increases, the anticipated costs for the Umatilla hatchery are still attractive. The facility, designed to produce 290,000 salmon and steelhead is expected to cost less per pound per year than either the hatchery originally approved in 1984 to produce 40,000 pounds of steelhead, or that approved in 1986 to produce 160,000 pounds of steelhead and salmon.

FIGURE 3

COMPARISON OF UMATILLA WITH LOWER SNAKE COMP HATCHERY COSTS

Hatchery	*Type of fish*	*Completion date*	*Pounds produced*	*Total Cost*	*$/lb*	*Annual O&M costs*	*$/lb/yr*
UMATILLA HATCHERY OPTIONS							
"40 K"	ST	1984*	40,000	$4.0M	$100	$0.10M	$11.50
"160 K"	ST,CHS,CHF	1987*	160,000	7.0M	43.75	0.55M	7.38
"290 K"	ST,CHS,CHF	1987*	290,000	8.0M	27.59	0.80M	5.24
"290 K"	**ST,CHS,CHF**	**1989***	**290,000**	**11.5M**	**39.66**	**0.95M**	**6.85**
"560 K"	ST,CHS,CHF	**	560,000	14.0M	25.00	1.70M	5.29
LOWER SNAKE COMP HATCHERIES							
LOOKNG.	CH	1982	69,600	$ 6.4M	$91.95	$0.46M	$14.95
IRRIGON	ST	1985	279,600	8.2M	29.33	1.03M	6.32
LYONS FRY	CH,ST,TR	1984	323,000	20.7M	64.09	1.66M	10.91
SAWTOOTH	ST	1984	149,000	9.6M	64.43	0.78M	11.04
CLEARWTR	ST	1987	441,000	17.8M	40.36	1.40M	6.80
MAGIC VAL	ST	1986	350,000	14.2M	40.57	.728M	5.73
McCALL	CH	1982	61,300	4.8M	78.30	.386M	13.35
TUCANN.	TR	1984	41,000	2.9M	70.73	.136M	9.69
TOTAL			1,714,500	$84.6M		$6.579M	
AVERAGE			214,313	10.6M	59.97	.822M	$ 9.85

Source: Bonneville Power Administration
* These are estimates, not facility completion dates
ST = STEELHEAD, CH = CHINOOK, TR = TROUT
All costs expressed in 1988 dollars
** Expansion of the facility to this increased level of production would require Council review and approval

ALTERNATIVES

The Council is considering the following options as it reviews the Umatilla Hatchery Master Plan. Comment is being sought on these alternatives to assist the Council in making its final decision.

1. Approve the master plan. The Council could approve the Umatilla hatchery master plan as proposed.

Council approval of the proposed master plan would allow construction of the Umatilla hatchery to begin. The hatchery could provide fish to rebuild salmon and supplement existing steelhead populations in the Umatilla Basin. Information gained by demonstrating the use of oxygen supplementation for production of salmon and steelhead might be applied throughout the Columbia River Basin and the Pacific Northwest. If current projections can be met, the hatchery would contribute over 91,000 adult fish toward the doubling goal.

This is the preferred option of the Oregon Department of Fish and Wildlife and the Confederated Tribes of the Umatilla Indian Reservation. The master plan, as proposed, is consistent with the comprehensive plan for the basin that has been developed by these entities.

As with all biological systems, several large uncertainties remain concerning the proposed master plan. These include whether chinook can be reintroduced into the subbasin at anticipated levels and whether oxygen supplementation can be used to increase the efficiency of producing steelhead and fall chinook. Any of these uncertainties might significantly reduce the benefits from the project or require more funds be invested than anticipated to reach project goals.

2. Approve the plan with conditions. The Council could approve the master plan with conditions. Under this alternative, hatchery construction could begin with the understanding that specific changes will be made to the plan and/or that additional work needs to be done. These changes could include:

a) Council review of plans for any new facilities that may be needed for rearing or release, or modification of existing acclimation facilities;

b) A monitoring and evaluation plan to determine the success of experimental spring chinook rearing practices, including a review of alternative approaches;

c) A technical analysis of water and habitat availability for supporting desired releases (similar to an analysis currently being undertaken for the Yakima/Klickitat Production Project);

d) A detailed monitoring program to assess impacts on resident fish and steelhead runs;

e) Additional studies to determine the fitness of proposed broodstock, including a review of alternative sources;

f) Additional detail on potential harvest implications and expected contributions to the doubling goal;

g) Baseline studies, safeguards and monitoring plans to protect genetic diversity; and,

h) Safeguards and evaluation studies to address potential disease risks at the hatchery.

This alternative would allow parties to address unresolved issues in the master plan while simultaneously starting hatchery construction. Revisions to the master plan would be incorporated as necessary to resolve issues and help ensure successful implementation. The process might resemble that being pursued for the Yakima/Klickitat Production Project where parties are continuing to refine elements of the experimental design and outplanting plan.

Implementation of the master plan might be delayed if the issues are hard to resolve. Anticipated benefits from the hatchery may also be achieved more slowly if hatchery program implementation is delayed while the conditions are being met. In this case, the costs for the hatchery project could be higher than estimated.

