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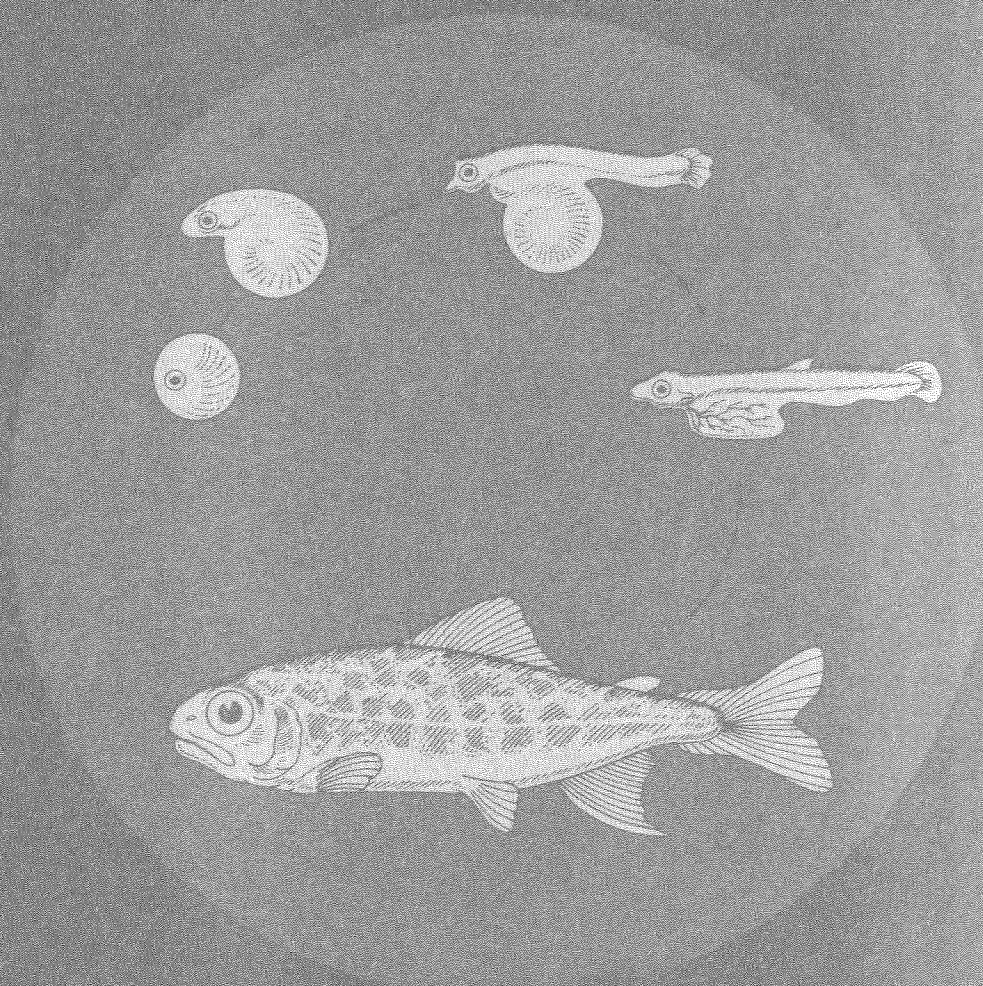

U.S. Department of Energy
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The Confederated Tribes of
the Warm Springs Reservation

July 1990

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HOOD RIVER PRODUCTION MASTER PLAN

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EXECUTIVE SUMMARY

Introduction

The Northwest Power Planning Council's (Council) 1987 Columbia River Fish and Wildlife Program (Program) authorizes the development of artificial production facilities to raise chinook salmon and steelhead for enhancement in the Hood, Umatilla, Walla Walla, Grande Ronde and Imnaha rivers and elsewhere. These artificial production facilities, known as the Northeast Oregon Hatchery Project (NEOH), will be used to supplement natural production in these rivers. Measure 703 (f) (5) of the Program 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 Council.

On February 26, 1991 the Council agreed to "disaggregate" Hood River from the Northeast Oregon Hatchery Project, and instead, link the Hood River Master Plan (now the Hood River Production Plan) to the Pelton Ladder Project (Pelton Ladder Master Plan 1991). The Hood River Production Plan (HRPP) and Pelton Ladder Project are linked because (1) the Pelton Ladder Master Plan identifies the Hood River Subbasin as a destination for spring chinook smolts produced by the Pelton Ladder Project, and (2) the Hood River Production Plan identifies a need for this spring chinook production. Disaggregation will allow the Hood River Production Plan to proceed in a more timely manner than if it were treated as a part of the Northeast Oregon Hatchery Project.

The HRPP will continue to develop over the next several years. The Confederated Tribes of Warm Springs (CTWS) and the Oregon Department of Fish and Wildlife (ODFW) along with Bonneville Power Administration (BPA) will establish a viable adaptive project management structure to oversee the development of the project and to insure its coordination with other related efforts. Additional review may occur by the Council, Columbia Basin Fish and Wildlife Authority (CBFWA), the US Forest Service (USFS), Pacific Power and Light (PPL), Pacific Northwest Utilities Conference Committee (PNUCC), and other interested agencies. It should be emphasized that the focus of this management structure is implementation (i.e., constructing, operating and evaluating the program), not program planning or fishery management oversight, although these latter functions clearly play major roles in the process.

Fisheries Management and Hatchery Policies

In its 1987 Program 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 Hood River propagation alternatives are being designed to increase runs in the Columbia by approximately 15,000 adults.

The Council's system policies of adaptive management, genetic risk assessment, and escapement will be followed to guide achievement of Hood River Production Plan goals. CTWS and ODFW policies governing hatchery practices including broodstock selection and spawning practices, outplanting, and disease control are discussed.

Management and Production Goals

The CTWS and ODFW have established the following fishery rehabilitation goals for the Hood River Subbasin:

1. The rehabilitation program will be consistent with tribal treaty rights, US-Canada Pacific Salmon Treaty and Columbia River Management Plan harvest and production agreements, the Council's Columbia River Basin Fish and Wildlife Program, and other applicable laws and regulations.

2. Re-establish naturally sustaining spring chinook runs in the Hood River Subbasin.

3. Rebuild naturally sustaining summer steelhead runs in the Hood River Subbasin.

4. Rebuild naturally sustaining winter steelhead runs in the Hood River Subbasin.

5. Maintain the genetic character of naturally producing populations of salmonids native to and re-established in the Hood River Subbasin.

6. Contribute to Columbia River tribal and non-tribal fisheries, ocean fisheries and the Council's interim goal of doubling salmon runs.

7. Achieve the following goals for adult returns to the mouth of the Hood River:

	Run Size Goals		
	Natural	Hatchery	Total
Spring Chinook	400	1,300	1,700
Summer Steelhead	1,200	6,800	8,000
Winter Steelhead	1,200	3,800	5,000

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

Production Profiles

Achievement of the run size goals will be accomplished by supplementing natural production using smolts reared at facilities outside of Hood River. Although the master plan is currently focused on establishing or enhancing spring chinook, and summer and winter steelhead runs, there is potential to enhance other anadromous species such as fall chinook and coho in the Hood River in the future.

Spring Chinook Production

Based on available information, it has been determined that the native spring chinook run in the Hood River Subbasin is extinct. This plan proposes to re-establish naturally sustaining spring chinook runs in the subbasin using Deschutes stock. In order to reach the run size goal of 1,700 adult returns, this plan recommends that the following actions be taken:

- Release 250,000 hatchery-reared smolts (age 1+) into the subbasin each year. Half of these smolts will be reared at an existing hatchery (e.g., Bonneville Hatchery) and the remaining 125,000 smolts will be reared at the Pelton Ladder.

- Broodstock used for the hatchery supplementation will be Deschutes stock from the Round Butte Hatchery. This stock will be used until a natural run can be developed (approximately two life cycles). Thereafter, at least 10 percent of the broodstock will be comprised of naturally produced spring chinook collected within the Hood River Subbasin. The eventual goal is to collect all broodstock from adults returning to the basin.

- Half of the smolts will be directly released (i.e., non-acclimated) into the West Fork of the Hood River. The remaining smolts will be acclimated in ponds at the proposed Powerdale Fish Facility.

Summer Steelhead Production

The Hood River Subbasin currently supports a moderate run of summer steelhead. This plan proposes rebuilding the summer steelhead runs to achieve a run size goal of 8,000 adult returns to the mouth of the Hood River. To achieve this goal, this plan recommends the following actions:

- Release 150,000 hatchery-reared smolts (age 1) into the subbasin each year. Smolts will be reared at the Oaks Springs Hatchery.

- Half of the smolts will be directly released (i.e., non-acclimated) into the West Fork of the Hood River. The remaining 75,000 smolts will be acclimated in ponds at the proposed Powerdale Fish Facility.

- Initially, the hatchery program will be developed using native runs of summer steelhead returning to the subbasin. Later, broodstock used for hatchery supplementation will be collected from hatchery returns to the proposed Powerdale Fish Facility and from natural segments of the summer steelhead run. After a natural run is established, a minimum of 10 percent of the hatchery broodstock will be comprised of naturally produced summer steelhead.

Winter Steelhead Production

Based on limited information, it appears that the Hood River winter steelhead population has declined significantly in recent years and may be headed towards extinction. This plan proposes to rebuild the winter steelhead runs to achieve a run size goal of 5,000 adult returns to the mouth of the Hood River. The HRPP recommends the following actions be taken to achieve this goal:

- Release 85,000 smolts (age 1) into the subbasin each year. Smolts will be reared at the Oak Springs Hatchery.

- All smolts will be directly released (i.e., non-acclimated) at two different sites in the East Fork and Middle Fork.

- The hatchery program will initially be developed using native runs of winter steelhead returning to the subbasin. Later, broodstock used for hatchery supplementation will be collected from both hatchery and natural segments of the winter steelhead run.

Facilities Needed to Implement the Plan

There are presently no facilities in the Hood River Subbasin to meet the plan's production requirements. Therefore, this plan proposes building a small- to medium-sized facility to hold and spawn broodstock, incubate eggs, and acclimate juvenile fish. An area adjacent to Powerdale Dam was selected as the preferred location for these facilities. Rearing will take place at existing facilities in the Columbia River Basin.

Powerdale Dam, located at river mile 4 on the Hood River mainstem, offers a unique management opportunity for the HRPP. The dam acts as a barrier to fish migrating upstream to spawn in Hood River. All fish must pass through the fish ladder on the river's east bank to access the spawning grounds. By modifying the ladder, it will be possible to regulate the fish that continue upstream to the spawning grounds. Wild or naturally produced fish will be allowed to continue their migration up Hood River to spawn, while the majority of marked, artificially produced fish can be removed from the river and not allowed to continue migrating up river. If some marked, artificially-produced fish are allowed to migrate to the spawning grounds, it will be done in accord with the ODFW's Wild Fish Management Policy. By regulating the number of hatchery fish introduced into the natural system, the genetic integrity of the wild and natural stocks can be maintained.

The specific facilities needed to implement the plan, listed in priority order, are as follows:

- Adult trap and counting facility located at Powerdale Dam fish ladder
- Adult holding ponds located at Powerdale Dam
- Egg collection facility located at Powerdale Dam
- Egg incubation facility located at Powerdale Dam or alternative incubation strategy
- Off-site rearing ponds for spring chinook, and summer and winter steelhead
- Juvenile acclimation ponds located at Powerdale Dam
- Juvenile migrant traps

Consistent with the Council section 700 (5) (A) (iv), the Hood River Fish Facility will be designed to meet appropriate technological requirements.

Monitoring and Evaluation Plan

The Monitoring and Evaluation Plan uses adaptive management to increase knowledge about uncertainties inherent in the HRPP. The monitoring and evaluation goals 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 Hood River Subbasin in a manner consistent with provisions of the Council's Fish and Wildlife Program.

2. Determine the success of achieving the management objectives in the Hood River Subbasin that are presented in the master plan and the Hood River Subbasin Plan (1989).

3. Assess the effects of HRPP on natural production of anadromous and resident fish populations.

4. Assess the contribution of Hood River supplementation program towards the Council's doubling goal.

Facilities needed for the Monitoring and Evaluation Plan are an adult trap and counting facility at Powerdale Dam and a juvenile migrant trap located at, or near Powerdale Dam.

Fishery Benefits

Based on the System Planning Model, it is estimated that the HRPP will contribute approximately 15,000 adult salmon and steelhead (2,212 spring chinook, 8,505 summer steelhead and 4,819 winter steelhead) to the Council's doubling goal. In addition, a total of 2,428 adults (299 spring chinook, 1,359 summer steelhead and 770 winter steelhead) will be contributed to ocean and Columbia River fisheries.

Harvest Plans

Guidelines for developing annual harvest plans for spring chinook, and summer and winter steelhead have been prepared by CTWS and ODFW. The purpose of these guidelines is to explain how harvest management will support and integrate with the salmon and steelhead program for the Hood River Subbasin.

Master Plan Development and Review

This master plan was jointly developed by CTWS and ODFW in cooperation with other agencies. Development of the plan was the responsibility of the NEOH Technical Work Group (TWG). The TWG is composed of technical staff from CTWS, ODFW, the Council, BPA, Confederated Tribes of the Umatilla Indian Reservation (CTUIR), Nez Perce Tribes (NPT), US Forest Service, US Fish and Wildlife Service (USFWS), National Marine Fisheries Service (NMFS) and other agencies.

RECOMMENDATIONS

The following recommendations are made:

1. Construct an adult trap, holding ponds, adult spawning, egg incubation, and juvenile acclimation facilities at Powerdale Dam on the Hood River mainstem.

2. Initially rear 250,000 spring chinook smolts, half at Pelton Ladder and the remaining 125,000 at an existing hatchery (e.g., Bonneville). Release 125,000 spring chinook directly into the Hood River's West Fork and acclimate the remaining spring chinook smolts at the proposed Powerdale Fish Facility.

3. Develop initial spring chinook run from Deschutes stock reared at Pelton Ladder and Bonneville Hatchery. As the run increases, give priority to use of naturally produced adults returning to the Hood River for broodstock.

4. Rear 150,000 summer steelhead smolts and 85,000 winter steelhead smolts at Oak Springs Hatchery. Release half of the summer steelhead smolts directly into Hood River's West Fork and acclimate the remaining 75,000 smolts at the proposed Powerdale Fish Facility. Release all winter steelhead smolts in the East and Middle forks of the Hood River. Some road and site improvements may be necessary to access some release sites during the winter

5. Develop the summer and winter steelhead hatchery program from naturally produced adults returning to the Hood River Subbasin.

6. Implement fish passage, habitat improvement and flow enhancement projects proposed for the Hood River.

7. Modify existing release locations, and plan new locations to provide adequate dispersal of fish.

8. Develop annual harvest plans for each species using the harvest plan guidelines presented in the master plan. These harvest plans will outline specific allocation and monitoring details associated with Indian and non-Indian fisheries in the Hood River Subbasin.

9. Continue to coordinate with appropriate Council and Authority System Planning, TWG's, fish and wildlife agencies, tribes, and BPA to integrate the HRPP with other fish enhancement programs in the Columbia River Basin.

INTRODUCTION

The Hood River, located in north central Oregon, flows in a northeasterly direction to enter the Columbia River at approximately river mile (RM) 169. The basin covers 352 square miles, approximately 225,352 acres (Figure 1).

The mainstem of the Hood River and the West, Middle, and East (below RM 22.7) forks of Hood River have an average grade of less than 2 percent. Several of the tributaries to the Middle and East forks head in glaciers on the northern and eastern slopes of Mount Hood. The East Fork, as well as many of the tributary streams in the drainage, are generally typified by steep gradients averaging in excess of 3 percent. The primary spawning and rearing areas for anadromous salmonids generally occur in those areas averaging less than a 2-percent grade. These areas include the mainstem; the West, Middle and East forks; and Lake Branch Creek--a tributary to the West Fork.

Only one natural and one man-made barrier significantly impede or block upstream passage of anadromous salmonids in the Hood River Subbasin: Punchbowl Falls and Powerdale Dam. Punchbowl Falls, located at RM 0.4 on the West Fork, historically impeded upstream passage of spring chinook and steelhead, and blocked passage of upstream migrant fall chinook and coho. A fish ladder, constructed to improve passage for upstream migrant adults, has operated successfully at the falls for the last 25 years.

Powerdale Dam is located on the Hood River mainstem at RM 4.5. Constructed of concrete, it is approximately 22 feet in height with a sloping apron and a concrete fish ladder on the eastern bank. The dam, owned and operated by the PP&L, diverts a large portion of the river flow to a powerhouse located approximately 3.2 miles downstream. Passage past Powerdale Dam is generally considered adequate except that fish can be falsely attracted to flows passing over the dam spillway or through the trash chute at the dam's western end.

Historical Perspective

Little information regarding the history of Hood River fish runs is available; however, it is strongly believed that existing anadromous stocks are at much lower levels than what the basin supported in the past.

The entire Hood River Subbasin is located within the boundary of land ceded to the United States by the seven bands of Wasco- and Sahaptin-speaking Indians whose representatives and chiefs were signatories to the Treaty with the Tribes of Middle Oregon of June 25, 1855. 12 Stat. 963. The Confederated Tribes of the Warm Springs Reservation of Oregon (CTWS) is the legal successor in interest to the Indian signatories to the treaty. The Hood River, which is the largest Oregon tributary entering the Bonneville Pool, currently maintains anadromous populations of fall chinook, summer and winter steelhead, and coho.

Article I of the treaty describes the 10-million acre area of eastern Oregon ceded by the tribes to the United States and sets out the boundaries of the Warm Springs Indian Reservation. Article I of the treaty also contains "the express right of taking fish in the streams running through and bordering said reservation...and at all other usual and accustomed stations, in common with citizens of the United States."

While the Hood River is not a stream bordering or running through the Warm Springs Indian Reservation to which the tribe reserved an exclusive fishing right, it is a stream which has

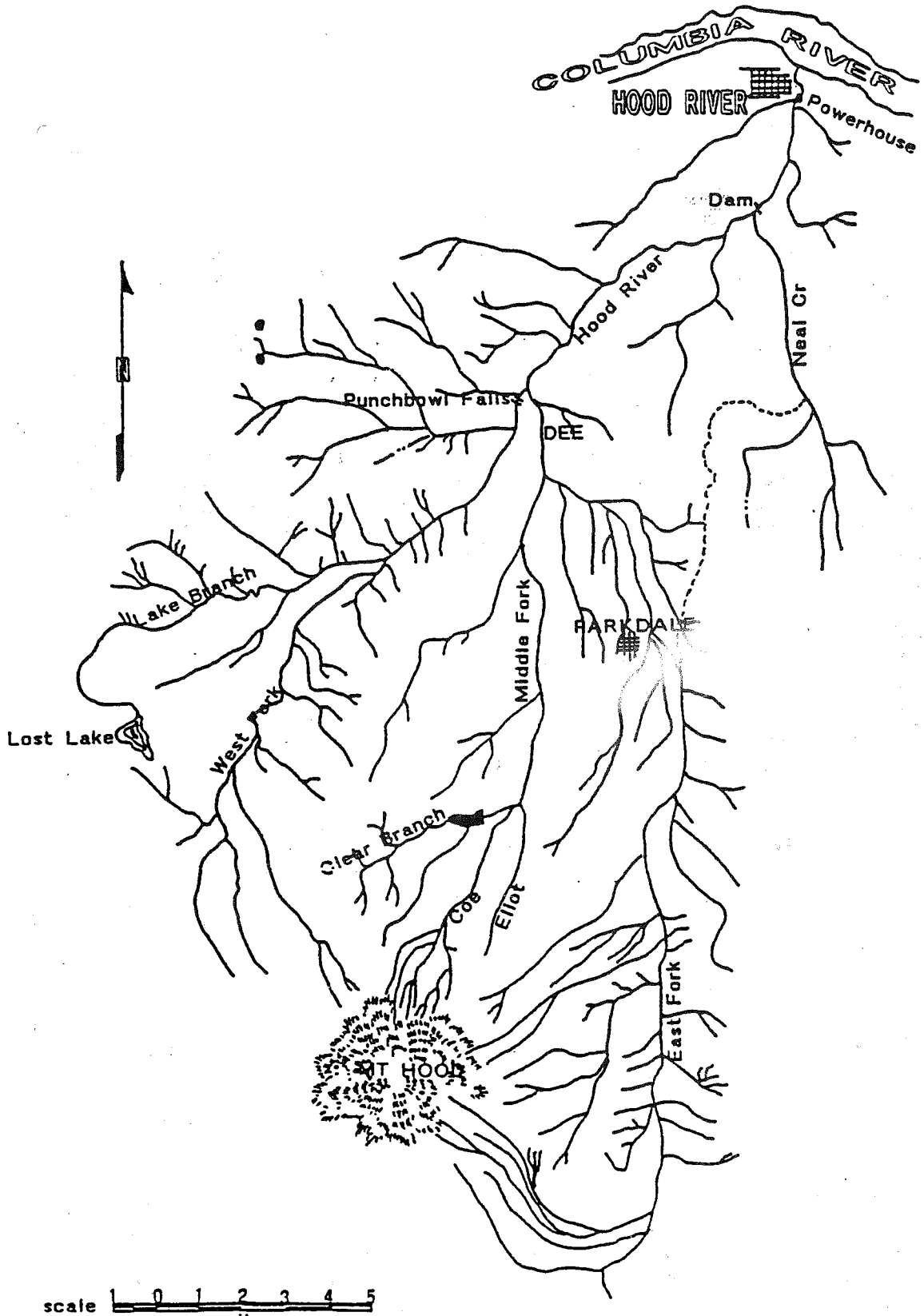


Figure 1. Hood River Subbasin

traditionally been fished by tribal members and their forefathers. Thus, the tribe's treaty rights attach at all usual and accustomed fishing places throughout the Hood River Subbasin. The tribe's treaty rights include not only a harvest allocation right to take up to 50 percent of the harvestable number of each salmon and steelhead run passing the tribe's usual and accustomed fishing places, but it also includes a right to sufficient water quality and quantity to maintain these runs at harvestable levels.

The tribes and its members also have land ownership rights in the Hood River Subbasin through their interest in several hundred acres of trust allotments located near the City of Hood River. These lands are managed by the Bureau of Indian Affairs for the tribes and its members, and are not subject to state or local land-use regulations.

In-Basin Environmental Problems

Various physical and environmental constraints currently limit the production potential of the Hood River Subbasin. While many of the limiting constraints can be directly attributed to man's activities within the drainage, a few are closely associated with the physical characteristics of the drainage. The primary biological and physical constraints limiting production in the Hood River Subbasin include (1) the relatively low biomass potential that is common to most of the free-flowing water in the drainage, and (2) high stream gradients.

