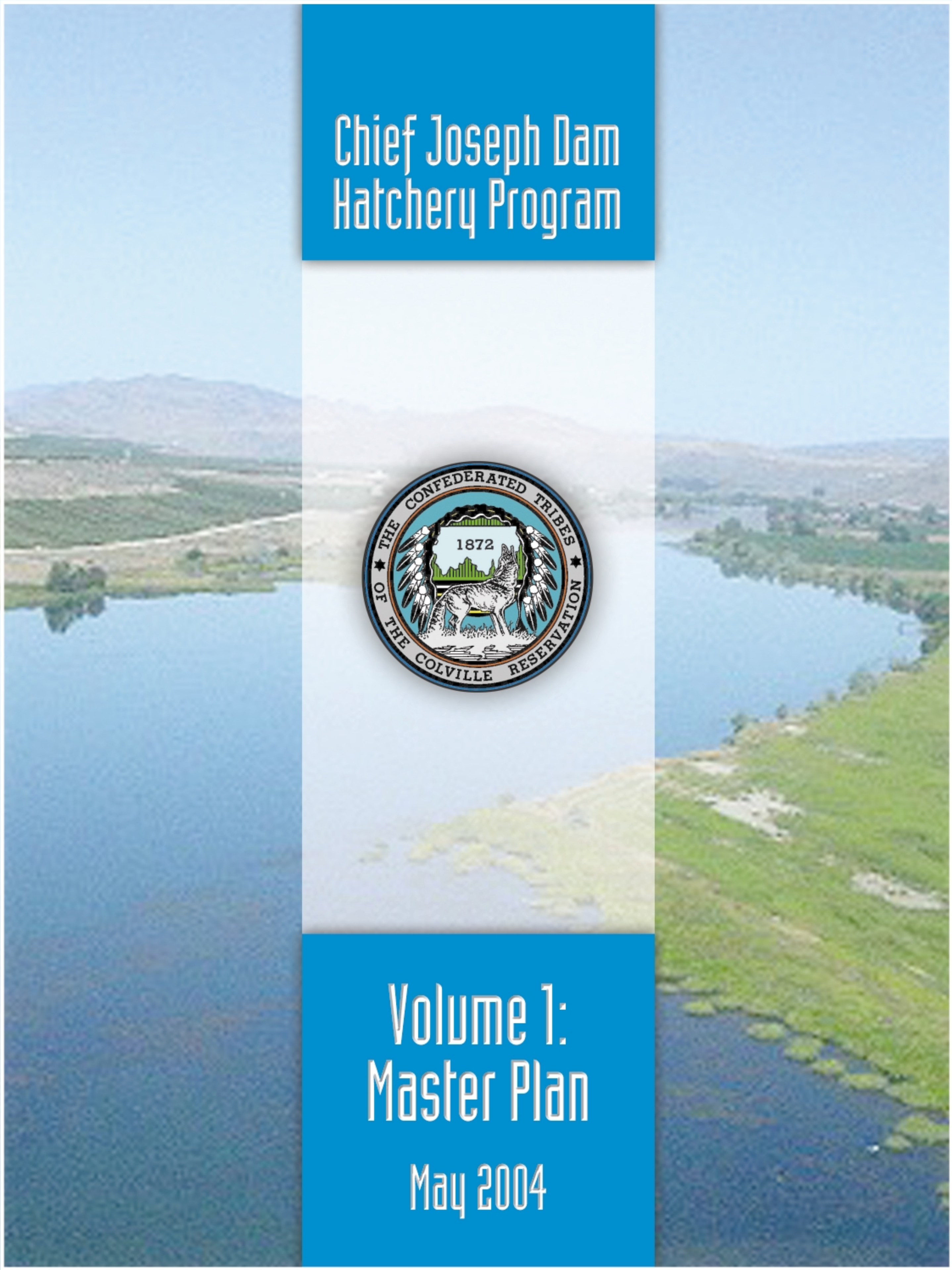
Chief Joseph Dam Hatchery Program



THE CONFEDERATED TRIBES OF THE COLVILLE RESERVATION 1872

Volume 1: Master Plan

May 2004

Chief Joseph Dam Hatchery Program

MASTER PLAN

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Executive Summary

"A Columbia River ecosystem that sustains an abundant, productive, and diverse community of fish and wildlife, mitigating across the basin for the adverse effects to fish and wildlife caused by the development and operation of the hydrosystem and providing the benefits from fish and wildlife valued by the people of the region. This ecosystem provides abundant opportunities for tribal trust and treaty right harvest and for non-tribal harvest and the conditions that allow for the recovery of the fish and wildlife affected by the operation of the hydrosystem and listed under the Endangered Species Act."

- Vision for the Columbia River Basin from the Northwest Power and Conservation Council's 2000 Fish and Wildlife Program

"An Okanogan Subbasin that supports self-sustaining, harvestable and diverse populations of fish and wildlife and their habitats, and supports the economies, customs, cultures, subsistence and recreational opportunities within the basin. Decisions to improve and protect fish and wildlife populations, their habitats and ecological functions are made using open and cooperative processes that respect different points of view, statutory responsibilities, and are made for the benefit of current and future generations."

- Vision for the Okanogan Subbasin from the Okanogan Subbasin Plan

INTRODUCTION

The upper reaches of the Columbia River once fostered some of the most abundant and extraordinary anadromous fish runs in the entire Columbia River Basin. Today all anadromous fish are extirpated from the Columbia River and its tributaries above Chief Joseph Dam. The Okanogan River is the uppermost tributary of the Columbia that is still available to anadromous fish.

The Okanogan subbasin presently supports summer/fall Chinook salmon, sockeye salmon, and summer steelhead. The Upper Columbia River Spring Chinook were listed as endangered in 1999. The listed Evolutionarily Significant Unit (ESU) includes all naturally-spawned populations of spring Chinook in accessible reaches of Columbia River tributaries between Rock Island and Chief Joseph dams, *excluding* the Okanogan River. Upper Columbia River Spring Chinook are at present considered extinct from the Okanogan subbasin.

Construction of Grand Coulee Dam eliminated salmon from the majority of the Colville Reservation. To provide partial mitigation for the anadromous fish losses caused by construction of Grand Coulee Dam, Congress authorized construction of four hatcheries. Only three of these hatcheries were built. The fourth hatchery, which was to be located on the Okanogan River was never constructed. In the 1980s the Colville Tribes reinitiated the question of the fourth hatchery and in 2000 the U.S. Bureau of Reclamation agreed that the full, authorized mitigation for construction of Grand Coulee Dam was still not complete and could be pursued.

Fish mortalities incurred at nine hydropower projects downstream from the Colville Reservation have further decimated the remaining anadromous fish populations returning to the waters around the Colville Reservation. However, the Colville Tribes never received hatchery mitigation for the loss of Okanogan subbasin anadromous fish that pass through the four federal hydroelectric projects on the lower Columbia River. Moreover, the formulas used to establish mitigation levels for the mid-Columbia Public Utility District dams left out the fish that should have been produced at the missing fourth hatchery, further compounding the initial lack of mitigation.

As a result of the extirpation of anadromous fish from the majority of the Colville Reservation, tribal members are forced to rely solely on the Tribes' limited remaining fisheries in the Okanogan subbasin and Columbia River below Chief Joseph Dam. These fisheries are not adequate to meet even the most cursory ceremonial and subsistence needs. Because of the extirpation of spring Chinook from the Okanogan subbasin the Colville Tribes are also no longer able to celebrate the important First Salmon Ceremony welcoming the return of the first spring Chinook of the season.

Current levels of mitigation are not adequate to address the federal government's trust obligations to protect the Colville Tribes' reserved fishing rights and associated resources; nor are they adequate to sustain naturally-spawning populations of Chinook salmon in the Okanogan subbasin, or to provide stable recreational fisheries to citizens in the region.

CHIEF JOSEPH DAM HATCHERY PROGRAM

The Master Plan for the Chief Joseph Dam Hatchery Program (CJDHP) describes the rationale, local and regional context, conceptual design of artificial production facilities, conceptual monitoring and evaluation plans, and estimated costs necessary to implement a comprehensive management program for summer/fall Chinook salmon in the Okanogan subbasin and the Columbia River between Wells and Chief Joseph dams.

The content of the CJDHP Master Plan was developed to meet the Step 1 requirements of the Council's three-step process for artificial production initiatives. Additionally, in its overall design and through its programmatic objectives and actions, the CJDHP is consistent with recommendations presented in the Independent Science Advisory Board's *Review of Salmon and Steelhead Supplementation* and the Council's recently completed draft *Artificial Production Review and Evaluation*.

The primary content and focus of this Master Plan is a conceptual proposal to construct and operate facilities to propagate summer/fall Chinook salmon. However, as part of the contract to develop this Master Plan, Council staff and BPA representatives agreed that a separable conceptual design for spring Chinook propagation facilities could be included. The reasons for including the spring Chinook components in Step 1 were:

- Very low relative cost to include both summer/fall and spring Chinook in the Master Plan development.
- Provide an opportunity for the Council and the Independent Science Review Panel to review the summer/fall and spring Chinook programs together within the context of the Okanogan subbasin ecosystem.
- Identify opportunities to achieve cost savings by developing, designing and constructing the summer/fall and spring Chinook propagation facilities at the same time.

The spring Chinook components in the CJDHP Master Plan are presented in a single separate chapter and all costs and facility requirements are presented as separable components.

SUMMARY OF SUMMER/FALL CHINOOK CHIEF JOSEPH DAM HATCHERY PROGRAM COMPONENTS

The summer/fall Chinook components of the CJDHP consist of two complementary programs:

1) An integrated recovery program designed to increase abundance, distribution, and diversity of naturally-spawning summer/fall Chinook salmon within their historical Okanogan subbasin habitat.
2) An integrated harvest program designed to support a tribal ceremonial and subsistence fishery, and to provide increased recreational fishing opportunities for local citizens.

The summer/fall Chinook population in the Okanogan River is at present supported by a single hatchery program that produces 576,000 yearling smolts annually. The proposed CJDHP will increase production of juvenile summer/fall Chinook by 2,000,000 including 1,100,000 fish for conservation purposes, and 900,000 fish for harvest purposes.

The **summer/fall Chinook integrated recovery program** will be implemented through five conservation actions:

- Development of a local Okanogan River broodstock.
- Expansion of current broodstock collection by two months, in order to propagate the full historical run of summer/fall Chinook.
- Propagation of both the yearling and subyearling life histories to achieve full, natural diversity and provide necessary programmatic flexibility.
- Improved distribution of spawning throughout the historical summer/fall Chinook habitat.
- Control of the proportion of hatchery-origin fish spawning in the wild.

The **summer/fall integrated harvest program** is designed to support a tribal ceremonial and subsistence fishery and to provide increased recreational fishing opportunities for local citizens. To support the integrated harvest objectives 500,000 early-arriving, and 400,000 later-arriving summer/fall Chinook will be released at Chief Joseph Dam Hatchery.

To ensure programmatic flexibility, keep costs low, and improve distribution of spawning, the CJDHP will rely on a combination of new and existing facilities. These include a new hatchery at the base of Chief Joseph Dam, two new acclimation ponds, and use of two existing Oroville-Tonasket Irrigation District settling ponds which have been modified for use as acclimation ponds.

SUMMARY OF SPRING CHINOOK CHIEF JOSEPH DAM HATCHERY PROGRAM COMPONENTS

Spring Chinook once provided important fisheries to the Colville Tribes. Given the Tribes' almost non-existent remaining salmon fisheries, and the singular cultural importance of spring Chinook, restoration of a stable ceremonial and subsistence spring Chinook fishery is a particularly high priority for the Colville Tribes. The Colville Tribes have developed a two-phase management plan to reintroduce extirpated spring Chinook into select waters in and around the Colville Reservation. The CJDHP would provide the artificial production facilities necessary for this phased reintroduction. A combination of existing and new facilities will be used to accomplish the program objectives.

The CJDHP spring Chinook component includes two complementary parts:

1) An integrated recovery program designed to restore naturally-spawning spring Chinook populations to their historical habitats in the waters in and around the Colville Reservation.
2) An isolated harvest program designed to restore a stable ceremonial and subsistence fishery, and to provide increased recreational fishing opportunities for local citizens.

Ultimately, if the full two-phase program is implemented, spring Chinook produced in the second phase may also provide benefit in the recovery of the listed Upper Columbia River Spring Chinook ESU.

The CJDHP spring Chinook programs will increase production of Carson stock spring Chinook destined for the Okanogan subbasin to 900,000 smolts. The spring Chinook **integrated recovery program** will initially re-introduce naturally-spawning populations of Carson stock spring Chinook into Omak Creek on the Colville Reservation. The **isolated harvest program** will support selective fisheries in the Okanogan and Similkameen rivers, in the tailrace of Chief Joseph Dam and in the Wells Pool, and near the confluence of the Okanogan River. These fisheries will target the Carson-stock spring Chinook produced in the program.

The CJDHP spring Chinook program is an experimental program and includes mechanisms to identify any potentially adverse interactions with summer/fall Chinook and steelhead populations, and to document the extent of tribal and recreational harvest. Information collected through monitoring and evaluation in the early phases of the program will be used to adapt and refine secondary phases of the program.

CRITICAL RESEARCH NEEDS

The Master Plan also identifies research needs that are critical to Step 2 planning. The first of these is research to test the viability of live-capture, selective fishing gear for broodstock collection. The success of the live-capture, selective fishing methods will also be vital to controlling the ratio of hatchery to natural fish on the spawning grounds. The second critical study consists of radio-telemetry research to determine where and when summer/fall Chinook migrate, where they congregate, the extent to which they are spatially separated from other population components, and whether the timing of passage over Wells Dam is related to timing and location of subsequent spawning. This information is critical to the development of broodstock protocol and subsequent acclimation of progeny.

CONCEPTUAL MONITORING AND EVALUATION

The CJDHP conceptual monitoring and evaluation design is based on quantifiable performance standards and indicators. The primary goals of the monitoring and evaluation program are to:

- Measure the relative success of the CJDHP integrated recovery programs in restoring the abundance, distribution, and diversity of naturally-spawning populations of Chinook in the Okanogan River and upper Columbia River above Wells Dam.
- Measure the relative success of the integrated harvest program (and if implemented, the isolated harvest program) in providing a stable ceremonial and subsistence fishery for the Colville Tribes, and in providing increased recreational fishing opportunities.
- Provide information necessary to adapt the CJDHP in order to minimize deleterious effects and maximize desired results.

The CJDHP is designed to be flexible and responsive to ecosystem conditions both within and outside of the subbasin. The Master Plan includes examples of a variety of contingency actions that could be implemented in response to changing conditions, these include specific intra- and inter-program adjustments. Information provided through the monitoring and evaluation program will be vital in determining when and where to adapt and adjust the CJDHP over time.

SUMMARY OF ESTIMATED COSTS

In developing estimated costs for the CJDHP substantial efforts were made to provide tangible levels of detail to back up estimated costs in all categories. The Colville Tribes believe the estimated costs presented in the Master Plan represent the uppermost limit of anticipated program costs – and that these costs are very reasonable relative to the size and complexity of the proposed CJDHP.

Estimated costs for the **summer/fall Chinook components** of the CJDHP are:

Capital construction costs for the Chief Joseph Dam Hatchery	$16,220,000
Capital construction costs for the acclimation ponds	$ 1,150,000
Total estimated capital expenses	**$17,370,000**
Operations and maintenance	$858,000
Monitoring and evaluation	$345,000
Total estimated annual operating expenses	**$1,203,000**

Estimated additional costs to include spring Chinook components to the CJDHP are:

Capital construction costs for additional Chief Joseph Dam Hatchery spring Chinook components	$5,400,000
Capital construction costs for the spring Chinook acclimation ponds	$170,000
Total estimated capital expenses	**$5,570,000**
Operations and maintenance	$222,000
Monitoring and evaluation	$163,000
Total estimated annual operating expenses	**$385,000**

With completion of the conceptual hatchery design and development of well-grounded cost estimates, the Colville Tribes have the basis for discussing potential cost sharing arrangements for hatchery construction, operation and maintenance with mid-Columbia parties that also have mitigation responsibilities to the Colville Tribes. Pending approval from the Council to move forward to Step 2, the Colville Tribes plan to seek funding partnerships for the summer/fall and spring Chinook programs during the next planning stage with the intent of broadening project sponsorship.

CONCLUSION

The Colville Tribes believe implementation of the proposed CJDHP will provide wide-ranging ecological, social, cultural, and economic benefits in the Okanogan subbasin and the Columbia River Basin. The proposed CJDHP is necessary to meet the federal government's trust obligations to the Colville Tribes, to correct long-standing mitigation inequities, to provide increased recreational fishing opportunities, and to restore populations of naturally-spawning summer/fall Chinook salmon, and possibly spring Chinook salmon, to their historical habitats in the Okanogan subbasin.

The Council's three-step process allows for a systematic review, evaluation and refinement of facility and program design at each step. The Colville Tribes request that the Council review and approve the following elements described in this Master Plan to proceed forward to the second step of the Council's three-step process:

- CJDHP summer/fall Chinook components.
- CJDHP spring Chinook components.
- Critical research necessary for Step 2, including testing of live-harvest, selective fishing gear, radio telemetry research, and refinement of water source information.

The long-term recovery and sustainability of natural-origin salmon and steelhead runs in the Columbia River Basin depends on cooperative, consistent and persistent actions by fishery co-managers, hydrosystem operators, local governments, and citizens throughout the Columbia Basin. The commitment to recovery of Chinook salmon in the upper Columbia, and to the citizens of the Okanogan subbasin, that would be signaled by the implementation of the CJDHP is key to building and sustaining these vital partnerships.

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Acronyms and Abbreviations

BAMP .... Biological Assessment and Management Plan
BiOp .... Biological Opinion
BKD .... Bacterial Kidney Disease
BPA .... Bonneville Power Administration
BOR .... Bureau of Reclamation
BY .... Brood Year
C&S .... Ceremonial and Subsistence
CCT .... Colville Confederated Tribes
Cfs .... Cubic Feet per Second
COE .... United States Army Corps of Engineers
Ctu .... Celsius Temperature Unit
Cu. Ft. .... Cubic Feet
ELISA .... Enzyme-Linked Immunosorbent Assay
EMAP .... Environmental Monitoring and Assessment Program
ESA .... Endangered Species Act
ESU .... Evolutionarily Significant Unit
FPC .... Fish Passage Center
FPP .... Fish per Pound
FTE .... Full-Time Equivalents
Ftu .... Fahrenheit Temperature Unit
Gpm .... Gallons per Minute
HGMP .... Hatchery and Genetic Management Plan
HxH .... Hatchery-Origin Fish Breeding with a Hatchery-Origin Fish
HxW .... Hatchery-Origin Fish Breeding with a Natural-Origin Fish
IHOT .... Integrated Hatchery Operations Team
INAD .... Investigational New Animal Drugs
ISAB .... Independent Scientific Advisory Board
M&E .... Monitoring and Evaluation
NMFS .... National Marine Fisheries Service, now designated NOAA Fisheries
NRR .... Natural Return Rate
O&M .... Operation and Maintenance
ODFW ...... Oregon Department of Fish and Wildlife
OTID .... Oroville-Tonasket Irrigation District
PNAMP ...... Pacific Northwest Aquatic Monitoring Partnership
PNFHPC ..... Pacific Northwest Fish Health Protection Committee
PSEP .... Puget Sound Estuary Program
PSMFC ...... Pacific State's Marine Fisheries Commission
PUD .... Public Utility District
Rkm .... River kilometer
RM .... River Mile
RM&E .... Research Monitoring and Evaluation
UCR .... Upper Columbia River
USFWS ...... United States Fish and Wildlife Service
WDFW ..... Washington Department of Fish and Wildlife
WDOE ...... Washington Department of Ecology
WRIA .... Water Resource Inventory Area
WxW .... Natural-Origin Fish Breeding with a Natural-Origin Fish
ylng .... Yearling

1.
CJDHP Master Plan Development and Document Organization

Chief Joseph Dam Hatchery Program
MASTER PLAN

1

Master Plan Development and Document Organization

1.1 NORTHWEST POWER AND CONSERVATION COUNCIL'S THREE-STEP PROCESS

The Northwest Power Act of 1980 directs the Northwest Power and Conservation Council (Council) to develop a program to protect, mitigate and enhance fish and wildlife of the Columbia River Basin that have been impacted by hydropower dams, and make annual funding recommendations to the Bonneville Power Administration (BPA) for projects to implement the Council's Fish and Wildlife Program. In 1997, as part of its Fish and Wildlife Program, the Council adopted a three-step review process for all "new production initiatives" in the Columbia River Basin. The Council defines new production initiatives, as they relate to artificial production, as projects that include: construction of significant new production facilities, planting fish in waters where they have not been planted before, increasing significantly the number of fish introduced, changing stocks or the number of stocks, or changing the location of production facilities.

The Council's three-step process requires all new production initiatives to follow a defined planning sequence towards eventual approval, construction and operation:

STEP 1
Completion and approval of a conceptual plan generally presented in the form of a Master Plan.

STEP 2
Development of a preliminary design with cost estimates, and completion of necessary environmental review including National Environmental Policy Act (NEPA) and Endangered Species Act (ESA).

STEP 3
Development of the final design prior to construction and operation.

In 2000 the Council amended the Fish and Wildlife Program to incorporate a set of eight scientific principles that broadly describe an ecosystem-based framework for fish and wildlife management. The amended 2000 Fish and Wildlife Program establishes a basinwide vision for fish and wildlife, biological objectives, and action strategies necessary to achieve the Council's basinwide vision. Consistent with this ecosystem-oriented approach, the Council's 2000 Fish and Wildlife Program identifies 17 topics that must be addressed in a complete Master Plan. Included within these topics are ten specific artificial production policies and related strategies.

NORTHWEST POWER AND CONSERVATION COUNCIL'S MASTER PLAN REQUIREMENTS:

1. Address the relationship and consistencies of the proposed project to the eight scientific principles outlined in the Council's Fish and Wildlife Program.
2. Describe the link of the proposal to other projects and activities in the subbasin and the desired end state condition for the target subbasin.
3. Define the biological objectives with measurable attributes that define progress, provide accountability and track changes through time associated with the project.
4. Define expected project benefits (e.g. preservation of biological diversity, fishery enhancement, water optimization, and habitat protection).
5. Describe the implementation strategies as they relate to the current conditions and restoration potential of the habitat for the target species and the life stage of interest.

6. Address the relationship of the project to the habitat strategies.
7. Ensure that cost-effective alternate measures are not overlooked and include descriptions of alternatives for resolving the resource problem, including a description of other management activities in the subbasin, province and basin.
8. Provide the historical and current status of anadromous and resident fish and wildlife in the subbasin most relevant to the proposed project.
9. Describe current and planned management of anadromous and resident fish and wildlife in the subbasin.
10. Demonstrate consistency of the proposed project with NOAA Fisheries recovery plans and other fishery management and watershed plans.
11. Describe the status of the comprehensive environmental assessment.
12. Describe the monitoring and evaluation plan associated with the project.
13. Describe and provide specific items and cost estimates for 10 fiscal years for planning and design (i.e. conceptual, preliminary and final), construction, operation and maintenance and monitoring and evaluation.
14. Address the relation and link to the Council's artificial production policies and strategies.
15. Provide a completed Hatchery and Genetic Management Plan (HGMP) for the target population(s).
16. Describe the harvest plan.
17. Provide a conceptual design of the proposed facilities, including an assessment of the availability and utility of existing facilities.

This Chief Joseph Dam Hatchery Program Master Plan is the Colville Tribes' Step 1 submittal describing the artificial propagation facilities necessary to implement a comprehensive management program for summer/fall Chinook salmon, and possibly also spring Chinook salmon, in the Okanogan[1] River and the Columbia River above Wells Dam. In responding to the Council's 17 Master Plan requirements, this Master Plan also places the proposed Chief Joseph Dam Hatchery Program within the ecological context of the Okanogan subbasin, and the Columbia Basin.

Responses to the Council's 17 Master Plan requirements are presented in the content of this Master Plan. The specific locations of these responses within this Master Plan is summarized in Chapter 3.

1.2 PROJECT HISTORY AND MASTER PLAN DEVELOPMENT

In developing this Master Plan the Colville Tribes chose specifically to incorporate the word "Program" into the title – Chief Joseph Dam Hatchery Program. This is a minor, but important, distinction. Although the Chief Joseph Dam Hatchery facilities described in this Master Plan are a critical element of this proposal, it is essential that reviewers understand the broader programmatic goals and context of the proposal. The Chief Joseph Dam Hatchery Program (CJDHP) is designed to implement a **comprehensive management program** for summer/fall Chinook, and possibly spring Chinook, in the Okanogan subbasin and in the Columbia River immediately below Chief Joseph Dam that is directly tied to the ecosystem within which it will be implemented.

The necessary facilities, programmatic goals, and related context of the CJDHP are described in detail in this Master Plan and in the accompanying appendices. The project history underlying development of this Master Plan also reflects the proposal's broad programmatic focus.

1.2.1 PROJECT HISTORY

Since the early 1990s, when new ESA listings of Columbia Basin salmon began to accumulate in file cabinets and courtrooms - federal, state and tribal scientists and policy makers throughout the region have tried to identify ways to stop the alarming and seemingly relentless slide towards extinction of one salmon population after another.

The Okanogan subbasin currently represents the uppermost limit of anadromous fish in the Columbia

[1] The word Okanogan/Okanagan is spelled differently in the U.S. and Canada. In this document the U.S. spelling of Okanogan is used when referring to locations on the U.S. side of the border. The Canadian spelling, Okanagan, is used when referring to locations on the Canadian side of the border or to members of the Canadian First Nations.

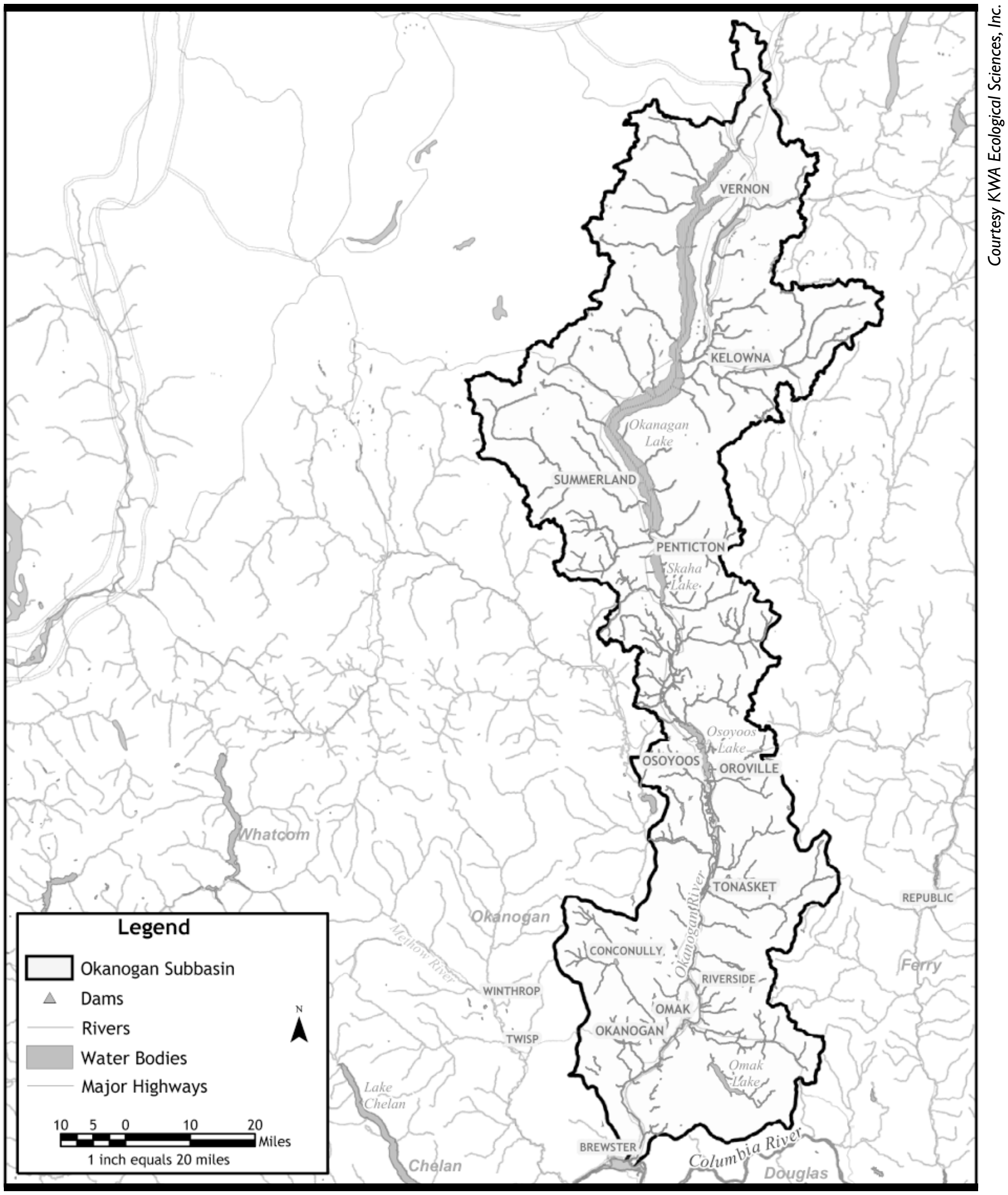


FIGURE 1: Okanogan Subbasin

River. Unfortunately, over the last century and a half, the once abundant salmon runs of the Okanogan subbasin have been reduced to sad remnants of their former glory. The Upper Columbia River Summer Steelhead and Upper Columbia River Spring Chinook are currently listed as endangered and the long-term future of other local species is uncertain. In spite of the urgency of protecting and restoring these fragile remaining upper Columbia River anadromous fish populations, funding for protection, mitigation and enhancement projects in the Okanogan subbasin over the last decade has been chronically inadequate. In the Council's 2003 rolling provincial review approximately 51 new projects were proposed for funding in the Columbia Cascade Province. Of those 51 project proposals, only a handful were funded for implementation in spite of the fact that the majority of projects received favorable reviews from the Council, the Independent Science Review Panel (ISRP) and the Columbia Basin Fish and Wildlife Authority (CBFWA).

The Colville Tribes has over the course of the last decade focused significant resources on protection and restoration of anadromous fish in the Okanogan subbasin. These efforts have included implementation of habitat protection and restoration actions, supplementation/enhancement activities, public education, watershed planning, and development of coordinated monitoring and evaluation programs [for examples of specific projects and activities see Chapter 6].

1.2.1.1 Project Chronology

In early 2001, the Colville Tribes initiated the preparation of draft HGMPs to guide the management of summer/fall and spring Chinook in the Okanogan subbasin. The Colville Tribes viewed the development of the HGMPs as an opportunity to better coordinate and improve management of key anadromous populations in the Okanogan subbasin. Regional fishery managers including Washington Department of Fish and Wildlife (WDFW), and U.S. Fish and Wildlife Service (USFWS), worked collaboratively with the Colville Tribes to develop and review the resulting draft summer/fall Chinook and spring Chinook HGMPs.

Information gleaned through the development of these two HGMPs pointed clearly to a need for additional artificial propagation facilities to meet Chinook salmon conservation and harvest objectives in the Okanogan River, and in the upper Columbia River above Wells Dam. In the process of developing the HGMPs, the inadequacy of the existing Okanogan subbasin Chinook artificial propagation facilities to address the troubled status of current Chinook populations in the upper Columbia River, the high mortalities exacted by nine downstream hydroelectric facilities, and substantial unmet mitigation and trust obligations - became increasingly evident. The impetus to develop the CJDHP Master Plan flowed from the Colville Tribes' desire to find effective means to address these shortfalls.

The draft Chinook HGMPs, and the collaborative process through which they were reviewed and developed provide the foundation for the CJDHP Master Plan proposal[2].

The development of the Mid-Columbia Habitat Conservation Plan (HCP) also provided an additional source of technical and management input in the development of the CJDHP. Mid-Columbia HCP negotiations began in 1993 and at the outset included NOAA Fisheries, USFWS, WDFW, Chelan County and Douglas County Public Utility Districts (PUDs), the Colville, Umatilla and Yakama Tribes, American Rivers, and relevant power purchasers. The Mid-Columbia HCP includes production goals intended to conserve low-risk, natural-origin populations and support recovery of listed species. Information developed in support of the HCP process was valuable to the design of the CJDHP [additional discussion of the contents of the Mid-Columbia HCP is included in the Chapter 6].

In December 2001, in response to a BPA solicitation for project proposals in the Columbia Cascade Province, the Colville Tribes submitted a suite of proposals designed to systematically address habitat restoration, fish propagation, fish harvest, and research monitoring and evaluation needs in the Okanogan subbasin. Included in that package were the following interrelated fish propagation and harvest proposals:

PROJECT 29050
Phase I Okanogan River Spring Chinook Production

PROJECT 29042
Selective Fish Collection and Harvesting Gear

PROJECT 29008
Adult Fish Counting and Trapping at Zosel Dam

PROJECT 29033
Design and Conduct Monitoring and Evaluation Associated with Reestablishment of Okanogan Subbasin Natural Production

PROJECT 29040
Develop and Propagate Local Okanogan River Summer/Fall Chinook

PROJECT 29051
Develop Local Okanogan River Steelhead Broodstock

PROJECT 29007
Okanogan Kelt Reconditioning

[2] At the time this Master Plan is being developed both the summer/fall and spring Chinook HGMPs are in the Phase II NOAA Fisheries' review process.