3. Defer action on the hatchery until after system planning is completed. The Council could wait until completion of the system planning process before approving the Umatilla hatchery master plan. Deferring approval of the master plan would allow time for regional fishery interests to develop a system-wide program for rebuilding Columbia River stocks. Thus, it would be clearer how the Umatilla hatchery fit into this regional strategy.

Efforts are underway to determine regional hatchery production needs and corresponding opportunities at existing and new facilities to meet these needs. Postponing approval of the the hatchery master plan could allow time to determine whether production expected from the Umatilla hatchery could be achieved elsewhere.

Deferral would also allow further discussions regarding the region's potential future role in funding and operating the Mitchell Act hatcheries. New responsibilities for regional support of these facilities may impact priorities and available funding for construction of new production facilities.

This alternative would likely be unacceptable to the fish management agencies and tribes. The Umatilla hatchery is a key component of the comprehensive plan and an important contributor in plans to improve runs above Bonneville Dam. Efforts to rebuild salmon and steelhead runs in the basin have long been recognized as a high priority. Delay of the project would further delay the rebuilding of these stocks.

In addition, the Council decided in 1987 to proceed with the Umatilla hatchery so that it would coincide with system planning completion. The Council recognized that a limited number of good hatchery sites exist in the basin and saw no reason to delay construction of the hatchery while developing the system plan.

Finally, a major purpose of the Umatilla hatchery is to demonstrate the use of oxygen supplementation to increase salmon and steelhead production. The results of this demonstration are expected to be reflected in future decisions concerning the use of added oxygen in meeting other regional fishery objectives. If the project were postponed, this information would not be available for a longer time period. Some information concerning the use of oxygen supplementation will be gained from study results at the Willamette hatchery, which will start within a year. Demonstration of oxygen supplementation at the Willamette facility differs from that at the Umatilla in several regards: 1) an existing facility is being retrofitted to use additional oxygen, 2) the facility uses surface water, and 3) the use of oxygen supplementation is only being demonstrated for spring chinook. Therefore, information on oxygen supplementation gained from studies at the Willamette facility will not be as comprehensive as that likely to be obtained from the Umatilla hatchery.

If the Umatilla hatchery is delayed, costs may also be higher. Hatchery planning, design and construction costs are rising and are expected to continue to rise. As a result, it can be expected that if the hatchery were delayed capital costs will increase.

4. Reduce the size of the production effort and/or phase its implementation. The Council could approve construction of a smaller facility than currently proposed. This would allow testing of a smaller-scale facility, and production could be increased at a later date if found to be desirable.

Scaling back production could reduce the risk of some of the uncertainties recognized in the master plan. It may prove to be a safer investment for the region and less risky for native fish. In addition, both capital and operation and maintenance costs for the hatchery would likely be lower than now proposed if a smaller facility were built. However, this might be a only a short-term gain.

Approval of this alternative might require additional design work. The current final design work costs $897,000. Further, it is very likely that capital costs for the larger facility would increase during this lag time. The costs may rise even further if additional planning and design is required. Also, master plan authors indicate that if a smaller facility than planned is approved, it may not be possible to monitor and evaluate the effectiveness of the plan. As a result, the benefits of the project would not be achieved as soon as anticipated.

5. Reject proposed plan. The Council could deny approval for the Umatilla hatchery master plan.

There are no apparent advantages to this alternative. It would mean that plans to restore salmon and rebuild steelhead runs in the Umatilla basin would be abandoned for the time being. As a result, expected systemwide benefits such as hatchery production contributions to ocean and Columbia River fisheries and the doubling goal, and knowledge gained by demonstrating the use of increased oxygen for production of Pacific salmon and steelhead would be lost.

The costs for the project to date, approximately $4 million, would have resulted in a decision not to produce more fish. In addition, the benefits of expenditures to improve habitat conditions in the Umatilla River and tributaries, allow for passage, and provide necessary flows would also be reduced if the hatchery is not constructed. Further, if at some future date the Council decides to build the hatchery, the costs to meet the production goals for the Umatilla basin will likely be higher.

Last, the hatchery is supported by the fish and wildlife agencies, tribes, Bonneville and others and is a key element in their plan to rebuild Umatilla runs. Rejection of the facility plan would severely affect their ability to rebuild salmon and steelhead runs in the Umatilla River basin.

La:bt/barb.am8.umatilla issue paper

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October 25, 1989

<N&A>

Dear <N>:

I am pleased to inform you that the Council approved the Umatilla Hatchery Master Plan (with appendices) at its October 11 meeting, allowing final design and hatchery construction to begin. The hatchery is a test of oxygen supplementation and is expected to produce up to 290,000 pounds of salmon and steelhead. Hatchery releases should re-establish natural runs of salmon and rebuild steelhead runs in the Umatilla River Basin and contribute significantly to the Council's goal to double Columbia Basin salmon and steelhead populations. In addition, knowledge obtained from using oxygen supplementation and from supplementing the drainage with large releases of hatchery fish may eventually be applicable in other parts of the basin.