Perennial glacial melt streams in the subbasin are typically low in nutrients and have little capacity for supporting large populations of resident trout and anadromous salmonids. The rapid seasonal melting of glaciers, and the associated rock flour and sand which are transported downstream further reduce productivity in the drainage by increasing turbidity levels and depositing large amounts of sand in the stream. High turbidity levels and heavy silt loads are a common occurrence in the mainstem, the Middle and East forks, and several of the tributary streams located in the upper headwaters of both the Middle and East forks. The Middle and East Fork drainages are also considered unsuitable for the production of spring chinook due to poor spawning gravel and insufficient juvenile and adult holding water. High peak flows that occur from November through February are also believed to reduce egg-to-smolt survival rates and restrict or impede movement into the upper reaches of many of the tributary streams (Hood River Subbasin Plan 1989) .

Aside from the physical and environmental constraints which limit production potential there are several areas in which man's activities have had, and will continue to have a significant impact on the fisheries resource. Attempting to rectify many of the habitat-related concerns will be difficult due to the relative inaccessibility of most of the drainage. Given the various physical and environmental constraints limiting production, it is also doubtful that habitat improvement projects alone will result in a substantial increase in the production of anadromous salmonids. Projects, in addition to artificial production, which have the greatest potential for increasing either egg-to-smolt survival rates or the production potential of the drainage include proper screening of all irrigation diversions, riparian enhancement measures and improvement of habitat diversity (i.e., large woody debris).

Environmental and physical constraints that, in general, are common throughout most of the drainage include low pool to riffle ratios, poor cover, low summer flows and poor water quality due to glacial turbidity. These limiting constraints are commonly associated with a variety of man's activities within the drainage that either directly or indirectly result in the loss or degradation of fish habitat and reduces the productive potential of the drainage.

Production of game fish is limited by a variety of physical and environmental constraints. In general, the Hood River Subbasin can be characterized as having relatively unproductive water with low biomass potential. This is reflected by the low specific conductance, alkalinity, hardness, and trace elements obtained in the lower river. Many of the tributary streams are inaccessible to anadromous salmonids because of passage barriers and high stream gradients. Egg-to-smolt mortality rates are increased in the mainstem and Middle and East forks of the Hood River by high turbidity levels and heavy siltation resulting from the rapid seasonal melting of glaciers on Mount Hood. A complete water quality index is located in Appendix H .

Past land and resource management practices on both public and private lands have resulted in the extensive degradation and loss of spawning and rearing habitat for anadromous salmonids. As co-managers of rivers located on ceded lands, the CTWS and ODFW, in cooperation with the USFS, have identified various physical and environmental constraints that limit the production of anadromous salmonids in the Hood River Subbasin. Resolving many of these concerns will require close cooperation with other state and federal regulatory agencies that have jurisdiction over activities in the basin.

The diversion of surface water for consumptive and non-consumptive uses is regulated by the Water Resources Commission (WRC) and the Department of Water Resources (DWR). During the irrigation season, the various demands placed on the water resource causes stream flows to reach critically low levels in several reaches. In addition, water temperatures may also increase above the optimum and several streams sections may become intermittent. Increasing stream flows and decreasing water temperatures throughout the basin will require a strict enforcement of (1) all minimum stream flows, (2) all stipulations regulating the maximum diversion and rate of withdrawal of surface water (as specified in each Certificate of Water Right), and (3) all legal cutoff dates for irrigation diversions.

The use of pesticides and herbicides is regulated by the Oregon Department of Agriculture (ODA). Both are used extensively on public and private lands and their misuse has the potential for seriously affecting water quality in many areas of the Hood River Subbasin. Although it is difficult to determine the magnitude of the problem at this time, several localized fish kills have occurred.

The USFS currently manages approximately 120,800 acres of forest land (Mount Hood National Forest) in the upper Hood River Subbasin. Past and present land management practices on public and private lands have resulted in the loss or degradation of spawning and rearing habitat in many areas of the drainage.

The ODFW has worked with both the irrigation districts and the operators of some of the larger diversions in an attempt to minimize the loss of downstream migrant salmonids. While several major diversions have been screened, several are in serious need of repair or have major design flaws which significantly reduce their efficiency. One of the primary concerns in the drainage is the East Fork Irrigation District's diversion. The diversion, which has been unscreened for nearly 25 years, diverts a significant portion of the East Fork of the Hood River (including fry, fingerlings, smolts and adults). It is believed that this diversion significantly increases the egg-to-smolt mortality rates for the East Fork drainage.

The primary problem associated with managing anadromous salmonids in the Hood River Subbasin has been the general lack of any quantitative data on the current status of most natural and wild runs. The most recent estimates available on run size were obtained at Powerdale Dam from 1963 through 1971. Currently, most of the assumptions about the status of the stocks, as well as many of the fishery management decisions are based on trends in the river sport fishery and old fish counts made at Powerdale Dam. While trends in the river sport fishery may be indicative of

trends in escapement to the Hood River it is important to have good quantitative data available on run size when deciding how each species should be managed.

There is currently little information, specific to the drainage, that can be used to estimate its current or potential production capacity for anadromous salmonids. Based on the available data it is assumed that production potential is relatively low in comparison with other Columbia River subbasins. Although instream habitat work and better resource management may result in improved egg-to-smolt survival rates it is believed that any significant increase in total run size may require hatchery supplementation.

Present Rehabilitation Efforts

The greatest potential for improving egg-to-smolt survival rates is believed to exist within the East Fork drainage. The East Fork is relatively accessible; is generally lacking in juvenile and adult holding water and instream structures; has a major diversion which significantly impacts anadromous and resident fish populations; and, has been more severely impacted by land management practices than the Middle and West fork drainages.

A number of habitat improvement projects have been implemented by ODFW and USFS to improve spawning and rearing habitat, and to eliminate barriers for anadromous salmonids. Projects undertaken by the USFS have generally been designed to mitigate for those losses which have resulted from past management practices. Habitat improvement projects have either been completed or are currently being conducted in Lake Branch Creek (a tributary to the West Fork), and in the East Fork drainage. Projects scheduled for 1991 will take place on Lake Branch and McGee creeks, both tributaries to the West Fork. Habitat improvement work has involved the installation of rock weirs, log weirs, gabion weirs and log deflectors, as well as the placement of boulders at various sites in the project area.

Projects implemented by ODFW have been designed to minimize egg-to-smolt mortality rates and to improve passage of both upstream and downstream migrant salmonids. In cooperation with private landowners and the irrigation districts, ODFW has attempted to have all diversions properly screened and has eliminated a potential barrier to upstream migrant salmonids at "moving" falls located at RM 3.7 in the West Fork.

In coordination with ODFW, Salmon and Trout Enhancement Program (STEP) volunteers have provided assistance in implementing several projects designed to improve spawning and rearing habitat in tributary streams. Rock structures and log deflectors were placed in Neal Creek, a tributary to the mainstem; and in Tony and Clear Branch creeks--tributaries to the Middle Fork. STEP volunteers also eliminated a velocity barrier in Lake Branch Creek and have provided assistance in conducting spawning ground surveys for winter steelhead.

Northeast Oregon Hatchery Master Plan Background

During the subbasin and system planning process, CTWS and ODFW identified the need for additional hatchery production in the Hood River Subbasin. The 1987 Fish and Wildlife Program was amended to include a measure to develop an artificial production facility to produce chinook salmon and steelhead smolts for the Hood River. The number of smolts needed to supplement production in the Hood River is based upon the System Planning Model from the Hood River Subbasin Plan.

The Fish and Wildlife Program measure, 703(f) (5) (A), 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 the Hood River Subbasin that will benefit from hatchery supplementation, and a 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-capitol or small-scale facilities to meet production objectives.

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

6. An evaluation of sites to verify suitability for outplanting facilities, including low-capitol 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 and the effects of the outplanting on resident fish populations.

8. Preliminary cost estimates for implementation of the measure.

Upon approval of the master plan by the Council, BPA shall fund the detailed design, engineering, construction, operation and maintenance, and evaluation and monitoring of the facilities.

The HRPP is being developed in coordination with four principal entities holding fisheries management authority and responsibility in the five northeast Oregon river subbasins: the Warm Springs, Umatilla, and Nez Perce Tribes, and ODFW. As the master plan was developed, the Council, BPA, other tribes, fishery agencies and interested parties had the opportunity to review and provide input to the master plan.

The Hood River component of the Northeast Oregon Master Plan has evolved into the HRPP and will not only protect and rebuild existing anadromous fish stocks, but will re-establish naturally producing spring chinook and produce the additional summer and winter steelhead needed to meet the production goals outlined in the Hood River Subbasin Plan.

FISHERIES MANAGEMENT POLICIES

System-Wide Goals and Policies

The original Fish and Wildlife Program established many important measures that began to address the detrimental impacts that the hydropower system had on the Columbia Basin salmon runs. However, the Program did not clearly identify a system-wide goal for increasing Columbia Basin salmon runs or provide guidance on how each of these measures were interrelated. In addition, the Program lacked procedures to monitor and evaluate the effectiveness of its fish and wildlife measures.

In its 1987 program amendments, the Council adopted a management framework and system policies to guide the planning, implementation, and evaluation of the Program's fishery enhancement efforts. As part of these efforts, the Council established an interim goal to increase adult run sizes in the Columbia Basin from 2.5 to 5.0 million annually. The Hood River project is designed to contribute about 15,000 adult salmon and steelhead towards this goal.

Doubling the salmon runs of the Columbia Basin requires a coordinated approach to effectively achieve improvements in production, passage and harvest management. Therefore, the Council adopted a series of policies 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.

Subbasin Goals and Policies

Development of HRPP will occur over the next several years. The Warm Springs Tribe and ODFW, along with BPA's assistance, will establish a viable adaptive project management structure to oversee the development of the project and to insure its coordination with other related efforts. Additional review may occur by the Council, CBFWA, USFWS, PPL, USFS, PNUCC, and other interested agencies. It should be emphasized that the focus of this management structure is implementation (i.e., constructing, operating, and evaluating the program), not program planning or fishery management oversight, although these latter functions clearly play major roles in the process.

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 Hood River program. Application of the adaptive management principle will involve the following five steps:

Step 1. Formulation of Management and Production Goals for the Hood River Subbasin

The rehabilitation program will:

- Be consistent with tribal treaty fishing rights, US-Canada Pacific Salmon Treaty and Columbia River Management Plan harvest and production agreements, the Council's Columbia River Basin Fish and Wildlife Program and other applicable laws and regulations.

- Re-establish runs of naturally sustaining spring chinook using Deschutes stock in the Hood River Subbasin.
- Rebuild naturally sustaining runs of summer steelhead in the Hood River Subbasin.
- Rebuild naturally sustaining runs of winter steelhead in the Hood River Subbasin.
- Maintain the genetic character of naturally producing populations of salmonids native to and re-established in the Hood River Subbasin.
- Contribute to Columbia River tribal and non-tribal fisheries, ocean fisheries and the Council's interim goal of doubling salmon runs.
- Achieve the adult return goals to the mouth of Hood River identified in Table 1.
- Provide sustainable Indian and non-Indian harvest of salmon and steelhead.

These goals are consistent with the Council's system production policies and will be refined during system planning, integration and evaluation (Hood River Subbasin Plan 1990).

Table 1. Estimated adult escapement following implementation of the HRPP for the Hood River Basin.

Species	Naturally Produced Adults	Hatchery Produced Adults	Total
Spring Chinook	400	1,300	1,700
Summer Steelhead	1,200	6,800	8,000
Winter Steelhead	1,200	3,800	5,000

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

The following areas of scientific uncertainty form the basis for the proposed Monitoring and Evaluation Plan described later in this document:

- What is the current status of summer and winter steelhead in Hood River?
- Can natural production of spring chinook, and summer and winter steelhead be restored or enhanced with releases of hatchery-reared smolts?
- Can natural production of spring chinook, and summer and winter steelhead be sustained using supplementation with hatchery-reared smolts?

- To what extent will acclimation of spring chinook and summer steelhead smolts, prior to release influence smolt-to-adult survival, homing ability, migration patterns, and spawning distribution?

- To what extent will length of acclimation time best enhance smolt-to-adult survival, migration patterns, and spawning distribution for spring chinook and summer steelhead?

- To what extent will the release location of hatchery spring chinook, and summer and winter steelhead smolts influence smolt-to-adult survival, migration patterns and spawning distribution?

- Will environmental factors preclude restoration of sustained, natural production at an acceptable level?

- To what extent will releases of hatchery-reared spring chinook, and summer and winter steelhead smolts influence natural production of resident fish?

- To what extent will releases of hatchery-reared spring chinook smolts and restoration of natural production influence natural production of summer and winter steelhead?

- To what extent will releases of hatchery-reared summer and winter steelhead, and enhancement of natural production, influence natural production of spring chinook?

- What contribution will spring chinook, and summer and winter steelhead smolt releases make to adult harvest?

Step 3. Hypothesis Formulation

A proposal to test uncertainties will be presented in the Monitoring and Evaluation Plan. To accurately assess these objectives, statistically testable hypotheses will be formulated. Experiments testing these hypotheses will measure the progress toward accomplishing tribal and state fishery rehabilitation goals for the Hood River Subbasin. At the same time, the subbasin's contribution to the Council's interim doubling goal for the Columbia River Basin will also be estimated. The experimental design will be reviewed by the Council's Monitoring and Evaluation Group (MEG).

Step 4. 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 Hood River Subbasin goals while maintaining reasonable costs is emphasized.

Step 5. 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. A management goal of CTWS and ODFW is to protect the genetic resources of existing anadromous and resident fish populations.

Broodstock collection, spawning practices, and hatchery/wild fish interactions will be the most important genetic considerations relative to anadromous fish supplementation. The Yakima/Klickitat Master Plan (1989) states:

> "Potential problems can be reduced if broodstock is selected from the same streams involved in the outplanting program. Proximate populations are expected to be closer genetically than distant populations. The most direct way to achieve a genetic optimum may be to avoid selective breeding in hatcheries altogether and select brood fish randomly from among all returning adults produced by the outplanting system. This strategy allows natural selection to alter the gene pool for highest survival under both hatchery and natural conditions. This strategy requires that all returning adults pass through fish ladders where traps can be installed."

The CBFWA Supplementation Technical Work Group has identified the following guidelines to reduce potential genetic impacts due to hatchery supplementation procedures (CBFWA 1988):

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. Hatchery practices that promote maintenance of genetic variation should be used. Examples include:

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

Monitoring the genetic change and performance of Hood River anadromous fish populations is essential for proper genetic resource management. Research and development with biochemical techniques have produced a number of tools that can be applied to genetic monitoring. The Yakima/Klickitat Master Plan (1989) identifies four steps for developing an effective genetic monitoring program:

1. Identifying precise questions to ask

2. Assessing available monitoring technologies

3. Integrating genetics into a monitoring strategy

4. Implementing the monitoring strategy

Harvest Management

Another key system policy adopted by the Council calls upon the tribal and state 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 Hood River Subbasin is being designed to support natural production goals, broodstock needs and monitoring and evaluation studies. As new information is developed from the evaluation studies, or as different harvest methods are applied, the fishery managers will adopt harvest regulations consistent with the rebuilding process.

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

Presently, there is preliminary state-tribal harvest coordination in the Hood River Subbasin. CTWS and ODFW desire to provide productive Indian and non-Indian fisheries in the Hood River Subbasin for all species identified for enhancement by this project. The harvest plan guidelines represent the first step of harvest planning. Later, CTWS and ODFW will develop annual harvest plans which will identify specific allocation of harvestable numbers for Indian and non-Indian fisheries in the Hood River Subbasin. As actual smolt-to-adult return rates become known for the Hood River, CTWS and ODFW will more accurately develop adult return forecasts which will be the basis for annual harvest allocation agreement.

Hood River spring chinook may 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 US-Canada Pacific Salmon Treaty and the states and tribes under the US v. Oregon Management Plan.

Hood River summer and winter steelhead are harvested primarily in the Columbia and Hood rivers. Management of these fisheries will be governed by the Pacific Salmon Commission and Pacific Fisheries Management Council under the US-Canada Pacific Salmon Treaty, and the states and tribes under the US v. Oregon Agreement.

Hatchery Practices

Hatchery programs can affect genetics by initial broodstock selection and spawning practices.

Broodstock Selection

When artificial propagation is used to rebuild depressed salmon and steelhead runs the use of native, indigenous broodstock is recommended. However, in rivers where salmon and steelhead are severely depressed or non-existent, other sources of broodstock must be relied upon.

For the Hood River Subbasin, broodstock selection for all species will be determined by the following criteria, listed in priority order:

1. Numbers of each stock available in the Hood River.

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 for each species and race are detailed in the Production Profile section of this document.

Spawning Practices

Spawning will be guided by the following principles:

- Eggs will be used from broodstock collected throughout the run.

- Mating will be random, with male to female ratios appropriate for breeding population sizes.

- All ages of returning fish will be used for egg taking and fertilization.

- Adults returning to the Hood River will be a priority and used as soon as they become available in adequate numbers.

The hatchery production program seeks to maintain the genetic character of the natural 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, however, 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 (Umatilla Hatchery Master Plan 1989). When possible, naturally produced fish will be used as broodstock. If severe shortages of males or constraints in the adult holding facilities results in the need to collect more

[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 of the breeding population.

females than the above ratios, a gamete split-cross fertilization scheme will be followed.[2] This will avoid the situation whereby a highly viable male dominates egg fertilization.

Sections of the Oregon Administration Rules (OAR) for salmon management and hatchery operations will be referenced to provide detailed guidelines for hatchery practices. These OAR's require protection of genetic variability and provide for supplementation of depressed stocks.

Outplanting Strategies

It is the goal of the monitoring and evaluation program to identify and develop rearing and release strategies that 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.

Fish Health Management

The use of hatcheries as an effective management tool is limited many times due to fish disease concerns. Today, fish health management is receiving more attention and is a major factor influencing current hatchery practices.

The prevention and control of disease in hatchery fish will receive a high priority in the Hood River Program. Guidelines of the Pacific Northwest Fish Health Protection Committee (Umatilla Hatchery Master Plan 1990) provide a basis for the fish health regulations under which the hatchery will operate. Additional state regulations, laws, and Administrative Rules have been developed by the State of Oregon to ensure proper fish health management. Fish immunogenetic defense systems are often species- and stock-specific, providing an argument for using native or closely related salmonid stocks for hatchery broodstock (Steward and Bjorn 1990).

Particular attention must be given to viral diseases because they are not treatable 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 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 hatchery. Plainly stated, the best way to avoid viral contamination in a hatchery is to make sure that none is inadvertently introduced with fish, eggs or water.

The Yakima/Klickitat Master Plan (1989) also states that:

> "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. Broodstocks 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

[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.

as bacterial gill disease and costasis have been transferred into hatcheries on eggs. The more known about the stocks to be transferred the better.

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

Coordination

The HRPP will operate in compliance with all current and applicable ODFW policies (i.e., wild fish management policy; disease policy).

Hatchery procedures for anadromous stocks will be in compliance with current applicable ODFW regulations (i.e., Manual for Fish Management 1977; A Department Guide for Introductions and Transfers of Finfish into Oregon Waters 1982) and other basin-wide guidelines.

MANAGEMENT STRUCTURE AND PROCESSES

Introduction

The fishery management agencies (CTWS and ODFW) with the assistance of BPA, have established a viable project management structure to oversee the development of the project and insure its coordination with other related efforts (Figure 2). It should be emphasized that the focus of this management structure is on implementation (i.e., constructing, operating, and evaluating the program), not program planning or fishery management oversight, although these latter functions clearly play major roles in the process.

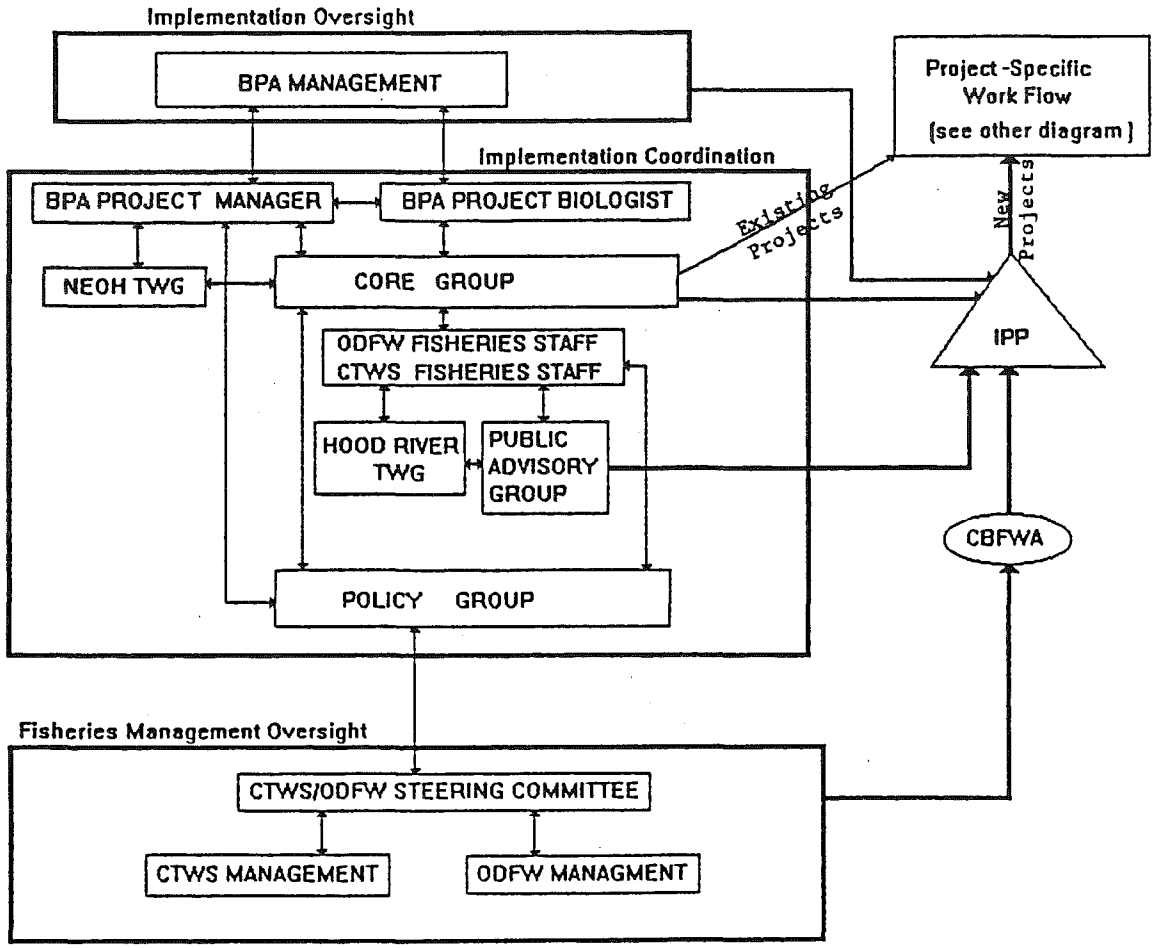


Figure 2. Hood River Implementation Coordination Structure

Two basic activities must be integrated to achieve acceptable implementation of the HRPP project: implementation and fishery management oversight. BPA is authorized by, and ultimately responsible under law to see that the program is implemented. The fishery resource managers (CTWS and ODFW) for the Hood River Subbasin 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 Northwest Power Planning Council is responsible to plan and ensure 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, CTWS, ODFW and others first submit program proposals, the Council then approves a program measure, and finally, 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.