These proposals were reviewed by the ISRP, underwent a "fix-it loop" comment and revisions process, followed by a final ISRP review in June 2002. In the interim BPA in response to substantial fiscal shortfalls triggered in part by the West Coast energy crisis, and existing funding obligations in other Provinces imposed significant limitations on funds available for project implementation across the entire Columbia Basin. In responding to the diminished available funding, the Council and BPA asked co-managers and project proponents to prioritize projects for immediate and secondary funding. As part of this process the Colville Tribes were also asked to separate out the previously aggregated and complimentary projects proposed for funding under the 2001 Columbia Cascade Provincial review.

In October 2002, the Council approved the Colville Tribes' Project 29040 to develop a Step 1 CJDHP Master Plan for summer/fall Chinook. However, as part of their broader anadromous fish recovery objectives, and consistent with the need articulated through the spring Chinook HGMP, the Colville Tribes also wish to implement a comprehensive spring Chinook program in the Okanogan subbasin[3]. In addition, the original 2001 proposal package included research critical to the success of both the conservation and harvest components of the proposed CJDHP, including testing of live-capture, selective fish collection and harvest gear.

The Council's staff and BPA representatives agreed that in addition to the conceptual design for hatchery facilities necessary for production of summer/fall Chinook, the Step 1 Master Plan could propose:

1) A conceptual design for separable spring Chinook hatchery facilities.
2) Research and associated budgets necessary to gather information in Step 2, which would be critical to final design of Chief Joseph Dam Hatchery if it progresses to Step 3.

The Colville Tribes, Council's staff, and BPA representatives agreed that inclusion of this additional information at the Step 1 Master Plan stage would be beneficial to both plan reviewers and decision-makers. Moreover, all parties recognized that potential cost efficiencies might be secured through early identification of design and construction alternatives associated with the spring Chinook components of the CJDHP proposal.

In April 2003, BPA agreed to fund development of the CJDHP Master Plan. Then in July 2003, BPA negotiated a contract with the Colville Tribes to develop a CJDHP Master Plan.

1.2.1.2 Master Plan Project Scope

The final contract was to develop a CJDHP Master Plan that, in addition to the summer/fall Chinook, included conceptual design of separable spring Chinook facilities. All parties agreed at that time that further planning of the hatchery to produce spring Chinook would be considered by the Council and BPA in the course of reviewing the completed Step 1 Master Plan, and that a decision regarding development of further detailed spring Chinook design work as part of the Step 2 process would be contingent on the outcome of the Step 1 Master Plan review. No BPA funds were used to develop the spring Chinook HGMP.

Towards this end, information relevant to the proposed CJDHP spring Chinook programs is presented separately in Chapter 13. Spring Chinook conceptual design costs are also presented as separate elements in Appendix B.

The approved scope of work to develop, produce and present a completed CJDHP Master Plan to the Council for review included 13 tasks. In addition, the CJDHP scope of work identified specific tasks necessary to complete Step 2 and 3, although this work is not funded under the existing contract and would be contingent upon approval of the Master Plan and development of new contracts.

The tasks and anticipated time frame for completion of each step are listed on the followinng page:

[3] The proposed spring Chinook programs include an integrated recovery program and isolated harvest program to be implemented within the Okanogan subbasin and in the Columbia River between the confluence with the Okanogan River and the base of Chief Joseph Dam.

STEP 1 - MASTER PLAN DEVELOPMENT AND SUBMITTAL (2003 TO 2005)

Estimated time frame:

- Approximately 13 months to develop complete CJDHP Step 1 Master Plan (includes selection of contractors, development of subcontracts, development of Master Plan pieces, and writing and production of final Master Plan and accompanying documents)
- Approximately 7 months from time the Master Plan is submitted to the Council, to the time the Council reaches a decision on the Master Plan (the 7 month time frame includes presentation of Master Plan to the Council, ISRP review and response loop, development of a Council Issue Paper, release of the Master Plan for public review and comment, Council staff summary of comments received and review of potential alternatives, and a final decision by the Council)

1. Initiate project management and administration activities including development of a contract with BPA and subcontracts necessary to complete the CJDHP Master Plan.
2. Establish a multi-disciplinary Steering and Design Committee to assist in project development and review.
3. Confirm quantities and quality of water supplies for the Chief Joseph Dam Hatchery (relief tunnel water, ground water, and Rufus Woods Lake subsurface water) prior to initiating development of the conceptual design. Develop conceptual designs for collection and conveyance of relief tunnel water supply and water supply from Rufus Woods Lake.
4. Include unique elements of the CJDHP Master Plan in the Okanogan River summer/fall Chinook HGMP. (Similar work on the Okanogan River spring Chinook HGMP will be completed at no cost to BPA.)
5. Coordinate with federal and Public Utility District (PUD) partners to ensure consistency of the CJDHP with Chinook salmon mitigation agreements in the Okanogan and Columbia rivers.
6. Propose and negotiate long-term agreements for use of existing Oroville-Tonasket Irrigation District settling ponds as fish acclimation facilities.
7. Develop a plan and associated budget to investigate a broodstock collection program to support development of a unique summer/fall Chinook broodstock for the Okanogan River.
8. Develop a plan and budget for a baseline data collection program to address uncertainties (run timing versus spawn timing and location) critical to the conceptual design of the Chief Joseph Dam Hatchery.
9. Based on the Council's Master Plan requirements, prepare a conceptual monitoring and evaluation plan based on performance indicators identified in the HGMPs.
10. Assist BPA in determining the best NEPA strategy (Step 2) to use for the CJDHP. Coordinate Phase I public processes for consideration in later NEPA activities.
11. Competitively contract for bioengineering work to prepare the Chief Joseph Dam Hatchery conceptual design based on the summer/fall Chinook HGMP and to include optional facilities for spring Chinook.
12. Contract for preparation of a CJDHP summary document to complete the Master Planning package.
13. Submit the complete CJDHP Master Plan to the Council. Coordinate with Council staff to provide necessary support and follow-up for the Master Plan review.

STEP 2 - DESIGN AND ENVIRONMENTAL REVIEW (2005 - 2007)

Estimated time frame:

- Approximately 15 to 20 months (does not include Council review time)

1. Project management and administration.
2. Continue Steering and Design Committee with altered membership as necessary to meet requirements of Step 2.
3. Continue contract for bioengineering work to prepare the Chief Joseph Dam Hatchery design.
4. Contract for NEPA and other environmental review work.
5. Conduct a cultural survey.
6. Prepare a Biological Assessment for NOAA Fisheries and USFWS, ESA review.
7. Obtain water appropriation and water discharge

permits necessary to use the Oroville-Tonasket Irrigation District settling ponds for fish acclimation facilities.
8. Implement research on critical uncertainties that will impact the design of Chief Joseph Dam Hatchery.
9. Implement testing of broodstock collection gear.

STEP 3 - FINAL DESIGN (2007 TO 2008)

Estimated time frame:
- Approximately 12 to 14 months (does not include Council review time)

1. Project management and administration.
2. Continue Steering and Design Committee with altered membership as necessary to meet requirements of Step 3.
3. Implement research on critical uncertainties that will impact the Chief Joseph Dam Hatchery design, as needed.
4. Implement testing of broodstock collection gear, as needed.
5. Submit final design of Chief Joseph Dam Hatchery for Council, BPA and other partner approval for construction.

The CJDHP Master Plan is constructed from five core building blocks. These include the Okanogan River Summer/Fall Chinook Salmon HGMP, Okanogan River Spring Chinook Salmon HGMP, Chief Joseph Dam Water Supply Report, Chief Joseph Dam Hatchery Conceptual Design, and a CJDHP Conceptual Monitoring and Evaluation Plan. In addition, per the agreement expressed in the scope of work, two complimentary research reports, one dealing with broodstock collection, and a second dealing with radio-telemetry, were developed for inclusion with this Master Plan.

In 2003, the Colville Tribes secured the services of a project manager and administrator to coordinate development and integration of the CJDHP Master Plan parts and to shepherd the Step 1 Master Planning process through to its conclusion. Subcontractors were selected (through RFP and sole sourcing) to develop, update or modify the core documents and complementary reports in the Master Plan. The following list outlines the major areas of project responsibility and associated contractors:

PROJECT RESPONSIBILITY & CONTRACTOR

Project management and administration, development of cost estimate framework and documentation.
D.J. Warren and Associates Inc. - Dan Warren

Development and review of summer/fall and spring Chinook HGMPs, technical and policy review of CJDHP components, and overall document review.
S.H. Smith Fisheries Consulting Inc. - Stephen Smith

Development of the water supply report.
U.S. Army Corps of Engineers - Joe Wright

U.S. Army Corps of Engineers coordination and support, fish passage consultation.
Fish Passage Solutions - John McKern

Conceptual design of CJDHP facilities including: Chief Joseph Dam Hatchery, new acclimation ponds, and modifications to existing acclimation ponds.
Tetra Tech/KCM - John McGlenn, Jim McCall, Darrel Nice, Don Beard, John Burke, and Irv Brock

Research plan for testing live-capture selective fishing gear for broodstock collection.
Mobrand Biometrics Inc. - Lars Mobrand and Kevin Malone

Research plan to assess behavior of adult summer/fall Chinook upstream of Wells Dam using radio-telemetry.
BioAnalysts, Inc. - John Stevenson and Albert Giorgi

Design of a conceptual monitoring and evaluation plan.
KWA Ecological Sciences Inc. - Keith Wolf and Paul Wagner

Writing/editing of the CJDHP Volume 1 Master Plan document and production of final Master Plan package.
Ziji Creative Resources Inc. - Alison Squier

Alison Squier

Figure 2: Photo CJDHP Steering and Design Committee Planning Meeting

Beginning in 2003, the Colville Tribes identified potential members to populate a multi-disciplinary Steering and Design Committee. In late August of 2003, this multi-disciplinary committee was formally established to assist in project development and review[4]. Steering and Design Committee members included the core group of subcontractors, hatchery and fishery personnel from the Colville Tribes, representatives from the U.S. Army Corps of Engineers, and other individuals with expertise relevant to the project. This committee met formally three times during the course of the Master Plan development to review and discuss the Master Plan components, and in particular, to review the evolving conceptual design of the facilities. In addition, select members of the Steering and Design Committee met frequently in informal subcommittees, participated in site visits, and participated in a tour of relevant locations in the Okanogan subbasin. During this process the Colville Tribes also sought input from BPA representatives and Council staff in the development of the Master Plan outline, planning meetings, and draft reviews.

1.2.2 CHIEF JOSEPH DAM HATCHERY PROGRAM GUIDING PRINCIPLES

At the outset of the planning process, the Colville Tribes identified a set of "CJDHP Guiding Principles". All aspects of the CJDHP Master Plan proposal - from project coordination, conceptual design, to development of the complete Step 1 Master Plan - are consistent with these guiding principles. The Colville Tribes are committed to maintaining consistency with these principles throughout development, approval, and eventual construction and operation of the CJDHP.

CJDHP GUIDING PRINCIPLES:

ACCOUNTABILITY

Do what is promised on time and on budget. Eliminate project "morph," which is defined in this context as the tendency of projects to expand in scope, increase in cost, and float beyond deadlines. Maintain consistency throughout the project to a clearly articulated progression from conception, to development, to execution, and finally - completion.

BEST AVAILABLE SCIENCE

Use best available scientific knowledge in all aspects of program planning, design, and implementation. Contribute to investigation of critical uncertainties through effective monitoring and evaluation, good documentation, timely reporting, and thoughtful analysis.

COST-EFFECTIVENESS

Choose the least-cost option whenever practical. Seek cost efficiencies and opportunities to share costs where possible. Build value analysis (value engineering) and other cost control mechanisms into the project planning and design from day one.

FLEXIBILITY

Build flexibility and adaptability into program elements. Design flexibility in facilities, particularly where it supports cost-effective approaches. Build program's components to accommodate adaptation or if necessary, termination, as new information becomes available.

INNOVATION

Seek innovative solutions and opportunities in planning, design and program implementation.

Throughout this Master Plan the CJDHP project components are referenced against these five guiding principles.

[4] Steering committee members and their affiliations are identified in Appendix I

Relationship of Master Plan Development to CJDHP Guiding Principles

Accountability

- Master Plan document developed within the identified time frame and budget
- Master Plan addresses all Council criteria

Best Available Science

- Consistent with Council's guidelines
- Consistent with ISAB recommendations
- Includes consideration of ISRP reviews of other production facilities, projects, and of research, monitoring and evaluation plans in the Columbia Basin
- Consistent with NOAA Fisheries guidance
- Incorporates broad review of current artificial production literature

Cost-Effectiveness

- Use of existing HGMPs as foundation of Master Plan
- Allegiance to clear project progression (conceive, design, execute, complete)

Flexibility

- Inclusion of spring Chinook components as separate chapter and of separable spring Chinook budget elements to facilitate flexibility for decision-makers

Innovation

- Approach to Master Plan development included interdisciplinary team involvement and review throughout process

1.2.3 REGIONAL SUPPORT FOR CHIEF JOSEPH DAM HATCHERY PROGRAM

Beginning in March 2004, the Colville Tribes conducted a series of informational presentations to local county and city governments, state agencies, regional salmon recovery boards, and other Okanogan subbasin stakeholders, to brief them on the CJDHP Master Plan proposal. These presentations included an overview of the desired outcomes, program structure, and potential benefits and impacts of the proposed CJDHP. A great deal of interest and regional support for the project was expressed in these meetings. The Colville Tribes requested and received letters of support for the CJDHP from a number of organizations.

At the time this Master Plan was in the final stages of production, letters of support had been received from: City of Bridgeport, City of Okanogan, City of Omak, City of Oroville, City of Pateros, Northwest Sportfishing Industry Association, Okanogan Conservation District, Okanagan Nation Alliance, Okanogan County Board of Commissioners, Oroville-Tonasket Irrigation District, U.S. Army Corps of Engineers, and Washington Department of Fish and Wildlife. Copies of these letters are attached in Appendix A.

1.3 OVERVIEW OF MASTER PLAN DOCUMENT ORGANIZATION

The CJDHP Master Plan is presented in two volumes. Volume 1 was developed specifically to address the Council's 17 Master Plan requirements and to provide a comprehensive overview of the CJDHP. Volume 2 consists of a set of appendices that provide the substantive detail behind the Master Plan document. The information presented in Volume 2 provides a great deal of supporting technical detail, as well as programmatic and historical information that in sum will contribute significantly to reviewer's understanding of the proposed CJDHP. The two volumes are bound separately to facilitate reviewers making use of both resources interactively (electronic versions of both volumes have also been provided).

Substantial portions of the information presented in the Volume 1 Master Plan are drawn directly from the appendices included in Volume 2. Where appropriate, throughout Volume 1 the reader is referred to documents contained in the Volume 2 appendices. In particular, references to the summer/fall or spring Chinook HGMPs are indicated where relevant in Volume 1.

To aide reviewers references to chapters within the Master Plan document, or to the appendices included in either Volume 1 or Volume 2 are displayed in brackets. All other literature references are presented in parenthesis. Throughout the document references to the Okanogan River Summer/Fall Chinook HGMP are abbreviated as *SF HGMP*. References to the Okanogan River Spring Chinook HGMP are abbreviated as *SP HGMP*.

1.3.1 VOLUME 1. MASTER PLAN

Following this introductory chapter, chapters 2 and 3 summarize information related to the Council's three-step process and requirements. Chapter 2 includes a summary of necessary Step 2 decisions. This includes a brief list of information needs that are critical to the next planning stages. This information is included to help define the limits of the decisions being made at Step 1, acknowledge areas where substantial uncertainty exists, and identify how those uncertainties would be addressed in Step 2. Chapter 3 compares the CJDHP with the Council's 17 Master Planning requirements and other significant regional guidance.

Chapters 4 though 7 establish the historical, ecological, management and biological context for the CJDHP. Chapter 4 outlines the historical and legal rationale for the CJDHP. The information presented in this chapter includes historical information about the Colville Tribes, an overview of the decline and extirpation of salmon populations in the Upper Columbia and Okanogan subbasin, discussion of the impact of those losses on the Colville Tribes, and an explanation of the inadequacy of historical and current mitigation in the Upper Columbia. Chapter 5 sets out the ecological justification for the summer/fall Chinook programs including a life history overview; historical and current artificial production, distribution, and harvest information; and a summary of current limiting factors. Chapter 6 places the CJDHP proposal within the broader context of the Okanogan subbasin. This chapter provides a description of the subbasin; current and ongoing planning and management activities; and highlights of ongoing and recent habitat protection and restoration, salmon enhancement, watershed planning, public education, and research, monitoring and evaluation activities relevant to the CJDHP. Chapter 7 establishes the CJDHP within a larger regional context.

Chapter 8 presents a review of alternatives that were considered in the course of developing and selecting the summer/fall Chinook options presented in the CJDHP.

Chapters 9, 10 and 11 get to the nuts and bolts of the programs, monitoring and evaluation activities, and facilities. Chapter 9 describes the CJDHP summer/fall Chinook programs. This overview includes the integrated recovery and harvest programs, program goals and actions, potential ecological and genetic effects of the CJDHP, and program contingencies and adaptation loops. Chapter 10 provides a sketch of the conceptual monitoring and evaluation program including examples of sample objectives, and linkages to other local and regional monitoring and evaluation efforts. Chapter 11 describes the conceptual design of the new summer/fall Chinook artificial production facilities and necessary modifications to existing facilities. This chapter also includes descriptions of the water supply for the Chief Joseph Dam Hatchery, general site considerations, and descriptions of support facility requirements.

Chapter 12 presents the estimated program costs associated with the various elements of the CJDHP summer/fall Chinook programs. This chapter includes "roll ups" of estimated costs for planning and design (conceptual, preliminary and final), construction, operations and maintenance, and monitoring and evaluation, including estimated cost projections extending out ten fiscal years.

Chapter 13, consistent with the agreement reached by the Council's staff, BPA representatives, and the Colville Tribes, includes an overview of the proposed CJDHP spring Chinook program components. This chapter includes a review of the rationale for including spring Chinook in the CJDHP, local and regional context with specific relevancy to the spring Chinook programs, a review of the alternatives considered in development of the spring Chinook program, an abbreviated description of the spring Chinook programs being proposed for inclusion in the CJDHP, descriptions of the separable spring Chinook facilities for Chief Joseph Dam Hatchery, and cost estimates specific to the spring Chinook components of the CJDHP.

Finally, chapter 14 consists of references to literature cited in Volume 1.

1.3.2 VOLUME 2. APPENDICES

Volume 2 includes nine appendices. Appendix A contains regional letters of support for the CJDHP. Appendix B consists of a very detailed series of spreadsheets that break down cost estimates for all aspects of the CJDHP and provide justification for those estimates. Appendix C and D are respectively, the Okanogan River Summer/Fall Chinook Salmon Hatchery Genetic Management Plan, and the Okanogan River Spring Chinook Salmon Hatchery Genetic Management Plan. Appendix E contains two reports, outlining proposed research that is critical to the CJDHP: one is a detailed research plan to assess behavior of adult summer/fall Chinook upstream of Wells Dam using radio-telemetry techniques, the other presents a research plan to test live-capture, fishing gear for summer/fall Chinook broodstock collection in the Okanogan, Similkameen and Columbia rivers. Appendix F is the Chief Joseph Dam Hatchery Water Supply Report. Appendix G is the CJDHP conceptual design for the hatchery facility and necessary modifications of existing facilities. Appendix H is the conceptual design for the CJDHP monitoring and evaluation program. Lastly, Appendix I lists members of the CJDHP Steering and Design Committee.

2.
Critical Research Needed for Step 2 Planning

Chief Joseph Dam Hatchery Program
MASTER PLAN

2

Critical Research Needed for Step 2 Planning

The purpose of this chapter is to summarize required and critical information needs that must be addressed in the Step 2 CJDHP planning process. The Colville Tribes request that the Council consider inclusion of these five items as part of a recommendation to proceed with Step 2 planning for the CJDHP.

Two of the five items listed below, completion of NEPA review, and completion of ESA review are required by the Council and will not be further discussed in this chapter. The other three items represent areas where critical uncertainties have been identified as a corollary to the CJDHP Step 1 conceptual design work.

Targeted research to resolve these uncertainties is essential to successful Step 2 planning. Without answers to these questions, or at least a narrowing of the window of uncertainty, the necessary level of planning refinement for Step 2 and Step 3 can not be accomplished.

Required and Critical Information for CJDHP Step 2 Planning:

1. Completion of NEPA review
2. Completion of ESA review
3. Confirmation of water supplies
4. Implement radio-telemetry study
5. Implement research on live-capture, selective gear for broodstock collection

2.1 CONFIRM WATER SUPPLY

The conceptual design of the Chief Joseph Dam Hatchery relies on a combination of reservoir water from the Rufus Woods Lake and groundwater from two additional sources to meet the various rearing program temperature and biological flow requirements.

In their preliminary water supply study, the U.S. Army Corps of Engineers (COE) identified three preferred water sources that in combination meet the CJDHP requirements. These sources include water from Rufus Woods Lake, groundwater from a relief tunnel in the Chief Joseph Dam, and groundwater from a possible well site located in a state park approximately 2.5 miles upstream of the proposed hatchery site.

Water from Rufus Woods Lake will be used to rear fish at the Chief Joseph Dam Hatchery and possibly to provide fish attraction water at a fish collection facility. Water from the well site at the state park and from the relief tunnel will be used for temperature mixing at the hatchery. In addition, water from the state park well field might be used to provide potable water for the hatchery facility and associated housing.

Additional detail regarding the preliminary water supply study is presented in Chapter 11 and in Appendix F.

2.2 IMPLEMENTATION OF RADIO-TELEMETRY STUDY

Completion of radio-telemetry research to determine where and when summer/fall Chinook migrate, where they congregate, and the extent to which they are spatially separated from other population components will be necessary to implement the CJDHP. Additionally, research to determine whether the timing of passage over Wells Dam is related to timing and location of subsequent spawning, must be completed. This information is critical to the development of broodstock protocol and subsequent acclimation of progeny.

The research objectives for this radio-telemetry study would include:

1. Identification of the locations and arrival time of summer/fall Chinook salmon spawning in the upper portion of the Columbia Cascade Province relative to their time of passage at Wells Dam.
2. Description of the migratory patterns of Chinook salmon as they approach Chief Joseph Dam and identification of the final destinations of fish that encounter the dam in order to best identify preferred locations for collection facilities.

In general the approach for accomplishing these objectives will be to describe the distribution, timing and final fates of tagged fish upstream from Wells Dam. Activities undertaken through this research will identify:

- Key holding areas in the mainstem prior to fish entering tributaries
- The timeframe fish enter the tributaries
- Holding areas within the Okanogan and Similkameen rivers
- Dates of arrival on spawning grounds
- The proportion of the tagged population destined for specific spawning areas
- The final destination or disposition of tagged fish
- Shoreline orientation as fish approach Chief Joseph Dam
- Extent of cross-over between shorelines for fish migrating to Chief Joseph Dam
- Movement of tagged fish within the Chief Joseph tailrace

Chapters 5, 6 and 9 in this Master Plan provide additional context for this research. A detailed study proposal to implement this radio-telemetry study is included in Appendix E.

2.3 IMPLEMENTATION OF RESEARCH ON LIVE-CAPTURE BROODSTOCK GEAR

The third piece of information critical to the success of the proposed CJDHP integrated recovery program is research to test live-capture, selective fishing gear for summer/fall Chinook salmon broodstock collection in the Okanogan, Similkameen, and Columbia rivers. The outcomes of this research will also be important to successful implementation of the CJDHP integrated harvest program.

This proposed study is designed to test the ability of different live-capture methods to collect 1,130 adults in order to initiate a local broodstock. The success of the live-capture methods will also be vital to controlling the ratio of hatchery to natural fish on the spawning grounds.

This live-capture, selective fishing gear study will include targeted research on the use of different selective fishing gear matched to specific sites in the Okanogan and Similkameen rivers, and in the Columbia River above Wells Dam. This research will include evaluation of diver set tangle nets in the lower Okanogan River in the vicinity of Monse bridge to Lake Pateros; beach seines at multiple sites on spawning grounds in the Okanogan River, primarily upstream from Omak Creek, as well as sites near the Similkameen Pond; floating trap-nets in the Columbia River below the Okanogan River confluence; fish wheels possibly along the south shore of Lake Pateros between the HWY 17 bridge and Chief Joseph Dam, and also possibly along the west shore of Janis Rapids; and dip net combinations on the Okanogan River at Janis Rapids or McLaughlin Falls, and on the Similkameen River in the area below Enloe Dam.

Chapters 5, 6 and 9 in this Master Plan provide additional context for this research. A detailed study proposal to implement research on live-capture broodstock is included in Appendix E.

3.
Consistency with Council Requirements and Comparison to Regional Guidelines

Chief Joseph Dam Hatchery Program
MASTER PLAN

3

Consistency with Council Requirements and Comparison to Regional Guidelines

The following chapter is included to make clear the consistency of the CJDHP with the Council's 17 Master Planning requirements. Although it is only necessary for a Master Plan to address these 17 Council requirements, in this chapter the CJDHP is also compared to recommendations presented in two recent regional examinations of artificial production. Those two include the *Independent Science Advisory Board's* (ISAB), *2003 Review of Salmon and Steelhead Supplementation* (ISAB 2003), and a Trout Unlimited commissioned issue paper titled, *Integrating artificial production with salmonid life history, genetic, and ecosystem diversity: a landscape perspective* (Williams et al 2003).

Together, the Council's Master Planning requirements along with these two documents represent an important sequential progression in thinking about the role and implementation of artificial production in the Columbia River Basin. In developing this Master Plan, the Colville Tribes believed a comparison of the proposed CJDHP against these three different, but complimentary, sets of artificial production guidance would be useful to reviewers.

Meeting the unmet trust obligations owed to the Colville Tribes was a significant consideration in the design of the CJDHP. Neither the ISAB recommendations nor Trout Unlimited issue paper address the Federal Government's trust obligations to the Tribes and cannot be used as the sole measure of the proposed CJDHP. Nevertheless, the Colville Tribes believe comparison with this broader regional guidance highlights the thoughtful, innovative and ecologically sound nature of the proposed CJDHP.

3.1 CONSISTENCY WITH COUNCIL'S MASTER PLANNING REQUIREMENTS

The Council's 17 Master Plan requirements are listed below along with references to the pertinent chapter section(s) in the CJDHP Volume 1 Master Plan. Where appropriate, references to the relevant appendices in Volume 2 are also included. The following section addresses the CJDHP summer/fall Chinook components in one response and the proposed spring Chinook program components in a separate response.

COUNCIL REQUIREMENT 1:

Address the relationship and consistencies of the proposed project to the eight scientific principles.

- Summer/fall Chinook response: See chapter sections 3.3, 4.4, 4.5, 4.7, 5.1, 5.2, 5.3, 6.1, 6.2, 6.3, 6.4, 6.5, 6.6, 6.7, 7.1, 7.2, 9.1, 9.4, 9.5, 9.7, 10.1, 10.2, and 10.3. See also Appendix C.
- Spring Chinook response: See chapter sections 4.4, 4.5, 6.1, 6.1, 6.2, 6.3, 6.4, 6.7, 7.1, 7.2, 13.2, 13.3, 13.8, and 13.9. See also Appendix D.

COUNCIL REQUIREMENT 2:

Describe the link of the proposal to other projects and activities in the subbasin and the desired end state condition for the target subbasin.

- Summer/fall Chinook response: See chapter sections 3.3, 6.6 and 6.7.
- Spring Chinook response: See chapter sections 6.6, 6.7 and 13.3.

COUNCIL REQUIREMENT 3:

Define the biological objectives with measurable attributes that define progress, provide accountability and track changes through time associated with this project.

- Summer/fall Chinook response: See chapter sections 3.3, 9.4, 9.5, 10.1, and 10.3. See also appendices C and H.

- Spring Chinook response: See chapter sections 10.1, 13.6, and 13.9. See also appendices D and H.

COUNCIL REQUIREMENT 4:

Define expected project benefits (e.g. preservation of biological diversity, fishery enhancement, water optimization, and habitat protection).

- Summer/fall Chinook response: See chapter sections 3.3, 9.1, 9.4, and 9.5. See also Appendix C.
- Spring Chinook response: See chapter sections 13.2, 13.5, and 13.6. See also Appendix D.

COUNCIL REQUIREMENT 5:

Describe the implementation strategies as they relate to the current conditions and restoration potential of the habitat for the target species and the life stage of interest.

- Summer/fall Chinook response: See chapter sections 2.1, 2.2, 2.3, 3.3, 5.1, 5.2, 5.3, 6.1, 6.6, 6.7, 7.1, 7.2, 9.4, and 9.5. See also appendices C and E.
- Spring Chinook response: See chapter sections 2.1, 2.2, 2.3, 6.5, 6.6, 6.7, 7.1, 7.2, 13.2, 13.3, 13.5, 13.6, and 13.8. See also appendices D and E.

COUNCIL REQUIREMENT 6:

Address the relationship to the habitat strategies.

- Summer/fall Chinook response: See chapter sections 3.3, 5.1, 5.2, 5.3, 6.5, 6.6, 6.7, 7.1, 7.2, 9.4, and 9.5. See also Appendix C.
- Spring Chinook response: See chapter sections 6.5, 6.6, 6.7, 7.1, 7.2, 13.2, 13.3, 13.5, 13.6, and 13.8. See also Appendix D.

COUNCIL REQUIREMENT 7:

Ensure that cost-effective alternate measures are not overlooked and include descriptions of alternatives for resolving the resource problem, including a description of other management activities in the subbasin, province and basin.

- Summer/fall Chinook response: See chapter sections 2.1, 2.2, 2.3, 3.3, 6.5, 6.6, 7.1, 7.2, 8.1, 8.2, 8.3, 9.2, 10.3, 10.4, 11.13, 12.1, 12.2, 12.3, 12.4, 12.5, and 12.6. See also appendices B and E.
- Spring Chinook response: See chapter sections 2.1, 2.2, 2.3, 6.5, 6.6, 7.1, 7.2, 10.4, 11.13, 13.3, 13.4, and 13.12. See also appendices B and E.

COUNCIL REQUIREMENT 8:

Provide the historical and current status of anadromous and resident fish and wildlife in the subbasin most relevant to the proposed project.

- Summer/fall Chinook response: See chapter sections 5.1, 6.3, and 6.4. See also Appendix C.
- Spring Chinook response: See chapter sections 6.3, 6.4, and 13.2. See also Appendix D.

COUNCIL REQUIREMENT 9:

Describe current and planned management of anadromous and resident fish and wildlife in the subbasin.

- Summer/fall Chinook response: See chapter sections 6.6, and 6.7.
- Spring Chinook response: See chapter sections 6.6, and 6.7, and 13.3.

COUNCIL REQUIREMENT 10:

Demonstrate consistency of the proposed project with NOAA Fisheries recovery plans and other fishery management and watershed plans.

- Summer/fall Chinook response: See chapters 6.6 and 7.2. See also appendices A and C.
- Spring Chinook response: See chapters 6.6, 7.2. See also appendices A and D.

COUNCIL REQUIREMENT 11:

Describe the status of the comprehensive environmental assessment.

- Summer/fall Chinook response: See chapter subsection 6.2.
- Spring Chinook response: See chapter subsection 6.2.

COUNCIL REQUIREMENT 12:

Describe the monitoring and evaluation plan.

- Summer/fall Chinook response: See chapter subsections 2.1, 2.2, 2.3, 3.3, 10.1, 10.2, 10.3, and 10.4. See also Appendix H.
- Spring Chinook response: See chapter subsections 2.1, 2.2, 2.3, 10.1, 10.4 and 13.9. See also Appendix H.

COUNCIL REQUIREMENT 13:

Describe and provide specific items and cost estimates for 10 Fiscal Years for planning and design (i.e. conceptual, preliminary and final), construction, operation and maintenance and monitoring and evaluation.

- Summer/fall Chinook response: See chapter sections 12.1, 12.2, 12.3, 12.4, 12.5, and 12.6. See also Appendix B.
- Spring Chinook response: See chapter section 13.12. See also Appendix B.

COUNCIL REQUIREMENT 14:

Address the relation and link to the Council's artificial production policies and strategies.

- Summer/fall Chinook response: See chapter sections 3.3, 4.4, 4.5, 5.1, 5.2, 5.3, 6.1, 6.3, 6.4, 7.1, 7.2, 9.1, 9.3, 9.4, 9.5, 9.6, 9.7, 9.8, 10.1, 10.2, 10.3, and 10.4. See also specific responses to the summer/fall Chinook HGMP alignment with the Council's artificial production policies and strategies in Appendix C.
- Spring Chinook response: See chapter sections 4.4, 4.5, 6.1, 6.3, 6.4, 7.1, 7.2, 13.2, 13.3, 13.5, 13.6, 13.8, and 13.9. See also specific responses to the spring Chinook HGMP alignment with the Council's artificial production policies and strategies in Appendix D.

COUNCIL REQUIREMENT 15:

Provide a completed Hatchery and Genetic Management Plan (HGMP) for the target population(s).

- Summer/fall Chinook response: See Appendix C.
- Spring Chinook response: See Appendix D.

COUNCIL REQUIREMENT 16:

Describe the harvest plan.

- Summer/fall Chinook response: See chapter sections 3.3, 7.2, 9.5, 9.7, 9.8, 10.1, 10.2, 10.3, and 10.4. See also Appendix C.
- Spring Chinook response: See chapter sections 7.2, 13.5, 13.6, and 13.9. See also Appendix D.

COUNCIL REQUIREMENT 17:

Provide a conceptual design of the proposed facilities, including an assessment of the availability and utility of existing facilities.

- Summer/fall Chinook response: See chapter sections 11.1, 11.2, 11.3, 11.4, 11.5, 11.6, 11.7, 11.8, 11.9, 11.10, 11.11, and 11.12. See also appendices F and G.
- Spring Chinook response: See chapter section 13.10. See also appendices F and G.