In addition to approving the master plan, the Council is calling for several further project planning and coordination activities. The Council believes the Oregon Department of Fish and Wildlife, Bonneville and Umatilla Tribes should complete these activities to ensure consistency with the Council's fish and wildlife program and system policies; particularly policies addressing genetic risks, harvest management, and adaptive management. These policies necessitate the coordinated action of the fish and wildlife management entities through committees or organizations with responsibilities or interests relevant to the Umatilla basin. Activities were discussed and found acceptable to all major commentors on the Umatilla Hatchery issue paper, and their completion is central to Council approval of construction.

The master plan and additional activities identified should be carried out through a hatchery project management structure similar to that identified in Attachment 1. The activities should be overseen by Bonneville, the Umatilla Tribes and Oregon Department of Fish and Wildlife, as these entities are responsible for implementation of the project and/or for managing the fishery resource in the Umatilla. These entities should report progress periodically to the Council and develop the annual operation plans with Bonneville for review by the Council and interested parties. In addition, they should consult with the Council to review any significant changes in hatchery costs, objectives for production or adult returns.

The following activities should be completed concurrent with hatchery construction:

1. Submit to the Council a refined comprehensive monitoring and evaluation plan for the Umatilla subbasin. The plan should identify the process for coordinating with the Monitoring and Evaluation Group, technical working

groups and with other existing monitoring and evaluation activities in the Columbia basin. The plan should include projected schedules and costs for the proposed efforts. It should also describe the processes for determining priorities for implementation of proposed studies and for receiving peer review and public comment.

2. Coordinate future plan modifications and refinements with system planning efforts. In particular, proposals to change production objectives, to select a different broodstock source or to transfer production from the hatchery to areas outside the basin need to be consistent with system planning efforts. Proposals to change the production program, including broodstock selection, should be made to the Columbia Basin Fish and Wildlife Authority and reported to the Council. Current proposals for broodstock selection are Carson spring chinook stock, upriver bright fall chinook stock and Umatilla River steelhead stocks. As discussed between Council staff and management entities, the process for selecting broodstock should include opportunities for Council and public review before a decision is made to collect broodstock from sources other than the Umatilla River or the original donor stocks.

3. Develop a proposal for a monitoring and evaluation study to assess genetic and ecological impacts of the hatchery program on resident fish and native summer steelhead populations for Council review. The proposal should identify estimated costs associated with the study and describe what might be learned through its implementation. The proposed study should be coordinated with the System Monitoring and Evaluation Program to ensure that it provides information of systemwide importance and is not duplicative of other evaluations, particularly studies in the Yakima Basin. If the results of the review suggest that studies are feasible and worthwhile, budget requests should be coordinated with Bonneville and the Council.

4. Review the proposed program to monitor and evaluate the survival of subyearling and yearling spring chinook smolts to returning adults. This review should be coordinated with the Monitoring and Evaluation Group, technical working groups and other interested parties and reflect their comments. Implement the program as scheduled, concurrent with the first releases of spring chinook from the hatchery.

5. Review water supply studies in the Yakima and Klickitat subbasins for possible application in the Umatilla Basin. The review should determine whether study elements of the Yakima/Klickitat program should be applied to the Umatilla basin to achieve the same degree of knowledge regarding available habitat. Where needed to be sure that sufficient water exists to achieve project goals, propose for Council review additional assessments with estimated costs and schedules for implementation.

6. Continue discussions with the U.S. Fish and Wildlife Service, the Corps of Engineers and the Council to address potential impacts to the Umatilla Wildlife Refuge from hatchery construction. Actions needed to resolve the potential impacts to the refuge should be reported to the Council.

Additional detail on the above activities can be found in the attached overview of comments prepared by Council staff. If you have any questions about the Council decision, please don't hesitate to contact us.

The Council appreciates the significant amount of effort made by all affected parties during Council deliberations on the Umatilla Hatchery Master Plan, and we look forward to working with you constructively to ensure that the important facility will be successful.

Sincerely,

Tom Trulove
Chairman

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Attachment 1. Overview of Comments and Staff Response

1. Project Management Structure:

Comments: The Oregon Department of Fish and Wildlife, Umatilla Tribes and Bonneville commented that a management structure has been developed to provide for planning and decision making, and for daily operation and maintenance needs for projects in the Umatilla basin. These parties believe this structure provides a process for regional interests to add needed plan refinements. Comments on the plan by the Pacific Northwest Utilities Conference Committee, Oregon Trout, and others, however, expressed concern that committee roles as outlined were unclear and that lines for coordinating with policy-makers, other technical committees and interested parties were also fuzzy. In addition, the Pacific Northwest Utilities Conference Committee requested that a single committee be set up to plan, review, and coordinate the technical aspects of all work in the Umatilla Basin. They believe that membership on this committee must include other interested parties, including the Pacific Northwest Utilities Conference Committee.