At various predetermined milestones in the project, 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. BPA's role is to establish funding for facility construction, and operation and maintenance of the projects upon approval by the Council. These services are obtained through contracting procedures, after considering input from Council and managing entities regarding project scope, objectives, timing, duration, costs, etc.

TWG'S: The Working Level

The working level where the above generic process plays out is the Technical Work Group (TWG) process. Project TWG's guide the planning, implementation, operations, and evaluations of projects and make recommendations on policy matters. Although the term "core group" is used, this term actually describes the project coordination functions of the key policy/implementation level participants: BPA, CTWS and ODFW. 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 staff assigned to the project that represents the organization on policy and technical matters. Generally, the TWG's role is to (1) set objectives/define scope of project consistent with the Program, (2) establish a project start date and schedule, (3) review interim products such as preliminary design, (4) establish operational parameters and monitor operations, and (5) define O&M requirements. BPA needs this input in order to ensure that fishery management decisions are integrated into the implementation process. The Council needs to monitor program consistency and TWG's are excellent vehicles for that.

A few operational procedures have been developed to enhance the ability of TWG's to serve their function. First, TWG participants are expected to represent their agencies on all matters related to the project and public concerns. It is understood that decision-making 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 TWG's are used to solicit input to make decisions about how to implement the project.

In sum, the TWG's constitute the working level where fishery managers, program overseers, and implementers jointly coordinate and communicate regarding the subject projects. Interested parties are also encouraged to participate in communicating their concerns at this level.

The core entities, by virtue of their responsibilities, are the principal members of a number of TWG's responsible to plan, manage and communicate regarding related basin activities.

Policy Considerations

As stated above, the most efficient level for project management is the lowest working level, in this case, the TWG'S. Although the TWG'S does not function specifically as a policy group, it can serve as the forum where policy decisions are communicated and factored into the management plan.

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 interested sportsmen and environmental groups want to be involved at the earliest practical phase so that their concerns are heard. The implementing and managing entities want to know about concerns early enough to accommodate them into the project, if possible. Also, it is more effective to resolve problems early and informally. Ideally, interest groups will participate as observers/commentators on specific TWG's, because this is the working level at which projects are formulated and carried out.

Therefore, an Advisory Group will be established at the TWG'S level as a forum for communicating and considering interest group concerns. Functionally, the Core Group will share project information, generated in TWG's 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'S review period established for the particular circumstances.

The Core Group will seek input on material such 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 proposes 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.

PRODUCTION PROFILES

Introduction

Re-establishing the spring chinook population and rebuilding steelhead populations in the Hood River will require the use of hatchery production facilities proposed as part of the HRPP. The intent of the hatchery program is to annually supplement streams with hatchery fish until the hatchery and natural adult return goals are achieved. Once these levels are obtained and the naturally produced populations become self-sustaining, hatchery supplementation will be adjusted accordingly. It is expected that this process will take many years and will undoubtedly require adjustments and changes to the approach developed in this plan.

This section describes plans for the use of hatchery production to achieve the desired adult return goals in the subbasin. An overview of the production history, detailed production profiles, supplementation strategies, and broodstock management is presented for each species.

This plan identifies the initial phase of an evolutionary program and may not reflect the long-term production program. As this program develops 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. The survival rates used to determine the hatchery production level required to achieve the natural and hatchery adult run size goals are best estimates only. 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 rates will be adjusted. This in turn may require appropriate changes in the hatchery production plans presented in this document.

CTWS and ODFW have established goals for adult returns of anadromous salmonids to the Hood River mouth. These goals include returns of 1,700 spring chinook, 8,000 summer steelhead, and 5,000 winter steelhead to be achieved through release of smolts produced for the HRPP (Table 2).

The goals include both a naturally produced adult return and a hatchery-produced adult return. The buildup rate for summer steelhead will be accelerated due to the current level of the natural steelhead population and the existing hatchery supplementation program. Re-establishing spring chinook and rebuilding winter steelhead populations will take longer since the wild spring chinook population is extinct and the winter steelhead population is believed to be at a low level. Although the HRPP is currently focused on spring chinook, and summer and winter steelhead, the potential also exists for future enhancement of other anadromous species, such as fall chinook and coho.

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. As will be discussed, the entire smolt requirement will initially be released in order to achieve run size goals for spring chinook, and summer and winter steelhead. Initially, summer and winter steelhead will be reared at at Oak Springs Hatchery and spring chinook will be reared at Round Butte Hatchery (i.e., Pelton Ladder) (Table 3).

It should be emphasized that the production profiles shown 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 CTWS and ODFW.

Table 2. CTWS/ODFW run size goals and anticipated adult returns from hatchery releases of spring chinook, and summer and winter steelhead in the Hood River Subbasin.

	---- Run Size Goal[a] ----			------- Adult Returns -------			
Species	Natural	Hatchery	Total	Existing	5 year[b]	10 year	15 year
ChS	400	1,300	1,700	<100[c]	1,400	1,700	1,700
StS	1,200	6,800	8,000	<5000	8,000	8,000	8,000
StW	1,200	3,800	5,000	<800	2,000	4,000	5,000
ChF[d]	1,200	N/A	1200	<300	600	600	600
Co	600	N/A	600	<300	600	600	600
Total	4,600	11,900	16,500	6,500	12,600	14,900	15,900

[a] Hatchery and wild adult returns to Hood River.
[b] Number of years after the anticipated completion of the Hood River facility.
[c] Adult returns from Carson smolt releases.
[d] Goals as established in system planning. Increases are assumed from the anticipated screening and habitat improvements.

Table 3. Initial smolt production profile for the HRPP[a]

	Oak Springs		Pelton Ladder[b]		Bonneville	
Species	Numbers	Pounds	Numbers	Pounds	Numbers	Pounds
ChS	-	-	125,000	13,889	125,000	13,889
StS	150,000	30,000	-	-	-	-
StW	85,000	17,000	-	-	-	-
Total	235,000	47,000	125,000	13,889	125,000	13,889

[a]Initial stages of production may be less than stated goals
[b]Round Butte Hatchery, Deschutes River

Spring Chinook Production

Production History

The native spring chinook run in the Hood River is extinct. Adult returns of Carson smolt releases exist in the Hood River today. Historically, it was assumed that the Hood River spring chinook spawned in the West Fork of Hood River and its tributaries. No spring chinook spawning has ever been observed between the mouth of the Hood River and Powerdale Dam. Summer flows in this section of the river would often drop to 50 cfs during the 1960s and early 1970s. These low summer flows precluded any spring chinook from over-summering in this area.

The Oregon State Game Commission operated an adult migrant trap at Powerdale Dam from 1963-1971. It was assumed that prior to the December 1964 flood, the adult counts were not 100 percent complete since fish could successfully negotiate the dam spillway at certain flows. However, following the 1964 flood, all adult chinook were forced to pass through the fish trap. Therefore, the 1965-1971 counts are considered to be made with 100 percent accuracy (personal communication, Jim Newton, ODFW, The Dalles).

On September 1, 1961, a glacial lake on the northwest flank of Mount Hood burst. The ensuing flood traveled down Ladd Creek and devastated nearly all of the West Fork of the Hood River. A large quantity of glacial silt, estimated to be 60 percent silt and 40 percent water, entered the West Fork of the Hood River killing large numbers of fish. This unusual flood event may have severely impacted the Hood River spring chinook population.

Angler salmon harvest data from the Hood River is limited to catch recorded on salmon/steelhead tags. From 1977 through 1979, the estimated sport harvest of spring chinook ranged from 0 to 41 salmon (Table 4). However, close scrutiny of this catch information revealed that the majority of this catch was made during the late summer and fall. Therefore, most of the catch is likely misidentified fish that could well have been steelhead, coho or fall chinook salmon.

Table 4. Sport harvest of spring chinook in the Hood River Subbasin, 1977-1989[a]

Year	Sport Catch
1977	3
1978	0
1979	3
1980	15
1981	9
1982	6
1983	12
1984	3
1985	4
1986	11
1987	0
1988	8
1989	41

[a]Estimates are from punch card returns (adjusted for non-response bias)

Based on the escapement of spring chinook above Powerdale Dam from 1965-1971, it is apparent that the Hood River native spring chinook population is extinct. During this seven year period only four spring chinook passed through the Powerdale Dam fishway (Table 5). For five consecutive years (1965-1969), the escapement of spring chinook ranged from 0 to 1 fish per year.

Table 5. Escapement of adult spring chinook past Powerdale Dam, 1963-1971

Year	Escapement
1963	22
1964	15
1965	0
1966	0
1967	1
1968	0
1969	1
1970	2
1971	0

The occasional spring chinook caught by anglers in recent years is likely strayed from other Columbia River populations (i,e, Carson stock). Possible returns from STEP volunteer hatchbox releases of unfed Carson stock spring chinook fry from 1984 to 1990 could also explain some of the returns caught by anglers in recent years (Jim Newton, ODFW, The Dalles, personal communication).

Life History Information

No quantitative and very little qualitative life history information exists on the extinct native spring chinook in the Hood River Subbasin. Spring chinook probably returned to the basin during April and May, primarily as 4-year-old fish and spawned from late August through late September. The fry likely emerged between mid-February and mid-April and the smolts migrated as age 1+ juveniles between early March and mid-June the following year.

No data is available on the age structure, sex ratio, length-weight ratio, fecundity, or egg-to-smolt and smolt-to-adult survival rates for historic native spring chinook in the Hood River Subbasin.

Based on estimates of low sport harvest for the years 1977-1985 (Table 4) and extremely low or nonexistent escapement past Powerdale Dam from 1963 through 1971 (Table 5), it has been determined that the native spring chinook run is extinct.

No data is currently available to accurately estimate the smolt production capacity for the drainage.

Hatchery Production

Supplementation History

Approximately 92,690 unmarked Carson stock fingerlings were planted in the Hood River in 1986. In 1988, a five-year hatchery supplementation program was implemented to supplement the Hood River Subbasin with spring chinook smolts (Carson stock). The first years brood release (1986 brood) totaled 149,939 smolts of which approximately 36 percent were marked. The existing program (1988-1991) calls for an annual release of approximately 120,000 to 150,000 spring chinook smolts into the drainage. In addition to the smolt releases, hatchbox fry have been released as part of STEP (Appendix E).

Production Profile

The planned spring chinook smolt production numbers are the basis for determining broodstock requirements and facility designs for the Hood River Production Plan. The smolt production requirements are based upon survival and fecundity information obtained from SPM of the Hood River Subbasin Plan (Table 6). Assuming a smolt-to-adult survival of 0.68 percent, it will require hatchery production of 250,000 smolts to achieve the run size goal of 1,700 spring chinook adults. Therefore, based on the survival and fecundity estimates listed below, approximately 200 adults would need to be collected for broodstock (Table 7).

Table 6. Spring chinook survival and fecundity estimates for the HRPP

Life History Stage	Estimated Survival	Source
Adult Prespawning	0.80	Hood River Subbasin Plan
Egg-to-Smolt	0.75	Hood River Subbasin Plan
Smolt-to-Adult	0.0068	Hood River Subbasin Plan
Fecundity	4,300 eggs/female	Hood River Subbasin Plan

Table 7. Spring chinook smolt, egg, spawner, and broodstock collection requirements for the HRPP

Life Stage	Estimated Numbers Required
Smolts	250,000
Eggs	335,000
Female spawners = # eggs/4,300	80
Females /males surviving to spawn	160
Adults to hold	200

All future hatchery releases of spring chinook will be of Deschutes stock from Round Butte Hatchery (Pelton Ladder Master Plan 1990). The Hood River Subbasin Plan was amended to incorporate the use of Deschutes stock spring chinook instead of Carson stock in all future outplantings. The Deschutes stock is preferred by the managers as it is a more locally adapted stock with relatively high survival rate. According to Bams (1976) and Reisenbichler (1981), locally adapted fish, when used to establish and maintain hatchery stocks, are likely to be better for supplementation than are fish from other populations. This change is consistent with ODFW's Natural Production/Wild Fish Management Policy (1990). Deschutes stock has been approved for use in the Hood River by ODFW pathologists, provided the proposed production fish are checked for disease prior to release.

Rearing Strategies

Artificial incubation and rearing of fish should parallel the biological life stages and timing of naturally produced fish. One-half of the smolts will be reared at an existing hatchery and the remaining 125,000 smolts will be reared at the Pelton Ladder (Pelton Ladder Master Plan 1990). The most widely used and successful release size for spring chinook is yearling smolts. The size range of most yearling smolts being released from hatcheries near the Hood River Subbasin (Bonneville Hatchery, Round Butte Hatchery) is between 5 and 10 fish per pound. Time of release is during the spring. Finally, the most common methods of release are directly into the stream, either from a liberation truck or from the acclimation site.

The proposed rearing and time of release strategy for the Hood River spring chinook program is as follows:

Age	Number	# fish/lb	Release time
1+	125,000	9 - 10	May - June (Acclimated)
1+	125,000	9 - 10	April - May (Non-Acclimated)

The optimum size and time for release of spring chinook juveniles in the Hood River is currently unknown. Initially, non-acclimated smolts will be released in April and May since it is felt that this is the normal migration period for spring chinook and should result in the highest survival. The remaining releases will be volitional at the proposed acclimation/recovery ponds at Powerdale Dam. Each group of the acclimated and non-acclimated smolts will contain smolts reared at both the Pelton Ladder and Bonneville Hatchery.

Release Sites

Selection of release sites in the Hood River Subbasin are dependent on (1) water resources (quantity and quality), (2) physical access to area, (3) climatic conditions, (4) physical terrain, and (5) land ownership and availability. Prior to 1987, release sites for spring chinook were located near traditional holding and spawning waters in the Hood River Subbasin.

Release sites for spring chinook were selected to support the planned monitoring and evaluation studies and to achieve the production, harvest and natural escapement goals established by ODFW and CTWS. Time and location of release are important in supplementation of wild stocks because those two factors can help regulate the extent and magnitude of interactions between hatchery and wild fish (Steward and Bjorn 1990). Fifty percent of the smolts will be released into the West Fork of Hood River. Possible release sites include Dry Run Bridge, Lake Branch (a tributary of the West Fork), and Twin Bridges at the confluence of Elk and McGee creeks. The remaining smolts will be held in acclimation ponds at Powerdale Dam for a maximum of four weeks.

Road improvements or winter snow removal may be planned for access to the West Fork at Dry Run Bridge or Lake Branch.

It is the goal of the monitoring and evaluation program to identify and develop rearing and release strategies that 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 between anadromous species, to minimize impacts to resident fish, and to provide information necessary to determine the most effective hatchery release strategies and locations. Release of smolts will occur below diversions until the diversions are screened.

Smolt releases should be made so that a portion of the release can be monitored at an Powerdale Dam. The remainder of the smolts could potentially be released directly from the acclimation facility.

Broodstock Management

Broodstock from Deschutes stock (i.e., Round Butte Hatchery) will be used for all future supplementation. This stock will be used until a natural run can be developed (approximately two life cycles). The use of Deschutes stock is favored by management entities because of its close proximity to the Hood River Subbasin. After a natural run has been established, a minimum of 10 percent of the hatchery broodstock will be comprised of naturally produced spring chinook. Jack and adult spring chinook returning to Hood River Subbasin will be collected and enumerated at an adult trapping facility to be located at Powerdale Dam. If the number of jacks and adults collected from the Hood River run of natural spring chinook is insufficient to meet the needs for natural broodstock, then the remaining broodstock will be collected from the hatchery run.

Broodstock Acquisition

The eventual goal is to collect all spring chinook broodstock from Deschutes stock returns to the basin. Once the natural run is established, supplementation of the natural run with hatchery fish will be done in compliance with the Oregon Wild Fish Management Policy (1990).

Broodstock acquisition of returning natural and hatchery stocks will occur by trapping fish at Powerdale Dam and transporting them to an adjacent holding facility to mature and later be spawned.

The last group of adult spring chinook from the 1991 Carson stock release should return to the mouth of the Hood River in 1995. Deschutes stock spring chinook could be released into Hood River as early as 1993. Offspring of the Carson releases that spawned naturally will not be marked and after 1995, Carson offspring will not be allowed to migrate past Powerdale Dam.

The 1997 run year will mark the first year that Deschutes stock returns will be of all age classes. Some of these marked returns will be allowed to migrate past Powerdale Dam. By not allowing the Carson stock offspring to spawn naturally with the Hood River stock, the Hood River stock can develop without the influence of other hatchery fish. The last possible year for any Carson stock offspring to return is 1999. After this, all unmarked returns will be assumed to be offspring of Deschutes stock spring chinook that migrated past Powerdale Dam and spawned naturally. Table 8 describes this scenario.

All Deschutes stock spring chinook released into the Hood River will be marked. The Carson stock spring chinook not allowed to migrate past Powerdale will be removed from the river and may be recycled through the lower river to provide additional harvest opportunity.

Table 8. Time frame for eliminating the Carson stock and re-establishing a natural run of spring chinook in Hood River using Deschutes stock

CARSON STOCK	DESCHUTES STOCK
YEAR	YEAR
1991 Last Release of Carson Stock	1991
1992	1992
1993 3 yrs	1993 1st Deschutes Stock Release[1]
1994 4 yrs	1994 2nd Release
1995 5 yrs	1995 3 yrs 3rd Release
1996[2] Prevent Carson Stock returns from migrating past Powerdale Dam.	1996 4 yrs 3 yrs 4th Release
1997	1997[3] 5 yrs 4 yrs 3 yrs 5th Release
1998	1998 5 yrs 4 yrs 3 yrs 4
1999	1999 5 yrs 4 yrs 3 yrs
2000	2000 [4]

[1]First year of Deschutes stock spring chinook in Hood River. These fish are to have an externally visible mark.
[2]Possible returns of naturally spawned Carson stock (unmarked) 1996-1999.
[3]First year of Deschutes stock returns of all age classes. Some marked returns will be allowed to migrate past Powerdale Dam to develop a naturally spawning run of spring chinook.
[4]Assume unmarked spring chinook returns to be Deschutes stock. These fish will be allowed to migrate past Powerdale Dam to develop a naturally spawning run.

Broodstock Selection

The eventual goal for Hood River spring chinook is to collect all the broodstock from adults returning to the basin. Broodstock, whether from in-basin or Deschutes stock, should be collected over the entire run. The spawners should represent the entire cross-section of the run. These and other criteria should be considered in the location of broodstock collection sites.

Summer Steelhead Production

Production History

Little information is available on the current status of summer steelhead in the Hood River Subbasin. However, based on sport harvest estimates (Table 9) and escapement past Powerdale Dam (Table 10), it is assumed that the Hood River Subbasin supports a moderate run of summer steelhead that is in fair condition. Based on the limited information available on the spatial distribution of the population, it is believed that summer steelhead are generally distributed throughout the entire drainage but primarily spawn and rear in the Hood River mainstem and West Fork drainage.

Table 9. Sport harvest of natural and hatchery summer steelhead in the Hood River Subbasin[a]

Run Year	Sport Catch
1977-78	1,770
1978-79	3,064
1979-80	1,105
1980-81	2,499
1981-82	2,854
1982-83	2,749
1983-84	2,406
1984-85	3,626
1985-86	3,745
1986-87	3,307
1987-88	3,135
1988-89	4,455
1989-90	2,546[b]

[a]Estimates are from punch-card returns (adjusted for non-response bias).
[b]1989 catch only.

Table 10. Escapement of adult summer and winter steelhead past Powerdale Dam, 1963-1971

Year	Escapement
1963	1,456
1964	1,317
1965	995
1966	2,024
1967	978
1968	870
1969	1,434
1970	504
1971	715

Life History Information

No quantitative, and very little qualitative life history information exists on summer steelhead in the Hood River Subbasin. Summer steelhead probably return to the basin from March through October, primarily as 1-salt and 2-salt fish, with the peak of the run occurring in June and July. These fish likely spawn from March through June of the following year; fry emerge in early June through late-July; and the smolts migrate between April and late June, primarily as age 2+ and 3+ juveniles.

No information is available on age structure, sex ratio, length-weight ratio, fecundity, and egg-to-smolt and smolt-to-adult survival rates for summer steelhead spawning and rearing in the Hood River Subbasin.

No data is currently available to accurately estimate the smolt production capacity for the Hood River Subbasin. The best estimate to date was developed by a technical committee comprised of personnel from the CTWS, ODFW, USFS, USFWS and NMFS. This Technical Committee estimated that the current (1989) smolt production capacity of the Hood River Subbasin is approximately 32,000 smolts (Hood River Subbasin Plan 1990). This estimate is based on a subjective evaluation of the habitat along with several assumptions about the spatial distribution of the population.

The only morphological or electrophoretic data available on summer steelhead in the Hood River Subbasin is presented in Schreck et al. (1986).

Hatchery Production

Supplementation History

Hatchery summer steelhead smolts have been released into the Hood River Subbasin for the last 33 years (Appendix B). These hatchery releases are intended to provide harvest opportunities and supplement the naturally spawning steelhead population in the Hood River. The number of smolts released has ranged from 1,800 to 185,510. During the late 1960s, adult summer steelhead were also released into the basin: 500 adults in 1968 and 262 adults in 1969 (Appendix D).

Although all hatchery steelhead smolts released into the Hood River Subbasin since 1984 have been marked, there has never been a study to evaluate the success or failure of the program. Limited information gathered from volunteer angler scale samples does indicate, however, that the hatchery summer steelhead do provide significant contributions to the fisheries and spawner escapement.

The present hatchery program calls for an annual release of 80,000 to 100,000 marked, hatchery summer steelhead smolts into the basin. These hatchery releases are intended to provide tribal and sport harvest opportunities and help supplement the basin's naturally spawning steelhead population.

Production Profile

The planned summer steelhead smolt production numbers are the basis for determining broodstock requirements and facility designs for the Hood River Production Plan.

The smolt production requirements are based upon survival and fecundity information obtained from System Planning Model of the Hood River Subbasin Plan. Smolt-to-adult survival is estimated to be 4.5 percent (Table 11). In order to return 6,700 summer steelhead adults, hatchery production of 150,000 smolts is required. Therefore, based on the survival and fecundity estimates listed below, approximately 165 adults would need to be collected for broodstock (Table 12).