3.2 COMPARISON TO INDEPENDENT SCIENTIFIC ADVISORY BOARD RECOMMENDATIONS

In 2003, the ISAB completed a review of salmon and steelhead supplementation in the Columbia River Basin. The ISAB report concluded that given the "...substantial uncertainty that is likely to remain for the foreseeable future concerning the efficacy and risks of supplementation, and recognizing that the objective of supplementation is to increase natural production while maintaining the long-term fitness of the population," all supplementation projects should be implemented following a conservative approach (ISAB 2003). In their report the ISAB outlined eight artificial production recommendations which are consistent with the artificial production policies identified in the Council's Master Plan requirements - but which expand and refine those concepts a little farther.

As noted at the outset of this document, the CJDHP is based on the comprehensive management programs outlined in the summer/fall Chinook HGMP (and spring Chinook HGMP). Both the summer/fall and spring Chinook HGMPs include specific responses to each of the eight ISAB recommendations. [See Appendix C, SF HGMP, pages 105-108 and Appendix D; SP HGMP, pages 108-111.]

The eight ISAB recommendations were:

ISAB RECOMMENDATION 1:

Only natural-origin adults should be used as broodstock.

ISAB RECOMMENDATION 2:

Performance standards for natural-origin and hatchery origin adult abundance and per capita production rates should be established.

ISAB RECOMMENDATION 3:

All supplementation programs should be conducted within an explicit experimental design.

ISAB RECOMMENDATION 4:

Reference populations should be established as experimental controls.

ISAB RECOMMENDATION 5:

Program plans should contain an objective means to assess when supplementation should be terminated.

ISAB RECOMMENDATION 6:

Multiple supplementation projects across the Columbia River Basin should be coordinated so that in the aggregate they constitute a basinwide adaptive management experiment.

ISAB RECOMMENDATION 7:

Supplementation projects should collect the data necessary to test their effectiveness.

ISAB RECOMMENDATION 8:

Supplementation should be used sparingly, focusing in areas where natural spawning populations are not replacing themselves, where habitat capacity is available to accommodate the additional production and where landscape conditions are suited to the experimental design.

3.3 COMPARISON TO LANDSCAPE HATCHERY MODEL

Trout Unlimited recently commissioned an issue paper titled, *Integrating artificial production with salmonid life history, genetic, and ecosystem diversity: a landscape perspective*. In that paper the author's coin the term 'landscape perspective' to describe an approach that "...grounds the management program's natural and artificial production activities within the subbasin and its ecology, geology, climate, patterns of annual variation, species diversity, and also with the target species' demographic, life history, and genetic attributes" (Williams et al 2003).

The landscape hatchery model extends the "...normative ecological concepts introduced in *Return to the River* (ISG 2000), into an alternative approach to managing artificial production activities and facilities in program and subbasin, where the management goal is to integrate natural and artificial production of steelhead and salmon populations" (Williams et al 2003). In addition to extending concepts presented in *Return to the River,* the landscape hatchery paradigm builds upon critiques of salmon management and hatchery operations presented in the Independent Scientific Advisory Board's *Review of Salmon and Steelhead Supplementation* (ISAB 2003), the Council's *Artificial Production Review* (1999), and a number of other recent notable publications. In the issue paper, Williams et al (2003) note that hatcheries within the Columbia basin currently fall within a continuum bracketed by conventional hatchery management at one end and the landscape perspective at the other – with most contemporary hatcheries falling somewhere in between.

In its programmatic entirety, the proposed CJDHP falls nearest the landscape perspective end of the continuum, although specific individual components of the Chief Joseph Dam Hatchery may fall closer to the conventional hatchery model. To understand the CJDHP it is essential to view the program in its entirety, and in relationship to the ecosystem within which it is proposed.

Table 1 summarizes the relationship of the CJDHP to the core attributes of the landscape hatchery concept as defined in the Trout Unlimited issue paper (note: these landscape attributes also correlate closely with the Council's eight scientific principles). While the proposed CJDHP does not entirely align with the landscape hatchery model – and it is important to note that some aspects of the CJDHP are intended specifically to address the Federal Government's trust obligations to the Colville Tribes – many aspect of the program are very consistent with the overall concept.

Table 1: Relationship of CJDHP to the Attributes of the Landscape Hatchery Perspective

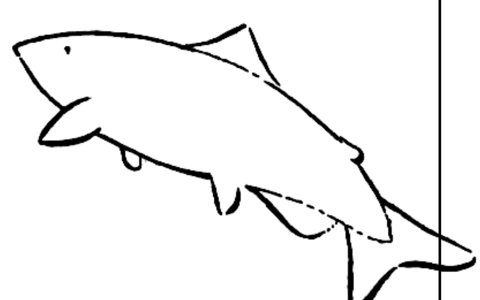
DESCRIPTION OF LANDSCAPE HATCHERY ATTRIBUTES (Williams et al 2003)	**RELATIONSHIP OF CJDHP TO LANDSCAPE HATCHERY CONCEPT**

Statement 1: Management of hatchery operations and the hatchery environment must be consistent with the attributes of the ecosystem.

	• Only local, Okanogan River broodstock will be used, improving the productivity of the population to the unique attributes of the Okanogan River.
	• Broodstock will be collected from the full run (i.e. include early-arriving and later-arriving run) to restore full life history of Okanogan summer/fall Chinook that is best suited to ecological conditions in subbasin.
	• CJDHP includes production and release of subyearling summer/fall Chinook (the natural life history characteristic) to evaluate their success and attributes against the release of yearling smolts that have historically shown better survival rates when negotiating the nine downstream dams.
	• CJDHP will rely on a combination of hatchery facilities and acclimation ponds to rear fish.
	    • The acclimation ponds yield a more natural setting than standard hatchery facilities. Additional integration of rearing techniques intended to mimic natural conditions will be considered at the acclimation facilities.
	    • The majority of fish will be transferred to acclimation ponds approximately 6 months prior to release.
	    • In all of the acclimation ponds fish will be reared at very low densities on local river water.
	    • Fish will be volitionally released from acclimation ponds.

Statement 2: Attributes of the wild population must be the model, the goal of the hatchery.	• Broodstock for CJDHP will be entirely natural-origin fish when appropriate. • Broodstock for the CJDHP will be derived only from Okanogan River Chinook. • Hatchery broodstock will reinstate propagation of fish from throughout the adult run (early-arriving and later-arriving) with an initial emphasis on the later-arriving Chinook to restore their depleted numbers in historical habitats. • The acclimation and release sites are situated specifically to restore spawning distribution throughout historical habitats (including reinstatement of later-arriving runs to lower reaches of the Okanogan River). • The proportion of hatchery-origin summer/fall Chinook allowed to spawn in the wild will be closely monitored and managed through selective harvest to optimize the integrity of the natural population.

Statement 3: Hatchery operations must take into account and support the keystone role of salmon and steelhead in the ecosystem.	• At present the bulk of mitigation hatcheries are concentrated at downstream locations and therefore do not contribute to replenishing nutrients to the upper reaches of the Columbia Basin. • CJDHP is expected to increase runs past Wells Dam by 3,000 to 15,000 early-arriving summer/fall Chinook and 3,000-14,000 later-arriving summer/fall Chinook. A primary objective of the CJDHP is to restore naturally-spawning populations of summer/fall Chinook throughout their historical habitat - this will ultimately result in increased distribution of nutrients throughout the Basin. • The CJDHP includes both integrated recovery and integrated harvest programs. A key objective of the integrated harvest program is establishment of a stable ceremonial and subsistence fishery for the Colville Tribes. The program will include a terminal fishery below Chief Joseph Dam. • The Colville Tribes will develop and test live-capture, selective harvest gear to specifically target hatchery-origin fish in order to assure adequate escapement of wild stocks to historical habitat. • In low run years management actions will focus on achieving escapement and broodstock needs and provide a minimal ceremonial and subsistence fishery for the Colville Tribes. In years when higher runs sizes are achieved tribal and recreational selective fisheries would be expanded to capture surplus hatchery-origin fish. Only in years characterized by notable run sizes would harvest of natural-origin fish take place. • Initial and repeated spawning of hatchery-origin fish in the Okanogan River will help cleanse under-used spawning grounds impacted by sediments.
Statement 4: Hatchery operations should not disrupt important ecological processes in the watershed.	• The carrying capacity of the Okanogan subbasin for summer/fall Chinook is estimated to be roughly 33%. • The carrying capacity of the Okanogan subbasin for other anadromous species has been considered in the development of the CJDHP. • The CJDHP is anticipated to have minimal deleterious effects on ESA-listed species in the Okanogan subbasin (or upper Columbia basin). Interactions will be closely monitored and the CDJHP will be modified as necessary should negative interactions occur. • Competition for food is not anticipated to be significant due to the timing and life stage of releases. • Predation on acclimation pond released fish is not anticipated to be significant due to timing and life stage of releases. • Terminal fisheries for the Colville Tribes and recreational anglers will be substantially selective, thereby protecting natural-origin Chinook • CJDHP has taken into account ocean and Columbia River harvest management (*U.S. v Oregon*) to the extent possible. • The carrying capacity of the Columbia River and its estuary for migrating smolts and rearing subyearlings is not presently known. Basinwide research addressing this critical unknown has been proposed and is much needed. Adjustments to the program size will be made, if necessary, when additional information is available. • The capacity of the Columbia River and its estuary to support additional hatchery-origin fish produced through the CJDHP is likely to fluctuate substantially in relation to the highly variable returns from natural-origin populations and existing hatchery programs, variable hydrologic conditions (spring and summer flows and temperatures), and the ongoing reduction of releases from other (mostly lower river) hatchery programs.

Statement 5: Hatchery operations must be tightly linked to all other management functions: habitat protection and restoration, and harvest regulation.	• Due in large part to the extensive negative out-of-subbasin impacts on Okanogan summer/fall Chinook populations (i.e. nine dams downstream from Okanogan subbasin), it is improbable that the conservation and harvest goals of the CJDHP could be met without assistance of artificial production. • The CJDHP, and need for the management programs it implements, is based on information gathered through regional and local assessments (i.e. BAMP, *Okanogan/Similkameen Subbasin Summary,* draft *Okanogan Subbasin Plan, Okanogan Limiting Factors Analysis*) as well as the summer/fall Chinook HGMP. • The CJDHP compliments habitat protection and restoration actions that have been, and will be, implemented throughout the Okanogan subbasin. • CJDHP production and harvest levels will be specifically connected to the success of natural populations in the Okanogan subbasin. • The CJDHP is consistent with, and complimentary to, salmon recovery management activities being implemented throughout the Okanogan subbasin. • CJDHP integrated recovery programs are intended to increased abundance, distribution and diversity of naturally-spawning populations, while CJDHP integrated harvest programs will provide for a stable ceremonial and subsistence fishery and an increased recreational fishery based primarily on hatchery-origin fish. • The CJDHP takes into account Transboundary coordination efforts.
Statement 6: Monitoring activities should give equal attention to concerns and management targets inside and outside the hatchery.	• The CJDHP monitoring and evaluation program, in combination with the Okanogan Baseline Monitoring and Evaluation Program, will measure "progress" against a set of specific performance standards and performance indicators which include: legal standards, harvest standards, conservation standards, life history characteristics, genetic characteristics, operation of artificial production facilities, and socio-economic effectiveness of the programs. • The CJDHP monitoring and evaluation program will be closely coordinated with a complementary Okanogan Baseline Monitoring and Evaluation Program. • Information gleaned through the combined monitoring and evaluation programs will be actively incorporated into adaptive management of the CJDHP – particularly in terms of establishing broodstock collection levels, assuring adequate wild escapement, monitoring interactions of hatchery and wild conspecifics and ESA-listed species, managing the integrated harvest program, etc. • Information gathered through regional and Basinwide monitoring and evaluation programs will be used to help guide adaptation of the CJDHP. • Information gathered through the CJDHP will be made available to other managers through annual reports and web-based data archives. 

4.
Historical and Legal Rationale

Chief Joseph Dam Hatchery Program
MASTER PLAN

4

Historical and Legal Rationale

Graphic credit: Desautel Hege

FIGURE 3: Map of Traditional Lands of the Colville Tribes

The following chapter describes the historical context within which the Executive Order establishing the Colville Reservation was developed, the cause and extent of salmon losses in the Upper Columbia and Okanogan rivers, the effects of those losses on the Colville Tribes and on the citizens of the Okanogan subbasin, and the lack of historical and current mitigation to address those losses.

4.1 CONFEDERATED TRIBES OF THE COLVILLE INDIAN RESERVATION

4.1.1 WHO ARE THE COLVILLE TRIBES

Twelve distinct Indian tribes constitute the Colville Tribes, they include: the Colville, Nespelem, San Poil, Lake, Palus, Wenatchi (Wenatchee), Chelan, Entiat, Methow, Southern Okanogan, Moses Columbia, and Nez Perce of Chief Joseph's Band. Over 8,700 descendants of these twelve tribes are currently enrolled members of the Colville Tribes.

All of the Colville Tribes were – and are – salmon people. For centuries, the cycles of the salmon established the seasonal rhythm of life for Colville Tribal members. The taste, smell, sound, sight, and touch of salmon reside in the collective heart of the Colville Tribes. The individual stories, communal memories, and formal history of the Tribes are permeated at every level by the cadence of the salmon.

The contemporary Colville Reservation includes approximately 1.4 million acres of land located in north central Washington and is situated primarily in Okanogan and Ferry counties. On its western flank the Reservation is bordered by the Okanogan River and on its southern and eastern edges, by the Columbia River. A straight line, parallel to and approximately 40 miles south of the U.S. Canadian border, defines the northern edge of the Reservation. The Colville Reservation is located in the Cascade Columbia and the Intermountain provinces. The western half of the Reservation is located in the Okanogan subbasin. The Okanogan subbasin currently is the uppermost limit of anadromous fish distribution in the Columbia River.

The Reservation ranges from 790 feet above sea level at the mouth of the Okanogan River to 6,774 feet at the summit of Moses Mountain. Reservation lands consists of a mix of tribally owned lands held in federal trust status for the Colville Tribes; land owned by individual Colville Tribal members, most of which is held in federal trust status; and fee property lands. Some tribal members also hold tribal allotments on lands surrounding the current Reservation.

4.2 THE BIG CONTEXT

Over the centuries both the forces of nature and the will of humans have repeatedly transformed the Columbia Basin. Between 12,000 and 11,000 B.C. the debris laden waters of Lake Missoula thundered repeatedly across what is now eastern Washington as the great ice dam on the Clark Fork River gave way, reformed and released again. The resulting floods reinvented the landscape across which they flowed, gouging deep channels and scablands, and carving an altered path for the Columbia River. The receding floods left behind a lunar landscape of misplaced geologic artifacts and scoured channels throughout much of eastern Washington, and transformed the topography of vast segments of the lower Columbia River Basin.

During the last ice age much of the Colville Tribes' traditional lands were covered by the great waves of ice that crawled across the northern latitudes. The Okanogan River Valley, the homeland of a number of the constituent tribes of the Colville Reservation, was sculpted in part by the retreat of one of these massive fingers of ice. As the ice age relented, the receding glacier scoured the wide, smooth contours of the Okanogan Valley and left in its wake a system of chain lakes that is unique to the Canada/U.S. reaches of the Columbia River Basin. Members of the Colville Tribes are descendants of people who have made their homes around the Upper Columbia and Okanogan rivers, and relied on the bounty of those rivers since the time when the waters of the last Lake Missoula flood, and ice of the last Okanogan Valley glacier, made their respective retreats.

Later, waves of European settlers began to flow across this same landscape. They came first as explorers, fur trappers, and missionaries studding the countryside with trading posts, forts and missions. Gold prospectors followed, washing through the mountains in floods with each new gold strike. Soon settlers arrived, multiplied, and gradually filled the valley bottoms and other arable lands with farms and grazing livestock. By the 1870s wheat farms extended further and further into the Palouse prairies edging out native bunch grass communities. Railroads blasted through the vast open spaces, slicing steel rivers through prairies and mountains to connect the wheat lands and population centers that lay to the east with communities along the newly developing Pacific Coast. Columbia Basin wheat was transported by rail and ship to provide flour for Asia, Europe, and eastern North America. The development of the lower Columbia River commercial salmon fisheries rose in prominence during this same era and soon cans of salmon followed the rail migration of the wheat.

Within this context of recurrent and accumulating waves of European settlement the individual bands and tribes that today make up the Colville Tribes sought to continue living much as they had for thousands of years. However, their movements, traditional lifestyles and the natural resources upon which they depended, were increasingly constrained or altered by European settlements. Between the late 1700s through the early 1900s epidemics swept through the indigenous populations decimating families, bands, and tribes. Throughout the mid-1800s sporadic, and occasionally sustained conflicts erupted between the region's Indian tribes and the growing populations of white settlers. For the most part, the bands that make up the current Colville Tribes, chose not to engage in these conflicts, but attempted instead, to coexist peacefully with the newcomers.

4.3 LEGAL WRANGLING, RESERVATIONS AND TREATIES

4.3.1 TREATIES AND TRIBULATIONS

The recitation of history necessary to establish the legal context and rights of Indian tribes can be a numbing litany of broken promises and compacts. However, a brief review of the Colville Tribes' history is essential to understanding the context of this proposal, including the trust obligations of the U.S. Government and the extent of losses experienced by the Colville Tribes.

In 1853 Isaac Stevens was appointed Governor of the newly created Washington Territory. In addition to his duties as Governor, Stevens was charged with surveying a route for a railroad to the Puget Sound. While engaged in these survey activities, Stevens encountered many Indian tribes and white settlers. Shortly after his arrival in the Northwest, in correspondence to his superiors, Stevens noted the accelerating potential for conflict between the new settlers who increasingly occupied more and more of the fertile valley bottoms and adjoining lands, and the local Indian tribes who had for generations relied on those same lands to hunt, fish, collect food, and establish seasonal camps (Buerge 1998).

Within only months of being dispatched to Washington Territory Stevens recommended that reservations be established and Indian tribes be relocated to the reservations "so far as practicable, so as not to interfere with the settlement of the country" (Buerge 1998). Stevens shortly thereafter embarked on a whirlwind of treaty negotiations. He launched these negotiations with a series of multi-day "Councils" with the region's Indian tribes, including most of the tribes from eastern Washington. Stevens or his designates identified and selected the tribal representatives who were to participate in these Councils. The Council discussions and subsequent treaty negotiations were conducted in a modified pigeon "Chinook" language, developed primarily to facilitate the fur trade. In many cases the "tribal representatives" who participated in these negotiations did not fully understand the content, or implications of the agreements they signed (Buerge 1998). In short succession in 1855, Steven's secured the Point Elliot Treaty in January, the Yakama Treaty in June, and the Hells Gate Treaty in July. The area ceded under the Yakama Treaty included lands of the Wenatchi (Wenatchee), Chelan, Entiat, and Moses Columbia tribes (all of whom later were relocated to the Colville Reservation). No representatives from the Moses Columbia or Chelan tribes were present at the Yakama Treaty signing (Hart 2001).

The treaties Stevens' developed with the Yakama and other tribes are important because language inserted in those treaties, particularly language assuring the right of tribal members "to fish and hunt at all usual and accustomed places, in common with citizens of the Territory", later established the framework within which the Executive Orders and subsequent Agreements with the Colville Tribes were developed.

4.3.2 THE 1872 EXECUTIVE ORDER

For nearly a hundred years the U.S. Government's Executive Branch made treaty arrangements with Indians "by and with the Advice and Consent of the Senate." Even though the House appropriated money to carry out the treaties, it had no voice in the development of the Indian policy reflected through those treaties. Through legislation introduced in 1867 members of the House attempted to repeal "all laws allowing the President, the Secretary of the Interior, or the commissioner of Indian affairs to enter into treaties with any Indian tribes." This legislation initially passed but was repealed only months later. After further unsuccessful attempts to gain leverage in federal Indian policy, the House refused to grant funds to carry out new treaties. Finally, the Senate submitted to pressure and supported the House in passing the 1871 Act that forbid the recognition of Indian nations and tribes as sovereign independent nations through treaties. *Antoine v. Washington*, 420 U.S. 194, 95 S. Ct. 944, 43 L.Ed.2d 129 (1975) "Antoine".

On July 2, 1872, roughly a year after Congress abolished the treaty process, President Grant established the Colville Reservation by Executive Order. When the Executive Order was issued in 1872, the Colville Reservation covered roughly 3.1 million acres. At that time, Reservation lands included the present western, southern, and eastern boundaries, (Okanogan and Columbia rivers) but extended on the northern perimeter to the Canadian border. Thus, along with the adjacent Moses Columbia Reservation, established in 1884, the lands reserved for members of the Colville Tribes totaled nearly 7 million acres for a brief period in time.

When the Colville Tribal members were relocated to the Reservation lands, they gave up widespread land and water holdings, and also relinquished extensive improvements made on many of those lands. The preservation of the fishing rights secured in the 1872 Executive Order was essential to securing the agreement of Colville Tribal members to relocate to the Reservation, *Confederated Tribes of the Colville Reservation v. Walton* 647 F.2d 42, 44 (9th Cir. 1981) "Walton".

4.3.3 LOST LAND

The Reservation lands secured for the Colville Tribes were whittled away in one legalized land grab after another to the present 1.5 million acres. In 1888, the first of many land losses occurred when the Moses Columbia Reservation was, for the most part, restored to the public domain. Then in 1891, less than twenty years after the establishment of the 1872 Reservation, the Colville Tribes were "asked" to cede the northern half (North Half) of the Reservation. The North Half included all lands north of a line running parallel to the Canadian border, approximately 40 miles south of the Canadian border. The resulting cession Agreement reduced the Tribes' remaining lands from approximately 3.1 million acres to the Reservation's current configuration of roughly 1.5 million acres.

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FIGURE 4: Photo of Colville Men Fishing from Rocks at Kettle Falls

Congress was initially unable to develop legislation to ratify the 1891 Agreement. Instead in 1892 Congress simply enacted legislation to restore the North Half to the public domain. The 1891 cession Agreement contained a crucial clause in Article 6 which stipulated "the right to hunt and fish in common with all other persons on lands not allotted to said Indians shall not be taken away or in anywise abridged" (Antoine). After a decade of petitioning and lobbying by the Colville Tribes, Congress finally ratified the 1891 Agreement in the Act of June 21, 1906 and also in a subsequent series of Appropriations Acts between 1906 and 1910. Shortly thereafter, the Colville Reservation was further reduced by the enactment of the Allotment Act of 1887, which opened Reservation lands to homesteaders and which was not repealed until 1935.

4.4 LOST SALMON

The upper reaches of the Columbia River once fostered some of the most bountiful anadromous fish runs in the entire Columbia Basin including the famous "June hogs". Among all the Columbia's fisheries, the fishery at Kettle Falls – which is presently submerged under the waters of Lake Roosevelt – was second only to the renowned Celilo Falls in its overall ceremonial significance and productivity. In the 1800s, prior over harvest by commercial fisheries in the lower Columbia River, and the extensive habitat degradation that occurred throughout the Columbia Basin, the combined salmon and steelhead harvest of the Indian tribes in the upper Columbia River was estimated in excess of two million pounds annually (Koch 1976).

In describing the now inundated fishery at Kettle Falls, Angus McDonald, who ran the Fort Colville trading post between 1852 and 1872, wrote, "salmon as heavy as one hundred pounds have been caught in those falls...One basket has caught a thousand salmon in a day" (Howay et al 1907). In 1870, the author of an annual report to the Commissioner of Indian Affairs, described the salmon chief, a Colville Indian, distributing "the salmon among his own and the different tribes of Indians [including San Poil, Spokane, Kalispel, Kootenai, Coeur d'Alene, and Nez Perce] that assemble at Kettle Falls for the purpose of catching their winter's supply" (Scholz et al 1985). Other accounts note that Indians from as far away as western Montana and the Dakotas came to Kettle Falls to trade buffalo meat and hides for salmon (Reyes 2002). Although it was the preeminent fishery, Kettle Falls was only one of many upper Columbia River fisheries important to the Colville Tribes and other tribes in the region.

The Okanogan River also provided the Colville Tribes with exceptionally important and productive fisheries.

For centuries, bands and families of the Colville Tribes traveled from their winter camps to various fishing sites along the Okanogan River each spring. The various families and bands fished, hunted, and collected roots and berries in the same general areas each year. Some of these sites were also shared with other tribes. In order to take advantage of successive fish runs, most of the more permanent tribal villages were located on or near rivers.

FIGURE 5: Photo of McLaughlin Falls

In the month of April, members of the Colville Tribes fished for suckers along the Okanogan River using traps at McLaughlin Falls and Janis Rapids, and using spears in eddies above the present town of Monse. Steelhead were taken in relatively small numbers beginning in March and April. Fishing for the more numerous Chinook salmon started in May and June and lasted into the fall. Weirs were commonly constructed at a number of locations including sites near the contemporary towns of Monse, Malott, Omak and Oroville. These weirs were supported by poles, which were lashed into tripods and constructed in such a way as to encourage migrating fish to swim into the traps where they were unable to escape. Once the fish were caught in the traps it was relatively simple to spear or net them. Nets were also employed in combination with the weirs at some of the falls or rapids, or in conditions where the water was murky.

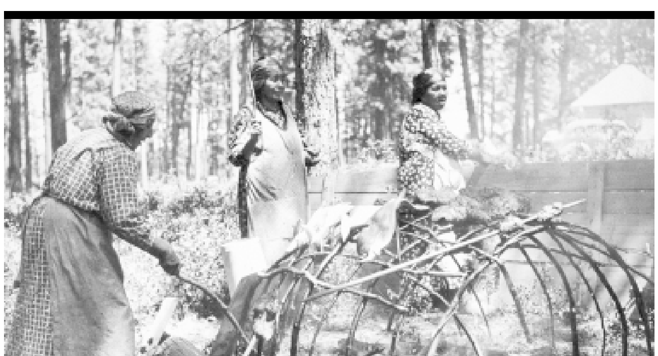

FIGURE 6: Photo of Colville Women Smoking Salmon at Kettle Falls, Circa 1939

Salmon were elemental to the lives of the Colville Tribes. Salmon provided the primary protein source for the Colville Tribes. Members of the Southern Okanogan band, for instance, ate 4 to 5 times as much salmon as game. During the fishing season, Colville Tribal members took enough salmon to last through the year, drying large quantities for use throughout the year. They also used some of this salmon for trade. Like many other tribes, the members of the Colville Tribes celebrated the changing seasons associated with major harvests of salmon, deer and distinctive roots and berries, with celebratory ceremonies and feasts.

4.4.1 LOST CULTURAL LEGACY

One of the most significant ceremonies to all of the Columbia Basin tribes, including the Colville Tribes, is the ceremony celebrating the arrival of the first returning salmon. The First Salmon Ceremony welcomes the return of the first Chinook salmon. The ceremony was initiated when the first Chinook of the season was caught at a communal weir. The communal fishing sites at Kettle Falls and Okanogan Falls were under the direction of a Colville salmon chief who oversaw construction of the fishing equipment, fishing activities including the initiation of the fishing season, distribution of the fish, and the rituals associated with the First Salmon Ceremony. The Colville Tribes' first salmon celebra-

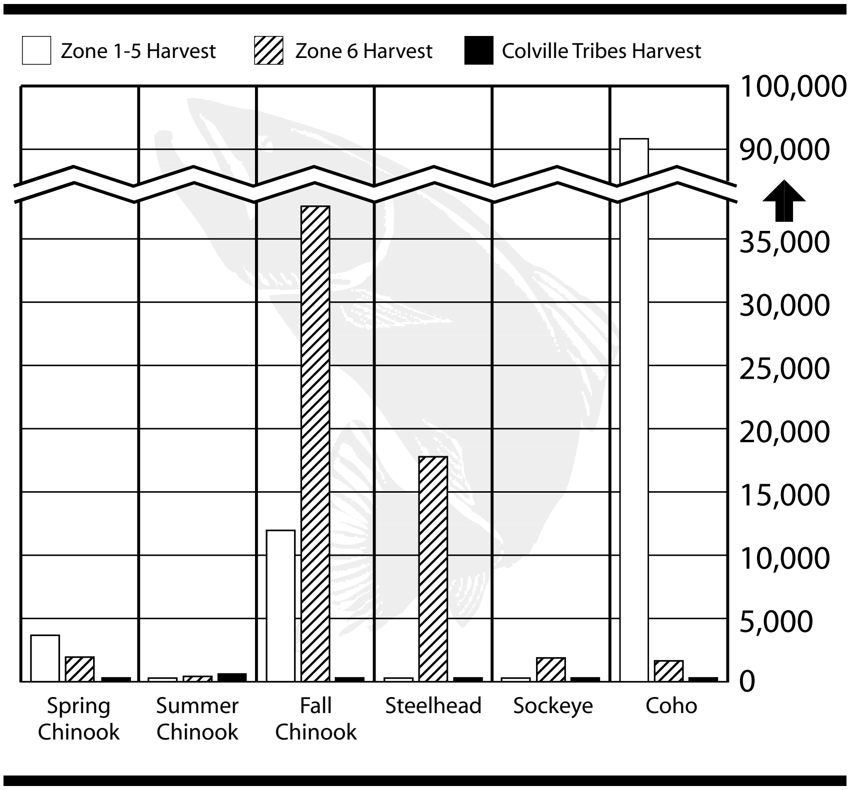

FIGURE 7: Comparison of Columbia River Anadromous Fish Harvests, Average 1991-2000

tion lasted 5 days and was an important social and cultural event.

This celebration of the returning salmon was part of historical lifeblood of the Colville Tribes and represents a vital cultural legacy that was passed down from one generation to the next for many hundreds of years. Today, the Colville Tribes no longer hold a First Salmon Ceremony. All anadromous salmon have been extirpated from the waters above Chief Joseph Dam and the presence of salmon in the remaining rivers and tributaries around the Colville Reservation has been significantly compromised.

As a result of the extirpation of anadromous fish from the majority of the Colville Reservation, Tribal members have been forced to rely entirely on very meager remaining anadromous fisheries in the Okanogan River subbasin and mainstem Columbia River at the base of Chief Joseph Dam. These sole remaining fisheries provide only a limited summer/fall Chinook salmon fishery immediately below Chief Joseph Dam, an irregular sockeye fishery and more recently, a limited Chinook fishery in the Okanogan River.

In this context it is important to also bear in mind that unlike many other northwest tribes, the Colville Tribes fish only for ceremonial and subsistence purposes – not for commercial gain. Yet, the Colville Tribes' remaining fisheries are not adequate to meet even these modest ceremonial and subsistence purposes. Over the last several decades the Colville Tribes' average annual combined salmon and steelhead harvest has been limited to 930 fish. Figure 7 illustrates the extreme paucity of the Colville Tribes' harvest relative to the harvests in the Columbia Basin fisheries Zones 1 to 5, and Zone 6

4.4.2 LOST RUNS, LOST ABUNDANCE, AND LOST DIVERSITY

The factors contributing to the dangerously compromised populations of wild salmon returning to the upper Columbia River can be abbreviated in three broad categories: first is the decimation of salmon populations caused by the enormous commercial cannery industry that flourished on the Columbia River in the nineteenth century; second is the extensive habitat degradation that occurred throughout the

Columbia Basin (including increasing and competing demands for water, accelerated timber harvest, secondary impacts from agriculture, and the sheer momentum of human expansion with its associated development), and; third is the transformation of the Columbia from a free flowing river to a series of impoundments punctuated by hydroelectric projects. Clearly, numerous other factors have also contributed to the decline of wild salmon including political, economic, and jurisdictional considerations; lack of adequate knowledge regarding the interrelationships of ecosystems and species; the role of early hatchery programs, and some current programs, in weakening and homogenizing wild salmon stocks; and finally broad environmental influences such as ocean conditions.

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FIGURE 8: Photo of Salmon Cannery, Probably Aberdeen, Washington, Year Unknown

During the reign of the commercial salmon canneries the large spring and summer Chinook of the upper Columbia Basin were the most highly prized of the five Pacific salmon and steelhead runs. The impact of the vast commercial canneries was disproportionately felt among the populations of upper Columbia Basin Chinook.

While the commercial factory-scale canneries were extraordinarily detrimental to salmon runs, smaller operations throughout the Columbia River Basin also took a significant toll. At the local level, during the 1850s and 1860s two early Okanogan Valley settlers, Benjamin MacDonald and John Utz, effectively commercialized the successful fishing techniques of the local tribes by building a weir across the Okanogan River. They trapped up to 20 wagon loads of salmon a day in their mechanism, and in a somewhat perverse turn of events sold their catch back to the local Indians.

By 1874 more than half of the historical salmon run that entered the Okanogan subbasin had been destroyed by lower river commercial fisheries. The Colville Tribes had lost roughly three-quarters of their fishery by 1884 and by 1890 runs of salmon to the Okanogan subbasin were almost completely destroyed (Ray 1972).

4.5 LOST MITIGATION

4.5.1 GRAND COULEE AND CHIEF JOSEPH DAMS

Beginning with the completion of Rock Island Dam in 1933 the construction of the hydropower projects adjacent to and below the Colville Reservation proceeded in a relentless succession of poured concrete. Bonneville Dam was completed in 1938, Grand Coulee in 1941, McNary in 1954, Chief Joseph in 1955, The Dalles and Priest Rapids in 1959, Rocky Reach in 1961, Wanapum in 1963, Wells in 1967, and finally the John Day Dam in 1968. In all, eleven dams have directly altered the Colville Tribes' access to stable self-sustaining populations of anadromous fish.