Staff response: The management structure described in the issue paper has been modified in response to these comments (Attachment 2). Conceptually, the structure is designed to promote proper adjustments to the hatchery program in response to gains in knowledge from within and outside the subbasin. As refined, the structure identifies responsibilities and procedures for communication and decision-making. The fishery managers--the Oregon Department of Fish and Wildlife and the Umatilla Tribes--will have an oversight responsibility in the project management structure to ensure that project implementation is consistent with state and federal laws and treaty rights. The two management entities will together comprise a steering committee to determine fishery resource policy for the basin. Bonneville will also maintain a strong role by overseeing project implementation.

As described in the structure, policy-level guidance from fishery management entities will be integrated throughout the implementation process. This interaction will be maintained by the "core group" comprised of staff assigned by each of the key policy/implementation participants in the process: Bonneville, the Oregon Department of Fish and Wildlife, the Umatilla Tribes and the Bureau of Reclamation. The group will represent the organizations day-to-day on both policy and technical matters. It will also oversee the Advisory Group, a forum for communicating and considering interest group concerns. The Pacific Northwest Utilities Conference Committee, Oregon Trout and other interest groups will have their primary opportunity for input on the project at the Advisory Group. They also may participate as observers/commentors on the specific technical work groups that will guide the planning, implementation, operations and evaluations of the projects if they desire.

2. Reporting to the Council:

Comments: The Pacific Northwest Utilities Conference Committee commented that the Council should review the hatchery's performance in more

detail in ten years, or at another appropriate time. They also expressed concern that the Council review any significant departures from, or changes in, the proposed project costs (capital or operation and maintenance) or anticipated benefits (production changes).

Bonneville argued that the existing processes for budget review provide ample opportunity for review and comment by interested parties. Currently, reports are sent out annually describing how the master plan is being carried out and proposing future changes. They contended that the Council and others, including the Pacific Northwest Utilities Conference Committee, should be able to use these reports and existing processes to follow and evaluate the master plan's implementation on an annual bases.

Staff response: In response to comments, Bonneville and the fishery management entities has identified opportunities for input by the Council and interested parties. Opportunities have been defined for review and comment on the performance and proposed changes regarding the hatchery and related Umatilla basin passage, flow, transport and habitat projects.

Annual Operation Plans will also be developed yearly by the fishery managers for the hatchery and satellite facilities. These plans will describe annual production profiles, release strategies and operation costs. Such plans will be subject to review by the technical working groups, Bonneville, the Council and others. In particular, the reports should describe hatchery program actions and examine the success of the hatchery program during the year in achieving defined goals, including important gains in knowledge. The reports should also identify how and where this information is being incorporated into decisions concerning project management and will be shared with others. With clarification, the Bonneville/Council Intergovernmental Agreement process and Bonneville's Implementation Planning Process should provide this opportunity for review and comment. In addition, the Oregon Department of Fish and Wildlife and the Umatilla Tribes would consult with the Council and other interested parties to review any significant expected changes in hatchery program costs, objectives for production, or adult returns.

3. Monitoring and Evaluation Plan

Comments: Dr. Williams and Oregon Trout expressed strong concerns regarding the need to monitor and evaluate all stages of the master plan's implementation. They felt that clear intent and procedures to proceed with monitoring work should be included as a priority in the master plan. They expressed concern that often the monitoring and evaluation portion of a management strategy are viewed as an add-on feature, and not as an integral part of the program as they felt it should be.

Staff response: Staff believes every effort should be made to maintain consistency between various monitoring and evaluation efforts in the Columbia basin and avoid work duplication. With this in mind, staff believes the management parties should submit to the Council a refined comprehensive monitoring and evaluation plan for the subbasin. This plan should identify the process for coordinating with the Monitoring and Evaluation Group, the technical working groups, and with other monitoring and evaluation activities

in the Columbia basin. It should also identify projected schedules for implementing various activities and their costs. Finally, the plan should describe the processes for determining priorities for implementation of proposed studies, and for receiving peer review and public comment.

4. Production Changes:

Comments: Oregon Trout, Dr. Williams and Trout Unlimited raised concerns in their comments regarding the selection of broodstock for Umatilla hatchery production. In addition, Idaho Salmon and Steelhead Unlimited expressed concern that use of Rapid River hatchery broodstock at some future time might conflict with efforts in other upriver subbasins to rebuild depleted runs using this broodstock source.

The Oregon Department of Fish and Wildlife and Umatilla Tribes commented that while all broodstock will eventually be taken from the Umatilla basin, chinook broodstock must now be obtained elsewhere to begin the hatchery production program. As a result, the proposed chinook broodstock source was selected as the most appropriate for meeting hatchery objectives.

Staff response: In order to avoid potential conflicts in the future regarding production, staff believes future decisions to adjust production objectives for the Umatilla hatchery master plan should be coordinated with system planning, especially proposals to transfer production from the hatchery to areas outside the basin. Also, proposals for changes in production should be proposed within the Columbia Basin Fish and Wildlife Authority and reported to the Council.

Priorities for broodstock selection should also be consistent with system planning efforts. As discussed at the meeting between Council staff, the Oregon Department of Fish and Wildlife and the Umatilla Tribes and other parties, the priorities for broodstock selection are stocks from: 1) the Umatilla River basin, 2) the original donor stock, and 3) other sources found to have genetic characteristics that are suitable for the basin. The selection process should provide ample opportunity for Council and public review before a decision is made to collect broodstock from sources other than the Umatilla River basin or the original donor stock.