Table 11. Summer steelhead survival and fecundity estimates for the HRPP

Life History Stage	Estimated Survival	Source
Adult Prespawning	0.80	Hood River Subbasin Plan
Egg-to-smolt	0.655	Hood River Subbasin Plan
Smolt-to-adult	0.045	Hood River Subbasin Plan
Fecundity	3500 eggs/female	Hood River Subbasin Plan

Table 12. Summer steelhead smolt, egg, spawner, and broodstock collection requirements for the HRPP

Life Stage	Estimated Numbers Required
Smolts	150,000
Eggs	230,000
Female spawners = # eggs/3500	66
Females/males surviving to spawn	132
Adults to hold	165

Rearing Strategies

Ideally, artificial incubation and rearing of fish should take approximately nine months. The most widely used and successful release size for summer steelhead is age 1 (personal communication, Jim Newton, ODFW, The Dalles). The size range of most yearling smolts released from past supplementation was between 5-10 fish per pound (Appendix B). Time of release is during the spring. Finally, the most common methods of release will be into the stream, either directly from a liberation truck or from the acclimation site located at Powerdale Dam.

The proposed rearing and time of release strategy for the Hood River summer steelhead program is as follows:

Age	Number	# fish/lb	Release Time
1	75,000	5	April - May (Non-acclimated)
1	75,000	5	April - May (Acclimated)

Release Sites

Selection of release sites in the Hood River Subbasin are dependent on (1) water resources (quantity and quality), (2) physical access to area, (3) climatic conditions, (4) physical terrain, and (5) land ownership.

Release sites for summer steelhead are located near traditional holding and spawning waters in the Hood River Subbasin.

Release sites for summer steelhead were selected to support the planned monitoring and evaluation studies, and to achieve production, harvest and natural escapement goals established by ODFW and CTWS. Fifty percent of the smolts will be released directly into the West Fork of the Hood River. Possible sites include Dry Run Bridge, Lake Branch--a tributary of the West Fork, and Twin Bridges at the confluence of Elk and McGee creeks on the West Fork. The remaining smolts will be held in acclimation ponds at the Powerdale Fish Facility for three to four weeks.

It is the goal of the monitoring and evaluation program to identify and develop rearing and releasing strategies that avoid the creation of adverse interactions between hatchery and naturally produced anadromous stocks and resident fishes. 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 and locations. Release of smolts will occur below diversions until the diversions are screened.

Broodstock Management

Originally the Hood River broodstock was used for supplementation. However from 1974 to 1991, summer steelhead smolt outplants were acquired from the South Santiam (Skamania) stock (Appendix B). Hatchery broodstock for the HRPP will be collected from both the Hood River Fish Facility hatchery returns and natural segments of the summer steelhead run returning to the Hood River.

After the natural escapement and broodstock collection goals are achieved, the remaining fish may be recycled through the lower river to provide additional harvest opportunities.

Broodstock Acquisition

Broodstock acquisition of returning natural and hatchery stocks will occur by trapping fish at Powerdale Dam. Naturally produced summer steelhead will be allowed to migrate above Powerdale Dam. Hatchery summer steelhead can comprise a maximum of 50 percent of the naturally spawning population (Oregon Wild Fish Management Policy 1990). Hatchery returning adults will be transferred to holding ponds where they will be allowed to mature, and then eventually spawned. After a natural run is established, a minimum of 10 percent of the hatchery broodstock will be comprised of naturally produced summer steelhead.

Broodstock Selection

Hatchery programs can affect genetics by initial broodstock selection and spawning practices. For the Hood River program, broodstock selection will be determined by the numbers of each summer steelhead stock available in the basin. Broodstock will be selected from existing sources, then from natural and hatchery stocks returning to the drainage.

The eventual goal for Hood River summer steelhead is to collect all broodstock from adults returning to the basin. Broodstock should be collected over the entire run. The spawners should represent the entire cross-section of the run. These and other criteria should be considered in the location of broodstock collection sites.

Winter Steelhead Production

Production History

Little information is available on the current status of winter steelhead in the Hood River Subbasin. However, based on sport harvest estimates for the years 1977 through 1989 (Table 13) and escapement past Powerdale Dam for the years 1963 through 1971 (Table 14), it is assumed that the winter steelhead run has declined significantly in recent years and may be headed towards extinction.

Based on what limited information is available on the spatial distribution of the population, it is believed that winter steelhead are generally distributed throughout the entire drainage, but primarily spawn and rear in the mainstem and its tributaries (excluding the West Fork), and in the Middle and East fork drainages.

Table 13. Sport harvest of winter steelhead in the Hood River Subbasin, 1977 - 1989[a]

Run Year	Sport Catch
1977-78	1,593
1978-79	860
1979-80	1,258
1980-81	2,451
1981-82	1,690
1982-83	1,053
1983-84	383
1984-85	578
1985-86	591
1986-87	713
1987-88	835
1988-89	417
1989-90	84[b]

[a]Estimates are from punch-card returns (adjusted for non-response bias)
[b]1989 catch only

Table 14. Escapement of adult summer and winter steelhead past Powerdale Dam, 1963-1971

Year	Escapement
1963	1,456
1964	1,317
1965	995
1966	2,024
1967	978
1968	870
1969	1,434
1970	504
1971	715

Life History Information

No quantitative and very little qualitative life history information exists for winter steelhead. It is assumed that winter steelhead have a life history cycle similar to that of winter steelhead located in lower Columbia River subbasins. Winter steelhead likely return to the drainage from November through March, primarily as 1-salt and 2-salt fish, with the peak of the run occurring between December and January. These fish would spawn from December through March; fry would emerge through early June and mid-July; and smolts would migrate from April to May, primarily as age 2+ and 3+ juveniles. No information is available on age structure, sex ratio, length-weight ratio, fecundity, and egg-to-smolt and smolt-to-adult survival rates for winter steelhead spawning and rearing in the Hood River Subbasin.

Data is currently unavailable to accurately estimate the smolt production capacity for the drainage. The best estimate to date estimates the current smolt capacity at approximately 31,000 smolts (Hood River Subbasin Plan 1990).

Hatchery Production

Supplementation History

Hatchery winter steelhead smolts have periodically been released into the Hood River Subbasin since 1962 (Appendix C). Annual hatchery releases have ranged from 26,250 to 400,365 unmarked fingerlings (1962 through 1976) and 23,872 to 99,235 unmarked smolts (1978 through 1986). Hatchbox fry have been released as part of STEP since 1985 (Appendix E). In 1966 and 1967, a total of 427 adult winter steelhead were also released into the basin.

Production Profile

Winter steelhead smolt production requirements are based upon survival and fecundity information obtained from the Hood River Subbasin Plan and US v. Oregon proceedings. Smolt-to-adult survival is estimated to be 4.5 percent (Table 15). In order to return 5,000 winter steelhead adults, hatchery production of 85,000 smolts is required. Therefore, based on the survival and fecundity estimates listed below, approximately 90 adults would need to be collected for broodstock (Table 16).

Table 15. Winter steelhead survival and fecundity estimates for the HRPP

Life History Stage	Estimated Survival	Source
Adult prespawning	0.850	Hood River Subbasin plan
Egg-to-smolt	0.655	Hood River Subbasin plan
Smolt-to-adult	0.045	Hood River Subbasin plan
Fecundity	3,500 eggs/female	Hood River Subbasin plan

Table 16. Winter steelhead smolt, egg, spawner, and broodstock collection requirements for the HRPP

Life Stage	Estimated Numbers Required
Smolts	85,000
Eggs	130,000
Female spawners = # eggs/3,500	38
Females/males surviving to spawn	76
Adults to hold	90

Rearing Strategies

Ideally, artificial incubation and rearing of fish should be similar to that of summer steelhead (about nine months). The most widely used and successful release size for winter steelhead is age 1. The size range of most yearling smolts being released from hatcheries is between 5-10 fish per pound. Time of release is during the spring. Finally, the most common methods of release are directly into the stream, either from a liberation truck or from the acclimation ponds at Powerdale Dam.

The proposed rearing and time of release strategy for the Hood River winter steelhead program is as follows:

Age	Number	# fish/lb	Release time
1	85,000	5	April - May (Non-acclimated)

Release Sites

Selection of release sites in the Hood River Subbasin are dependent on (1) water resources (quantity and quality), (2) physical access to area, (3) climatic conditions, (4) physical terrain, and (5) land ownership. Release sites previously used for winter steelhead (Appendix C) will be used as these locations are near the historical distribution of winter steelhead.

Release sites for winter steelhead were selected to support the planned monitoring and evaluation studies and to achieve production, harvest and natural escapement goals established by ODFW and CTWS. Fifty percent of the smolts are to be released at two different sites. Possible release sites include below Toll Bridge and the HW 35 bridge near Robin Hood Campground on the East Fork; the Middle Fork of the Hood River near Red Hill Road Bridge; or Lake Branch Creek below Clear Branch Dam. The lower sites in the East Fork will be used until the East Fork diversion intake is properly screened.

It is the goal of the monitoring and evaluation program to identify and develop rearing and releasing strategies that 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 and locations.

Broodstock Management
Annual winter steelhead smolt outplants have been acquired from the Big Creek stock of winter steelhead. Hatchery broodstock will eventually be collected from both hatchery and natural segments of the winter steelhead run returning to the Hood River. After natural escapement and broodstock collection goals are met, the remaining fish may be recycled through the lower river to provide additional harvest opportunity.

Broodstock Acquisition
Broodstock acquisition of returning natural and hatchery stocks will occur by trapping fish at Powerdale Dam. Naturally produced winter steelhead will be allowed to migrate above Powerdale Dam. Hood River hatchery winter steelhead can contribute a maximum of 50 percent of the naturally spawning population (Oregon Wild Fish Management Policy 1990). Hatchery-returning adults will be transferred to holding ponds, allowed to mature, and eventually spawned. After a natural run has been established, a minimum of 10 percent of the hatchery broodstock will be comprised of naturally produced winter steelhead.

Broodstock Selection
Hatching programs can affect genetics by initial broodstock selection and spawning practices. For the Hood River program, broodstock selection will be determined by the numbers of winter steelhead available in the Hood River. Broodstock will be selected from existing (current) sources, then from natural and hatchery stocks returning to the drainage.

The eventual goal for the Hood River winter steelhead is to collect all broodstock from adults returning to the basin. Broodstock should be collected over the entire run. The spawners should represent the entire cross-section of the run. These and other criteria should be considered in the location of broodstock collection sites.

FACILITIES NEEDED TO IMPLEMENT PLAN

Introduction

As outlined in the previous sections, this plan calls for the production and release of approximately 500,000 smolts in the Hood River Subbasin. The specific facilities needed to implement this plan are:

- Adult trap/counting facility
- Adult holding ponds
- Egg collection facility
- Short-term egg incubation facility
- Rearing facilities for spring chinook, and summer and winter steelhead
- Juvenile acclimation ponds for spring chinook and summer steelhead
- Release sites for non-acclimated smolts
- Juvenile migrant traps

There are presently no facilities in the Hood River Subbasin to meet the plan's production requirements. Therefore, this plan proposes building a small- to medium-sized facility to hold and spawn broodstock, incubate eggs, and acclimate juvenile fish. An area adjacent to Powerdale Dam was selected as the preferred location for these facilities. Rearing will take place at existing facilities in the Columbia River Basin.

Site Alternatives

The Hood River Subbasin is limited in potential sites for the facilities proposed for the HRPP. Most of the basin exists in a narrow, steep canyon with little flat land near the river. Most of the flat areas that do exist are found high in the subbasin.

The following is an overview of the potential sites evaluated as part of the master planning process:

Adult Trapping Alternatives

Powerdale Dam

Powerdale Dam is located at river mile 4.5. This Pacific Power and Light Company structure diverts approximately 500 cfs into the penstock of the Powerdale powerhouse (RM 1.5). Powerdale Dam is located in a narrow 'U' shaped valley just immediately downstream from the mouth of Neal Creek. The concrete dam is approximately twenty feet high. The crest of the dam is approximately 290 feet above sea level.

- Fish barrier already exists
- Fish ladder already exists
- Adequate land, water, power exists
- Adequate elevation for water intake exists
- Site is low in subbasin, no tributaries below site
- Access already exists, would have to be improved
- Some security needed as area can be accessed by the public

Punchbowl Falls
Punchbowl Falls is located on the West Fork of the Hood River (RM 0.25). The falls, formed by a basalt rock formation, is approximately twenty feet high. The falls is located in a deep narrow gorge immediately upstream from the mouth of Deadpoint Creek. The crest of the waterfall is approximately 800 feet above sea level.

- Ladder exists
- Site high in subbasin
- Access to ladder very difficult
- Vulnerable to high water
- Ladder is designed to be overtopped in flood
- Would have to hoist fish out; difficult, expensive and risky for fish

Moving Falls
The Moving Falls Fishway is located on the West Fork of the Hood River (RM 2.5). Moving Falls was a waterfall that began to form during the late 1970's. The falls formed as the result of an active head cut that quickly eroded a layer of volcanic ash underlaying an old cemented mud flow. In less than five years, the falls moved upstream two hundred yards and increased in height to fifteen feet. The top of the fishway is approximately 1000 feet above sea level.

- Would involve constructing a barrier; would have to redirect flow
- Site high in subbasin
- No electricity source currently available
- Would need to provide year-round maintenance of roads and equipment to maintain access and prevent icing of equipment.

Adult Holding Alternatives

Powerdale Dam
- Adequate elevation for water intake exists
- Adequate land available for ponds/buildings
- Electricity and water accessible
- Preliminary access already exists, would need improvements

Green Point
This site is a flat area located immediately downstream of the mouth of Greenpoint Creek, which enters the West Fork of the Hood River at approximately RM 2.0.

- Access difficult
- Moving adult fish would be difficult
- Water source is flashy
- Winter access is difficult
- No drinking water available
- No electricity
- Would have to provide year round maintenance of roads and equipment to maintain access and prevent icing of equipment.

Moving Falls
- Area vulnerable to floods
- No electrical source
- Would have to provide year round maintenance of roads and equipment to maintain access and prevent icing of equipment.

Below Powerdale Dam/East Bank

- Area is in a flood plain
- Adequate flow does not exist year round
- Adequate elevation change for intake does not exist

Rearing Site Alternatives

Oak Springs Hatchery, Deschutes River (summer and winter steelhead)

- Good water supply available
- Has capacity for HRPP
- Known to produce good quality smolts

Pelton Ladder (Round Butte Hatchery, Deschutes River) and Bonneville Hatchery (spring chinook)

- Good water supply available
- Has capacity for HRPP
- Known to produce good quality smolts

Powerdale Fish Facility, Hood River (spring chinook, summer and winter steelhead)

- Would not be necessary to transport fish to an off site rearing facility
- No other water source besides Hood River
- Possible problems with rearing water temperature

Acclimation Site Alternatives

Powerdale Dam

- Adequate land, water, electricity exists
- Adequate elevation for water intake exists
- Some access already available, would need improvements

Moving Falls

- Would involve constructing a barrier, re-route flow
- No electricity source
- Would have to provide year-round maintenance of roads and equipment to maintain access and prevent icing of equipment.

Release Sites

Potential release sites are listed below. Snow removal will be necessary at two release sites: Dry Run Bridge and Lake Branch on the West Fork of Hood River. A possible site for improvement is the West Fork Bridge. This bridge is located approximately 40 feet above the water. A pipe from the bridge to the water for releasing smolts at this site may be desirable.

Spring Chinook -	Dry Run Bridge at Lolo Pass Road crossing T. 1N, R. 9 E, Sec. 31, SWNW, W.B.M.	West Fork
	Lake Branch approximately three miles below Lost Lake T.1N, R. 7 1/2 E, Sec. 33, NWSW ,W.B.M.	West Fork

	West Fork Bridge at Lost Lake Road crossing T. 1N, R. 9 E, Sec. 22, SWNW, W.B.M.	West Fork
	Twin Bridges immediately below confluence of Elk and McGee Creeks T. 1 S, R. 7 1/2 E, Sec. 25, SWNW, W.B.M.	West Fork
Summer Steelhead -	Dry Run Bridge	West Fork
	Lake Branch	West Fork
	West Fork Bridge	West Fork
	Twin Bridges	West Fork
Winter Steelhead -	Toll Bridge Toll Bridge Park T. 1 S, R. 10 E, Sec. 2, NWNE, W.B.M.	East Fork
	Red Hill Road Bridge T. 1 N, R. 10 E, Sec. 31, NESW, W.B.M.	Middle Fork
	Others:	
	HW 35 Bridge at Robin Hood Camp Ground	East Fork
	Lake Branch Creek	Middle Fork

Alternatives also exist in operation of the facilities. Incubation of spring chinook, summer steelhead and winter steelhead eggs from the Hood River stock could occur on a short-term basis at the Hood River facility. This would allow the eggs to be isolated before transfer to a hatchery for long term incubation, thus allowing disease to be detected before the eggs could infect the hatchery facilities. This would also allow several groups of fish to be spawned and then the eggs transferred in a large group, rather than several small groups.

Incubation Alternatives

Powerdale Dam

- Short-term incubation facility at Powerdale Dam.
- Could transport fish in larger groups rather than every time fish are spawned.
- Could isolate eggs to determine any disease problems before transportation to hatchery for full term incubation.
- Would need back-up system for emergencies

Transportation immediately after spawning each group of fish

- Mileage, and salary for transportation personnel
- No need for incubation facility at Powerdale Dam

Transport adults before spawning

- Not a sound biological strategy due to disease problems
- No adult holding facilities exist at Oak Springs Hatchery

Existing Facilities

There are currently no existing production facilities within the Hood River Subbasin. The existing production program utilizes hatchery stocks from outside of the Hood River Subbasin. This master plan calls for utilizing Hood River broodstock for summer and winter steelhead and Deschutes broodstock for spring chinook.

Powerdale Dam was selected as the best location for the Hood River propagational facility as it is low in the subbasin, primitive access already exists, utilities are available and there is a constant water source.

There is an existing fish ladder at Powerdale Dam, located on the east side of the river. The fish ladder will be modified to incorporate a trapping and enumeration facility for adult fish. There is adequate land adjacent to the ladder on the east bank for holding ponds, a spawning facility, a short-term incubation facility and juvenile acclimation ponds.

Oak Springs Hatchery is currently planning to expand its facilities and plans are being created to provide room for rearing summer and winter steelhead for the HRPP. Rearing of spring chinook will occur at Pelton Ladder (Pelton Ladder Master Plan 1990) and at an existing hatchery, possibly Bonneville.

Project Site and Facilities

The proposed facility site is located on property owned by PP&L adjacent to their Powerdale Dam on the east side of Hood River, 4.5 miles from the Columbia River. Preliminary sketches and descriptions for the Hood River Fish Facility are presented in Figures 3 and 4.

Access

Pedestrian access to the site is by a pedestrian bridge across the dam. Two possible vehicular access routes are apparent. Current vehicular access is by a one-mile section of unimproved road to the south of the site. This road passes through private property. A second alternative for vehicular access is situated on private property, north of the facility site. Both would require negotiations with private landowners for access rights.

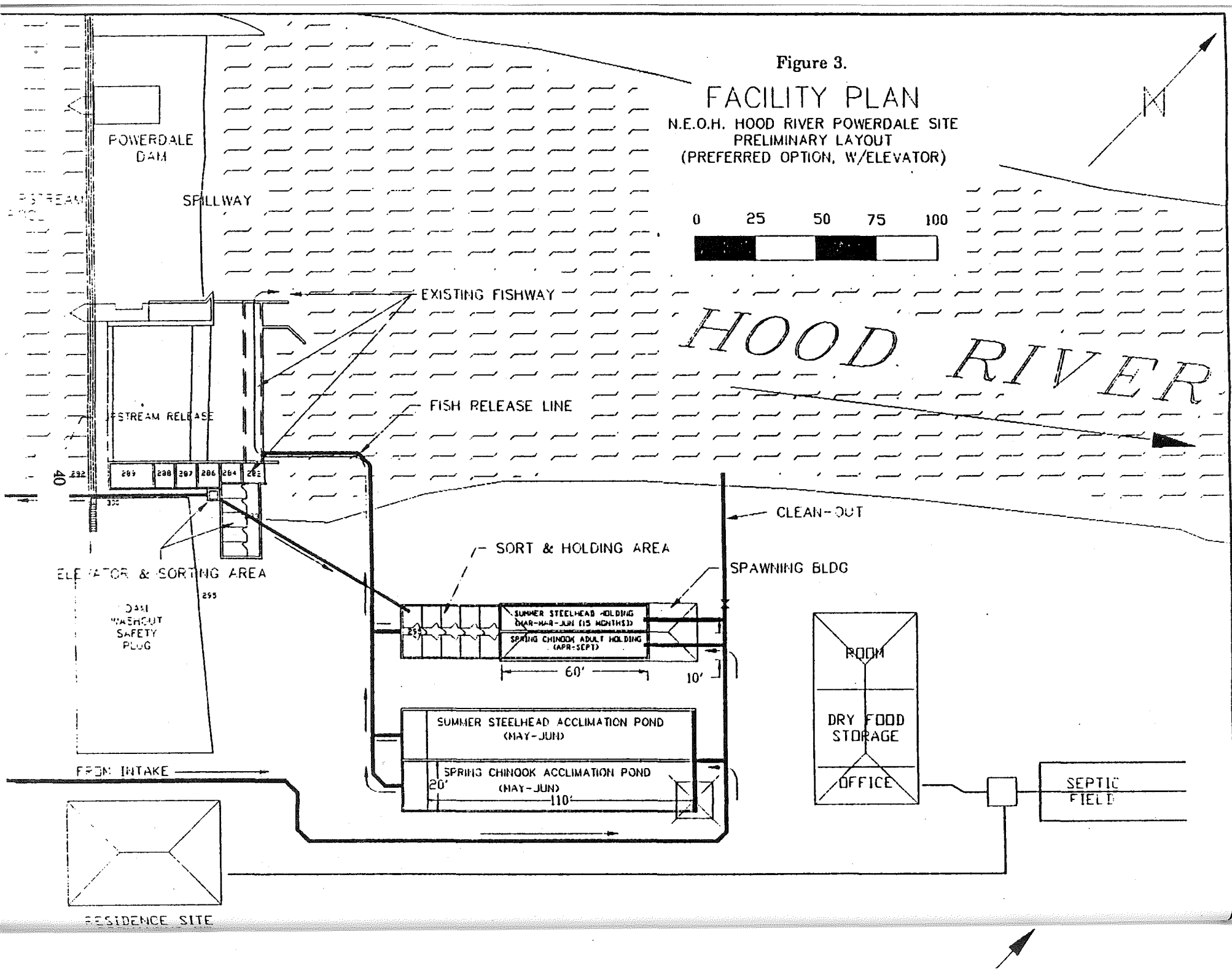
The southerly, existing vehicular access route, being in place, is preferable. The grade is 20 percent, however, which is too steep for fish liberation tankers. Therefore, this road would require some realignment and adjustment to be practical.