Although the hydroelectric projects on the Columbia River have provided substantial benefits in terms of electricity, irrigation and flood control, the trade-offs have been considerable. The Colville Tribes are particularly, and uniquely, affected by these trade-offs. On one hand they are a salmon people with indelible ceremonial and subsistence ties to salmon, while on the other hand the Colville Tribes are dependent on hydropower revenue generated at Grand Coulee Dam, which is the source of the Tribes' annual payments under the Grand Coulee Dam Settlement of 1995.

No dam had as profound an effect on the Colville Tribes as Grand Coulee. The completion of Grand Coulee blocked access by all anadromous fish to approximately 1,140 lineal miles of habitat above it (Scholz et al 1985). Huge areas of valuable fish and wildlife habitats along the Columbia River were inundated. In a 1947 report on the Columbia Basin Project, the Bureau of Reclamation acknowledged, "many valuable [salmon] breeding areas have been totally eliminated by construction of dams wholly unprovided with fishways." The report's author continued, "...a large part of the spawning and rearing areas originally available has either been completely eliminated or so seriously reduced as to be useless" (U.S. Bureau of Reclamation 1947).

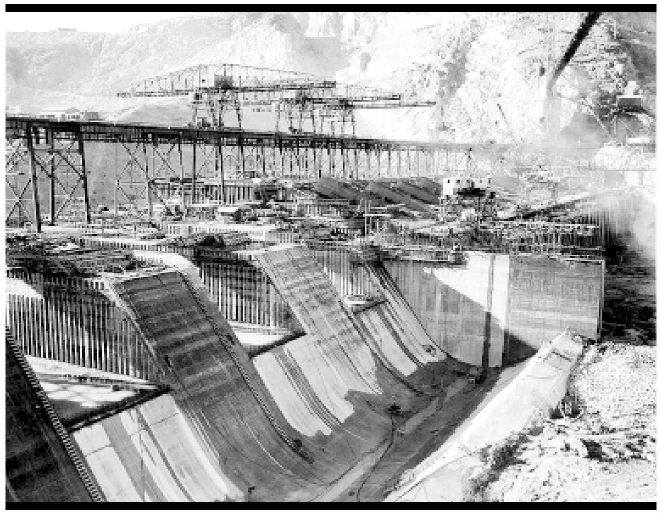


FIGURE 9: Photo of Spillway Construction at Grand Coulee Dam, 1937

In 1917 Ephrata attorney William Clapp, garnered the support and enthusiasm of Ephrata area residents, and eventually the State of Washington, for the construction of Grand Coulee Dam. The Dam was initially conceived as an irrigation and flood control project that would green the desert of central Washington while also providing flood control for downstream communities. Electricity generation was not a project priority at the outset. Preliminary feasibility studies were conducted in the 1920s and initial excavation of the site began in 1933. Early designs were for a "low dam" and included provision of fish passage facilities similar to those constructed at Bonneville Dam. However, a second option was also developed for a "high dam" that would sit approximately 200 feet higher to provide for increased power generating capacity. In 1935, responding in large part to growing demand for additional electricity, Congress reauthorized construction of Grand Coulee as a "high dam."

In 1937 the Bureau of Reclamation signed an agreement with Washington Department of Fisheries (WDF) under which WDF would develop a recommended approach to mitigating for the losses of anadromous fish caused by construction of Grand Coulee Dam. In response, WDF in coordination with the U.S. Bureau of Fisheries (now the USFWS) presented two options. The first was an appraisal of the viability of constructing fish passage above Grand Coulee Dam. The WDF report concluded that the engineering challenges and potential biological effects associated with constructing passage over a dam as high as Grand Coulee were not surmountable. The second option, which WDF recommended, centered on construction of a system of mitigation hatcheries. This option included construction of a fish trapping facility at Rock Island Dam and of a system of four hatcheries — one hatchery at Leavenworth, and three tributary sub-stations to be located on the Entiat, Methow, and Okanogan rivers.

Congress authorized construction of the mitigation hatcheries. The trapping facility at Rock Island Dam, the hatchery at Leavenworth and the hatchery sub-stations on the Entiat and Methow Rivers were completed. However, the Okanogan River hatchery was never constructed. Complications related to the proposed location of the hatchery, in combination with severe funding restrictions resulting from the onset of World War II, effectively mothballed the project. For many years, the promised fourth hatchery was mostly forgotten. The Colville Tribes reinitiated the question of the fourth hatchery in the 1980s and in 2000 the U.S. Bureau of Reclamation agreed that the full, authorized mitigation for construction of Grand Coulee Dam was still not complete and could be pursued.

Chief Joseph Dam was completed in 1955 and like its upstream neighbor, it too was built with no provision for fish passage. Chief Joseph Dam blocked anadromous fish access to another 50 miles of the Columbia River. In all, roughly 37% of all anadromous fish losses in the Columbia Basin occurred in the areas blocked by Grand Coulee and Chief Joseph dams (Scholz et al 1985).

4.5.2 COMPOUNDING THE EFFECTS OF UNMET MITIGATION

Below Grand Coulee and Chief Joseph dams nine more hydroelectric projects (four federal and five non-federal) hinder anadromous fish passage between the ocean and the Okanogan subbasin. While it is true that over the last two decades fish passage mortalities associated with those nine dams have been significantly reduced, depending on river flows, passage still claims 35 to 70% of outmigrating juvenile Chinook salmon, and over 20% of the returning adults. Historically the fish mortality percentages were much higher. Over a period of 50 to 60 years, the composite impacts of downstream hydropower mortalities on the viability of naturally-spawning populations of Chinook in the Okanogan subbasin have been devastating.

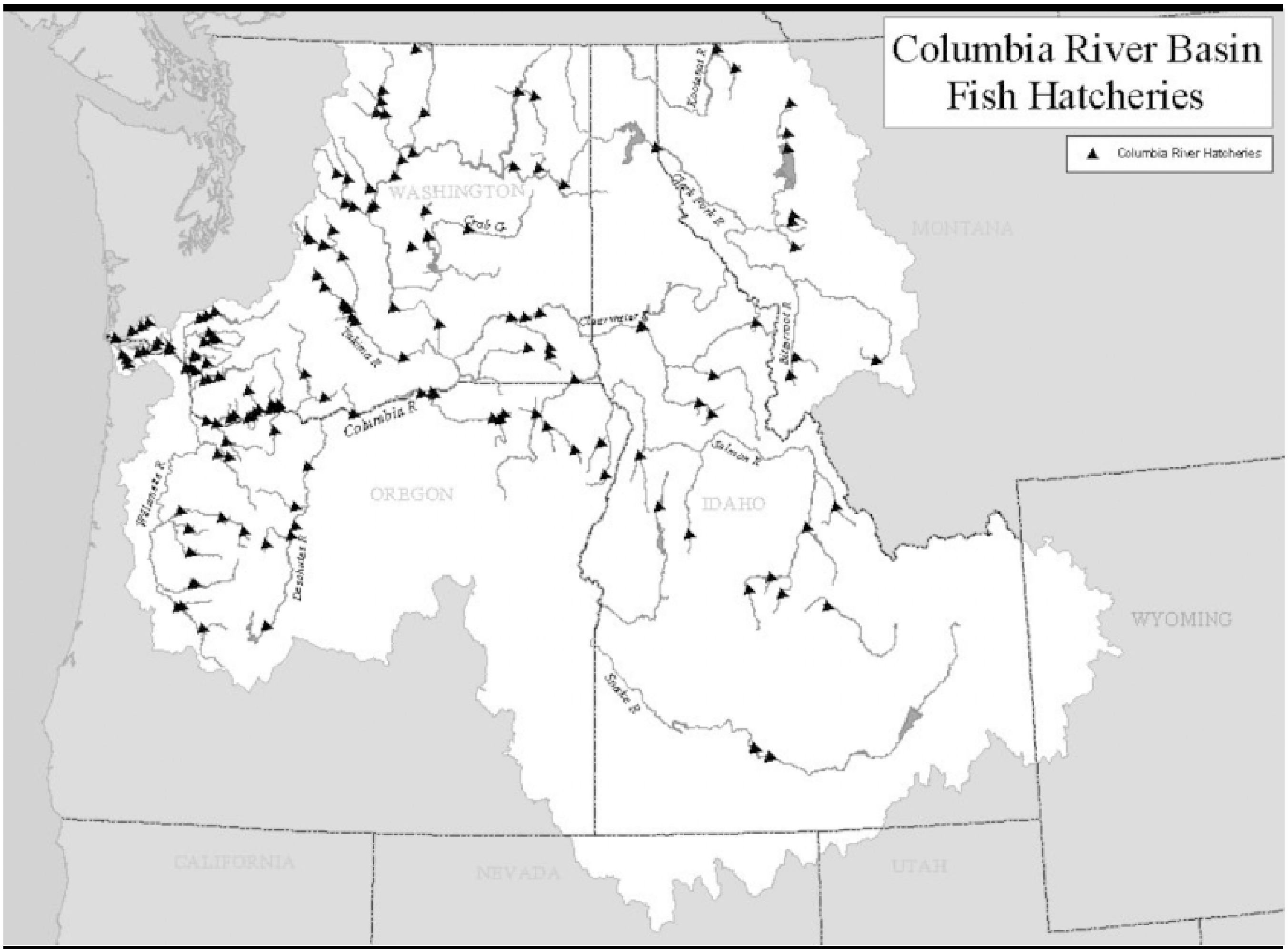
The precarious numbers of salmon in the Okanogan subbasin are also due in part to long-standing mitigation inequities that extend well beyond the missing fourth Okanogan hatchery. Notably, the Colville Tribes have never received the initial federal salmon mitigation that other subbasins in the Columbia Cascade Province received. In addition, the federal government never provided Okanogan anadromous fish hatchery mitigation to the Colville Tribes for the loss of adult and juvenile fish that pass through the four Corps of Engineers' hydroelectric projects on the Lower Columbia River. Fish mortalities at these four projects alone are currently estimated to range from 4 to 10% per project for juvenile salmon and about 2% for adults. Before the recent improvements of fish passage systems and operations at the dams these losses were historically much higher.

The vast majority of the Mitchell Act hatcheries, which were built specifically to provide mitigation for losses caused by the Columbia River federal hydropower projects, were constructed in downstream locations. Benefits from the Mitchell Act hatcheries have flowed almost exclusively to lower Columbia River tribes, commercial fisheries, and downstream and ocean based recreational fisheries. The Mitchell Act program has done nothing to contribute to maintaining viable salmon populations in the Okanogan subbasin. Moreover, fisheries directed toward Mitchell Act hatchery progeny have further depleted the runs of fish destined to spawn in the waters around the Colville Reservation.

In discussing the disproportionate concentration of hatcheries on the lower Columbia River, the authors of the Council's *2003 Draft Artificial Production Review and Evaluation Basin-Level Report* explain, "Hatchery managers reported planned releases of 235,690,000 juvenile fish of all species from hatchery programs in the U.S. portion of the Columbia Basin. Approximately 88% or 207,734,500 fish are planned releases of anadromous salmonids below the fish passage barriers at the Chief Joseph and Hells Canyon dams. The largest proportion, (42%) occurs in the Lower Columbia Province, as a result of earlier attempts to provide fish for the ocean and lower river commercial fisheries" (NPCC 2003).

The substantial unmet mitigation owed to the Colville Tribes has been further compounded by the structure of formulas used to determine mitigation levels for the mid-Columbia Public Utility District (PUD) dams. These formulas, which were based on the average run sizes of salmon and steelhead in a 10-year period during the 1970s and 1980s (Bugert 1998), do not account for the fish that would have been produced at the missing fourth Okanogan hatchery. Additionally, most of these post-dam runs were supported in large part by the initial hatchery mitigation programs funded by the PUDs and the federal government. Since the Colville Tribes did not receive the initial mitigation from the construction of federal and PUD dams, the basis for the new agreements further discounts the obligations to the Colville Tribes.

The Federal Government has clear trust obligations to the Colville Tribes to protect the reserved fishing rights and associated resources ascribed to the Colville Tribes. The current levels of mitigation not begin to meet these obligations.



Source: Northwest Power and Conservation Council, Draft APRE Report 2003-17

FIGURE 10: Location of Hatcheries within the U.S. Portion of the Columbia River Basin

4.6 LEGAL CHALLENGES TO RIGHTS SECURED IN THE EXECUTIVE ORDER AND AGREEMENTS

In the 1970s the validity of the Colville Tribes' 1891 Agreement was challenged when the State of Washington sought to prosecute a Colville tribal member for hunting on public lands within the ceded North Half in violation of state law. The U.S. Supreme Court ruled that the 1891 Agreement was properly ratified, that the Agreement is the equivalent of a treaty for Supremacy Clause purposes, and that the State of Washington has no authority to apply its hunting and fishing laws to Colville tribal members hunting and fishing on the North Half. The Court noted that the effect of the 1891 Agreement was to "preserve" hunting and fishing rights secured under the 1872 Executive Order (Antoine). The hunting and fishing rights for the ceded North Half also include gathering rights and the reserved water rights recognized in the Walton case to support fish restoration and preservation and to support wildlife and plant habitat.

The Supreme Court in Antoine contrasted the language in Article 6 of the 1891 Agreement, "...shall not be taken away or in anywise abridged..." with counterpart language in the 1855 Stevens Treaties with other Northwest Indian tribes. For example, "the right of taking fish at all usual and accustomed places, in common with citizens of the Territory," *U.S. v. Winans*, 198 U.S. 371, 378 (1905), which is the language from Article 3 of the 1855 Treaty with the Yakima–and commented that Article 6 of the 1891 North Half Agreement presents a "stronger case" for a "flat prohibition" on any qualification of the right (Antoine).

Consistent with the reserved fishing and other rights described above, the members of the Colville Tribes and its members continue to harvest anadromous fish in the Columbia and Okanogan Rivers within the Colville Reservation and North Half. The territory encompassed by these rights includes the entire length of the Okanogan River within the United States (approximately 75 river miles) and the Columbia River within the United States above the Okanogan confluence (160 river miles), as well as all tributaries within that 3 million acre area. These reserved rights are generally analogous to the fishing rights of other Northwest tribes that arise under the 1855 treaties. The Colville Tribes' fishing and water rights are federally protected tribal assets or property rights which all agencies of the United States have a trust responsibility to protect (see *Klamath Water Users Protection Association v. Patterson*, 204 F.3d 1206 [9th Cir. 2000]).

Chris Fisher

FIGURE 11: Photo Contemporary Fishing in the Okanogan Subbasin

4.7 RIPPLES IN A POOL WITHOUT MANY SALMON

Salmon are part of the cultural identity of many communities in the Northwest – not just that of the Indian tribes. The Chinook and sockeye salmon fisheries in the Okanogan subbasin are vital to the economic health of these largely rural and economically fragile communities. The price paid in the upper Columbia Basin, in terms of depressed, listed, and extirpated anadromous fish; loss of habitat; and loss of ecosystem functionality has been greater than anywhere else in the Columbia Basin.

The ecological costs of providing power and flood control have fallen predominantly on the communities and ecosystems of the upper Columbia River. Yet, as noted previously, the mitigation for the hydropower projects that provide those same benefits is located almost entirely in the lower portions of the Columbia River. The economic and ecological costs associated with the historical frenzy of the commercial salmon industry were also borne disproportionately by the communities in the upper Columbia. Finally, harvest management today (e.g. *U.S. v Oregon*), is also disproportionately targeted to benefit downstream communities with little acknowledgement of the importance of ensuring adequate returns of salmon and steelhead to the upper Columbia River.

In concert with the efforts of the Colville Tribes many local citizens as well as state and federal agencies, members of Canadian First Nations, and government agencies in Canada, have contributed to the protection and restoration of migration, spawning and rearing habitat for anadromous fish in the upper Columbia, and specifically in the Okanogan subbasin. Yet the ripple effects associated with the enormous salmon losses and historically inadequate mitigation continue to undermine the contemporary communities and economies of the upper Columbia River.

The integrated management programs that would be implemented through the CJDHP will go a long way towards beginning to correct these longstanding inequities by helping to restore viable populations of naturally-spawning summer/fall Chinook salmon to the Okanogan subbasin. In the Columbia Basin, the long-term recovery and sustainability of salmon and steelhead runs depends on cooperative, consistent and persistent action by fishery co-managers, hydrosystem managers, as well as numerous local governments and citizens throughout the Columbia Basin. Establishing and maintaining partnerships between private landowners, agencies, non-governmental organizations, and tribes is essential to recovering and protecting salmon populations. The commitment to the citizens of the region and to the recovery of Chinook in the upper Columbia that would be signaled by the implementation of the CJDHP is vital to building and sustaining these important partnerships.

5. Ecological Rationale

Chief Joseph Dam Hatchery Program MASTER PLAN

5

Ecological Rationale

5.1 UPPER COLUMBIA RIVER ESU SUMMER/FALL CHINOOK SALMON

5.1.1 CURRENT POPULATION STATUS

The NOAA Fisheries 1997 Status Review of Chinook salmon from Washington, Idaho, Oregon, and California, identifies the Upper Columbia River summer/fall Chinook ESU as not currently in danger of extinction, and not expected to become so in the foreseeable future (Meyers et al. 1998). In recent decades smolt-to-adult survival of Okanogan River summer/fall Chinook salmon has varied widely due largely to freshwater and marine conditions, but also due to mortalities associated with the nine down-stream Columbia River hydropower projects. Early-arriving adult summer/fall Chinook counts at Wells Dam between 1980 and 2001 ranged from 1,343 to 33,244 [see SF HGMP, p.87 for associated table].

In the last two years returns of summer/fall Chinook to the Similkameen River and upper Okanogan River have increased substantially due in large part to improved ocean conditions. However, records from the years 1987 to 1996 show the long-term trend for the Okanogan population is -5.2% with a short-term trend of -8.8% (Brown, 1999). Based on these negative escapement trends, the Methow and Okanogan river summer/fall Chinook stocks are considered depressed.

5.1.2 LIFE HISTORY

Upper Columbia River summer/fall Chinook migrate past Wells Dam and enter the Okanogan River from mid-July through November. They are considered to have an ocean-type life history. The Upper Columbia River summer/fall Chinook run includes an "early-arriving" and a "later-arriving" component. For the purposes of this CJDHP the early-arriving component is defined as those fish passing Wells Dam from July 10 to August 28, while the later-arriving component consists of fish passing the Wells Dam between August 29 and November 15.

Adult summer/fall Chinook spawn in the Okanogan subbasin from late September through early November, with spawning peaking in mid-October (Peven and Duree 1997; Murdoch and Miller 1999). Peak spawn timing is a continuum, occurring later in the season in the lower Okanogan River, and earlier in the upper Okanogan and Similkameen rivers.

Approximately 50% of the spawning adult summer/fall Chinook in the Okanogan subbasin are 5-year old fish, with the remainder predominantly 4-year old fish (Murdoch and Miller 1999). Emergence timing is thought to occur from January through April, although specific data is not currently available. Summer/fall Chinook juveniles generally emigrate to the ocean as subyearling fry, leaving the Okanogan River from 1 to 4 months after emergence. There is evidence that some fish may undergo an extended residence period, including a protracted downstream migration. Many subyearlings rear in the mid-Columbia impoundments for various periods of time during their outmigration (Peven and Duree 1997). Additionally, some migrants over-winter in these impoundments and enter the ocean as yearlings.

5.1.3 CURRENT AND HISTORICAL DISTRIBUTION

Contemporary summer/fall Chinook spawning generally occurs in spatially discontinuous areas along the Okanogan River from just below the town of Malott (RM 14.5) to an area located below Zosel Dam at approximately river mile 77 near the outlet of Osoyoos Lake (Murdoch and Miller 1999). Spawning also occurs in the Similkameen River (which enters

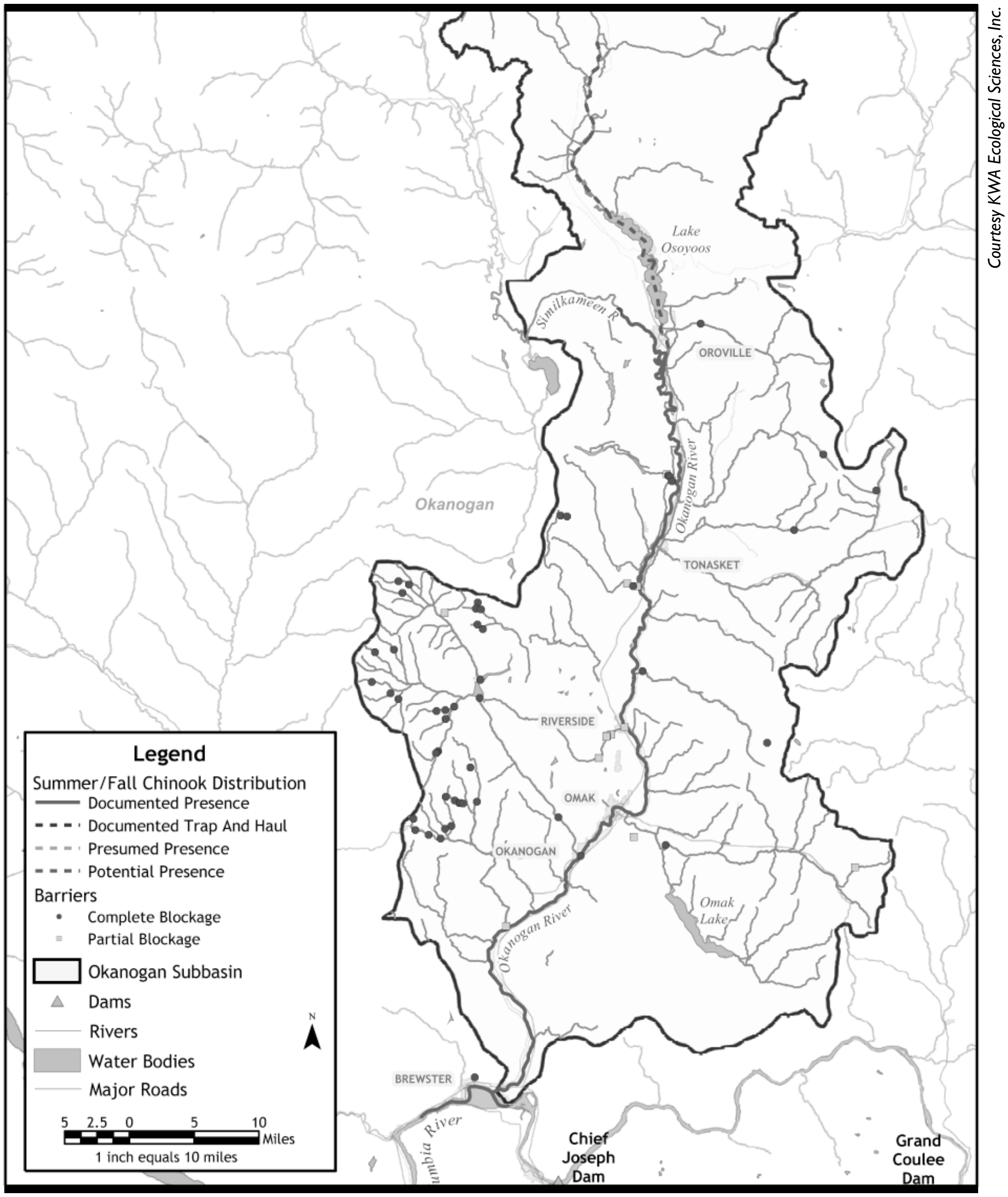


FIGURE 12: Okanogan Subbasin Summer/Fall Chinook Distribution

the Okanogan River at approximately river mile 76 just south of the town of Oroville) up to Enloe Dam at river mile 8.8. Distribution of summer/fall Chinook salmon in the Okanogan River extends upstream as far as McIntyre Dam, which is located 12.5 miles upstream of Osoyoos Lake in Canada. It is possible that during high flow periods some fish may pass beyond McIntyre Dam (Entrix and Golder 2002).

The majority of spawning in the Okanogan subbasin is at present heavily concentrated in the Similkameen River. From 1998 through 2002 the proportion of hatchery-origin fish spawning in the Similkameen River averaged 57%, while in the Okanogan River, hatchery-origin fish averaged 51% of the natural spawners.

Between 1995 and 2000, approximately 78% of the returning adult hatchery Okanogan summer/fall Chinook spawned in the Similkameen River. This localized activity is associated primarily with WDFW's artificial production program at Similkameen Pond. Summer/fall Chinook spawning in the Similkameen River is largely concentrated within an 8.7-mile stretch of river between Enloe Dam and Driscoll Island. The high rate of smolt-to-adult survival of summer/fall Chinook from Similkameen Pond has resulted in spawner densities in the Similkameen River greater than 400 redds per .62 mile (400 redds/km). As a result, habitat capacity in much of the Similkameen River is currently at its limit with redd superimposition occurring in much of the available habitat.


Steve Smith

FIGURE 13: Photo of Falls Below Enloe Dam on Similkameen River

Summer/fall Chinook historically provided an important tribal fishery in the Okanogan subbasin. Members of the Colville Tribes are known to have constructed fishing weirs at numerous sites including locations near the current towns of Monse, Malott, Omak and Oroville. However, as noted previously, by 1874 more than half of the historical salmon run that entered the Okanogan subbasin had been destroyed by lower river commercial fisheries and by 1890 runs of salmon to the Okanogan subbasin were almost completely destroyed (Ray 1972).

Bryant and Parkhurst (1950) in *Survey of the Columbia River and its Tributaries, Part IV*, commented, "In recent years the runs of Chinook salmon entering the Okanogan River have not been large. The chief Chinook spawning areas are located in the lower 16 miles up to the town of Malott, and for a distance of a few miles downstream from Lake Osoyoos." Dense spawning also occurred historically in the Okanogan River near the towns of Riverside (RM 49), and Omak (RM 32) where habitat is currently under-seeded (French & Wahle 1960, 1965). Today the lower 16 miles of the Okanogan River are inundated by Wells Pool and are thus unavailable for spawning. Bryant and Parkhurst's observation suggests that the Chinook spawning in the lower river (most likely the later-arriving summer/fall Chinook) were once a major portion of the Okanogan River population.

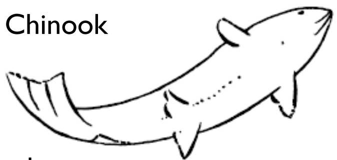
With the exception of the Similkameen River, much of the historical summer/fall Chinook spawning habitat in the Okanogan River has been largely underused for many decades. Of the hatchery fish that do spawn in the Okanogan River, 76% spawn above the city of Riverside (RM 40.3) leaving substantial habitat in the lower reaches of the Okanogan largely unseeded. As noted earlier, at present only the early-arriving portion of the summer/fall Chinook run is propagated. A central objective of the CJDHP is to increase use of available spawning habitat on the lower reaches of the Okanogan River and particularly, to restore the later-arriving component of summer/fall Chinook, which may be better suited to the conditions likely to be encountered in this reach of the River.

5.1.4 HABITAT CAPACITY

Accurate estimates of habitat carrying capacity are notoriously difficult to gage. In 1998, as part of development of the Mid-Columbia PUD HCPs a document titled, *Biological Assessment and Management Plan: Mid Columbia River Hatchery Program* (BAMP), was produced with cooperation from National Marine Fisheries Service (now NOAA Fisheries), USFWS, WDFW, Confederated Tribes of the Yakama Indian Nation, Colville Tribes, Confederated Tribes of the Umatilla Indian Reservation, Chelan County PUD, and Douglas County PUD. The BAMP included a plan for operation and evaluation of anadromous salmonid hatcheries in the Columbia River upstream of the Yakima River confluence, and included genetic and ecologic assessments of summer/fall Chinook, spring Chinook, sockeye and steelhead.

As part of the development of the BAMP, a Hatchery Work Group was established to specifically address production issues. This group, using a variety of state of the art methods, provided estimates of the carrying capacity of the Cascade Columbia subbasins, including the Okanogan. The Okanogan subbasin results are summarized in Table 2.

Table 2: Estimated Carrying Capacity of Natural-origin Anadromous Fish in Okanogan Subbasin (Bugert 1998)



	SMOLT CAPACITY	RECENT 10-YR AVERAGE	PERCENT OF CAPACITY
Summer/fall Chinook	1,440,000	475,000	33%
Sockeye	4,000,000	990,000	25%
Steelhead	17,600	15,700	89%
Spring Chinook	Not reported	0	0%

At the time these estimates were developed in 1998, the Hatchery Work Group estimated the Okanogan subbasin was at 33% of capacity. In the last few years, substantial returns of Chinook largely related to improved ocean conditions have likely increased use of available habitat somewhat above the identified 33%.

It is important to note the very low carrying capacity for Okanogan steelhead (Table 2) is a result primarily of degraded habitat in tributary streams in both the U.S. and Canadian portions of the subbasin, as well as impediments to passage in some of the tributaries. The tributary habitats critical to steelhead will not be used by hatchery-origin summer/fall Chinook. Substantial ongoing efforts are underway to restore select tributary habitat in the Okanogan subbasin [see Chapter 6].

5.1.5 CURRENT AND HISTORICAL ARTIFICIAL PRODUCTION

Summer/fall Chinook populations in the Okanogan subbasin are currently supplemented by a single hatchery program, which releases 576,000 yearling smolts annually from the Similkameen Pond. WDFW operates this facility, which is located on the Similkameen River at river mile 3.1 (the Similkameen enters the Okanogan at RM 77). The Similkameen Pond program was developed to "mitigate for the loss of summer Chinook salmon adults that would have been produced in the region in the absence of Wells, Rocky Reach, and Rock Island hydroelectric projects" (WDFW 1999).

Propagation of summer/fall Chinook in the upper Columbia began in 1967 with operation of the Wells Dam spawning channel. Historically the entire run of summer/fall Chinook passing Wells Dam from July 10 through November 15 was used to propagate the Upper Columbia River Summer/Fall Chinook ESU. Broodstock for Okanogan River summer/fall Chinook was diverted from ladders at Wells Dam and/or derived from volunteers that entered a trap located at the hatchery discharge. The major populations intercepted at Wells Dam were summer/fall Chinook from the Methow and Okanogan subbasins. Regional experts generally agree that over the years only about 3% of non-indigenous stocks have been incorporated into this current broodstock (Brown 1999). Beginning in 1987, broodstock collection after August 28 was terminated to avoid the possible inclusion of stray fall Chinook from downriver production programs (Turtle Rock was at that time using fall Chinook broodstock collected at Priest Rapids). Since that time, early-arriving summer/fall Chinook broodstock for the Rocky Reach/Turtle Rock program and the Similkameen Pond program have been obtained from the trap at Wells Dam (Brown 1999). Under the existing program, early-arriving summer/fall Chinook broodstock destined for the Okanogan and Methow subbasins are collected each year from the run at large reaching Wells Dam. Trapping in the Wells Dam east ladder begins on July 10th and ends on August 28th [see SF HGMP, p. 51].

Current broodstock collection aims to achieve a minimum natural escapement of 2,000 adults and jacks past Wells Dam, and when possible to reach an escapement level of 3,500 fish. In low run years, hatchery programs are reduced or deferred to increase escapement. During those years, the order of elimination in hatchery programs is: 1) Wells subyearlings, 2) Wells yearlings, 3) the Carlton

Table 3: Survival Rates for Early-Arriving Summer/Fall Chinook (1983-1987 Brood Years)

HATCHERY SURVIVAL RATE	AGE	RELEASE YEARS	RELEASE–ADULT
Rocky Reach	Yearling	1984-1989	1.4%
Wells	Subyearling	1976-1979	0.1%
Wells	Yearling	1976-1979	0.41%

(Methow) and Similkameen (Okanogan) programs. Later-arriving summer/fall Chinook broodstock are not currently collected. The contemporary stocks in the Okanogan subbasin are considered a mix of summer and fall stocks (Miller and Hillman 1994, 1996, 1997, 1998).

Table 3 presents historical survival rates from WDFW's programs in the Columbia Cascade Province (Bugert 1998).

Due in large part to the reliance on early-arriving summer/fall Chinook for hatchery broodstock since 1987, combined with mortalities associated with nine downstream dams, the natural-origin later-arriving Okanogan summer/fall Chinook populations in the Okanogan subbasin have declined to significantly lower levels than their early-arriving counterparts. It is probable that the current overall summer/fall Chinook population of the Okanogan and upper Columbia rivers is not representative genotypically, phenotypically, or behaviorally of the historical, indigenous population.

The Similkameen summer/fall Chinook program has not been able to consistently produce sufficient fish to meet its limited program objectives. In recent years the Similkameen production program has lost substantial numbers of fish due to cold-water disease, BKD, and Ich. Water quality problems including high water temperature, pollution, and heavy loads of fine sediments have also posed challenges for the program's operators [SF HGMP, p.49].

5.1.6 HARVEST

The Colville Tribes currently manage a ceremonial and subsistence fishery in the tailrace immediately below Chief Joseph Dam. The fishery uses hook-and-line gear to snag summer/fall Chinook and is designed to harvest summer/fall Chinook in excess of the current escapement objective of 3,500 fish. The fishery historically began on July 1 and ended no later than September 30. In 2002, the duration of the fishery was extended, and the location expanded 12 miles to the confluence of the Okanogan River.

In the past, the Colville Tribes have targeted summer/fall Chinook in this Chief Joseph Dam tailrace fishery, harvesting an average of 650 adults annually (1980-2003). The 1982-89 brood year average ocean fisheries exploitation rate was 39%, with the total exploitation rate of 68% estimated for the same years (Brown 2001). Because the Colville Tribes' tailrace fishery is located in a terminal site and uses hook-and-line gear, the capacity to harvest large numbers of Chinook surplus to escapement needs is very limited. From 1980 - 2000, tribal members harvested 200 to 1,100 summer/fall Chinook and between 12 to 819 steelhead. Even with the extraordinary record run of summer/fall Chinook past Wells Dam of 47,700 fish in 2001, the Colville Tribes' harvest was estimated at only 3,400 Chinook.