5. Native Summer Steelhead and Resident Trout

Comments: Council members, Oregon Trout and other commentors questioned whether hatchery production objectives and their implications for native stocks were approved by the Oregon Fish and Wildlife Commission or the Department. Oregon Trout stated that the commission is the only appropriate parties for making such a decision, and that questions needed to be resolved before approval of the master plan.

Oregon Trout, Dr. Williams and others have also expressed concern that genetic diversity could be affected by the proposed master plan unless a genetics monitoring plan is initiated immediately. They suggested that the hatchery program may present an opportunity to learn more about possible

genetic and ecological risks for resident trout and native summer steelhead populations due to competition with hatchery fish. They commented that the master plan should address the associated genetic and ecological risks for these stocks.

Staff response: The Oregon Department of Fish and Wildlife and Umatilla Tribes have provided letters stating that decisions regarding the acceptability of potentially displacing native steelhead stocks in order to increase runs of hatchery chinook salmon are consistent with state and tribal policy. In its letter, the Oregon Department of Fish and Wildlife commented that, while the program for steelhead in the Umatilla has not been highlighted as an issue, it has been brought before the Commission by department staff on several occasions as part of a decision package. These decision packages include the U.S. vs. Oregon Agreement, the amendment package for the Council's Fish and Wildlife Program, and the Draft Subbasin Plans. In a related letter to Council Member Paulus, dated June 12, 1989, the Oregon Department of Fish and Wildlife stated that they share concerns over the potential genetic impacts of hatchery releases on the small natural run of summer steelhead in the Umatilla river. They indicated that they intend to take every reasonable precaution to assure that this valuable resource of genetic material is not harmed, and that they intend to modify the Master Plan to assure that genetic diversity is maximized by responsible hatchery practices. The Oregon Department of Fish and Wildlife is currently considering a new wild fish policy. Adoption of the policy should help clarify the process for making future decisions to increase natural and artificial production of anadromous fish.

A proposed monitoring and evaluation study should be developed for Council review in consultation with interested parties to assess impacts of the hatchery program on resident fish and native summer steelhead populations. The proposal should identify estimated costs associated with the study, and describe what might be learned through its implementation. The proposed study should be coordinated with the System Monitoring and Evaluation Program to ensure that it provides information of system wide value and is not duplicative of other evaluations, particularly studies being pursued in the Yakima River basin. If the results of this review favor immediate implementation of a genetics program, Bonneville may be called upon to implement it.

6. Spring Chinook

Comments: Dr. Williams and Oregon Trout expressed concern about the viability of the spring chinook subyearling release program. They questioned whether the viability of subyearling smolt releases could be tested experimentally in a smaller and more statistically balanced treatment.

Staff response: The master plan proposes implementation of a monitoring and evaluation program to study and compare the survival of subyearling and yearling spring chinook smolt releases. Staff believes this program should be reviewed by the Monitoring and Evaluation Group, technical working groups and interested parties and should be refined based on comments received. As

scheduled, the program should be initiated simultaneously with the first releases of spring chinook from the hatchery.

7. Water Availability

Comments: Trout Unlimited, Oregon Trout, Dr. Williams and others questioned whether adequate habitat was available to support the desired releases and production. Dr. Williams commented that a better estimate of the smolt carrying capacity may be needed in order to coordinate the anticipated releases with available habitat.

Staff response: Water supply studies in the Yakima and Klickitat subbasins should be reviewed for possible application in the Umatilla basin. The review should describe whether elements of the Yakima/Klickitat studies could be combined with water analyses conducted to date in the Umatilla basin to gain better knowledge of available habitat. Additional assessments should be conducted where needed to be consistent with the process being implemented in the Yakima and Klickitat subbasins. The goal of this effort is to reduce the risk that funds will be invested in areas where inadequate water supplies might undermine production.

8. Potential impacts on the Umatilla National Wildlife Refuge

Comments: The U.S. Fish and Wildlife Service refuge manager commented that development of hatchery water supply wells on or adjacent to the refuge could impact the refuge. Senior officials in the agency have assured the Council that discussions have been initiated between the Service and the other parties involved in planning and design of the hatchery to avoid any adverse impacts.

Staff Response: Staff believes discussions between the Fish and Wildlife Service and other parties including the Corps of Engineers, Oregon Department of Fish and Wildlife, Umatilla Tribes, Bonneville and Council should continue to address this important issue. Any impacts that are identified during these discussions, and potential actions to avoid or mitigate for them, should be reported to the Council.

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Attachment 2.

Umatilla Project Management Structure (and Governance)

Introduction - As the Umatilla hatchery program has evolved over the past several years, the fishery management agencies and BPA have established a viable project management structure to oversee the development of the project and insure its coordination with other related efforts. It should be emphasized that the focus of this management structure is implementation (ie: constructing, operating, and evaluating the program), not program planning or fishery management oversight, although these latter functions clearly play major roles in the process.