In addition to major alignment changes, this 6000-foot roadbed would have to be improved to handle heavy trucks.

Water Supply

The Hood River Fish Facility intake would be placed approximately 1500 feet upstream of the dam. This would provide a water source upstream of Neal Creek, a small tributary which is thought to be unsuitable for fish due to potential agricultural chemical runoff. This intake location would also provide approximately 5 feet of head between the upstream water surface and the outlet headers.

Figure 3.


FACILITY PLAN
N.E.O.H. HOOD RIVER POWERDALE SITE
PRELIMINARY LAYOUT
(PREFERRED OPTION, W/ELEVATOR)
N
0 25 50 75 100
POWERDALE DAM
SPILLWAY
EXISTING FISHWAY
HOOD RIVER
FISH RELEASE LINE
CLEAN-OUT
SORT & HOLDING AREA
SPAWNING BLDG
ELEVATOR & SORTING AREA
DAM WASHOUT SAFETY PLUG
SUMMER STEELHEAD HOLDING (MAR-MAR-JUN (15 MONTHS))
SPRING CHINOOK ADULT HOLDING (APR-SEPT)
60'
10'
SUMMER STEELHEAD ACCLIMATION POND (MAY-JUN)
SPRING CHINOOK ACCLIMATION POND (MAY-JUN)
20'
110'
ROOM
DRY FOOD STORAGE
OFFICE
SEPTIC FIELD
FROM INTAKE
RESIDENCE SITE

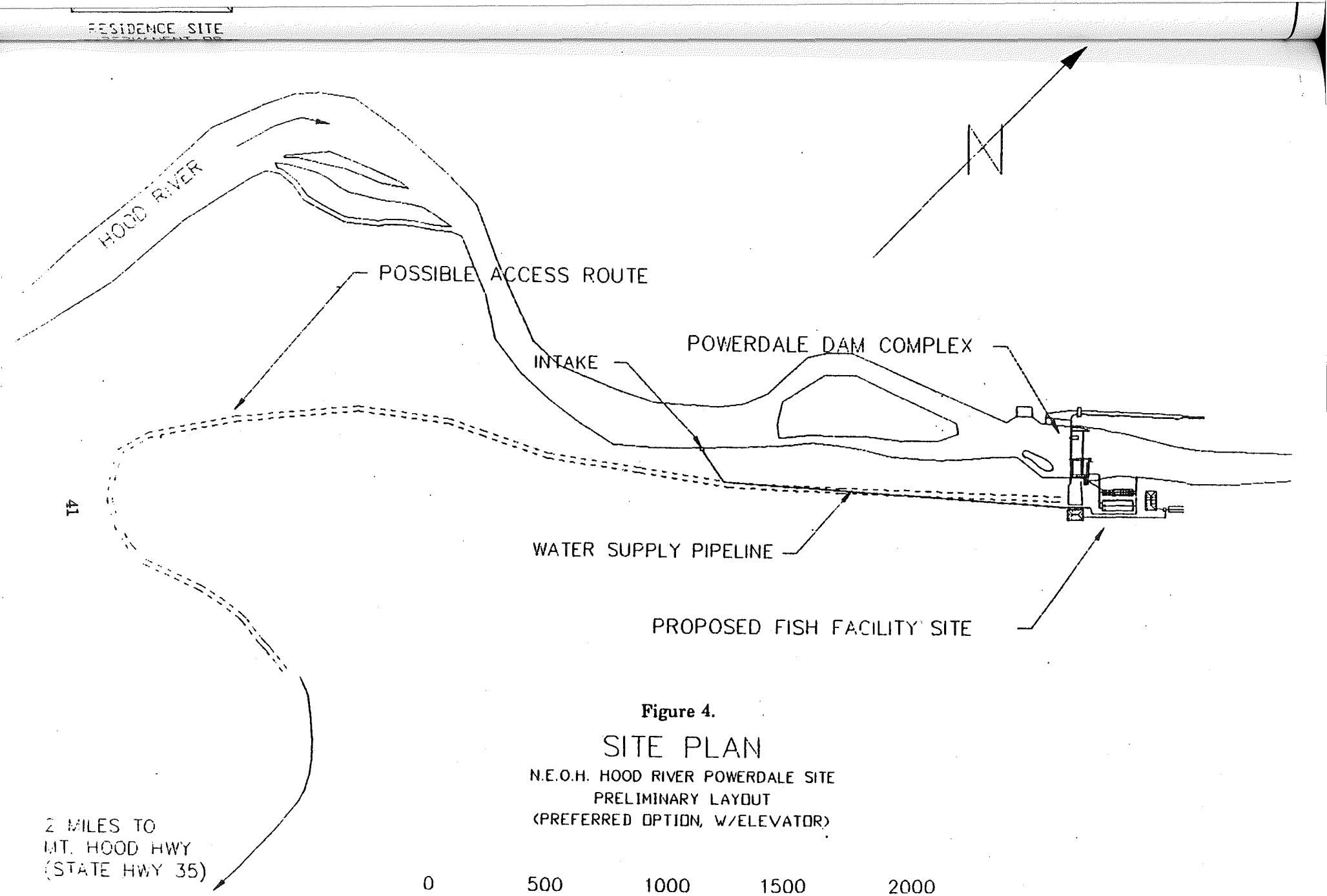


Figure 4.

SITE PLAN

N.E.O.H. HOOD RIVER POWERDALE SITE
PRELIMINARY LAYOUT
(PREFERRED OPTION, W/ELEVATOR)

The intake could be a cast-in-place concrete vault with appropriate screening and trash rack installed.

The water requirements for the fish operations are 10 cfs. Adding 20 percent for unforeseen factors, 12 cfs are required. With a 5 foot drop in 1500 feet, this can be accommodated with a 24-inch diameter pipeline.

Water quality information is located in Appendix H. Temperature readings began in July 1990 and are currently being recorded every 2 hours in the West Fork, East Fork and Hood River mainstem. Digging a well may be necessary to supply incubation water.

Broodstock Collection Facilities

It is necessary to examine all fish for species, sex, disease and origin. To accomplish this, the fish will have to be anesthetized, examined out of water, and then returned to the water to allow the anesthetic to wear off. Some fish will be returned to the river to allow migration upstream for natural spawning; some fish will be retained for spawning stock; and some may be recycled downstream for harvest opportunities. It is proposed to capture the fish by modifying the existing Powerdale Dam fish ladder so as that fish can be diverted to a temporary holding tank adjacent to the ladder. The fish will then be anesthetized, lifted by elevator to a fish examining station, and placed on a table for examination. After examination, the fish will be distributed through pipelines: some upstream and some to holding pens.

Adult Holding and Spawning Facilities

One pond will be used for holding both spring chinook and winter steelhead. Spring chinook will be held in the pond from April through September so the pond would be available to hold winter steelhead from October through March. This holding pond should have the capacity to hold 300 adults with an average weight of 15 pounds. A pond 60-feet long, by 10-feet wide and 6-feet deep, with a volume of 8 cubic feet per fish is needed to meet project goals.

The holding pond for summer steelhead should be capable of holding 165 adults with an average weight of 8 pounds. A pond 40-feet long, by 5-feet wide and 4-feet deep, with a volume of 4 cubic feet per fish is needed to meet project goals.

Incubation and Rearing Facilities

Two options exist for treatment of eggs. Eggs can be transported by truck after each group of fish are spawned, or the eggs could be incubated on a short-term basis at the facility, then transported in larger groups to the appropriate rearing facility. Incubation facilities would need to be designed to incubate at least 335,000 spring chinook eggs, 230,000 summer steelhead eggs, and 130,000 winter steelhead eggs.

Rearing for 125,000 Deschutes stock spring chinook smolts will occur at the Pelton Ladder. Rearing for the remaining 125,000 smolts will occur at Bonneville Hatchery or another site yet to be determined. Summer and winter steelhead smolts will be reared at Oak Springs Hatchery.

Acclimation and Release Sites

The acclimation pond for spring chinook will need a minimum 100' by 20' configuration to hold the juvenile fish from May to June. The pond should have a capacity to hold 125,000 smolts at 9 fish per pound. Pond volume should be 21 pounds per cubic foot and have a minimum depth of 3.5 feet.

The acclimation pond for summer steelhead will need a minimum 100' by 20' configuration to hold the juvenile fish from May to June. The pond should have a capacity of 75,000 smolts at 5 fish/pound. Pond volume should be 81 pounds per cubic foot and have a minimum depth of 3.5 feet

Smolt releases will be made so that a portion of the release could be monitored at a monitoring and evaluation facility. The remainder of the releases would be directly released from the acclimation facility. Smolt releases should generally be made where fish will be available for harvest or natural reproduction. Smolt release should be timed to ensure adequate water budget and water temperatures for migration.

Release sites for spring chinook and summer and winter steelhead were selected to support the planned monitoring and evaluation studies and to achieve the production, harvest and natural escapement goals established by ODFW and CTWS.

Half of the of the spring chinook smolts (125,000) are to be released into the West Fork of Hood River. Possible release sites include (1) Dry Run Bridge, (2) Lake Branch, a tributary of the West Fork, and (3) Twin Bridges at the confluence of Elk and McGee Creeks on the West Fork. The remaining smolts will be held in acclimation ponds at the Powerdale Fish Facility for the required period of time as recommended by the Monitoring and Evaluation Plan.

Half (75,000) of the summer steelhead smolts will be release directly into the West Fork of Hood River. Possible release sites include (1) Dry Run Bridge, (2) Lake Branch and (3) Twin Bridges at the confluence of Elk and McGee Creeks on the West Fork. The remaining smolts will be acclimated before release at the Powerdale Fish Facility for the required period of time as recommended by the Monitoring and Evaluation Plan.

The winter steelhead smolts are to be released directly into the Hood River, possibly in the East Fork below Toll bridge and the Middle Fork of the Hood River near Red Hill Road Bridge. Road improvements or winter snow removal maintenance may be necessary to access the West Fork of the Hood River at Dry Run Bridge for summer steelhead and spring chinook smolt releases.

The goal of the Monitoring and Evaluation Plan is to identify and develop rearing and releasing strategies that 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 and locations.

A downstream migrant trap is needed to sample smolts to determine smolt release survival and natural production.

Buildings

Since adults will be held on-site on a year-round basis, they will require year-round attention from a hatchery manager. It is yet to be determined if a full time, on-site attendant and housing will be necessary.

An office is necessary for paperwork and restrooms for transient workers and guests. It is proposed that feed for this facility would first be delivered to another larger hatchery, and then distributed to the Hood River Fish Facility. The type of feed and storage has yet to be determined. The utility room could serve as storage for equipment or a location for minimal incubation while eggs are awaiting transportation to other hatcheries.

Septic systems would be required. It is anticipated that one system would serve both the residence and hatchery building.

Utilities

The Powerdale Dam has electrical service, and high voltage lines exist on the proposed facility site. However, the voltage would have to be reduced for use at the Hood River Fish Facilities.

The Powerdale Dam facilities on the west side of the Hood River are served by a public water district. Two options exist for bringing water to the Hood River Fish Facility: either a water line could be brought across the river, or a well could be drilled at the facility site. Phone service is available at the site and can be easily extended to the proposed facility site.

Waste Disposal

It has not been determined yet if a waste disposal system is needed for this facility. If a waste disposal system is needed, the following describes a typical system.

A vacuum cleaning operation for each pond could be accomplished in about 30 minutes. Assuming the use of a 2 inch hose and a velocity of 5 feet per second, then the vacuum water will accumulate at about 50 gallons per minute.

An Imhoff configuration would allow solids to settle from the supernatant liquid, which could be drawn off separately and discharged through the normal facility waste stream. As for solids, current hatchery practices encourage biodegradation of solids in the settling tanks, ultimately resulting in only minimal amount of waste needing disposal. Land application or a commercial septic pumper would be employed for final disposal. Local farmers would probably readily accept the material as a fertilizer.

Preliminary Costs

Preliminary construction costs are estimated at $1,250,000. This includes road improvements, piping, pond construction, fencing, building construction and waste disposal system.

Preliminary operation and maintenance costs are estimated at $107,000. This includes first year start-up costs, plus annual operation and maintenance costs. Operation and maintenance includes items such as personal services, supplies, transportation of fish, feed, chemicals, and equipment maintenance.

MONITORING AND EVALUATION PLAN

Introduction

The purpose of this section is to summarize the Monitoring and Evaluation Plan for the restoration and enhancement of spring chinook, and summer and winter steelhead in the Hood River. Monitoring and evaluation are necessary to increase (establish) the level of knowledge associated with scientific uncertainties inherent in fisheries 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 Plan will compliment the Council's System Monitoring and Evaluation Program by using the adaptive management process to attain the goals of the Hood River Subbasin Plan (1990). A more detailed analysis of the Monitoring and Evaluation Plan will be performed in the next phase of the project. This analysis will be consistent with regional approaches currently under development and will include specific tasks for achieving Monitoring and Evaluation Plan objectives.

Monitoring and Evaluation Goals:

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 Hood River Subbasin in a manner consistent with provisions of the Council's Fish and Wildlife Program.

2. Determine the success of achieving the management objectives in the Hood River Subbasin that are presented in the master plan and the subbasin plan.

3. Provide information on the effects of the HRPP on natural production and resident fish populations.

4. Assess the contribution of the Hood River Hatchery Production Program towards the Council doubling goal.

Critical Uncertainties

There are a number of uncertainties associated with production (rearing and release), and the restoration and enhancement of anadromous fish in Hood River. 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, and summer and winter steelhead. These uncertainties create differences in the critical uncertainties associated with each species.

Both quantitative and qualitative data are lacking on all aspects of the life history of spring chinook, and summer and winter steelhead in the Hood River Subbasin. The lack of this information makes it extremely difficult to effectively manage the species, either as a distinct race or in conjunction with other species of trout and anadromous salmonids present in the subbasin, particularly at a time when the run is considered to be at a very low level. To effectively

manage spring chinook and steelhead in the Hood River Subbasin and to properly implement and evaluate actions specified in this plan, as well as actions listed in other Columbia River subbasin plans, data on run size, smolt production, spatial distribution and life history should be collected. Data is currently unavailable to accurately estimate the smolt production capacity for the Hood River Subbasin.

The following sections give an overview of the uncertainties (listed in priority order) associated with each species--spring chinook, and summer and winter steelhead. Criteria used to establish these priorities are summarized in Table 17.

Spring Chinook

All prior supplementation has been made using Carson stock (Appendix A). All proposed releases will be made using Deschutes stock. Due to the lack of a counting facility, only estimates of current run size of spring chinook (Carson stock) can be made.

To effectively manage spring chinook in the Hood River Subbasin and to properly implement and evaluate the action specified in this plan, the CTWS and ODFW consider it vital that the following uncertainties be addressed.

Uncertainties

1. **What is the current status of natural spring chinook production and what are the life history characteristics?**

   As the native Hood River stock of spring chinook is extinct, it is important to monitor the Carson stock returns of spring chinook that are present in the subbasin. The Carson returns can be used as a model to predict life history characteristics and distribution of the natural spring chinook run that is developed with Deschutes stock.

2. **Can natural production of spring chinook be restored with releases of hatchery-reared smolts?**

   One of the management goals for the Hood River Subbasin is to develop naturally spawning populations of spring chinook using smolt releases. Monitoring the results of the proposed supplementation activities will determine if subbasin goals are being achieved. Monitoring the success of this strategy will be critical to determine the success of the entire project.

3. **Can natural production of spring chinook salmon be sustained (following restoration) using supplementation with hatchery-reared smolts.**

   One of the management goals for the Hood River Subbasin is to sustain naturally spawning populations of spring chinook using smolt releases. Monitoring the population will determine if this goal is being achieved. Monitoring the success of this strategy will be critical to determine the success of the entire project.

4. **To what extent will acclimation of smolts prior to release influence smolt-to-adult survival, homing ability, migration patterns, and spawning distribution?**

   If acclimation is shown to be an effective release strategy and improve the survival rate and homing ability of spring chinook, it will be used as a management approach to assist the managers in reaching the management goals for the Hood River Subbasin. Evaluation of the acclimation success is a critical step to accomplish management goals. The effect of acclimation on Deschutes stock spring chinook has never been documented. If acclimation proves to be effective with the test group of fish, acclimation of all spring chinook smolts will be considered.

Table 17. Summary of Products and criteria for establishing priority of uncertainties associated with HRPP.

Uncertainty Number (Priority)	Product of Evaluation	Criteria For Prioritization: Adequately studied at Hood River Basin	Important System wide Application	Important Contribution for Optimization of Hatchery Production	Contribution to Meeting Goals: Brood stock Development	Natural Production	Hatchery
1.	Status of existing runs in Hood River. ChS, StS, StW.	YES	NO	YES	YES	YES	YES
2.	Determine if natural production can be developed (Chs) or enhanced (StS, StW) from smolt releases.	YES	YES	YES	YES	YES	YES
3.	Determine if natural production can be sustained from smolt releases. ChS, StS, StW.	YES	YES	NO	NO	YES	YES
4.	Influence of acclimation on survival, homing migration patterns, spawning distribution, ChS, StS.	YES	YES	YES	YES	NO	YES
5.	Influence of acclimation length on survival, homing migration patterns, spawning distribution, ChS, StS.	YES	YES	YES	YES	NO	YES
6.	Influence of release location on survival, homing, migration patterns, spawning distribution, ChS, StS.	YES	YES	YES	YES	NO	YES
7.	Environmental limiting factors. ChS, StS, StW.	YES	YES	YES	NO	YES	YES

Table 17 continued.

Uncertainty Number (Priority)	Product of Evaluation	Criteria For Prioritization: Adequately studied at Hood River Basin	Important System wide Application	Important Contribution for Optimization of Hatchery Production	Contribution to Meeting Goals: Brood stock Development	Natural Production	Hatchery
8.	Effect of ChS, StS, and StW supplementation on resident fish populations.	YES	YES	NO	NO	YES	NO
9.	Assessment of changes in steelhead natural production resulting from increased chinook procuction Chs, StS, StW.	YES	YES	NO	NO	YES	NO
10.	Assessment of changes in chinook natural production resulting from increased steelhead production. Chs, STS, STW.	YES	YES	NO	NO	YES	NO
11.	What contribution will releases of smolts make to adult harvest. ChS, StS, StW.	YES	NO	NO	NO	YES	NO

5. **To what extent will length of acclimation time of smolts prior to release influence smolt-to-adult survival, homing ability, migration patterns, and spawning distribution?**

   Monitoring and evaluating what length of acclimation time best enhances smolt-to-adult survival and the homing ability of spring chinook will allow managers to maximize the benefits from smolt acclimation. This, in turn may accelerate achievement of subbasin goals.

6. **To what extent will release location for hatchery smolts influence smolt-to-adult survival, migration patterns and spawning distribution?**

   Monitoring and evaluating different release sites and determining the most effective site(s) is important to maximize the benefits of release strategies.

7. **Will environmental factors preclude restoration of sustained natural production at an acceptable level?**

   Determining if environmental factors exist that may prevent restoration of sustained natural production at the desired level, is necessary for predicting how quickly subbasin management goals will be reached and if those goals need to be adjusted given limiting environmental factors.

8. **To what extent will releases of hatchery-reared spring chinook smolts and restoration of natural production influence natural production of resident fish?**

   One of the goals of the Hood River project is to develop and sustain naturally spawning anadromous fish populations with minimal impacts to resident fish present in the subbasin. Without monitoring the impacts to resident fish from enhancement of anadromous populations, it would be impossible to determine the level of impact to resident fish populations.

9. **To what extent will releases of hatchery-reared spring chinook smolts and restoration of natural production influence natural production of summer and winter steelhead?**

   A goal of the Monitoring and Evaluation Plan is to provide information on the effects of supplementation on current natural production of salmonids in the basin.

10. **What contribution will spring chinook smolt releases make to adult harvest?**

    Monitoring both Indian and non-Indian harvests of adult spring chinook is important to make an accurately assess the total run size.

Management Implications

It is felt that developing and maintaining a long-term data base on this kind of information is needed to achieve the objectives established in the spring chinook section of this plan (Hood River Subbasin Plan 1990). The lack of such information makes it extremely difficult to effectively manage the species either as a distinct race or in conjunction with other species of trout and anadromous salmonids present in the subbasin.

The monitoring programs not only provide the means to accurately estimate the productive capacity of the drainage, but are also considered necessary to optimize production for the drainage. Without the proposed monitoring program, CTWS and ODFW feel that production will probably be maintained at a level well below the productive capability of the drainage.

Summer Steelhead

Hatchery summer steelhead smolts have been released into the Hood River Subbasin for the last 33 years (Appendix B). The hatchery releases were intended to provide harvest and supplement the naturally spawning population of steelhead in the Hood River. In 1968 and 1969, a total of 762 adult summer steelhead were released into the Hood River Subbasin (Appendix B-Table 4). Future supplementation will use fish from the existing natural run whenever possible. Since a counting facility does not exist, current summer steelhead run size must be estimated.

To effectively manage summer steelhead in the Hood River Subbasin and to properly implement and evaluate the action specified in this plan, CTWS and ODFW consider it vital that the following data be collected.

Uncertainties

1. **What is the current status of natural summer steelhead production and what are the life history characteristics?**

   The current run size of natural summer steelhead is an estimate, based on punch card returns from anglers. An accurate assessment of run size and life history characteristics are critical to proper management. This will help managers determine what aspects of natural production can be protected and enhanced.

2. **Can natural production of summer steelhead be enhanced with releases of Hood River stock, hatchery-reared smolts?**

   One of the management goals for the Hood River Subbasin is to enhance naturally spawning populations of summer steelhead using smolt releases. Monitoring the results of the proposed supplementation activities will determine if subbasin goals are being achieved. Monitoring the success of this strategy will be critical to determining the success of the entire project.

3. **Can natural production of summer steelhead salmon be sustained using supplementation with Hood River stock, hatchery-reared smolts?**

   One of the management goals for the Hood River Subbasin is to sustain naturally spawning populations of summer steelhead using smolt releases. Monitoring the population will determine if this goal is being achieved. Monitoring the success of this strategy is critical to determine the success of the entire project.

4. **To what extent will acclimation of smolts prior to release influence smolt-to-adult survival, homing ability, migration patterns, and spawning distribution?**

   If acclimation is shown to be an effective release strategy and improve smolt-to-adult survival and the homing ability of summer steelhead, it will be used as a management approach to assist the managers in reaching the management goals for the Hood River Subbasin. Evaluation of the success of acclimation is a critical step in accomplishing management goals. Acclimation has never been utilized in the Hood River Subbasin. If acclimation proves to be effective with the test group of fish, acclimation of all summer steelhead smolts will be considered.

5. **To what extent will length of acclimation time of smolts prior to release influence smolt-to-adult survival, homing ability, migration patterns, and spawning distribution?**

   Monitoring and evaluating what length of acclimation time best enhances the smolt-to-adult survival rate and homing ability of summer steelhead will allow the managers to maximize the benefits from acclimation of smolts. This, in turn may accelerate achievement of subbasin goals.