Historically, parties to the *U.S. v Oregon* agreement, in determining harvest levels, have not taken into account the need to provide for escapement of summer/fall Chinook to the upper Columbia sufficient to ensure the sustainability of naturally-spawning populations in the Okanogan subbasin, and provision of adequate ceremonial and subsistence fisheries for the Colville Tribes. Early-arriving summer/fall Chinook from the mid-Columbia region have in the past been heavily exploited in the ocean fisheries, although in recent years these fisheries have been restricted. The exploitation rate of summer/fall Chinook in the lower

Columbia River is not as great.

Recreational fisheries for summer/fall Chinook in the Okanogan and upper Columbia rivers are opened when forecasted runs of summer Chinook indicate a significant surplus to broodstock and escapement needs. A surplus is calculated as the anticipated run at Priest Rapids Dam less 5,750 fish required for broodstock at hatchery programs upstream of the Priest Rapids Dam, less 2.5% of the Priest Rapids count for lower-river recreational fisheries, less 5% harvest by the Wanapum Tribe, less an allocation for natural escapement in the Wenatchee, Methow, Similkameen, Okanogan, Entiat, and Chelan rivers. As escapement goals for each of these rivers has not yet been established, WDFW has conservatively used the sum of the maximum annual escapements to each river for 1996-2000, about 11,000 fish at Priest Rapids Dam as the trigger to open recreational fisheries.

The recreational fishery in the Okanogan River has been very infrequent due to the consistently poor runs of summer Chinook until recent years. Anglers are currently allowed to harvest hatchery-origin and natural-origin Chinook.

5.2 FACTORS LIMITING UPPER COLUMBIA RIVER SUMMER/FALL CHINOOK

5.2.1 OUT-OF-SUBBASIN LIMITING FACTORS

The most significant factor limiting productivity of naturally-spawning populations of upper Columbia River summer/fall Chinook in the upper Columbia River and Okanogan subbasin is the juvenile and adult mortalities associated with passage through nine downstream dams on the mainstem Columbia River.

Significant improvements have been made in system survival in recent years through increases in spring and summer flows, spill programs, improved juvenile bypass systems and transportation of juvenile fish at McNary Dam. In addition, performance standards for adult and juvenile passage have been developed as part of the Council's Fish and Wildlife Program, FERC licensing requirements, and NOAA Fisheries' ESA regulation. Basinwide monitoring and evaluation programs are being developed which, once implemented, will compare actual performance measures against the performance standards.

Actions to improve juvenile and adult salmon passage through the hydroelectric system are critical to the long-term viability of natural-origin summer/fall Chinook populations in the Okanogan subbasin. Increased survival of juvenile fish is particularly important for both yearling migrants in the spring and subyearling migrants in the summer months. The results of current decisions regarding spill and implementation of new surface bypass technology at downstream hydropower facilities will also have impacts on the survival of juvenile summer/fall Chinook from the Okanogan subbasin. Progress in passage survival will affect the abundance and productivity of summer/fall Chinook – as well as life history diversity. The ability to successfully transition yearling programs to the natural, subyearling life history types is substantially dependent on survival improvements made at the downstream dams and associated reservoirs.

Other out-of-subbasin factors limiting productivity of naturally-spawning populations of upper Columbia River summer/fall Chinook in the upper Columbia River and Okanogan subbasin include: the effect of *U.S. v Oregon* established harvests on levels of escapement to the upper Columbia basin; habitat degradation throughout the downstream portions of the Columbia Basin and estuary; and broad ecological influences including ocean conditions, human population growth, and global warming.

The carrying capacity of the Columbia River and its estuary for migrating smolts and rearing subyearlings is at present unknown. Basinwide research addressing this critical question has been proposed. It is anticipated that the capacity of the Columbia River and its estuary to support additional hatchery-origin fish produced through the CJDHP will fluctuate due to the highly variable returns from natural-origin populations and existing hatchery programs, highly variable hydrologic conditions (spring and summer flows and temperatures), and the ongoing reduction of releases from other (mostly lower river) hatchery programs.

5.2.2 LOCAL WITHIN-SUBBASIN LIMITING FACTORS

An assessment of the factors limiting productivity of natural populations of the Upper Columbia River summer/fall Chinook ESU in the Okanogan subbasin is presented in reach-by-reach detail in *Salmon and Steelhead Habitat Limiting Factors Assessment Watershed Resource Inventory 49: Okanogan Watershed* (Entrix and Golder 2002). In addition, the draft *Okanogan Subbasin Plan* (to be completed May 28, 2004) has identified summer/fall Chinook as one of the focal species and will include relevant EDT assessments for the mainstem Okanogan River and key tributaries.

In their discussion of limiting factors, the authors of the draft *Okanogan Subbasin Plan* note that a number of key documents and reports have addressed factors affecting the decline of Chinook and steelhead in the upper Columbia, but that among these documents there is not always clear agreement regarding the importance of various limiting factors. The Colville Tribes hope the *Okanogan Subbasin Plan*, once complete, will contain an effective synthesis of some of the central findings and conclusions offered in the primary assessment reports. The completed EDT analysis is expected to add quantitative value to the discussion of Okanogan subbasin limiting factors.

Based on existing assessment information, the primary limiting factor for summer/fall Chinook in the Okanogan subbasin is the uneven and inadequate distribution of spawning activity through available and historically important Okanogan River habitat. In summary, the other major local factors limiting productivity of Upper Columbia River summer/fall Chinook in descending order of importance include: agricultural water withdrawals from the mainstem Okanogan River, elevated summer water temperatures, sedimentation, and loss of riparian vegetation.

5.3 SUMMARY ECOLOGICAL RATIONALE

Although Upper Columbia River summer/fall Chinook summer/fall Chinook are not considered endangered, their status is depressed based on short- and long-term trends. The most significant factor limiting productivity of naturally-spawning populations of summer/fall Chinook in the upper Columbia River and Okanogan subbasin is the juvenile and adult mortalities associated with passage through nine downstream dams on the mainstem Columbia River. Until substantial improvements to downstream passage and river operations are achieved, it is unlikely that naturally-spawning populations, adequate to meet ceremonial and subsistence needs of the Colville Tribes, and adequate to restore naturally-spawning populations to sustainable levels can be achieved.

Additionally, due in large part to the reliance on early-arriving summer/fall Chinook for hatchery broodstock since 1987, combined with mortalities associated with nine downstream dams, the natural-origin, later-arriving Okanogan summer/fall Chinook populations in the Okanogan subbasin have declined to significantly lower levels than their early-arriving counterparts.

The current artificial production program at Similkameen Pond is unable to meet conservation and harvest objectives necessary to address the troubled status of current Chinook populations in the upper Columbia River and the high mortalities exacted by nine downstream hydroelectric facilities. The proposed CJDHP will provide necessary facilities to improve the distribution, abundance and life history diversity of summer/fall Chinook in the Okanogan subbasin.

6.
Local
Context

Chief Joseph Dam Hatchery Program

MASTER PLAN

6

Local Context

6.1 DESCRIPTION OF THE OKANOGAN SUBBASIN

6.1.1 OVERVIEW

The first time visitor to the Okanogan subbasin is often struck by the uniqueness of the terrain. In general, the Okanogan River is an exceptionally flat and slow moving river. The average width of the drainage area for the mainstem Okanogan is approximately 35 miles, and the valley floodplain averages about 1 mile in width. The eastern and western boundaries of the mainstem subbasin are outlined by steep, jagged ridgelines with elevations ranging from 1,500 feet to more than 6,000 feet above the subbasin floor. In summer months the Okanogan valley can broil under waves of heat and unremitting sunshine. In the winter, snow blankets large portions of the subbasin. The River valley is characterized largely by agricultural development, however remarkable gems, including picturesque waterfalls and mild rapids, are sprinkled throughout the length of the River. Knowledgeable visitors who spend some time exploring the area are often impressed by the obvious capacity of much of the Okanogan subbasin habitat to support healthy runs of salmon.

Upper Columbia Regional Fisheries Enhancement Group

FIGURE 14: Photo of the Okanogan River

From its headwaters in British Columbia, the Okanogan River descends at a languid pace through Okanogan Lake, Skaha Lake, Lake Vaseaux, and Osoyoos Lake before reaching the United States where it meanders gently another 79 miles to its confluence with the Columbia River (RM 533.5). The elevation of the mainstem drops from 920 feet at the international boundary to 780 feet at the River's confluence with the Columbia River. Osoyoos Lake occupies the northernmost 4 miles of the Okanogan Valley floor in Washington State and extends several miles into Canada.

The Okanogan subbasin, including the Similkameen subwatershed, is the largest and most complex of the four mid-Columbia River tributaries (Entiat, Okanogan, Methow and Wenatchee). The subbasin includes nearly 2,600 square miles within the state of Washington, and about 6,300 square miles in the Canadian province of British Columbia. For the purposes of the draft *Okanogan/Similkameen Subbasin Plan*, at least 71 subbasin tributaries were identified on the U.S. side of the subbasin. On the Canadian side, the British Columbia Ministry of Water, Air and Land Protection's *Watershed Atlas* identifies an additional 94 subwatersheds. The Similkameen River enters the Okanogan River from the west approximately 2 miles south of the U.S./Canada border (Okanogan RM 77). The Similkameen is the Okanogan River's largest tributary draining a watershed of nearly 2,900 square miles.

Average precipitation in the main Okanogan Valley is 12 inches, the majority of which falls as snow (Talayco 2002). The Okanogan subbasin exhibits a typical snowmelt system with high flows coinciding with spring rains and melting snow pack, peaking between late May and early June. Minimum flows occur in early fall to mid-winter. The Similkameen River contributes 75% of the Okanogan

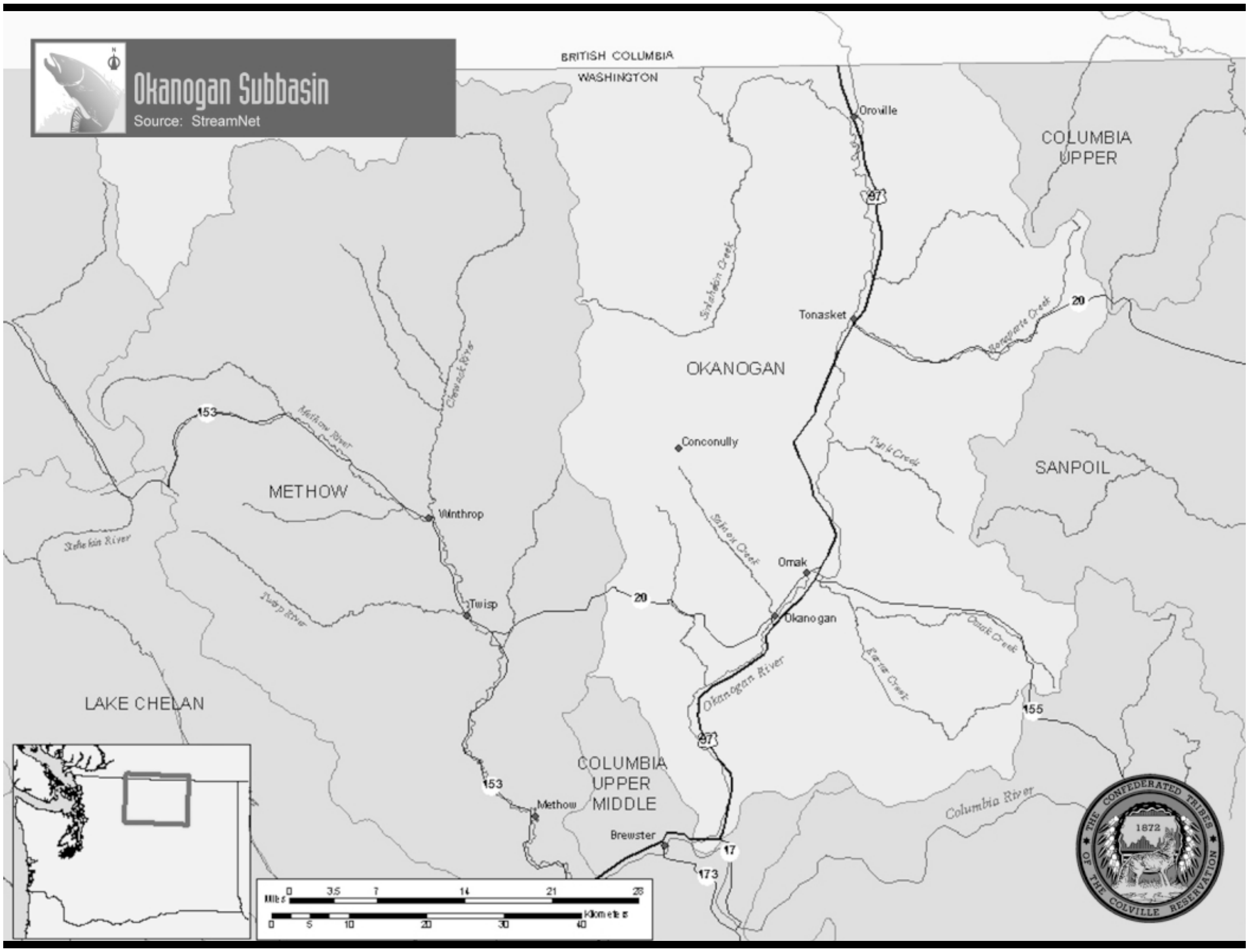


FIGURE 15: Map of the Okanogan Subbasin

River's flow (Talayco 2002). Isolated summer thunderstorms, occurring approximately once every two years, can cause flash flooding within subwatersheds.

6.1.2 LAND USE

Approximately 34% of the lands in the U.S. Okanogan subbasin are privately owned. The Colville Reservation makes up roughly 25% of the U.S. subbasin. The remaining 41% is publicly owned, and of that portion 21% is managed by the U.S. Forest Service (USFS), 17% is managed by the State of Washington, with the remaining 3% managed by the Bureau of Land Management (Entrix and Golder 2002). Major U.S. communities within the subbasin include the towns of Brewster, Omak, Tonasket and Oroville (in the Canadian subbasin are the towns of Osoyoos, Oliver, Penticton and Kelowna).

State and county highways run parallel to the Okanogan River at close proximity for its entire length in the U.S. except for a reach from Riverside to Janis, Washington. On the U.S. side, the stretch of River between the towns of Riverside and Janis is the only largely undeveloped reach. In the Canadian portion of the subbasin, British Columbia's major highway corridor also runs parallel to the River from Kelowna to Osoyoos.

Land use in the Okanogan subbasin includes agriculture, range, timber, residential and recreation, and some industrial and commercial. Agricultural fields are located directly adjacent to the Okanogan River along much of its length. On the U.S. side, the Okanogan subbasin contains approximately 36,000 to 40,000 acres of irrigated lands. Agricultural water withdrawals pose an ongoing challenge to salmon restoration in some mainstem, and many tributary reaches. Approximately 60% of the irrigated acreage (24,421 acres) is under the control of irrigation districts or ditch companies (Entrix and Golder 2002). Nine irrigation districts and canal companies operate on the U.S. side of the Okanogan subbasin. The Oroville-Tonasket Irrigation District (OTID) is responsible for irrigation of roughly 20% of the total irrigated land in the U.S. Okanogan subbasin (Entrix and Golder 2002).

Steve Smith

FIGURE 16: Photo Zosel Dam

The unique partnership between the Colville Tribes and the OTID warrants a brief comment. Like many irrigation districts, the OTID makes use of settling ponds prior to distributing its irrigation waters. The OTID use their settling ponds for six months out of the year and in the remaining six months the ponds sit idle. As it happens, the requirements of over-wintering summer/fall Chinook salmon in the Okanogan subbasin align very well with the time period when the OTID ponds are not in use. In an innovative partnership between the OTID and the Colville Tribes, the Tribes have agreed to lease these ponds, pay electrical pumping charges, and conduct upgrades and modifications necessary to convert the ponds for use as acclimation facilities during the irrigation district's off-season. This partnership between the OTID and the Colville Tribes represents one example of the types of creative, innovative, and cost effective strategies that can – and must – be developed to restore and conserve salmon and steelhead populations.

6.1.3 DAMS AND OTHER IMPEDIMENTS

Twenty dams are located in the U.S. portion of the Okanogan subbasin including nine owned by the state, seven private, three federal, and one operated by a PUD. In the Canadian Okanogan subbasin, 13 vertical drop structures exist along the Okanogan River (NMFS 1996). In addition, Canadian low-head dams at Okanogan Lake, Skaha Lake and Vaseaux Lake are impassable to fish.

Diversions in Loup Loup, Salmon, and Antoine creeks prevent the full use of habitat potentially available to anadromous salmonids in the U.S. portions of the subbasin. The Similkameen River is presently impassable to all anadromous salmonids at Enloe Dam (RM 8.8). It is largely believed that prior to construction of Enloe Dam, a series of natural falls blocked salmon and steelhead passage into the subwatershed. In one of the local Coyote stories shared in the Okanagan tradition, Coyote (Sen'k'lip), is said to have created a big dam on the Similkameen River to stop the salmon from passing. Coyote did this when the Similkameen people told him they would not give him one of their prettiest daughters in exchange for salmon in the summer because they had plenty of mountain goat to eat (Vedan 2002).

Zosel Dam at river mile 77 is used to control the levels of Osoyoos Lake. Reconstruction work completed in 1987 resulted in improved fish passage into Osoyoos Lake. McIntyre Dam, located 12.5 miles above Osoyoos Lake is the current upper limit to migratory fish in the Okanogan River, although historically anadromous salmon, in particular sockeye, are known to have used the waters of Okanagan Lake.

6.1.4 RIVER AND TRIBUTARY CONDITIONS

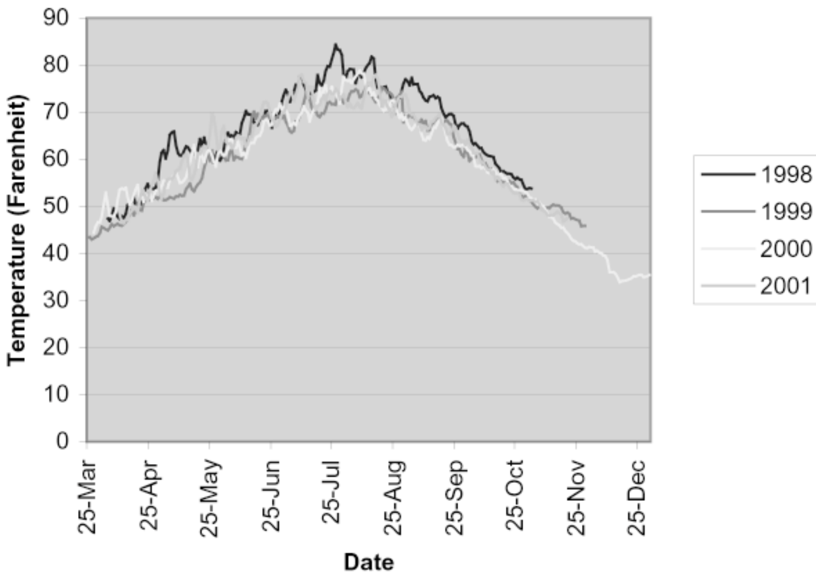


Figure 17: Okanogan River Average Monthly Temperatures Measured at Oroville, WA with Thermographs 1998-2001

The Okanogan River is channelized from its mouth to the town of Oliver in Canada.
The lowest 17 miles of the Okanogan River presently lie within the backwater pool (Lake Pateros) of Wells Dam. This area is subject to daily water fluctuations from Wells Dam operational changes. Temperatures in this portion of the Columbia River range from 38°F to 75°F. Stream banks in this reach are rarely exposed to high-energy flows and remain relatively intact, due to low gradient and storage influences. Substrate consists almost entirely of mud, silt, and sand. Riparian vegetation is composed of a dense layer of shrubs and saplings, which effectively protect the banks from scouring and erosion. There are few mature trees in this reach.

The Okanogan River between river mile 17 and the base of Osoyoos Lake, is a broad, shallow, low gradient, channel with relatively homogeneous habitat. There are few pools, and limited large woody debris. Sediment levels are high and substrate embeddedness is relatively widespread.

Temperatures in the Okanogan River regularly exceed lethal tolerance levels for salmonids in mid-to-late summer. Temperatures in the Okanogan River ranged from 32°F to 85°F between 1998 and 2001 (Colville Tribes, unpublished data). Due to the extensive series of lakes in the Canadian portion of the basin, the Okanogan River actually tends to be warmer in the northern reaches near Oroville, WA, than it is further south in Malott, WA (Figures 17 and 18). High water temperatures in late summer and fall often form a temporary thermal barrier, blocking adults from migrating to spawning grounds. These thermal conditions have also sometimes excluded juvenile salmon from rearing in most of the Okanogan subbasin, except during the first few weeks after emergence (Talayco 2002). When temperatures reach critical levels, dissolved oxygen concentrations in the Okanogan River are generally at or above saturation levels. The lowest saturation values have been detected at Malott, WA.

Although it is typically cooler than the Okanogan River, the Similkameen River is also 303(d) listed for temperature. Between 1999 and 2001, Similkameen River temperatures ranged from 33°F to 74°F (Colville Tribes, unpublished data). Mid-summer

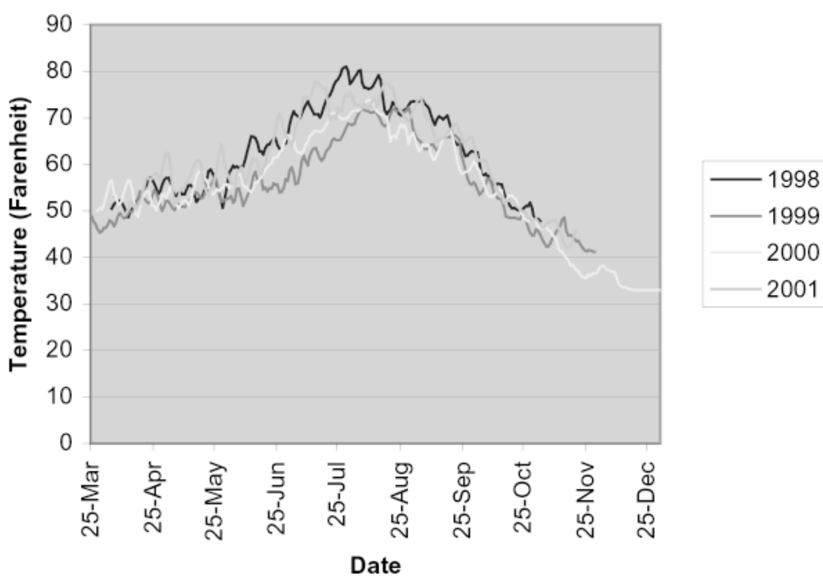


Figure 18: Okanogan River Average Monthly Temperatures Measured at Malott, WA with Thermographs 1998-2001

temperatures exceed 71°F, precluding summer rearing of salmonid juveniles. The Similkameen River also has high levels of suspended sediment.

6.2 STATUS OF CURRENT ENVIRONMENTAL ASSESSMENTS

The following section lists major environmental assessments that have been completed in the Okanogan subbasin in recent years. This is by no means a comprehensive list. In addition to the assessments conducted by various U.S. agencies, Canadian agencies and watershed planning groups have also completed a number of assessments associated with watershed planning activities in the Canadian portion of the Okanogan subbasin. A comprehensive list of additional U.S. and Canadian assessment resources will be included in the completed *Okanogan Subbasin Plan*.

It is worth noting however, that the bulk of assessments completed to date in the U.S. Okanogan Subbasin have generally been conducted at a relatively course scale. There is a substantial need to develop adequate baseline data throughout much of the Okanogan subbasin. It is anticipated that the Okanogan/Similkameen Baseline Monitoring and Evaluation Program (BPA Project 200302200) will help to address this unmet need [see Chapter 10 for additional discussion].

6.2.1 OKANOGAN SUBBASIN PLAN

In accordance with the Council's subbasin planning directives and timeline an Okanogan Subbasin Plan is currently being developed. The completed subbasin plan will incorporate information from the draft Okanogan/Similkameen Subbasin Summary, from new EDT modeling, and from information gathered as part of Washington State Salmon Recovery Planning requirements, and Canadian information sources.

6.2.2 OKANOGAN/SIMILKAMEEN SUBBASIN SUMMARY

The draft *Okanogan/Similkameen Subbasin Summary* was completed in 2002. This document contains extensive assessment information for the Okanogan subbasin (Talayco 2002). Although the document is somewhat unwieldy due to the sheer quantity of materials and a somewhat challenging organizational structure, there is a great deal of valuable assessment data gathered in the document. Appendices include extensive maps documenting anadromous fish distributions, land use, habitat, and hydrological information for both the U.S. and Canadian portions of the subbasin. As noted above, information contained in the *Okanogan/Similkameen Subbasin Summary* will be updated and incorporated selectively into the *Okanogan Subbasin Plan*.

6.2.3 SALMON AND STEELHEAD HABITAT LIMITING FACTORS ASSESSMENT

The draft *Salmon and Steelhead Habitat Limiting Factors Assessment Watershed Resource Inventory 49: Okanogan Watershed* (Okanogan LFA) was completed in 2002 (Entrix and Golder 2002). The Okanogan LFA provides a summary of the current understanding of habitat conditions in the Okanogan River and its tributaries based on the professional knowledge of a Technical Advisory Group that included a mixture of agency and consulting scientists from both the U.S. and Canada. The Okanogan LFA identified action items for each sub-watershed to address the identified limiting factors. The action items are not prioritized but do provide a good summary of immediate needs in the Okanogan subbasin tributaries.

6.2.4 BIOLOGICAL ASSESSMENT AND MANAGEMENT PLAN: MID COLUMBIA RIVER HATCHERY PROGRAM

As noted in Chapter 5, as part of negotiations for the Mid-Columbia HCPs, a document titled, *Biological Assessment and Management Plan: Mid Columbia River Hatchery Program*, was developed (BAMP) (Bugert 1998). The BAMP presents a plan for operation, and evaluation of anadromous salmonid hatcheries in the Columbia River upstream of the Yakima River confluence. Although the BAMP has not been formally approved, it includes broadly supported genetic, and ecologic assessments of summer/fall Chinook, spring Chinook, sockeye and steelhead.

6.3 OTHER ANADROMOUS FISH IN THE OKANOGAN SUBBASIN

The Okanogan River represents the uppermost tributary of the upper Columbia River currently available to anadromous salmonids. The Okanogan subbasin presently supports runs of summer/fall Chinook salmon, sockeye salmon, and a limited run of summer steelhead.

6.3.1 UPPER COLUMBIA SUMMER STEELHEAD

The summer run steelhead of the Okanogan are considered part of the Upper Columbia Summer Steelhead ESU, and were listed as endangered on August 18, 1997. Although the historical records for steelhead in the Okanogan subbasin are not very complete, Mullan et al. (1992) asserts that few steelhead historically used the Okanogan River. Current habitat conditions in much of the Okanogan subbasin are generally poor to support most life history requirements of steelhead, although the Colville Tribes have committed substantial efforts to restoration of key habitat and to innovative supplementation strategies.

Salmon Creek historically supported self-sustaining steelhead runs, but lack of stream flow currently restricts access in many years. As much as half of the steelhead production in the U.S. portion of the Okanogan subbasin may have been lost to irrigation water withdrawals on Salmon Creek which currently cause severe limits to access (WDFW and WWTIT 1994). In 1955-56, the escapement estimate to the Okanogan was about 50 fish from a total run size of about 97 fish (WDFW 1990). Assuming a 50% loss in production from Salmon Creek since 1916, the average run-size prior to the extensive hydroelectric development in the mid-Columbia River reach, is believed to have been about 200 fish. The estimated total run-size of naturally produced summer steelhead to the Okanogan subbasin declined to between 4 and 34 fish, from 1977 to 1988 (WDFW 1990).

Some evidence suggests that historically steelhead may have also used other tributaries in the Okanogan subbasin (Chapman et al. 1994a). It is also possible that Okanogan subbasin steelhead production could at one time have occurred primarily in Canada, with remnant populations still existing today above Zosel Dam. Fulton (1970) indicates that Omak Creek may have been important to steelhead production. Since the mid-1990s the Colville Tribes have engaged in extensive efforts to restore steelhead in Omak Creek. Actions have included: road decommissioning, riparian planting, removal of fish passage barriers, channel restoration, and construction of fences to reduce impacts caused by livestock. In 2003 the Colville Tribes initiated a local broodstock program on Omak Creek to improve steelhead viability.

A steelhead kelt reconditioning program is also being initiated. In 2004, the Tribes counted over 100 steelhead entering Omak Creek [see Chapter 6 for additional information on projects and programs].

6.3.2 SOCKEYE SALMON

According to WDFW & WWTIT (1994), a "healthy" stock of sockeye salmon continues to use the Okanogan subbasin for spawning and rearing. The Okanogan sockeye are not currently listed under the ESA. Spawning population escapement estimates ranged from 20,202 to 34,679 fish in 1993, depending on the methodology used to calculate spawning population size (Hansen 1993). Sockeye spawning occurs predominantly in the mainstem of the Okanagan River upstream of Osoyoos Lake, with some spawning also taking place in the tributaries of Osoyoos Lake in years with high flows. McIntyre Dam, 12.5 miles upstream of Osoyoos Lake, generally represents the upstream limit of spawning under typical flow years. In years with high flows sockeye may pass the dam. Sockeye have been observed spawning up to Skaha Lake (Entrix and Golder 2002). Spawning may occur as early as September 15, with timing linked closely to water temperatures. In Hansen's study, approximately 58% of the spawning population was male and 42% female. Sockeye in the Okanagan spend either one or two years in freshwater residency before smoltification and seaward outmigration (Hansen 1993).

6.3.3 UPPER COLUMBIA SPRING CHINOOK

The Upper Columbia River Spring Chinook were listed as Endangered on March 24, 1999. The listed

ESU includes all naturally spawned populations of spring Chinook in accessible reaches of Columbia River tributaries between Rock Island and Chief Joseph dams, *excluding* the Okanogan River. Several hatchery populations from the Methow and Wenatchee subbasins where included in the listed ESU. Critical habitat for the listed ESU was designated on February 16, 2000, and included all river reaches accessible to listed spring Chinook in Columbia River tributaries between Rock Island and Chief Joseph dams, *excluding* the Okanogan River (Talayco 2002). Upper Columbia River Spring Chinook are considered extinct from the Okanogan subbasin.

FIGURE 19: 1913 Photo of Dolly Varden (Bull Trout) Caught in Okanogan River

The Upper Columbia River Spring Chinook ESU includes stream-type Chinook salmon spawning above Rock Island Dam in the Wenatchee, Entiat, and Methow rivers. All Chinook salmon in the Okanogan River are now believed to be ocean-type and are considered part of the Upper Columbia River Summer/Fall Chinook ESU (Meyers 1998). Historically, spring Chinook salmon were numerous in the Okanogan subbasin and were harvested by members of the Colville Tribes in the Okanogan River during their May thru October salmon fisheries.

Upper Columbia River Spring Chinook are discussed in greater detail in Chapter 13 [see also Appendix D].

6.4 RESIDENT FISH

Important native resident species in the Okanogan subbasin include mountain whitefish, rainbow trout, and westslope cutthroat trout.

6.4.1 BULL TROUT

The distinct population segment for bull trout, incorporating the entire Columbia River (i.e., upper and lower), was listed as endangered on June 20, 1999. The Okanogan River does not provide suitable habitat for bull trout due to their requirement for very cold, clean waters with clean gravel/cobble substrate for successful spawning and rearing. Bull trout were documented in Salmon and Loup Loup creeks, and are also known to have migrated in the Okanogan River. There is some disagreement as to whether bull trout were once present in the Okanogan River. A 1913 account of local fishing success in *The Chronicle* notes, "some extra nice big Dolly Varden trout that had been caught by Phillip Umbrite in the Okanogan River from the bridge right in the heart of Omak" (V.4, No. 25, November 7, 1913). The same day's paper also notes, "O.E. Bisher was seen leading two fine specimens of the Dolly Varden trout tribe down Main street last Saturday headed for the hotel and the skillet. Bish said they had nabbed a hook baited with beef steak which he had cast carelessly into the Okanogan River."

Bull trout were reported in creel census records from the 1940s and 1950s in the north fork of Salmon Creek (Entrix and Golder 2002). Scott and Crossman (1973) reported that bull trout are not present within the Canadian portions of the Okanogan River system.

Various exotic (non-native) warm water species have also been introduced into the Okanogan subbasin (OWC 2000). These include: largemouth bass, smallmouth bass, black crappie, bluegill, yellow perch, pumpkinseed sunfish, black bullhead, tench, common carp, and walleye.

6.5 OKANOGAN SUBBASIN COORDINATED PLANNING ACTIVITIES

There are a host of coordinated salmon and steelhead recovery activities currently underway in the Okanogan subbasin. Following is an abbreviated account of activities with the greatest relevancy to the CJDHP. For a more complete list of planning activities targeted to fish, wildlife and the larger ecosystem of the Okanogan subbasin (both U.S. and Canada) readers are encouraged to refer to the draft *Okanogan Subbasin Plan*.

6.5.1 OKANOGAN SUBBASIN PLANNING

As noted earlier, in accordance with the Council's subbasin planning directives and timeline a subbasin plan is being developed for the Okanogan subbasin. The Colville Tribes and Okanogan County lead the subbasin planning effort in the Okanogan subbasin. The Colville Tribes are coordinating the development of the assessment and inventory and final management plan, while Okanogan County is coordinating the public outreach and communication. In addition to an updated assessment, planners have updated the subbasin inventory of projects and programs and are developing an Okanogan subbasin management plan. Subbasin planners in the Okanogan subbasin coordinated their product with other planning activities in the subbasin, particularly Washington State's Salmon Recovery planning requirements. Okanogan subbasin planners have also made extensive efforts to coordinate with key management agencies, First Nations, and citizens groups in the Canadian portion of the subbasin.