Two basic activities must be integrated to achieve acceptable implementation of the Umatilla projects on the F&W Program: implementation, and fishery management oversight. BPA and BR are authorized by, and ultimately responsible under, law (Power Act, Umatilla Basin Act, etc.) to see that the program is implemented. Oregon and the Tribes have implementation responsibilities as well and legal responsibilities for managing fishery resources in the Umatilla. The Council is responsible to plan and insure program compliance. The purpose for the project management structure is to facilitate coordination and oversight among these activities as various projects are planned, built and operated.

Generic Management Process - In the most simplistic terms, the Tribes, ODFW and others submit program proposals, the Council approves a program measure and BPA begins implementation. BPA works with the management entities, within the "core group" concept, to identify project scope and appropriate bio-technical criteria. Interested entities also provide input through an advisory process. BPA assures project funding, obtains necessary environmental clearances and permits, and enters into legal contract instruments to procure necessary products, as agreed among all entities. These contracts may or may not be placed directly with a management entity. Regardless, BPA's relationship with the entities under a contract is substantially different than the relationship with them as fishery managers.

As the project progresses, at various predetermined milestones, the Council, the management entities, and interested observers have the opportunity to review and assess progress towards project objectives. Comments from these reviews are considered by BPA and the management entities in subsequent activity on the project. Upon completion of facility construction, BPA's need is to procure services for O&M and for M&E. Again, such services are obtained through contracting procedures, after considering input from Council and managing entities regarding project scope, objectives, timing, duration, costs, etc.

Fishery Management Process - The fishery resource managers (ODFW and CTUIR) for the Umatilla basin have an oversight responsibility in the project management structure tot ensure that project implementation is consistent with state and federal laws and treaty rights.

An interactive process between ODFW and CTUIR (which together comprise the Umatilla Steering Committee) is the vehicle for determining resource management policy in the basin.

Integration of resource management policy development and implementation with the Umatilla program goals is achieved by the direct involvement by CTUIR and

ODFW management staff in the technical work group process, under the guidance of the Umatilla Steering Committee.

TWGs: The Working Level - The working level where the above generic process plays out is the Technical Work Group (TWG) process. (See the attached diagram 1). Project TWGs are technical working groups that guide the planning, implementation, operations and evaluations of projects and make recommendations on policy matters. Although we speak of a "core group", this term actually describes the project coordination functions of the key policy/implementation level participants: BPA, ODFW, Tribes, and BR. Working day-to-day at the TWG level, this "group" manages all aspects of program planning and implementation, with each entity performing its respective functions as noted above. Each entity has project staff assigned to the project that represent the organization on policy and technical matters.

Generally, the TWG's role is to set objectives/define scope of project consistent with the program, establish a project start date and schedule, review interim products such as predesign, establish operational parameters and monitor operations, and define M&E requirements. BPA (or BR) need such input in order to carry out implementation. The management entities need a forum to insure that fishery management decisions are integrated into the implementation process. The Council needs to monitor program consistency and TWGs are excellent vehicles for that.

We have developed a few operational procedures for TWGs to enhance their ability to serve their function. First, TWG participants are expected to represent their agencies on all matters related to the project. It is understood that decisionmaking authority is not normally delegated at this level, but the intent is to work matters out as fully as possible at the lowest possible working level. Secondly, the TWG is the forum for accomplishing reviews of all pertinent project material, including draft statements of work, proposals, designs, draft O&M agreements etc. The TWGs are used to solicit input to make decisions about how to implement the project.

In sum, the TWGs constitute the working level where fishery managers, program overseers, implementers and interested parties jointly coordinate and communicate regarding the subject projects, which BPA (or BR) subsequently carries out.

The core entities, by virtue of their responsibilities, are the principal members of a number of TWGs responsible to plan, manage and communicate regarding related basin activities, as described below.

- The Umatilla Hatchery, Passage, and Habitat Technical Work Groups, and the River Operations Group represented by ODFW, CTUIR, BPA, NPPC, PNUCC, BR and the irrigation districts are the technical level groups that coordinate implementation of hatchery, passage, flow, transport, and habitat projects. It is the responsibility of these groups to keep decisionmakers informed of progress and identify matters which require policy-level guidance. (Additional discussion of the River Operations Group is contained in the Basin Workplan, p. 14.)

  Note that the function of many TWGs undergoes a transition as projects shift from planning through construction to operations. During implementation, TWGs focus on activities related to getting the project built. After completion, the focus shifts to operational monitoring or to management of M&E activities.

- The Umatilla M&E Oversight Committee (UMEOC), represented by ODFW, CTUIR, BPA, NPPC/MEG, has been formed to coordinate hatchery and natural production and passage research activities in the Umatilla. Led by the Core Group, this group is responsible to ensure minimal duplication of effort, maintain experimental design standards and coordinate research activities with systemwide programs and to integrate M&E results into management planning and implementation. The group will provide peer review and input to BPA and BR regarding implementation procedures.

  Consistent with the adaptive management approach, this group will identify refinements to project goals, modification to yearly production planning, and revisions to hatchery operations based on monitoring and evaluation results, and operational experience. The group will recommend such changes to the core group entities and to BPA for adoption and to the Council for possible amendment.