6. **To what extent will the release location for hatchery smolts influence smolt-to-adult survival, migration patterns, and spawning distribution?**

   Monitoring and evaluating different release sites and determining the most effective site(s) is important to maximize the benefits of release strategies.

7. **Will environmental factors preclude restoration of sustained natural production at an acceptable level?**

   Determining if environmental factors exist that may prevent restoration of sustained natural production at the desired level, is necessary for predicting how quickly subbasin management goals will be reached and if those goals need to be adjusted given limiting environmental factors.

8. **To what extent will releases of hatchery-reared summer steelhead smolts and restoration of natural production influence natural production of resident fish?**

   One goal of the Hood River project is to develop and sustain naturally spawning anadromous fish populations with minimal impacts to resident fish present in the subbasin. Without monitoring the impacts to resident fish from enhancement of anadromous populations, it would be impossible to determine the level of impact to resident fish populations.

9. **To what extent will releases of hatchery-reared summer steelhead smolts and restoration of natural production influence natural production of spring chinook and winter steelhead.**

   A goal of the Monitoring and Evaluation Plan is to provide information on the effects of supplementation on current natural production of salmonids in the basin.

10. **What contribution will summer steelhead smolt releases make to adult harvest?**

    Monitoring both Indian and non-Indian harvest of adult summer steelhead is important to make an accurate assessment of total run size.

Management Implications

Developing and maintaining a long-term data base on this kind of information is a vital component of the various strategies designed to achieve the objectives established in the summer steelhead section of this plan. The lack of this information makes it extremely difficult to effectively manage the species either as a distinct race or in conjunction with other species of trout and anadromous salmonids present in the Hood River Subbasin.

The monitoring programs not only provide the means to accurately estimate the productive capacity of the drainage, but are also considered necessary to optimize production for the drainage. Without the proposed monitoring program, CTWS and ODFW feel that production will probably be maintained at a level well below the productive capability of the drainage.

Winter Steelhead

Since 1962 hatchery winter steelhead smolts have periodically been released into the Hood River Subbasin (Appendix C). Hatchery releases ranged from 26,250 to 400,365 unmarked fingerlings from 1962 through 1976; and from 23,872 to 99,235 unmarked smolts from 1978 through 1986. Hatchbox fry were released as part of STEP since 1985 (Appendix E). In 1966 and 1967, a total of 427 adults, were also released into the basin. All future supplementation will occur using the native run of winter steelhead as broodstock. Since a counting facility does not exist, current winter steelhead run size must be estimated.

To effectively manage summer steelhead in the Hood River Subbasin and to properly implement and evaluate the action specified in this plan, CTWS and ODFW consider it vital that the following data be collected.

Uncertainties

1. **What is the current status of natural winter steelhead production and what are the life history characteristics?**

   The current run size of natural winter steelhead is an estimate, based on punch card returns from anglers. An accurate assessment of run size and life history characteristics are critical to proper management. This will help managers determine in what aspects natural production can be protected and enhanced.

2. **Can natural production of winter steelhead be enhanced with releases of Hood River stock, hatchery-reared smolts?**

   One of the management goals for the Hood River Subbasin is to enhance naturally spawning populations of winter steelhead using smolt releases. Monitoring the results of the proposed supplementation activities will determine if subbasin goals are being achieved. Monitoring the success of this strategy is critical to determine the success of the entire project.

3. **Can natural production of winter steelhead be sustained using supplementation with Hood River stock, hatchery-reared smolts?**

   One of the management goals for the Hood River Subbasin is to sustain naturally spawning populations of winter steelhead using smolt releases. Monitoring the population will determine if this goal is being achieved. Monitoring the success of this strategy is critical to determine the success of the entire project.

4. **To what extent will release location for hatchery smolts influence smolt-to-adult survival, migration patterns, and spawning distribution?**

   If the direct release of smolts is shown to be an effective release strategy and improve survival rates of winter steelhead, it will be used as a management approach to help managers reach the management goals for the Hood River Subbasin. Evaluation of the success of the direct release of smolts is a critical step to accomplish management goals.

5. **Will environmental factors preclude restoration of sustained natural production at an acceptable level?**

   Determining if environmental factors exist that may prevent restoration of sustained natural production at the desired level, is necessary to predict how quickly subbasin management goals will be reached and if those goals need to be adjusted given limiting environmental factors.

6. **To what extent will releases of hatchery-reared winter steelhead smolts and restoration of natural production influence natural production of resident fish?**

   One of the goals of the Hood River project is to develop and sustain naturally spawning anadromous fish populations with minimal impacts to resident fish present in the subbasin. Without monitoring the impacts to resident fish from enhancement of anadromous populations it would be impossible to determine the level of impact to resident fish populations.

7. **To what extent will releases of hatchery-reared winter steelhead smolts and restoration of natural production influence natural production of spring chinook and summer steelhead?**

   A goal of the Monitoring and Evaluation Plan is to provide information on the effects of supplementation on current natural production of salmonids in the basin.

8. **What contribution will winter steelhead smolt releases make to adult harvest?**

   Monitoring both Indian and non-Indian harvest of adult winter steelhead is important to make an accurate assessment of total run size.

Management Implications

Developing and maintaining a long-term data base on this kind of information is a vital component of the various strategies designed to achieve the objectives established in the winter steelhead section of this plan. The lack of this information makes it extremely difficult to effectively manage the species either as a distinct race or in conjunction with other species of trout and anadromous salmonids present in the Hood River Subbasin.

The monitoring programs not only provide the means to accurately estimate the productive capacity of the drainage, but are also considered necessary to optimize production for the drainage. Without the proposed monitoring program, CTWS and ODFW feel that production will probably be maintained at a level well below the productive capability of the drainage.

A thorough evaluation of the benefits of acclimation for spring chinook salmon and summer steelhead has not been conducted throughout the Columbia Basin. Intuitively, fish should survive at a higher rate, and home more accurately if allowed to recover from stresses of hauling prior to release. A total of 125,000 spring chinook and 75,000 summer steelhead smolts will be acclimated in ponds to be constructed at the Powerdale Dam Fish Facility.

CTWS and ODFW have agreed to test the effectiveness of acclimating spring chinook and summer steelhead smolts before they are released into the Hood River, using acclimation ponds to be constructed at the Powerdale Dam Fish Facility. The length of acclimation time for the smolts has yet to be determined. Smolts releases will be timed appropriately to ensure adequate water budget and water temperatures for migration. Comparisons of survival rates between the acclimated and non-acclimated fish will be made based upon the catch, plus escapement of each group of fish.

Experimental Approach

The monitoring and evaluation needs associated with this project are as follow:

1. **Monitor run size (harvest and escapement).**

   No data exists on the current status of Hood River anadromous fish stocks although it is assumed that the spring chinook and winter steelhead runs are currently at low levels. Long-term data on run size would provide the minimum amount of information considered necessary to (1) effectively manage spring chinook, and summer and winter steelhead in the Hood River Subbasin; (2) maximize production; and (3) optimize harvest opportunities in the drainage. This information would also provide the only means for determining whether or not the harvest and escapement goals defined by this plan have been achieved.

2. **Monitor smolt production.**

   Monitoring smolt production is a method available for accurately estimating the smolt production of the drainage; an estimate of which is currently unavailable for the Hood River Subbasin. This information is considered necessary to determine if the goals and objectives listed in this plan are achievable given the environmental and physical constraints that currently exist within the drainage. The monitoring program would also provide the means to evaluate the effectiveness of laws and regulations designed to protect and enhance the fisheries resource.

3. **Determine spatial and temporal distribution.**

   Limited information exists on the spawning and rearing distribution of spring chinook, and summer and winter steelhead in the Hood River Subbasin. It is assumed that the spring chinook population is primarily located in the West Fork, and several streams tributary to the West Fork. Little if any spawning or rearing occurs in the Middle and East Fork drainages. It is assumed that summer steelhead are generally distributed throughout the entire drainage, but primarily spawn and rear in the mainstem of the Hood River and its tributaries (excluding the Middle and East forks) and in the West Fork drainage. Winter steelhead are believed to be distributed throughout the entire drainage, but primarily spawn and rear in the and its tributaries (excluding the West Fork) and in the Middle and East Fork drainage.

   Information on the spatial distribution of the population is important for managing the fisheries resource and for evaluating the benefits associated with habitat improvement projects

currently under consideration or those which may be proposed in the future. Data would help to optimize the benefits associated with any future habitat improvement projects that may be implemented in the drainage.

4. **Obtain life history information.**

   General life history information such as the adult age composition, sex ratio, adult length-weight ratio, fecundity, and egg-to-smolt and smolt-to-adult survival rates are unavailable for spring chinook, and summer and winter steelhead in the Hood River Subbasin. This information is important for effectively managing the fisheries resource and protecting the native stock.

5. **Estimate juvenile rearing densities.**

   Limited information exists on the rearing densities of spring chinook, and summer and winter steelhead in the Hood River Subbasin. This information would be important to accurately evaluate the benefits derived from habitat improvement projects currently under consideration, or those which may be proposed in the future and would provide the means for evaluating laws and regulations designed to protect and enhance the fishery resource.

6. **Initiate a genetic monitoring program.**

   This program should consist of both morphometric and electrophoretic analysis of the existing stocks. These studies could potentially define the degree of difference between the existing indigenous and hatchery stocks in the Hood River.

Experimental opportunity is limited by factors such as rough terrain in the subbasin (which limits accessibility), very little baseline data, channel morphology, available release and recapture sites, hatchery production sites and available stocks.

To identify the initial experimental design for the project, a set of criteria based on a desired level of statistical precision and production needs was established. These criteria are:

1. Uncertainties should be evaluated in priority order.

2. Each treatment should be replicated for four years to ensure that performances are observed under a variety of environmental conditions. This should provide the ability to distinguish a 50 percent difference among treatments with 95 percent certainty.

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

Mobrand (1987) highlights the need in fisheries studies to maximize learning opportunity within a year to minimize the influence of year-to-year environmental variation. Therefore, sufficient numbers of marked fish and sufficient replication of treatments will be needed 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, interest is in is whether one treatment is better than another (treatment difference) consistently through time.

In general, two statistical techniques for data analysis will be applied. 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, interval estimates will be made to determine 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).

Release and recovery of coded-wire-tagged adults and other fish marks that are applied to juvenile fish 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 Hood Rivers) and escapement. All smolts released into the Hood River will have identifiable external marks.

Monitoring Sites

Monitoring and evaluation stations at selected sites throughout the Hood River Subbasin are needed to trap and count juvenile and adult anadromous fish. No data collection sites currently exist in Hood River. Implementation of monitoring and evaluation stations are of primary importance to evaluating the success of the HRPP, as none exist at this time.

Powerdale Dam will serve as the primary monitoring and collection site for adult and juvenile salmonids. An adult trap and a juvenile sampler needs to be constructed at Powerdale Dam to allow trapping and counting of marked experimental and production groups of fish. Other possible monitoring sites on the Hood River are the Punchbowl fish ladder (adults) and the irrigation diversions (juveniles).

Objectives and Hypotheses

The following section provides an overview and approach with each objective to explain the experimental design and performance parameters that will be statistically tested. The objectives are categorized by species. 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 priorities of objectives parallel that of the critical uncertainties. In the overview and approach sections, the uncertainties that are addressed by the objective are given.

Objective 1: **Determine size of current runs of spring chinook, and summer and winter steelhead.**

Overview and Approach: The current estimates of run size for spring chinook, and summer and winter steelhead are from angler punch-card data. No facilities for trapping and enumerating fish entering the Hood River Subbasin currently exist. For the Hood River Fish Facility, plans include trapping and counting returning adult spring chinook, and summer and winter steelhead migrating past Powerdale Dam. It is critical to collect accurate run-size information to effectively manage fish in Hood River. This objective addresses uncertainty priority number one.

Objective 2: **Determine adult life history characteristics of current runs of spring chinook, and summer and winter steelhead.**

Overview and Approach: Collection of data regarding run timing, distribution, sex ratio, spawning timing, distribution and age structure is of primary importance for proper management of spring chinook, and summer and winter steelhead in the Hood River. This objective is an integral part of all other objectives and addresses uncertainty priority number one.

Objective 3: **Determine juvenile life history characteristics of current runs of spring chinook, and summer and winter steelhead.**

Overview and Approach: Collection of data regarding juvenile migration timing, distribution and abundance and age structure are of primary importance for effective management of spring chinook, and summer and winter steelhead in the Hood River. This objective addresses uncertainty priority number one.

Objective 4: **Determine success of re-establishing natural production of spring chinook in the Hood River using hatchery smolt releases.**

Hypothesis 4.1: The Hood River Subbasin is capable of supporting a sustained natural production level of 400 spring chinook salmon.

Hypothesis 4.2: Adult prespawning survival rate and spawning success in the Hood River Subbasin will be within the range observed in subbasins that support sustained spring chinook natural production.

Hypothesis 4.3: Egg-to-fry and fry-to-smolt survival rates in the Hood River Subbasin will be within the range observed in subbasins that support sustained spring chinook natural production.

Overview and Approach: Various changes in the aquatic habitat have occurred since spring chinook were last known to naturally reproduce successfully in abundance in the Hood River. It is believed that the existing habitat can provide the essential elements for re-establishing natural spring chinook. With planned future improvements in the habitat and passage conditions in the basin, long-term natural production goals of 400 spring chinook may be achieved.

Experimental opportunities are limited in the Hood River because spring chinook spawning will probably occur primarily in the West Fork of Hood River, eliminating the possibility of establishing areas of streams that can be used for different treatments and controls. An evaluation of this type may not have wide application outside the Hood River Subbasin, 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.

Work on this objective will primarily involve assessing environmental conditions and estimating 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 summer and winter steelhead that spawn naturally. The major uncertainty is whether the natural escapement goals that have been established are either greater or less than the actual natural production capability of the environment. With estimates of important population parameters and the system planning model, it is possible to generate a better

understanding of the basin's natural production capacity of spring chinook and, later, refinement of natural escapement goals. This objective addresses uncertainty priority number two.

Objective 5: **Determine success of enhancing natural production of summer and winter steelhead in the Hood River using hatchery smolt releases.**

Hypothesis 5.1: Winter steelhead natural production will be enhanced by annual supplementation with hatchery-reared smolts.

Hypothesis 5.2: Supplementation of winter steelhead with hatchery-reared smolts will not alter the life history and genetic characteristics of the natural population.

Hypothesis 5.3: Summer steelhead natural production will be enhanced by annual supplementation with hatchery-reared smolts.

Hypothesis 5.4: Supplementation of summer steelhead with hatchery-reared smolts will not alter the life history and genetic characteristics of the natural population.

Overview and Approach: As summer and winter steelhead already exist in the Hood River, the HRPP is designed to use hatchery supplementation to enhance these natural runs. Through the Monitoring and Evaluation Plan, it can be determined if hatchery-produced fish can, through natural spawning processes, reproduce as effectively as native steelhead.

Experimental opportunities are limited in the Hood River because spring chinook spawning is expected to occur primarily in the West Fork of the Hood River, eliminating the possibility of establishing areas of streams that can be used for different treatments and controls. An evaluation of this type may not have wide application outside the Hood River Subbasin, 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 limit natural production success.

A goal of the HRPP is to maintain the genetic character of naturally producing populations of summer and winter steelhead. A significant component of the Monitoring and Evaluation Plan will be to monitor the genetic characteristics of the summer and winter steelhead runs, to ensure that the genetic character of these runs are not altered by implementation of the HRPP.

Work on this objective will primarily involve assessing environmental conditions and estimating 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 summer and winter steelhead that spawn naturally. The major uncertainty is whether the natural escapement goals that are established are either greater or less than the actual natural production capability of the environment. With estimates of important population parameters and the system planning model, it is possible to generate a better understanding of the basin's natural production capacity of summer and winter steelhead and later refine our natural escapement goals if necessary. This objective addresses uncertainty priority number two.

Objective 6: **Determine if the Hood River Subbasin has adequate streams to meet the experimental requirements for treatment, control, and spatial replication of a chinook and steelhead supplementation study. If so, then proceed to Objective 7.**

Objective 7: **Determine the success of sustaining natural production of spring chinook, summer and winter steelhead in the Hood River, using hatchery smolt releases.**

Hypothesis 7.1: Spring chinook natural production can be sustained by supplementing annually with hatchery-reared smolts.

Overview and Approach: The determination of smolt and adult production treatment and control streams is needed first to establish baseline data. Smolts will be stocked into treatment streams and control streams will be maintained as unstocked streams. Egg deposition, fry production, and smolt production will be estimated in both treatment and control streams. Returning adults will be counted and classified as hatchery of wild. Treatment should be applied for a minimum of four years. This objective addresses uncertainty priority number three.

Objective 8: **Determine genetic characteristics of winter and summer steelhead populations.**

Overview and Approach: A management objective of the HRPP is to maintain the genetic character of naturally producing populations of salmonids native to and re-established in the Hood River Subbasin. Establishing baseline data is necessary to monitor the change in genetic characteristics through time. Isozyme techniques to assess allelic variation is the most applicable method to address this objective. As new techniques become available to evaluate changes in genetic characteristics, they will be incorporated into the HRPP Monitoring and Evaluation Plan. This objective addresses uncertainty number two.

Objective 9: **Determine the effectiveness of acclimating spring chinook and summer steelhead smolts prior to release in the Hood River.**

Hypothesis 9.1: Acclimation of spring chinook smolts prior to release will increase smolt-to-adult survival.

Hypothesis 9.2: Acclimation of spring chinook smolts prior to release will increase homing accuracy.

Hypothesis 9.3: Acclimation of summer steelhead smolts prior to release will increase smolt-to-adult survival.

Hypothesis 9.4: Acclimation of summer steelhead smolts prior to release will increase homing accuracy.

Overview and Approach: The proposed initial evaluation involves rearing one-half of the spring chinook smolts at the Pelton Ladder (Pelton Ladder Master Plan 1990) and the remaining smolts at Round Butte Hatchery. One half of the spring chinook smolts will be acclimated at the Hood River Fish Facility and the remaining smolts with be released directly into the Hood River. The acclimated group of fish will contain fish reared both at Pelton Ladder and Round Butte Dam, as will the group of smolts released directly into Hood River. Each group of fish will be differentially marked.

	Pelton Ladder	Round Butte Dam
Acclimated	Mark #1	Mark #2
Non-Acclimated	Mark #3	Mark #4

The summer steelhead smolts will be reared at Oak Springs Hatchery. Half of these smolts will be acclimated before release at the Hood River Fish Facility, and the remaining smolts will be released directly into the Hood River. Each group will have different marks. This objective addresses uncertainty priority four.

Objective 10: **Determine what length of acclimation time most influences the smolt to adult survival, homing ability, migration pattern and spawning distribution of spring chinook and summer steelhead.**

Hypothesis 10.1: There will be no difference in smolt-to-adult survival and homing accuracy of spring chinook that are acclimated for different lengths of time prior to release.

Hypothesis 10.2: There will be no difference in smolt-to-adult survival and homing accuracy of summer steelhead that are acclimated for different lengths of time prior to release.

Overview and Approach: Different lengths of acclimation time will be tested to determine what length of time most influences the smolt-to-adult survival, homing ability, migration pattern and spawning distribution of spring chinook and summer steelhead. Test groups of acclimated smolts will have distinctive marks. This objective addresses uncertainty priority number five.

Objective 11: **Determine to what extent location of release of hatchery smolts will influence smolt-to-adult survival, migration pattern and spawning distribution for spring chinook, and summer and winter steelhead.**

Hypothesis 11.1: There will be no difference in smolt-to-adult survival and spawning distribution between winter steelhead smolts released in different location in the Hood River Subbasin.

Hypothesis 11.2: There will be no difference in smolt-to-adult survival and spawning distribution between winter steelhead smolts released in different locations in the Hood River Subbasin.

Overview and Approach: Possible release sites for spring chinook and summer steelhead smolts include Dry Run Bridge, Lake Branch and Twin Bridges at the confluence of Elk and McGee creeks on the West Fork. Possible release sites include below Toll Bridge and the HW 35 bridge near Robin Hood Campground on the East Fork, and in the Middle Fork of the Hood River, near Red Hill Road Bridge or Lake Branch Creek below Clear Branch Dam. The effectiveness of each of these release sites will be evaluated for influence on smolt-to-adult survival, migration pattern and spawning distribution. This objective addresses uncertainty priority number six.

Objective 12: **Monitor to what extent releases of hatchery-reared spring chinook, summer and winter steelhead smolts and restoration of natural production effect natural production of resident fish.**

Hypothesis 12.1: Spring chinook natural production can be restored without resulting in significant reductions in resident fish populations.

Hypothesis 12.2: Supplementation of the winter and summer steelhead populations with hatchery-reared smolts will not result in significant reduction in resident fish populations.

Overview and Approach: This program proposes to re-establish a naturally producing population of spring chinook and enhance summer and winter steelhead production in the Hood River, and may thus potentially displace some resident fish. This will be monitored closely and periodic evaluations of the data will occur. This objective addresses uncertainty priority number eight.

Objective 13: **Monitor to what extent releases of hatchery-reared spring chinook smolts and restoration of natural production affect natural production of summer and winter steelhead.**

Hypothesis 13.1: Spring chinook natural production can be restored without causing significant reductions in summer and winter steelhead natural production.

Hypothesis 13.2: Supplementation of spring chinook with annual releases of hatchery-reared smolts will not cause significant reductions in summer and winter steelhead natural production.

Overview and Approach: This program proposes to increase run sizes of spring chinook, and summer and winter steelhead. Increasing run sizes of this species may create competition for resources between them. This objective addresses uncertainty number nine.

Objective 14: **Monitor to what extent releases of hatchery-reared summer and winter steelhead and enhancement of natural production affect natural production of spring chinook.**

Hypothesis 14.1: Supplementation of winter and summer steelhead with annual releases of hatchery-reared smolts will not cause significant reductions in summer and winter steelhead natural production.

Overview and Approach: This program proposes to increase run sizes of spring chinook, and summer and winter steelhead. Increasing run sizes of this species may create competition for resources between them. This objective addresses uncertainty number ten.

Objective 15: **Estimate the contribution spring chinook, and summer and winter steelhead smolt releases will make to adult harvest.**

Hypothesis 15.1: Both the catch rate and harvest of spring chinook, and summer and winter steelhead in the Hood River Subbasin will be enhanced with releases of hatchery-reared smolts.

Overview and Approach: One of the goals of the Hood River Master Plan 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 to determine survival of marked test groups of salmon and steelhead. Obtaining adequate estimates of these diverse harvests requires coordination of harvest survey efforts between state and tribal authorities. Statistical creel programs will be designed to estimate catch by mark. This objective addresses uncertainty priority number eleven.