Subbasin planners in the Okanogan subbasin reviewed the need for, and components of, the CJDHP in the context of: historical and current conditions, known limiting factors, inventory of programs and projects, and the Okanogan subbasin vision. The CJDHP is an important tool (i.e. identified strategy) for meeting the biological objectives identified in the Okanogan Subbasin management plan and is consistent with the strategies identified in the plan.

6.5.2 UPPER COLUMBIA SALMON RECOVERY BOARD

The Upper Columbia Salmon Recovery Board (UCSRB) is a standing committee of the North Central Washington Resource Conservation and Development Council. The UCSRB Board of Directors includes elected officials or designates from Chelan, Douglas, and Okanogan Counties, the Colville Tribes and the Yakama Nation. The UCSRB coordinates and oversees regional recovery planning for salmon. The UCSRB is guiding development of a draft Upper Columbia salmon recovery plan as part of the State of Washington's statewide salmon recovery planning efforts. The draft plan is slated for completion in December of 2004 with a final plan to be completed by June of 2005. The UCSRB's efforts are being integrated with subbasin planning activities in the Okanogan subbasin. As noted previously, the completed *Okanogan Subbasin Plan* will also include elements necessary for a Washington State Salmon Recovery Plan.

6.5.3 OKANOGAN SUBBASIN LEAD ENTITY STRATEGY

The Colville Tribes and Okanogan County have been co-leads for the 'Okanogan County Lead Entity Strategy' since 1999. The primary purpose of the Okanogan County Lead Entity is to provide guidance regarding the development of habitat protection and restoration projects. These efforts focus primarily on the Salmon Recovery Funding Board's grant process, and Okanogan County's related contractual work with the WDFW. Each designated Lead Entity maintains a separate Citizen Committee and conducts a project prioritization process. During the last three years the Upper Columbia Lead Entities have coordinated salmon recovery efforts in the Upper Columbia by submitting an integrated regional project list. This level of cooperation and coordination is indicative of the shared commitment to salmon recovery in the subbasin – as well as of some broadly shared agreement regarding prioritization of actions to achieve recovery goals. The CJDHP is consistent with, and would complement, the types of habitat restoration priorities articulated through the Okanogan County Lead Entity strategy.

6.5.4 UPPER COLUMBIA REGIONAL TECHNICAL TEAM

The Regional Technical Team's (RTT) membership includes a broad range of technical experts from the Okanogan subbasin and the Columbia Basin at large. To support salmon recovery planning efforts, the RTT developed an *Upper Columbia Biological Strategy* specifically to provide guidance to the Washington State Salmon Recovery Funding Board process. The RTT's *Upper Columbia Biological Strategy* has also been adopted as a tool to help guide subbasin planning work in the region. Technical guidance developed by the RTT was taken into consideration in the development of the summer/fall Chinook HGMP that is foundational to the CJDHP. The RTT has also provided substantial input in the development of the Okanogan Subbasin Plan.

6.5.5 UPPER COLUMBIA RIVER REGIONAL FISHERIES ENHANCEMENT GROUP

While not explicitly a planning body, the Upper Columbia River Regional Fisheries Enhancement Group (UCRFEG) has supported planning efforts and implementation of those plans through facilitation of community stewardship of fish and fish habitats in the upper Columbia region, including the Okanogan subbasin. The group coordinates delivery of state salmon recovery funding for local community projects and has facilitated Transboundary community demonstration projects. The UCRFEG provides a liaison between legislators, planning agencies, technicians, fish biologists and landowners in the Okanogan subbasin. The success of the CJDHP in restoring naturally-spawning summer/fall Chinook populations in the Okanogan is in part dependent on the cooperation and support of landowners and citizens in the Okanogan subbasin. The UCRFEG is an important tool for educating the Okanogan subbasin populace about the importance and means of achieving improved habitat conditions throughout the subbasin – and to implementing on the ground projects that address identified limiting factors.

6.5.6 TRANSBOUNDARY COORDINATION

6.5.6.1 Canadian Okanagan Subbasin Technical Working Group

The Canadian Okanagan Subbasin Technical Working Group (COBTWG) is a working group addressing technical issues associated with management of salmon and resident fish stocks and their habitat requirements in the Canadian portions of the Okanagan subbasin. COBTWG participants include Fisheries and Oceans Canada (federal), Okanagan Nation Alliance Fisheries Program (Okanagan First Nations), and the B.C. Ministry of Water, Land, and Air Protection (provincial). The COBTWG has provided some input in the development of the Okanogan Subbasin Plan. Coordination of planning activities among technical groups on the U.S. side of the border, the Colville Tribes, and the COBTWG is ongoing.

6.5.6.2 Okanagan Nation Alliance and the Colville Confederated Tribes

In March of 2001, the Okanagan Nation Alliance entered into a Letter of Understanding with the Colville Tribes committing to work together in implementing ecosystem-based management principles to recover sockeye, Chinook and steelhead in the Okanogan subbasin. The Okanagan Nation Alliance leads a Transboundary effort to restore Okanogan subbasin salmon ecosystems and in particular, the historical Okanagan Nation salmon fisheries. A specific focus of the Okanagan Nation Alliance's efforts is restoration of Okanagan sockeye to their former range in the upper Okanogan subbasin.

Both the Colville Tribes and Okanagan Nation Alliance recognize that habitat improvements and passage improvements for sockeye, steelhead or Chinook salmon will have overlapping benefits for all species. In addition, both the Colville Tribes and Okanagan Nation Alliance agree that salmon don't recognize international borders, and that conservation and restoration measures must be implemented regardless of political borders. The focus of the CJDHP on addressing historical - and historic - inequities in mitigation for Upper Columbia salmon losses, along with the CJDHP's emphasis on implementing actions within a larger ecosystem framework, is consistent with the focus of the joint Transboundary efforts of the Colville Tribes and Okanagan Nation Alliance.

6.6 CURRENT AND PLANNED MANAGEMENT ACTIVITIES

The following section includes an abbreviated overview of current and planned management activities that would specifically affect operation of the CJDHP, or activities that would be affected by the proposed program. A more comprehensive list of management activities in the Okanogan subbasin is presented in the draft *Okanogan Subbasin Plan*.

6.6.1 MID-COLUMBIA PLANS

6.6.1.1 Mid-Columbia Habitat Conservation Plans

Aside from artificial production associated with the Grand Coulee Dam Mitigation Agreement, artificial production in the Okanogan subbasin has historically been driven by mitigation agreements among the Douglas, Chelan, and Grant County PUDs. Chelan County PUD provides funding for Eastbank Hatchery and Similkameen Pond, and Douglas County Public Utility District operates Wells Dam and Wells Hatchery.

At present, the Mid-Columbia Habitat Conservation Plans (HCPs) for anadromous salmon and steelhead have been signed by NOAA Fisheries, USFWS, WDFW, the Colville Tribes and Douglas and Chelan PUDs; and undergone regulatory review by NOAA Fisheries. In November 2003, the plans were submitted to the Federal Energy Regulatory Commission for review. The FERC will decide how to amend the Mid-Columbia PUD project licenses based on the HCPs.

The Chelan and Douglas PUDs worked with various state and federal fisheries agencies, including NOAA Fisheries, USFWS, WDFW, three tribes and American Rivers, to develop the HCPs. Chelan PUD developed plans for the Rocky Reach and Rock Island hydroelectric projects. Douglas PUD developed a HCP for the Wells hydroelectric project.

The HCPs commit the two utilities to a 50-year program to ensure that their hydroelectric projects have no net impact on mid-Columbia salmon and steelhead runs. These goals are to be accomplished through a combination of fish bypass systems, spill at the hydro projects, off-site hatchery programs and evaluations, and habitat restoration work conducted in mid-Columbia tributary streams. In addition to meeting the ESA, the plans are also intended to satisfy the projects' obligations under the Federal Power Act, the Fish and Wildlife Coordination Act, the Essential Fish Habitat provisions of the Magnuson-Stevens Fishery Conservation and Management Act, the Pacific Northwest Electric Power Planning and Conservation Act and Title 77 RCW of the State of Washington, and to obligate the parties to work together to address water quality issues.

6.6.1.2 Biological Assessment and Management Plan

A comprehensive ESU-wide plan for the propagation of Upper Columbia River summer/fall Chinook does not currently exist. As referenced earlier, the Mid-Columbia HCP process included development of the BAMP, which once approved would provide some ESU-wide coordination. The BAMP outlines a phased approach to increasing artificial production of summer/fall Chinook in the mid-Columbia region (upstream from the Yakima River) to make progress toward a "no net impact" objective for operations of the Mid-Columbia PUDs. The document includes identification of production increases intended to be consistent with conservation of low-risk, natural populations and recovery of listed species. The BAMP approach relies on phased production in order to minimize negative effects of collecting broodstocks on natural populations and to allow for possible adaptation of the program based on monitoring outcomes. At this time the BAMP has not been formerly approved.

The proposed CJDHP includes several deviations from the BAMP, which are outlined in detail in the summer/fall Chinook [see SF HGMP, p. 35 for additional detail].

6.6.2 COLVILLE TRIBES

The Colville Tribes are currently developing a tribal anadromous fish management plan. The draft plan includes the following goals and objectives:

- Enhance and restore all anadromous salmonid species and stocks under the management authority of the Colville Tribes – to historical levels if possible, but at least to fishable levels;
- Facilitate regulated fisheries on relatively abundant hatchery stocks of anadromous salmon and steelhead, while protecting weak stocks;
- Facilitate the pursuit by Tribal members of their rightful ceremonial and subsistence fisheries;
- Ensure that anadromous fisheries will operate in concert with the recovery of endangered upper Columbia River steelhead and upper Columbia River spring Chinook;
- Provide for complimentary recreational fisheries in the Okanogan, Methow, and Columbia rivers, when feasible, i.e., at larger runs sizes;

- Ensure spawning escapement sufficient to allow natural populations of anadromous salmonids, including stocks targeted for fisheries as well as ESA-listed anadromous salmonid species, to rebuild;
- Develop plans and methodologies for selective harvest of specific stocks of anadromous salmonids – to facilitate conservation and rebuilding of depleted stocks;
- Integrate conservation enforcement with fish restoration measures and fishery development;
- Develop plans and methodologies to restore anadromous species that are currently depleted or extirpated (i.e., sockeye and coho salmon) to areas under the Colville Tribes' jurisdiction, and that are accessible to anadromous fish;
- Evaluate the feasibility of strategies and methodologies to restore anadromous species and stocks that are currently extirpated in the Upper Columbia Blocked Area's which fall under Colville Tribes jurisdiction;
- Incorporate public education and outreach activities into anadromous fishery management planning;
- Integrate individual anadromous salmonid species management plans (i.e., Chinook salmon, coho salmon, sockeye salmon, and steelhead) into an overall integrated framework;
- Integrate individual anadromous salmonid species management plans with resident fish management plans (i.e., sturgeon, trout, bass, catfish and walleye) within an overall integrated framework;
- Coordinate anadromous fishery management with ESA processes, i.e., Hydropower Biological Assessments/Biological Opinions, Harvest Biological Assessments/Biological Opinions, HGMPs, Habitat Conservation Plans, and Fish Recovery Plans;
- Coordinate anadromous fishery management with BPA-funded enhancement & mitigation, the Council's Fish and Wildlife Program and regional ecosystem management processes (i.e., Provincial Review and Subbasin Planning); and
- Coordinate anadromous fish restoration efforts from various funding sources (i.e., NOAA Fisheries, USFWS, Bureau of Reclamation, BPA, Bureau of Indian Affairs, Congressional Appropriations, the Pacific Coastal Salmon Recovery Fund, and other grant sources) into a comprehensive Master Plan that links the various efforts.


Alison Squier

FIGURE 20: Photo Colville Fish and Wildlife Staff Moving Temporary Fish Trap in Omak Creek

Central to the Colville Tribes' anadromous fish management plan is the restoration of natural spawning populations of summer/fall and spring Chinook, sockeye salmon, and steelhead to their historical habitat throughout the traditional lands of the Colville Tribes.

The Colville Tribes intend to restore spring Chinook runs to the base of Chief Joseph Dam for harvest purposes and into the Okanogan River subbasin to reintroduce extirpated runs. [Details of the Colville Tribes' proposed spring Chinook programs are presented in Chapter 13, and in Appendix D.]

The Colville Tribes are also investigating the feasibility of restoring runs of summer/fall Chinook above Chief Joseph Dam. A spawning habitat survey has been completed for upper Rufus Woods Lake. A reconnaissance study of adult and juvenile fish passage options at Chief Joseph Dam has also been completed (COE 2002). Pending implementation of the CJDHP, and once anticipated increased runs of summer/fall Chinook have been achieved, the Colville Tribes may elect to collect and pass some of those fish above the Dam as part of an experiment to test the feasibility of adult spawning in the Lake and passage around Chief

Joseph Dam. The live-capture gear and methodologies developed as part of the CJDHP broodstock collection program, and the hatchery's adult collection facilities, may provide valuable cost-effective means to pass fish over the Chief Joseph Dam. The Colville Tribes plan to explore a range of cost-effective options [see SF HGMP, p. 40].

The Colville Tribes currently manage a ceremonial and subsistence fishery in the tailrace immediately below Chief Joseph Dam. The fishery uses hook-and-line gear to snag Upper Columbia River summer/fall Chinook. Historically the fishery began on July 1 and ended no later than September 30. The fishery is designed to harvest summer/fall Chinook in excess of the current escapement objective of 3,500 fish. Incidental harvest of steelhead is restricted under regulation of the ESA. In 2001, steelhead mortality was limited to 200 fish. Starting in 2002, the fishery was extended through October 31, and was physically extended downriver 12 miles to the confluence of the Okanogan River. Mortality of both hatchery-origin and natural-origin steelhead is specified as a percentage of the run over Wells Dam (CCT 2002). As noted previously, because the tailrace fishery is located in a terminal site and uses hook-and-line gear, it has very limited capacity to harvest large numbers of Chinook surplus to escapement needs.

6.6.3 YAKAMA NATION

The Yakama Nation plans to re-introduce naturally-spawning coho salmon in the Methow subbasin, and has identified an interest in eventually expanding this re-introduction into the Okanogan subbasin. Their plan is to implement these coho restoration activities in phases. The first phase, which is described in the Mid-Columbia coho HGMP identified two goals: 1) continue existing studies and initiate new ones to determine whether a brood stock can be developed from Lower Columbia River coho stocks whose progeny can survive in increasing numbers to return as adults to the mid-Columbia region; and 2) initiate natural reproduction in areas of low risk to sensitive species. Results of these studies will guide future decisions regarding re-introduction of coho into the Methow subbasin and any other expansion of the program.

If these proposals are implemented the co-managers in the Columbia Cascade Province will need to coordinate closely to minimize deleterious effects or interactions from the coho or summer/fall Chinook artificial production programs. Information gleaned from the monitoring and evaluation programs associated with the CJDHP and the proposed coho re-introduction program, in addition to the Okanogan Baseline monitoring and evaluation program will be essential to making decisions about whether, and how, to proceed with artificial production programs in the upper Columbia. In addition, the results of basinwide review efforts on artificial production and supplementation will need to be considered carefully.

6.6.4 WASHINGTON DEPARTMENT OF FISH AND WILDLIFE

The WDFW, as the state agency with legislated authority for management of fish in Washington, and as the lead agency in the summer Chinook salmon run-size enhancement program funded by Chelan County PUD and Douglas County PUD, operates the Similkameen Pond summer/fall Chinook program, traps summer/fall Chinook broodstock at Wells Dam, and operates the Eastbank Hatchery.

The WDFW is an active participant in salmon recovery and subbasin planning activities in the Okanogan subbasin, including coordination and implementation of regional monitoring and evaluation programs. The WDFW is responsible for the administration of State statutes directed towards the protection of fish and wildlife habitats and is also a party to the *U.S. v Oregon* agreements.

The recreational fishery in the upper Columbia and Okanogan rivers is managed by WDFW. Recreational fisheries for summer/fall Chinook in the Okanogan and upper Columbia rivers are opened when forecasted runs of summer Chinook indicate a significant surplus to broodstock and escapement needs. A surplus is calculated as the anticipated run at Priest Rapids Dam less 5,750 fish required for broodstock at hatchery programs upstream of the Dam, less 2.5% of the Priest Rapids count for lower-river recreational fisheries, less 5% harvest by the Wanapum Tribe, less an allocation for natural escapement in the Wenatchee, Methow, Similkameen, Okanogan, Entiat, and Chelan rivers. As escapement goals for each of these rivers has not yet been established, WDFW has conservatively used the sum of the maximum annual escapements to each river for 1996-2000, about 11,000 fish at Priest Rapids Dam as the trigger to open recreational fisheries.

6.6.5 OKANAGAN NATION ALLIANCE

The Okanagan Nation Alliance (ONA) is the Tribal Council representing the Okanagan Nation. The Okanagan Nation's traditional homelands cover a large area of the southern interior of British Columbia and Northern Washington. The ONA is comprised of the following Indian Band Reserves: Upper Nicola, Okanagan, Westbank, Tsinstikeptum, Penticton, Osoyoos, Upper Similkameen, and Lower Similkameen.

The Okanagan River flows from Canada and summer/fall Chinook salmon still migrate through Osoyoos Lake to spawn and rear in Canadian waters. As noted previously, the ONA and the Colville Tribes have agreed to collaborate on recovery of fish and wildlife in the Transboundary Okanagan subbasin. The ONA is now working through Canada's Species At Risk Act (SARA) to seek a listing and develop recovery plans for Chinook salmon in the Canadian portions of the Okanagan River. It is worth noting a key difference between the Canadian SARA and the U.S. ESA. Under SARA work does not stop at protecting and restoring endangered species – an objective under SARA is also reinstatement of extirpated species to historical habitat.

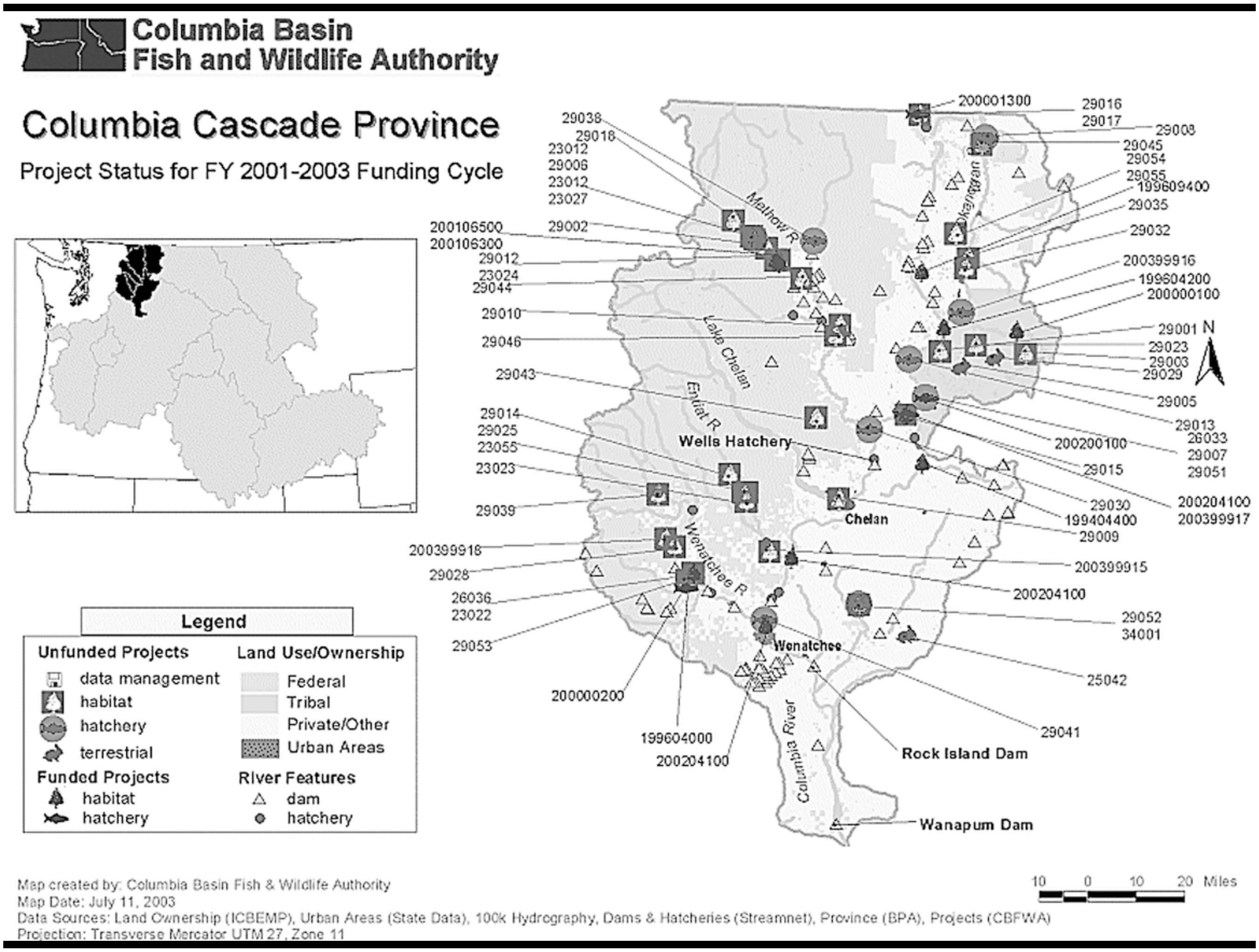
The CJDHP and its underlying summer/fall Chinook HGMP (and possibly spring Chinook HGMP) may need to be expanded in the future to reflect any artificial production plans that arise from Canadian recovery efforts related to summer/fall Chinook. This could include additions in production, changes in release sites of existing production, or further refinement of harvest management guidelines to protect fish arising from Canadian waters. The Colville Tribes' have used BPA funding to study passage at Enloe Dam (see next section) and the ONA and the Colville Tribes have agreed to work toward a regional resolution to fish passage issues at Enloe Dam and to working with the Upper and Lower Similkameen Indian Bands to protect related fishing rights and interests.

Significant numbers of sockeye currently spawn in the Canadian portion of Okanagan River (35,000 - 45,000 in 2000 and 2001). After successfully migrating over 9 mainstem Columbia River dams sockeye migration is terminated at McIntyre Dam. The barrier at McIntyre Dam could easily be bypassed or laddered, which would allow sockeye to access an additional 6.8 miles of their historical range. The Colville Tribes implemented a BPA funded project to evaluate an experimental re-introduction of sockeye salmon into Skaha Lake and Canadian fisheries authorities have indicated that passage of sockeye past McIntyre Dam is acceptable. Cooperative efforts to develop necessary passage facilities at McIntyre Dam are currently ongoing.

6.7 RELEVANT RECENT AND ONGOING PROJECTS AND PROGRAMS

The follow section summarizes key projects or programs enacted in recent years to address salmon and steelhead conservation and restoration in the Okanogan basin. The Okanogan Subbasin Plan includes a far more comprehensive list of fish and wildlife projects and programs, including an extensive list of projects that have been implemented in the Canadian portion of the subbasin.

Although funding for restoration and conservation projects in the Cascade Columbia, including the Okanogan subbasin, has been very limited for many years, the Colville Tribes, federal and state agencies, Okanogan County, and citizen groups have worked aggressively to develop and identify funds to implement a variety of restoration and conservation programs. Sources of funding for recovery and restoration projects in the Okanogan subbasin have come from BPA, Pacific Coastal Salmon Recovery Funds (both as direct awards to the Colville Tribes and via the Washington State administered funds), Bureau of Indian Affairs, National Fish and Wildlife Foundation, Washington Department of Natural Resources, through the Canadian Forest Renewal B.C. program, and through a wide variety of federal and state grant programs.



Source: Columbia Basin Fish and Wildlife Authority: http://www.cbfwa.org/

FIGURE 21: BPA Funded Fish and Wildlife Projects in the Columbia Cascade Province, FY 2001-2003 Funding Cycle

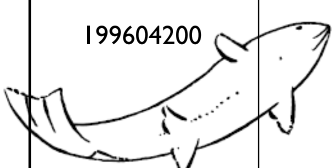
NOAA Fisheries has recently developed performance metrics to more effectively track progress of salmon recovery activities implemented through the Pacific Coastal Salmon Recovery Fund program. This performance metrics sorts conservation and recovery projects into five broad categories: habitat protection and enhancement; salmon enhancement; watershed planning and coordination; public education; and research, monitoring and evaluation. The list of relevant projects presented in Tables 4 through 8 is organized in those five categories. In addition, a visual summary of the fiscal year 2001-2003 BPA funded projects implemented in the Columbia Cascade Province is provided in Figure 21.

6.7.1 HABITAT PROTECTION AND RESTORATION

Recent habitat protection and restoration activities in the Okanogan subbasin have included: protection and restoration of land along key tributaries and mainstem reaches, restoration of stream channels, restoration of riparian habitat, fencing programs, screening projects, and removal of passage blockages. Habitat restoration in the Okanogan subbasin to date has been focused primarily on Salmon and Omak creeks, and on discreet reaches of the Okanogan mainstem. In particular, the systematic restoration efforts in Omak Creek have resulted in significantly increased canopy cover, improved steam function in the lower reaches of the Creek, and elimination of sources of sediment loading. Actions are currently underway to improve passage at Mission Falls on Omak Creek. The Colville Tribes plan on beginning similar restoration efforts on either Antoine or Loop Loop Creek in the near future. These combined habitat protection and restoration activities, and future work, will be vital to the success of the CJDHP.

Table 4: Partial List Okanogan Subbasin Habitat Recovery and Restoration Projects

PROJECT NUMBER	FUNDING SOURCE	PROJECT DESCRIPTION AND BENEFITS DERIVED FROM PROJECT
200000100	BPA	Redesign channel in lower Omak Creek to address erosion and lateral migration of the channel. Benefit: improved rearing and spawning habitat for summer steelhead and Chinook salmon.
00-1683-D	SRFB	Point bar and log weir construction on mainstem Omak Creek to divert flow from exposed banks. Benefit: improved rearing and spawning habitat for summer steelhead and Chinook salmon.
CCT02-2	PCSRF	Habitat acquisition on lower Omak Creek to restore and protect important riparian habitat. Benefit: improved rearing and spawning habitat for summer steelhead and Chinook salmon.
CCT02-4	PCSRF	Omak Creek summer steelhead habitat passage project to remove barrier to passage at Mission Falls and replace collapsing culverts on road crossing upstream from Mission Falls. Benefit: restore access for summer steelhead and protect Creek from massive sediment load dump if culverts collapse.
NA	BIA	Riparian restoration and stream bank stabilization along Omak Creek (mitigation for fire retardant spill in Omak Creek). Benefit: improved rearing and spawning habitat for summer steelhead and Chinook salmon.
CCT01-1	PCSRF	Omak Creek groundwater supplementation feasibility study to determine if well water could be used to effectively increase flows and decrease water temperatures on a portion of lower Omak Creek. Goal was to address elevated stream temperatures, although feasibility study indicated well flows were not adequate to achieve desired results.
198347700	BPA	Study passage related issues at Enloe Dam and identify potential of salmonid habitat above the dam. Benefit: open additional habitat for sockeye salmon.
199604200	BPA	Conduct ongoing restoration work in Salmon Creek to restore habitat and open access to important habitat through restoration of water flows, current efforts involve completion of EIS. Benefit: restore important habitat for spring Chinook salmon and summer steelhead.



6.7.2 SALMON ENHANCEMENT

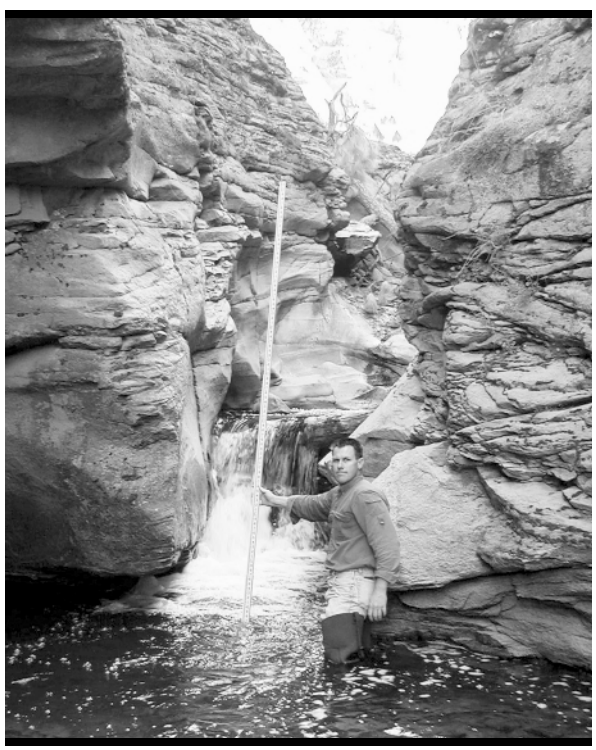
In addition to the WDFW run summer/fall Chinook artificial production program currently implemented at Similkameen Pond, the Colville Tribes have initiated a number of programs designed to restore naturally-spawning populations of salmon and steelhead to the Okanogan subbasin. The programs described in the CJDHP will complement these existing programs [see Chapter 9; and the SF HGMP, pp. 28-34, and 40-43, for additional discussion of potential ecological interactions of CJDHP with other species].

Table 5: Partial List Okanogan Subbasin Salmon Enhancement Projects

PROJECT NUMBER	FUNDING SOURCE	PROJECT DESCRIPTION AND BENEFITS DERIVED FROM PROJECT
200001300	BPA	Evaluate an experimental re-introduction of sockeye salmon into Skaha Lake. Benefit: restore sockeye habitat.
CCT01-2	PCSRF	Conduct steelhead kelt reconditioning feasibility study. Benefit: increase natural-origin summer steelhead populations.
CCT01-4	PCSRF	Construct St. Mary's Mission (Omak Creek) acclimation pond. Benefit: improve distribution of natural-origin spring Chinook salmon.
CCT01-5 and CCT03-2	PCSRF	Develop local Okanogan River locally adapted summer steelhead broodstock – Phase 1 and Phase 2. Benefit: increase natural-origin summer steelhead populations.
CCT02-3	PCSRF	Modify OTID irrigation settling pond to make it suitable for rearing Okanogan summer Chinook – Bonaparte Acclimation Pond. Benefit: improve distribution of natural-origin summer/fall Chinook salmon.

6.7.3 WATERSHED PLANNING AND COORDINATION

There are numerous efforts to more effectively coordinate and prioritize conservation and recovery activities in the Okanogan subbasin, the Columbia Cascade Province, and the Columbia River Basin. Effective coordination and information sharing are crucial to assuring sustainability of salmon and steelhead populations. In the Okanogan subbasin many of these planning and coordination activities involve participation of scientists, as well as local governments and citizens. An important benefit of coordinated planning is the ability to identify cost-share opportunities and alternative sources of project funding. An additional important benefit is more effective prioritization of activities and fund allocations. The existing watershed plans and ongoing coordination between agencies, tribes and citizens is utterly essential to successful implementation of the CJDHP.



Alison Squier

FIGURE 22: Photo Mission Falls on Omak Creek

Table 6: Partial List Okanogan Subbasin Watershed Planning Projects

PROJECT NUMBER	FUNDING SOURCE	PROJECT DESCRIPTION AND BENEFITS DERIVED FROM PROJECT
NA	BPA	Okanogan Subbasin Planning. Benefit: prioritized objectives and strategies for salmon recovery in Okanogan subbasin
199604200	BPA	Watershed coordination in Okanogan subbasin including collection of data necessary to recovery of anadromous fish. Benefit: more effective salmon and steelhead recovery and enhancement efforts.
CCT01-3, CCT02-6, and CCT03-4	PCSRF	Upper Columbia Basin salmon recovery planning and coordination. Funds allow for participation of Colville Tribes in watershed planning activities, Upper Columbia Salmon Recovery Board, TRT, RTT, and numerous other salmon recovery and planning forums and technical groups. Funding is also used in development of the Colville Tribes' anadromous fish restoration plan. Benefit: more effective salmon and steelhead recovery and enhancement efforts.

6.7.4 PUBLIC EDUCATION

Public education and outreach activities are often identified as high priorities in forums and workshops convened around salmon recovery, yet these programs are fairly consistently cut from budgets when funding is tight. Public education and outreach is crucial to forging successful partnerships to recover and assure the sustainability of salmon and steelhead throughout the Columbia River basin.

When the Colville Tribes presented the CJDHP proposal to local stakeholder groups, some commented on the importance of including public educational facilities at the Chief Joseph Dam Hatchery site. Although educational and outreach efforts are sometimes viewed as providing somewhat intangible benefits, the Colville Tribes is committed to developing educational opportunities and partnerships wherever possible.

Table 7: Partial List Okanogan Subbasin Public Education Projects

PROJECT NUMBER	FUNDING SOURCE	PROJECT DESCRIPTION AND BENEFITS DERIVED FROM PROJECT
CCT01-3a	PSCRF	Salmon recovery education and outreach to develop displays and educational materials for use in schools, at public meetings, festivals and fairs, etc. Benefit: more effective salmon and steelhead recovery and enhancement efforts.
NA	NA	Okanogan River Salmon Festivals – this weeklong event was coordinated for the first time by the UCRFEG in 2002, and then again in 2003. The event consisted of a series of traveling festivals coordinated to follow the upstream migration of salmon to their home waters in the Okanogan subbasin. Events were held in communities along the Okanogan River each weekend moving upstream along with the returning salmon. Benefit: more effective salmon and steelhead recovery and enhancement efforts.