- A Umatilla Hatchery Experimental Design Task Team (EDTT) will be formed as a technical subgroup under UMEOC to refine the hatchery monitoring and evaluation experimental design and ensure consistency with the Systemwide Monitoring and Evaluation Program.

  Other EDTTs will be established as necessary to develop experimental procedures for other M&E needs, such as passage, habitat, and flow. In some cases, the TWGs for these functions may simply take on this function also, and coordinate through the umbrella research group (UMEOC).

These functional TWGs constitute the project management structure, whose function is to facilitate coordination and communication needed to implement projects and insure that fishery management oversight occurs. The project management structure is NOT the implementation process, nor is it the fishery management process. Instead, its the tool or vehicle that facilitates these other processes. Everyone is responsible to make sure that the project management structure works.

Policy Considerations - As stated above, the most efficient level for project management is the lowest working level, in this case, the TWG. Although the TWG does not function specifically as a policy group, it can serve as the forum where policy decisions are communicated and factored into the management plans. Each entity has a distinct process for dealing with policy matters, as the following generic example illustrates.

- A policy issue arises at a TWG meeting and the Core Group members jointly discuss how the issue might be handled. There is agreement that the fishery management entities will obtain policy direction from management before progress can occur. ODFW Regional staff consult with Portland staff to determine at what level the issue can be resolved. Various levels of decision might include the Chief of Fisheries, the Department Director or even the F&W Commission. Tribal fisheries staff consult with Fisheries Program Managers, who in turn communicate with the Natural Resources Director. Recommendations would be passed up to the F&W Committee and perhaps to the Tribal Council for final approval.

  Within BPA, the Project Manager would communicate with, successively, the Project Management Branch Chief, F&W Division Director, Power Sales Office

Director, on up to the Administator's Office, as needed to establish a BPA position.

The ODFW Chief of Fisheries and the Tribal Policy Representative, acting as the Steering Committee, take the ODFW and Tribal policy positions and work out a joint policy position. The position may get communicated at the TWG level, or separate meetings may be needed between the Steering Committee and BPA management to communicate and work out a solution acceptable to all. The full process may involve several iterations before an acceptable solution is reached.

Public Advisory Considerations - Review and input by interested parties in a timely manner is critical to planning and implementing sound projects. Entities such as PNUCC and Oregon Trout desire to be involved at the earliest practical phase so that their concerns can be communicated. The implementing and managing entities would prefer to have early knowledge of any concerns in order to accommodate them if possible. Also, it is more effective to resolve problems early and informally. Ideally interest groups will participate as observers/commenters on specific TWGs, because this is the working level where projects are formulated and carried out. However, with 5 or more major TWGs and several potential M&E task teams the commitment of staff resources to such a level of involvement becomes prohibitive.

Therefore, an Advisory Group will be established at the TWG level as a forum for communicating and considering interest group concerns. Functionally, the Core Group will share project information, generated in TWGs or by the Core Group, with interested entities (who so identify themselves to the Core Group), as a means of obtaining input on the project. Comments received will be considered by the Core Group, or members thereof, as advisory in nature. The Core Group will allow reasonable review time before taking action on a specific review item. Generally, the review period will conform to the TWG review period established for the particular circumstances.

Seek input on

The Core Group will seek input on such material as draft Statements of Work, draft O&M Agreements, draft Annual Operating Plans, project completion or status reports, etc. The Core Group recognizes that such a review process is imperfect, and that it is not a substitute for TWG participation and submits that TWG participation is the best way to contribute to the process. This process affords a reasonable opportunity for early (pre-IPP) involvement in project implementation, while allowing implementation to proceed on schedule. It also does not compromise other formal processes for involvement, such as IPP and other Public Involvement processes.

Application to Umatilla Hatchery - (Also see Workflow Diagram) The Council approved the original hatchery measure and amended the program 2 times to increase project scope, etc. Each event was proceeded by a public involvement period. By contract, BPA has enabled ODFW and the Tribes to plan for the hatchery program, input to facility design, and establish the broad operational parameters for the program (via the hatchery master plan). These activities have taken place at the TWG working level. We have also contracted with the Corps for facility design and construction.

Currently, Council is considering whether to approve the HMP. The final design is complete and construction awaits Council approval. Activities have begun between BPA and ODFW to develop an O&M agreement for hatchery operations. ODFW may involve CTUIR in review as per their MOA. After

preliminary drafts have been discussed, a draft will be circulated to the hatchery TWG for review by their entities. BPA and ODFW will take comments into consideration in finalizing and agreeing to the O&M agreement. The O&M agreement is a contract between the operator (ODFW, to start) and BPA spelling out requirements for hatchery operation. Currently O&M of existing satellite facilities (Bonifer and Minthorn) is handled through an IGA. As new facilities come on line and the hatchery program gets underway, an O&M agreement will be established with the Tribes, with ODFW review, for satellite operations.