GENETIC RISK ASSESSMENT

Introduction

It was apparent to the conservation agencies participating in the Northwest Power Planning Council's planning process that conservation of the genetic resources in each fish stock was an important aspect of achieving sustained increases in the productivity of Columbia Basin's salmonids. Therefore, the Council established a policy that a Genetic Risk Assessment (GRA) be completed in planning for any production project under the Council's purview (Columbia River Basin Fish and Wildlife Program, Section 204, paragraph b). The purpose of the GRA is to insure that due consideration has been given to production strategies such that the genetic integrity of existing fish populations is not jeopardized.

This GRA is the beginning of a process to insure that no avoidable and irreversible losses of genetic diversity occur as a result of this enhancement project. Planners and managers have recognized that many uncertainties exist regarding the genetic resources of any given population and that population's ability to respond to environmental and manmade perturbations.

The GRA is affected by several agency policies and planning documents. The Council has published, "Principles for Genetic Conservation and Production Quality" (Riggs 1990). A summary of key points from this document, along with additional genetic considerations were included in the Integrated System Plan (Columbia Basin Fish and Wildlife Authority 1990). The Oregon Department of Fish and Wildlife has a Wild Fish Management Policy that provides several specific guidelines for enhancement projects. Finally, the Hood River Master Plan and Genetic Risk Assessment are guided by the management goals established in the Hood River Master Plan. This assessment will continue to be modified as new guidelines are developed and new information becomes available.

Classification and Types of Genetic Risk

The Integrated System Plan specifies three types of genetic risk that are to be assessed in the Genetic Risk Assessment:

1. Loss of the population as a whole (extinction).

2. Loss of diversity or genetic variation within the population (may occur through genetic drift or founder effects occurring for a variety of reasons).

3. Loss of, or changes in, population identity including loss of diversity among populations, characteristics of adaptation within populations, or of other evolved features of genetic organization (may occur through interbreeding or inadvertent effects of artificial selection).

Busack (1990) distinguished a fourth type of genetic rick (previously grouped with type 3) that will also be distinguished here:

4. Changes in genetic composition as an adaptation to survival in a hatchery environment (domestication selection).

A detailed explanation of each classification is located in the complete Genetic Risk Assessment prepared for this project (Cramer 1991).

Stock Specific Risk Analysis

This section of the report presents an analysis of the likely magnitude and uncertainty of genetic risks, by species and race, associated with the specific operating plans presented in the Hood River Master Plan. These risks are categorized according to the four genetic yardsticks discussed in Section II of the Genetic Risk Assessment, "Classification of Types of Genetic Risk," and are assessed based on information presented in Section IV, "Characterization of Target Population" (Cramer 1991). Types of risk are presented under each species and race in their order of highest to lowest risk.

The magnitude of genetic risk must be assessed by comparison to the genetic goals for the program and the policies of the resource management agencies. Genetically related goals stated in the master plan are:

- To re-establish and rebuild naturally sustaining spring chinook, and summer and winter steelhead runs in the Hood River Subbasin.

- To maintain the genetic character of naturally producing populations of salmonids native to and reestablished in the Hood River Subbasin.

Summer Steelhead

Rank 1 Risk - Type 3: Loss of Population Identity

An early draft of the master plan stated, "Hatchery broodstock for the NEOH Hood River propagational facility will be collected from both hatchery and natural segments of the summer steelhead run returning to the Hood River." Further, it stated, "If necessary, broodstock may be supplemented from Skamania stock." Data presented in this report demonstrate that run timing and spawning timing of the Skamania stock differ substantially from that of the Hood River stock. If both stocks were used for brood (random matings are stipulated in the Plan), some of the latest spawning Skamania stock would be spawned with earliest spawning Hood River stock. This overlap would amount to roughly 10 percent of the matings with natal stock. This overlap of Skamania stock into the matings of natal stock would increase as the proportion of hatchery fish in the run increased. Returns of these hybrid fish would result in further introgression of Skamania genes into the Hood River stock in future generations. The expected result would be a gradual loss of Hood River stock identity and a reduction in fitness for natural reproduction. This risk is unacceptable, given the genetic goal for steelhead supplementation. Accordingly, the master plan has been modified to exclude the use of Skamania steelhead or their progeny from broodstock. Thus, operational plans have been adjusted to minimize risk.

A risk remains that naturally reproducing Skamania stock, if present, might be mistaken for native Hood River steelhead. It was suggested in the risk analysis that a greater number of adults be held for brood than is necessary, and those ripening in January and February should be discarded as probable Skamania origin. The managing agencies agree that there may be some hatchery steelhead and some progeny of hatchery steelhead spawning naturally in the Hood River. However, no data exists on exact, current run timing or spawning time for the wild populations. Given that these two populations have not been tracked from historic times to the present with concurrent documentation of hatchery releases and hatchery fish returns, recommended by the Genetics Program Leader for ODFW that any artificial selection against any value of the two phenotypes, should not occur (personal communication, Kathryn Kostow, ODFW, Portland).

There is a further risk of combining substocks that may be differentiated within the Hood River Subbasin. The known spawning area in the West Fork is fairly homogeneous, so substocks are

unlikely. However, summer steelhead may spawn in other portions of the basin. Spawning should be surveyed throughout the basin during this time, and winter and summer steelhead should be distinctively tagged as they pass Powerdale Dam to enable visual identification of race by surveyors.

An additional risk in this category is to stocks outside the basin if hatchery fish from the Hood River stray to spawn. The master plan calls for rearing of the Hood River summer steelhead at Oak Springs Hatchery on the Deschutes River. This off-site rearing may result in some straying, particularly into the Deschutes River. It is believed this straying will be minimal, but it is uncertainty that warrants monitoring. Hood River steelhead should be fin marked differently than Deschutes steelhead so strays into the Deschutes can be distinguished. It is anticipated that acclimation of summer steelhead smolts in Hood River before release will assist in lowering the amount of straying that could occur.

Rank 2 Risk - Type 2: Loss of Within Population Variability

The risk of losing within population variability is a function of effective population size. The abundance of indigenous spawners is uncertain and may be low. The population size of naturally produced summer steelhead appears to be near historic levels (500-1,000 spawners per year), but the portion of these that are indigenous stock is unknown. The ODFW Wild Fish Management Policy calls for a minimum of 300 spawners, which would equate to 75 spawners/yr over the 4 yr average brood cycle of indigenous steelhead. If we assume natural reproduction of Skamania stock is low (this assumption is reasonable based on poor natural reproduction of Skamania stock throughout the Willamette River Basin [personal communication, D. Swarts, ODFW, Clackamas], then the escapement of indigenous stock will exceed several hundred fish per year and the risk of decreasing indigenous escapement to less than 75 spawners/yr is very small.

It is possible the effective population size could be reduced as a secondary effect of hatchery practices. The effective population size of naturally reproducing fish would be reduced if hatchery fish were released in such a way that caused intra-specific competition for food and space. Additionally, hatchery programs attract anglers, and this is likely to increase harvest rate. The master plan sets harvest guidelines and smolt release procedures that should prevent adverse impacts. Still, these are uncertainties which should be monitored and addressed through adaptive management. The master plan states, "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." This goal is to be achieved through monitoring of harvest, escapement, spawning distribution, smolt production, and genetically controlled traits.

Rank 3 Risk - Type 3: Domestication Selection

The master plan incorporates special measures to minimize this risk. The most important measure is that all hatchery fish will be marked before release and only unmarked returns will be used for brood. Spawners of all ages will be taken from throughout the run in proportion to their abundance. A 1:1 sex ratio at spawning will be maintained.

The master plan does not address hatchery practices during rearing, and these practices can be genetically selective. For example, size grading is commonly practiced in hatcheries. If size grading is necessary, rearing of the "grade outs" should continue separately and they should be released along with the other fish. Even though eggs will only be taken from unmarked fish, marked fish will be allowed to spawn naturally with wild fish, so care should be taken to avoid any type of selection in the hatchery. If the appropriate care is taken, the genetic risk here should be small.

The risk assessment supports the option of using non-random mating as a hatchery practice. CTWS and ODFW agree that natural mate selection in animals is non-random. There will be

some relaxation of courtship-related selection pressures (as well as of other natural selection pressures) under the artificial environment. However, it is felt by CTWS and ODFW that artificial selection based on human judgement cannot compensate for relaxation of natural selection. The actual mechanisms or variations involved in such complex, polygenic, behavior phenotypes as courtship and mate selection are not well understood. The only way to approximate a "copy" of natural mate selection would be to let the fish select their own mate(s). Since that cannot be done, it is recommended by the Genetics Program leader for ODFW that random selection of broodstock and random mating be used (personal communication, Kathryn Kostow, ODFW, Portland).

Rank 4 Risk - Type 1: Extinction
Steelhead populations appear healthy, although the relative abundance of summer and winter races is uncertain. Extinction could become a threat without the project if heavy stocking continued with the poorly adapted Skamania stock. Hatchery fish could reduce survival of wild fish by competing for spawning sites and by interbreeding and reducing fitness below the viable level. The threat of extinction is small but real and will be reduced by implementation of the master plan.

Extinction is also a minor threat to nontarget species as a result of increased harvest, competition, predation or disease. Much of the risk will be eliminated by release of smolts (rather than fingerlings) at their optimum readiness to migrate. Over-harvest can be prevented by limiting the take of unmarked fish (all hatchery fish will be marked). Creation of excessive competition or predation between species seems improbable, because these species coexisted in the basin before man began to heavily exploit them and their environment. Still, this risk remains an uncertainty that should be evaluated as the program progresses. This has been adequately addressed in the Monitoring and Evaluation Plan of the master plan which calls for monitoring of smolt production, rearing distribution, and rearing densities.

Winter Steelhead

Rank 1 Risk - Type 3: Loss of Population Identity
An early draft of the master plan stated "Annual winter steelhead smolt outplants are acquired from the Big Creek stock of winter steelhead. Hatchery broodstock will eventually be collected from both hatchery and natural segments of the winter steelhead run returning to the Hood River." Further, it stated, "If necessary, broodstock may be supplemented with Big Creek stock." Data presented in this report demonstrate that run timing and spawning timing of the Big Creek stock differ substantially from that of the Hood River stock. As explained for summer steelhead, the result of this interbreeding of stocks would be a gradual reduction in fitness for natural reproduction. This risk is unacceptable, given the genetic goals of the master plan. Accordingly, the master plan has been modified to exclude the use of Big Creek steelhead or their progeny from broodstock. Thus, operational plans have been adjusted to minimize this risk.

A risk remains that naturally reproducing Big Creek stock, if present, might be mistaken for native Hood River steelhead. It was suggested in the risk analysis that a greater number of adults be held for brood than is necessary, and those ripening in January and February should be discarded as probable Skamania origin. The managing agencies agree that there may be some hatchery steelhead and some progeny of hatchery steelhead spawning naturally in the Hood River. However, no data exists on exact, current run timing or spawning time for the wild populations. Given that these two populations have not been tracked from historic times to the present with concurrent documentation of hatchery releases and hatchery fish returns, the Genetics Program Leader for ODFW recommends that artificial selection against any value of the two phenotypes, should not occur (personal communication, Kathryn Kostow, ODFW, Portland).

As an additional check on separation of hatchery and wild fish, brood fish should be tagged and scale sampled at capture, the scales then analyzed, and finally the hatchery fish omitted from spawning. This is a necessary step, because hatchery winter steelhead released in Hood River have not been marked. Hatchery and wild fish can be distinguished by their age at smolting: hatchery fish smolt at age 1 and wild fish smolt predominantly at age 2.

There is further risk of combining substocks that may be differentiated within the Hood River Subbasin. Winter steelhead are believed to spawn throughout the basin, so substocks may be present. There is suggestive, but inconclusive evidence that a substock may exist in Neal Creek. Spawning should be surveyed throughout the basin from March through June to determine if substocks exist with distinct times and locations of spawning. The existence of unique substocks can also be identified by differences in migration time as they pass Powerdale Dam. In order to relate migration timing to time and location of spawning, fish should be tagged as they pass Powerdale Dam and then spawning areas should be surveyed to identify tagged fish. Tags should be chosen to enable surveyors to easily distinguish summer and winter races.

As with summer steelhead, there is a risk to stocks outside the basin if hatchery fish from the Hood River stray to spawn. The Master plan calls for rearing of Hood River winter steelhead at Oak Springs Hatchery on the Deschutes River. This off-site rearing may result in some straying, particularly into the Deschutes River. It is believed this straying will be minimal, but is an uncertainty that warrants monitoring. Hood River steelhead should be fin-marked differently from Deschutes steelhead so strays into the Deschutes can be distinguished.

Rank 2 Risk - Loss of Within Population Variability

The risk of losing within population variability is a function of effective population size. The abundance of indigenous spawners is uncertain and may be low. The population size of naturally produced winter steelhead appears to be near historic levels (500-1,000 spawners per year), but the portion of these that are indigenous stock is unknown. ODFW Wild Fish Management Policy calls for minimum of 300 spawners, which would equate to 75 spawners/year over the 4-year average brood cycle of indigenous steelhead. If we assume natural reproduction of Big Creek stock is low (this assumption is reasonable based on low angler catches from December-February, then the escapement of indigenous stock will exceed several hundred fish per year and the risk of decreasing indigenous escapement to less than 75 spawners/year is very small.

It is possible the effective population size could be reduced as a secondary effect of hatchery practices such as competition for food and space and increased harvest rate. As described for summer steelhead, this risk is minimal and adequately addressed in the Monitoring and Evaluation Plan of the master plan.

Rank 3 Risk - Type 4: Domestication Selection

The master plan incorporates special measures to minimize this risk. The most important measure is that all hatchery fish will be marked before release and only unmarked returns will be used for brood. Spawners of all ages will be taken from throughout the run in proportion to their abundance. A 1:1 sex ratio at spawning will be maintained.

Issues of rearing practices and breeding practices are the same as described for this risk under Summer Steelhead.

Rank 4 Risk - Type 1: Extinction

As for summer steelhead, the master plan will reduce the risk of winter steelhead extinction. The discussion for this risk type under Summer Steelhead fully applies to winter steelhead.

Spring Chinook

Rank 1 Risk - Type 2: Loss of Within Population Variability
Because spring chinook are extinct in the Hood River Subbasin and are being reintroduced, the greatest generic risk is the Founder Effect: the genetic variability will be limited to that which is available from the founding population. Differences in the temperature and flow regimes between the Hood River and Deschutes River basins indicate the introduced stock is likely to face new selective pressures. If such natural selection occurs, then the effective population size of the donor population will be less than the number of fish used for spawning. This is an important consideration to plan for since effective population size is a measure of a population's genetic variability (Kapuscinski and Lankan 1986).

An additional genetic risk from reintroducing spring chinook will be to other indigenous species that must compete with juvenile chinook for rearing areas and forage. Juvenile spring chinook have been essentially absent from the basin for at least 25 years. Greatest competition is likely to be with juvenile fall chinook, which are limited to the lower basin and are at very low levels. Spatial separation of spawning areas should limit this competition between spring and fall races. Spring chinook are expected to spawn and rear in the West Fork while fall chinook spawn primarily in the main stem below Powerdale Dam.

Competition of chinook with other species indigenous to the basin should not pose a threat to their persistence, because they historically coexisted in the Hood River Subbasin. However, this remains an uncertainty that will be addressed in the Monitoring and Evaluation Plan.

Rank 2 Risk - Type 3: Loss of Population Identity
If other locally adapted stocks are ever used for supplementation in the basin, with the Deschutes stock spring chinook, there will be a risk of interbreeding these stocks with each other. This may disrupt co-adapted gene complexes specific to each stock. Such disruption could reduce fitness. However, co-adapted gene complexes may be the same for these stocks, because all three stocks would have experienced similar selective pressures during their outmigration through the Columbia River and its estuary. If supplementation does not prove to be successful, a mix of donor populations might provide a wider range of genetic variation on which natural selection should act (personal communication, Kathryn Kostow, ODFW, Portland). A recommendation has been made to use volunteer migrants entering the Hood River, as well as a donor population from the Willamette if donor stocks other than the Deschutes population are wanted.

Rank 3 Risk - Type 4: Domestication Selection
The master plan incorporates special measures to minimize this risk. All hatchery-reared fish will be marked before release. Once returns from natural production begin, only unmarked returns will be used for brood. Spawners of all ages will be taken from throughout the run in proportion to their abundance (unless designated for experimental groups selected for spawning time). A 1:1 sex ratio at spawning will be maintained.

Issues of rearing practices and breeding practices are the same as described for this risk under Summer Steelhead. The Genetics Program Leader for ODFW recommends that spring chinook mate randomly (personal communication, Kathryn Kostow, ODFW, Portland).

Rank 4 Risk - Type 1: Extinction
This risk is zero because the population is already extinct.

Recommendations

1. The genetic risks are small compared to the potential benefits of the Hood River Production Plan if the recommendations listed here are implemented.

2. Although the genetic risks of the proposed plan appear to be low, this assessment was based on available data, not ideal data. Many uncertainties remain as to the accuracy of assumptions and deductions. Therefore, it is recommended that monitoring and evaluation procedures described in the full Genetic Risk Assessment (Cramer 1991) be implemented to enable future adjustment of the master plan as necessary to meet its goals.

3. Skamania stock summer steelhead and their progeny should be excluded from broodstock selection based on hatchery marks.

4. Big Creek stock winter steelhead and their progeny should be excluded from broodstock selection based on hatchery marks.

5. Since the effects of artificial selection and relaxed natural selection may affect the hatchery population over time, it is recommended that life history, behavioral, and morphological phenotypes be carefully monitored in the broodstock.

7. If size grading is necessary, rearing the "grade outs" should continue separately and they should be released along with the other fish.

FISHERY BENEFITS

Contributions toward the Council's doubling goal and to ocean and Columbia River fisheries are assessed in Tables 18-20. Model parameters and values are recent averages, and were developed by Northwest Power Planning Council's System Planning Model (SPM) with the use of data sets generated during the system planning process (Northwest Power Planning Council 1989).

The model input value (RELEASE) is the number of smolts or juveniles released from the Hood River Subbasin. The subsequent survival rates (DOWNSTREAM PASSAGE) include out-migrant survival through Bonneville Dam. Estuary and Ocean Survival (ESTUARY AND OCEAN SURVIVAL) was estimated using a survival rate for the period when the smolts enter the Columbia River Estuary to their return to the mouth of the Columbia River (based on a four year cycle). Survival through ocean harvest (OCEAN HARVEST) represents present ocean harvest rates of each species. Lower river fisheries are commercial and sport harvest rates in Zones 1-5 in the Columbia River (LOWER RIVER FISHING). Upstream adults dam passage survival was estimated at Bonneville (BONNEVILLE PASSAGE). Zone 6 harvest is for commercial, subsistence, and ceremonial harvest (ZONE 6 HARVEST) 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 Hood River. Escapement (ESCAPEMENT) is the estimated adult return to the mouth of the Hood River. The numbers lost column indicated 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 Hood River absent the respective mortality factor.

Tables 18-20 display model results for hatchery releases of spring chinook, and summer and winter steelhead from the Hood River Fish Facility. A total of 15,536 adult fish will be contributed toward the Council's doubling goal, including 2,212 spring chinook, 8,505 summer steelhead and 4,819 winter steelhead. The Council's goal is measured as returns to the mouth of the Columbia River plus prior fisheries. This number is represented in the tables as the NUMBERS REMAINING from ESTUARY AND OCEAN SURVIVAL (escapement to the mouth of the Columbia River) plus the NUMBERS LOST to OCEAN HARVEST.

A total of 2,428 adults will be contributed to ocean and Columbia River fisheries including 299 spring chinook, 1,359 summer steelhead and 770 winter steelhead. This was determined by adding NUMBERS LOST in the OCEAN HARVEST, LOWER RIVER FISHING and ZONE 6 HARVEST categories.

Table 18. Hood River spring chinook survival history from smolt release to adult escapement

EVENT	SURVIVAL RATES	NUMBERS REMAINING	NUMBERS LOST	ESCAPEMENT EQUIVALENTS
RELEASE	-	250,000	-	-
POST RELEASE SURVIVAL	.50	125,000	125,000	1,733
DOWNSTREAM PASSAGE	.81	101,250	23,750	408
ESTUARY AND OCEAN SURVIVAL[a]	.02	2,126	21,624	80,712
OCEAN HARVEST	.96	2,040	86	74
LOWER RIVER HARVEST	.96	1,958	82	74
BONNEVILLE PASSAGE	.95	1,860	98	93
ZONE 6 HARVEST	.93	1,729	131	132
ESCAPEMENT	-	1,729	-	1,729

[a]Ocean mortality and ocean harvest occur concurrently over several years. In this example, the ocean harvest survival rate is expressed as a function of the number of fish after estuary and ocean mortality is assumed to have occurred.

Table 19. Hood River summer steelhead survival history from smolt release to adult escapement

EVENT	SURVIVAL RATES	NUMBERS REMAINING	NUMBERS LOST	ESCAPEMENT EQUIVALENTS
RELEASE	-	150,000	-	-
POST RELEASE SURVIVAL	.50	75,000	75,000	6,730
DOWNSTREAM PASSAGE	.81	60,750	14,250	1,579
ESTUARY AND OCEAN SURVIVAL[a]	.41	8,505	52,245	41,344
OCEAN HARVEST	1.00	8,505	0	0
LOWER RIVER HARVEST	.98	8,334	171	137
BONNEVILLE PASSAGE	.95	7,918	416	354
ZONE 6 HARVEST	.85	6,730	1,188	1,188
ESCAPEMENT	-	6,730	-	6,730

[a]Ocean mortality and ocean harvest occur concurrently over several years. In this example, the ocean harvest survival rate is expressed as a function of the number of fish after estuary and ocean mortality is assumed to have occurred.

Table 20. Hood River winter steelhead survival history from smolt release to adult escapement.

EVENT	SURVIVAL RATES	NUMBERS REMAINING	NUMBERS LOST	ESCAPEMENT EQUIVALENTS
RELEASE	-	85,000	-	-
POST RELEASE SURVIVAL	.50	42,500	42,500	3,815
DOWNSTREAM PASSAGE	.81	34,425	8,075	896
ESTUARY AND OCEAN SURVIVAL[a]	.41	4,819	29,606	23,430
OCEAN HARVEST	1.0	4,819	0	0
LOWER RIVER HARVEST	.98	4,722	97	79
BONNEVILLE PASSAGE	.95	4,485	237	202
ZONE 6 HARVEST	.85	3,812	673	674
ESCAPEMENT	-	3,812	-	3,812

[a]Ocean mortality and ocean harvest occur concurrently over several years. In this example, the ocean harvest survival rate is expressed as a function of the number of fish after estuary and ocean mortality is assumed to have occurred.

HARVEST PLANS

One of the primary purposes of the HRPP is to develop facilities which increase the number of salmon and steelhead available for harvest in the Hood River Subbasin while rebuilding and maintaining adequate hatchery and natural production. In addition, an extensive evaluation and monitoring plan will be developed to guide and evaluate the success of the HRPP.