6.7.5 RESEARCH, MONITORING AND EVALUATION

One of the fundamental needs in the Okanogan subbasin is comprehensive baseline data. In late 2004, BPA agreed to fund project 200399916 to initiate an Okanogan/Similkameen Baseline monitoring and evaluation project. This project, in coordination with many project specific, as well as larger regional, monitoring and evaluation programs, will begin to address the data and information voids that exist in the Okanogan subbasin. Successful implementation and adaptation of the CJDHP are dependent on coordinated and effective monitoring and evaluation programs [see Chapter 10, and Appendix H for additional discussion of CJDHP specific, and other regional monitoring and evaluation activities].

Table 8: Partial List Okanogan Subbasin Research, Monitoring and Evaluation Projects

PROJECT NUMBER	FUNDING SOURCE	PROJECT DESCRIPTION AND BENEFITS DERIVED FROM PROJECT
200399916	BPA	Okanogan/Similkameen Baseline monitoring and evaluation program. Benefit: increase knowledge about existing conditions and improve ability to adapt recovery and harvest programs to restore naturally-spawning populations of salmon and steelhead.
CCT02-5 and CCT03-3	PCSRF	Conduct monitoring and evaluation of project measures associated with recovery and restoration of Chinook and steelhead in Omak Creek. Benefit: increase knowledge about existing conditions and improve ability to adapt recovery and harvest programs to restore naturally-spawning populations of salmon and steelhead.

7.
Regional Context

Chief Joseph Dam Hatchery Program
MASTER PLAN

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Regional Context

7.1 OUT-OF-SUBBASIN CONSIDERATIONS

The important role that the six federal and five PUD downstream hydroelectric projects play in limiting the viability of Upper Columbia River summer/fall Chinook populations cannot be overstated. Although, as noted earlier, fish mortalities through the Columbia River dams have decreased in recent years, the toll the dams take on the Okanogan subbasin's summer/fall Chinook populations is still the greatest limiting factor for this population. Actions to improve juvenile and adult salmon survival through the Columbia River hydroelectric projects are critical to the long-term viability of natural-origin summer/fall Chinook populations and to the success of the CJDHP.

The effect of ocean and lower-river harvest, on the number of fish returning to the Okanogan subbasin is also a considerable factor in the sustainability of naturally-spawning populations. As noted earlier, the outcome of ongoing *U.S. v Oregon* negotiations will potentially have a significant impact on the benefits of the CJDHP.

Favorable ocean conditions in the recent years have also underscored the significance that ocean habitat plays in the life cycle of salmonids. In addition, global warming, human population growth, as well as political and economic priorities, are inescapable factors to the success of conservation and recovery efforts. While the CJDHP cannot possibly address these out-of-subbasin considerations directly, they are at least acknowledged implicitly in the thinking underlying the program design.

7.2 CURRENT AND PLANNED REGIONAL MANAGEMENT ACTIVITIES

A number of regional (i.e. Columbia River Basin scale) management activities have potential significant impacts on the implementation of the CJDHP. Management decisions and actions at the basinwide scale related to harvest, habitat, hydropower and hatcheries all obviously would have varying impacts on the proposed CJDHP and vice versa. Federal Columbia River Power System operations including decisions related to spill, flow, flood control, Upper Columbia Alternative Flood Control (VARQ), etc. all will influence the potential benefits of the CJDHP. In addition, management activities in the Columbia River estuary, management of predators throughout the length of the mainstem and into the estuary, management of mainstem habitat, and management of other hatchery programs in the Columbia Basin will also affect the CJDHP. Following is a very brief accounting of a handful of specific management activities that must be taken into account in relationship to planning and implementation of the CJDHP.

7.2.1 COUNCIL'S FISH AND WILDLIFE PROGRAM AND ARTIFICIAL PRODUCTION REVIEW

The regional management framework and scientific principles articulated through the Council's 2000 Fish and Wildlife Program have provided significant guidance and context for the development of the CJDHP. This Master Plan is developed specifically to meet those programmatic guidelines and is attuned with the larger basinwide recovery and restoration context outlined in the Council's Program.

More specifically, the Council's Artificial Production Review (APR) (NPPC 1999) identifies necessary reforms of artificial production programs throughout the Columbia Basin. The APR includes 10 policies to guide the use of artificial production. This Master Plan, and the summer/fall Chinook HGMP (and spring Chinook HGMP) which form the backbone of the CJDHP, include a comprehensive set of performance standards and their associated performance indicators which are consistent with the guidelines developed through the APR; and with the spirit of reforms suggested in the APR.

7.2.2 ESA AND BIOLOGICAL OPINION

The ESA status of anadromous fish in the Okanogan subbasin has been discussed in previous Chapters of this document. The CJDHP is largely based on the summer/fall (and spring) Chinook HGMPs. The HGMPs are designed to address ESA requirements and include specific discussion of potential ecological interactions and possible take of ESA listed species. Both of these HGMPs are currently in the three-phase NOAA Fisheries review process.

National Wildlife Federation et al. v National Marine Fisheries Service et al. challenged the NOAA Fisheries 2000 Biological Opinion (BiOp) on operation of the Federal Columbia River Power System for salmon and steelhead. In June 2003, Judge Redden remanded the 2000 BiOp to NOAA Fisheries to resolve several deficiencies including: reliance on federal mitigation actions that have not undergone section 7 consultation under the Endangered Species Act; and reliance on range-wide off-site non-federal mitigation actions that are not reasonably certain to occur. In a subsequent "minute order," the Judge denied plaintiffs' motion to vacate the BiOp and stated that it will remain in place as deficiencies are addressed.

NOAA Fisheries is currently engaged in collaboration with state and tribal entities on scientific and analytical issues relevant to the remand process for revising the 2000 BiOp. Because this process is ongoing, NOAA Fisheries has at present deferred making decisions about revisions to the BiOp until these collaborative efforts are complete. Ultimately, the result of these negotiations will have direct and indirect results. In addition, the decision recently announced by the Bush Administration regarding how to consider hatchery fish relative to wild fish may have enormous implications for salmon recovery programs throughout the Columbia River Basin.

7.2.3 *U.S. V OREGON*

U.S. v Oregon, legally upheld the Columbia River treaty tribes' reserved fishing rights. Specifically the decision acknowledged the treaty tribes reserved rights to fish at "all usual and accustomed" places whether on or off the reservation, and were also entitled to a "fair and equitable share" of the resource. *U.S. v Oregon* is tied closely to *U.S. v Washington*, which among other things defined "fair and equitable share" as 50% of all the harvestable fish destined for the tribes' traditional fishing places, and established the tribes as co-managers of the resource.

In 1988, under the authority of *U.S. v Oregon*, the states of Washington, Oregon and Idaho, federal fishery agencies, and the treaty tribes agreed to the Columbia River Fish Management Plan (CRFMP), which defined detailed harvest and fish production processes. This Plan expired in 1998, and is currently being renegotiated.

The Colville Tribes were not a party to the *U.S. v Oregon* agreement. The upper Columbia River fisheries nevertheless, are significantly impacted by harvest levels agreed to in *U.S. v Oregon*. The Colville Tribes have proposed that some core principles be considered in the current negotiations of *U.S. v Oregon*. These principles are important to assuring the sustainability of naturally-spawning populations of salmon and steelhead in the Okanogan subbasin and are crucial to the implementation of the CJDHP. The Colville Tribes' recommended principles state:

- Lower river (Zones 1-6) and ocean harvest of salmon and steelhead stocks arising from the Okanogan River and Columbia River below Chief Joseph Dam, the Colville Tribes' traditional fishing areas, must allow sufficient fish to return to provide the Colville Tribes with a stable, equitable, and sufficient ceremonial and subsistence fishery. Sufficient fish should also be allowed through lower river fisheries to provide for an Okanogan recreational fishery in co-managed waters.
- Lower river and ocean harvest of salmon and steelhead stocks arising from waters in the Colville Tribes' remaining fishing areas must allow sufficient escapement to meet objectives for naturally-spawning populations and hatchery broodstocks.
- Artificial propagation and habitat restoration programs to mitigate salmon and steelhead populations historically accessible to the Colville Tribes must provide equitable numbers of fish to waters currently available for Colville Tribes' harvest.
- Production and harvest programs must not significantly impede the recovery of salmon and

- steelhead populations and fishing opportunities available to the Colville Tribes.
- Harvest and production planning within the *U.S. v. Oregon* management framework must account for and integrate the future propagation and habitat programs and plans of the Colville Tribes.

7.2.4 REGIONAL RESEARCH, MONITORING, AND EVALUATION PROGRAMS

There is substantial agreement throughout the Columbia River Basin on the need for better basinwide and province scale coordination of the design, implementation, data archiving and analysis of research, monitoring and evaluation programs. Such coordination includes the need for improved and standardized performance measures and indicators, improved (increased) use of available technology such as fish tagging, and standardization of data collection protocols and reporting tools. Efforts to achieve these improved levels of coordination at a basinwide scale are in their infancy in the Columbia River Basin.

Recently NOAA Fisheries implemented a standardized set of performance measures for all programs funded through the Pacific Coastal Salmon Recovery Fund (administered by states and tribes in Washington, Oregon, California, Idaho and Alaska). Another recent large-scale coordination effort is a group called the Pacific Northwest Aquatic Monitoring Partnership (PNAMP). Although this group is just getting started, it was established with the intent to coordinate scientific information related to anadromous fish such as watershed condition monitoring, fish population monitoring, effectiveness monitoring, and management of resulting data at a regional scale. To date, PNAMP participants have included state, federal, and tribal personnel. Those participants have drafted a coordination plan for monitoring in the Pacific Northwest titled, R*ecommendations for Coordinating State, Federal, and Tribal Watershed and Salmon Monitoring Programs in the Pacific Northwest.*

The Okanogan Subbasin Plan contains a fairly detailed review of the PNAMP recommendations, information regarding the Columbia Cascade province-scale monitoring activities, as well as summaries of important Canadian research, monitoring and evaluation initiatives. Additional discussion of specific CJDHP and Okanogan subbasin monitoring and evaluation is contained in Chapter 10 and in Appendix H.

Monitoring and evaluation activities associated with the CJDHP will be coordinated to the maximum extent possible with larger scale regional research, monitoring and evaluation programs. The Colville Tribes anticipate that as these regional programs evolve they will contribute substantial information necessary to most effectively adapt the CJDHP.

8.
Alternatives Considered

Chief Joseph Dam Hatchery Program
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Alternatives Considered

8.1 BASIS FOR CHOOSING ALTERNATIVES

In proposing the CJDHP the Colville Tribes seek to meet both conservation and harvest goals. The conservation goal is to increase the abundance, distribution and diversity of naturally-spawning summer/fall Chinook in the Okanogan and Columbia rivers. The harvest goal is to increase and stabilize tribal ceremonial and subsistence fisheries, and local recreational fisheries.

Summer/fall Chinook populations in the Okanogan subbasin are presently supported by a single artificial production program at the Similkameen Pond which is inadequate to meet the Colville Tribes' ceremonial or subsistence fishery needs, and which does not appear to support the sustainability of naturally-spawning populations in the subbasin [see previous discussions in Chapters 5 and 6].

In selecting the alternative presented in the CJDHP, among many other factors, the Colville Tribes considered:

1) The ability of different approaches to meet the Colville Tribes' conservation and harvest goals.
2) The ability of different approaches to address specific limiting factors (e.g. nine downstream dams, uneven and inadequate distribution through historical habitat).
3) The ability of various alternate approaches to meet the unmet mitigation obligations of the federal government.
4) The ability of various alternatives to correct other long-standing mitigation inequities.
5) The relative risks of various alternatives to natural-origin salmon and steelhead in the Okanogan and neighboring subbasins.
6) The relative costs of various approaches.
7) The level of flexibility afforded by various approaches.

8.2 STRATEGIC ALTERNATIVES SUMMER/FALL CHINOOK

As noted at the outset of this document, the CJDHP is based on an integrated management strategy articulated through the summer/fall Chinook HGMP. Prior to development of the Okanogan Summer/Fall Chinook HGMP, three strategic alternatives were developed. The Colville Tribes evaluated those alternatives to arrive at the proposed CJDHP. This proposal is a combination of Alternative 2 and Alternative 3, which are summarized below.

8.2.1 ALTERNATIVE 1. DISPERSE EXISTING SUMMER CHINOOK PRODUCTION

This option addresses integrated recovery goals. The goals of this program would be to 1) make greater and more efficient use of potential spawning and rearing habitat in the Okanogan River, 2) develop a locally adapted brood stock for the Okanogan basin, and 3) provide added tribal and sport fishing opportunity.

Under this alternative, additional acclimation facilities would be developed downstream from the confluence of the Similkameen River. Existing mitigation production, which is currently released at Columbia River mainstem locations, would be moved into the Okanogan River. Current smolt releases in the Similkameen River would be dispersed to minimize redd superimposition. Tribal and sport harvest would be expanded when appropriate and would target adipose-clipped, hatchery-origin Chinook. Broodstock would be trapped in the Similkameen and/or Okanogan rivers to develop a summer/fall Chinook population adapted to environmental conditions unique to the Okanogan basin.

8.2.2 ALTERNATIVE 2. EXPAND SUMMER CHINOOK PRODUCTION

This alternative includes integrated recovery, integrated harvest, and isolated harvest components. The goals of this program would be to 1) make greater and more efficient use of potential spawning and rearing habitat in the Okanogan River, 2) develop a locally adapted broodstock for the Okanogan basin, and 3) provide added tribal and sport fishing opportunity.

The integrated harvest components would include the integrated recovery actions listed in Alternative 1, but would also expand production to provide improved selective fishing opportunities. Under this alternative some of the production would be released as sub-yearlings to mimic the natural life history of the summer/fall Chinook and make use of the rearing capacity of the Columbia River reservoirs.

The goal of the isolated harvest components would be to 1) increase tribal and sport fishing in the Columbia River between the confluence of the Okanogan River and Chief Joseph Dam and 2) increase production for possible later smolt releases above Chief Joseph Dam. Under this alternative, propagation facilities would be constructed at a new or existing hatchery site. Adipose-clipped, hatchery-origin summer Chinook would be acclimated and released below Chief Joseph Dam for subsequent harvest by tribal members and sport anglers. Tribal anglers could also make use of new, selective trap nets in addition to the current hook and line methods employed at the dam.

8.2.3 ALTERNATIVE 3. INTEGRATE FALL CHINOOK PRODUCTION

The goals of this integrated program would be to 1) propagate the late arriving summer/fall Chinook for acclimation and release into the lower Okanogan River and Columbia River, and 2) increase tribal and sport fishing opportunity.

Under this alternative, later arriving, fall-type Chinook would be propagated, acclimated, and released to supplement spawning in the lower Okanogan River and the Columbia River above Brewster. This program would ensure the entire life history template of the summer/fall Chinook is maintained in the upper Columbia region. Juveniles would be released as both yearlings and sub-yearlings. Broodstock would be collected initially at Wells Dam. This broodstock would also be available for potential use above Chief Joseph Dam. Harvest would be selective, targeting adipose-clipped, hatchery-origin Chinook. Additional acclimation sites on the lower 25 miles of the Okanogan River would be added to acclimate the later-arriving Chinook.

8.3 OTHER ALTERNATIVES CONSIDERED

Discussion of alternatives considered in relationship to the development of the water supply and hatchery facility design are discussed in Chapter 11. Alternatives considered regarding the spring Chinook programs are included in Chapter 13.

9.
Chief Joseph Dam Hatchery Program Summer/Fall Chinook Components

Chief Joseph Dam Hatchery Program
MASTER PLAN

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Chief Joseph Dam Hatchery Program Summer/Fall Chinook Components

9.1 OVERVIEW OF PROPOSED SUMMER/FALL CHINOOK PROGRAMS

The CJDHP is designed to support conservation and harvest of summer/fall Chinook salmon in the Okanogan River and Columbia River above Wells Dam. The CJDHP consists of two complementary programs: an integrated recovery program designed to increase abundance, distribution, and diversity of naturally-spawning summer/fall Chinook salmon populations within historical Okanogan subbasin habitat; and an integrated harvest program designed to support a tribal ceremonial and subsistence fishery. The latter program will also provide increased recreational fishing opportunities for local citizens. In addition, the Colville Tribes plan to use 100 to 300 surplus adult summer/fall Chinook to test the suitability of historical habitat in Rufus Woods Lake for potential re-introduction of summer/fall Chinook above Chief Joseph Dam.

The summer/fall Chinook salmon population in the Okanogan River is at present supported by a single hatchery program that produces 576,000 yearling smolts annually. The proposed CJDHP will increase production of juvenile summer/fall Chinook by 2,000,000: 1,100,000 summer/fall Chinook for conservation purposes, and 900,000 fish for harvest purposes. Figure 23 summarizes the proposed releases.

Relationship of Summer/Fall Chinook Programs to CJDHP Guiding Principles

Accountability
- Measure program performance against specific performance standards and indicators
- Marking of all summer/fall Chinook

Best Available Science
- Program designed to address ecological context of subbasin it will be implemented within
- Use of local broodstock
- Propagation of full life history diversity
- Production facilities designed for low density rearing and acclimation on home waters
- Use of disbursed acclimation sites in historical habitat
- Use of marking protocols

Cost-Effectiveness
- Use and modification of existing irrigation ponds for acclimation facilities
- Apply known water supply

Flexibility
- Use of combination of acclimation and hatchery facilities
- Integration of the recovery and harvest programs to meet overall programmatic objectives
- Built-in adaptation and feed-back loops

Innovation
- Use of live-capture, selective-fishing gear for broodstock collection, ceremonial and subsistence harvest, and to optimize escapement of hatchery-origin summer/fall Chinook
- Partnership with OTID to use acclimation facilities

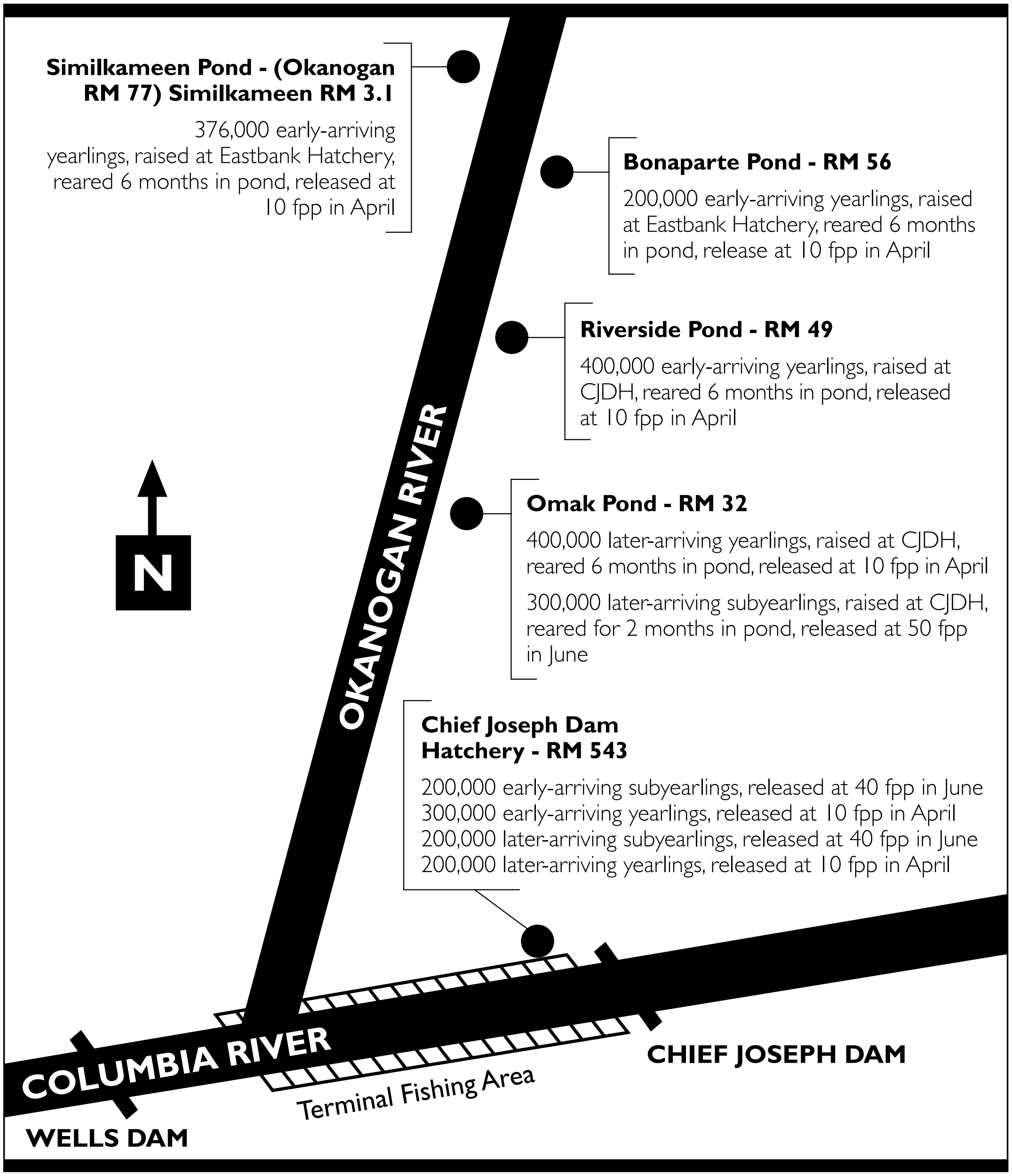
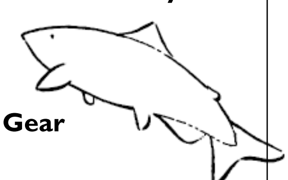


FIGURE 23: Proposed CJDHP Summer/Fall Chinook Releases

9.2 USE OF NEW AND EXISTING FACILITIES

To ensure programmatic flexibility and to keep costs low, the CJDHP will make use of a combination of new and existing hatchery facilities and acclimation ponds. These facilities include a new hatchery facility at the base of Chief Joseph Dam, two new acclimation facilities, and two existing OTID acclimation facilities (a contingency acclimation pond is also identified). Table 9 lists the hatchery, acclimation and adult collection facilities that will be used to meet the CJDHP objectives. In addition, in another cost saving measure, existing facilities at the Colville Trout Hatchery may be used to provide food storage and some general maintenance functions rather than constructing additional facilities at the new Chief Joseph Dam Hatchery.

Table 9: Proposed CJDHP Summer/Fall Chinook New and Existing Facilities

HATCHERIES:	
Chief Joseph Dam Hatchery (new facility)	To be constructed on the right bank of the Columbia River at approximately RM 543 (Reservation side) immediately below Chief Joseph Dam (Chief Joseph Dam located at RM 544.6).
ACCLIMATION FACILITIES:	
Similkameen Pond (existing facility)	Located on the Similkameen River at RM 3.1, near the town of Oroville. The Similkameen River enters the Okanogan River at approximately RM 77.
Riverside Pond (new facility)	To be located on the west bank of the Okanogan River at approximately RM 49 upstream from the town of Riverside.
Tonasket Pond (contingency for Riverside Pond)	Located on the east bank of the Okanogan River at RM 59 about 2 miles upstream from the town of Tonasket.
Bonaparte Pond (existing facility)	Located on the west bank of the Okanogan River at RM 56 about 1 mile downstream from the town of Tonasket.
Omak Pond (new facility)	To be located on the west bank of the Okanogan River at RM 32 at the confluence of Omak Creek.
ADULT COLLECTION FACILITIES:	
Wells Dam Trap (existing facility)	Located on the Columbia River at Wells Dam at RM 515. This is an existing collection site and is a contingency site for future CJDHP broodstock collection.
Chief Joseph Dam Hatchery (new facility) 	To be constructed on the right bank at approximately RM 543 (Reservation side) of the Columbia River immediately below Chief Joseph Dam (this is a contingency site for broodstock collection).
Live-Capture Gear	Fishing will occur in the Okanogan River, at its confluence with the Columbia River (RM 533.5), and in the Columbia River above the confluence with the Okanogan and below Chief Joseph Dam.

9.3 SIZE OF PROGRAMS

The initial size of the CJDHP integrated recovery and integrated harvest programs is based on: the Colville Tribes' need to provide a stable ceremonial and subsistence fishery for tribal members; the need to bolster escapements of summer/fall Chinook to the Okanogan subbasin; the need to increase diversity of summer/fall Chinook in mid and lower Okanogan River habitats; the need to improve distribution of naturally-spawning populations through increasing the use of currently underutilized, but suitable habitat; and the need to address the substantially unmet federal mitigation that is still due to the Colville Tribes.

Depending on out-of-subbasin factors, which have a direct influence on the highly variable summer/fall Chinook smolt-to-adult survival rates in the Okanogan subbasin, the CJDHP is expected to increase runs past Wells Dam by 3,000 to 15,000 early-arriving summer/fall Chinook, and 3,000-14,000 later-arriving summer/fall Chinook. In years with low returning numbers of fish, the programs would be managed to achieve escapement and broodstock needs, and provide a minimal ceremonial and subsistence fishery for the Colville Tribes. In years with higher numbers of returning fish, tribal and recreational selective fisheries would be expanded to capture surplus hatchery-origin fish. In those years characterized by very large run sizes, harvest of natural-origin fish could also take place. The live-capture, selective tribal and recreational fisheries will also be managed to optimize the escapement of hatchery-origin fish to the spawning grounds [see SF HGMP, pp. 51-56].

The size of the integrated recovery and integrated harvest programs will be adjusted as needed based on information and analysis gained from the CJDHP monitoring and evaluation program, the Okanogan subbasin baseline monitoring and evaluation program, and input from other basinwide research, monitoring and evaluation activities. The numbers of fish released in the CJDHP integrated recovery program will be based directly on the response of the natural-origin population.

Over time successful expansion of the natural-origin summer/fall Chinook population is expected to lead to a shift in production from the recovery program to the harvest program, or to a reduction in overall release numbers. When the carrying capacity of the Okanogan River is reached, a portion of the releases might be shifted from the acclimation pond sites to direct releases from Chief Joseph Dam Hatchery in order to increase the run size to the Colville Tribes' terminal fishery below Chief Joseph Dam.

9.4 INTEGRATED RECOVERY PROGRAM

9.4.1 PROGRAM OVERVIEW AND GOAL

The CJDHP summer/fall Chinook integrated recovery program is designed to integrate existing and proposed summer/fall Chinook propagation programs with potential natural production capacity. The goal of the integrated recovery program is to increase abundance, distribution, and diversity of naturally-spawning summer/fall Chinook salmon populations within historical habitat in the Okanogan River and Columbia River above Wells Dam.

The program's goal will be achieved through five conservation actions: 1) development of a local Okanogan River broodstock; 2) expansion of current broodstock collection by two months, in order to propagate the full historical run of summer/fall Chinook; 3) propagation of both the yearling and subyearling life histories, to achieve full, natural diversity; 4) improved distribution of spawning throughout historical habitat; and 5) control of the proportion of hatchery-origin fish spawning in the wild.

9.4.2 CONSERVATION ACTION 1: INITIATE LOCAL BROODSTOCK FOR OKANOGAN RIVER

Foundational to the CJDHP is the initiation of a local broodstock for the Okanogan River. The current broodstock collection at Wells Dam does not account for the entire run timing, and spawn timing, from the upper to lower Okanogan River. Under the CJDHP the Upper Columbia River Summer/Fall Chinook in the Okanogan River will be managed as a single population and broodstock, but the full continuum in run timing, and spawn timing, from the upper to lower Okanogan River will be recognized. Progeny will be acclimated at sites from the upper basin to lower river based on parental spawn timing [see SF HGMP, p.52].

Under the CJDHP the Colville Tribes will shift broodstock collection from Wells Dam to collection points in the Okanogan River and in the Columbia River near the confluence of the Okanogan River. When necessary, collection may also take place at Chief Joseph Dam Hatchery.

As noted in Chapter 2, in order to meet the conservation objectives of the CJDHP, critical research on radio-telemetry and live-harvest, selective fishing gear must be completed. Completion of radio-telemetry research to determine where and when summer/fall Chinook migrate, where they congregate, and the extent to which they are spatially separated from other population components in the upper Columbia is necessary to fully develop the CJDHP broodstock collection programs. In addition, research to determine whether the timing of passage over Wells Dam is related to timing and location of subsequent spawning must also be completed. This information is critical to refinement of broodstock protocol and subsequent acclimation of progeny.

The second piece of essential research is testing of live-capture gear, and identification of suitable locations for summer/fall Chinook salmon broodstock collection in the Okanogan, Similkameen, and Columbia rivers.

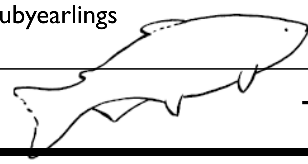
The initial proposed CJDHP broodstock collection goals are identified in Table 10.

9.4.3 CONSERVATION ACTION 2: EXPAND BROODSTOCK COLLECTION TO INCLUDE FULL RUN

As described in Chapter 5, historically fish passing Wells Dam from July 10th through November 15th were used to propagate the Okanogan River summer/fall Chinook ESU. Since 1987, only the early portion of the run – those fish passing Wells Dam from July 10th through August 28 – have been collected for broodstock. This broodstock collection includes a mix of Okanogan and Methow Chinook. The Colville Tribes and WDFW agree that the Upper Columbia River summer/fall Chinook in the Okanogan River should be managed as a single population and broodstock, but also believe it is important to recognize the full continuum in run timing and spawn timing from the upper to lower Okanogan River in order to restore the complete genetic profile of this ESU. With implementation of the CJDHP, both the early and later-arriving portions of the Okanogan summer/fall Chinook run will once again be propagated in the Okanogan subbasin. A central objective of the CJDHP is to increase the use of suitable lower-river spawning habitat by later-arriving summer/fall Chinook.

Table 10: CJDHP Broodstock Collection Goals

EARLY-ARRIVING SUMMER/FALL CHINOOK: 1070 ADULTS; 1:1 SEX RATIO	
Riverside Pond yearlings	228
Chief Joseph Dam Hatchery yearlings	172
Chief Joseph Dam Hatchery subyearlings	112
TOTAL	**512**
LATER-ARRIVING SUMMER/FALL CHINOOK: 618 ADULTS, 1:1 SEX RATIO	
Omak Pond yearlings	228
Omak Pond subyearlings	166
Chief Joseph Dam Hatchery yearlings	114
Chief Joseph Dam Hatchery subyearlings	110
TOTAL	**618**



All hatchery-origin summer/fall Chinook escaping to and above Wells Dam will be adipose fin clipped, whereas natural-origin fish will be unmarked. Natural-origin Chinook will be integrated into the hatchery broodstock to ensure that the hatchery fish are not allowed to genetically diverge from the naturally-spawning fish.

9.4.3.1 Early-Arriving Summer/Fall Chinook

Early-arriving summer/fall Chinook broodstock for the Okanogan subbasin will be collected using live-capture, selective fishing gear fished in and near the Okanogan River consistent with broodstock collection contingencies outlined in the summer/fall Chinook HGMP [p. 52]. All broodstock collection protocols associated with the CJDHP will be reviewed annually. Broodstock collection at Wells Dam will continue only as a contingency action.

The collection of early-arriving summer/fall Chinook broodstock will be based on the run size at Wells Dam. The run at Rocky Reach Dam is also critical as it provides an estimate of the anticipated run at Wells Dam. Since 1990, the Wells Dam count has varied significantly, from 44% to 80%, of the Rocky Reach Dam count. Fishery managers collecting broodstock at Wells Dam will need to be cognizant of the cumulative counts at Rocky Reach Dam to follow collection protocols. The summer/fall HGMP defines program priorities in the event that there are insufficient early-arriving summer/fall Chinook broodstock [SF HGMP, pp. 53 and 56].

Escapement goal for early-arriving summer/fall Chinook past Wells Dam:		3,500
Broodstock objective at Wells Dam:		1,070
	Total	4,570

Once the radio-telemetry and broodstock collection research is complete, similar protocols will be developed for broodstock collected in the Okanogan River based on information gathered about the success of live-capture, selective fishing gears and the attributes at various fishing sites.

From 1998-2002 the proportion of hatchery-origin fish spawning in the Similkameen River averaged 57% (range 41-70%), while in the Okanogan River, hatchery-origin fish have averaged 51% of the natural spawners (range 33-61%). In both rivers, the proportion of hatchery-origin spawners increases with increasing escapement. This information will be important in establishing protocols for broodstock collection. In collecting broodstock, up to 100% of broodstock will be unmarked, natural-origin fish. Not more than 20% of the natural-origin run will be collected for broodstock (Table 11). Jack Chinook will be collected as a portion of the run at large.

9.4.3.2 Later-Arriving Summer/Fall Chinook

Broodstock for the later-arriving summer/fall Chinook program will be collected using live-capture, selective fishing gear or if necessary, will be collected at Wells Dam's east bank ladder trap from August 29th through November 15th. Fish will be taken equally from throughout the run, with an equivalent collection of males and females. The broodstock collection

Table 11: Proportion of Natural-Origin, Early-Arriving Summer/Fall Chinook in Hatchery Broodstocks

ANTICIPATED COUNT OF EARLY-ARRIVING SUMMER/FALL CHINOOK AT WELLS DAM	MAX. % OF BROOD-STOCK NATURAL-ORIGIN	MAX. % OF NATURAL-ORIGIN FISH IN BROOD-STOCK
< 2 ,000	50%	20%
2,000 - 5,000	75%	20%
>5,000	100%	20%

objective will be 616 adults to achieve a total program goal of 600,000 yearlings and 500,000 subyearlings.