As the program transitions into its full operational phase, day to day operations of all facets of the program will be spelled out by Annual Operating Plans (AOPs). Under provisions of the hatchery and satellite O&M agreements, the fishery managers will develop Annual Operating Plans (AOP) for the hatchery and satellite facilities that define annual production profiles, release strategies and operating costs. Draft AOPs will be distributed for TWG review and will be subject to BPA and Council review and approval in terms of conformance of the AOP to the provisions of the approved hatchery master plan.

Also by contract, BPA will fund the hatchery M&E program, as it is defined by the Umatilla Research Coordinating Committee and the Umatilla EDWG described above. As new (post-FY 89) projects, hatchery M&E studies will also be subject to the IPP process. The UMEOC, as a TWG, will be the operating level for input of fishery management bio-technical matters. We expect that UMEOC will establish a process to review and develop recommendations for hatchery production, harvest, natural escapement, operation of hatchery, passage and flow enhancement facilities, and future research, that will ensure that research results (1) are incorporated into management decisions by ODFW and CTUIR (and the master plan as needed) and (2) could be used by the Council to amend the program if needed.

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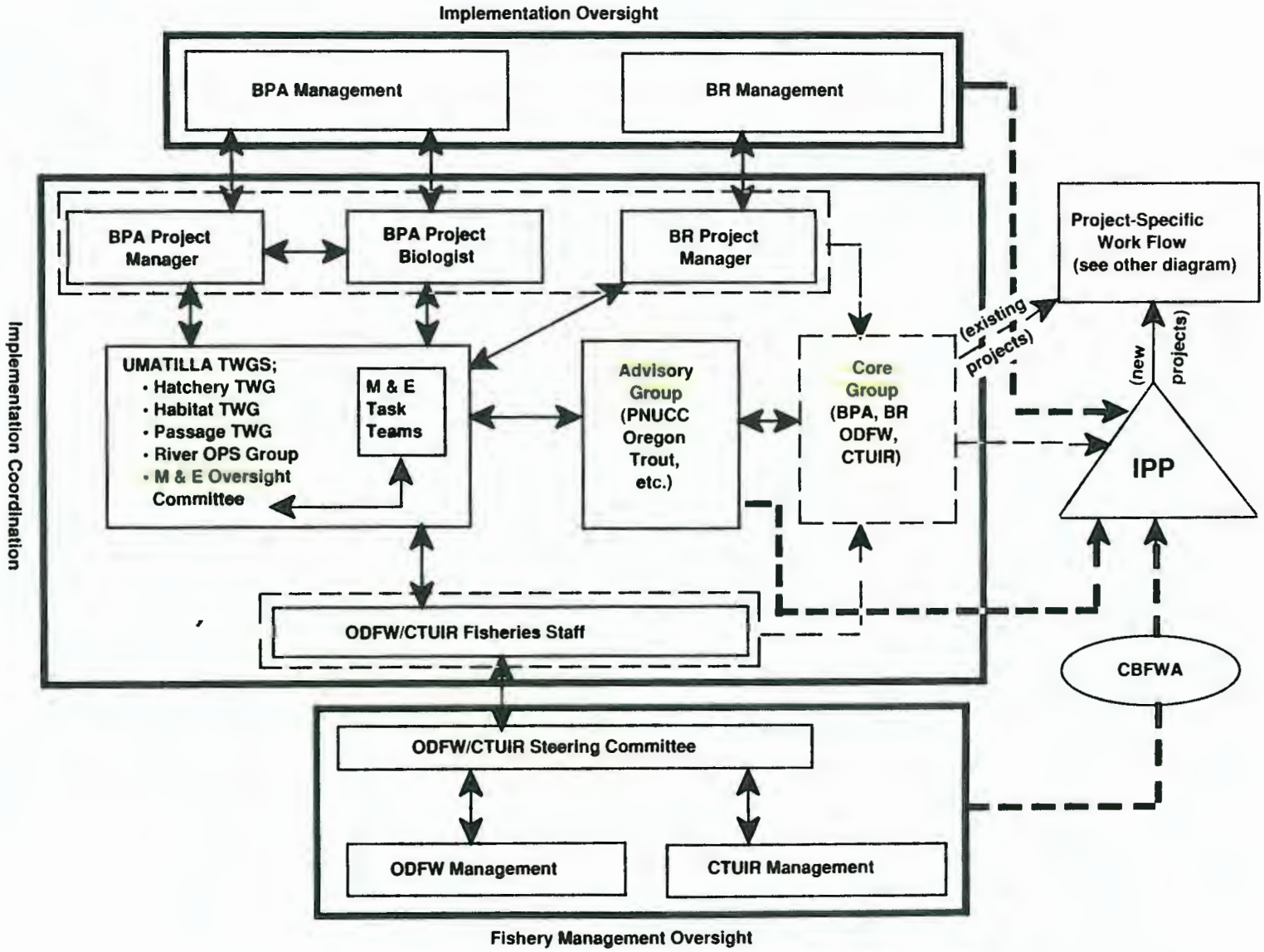
UMATILLA IMPLEMENTATION COORDINATION STRUCTURE



UMATILLA HATCHERY PROJECT WORK FLOW