The purpose of these harvest plans is to explain how harvest management will support and integrate the salmon enhancement program for the Hood River Subbasin. The proposed harvest plan guidelines are designed to (1) support the rebuilding of salmon and steelhead populations in the Hood River; (2) provide information for the monitoring and evaluation program for the Hood River Subbasin; (3) be consistent with Indian treaty fishing rights, the US/Canada Pacific Salmon Treaty, and the US 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 Hood River must also address and consider the natural and hatchery production objectives developed by the CTWS and ODFW.

CTWS and ODFW want to provide productive Indian and non-Indian fisheries in the Hood River Subbasin for all species currently being enhanced. The harvest plan guidelines (Tables 21, 22 and 23) represent the first step of harvest planning. This plan will provide for a regulated tribal and sport harvest of Hood River spring chinook, and summer steelhead and winter steelhead. CTWS and ODFW have agreed to not discuss the harvest allocation until sustainable runs have been developed in Hood River. The managing agencies will cooperatively develop a sport and tribal harvest program that addresses the following:

- Timing of sport and tribal harvest
- Apportionment of harvest
- Method of harvest
- Reporting of harvest

Harvest Plan Guidelines

CTWS and ODFW will develop Hood River salmon and steelhead harvest plan guidelines that outline the catch apportionment of adults returning to the Hood River at various run sizes. CTWS and ODFW have identified hatchery broodstock, spawning escapement, and evaluation requirements as having high priority. However, it is the intent of the CTWS and ODFW to provide a level of harvest that is compatible with the respective natural and hatchery run size and rebuilding goals for each species. CTWS and ODFW will use harvest guidelines to develop annual harvest plans that specify allowable catch, allocation and location of Indian and non-Indian fisheries in the Hood River.

CTWS and ODFW will develop run size estimate models for run size monitoring based on previous years escapement and spawning ground information to make sound harvest allocation decisions. Creel surveys will need to be developed and implemented to monitor annual harvests. Initially, information on run sizes will be limited, so harvest guidelines will be flexible. As run size information is collected, CTWS and ODFW will adjust harvest guidelines accordingly.

The number of hatchery broodstock needed for spring chinook (Deschutes stock) and summer steelhead (Hood River) is expected to be achieved with current runs. However, a broodstock build-up period will be necessary for winter steelhead. Emergency closures of Hood River (or sections of the Hood River) may be necessary during this build-up period, to give fish populations time to

reach adequate numbers to sustain a harvest. The number of winter steelhead and spring chinook broodstock collected from the Hood River 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 harvest opportunities.

CTWS and ODFW will develop annual harvest plans at a later time. These plans will identify specific allocation of returns above escapement needs and location of Indian and non-Indian fisheries in the Hood River. As actual smolt-to-adult return rates become known, CTWS and ODFW will more accurately develop adult return forecasts which will serve as the basis for annual agreements regarding allocation of returns above escapement needs.

The harvest plan guidelines may also include the needs of the evaluation and monitoring program for the Hood River Subbasin. The monitoring and evaluation program will provide important information to guide managers of the HRPP to achieve broodstock, spawning, and harvest goals.

Future guidelines may require:

- Harvest area restrictions
- Gear restrictions (e.g., barbless hooks, dip net only)
- Timing restrictions (e.g., dates and times)
- Harvest of only hatchery-marked steelhead

Table 21. Harvest Guidelines for Spring Chinook Salmon[1]

Run Size Goal (to mouth) = 1,700 (400 natural, 1,300 hatchery)
Brood Stock Collection Goal = 200
Interim Spawning Escapement Goal = 400

	CARSON STOCK				DESCHUTES/HR STOCK			
YEAR	RUN SIZE[2]	HR HATCHERY BROOD STOCK	SPAWNING ESCAPEMENT	IN-RIVER HARVEST[3]	RUN SIZE	HR HATCHERY BROOD STOCK	SPAWNING ESCAPEMENT	IN- RIVER HARVEST
1993	500	N/A	0	500	0[4]	0	0	Based on
1994	500	N/A	0	500	0	0	0	Returns
1995	500	N/A	0	500	85[5]	0	85	Above
1996	350[6]	N/A	0	350	1411	150	250	Escapement
1997	250	N/A	0	250	1700	200[7]	400[8]	and Brood
1998	175	N/A	0	175	1700	200	400	Stock Needs[9]
1999	100	N/A	0	100	1700	200	400	
2000	50	N/A	0	50	1700	200	400	

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

[2]Run sizes are estimates based on punch card data.

[3]No fish are needed for brood stock or spawning escapement so all returns are potentially available for harvest.

[4]The first release of Deschutes stock into Hood River will occur at the earliest, in 1993.

[5]Based on percent age composition, (Lindsay et al., 1989).
3 yr olds=5% (85 fish) 4 yr olds=78% (1326 fish) 5 yr olds=17% (289 fish)

[6]The last release of Carson Stock in Hood River will be in 1991. Run sizes should begin to drop in 1996 as offspring of Carson fish that may have spawned naturally will be returning.

[7]Brood stock collection goal achieved.

[8]Spawning escapement goal achieved.

[9]Based on total run sizes as evaluated and agreed to by CTWS and ODFW.

Table 22. Harvest guidelines for summer steelhead[1]

Run Size Goal (to mouth) = 8,000 (1,200 natural and 6,800 hatchery)

Broodstock Collection Goal = 165

Spawning Escapement Goal = 2,400 (1,200 natural, 1,200 hatchery)

YEAR	TOTAL RUN SIZE[2]	BROODSTOCK[3]	ESCAPEMENT	HARVEST
1995[4]	1,000	110[5]	890	Based
1996	3,250	165	2,400	on
1997	6,625	165	2,400	Returns
1998	7,750	165	2,400	Above
1999	8,000	165	2,400	Broodstock
2000	8,000	165	2,400	Needs[6]
2001	8,000	165	2,400	
2002	8,000	165	2,400	

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

[2]Includes wild and Northeast Oregon Hatchery Project returns, to the mouth of the Hood River.

[3]Brood stock requirement for the Hood River facility only.

[4]Schedule dependent on completion of construction.

[5]Brood stock limited to a maximum of 10% - 15% of wild run.

[6]Based on total run sizes as evaluated and agreed to by CTWS and ODFW.

Table 23. Harvest guidelines for winter steelhead[1]

Run Size Goal (to mouth) = 5,000 (1,200 natural, 3,800 hatchery)

Broodstock Collection Goal = 90

Interim Spawning Escapement Goal = 2,400 (1,200 natural, 1,200 hatchery)

YEAR	TOTAL RUN SIZE[2]	BROODSTOCK[3]	ESCAPEMENT	HARVEST
1995[4]	250	36[5]	214	Based
1996	713	90	1,087	on
1997	3,358	90	2,400	Returns
1998	5,000	90	2,400	Above
1999	5,000	90	2,400	Broodstock
2000	5,000	90	2,400	Needs[6]
2001	5,000	90	2,400	
2002	5,000	90	2,400	

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

[2]Includes wild and Hood River hatchery returns to the mouth of the Hood River.

[3]Brood stock requirement for the Hood River facility only.

[4]Schedule dependent on completion of construction.

[5]Brood stock limited to a maximum of 10% - 15% of wild run.

[6]Based on total run sizes as evaluated and agreed to by CTWS and ODFW.

RESIDENT FISH INTERACTIONS ASSESSMENT

Background

The impact of the Hood River Production Plan on resident fish in the Hood River Subbasin is unknown. The HRPP does not bring artificial production to the Hood River Subbasin for the first time. Stocking of spring chinook, and summer and winter steelhead has been going on in the basin since 1986, 1958 and 1962 respectively; rainbow trout were supplemented as early as 1955 and sea run cutthroat were supplemented in 1956, from 1974-78, and from 1985-87. The potential for interspecific competition depends on the relative abundance of the stocked and resident fish species and the degree of niche overlap between them (Steward and Bjorn 1990).

Production Constraints

Various physical and environmental constraints currently limit fisheries production potential in the Hood River Subbasin. While many of the limiting constraints can be directly attributed to man's activities within the drainage, a few are closely associated with the physical characteristics of the drainage. The primary biological and physical constraints limiting production in the Hood River Subbasin include (1) the relatively low biomass potential common to most of the free flowing water in the drainage; (2) natural passage barriers; and (3) high stream gradients.

Perennial streams in the Hood River Subbasin which are fed by glacial melt are typically low in nutrients and have little capacity for supporting large populations of resident trout and anadromous salmonids. The rapid seasonal melting of glaciers and the associated rock flour and sand that is transported downstream further reduce productivity in the drainage by increasing turbidity levels and depositing large amounts of sand in the stream. High turbidity levels and heavy silt loads are a common occurrence in the mainstem of the Hood River, the Middle and East forks of the Hood River, and several of the tributary streams located in the upper headwaters of both the Middle and East forks of the Hood River. High peak flows that occur from November through February are believed to reduce the egg-to-smolt survival rate and natural passage barriers. High stream gradients, either singly or in combination, restrict or impede movement into the upper reaches of many of the tributary streams.

Other environmental and physical constraints that, in general, are common throughout most of the drainage include low pool to riffle ratios, poor cover, man-made passage barriers, and poor water quality due to glacial turbidity. These indirectly result in the loss of degradation of fish habitat. Either singly or in combination these limiting constraints result in a significant reduction in the productive potential of the drainage.

Data Needs

Both quantitative and qualitative data are lacking on all aspects of the life history of resident fish in the Hood River Subbasin. The lack of this information makes it extremely difficult to effectively manage the resident fish species in conjunction with each other and anadromous salmonids present in the basin. To both effectively manage resident fish in the basin, and properly implement and evaluate actions specified in this plan, CTWS and ODFW consider it vital that the following data be collected:

Species Abundance and Distribution

Limited information exists on the abundance and diversity of resident fish species in the Hood River Subbasin. Identification of all existing species is critical for the effective management of the basin's fishery resources.

Rearing Densities

A quantitative estimate of the carrying capacity of the Hood River Subbasin is currently unavailable. Estimating rearing densities in the basin would provide a more accurate means of evaluating the basin's production potential. Estimates should also provide the means to evaluate the effectiveness of laws and regulations designed to protect and enhance the fisheries resource.

Spatial Distribution

Limited information exists on the current temporal and spatial distribution of the resident fish populations in Hood River. Developing a data base on the spatial distribution of the various resident fish species is considered important for evaluating the benefits associated with present or future habitat improvement projects. Data would also provide the information needed to optimize the benefits associated with any future habitat-improvement projects in the basin.

Life History Information

General life history information such as the age composition, sex ratio, length:weight ratio, fecundity, and egg-to-adult survival rate are unavailable for Hood River resident fish. This type of biological information is considered important for the effective management of the fisheries resource.

Status of Indigenous Populations under the Wild Fish Management Plan

According to ODFW's provisional wild fish list (1991), the Hood River Subbasin contains the following wild fish populations:

Species	No. of Populations
Anadromous Cutthroat*	1
Resident Cutthroat	40
Resident Rainbow	38
Bull Trout	2
Mountain Whitefish*	1

* Listed as a State Sensitive Species

An overview of each of these species is presented in the following sections.

Sea Run Cutthroat

Little information is available on the current status of the sea run cutthroat run in the Hood River Subbasin; however, it is assumed that the run is fairly low. Based on information available on the spatial distribution of the population it is believed that the population is primarily located in the mainstem of the Hood River and its tributaries (excluding the Middle and West forks of the Hood River), and in the East Fork Drainage.

Hatchery smolts (Nestucca River, Alsea River, and Big Creek stocks) were released into the Hood River Subbasin in 1956, from 1974 and from 1985-87.

Wild Production

Life History Information

No quantitative and very little qualitative life history information exists for sea run cutthroat in the Hood River Subbasin. It is assumed that sea run cutthroat trout in the Hood River Subbasin have a life-history cycle similar to that of sea run cutthroat trout located in other lower Columbia River subbasins. Sea run cutthroat probably return to the Hood River Subbasin from August through December, primarily as one-salt fish, with the peak of the run occurring in late September and early November; spawn from January through March of the following year; emergence from March through April; and migration as smolts during April and late June, primarily as age 3+ and age 4+ juveniles.

No information is available on the age structure, sex ratio, length:weight ratio, fecundity, and egg-to-smolt ant smolt-to-adult survival rates for sea run cutthroat trout in the Hood River.

Although the current run size is unknown, based on estimates of escapement past Powerdale Dam for the years 1963-71 (Table 24), it is assumed that the sea run cutthroat trout run is fairly low.

Table 24. Escapement of adult sea run cutthroat trout past Powerdale Dam, 1963-71.

Year	Escapement
1963	37
1964	17
1965	27
1966	57
1967	101
1968	134
1969	177
1970	18
1971	45

Habitat Carrying Capacity
Data is currently unavailable to accurately estimate the smolt production capacity for the drainage. The best estimate to date was developed from the estimates of smolt production capacity for summer and winter steelhead. Smolt capacity was estimated for sea run cutthroat trout based on the assumption that summer and winter steelhead account for approximately 60% of the combined smolt production of the three species. The basis for estimating smolt capacity for summer and winter steelhead is presented in the summer and winter steelhead sections of this plan.

Genetic Information
No morphological or electrophoretic data are available on sea run cutthroat trout in the Hood River Subbasin.

Hatchery Production

Hatchery Facilities
No hatchery facilities exist in the Hood River Subbasin.

Supplementation History
Hatchery sea run cutthroat trout smolts (Nestucca River, Alsea River, and Big Creek stocks) were released into the Hood River Subbasin in 1956, from 1974-78, and from 1985-87. The number released has ranged from 538 to 32,949 smolts. Recent releases of hatchery sea run cutthroat trout smolts into the Hood River Subbasin have not been marked.

The most recent hatchery program was possible primarily because an excess of hatchery smolts was available from Big Creek Hatchery. There are currently no dedicated hatchery facilities for maintaining an ongoing program to supplement the Hood River Subbasin with sea run cutthroat trout smolts.

Cutthroat Trout

Little information is available on the current status of cutthroat trout populations in the Hood River Subbasin. Based on limited available information for the spatial distribution of the population, it is believed that the most of the populations are located primarily in the mainstem of the Hood River and its tributaries (excluding the West Fork of the Hood River), and in the East Fork Drainage of the Hood River.

Wild Production

Life History Information
No quantitative and very little qualitative life history information exists for cutthroat trout in the Hood River Subbasin. It is assumed that cutthroat trout in the Hood River Subbasin have a life-history cycle similar to that of cutthroat trout located in other lower Columbia River subbasins. Cutthroat trout probably spawn during early April to early May and emerge from the gravel from late April to late May.

No data is available on the age structure, sex ratio, length:weight ratio, fecundity, and egg-to-adult survival rate for cutthroat trout in the Hood River Subbasin.

Habitat Carrying Capacity
Data is currently unavailable to accurately estimate the carrying capacity of the drainage.

Genetic Information
No morphological or electrophoretic data are available for cutthroat trout in the Hood River Subbasin.

Hatchery Production

Hatchery Facilities
No hatchery facilities exist in the Hood River Subbasin.

Supplementation History
The Hood River Subbasin has never been supplemented with hatchery cutthroat trout and there are no plans to do so in the foreseeable future.

Rainbow Trout

Little information is available on the current status of the rainbow trout populations in the Hood River Subbasin. Based on limited information, it is believed that rainbow trout probably spawn and rear throughout much of the drainage. It is assumed that the productive potential of the drainage is limited by (1) insufficient juvenile and adult holding water; (2) the relatively unproductive waters typical of the drainage; (3) poor water quality resulting form glacial runoff; and (4) competition with other species of resident trout and anadromous salmonids. Legal-sized hatchery trout have been released into the drainage since as early as 1955.

Wild Production

Life History Information

No quantitative and very little qualitative life history information exists for rainbow trout in the Hood River Subbasin. It is assumed that rainbow trout in the Hood River Subbasin have a life-history cycle similar to that of rainbow trout located in other lower Columbia River subbasins. Rainbow trout likely spawn during April and May, primarily as three- and four-year-old fish, and emerge from the gravel during mid-June and mid-July.

No data is available on the age structure, sex ratio, length:ratio, fecundity, and the egg-to-adult survival rate for rainbow trout in the Hood River Subbasin.

Habitat Carrying Capacity

Data is currently unavailable to accurately estimate the carrying capacity of the Hood River Subbasin.

Genetic Information

No morphological or electrophoretic data are available for rainbow trout in the Hood River Subbasin.

Hatchery Production

Hatchery Facilities

No hatchery facilities exist in the Hood River Subbasin.

Supplementation History

The Hood River Subbasin has been supplemented with legal-sized hatchery fish since as early as 1955. Hatchery releases into the free-flowing waters of the Hood River Subbasin have ranged from approximately 10,000-50,000 legal-sized fish. STEP volunteers began releasing hatchbox fry into the Hood River Subbasin in 1985 (Appendix E).

Bull Trout

Little information is available on the current status of the bull trout populations in the Hood River Subbasin. Bull trout has been designated by ODFW as a sensitive species in Oregon. Based on limited information available, it is believed that relatively low numbers of bull trout probably spawn and rear in the mainstem of the Hood River; the Middle Fork of the Hood River; and Clear Branch Creek--a tributary to the Middle Fork. It is assumed that the productive potential of the drainage is limited by (1) insufficient juvenile and adult holding water; (2) the relatively unproductive waters typical of the drainage; (3) poor water quality resulting form glacial runoff; and (4) competition with other species of resident trout and anadromous salmonids present in the subbasin.

The resident populations of bull trout have never been supplemented with hatchery fish and are representative of the last remaining wild populations of bull trout present in the Mid-Columbia District.

Wild Production

Life History Information
No quantitative and very little qualitative life history information exists for the Hood River stock of bull trout. It is assumed that bull trout is the Hood River Subbasin have a life history cycle similar to that of bull trout located in other lower Columbia River subbasins. Bull trout probably spawn from mid-August through November, and emerge from the gravel during March or April. No data is available on the age structure, sex ratio, length:weight ratio, fecundity, and egg-to-adult survival rate for bull trout in the Hood River Subbasin.

Habitat Carrying Capacity
Data is currently unavailable to accurately estimate the basin's carrying capacity.

Genetic Information
No morphological or electrophoretic data are available on bull trout in the Hood River Subbasin.

Hatchery Production

Hatchery facilities
No hatchery facilities exist in the Hood River Subbasin.

Supplementation History
The Hood River Subbasin has never been supplemented with hatchery bull trout and there are no plans to do so in the foreseeable future.

Mountain Whitefish

Whitefish are culturally significant to the Warm Springs Tribes, not only in contemporary culture, but also from a traditional and historical perspective. Mountain whitefish, though not as important as salmon and other primary food sources, has played in important role in the seasonal subsistence treks of the tribes.Significance of this species is evidenced by the numerous locations recited in oral history for the procurement and processing of these fish. Since the establishment of the reservation, mountain whitefish procurement has continued to be important for subsistence activities and in maintaining traditional cultures.

Approach

Three phases are identified to evaluate the potential impacts of supplementation activities on resident fish populations. These include:

1. Collecting baseline information to assess resident trout distribution, population status, genetic structure and life history characteristics prior to supplementation activities.

2. Developing and conducting experiments to assess potential impacts to resident trout populations prior to proposed supplementation activities.

3. Developing methodologies and strategies for long-term monitoring of potential impacts to resident trout populations.

Proposal Outline

Limited biological information currently exists for the resident trout populations in the Hood River Subbasin. The purpose of this proposal is to collect baseline biological information on resident trout populations in the Hood River Subbasin. This baseline information will be collected in a manner consistent to that being collected in the Yakima and SE Washington resident trout studies so that it can be applied to those analyses.

The primary goal of this proposal is to determine distribution, population status, and general life history characteristics of resident trout in the Hood River Subbasin. Specific objectives, tasks and methods are as follows:

Objective 1: Determine species composition and distribution of resident trout in the Hood River Basin.

Task 1.1: Conduct a literature review of available information related to resident fish species in the Hood River Subbasin and applicable resident trout interactions studies.

Task 1.2: Conduct exploratory surveys of resident trout spawning and rearing areas in the Hood River and tributaries to qualitatively determine species composition and distribution.

Method: Electro-shocking and visual observations will be conducted in areas of the mainstem Hood River and its tributaries. General qualitative information on trout presence/absence, distribution, relative abundance, and species composition will be obtained. Sampling will be conducted twice per year.

Objective 2: Conduct population estimates of resident trout in the Hood River Subbasin.

Task 2.1. Conduct population estimates in selected stream areas to obtain juvenile and adult population abundance and species composition.

Method: After exploratory surveys are conducted, specific streams and areas will be selected for conducting population estimates. Streams will be selected based upon abundance, distribution, and species composition of resident trout, as well as proximity to supplementation release areas.

Standard electro-shocking techniques will be used to conduct population estimates in index areas twice per year.

Objective 3: Determine general life history characteristics of resident trout in the Hood River Basin.

Task 3.1: Determine spawning timing, age composition, growth rates, sex ratio, and age-size relationships.

Method: Spawning ground surveys will be conducted on selected stream areas in the Hood River Subbasin. Scales, weight, length, and sex information will be collected during Task 2.1.

Objective 4: Prepare a report summarizing the results of the study.

Task 4.1: Summarize data collected, assess the application to existing studies, and prepare an analysis of potential impacts of the Hood River Production Plan on resident trout in the Hood River Subbasin.

Objective 5: Determine the exposure of resident fish populations to ongoing and planned releases of hatchery-reared salmon and steelhead smolts.

Task 5.1: Estimate resident fish abundance and distribution near release sites before and after releases of hatchery-reared salmonids by direct observation.

Method: An estimate of resident fish numbers will be conducted 24 hours before and 24, 46, and 72 hours after releases of hatchery-reared salmonids by direct observation.

Task 5.2: Describe the behavior of resident fish and hatchery-reared salmonids near release sites before and after releases of hatchery-reared salmonids.

Method: Direct observations will be conducted 24, 48, and 72 hours after releases of hatchery-reared salmonids.

Objective 6: Identify opportunities for avoiding and/or mitigating potential or existing impacts on resident fish.

Objective 7: Reassess both the need for and prospects of using the recently acquired baseline data from the Hood River Subbasin and data from other studies to evaluate interaction between resident fish and hatchery-reared salmonids. Design the necessary studies and/or monitoring programs.

MASTER PLAN DEVELOPMENT AND REVIEW

The Hood River Production Plan was developed by CTWS and ODFW in cooperation with other agencies. Development of this plan was the responsibility of the HRPP Technical Work Group--a committee composed of technical staff from CTWS, ODFW, the Northwest Power Planning Council, BPA, CTUIR, Nez Perce Tribes, and other agencies.

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APPENDICES