Interim escapement goal for later-arriving summer/fall Chinook past Wells Dam:		1,200
Broodstock objective at Wells Dam:		616
	Total	1,816

The number of broodstock to be collected will be based on the anticipated escapement past Wells Dam. The management objective is to fully seed the available habitat in the Okanogan and Columbia rivers while spreading the risk of low population productivity and survival of this ESU between natural and hatchery production. However, the habitat capacity and corresponding escapement needs are not fully known. The size of the CJDHP will be adjusted based on information gathered through the CJDHP and Okanogan/Similkameen Baseline monitoring and evaluation program. At this time, an escapement objective for later-arriving summer/fall Chinook above Wells Dam is assumed to be 1,200. Because summer/fall Chinook populations in the Okanogan subbasin must pass nine dams and as a result face substantial cumulative passage mortalities, higher productivity of hatchery populations is factored into the broodstock collection protocol as a means to minimize risks of population failure [see SF HGMP, p.56].

As with the early-arriving fish, the broodstock for the later-arriving summer/fall Chinook must also be managed for natural-origin fish as indicated in Table 12. In collecting broodstock, up to 100% of broodstock

Table 12: Proportion of Natural-Origin, Later-Arriving Summer/Fall Chinook in Hatchery Broodstock

ANTICIPATED COUNT OF LATER-ARRIVING SUMMER/FALL CHINOOK AT WELLS DAM	MAX. % OF BROOD-STOCK NATURAL-ORIGIN	MAX. % OF NATURAL-ORIGIN FISH IN BROOD-STOCK
< 2 ,000	50%	20%
2,000 - 3,000	75%	20%
>3,000	100%	20%

should be unmarked, natural-origin fish; not more than 20% of the natural-origin run should be collected for broodstock.

9.4.4 CONSERVATION ACTION 3: PROPAGATE YEARLING AND SUBYEARLING LIFE HISTORIES

Diversification of juvenile fish releases to include both subyearling and yearling fish is also an important action of the CJDHP. Information gleaned from artificial production programs in both the Columbia and Snake rivers indicate that yearling smolts have a 15 times higher survival rate than that of subyearlings (Bugert 1998). Although the lower survival rates of subyearling programs make such programs somewhat controversial, maintaining and enhancing life history diversity is an important component of the CJDHP integrated recovery program.

The subyearling programs proposed in the CJDHP will be based initially on information gathered from new subyearling programs for fall Chinook in the Snake River, successful releases from the Priest Rapids Hatchery program, and subyearling programs at Wells and Turtle Rock hatcheries. The subyearling component of the CJDHP will provide an opportunity to compare cost-effectiveness and biological characteristics of the subyearling program with the yearling program. The subyearling program will also allow exploitation of the potential capacity of the Columbia River reservoirs to rear juvenile fish. Although the lower survival rates of subyearling programs make such programs somewhat controversial, maintaining and enhancing life history diversity is an important component of the CJDHP integrated recovery program. Improving passage conditions at the nine downstream dams is also likely to yield better results from subyearling programs and may be a preferable option to altering the life history characteristics to accommodate the downstream dams.

In order to accomplish this action, production will be dispersed to fully utilize historical spawning habitats. Yearling, early-arriving summer/fall Chinook, will be reared, acclimated, and released at Similkameen, Bonaparte, and Riverside ponds and from Chief Joseph Dam Hatchery. Yearling and subyearling later-arriving Chinook will be reared, acclimated, and released from Omak Pond on the lower Okanogan River and from Chief Joseph Dam Hatchery to increase spawning in historical, Columbia River habitat.

9.4.5 CONSERVATION ACTION 4: IMPROVE SPAWNING DISTRIBUTION

As explained in Chapter 5, summer/fall Chinook spawning is currently highly concentrated in the Similkameen River with superimposition of redds occurring on a regular basis, while substantial suitable habitat in the rest of the Okanogan subbasin remains largely under seeded. The CJDHP will redistribute existing production and add new acclimation sites to increase abundance, distribution, and diversity of naturally-spawning summer/fall Chinook salmon populations through their historical Okanogan subbasin habitat.

Under the program, the current production of 576,000 early-arriving summer/fall Chinook reared at Similkameen Pond will be split between WDFW's Similkameen Pond and the Oroville-Tonasket Irrigation District's Bonaparte acclimation pond (200,000 reared and released from the Bonaparte Pond and the remaining 376,000 will be reared at the Similkameen Pond). A new pond constructed just upstream from town of Riverside at Okanogan river mile 49, will be used to rear and release 400,000 early-arriving summer/fall Chinook yearlings. In addition, 700,000 later-arriving summer/fall Chinook (300,000 subyearling and 400,000 yearling), will be reared and released from Omak Pond at river mile 32. Figures 23 and 24 illustrate the relative locations of the new and existing acclimation facilities.

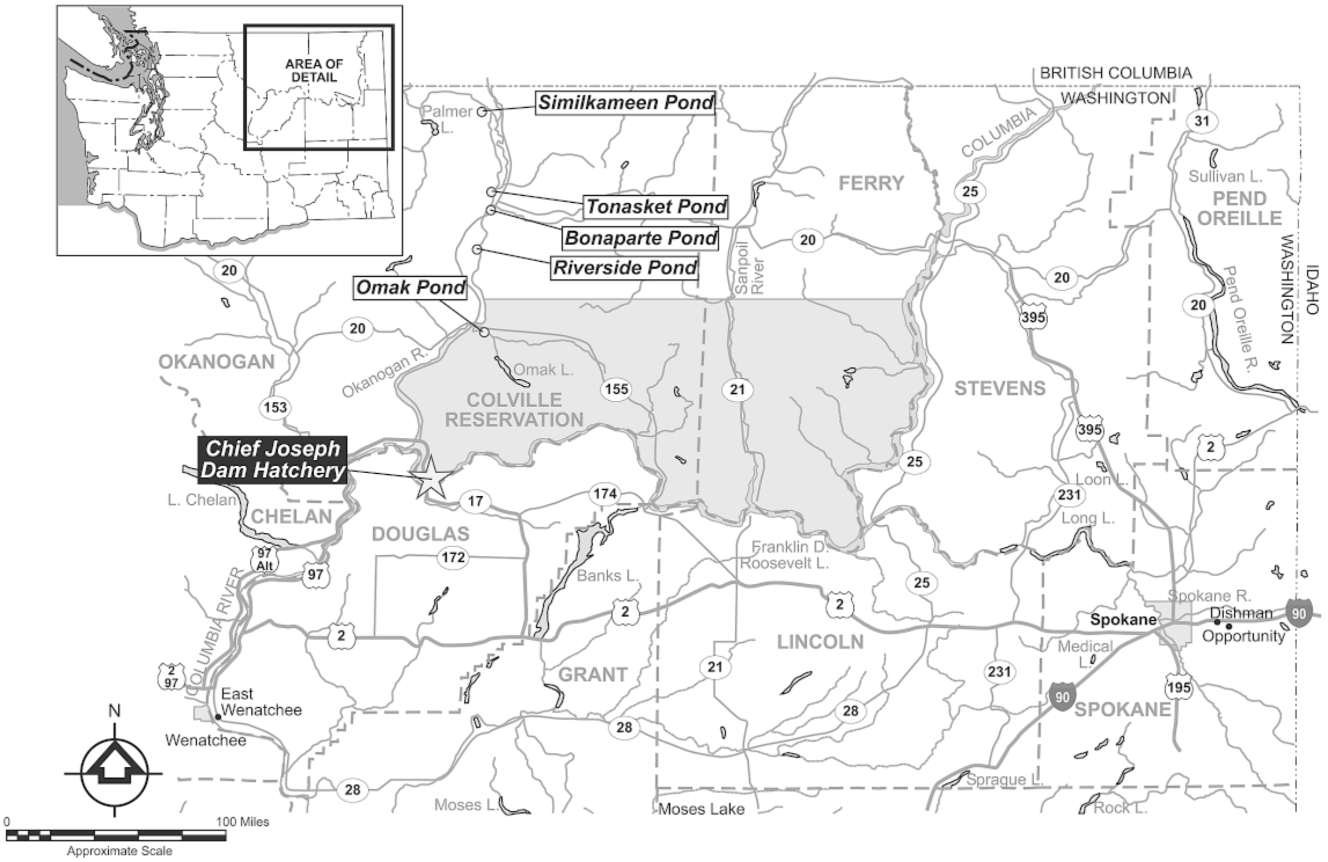


FIGURE 24: Location of Chief Joseph Dam Hatchery and Summer/Fall Chinook Acclimation Facilities

9.4.6 CONSERVATION ACTION 5: CONTROL PROPORTION OF HATCHERY-ORIGIN FISH SPAWNING IN THE WILD

Until better knowledge exists about the relative reproductive success of hatchery-origin and natural-origin salmon, the naturally-spawning population will be managed to increase the proportion of natural-origin fish in the escapement. Collecting information to answer these uncertainties will be a core function of the CJDHP monitoring and evaluation program. Preliminary CJDHP goals to guide harvest and propagation activities are reflected in Table 13.

The Colville Tribes recognize that a number of years of low escapement may be expected due to out-of-subbasin conditions. In years with lower escapements, the sustainability of the population may best be served by allowing a greater proportion of the locally adapted hatchery-origin fish on the spawning grounds. Also, during early years of the later-arriving summer/fall Chinook propagation program, a high proportion of hatchery-origin spawners will be necessary. These goals will need to be revised based on ongoing results of the monitoring and evaluation program as well as on improved general knowledge of the effects of supplementation as such information becomes available.

Marking protocols in combination with the live-capture, selective fishing gear will be used as important tools to control the proportion of hatchery-origin fish relative to wild fish in the Okanogan subbasin.

Table 13: Desired Proportion of Naturally-spawning, Hatchery-Origin Summer/Fall Chinook, Okanogan and Similkameen Rivers

	CURRENT % HATCHERY	LONG-TERM % HATCHERY
Wells Dam Escapement << 3,500 Early-Arriving Summer/Fall Chinook	~ 47%	< 50%
Wells Dam Escapement >> 3,500 Early-Arriving Summer/Fall Chinook	~ 64%	< 20%

9.5 INTEGRATED HARVEST PROGRAM

9.5.1 PROGRAM OVERVIEW AND GOAL

The goal of the CJDHP integrated harvest program is to support a tribal ceremonial and subsistence fishery and to provide increased recreational fishing opportunities for local citizens. To support the CJDHP integrated harvest objectives 500,000 early-arriving (200,000 subyearling and 300,000 yearling), and 400,000 later-arriving summer/fall Chinook (200,000 subyearling and 200,000 yearling) will be released at Chief Joseph Dam Hatchery.

The CJDHP integrated harvest program will rear summer/fall Chinook using the same broodstock as the CJDHP integrated recovery program to ensure that naturally-spawning fish from both programs are the same. Summer/fall Chinook will be reared and released at Chief Joseph Dam Hatchery to enhance the Colville Tribes' ceremonial and subsistence fishery located immediately below Chief Joseph Dam. Hatchery fish released at Chief Joseph Dam Hatchery specifically for the integrated harvest program will return to the terminal fishing area below Chief Joseph Dam.

9.5.2 HARVEST ACTION 1: MARK ALL HATCHERY SUMMER/FALL CHINOOK

In order to determine their role in population viability, to support tribal ceremonial and subsistence fishing, and recreational angling on hatchery-origin fish surplus to conservation needs, all hatchery-origin summer/fall Chinook produced at Chief Joseph Dam Hatchery will be adipose fin clipped, and approximately 40% will be coded wire tagged.

9.5.3 HARVEST ACTION 2: LIVE-CAPTURE, SELECTIVE FISHERIES FOR HATCHERY-ORIGIN FISH

The success of the CJDHP requires deployment of live-capture, selective fishing gear as the primary means of harvest. The major objective for these new, selective fisheries is to harvest surplus hatchery-origin summer/fall Chinook specifically to rebuild ceremonial and subsistence fishing. This innovative fishing strategy will be critical to limiting the proportion of hatchery-origin fish spawning in the wild and limiting the take of non-target species.

Once the CJDHP programs are in operation, the Colville Tribes plan to: 1) continue their modest hook-and-line tailrace fishery immediately below Chief Joseph Dam from July 1 to October 31; 2) initiate a live-capture, selective fishery from Chief Joseph Dam downstream to the area of the Okanogan River confluence from July 1 to October 31; and 3) initiate a live-capture, selective fishery in the upper Okanogan River from July 1 to September 30 (in some years a thermal barrier may limit the Okanogan River fishery at this time of year), and in the lower Okanogan River from July 1 to October 15. These tribal ceremonial and subsistence fisheries will be regulated in cooperation with recreational fisheries, which will also target hatchery-origin summer/fall Chinook.

As discussed in detail in Chapter 4, the Colville Tribes have reserved rights to harvest anadromous fish in an area including the entire length of the Okanogan River within the United States (approximately 75 river miles) and the Columbia River within the United States above the Okanogan confluence (160 river miles), as well as all tributaries within the 3 million acre area encompassed by the current Reservation boundaries and the ceded North Half. The Colville Tribes intend to pursue development with the federal government of in-lieu fishing sites in waters adjoining the Reservation and ceded lands, including the Okanogan River upstream to Zosel Dam.

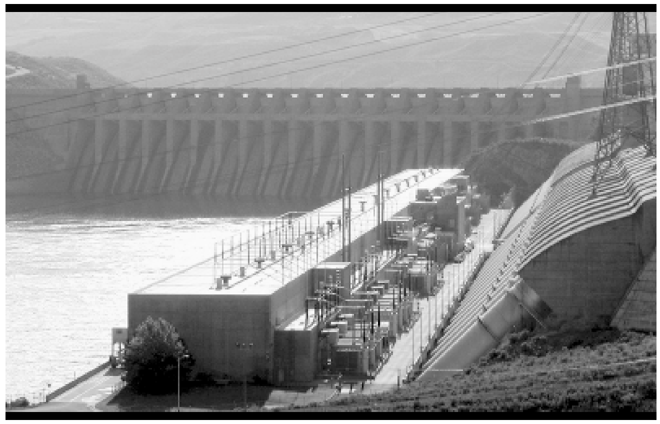


FIGURE 25: Photo Chief Joseph Dam

9.5.4 HARVEST ACTION 3: OPTIMIZE ESCAPEMENT OF HATCHERY CHINOOK IN NATURALLY-SPAWNING POPULATION

Future harvest management of Okanogan summer/fall Chinook will be managed to: 1) ensure adequate natural escapement of Okanogan summer/fall Chinook, 2) ensure broodstock collection for summer/fall Chinook propagation programs, 3) provide at least a minimal ceremonial and subsistence fishing opportunity for tribal members, 4) share surplus hatchery-origin Chinook between tribal and recreational fisheries, and 5) develop fishery capacity in strong run years to harvest significant surpluses of hatchery-origin Chinook and even natural-origin fish when appropriate.

The productivity of the natural spawning population should be improved by allowing significant numbers of hatchery-origin fish to spawn only when necessary to maintain minimum escapement levels. Production and harvest will be managed to optimize escapement of hatchery fish to the benefit of the natural population.

Progress against a comprehensive set of performance standards and performance indicators will be measured as part of the CJDHP monitoring and evaluation program. Data gathered through this monitoring and evaluation program, and the Okanogan/Similkameen Baseline monitoring and evaluation program will provide the information necessary to shift production (both short- and long-term) between release sites on the Okanogan River and below Chief Joseph Dam to optimize conservation and harvest benefits, and to minimize risks.

9.5.5 HARVEST ACTION 4: SHARE HARVEST OPPORTUNITIES WITH RECREATIONAL ANGLERS

In addition to addressing federal trust obligations and meeting the ceremonial and subsistence needs of the Colville Tribes, the summer/fall Chinook releases from the Chief Joseph Dam Hatchery will increase recreational angling opportunities in the Columbia River between Wells and Chief Joseph dams from approximately mid-July through October. The Lower Columbia River and ocean fisheries will also be supported by production from the CJDHP summer/fall Chinook programs.

The recreational fishery would be closed in years with lower summer/fall Chinook runs (less than 8,000 fish), to ensure adequate natural escapement and broodstock needs are met, and to assure a minimal tribal ceremonial and subsistence fishery. In medium run years, the tribal ceremonial and subsistence and recreational fisheries would share in the harvestable surplus of hatchery-origin fish. In higher run years both tribal and recreational fisheries would be managed to also allow harvest of natural-origin fish that are in excess of broodstock needs, are in excess of natural spawning escapement goals, and are not needed to ensure the proportion of hatchery-origin fish is not too high in the naturally-spawning population [see SF HGMP, p. 94].

9.6 DESCRIPTION OF PRODUCTION PROGRAM

The proposed summer/fall Chinook CJDHP programs are described in substantial detail in the Okanogan summer/fall Chinook HGMP located in Appendix C. However, reviewers should note the summer/fall Chinook HGMP describes a comprehensive program for management of summer/fall Chinook in the Okanogan River and therefore includes current production programs for the Eastbank Hatchery in addition to the proposed CJDHP.

9.6.1 MATING

Fish will be spawned at a one male to one female ratio. When necessary, gametes of the least numerous sex are split into subsets and these are crossed with gametes from a different individual of the more numerous sex.

Depending on the run size, natural-origin fish will make up to 100% of the broodstock, unless limited by unexpected low numbers of natural-origin recruits in the run. Hatchery-origin brood will be randomly spawned to achieve a random mix of HxH, WxW, HxW, and WxH crosses. A one-to-one mating scheme will be used for summer/fall Chinook. Males will be live-spawned on the first spawning day as necessary to make up for a low male to female ratio. Jacks will be included because inclusion of jacks in the run-at-large broodstock collection can help alleviate occasional low adult male occurrence (Brown 2001) [see SF HGMP, p. 62].

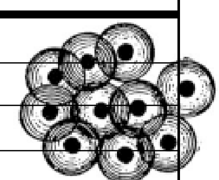
9.6.2 INCUBATION

The CJDHP summer/fall Chinook programs will require 1.14 million early-arriving summer/fall Chinook eggs and 1.39 million later-arriving summer/fall Chinook eggs. In cases where there is a shortage of eggs, the subyearling programs will be initially deferred in favor of the yearling programs.

The summer/fall Chinook programs may take up to 10% surplus eggs to ensure program release goals are met. The number of surplus eggs will be based on program performance and the preeminent objective of ensuring adequate escapement to the spawning grounds. Under no circumstances, will smolts in excess of 110% of program objectives be released. Ultimately, the take of surplus eggs will be minimized when program survival levels are determined and stabilized through information gleaned through the monitoring and evaluation program [see SF HGMP, p.64].

Table 14: Number of Eggs Required to Meet CJDHP Production Goals

PROGRAM	PRODUCTION GOAL	SURVIVAL	EGGS REQUIRED
EARLY-ARRIVING			
Riverside Pond	400,000 yearling	Egg-to-smolt 78%	513,000
Chief Joseph Dam Hatchery	300,000 yearling	Egg-to-smolt 78%	385,000
Chief Joseph Dam Hatchery	200,000 subyearling	Egg-to-fingerling 81%	245,000
		Total early-arriving eggs	**1,143,000**
LATER-ARRIVING			
Chief Joseph Dam Hatchery	200,000 yearling	Egg-to-smolt 78%	Total combined 503,000
Chief Joseph Dam Hatchery	200,000 subyearling	Egg-to-fingerling 81%	
Omak Pond	300,000 subyearlings	Egg-to-smolt 78%	Total combined 890,000
Omak Pond	400,000 yearlings	Egg-to-fingerling 81%	
		Total later-arriving eggs	**1,393,000**



9.6.3 REARING

Rearing conditions at the proposed Chief Joseph Dam Hatchery are based on density and flow criteria of 1lb./inch/gpm, 0.75 lbs./cubic foot, and 1 turnover/hour.


Alison Squier

FIGURE 26: Photo Bonaparte Acclimation Pond

Acclimation pond rearing densities for the CDJHP are designed to be very low in order to create a more natural rearing environment. The Similkameen Pond (an existing facility) was initially designed based on rearing densities described by Piper (1982). Redistributing the Similkameen Pond production between Similkameen and Bonaparte ponds will result in much lower rearing densities at Similkameen, close to about 4 lbs/gpm and 0.49 lbs./ cubic foot at time of release (assuming 10 fpp). At Bonaparte Pond, rearing densities could be as low as 1.8 lbs./gpm and 0.26 lbs./ cubic foot. Rearing densities in Tonasket Pond (an existing OTID irrigation settling pond which is a contingency for Riverside) could be as low as 3.6 lbs./ gpm and 0.54 lbs./cubic foot. However, flow rates in the pond may be reduced to save on pumping costs, in which case loading rates would be closer to Piper's criteria. Descriptions of the two new acclimation ponds, at Riverside and Omak, are included in Chapter 11. Loading densities at both ponds will be substantially lower than Piper's criteria.

Transfer of summer/fall Chinook from the hatchery facilities to the CJDHP acclimation ponds will occur only after river temperatures are similar to the water temperature at the hatchery. Typically this thermal condition occurs in October. Transfer to the acclimation ponds might be further delayed to prevent disease infections if substantial numbers of naturally spawned carcasses are present immediately above the pond's water intake. Prior to complete production transfer, tests will be conducted with a sample size of fish to ensure acclimation conditions are suitable to ensure fish survival.

All fish will be transported to their final rearing and acclimation ponds months prior to release.

The yearling summer/fall Chinook fish will be reared in the acclimation ponds for six months and then released volitionally in early to mid April with forced release to follow as necessary. The subyearling fish will be reared for two months and released volitionally in June, with forced release to follow as necessary. All fish will be reared in the acclimation ponds on local river water at very low densities. All of the acclimation facilities will be covered with netting to prevent avian predation. Releases will be coordinated with initiation of the mid-Columbia flow and spill programs to increase survival of fish passing the dams. These operations normally start about April 12th.

Integration of rearing techniques to mimic natural conditions will be considered at the acclimation facilities. In particular, consideration will be given to adding structure and subsurface feeders to emulate natural conditions. The research on NATURES and other relevant data will be reviewed prior to final design to determine if survival advantages justify the cost of necessary modifications or additions. At this time natural rearing techniques will not be applied in the design of the Chief Joseph Dam Hatchery facilities.

Those remaining summer/fall Chinook not transported to acclimation ponds (destined for the terminal Chief Joseph Dam fishery) will be reared and acclimated at Chief Joseph Dam Hatchery from hatching through release. Fish will be reared on water from the Chief Joseph Dam relief tunnel and subsurface waters from Rufus Woods Lake [see Chapter 11, see also SF HGMP, pp. 64-78].

9.7 POTENTIAL ECOLOGICAL AND GENETIC EFFECTS

9.7.1 POSSIBLE EFFECTS ON ESA LISTED SPECIES

Two ESA-listed anadromous fish ESUs could be incidentally affected by the CJDHP - Upper Columbia River Spring Chinook and Upper Columbia River Steelhead. Because Upper Columbia River Spring Chinook are extirpated from the Okanogan subbasin, the majority of possible effects of the CJDHP would be between summer/fall Chinook and Upper Columbia River steelhead.

The CJDHP monitoring and evaluation program will assess all aspects of steelhead and Chinook interactions as well as measuring possible interactions between Methow River Spring Chinook (i.e. straying of summer/fall into the Methow River). Information derived from the CJDHP monitoring and evaluation program will be used to adjust the Chinook program as necessary to minimize or eliminate any significant problems with listed species. The Council's Step 2 requirement to complete NEPA includes completion of a Biological Assessment and Essential Fish Habitat report to comply with possible effects on ESA listed species.

9.7.1.1 Upper Columbia River Spring Chinook

There are no ESA-listed Upper Columbia River Spring Chinook spawning in the Okanogan or Columbia rivers. The summer/fall Chinook released into the Okanogan subbasin would be expected to migrate back to their natal river. Fish released directly from Chief Joseph Dam Hatchery will either be harvested, return to the hatchery, or spawn in the Columbia River. No genetic interactions are expected between these two Chinook ESUs. Spring Chinook in the Methow River will be monitored to determine if Okanogan summer/fall Chinook are present in the spawning spring Chinook population in sufficient numbers to cause concern. Spring Chinook in the Methow would spawn earlier in the season than summer/fall Chinook so surveys will be completed earlier in the season. Coded wire tags recovered from salmon carcasses will indicate any presence of hatchery-origin fish from the Okanogan subbasin.

Adult upper Columbia River Spring Chinook could be minimally exposed to the harvest directed on the adult summer/fall Chinook arising from this program. Incidental harvest effects are examined in *Biological Assessment for the 2002 - 2012 Chief Joseph Dam Tailrace Fishery for Colville Tribal Members and the Incidental Impacts on Salmon and Steelhead Species Listed Under the Endangered Species Act* (CCT 2002).

9.7.1.2 Upper Columbia River Steelhead

Low numbers of upper Columbia River steelhead may spawn and rear in the upper Okanogan River including Canadian waters, the lower Similkameen River, and in lower tributaries of the Okanogan River. Rearing and migrating steelhead may be affected by the summer/fall Chinook arising from the CJDHP.

Upper Columbia River steelhead spawn in tributaries of the Okanogan River. Young of the year steelhead are thought to rear in the tributaries until their smolt migration the following spring. Some juvenile steelhead may drop out of the tributaries in May and June of their first year and rear through the summer in limited microhabitats in the Okanogan River where water temperatures from subsurface flow are suitable. Yearling summer/fall Chinook should have migrated from the Okanogan River prior to any juvenile steelhead inhabiting these waters. Any steelhead fry that would be in the Okanogan River would also be occupying shallow habitats, whereas the larger Chinook should be in deeper, faster waters. Therefore predation and competition by Chinook on young of the year steelhead for food and space should be minimal and insignificant.

Yearling Chinook can be expected to co-habit waters of the Okanogan River with yearling steelhead (arising from tributary streams) prior to and during their migration. Predation is not expected to occur because the steelhead will be too large for Chinook consumption. Competition for food and space will occur to a limited extent, but should have only minor adverse effects since the Chinook will be actively migrating to the larger waters of the Columbia River. Also steelhead and Chinook tend to occupy different habitat types when rearing, with steelhead occupying riffle habitat and Chinook occupying deeper pools.

All early-arriving summer/fall Chinook released in the Okanogan and Similkameen rivers in April will be yearling smolts and are therefore expected to actively migrate down to, and through, the Columbia River. These fish will be about 130 to 140 mm in length at the time of release. Early-arriving summer/fall Chinook released from Chief Joseph Dam Hatchery will be yearlings of a similar size and will be released at approximately the same time. Under the CJDHP subyearlings about 45 to 55 mm in length will also be released from the Chief Joseph Dam Hatchery in June. Later-arriving summer/fall Chinook released in the lower Okanogan River and at Chief Joseph Dam Hatchery will be yearlings of about 130 to 140 mm in length and will be released in April. Subyearling summer/fall Chinook of about 45 to 55 mm in length will be released in June.

The June subyearling summer/fall Chinook released in the lower Okanogan River should not co-habit waters used by steelhead fry because these fish are expected to reside primarily in the tributary streams. If some steelhead fry are present in the lower Okanogan, it is possible some competition for food could occur until the Chinook migrate out to the Columbia River. This competition is expected to be short-lived and fairly insignificant since steelhead and Chinook tend to occupy different habitat types.

The increased numbers of summer/fall Chinook spawning in the Okanogan River as a result of the CJDHP should provide a beneficial effect for the steelhead populations. Carcasses of spawned out Chinook will provide nutrients and a direct food source for rearing steelhead. Chinook will also be spawning in riffle areas that until recently have been unutilized or underutilized. This spawning action will clean the gravels of silt, a perennial problem in the Okanogan River, which in some areas might provide better rearing habitat for steelhead. Emerging Chinook fry will also provide a food supply for yearling steelhead.

If trapping of broodstock at Wells Dam is necessary, delay of adult steelhead could occur. Trapping protocols will be designed to minimize any delays that could affect steelhead survival and spawning success.

9.7.1.3 Bull Trout

Listed bull trout are not believed to exist in the Okanogan River downstream from Zosel Dam and Enloe Dam. Therefore the CJDHP should not affect this listed species in the Okanogan subbasin. The change in numbers of migrating Chinook resulting from this program should also have inconsequential effects to any bull trout residing in the Columbia River.

9.7.2 DISEASE TRANSMISSION

Interactions between hatchery-origin and natural-origin fish can be a source of pathogen transmission. Because most pathogens responsible for diseases are present in both hatchery-origin and natural-origin fish, there is uncertainty as to the extent to which hatchery-origin fish are responsible for transmission of diseases. Hatchery fish are often more susceptible to disease because of high rearing densities (Bugert 1998). The rearing densities in the CJDHP acclimation ponds will be much lower than standard propagation guidelines thereby reducing the probability of disease outbreaks. The volitional release strategy for these ponds should also minimize crowding of hatchery-origin and natural-origin fish in the Okanogan and Columbia rivers, reducing the potential for disease transmission.

The carcasses from the numbers of fish returning to spawn as a result of this program, in combination with the relatively high fall temperatures, could provide a medium for colonization of pathogens. To reduce the risk of infection, transporting juvenile fish to acclimation ponds may need to be occasionally delayed until water temperatures decline.

9.8 PROGRAM CONTINGENCIES AND ADAPTATION LOOP

Due in large part to the extensive negative out-of-subbasin impacts on Okanogan summer/fall Chinook populations, at this time it is highly improbable that the conservation and harvest goals of the CJDHP could be met without assistance of artificial production. All components of the CJDHP are expected to continue into the foreseeable future unless results from the monitoring and evaluation programs suggest that certain components should be discontinued, due to either insufficient benefits, or unacceptable risks. The CJDHP is designed as an adaptive program. The summer/fall Chinook HGMP identifies a comprehensive set of performance standards and indicators, which are the basis of the CJDHP monitoring and evaluation program. The integrated recovery and integrated harvest components will be adjusted regularly based on the results of the CJDHP monitoring and evaluation program analysis. In addition, information gathered through the Okanogan/Similkameen Baseline Monitoring and Evaluation Program will be incorporated into the management of the CJDHP to provide a more comprehensive picture

CONDITION:	CONTINGENCY RESPONSE ACTION:
Excessive escapement of hatchery-origin summer/fall Chinook in the Okanogan subbasin.	• Increase selective fishing pressure • Shift some of the juvenile releases from Okanogan River ponds to Chief Joseph Dam Hatchery or Colville Trout Hatchery • Reduce production numbers • Change some summer/fall Chinook production to spring Chinook
Significant adverse ecological interactions with natural populations.	• Improve rearing and release protocols to reduce juvenile residency time • Reduce production; shift some or all of the production from Okanogan River ponds to Chief Joseph Dam Hatchery
Unsatisfied harvest demand of tribal or recreational fishermen.	• Increase smolt quality or passage survival to increase adult returns • Increase production • Increase selective fishing capability • Adjust harvest allocation between fishing sectors
Underutilized supply of harvestable summer/fall Chinook.	• Reduce production • Develop new release sites to expand fishing opportunity • Open access to fishery for other tribes
Excessive harvest mortality to non-target species or natural-origin summer/fall Chinook.	• Improve or restrict selective fishing gears • Target harvest to hatchery-origin fish only • Alter timing or location of fisheries • Reduce production • Shift releases to other acclimation sites 
Inadequate broodstock collection using live-capture, selective fishing gears.	• Improve gear efficiency or effort • Incorporate volunteers to Chief Joseph Dam Hatchery • Supplement with fish from Wells Dam trap
Insufficient escapement to the Okanogan subbasin.	• Improve smolt quality • Reallocate production from the Integrated Harvest Program to the Integrated Recovery Program • Reduce incidental harvest mortalities • Increase habitat improvements

of the fit between the CJDHP and the rest of the Okanogan subbasin ecosystem [see Chapter 10 and Appendix H for information on the conceptual monitoring and evaluation program].

The preceeding list of possible contingency actions identifies a limited range of conditions that might arise, along with examples of potential responsive actions. It is not possible to foresee all of the conditions that might arise, or to anticipate the single correct response. The list below is intended to indicate that many adaptive responses are possible; in fact in some cases many combined responses might be appropriate. The following list does not include any of the possible actions that could be taken to improve fish culture within the Chief Joseph Dam Hatchery itself. The integrated programs of the CJDHP will be adjusted and adapted to comport to existing conditions and best available scientific knowledge.

10.
Monitoring and Evaluation Program Conceptual Design

Chief Joseph Dam Hatchery Program
MASTER PLAN

10

Monitoring and Evaluation Program Conceptual Design

The following chapter summarizes key elements of the CJDHP Conceptual Monitoring and Evaluation Program design. In accordance with the Council's requirements the monitoring and evaluation plan presented here is conceptual only. The CJDHP Conceptual Monitoring and Evaluation Program is based on a set of specific quantifiable performance standards and indicators that measure conditions, performance, and interactions within the Chief Joseph Dam Hatchery, within the associated acclimation ponds, and in the Okanogan subbasin ecosystem where the CJDHP will be implemented. The performance standards in the CJDHP conceptual monitoring and evaluation plan were adopted directly from the summer/fall Chinook HGMP (and spring Chinook HGMP), which were in turn adapted from the draft, *Performance Standards and Indicators for the Use of Artificial Production for Anadromous and Resident Fish Populations in the Pacific Northwest* (NMFS 2000).

This chapter contains an abbreviated overview of the CJDHP Conceptual Monitoring and Evaluation Program additional descriptive detail including examples of protocol, methods, and sample tasks is attached in Appendix G. Appendix G also includes a table aligning CJDHP performance standards with performance indicators, and with related sample tasks. Given that the full range of monitoring and evaluation necessary to give a holistic picture of conditions at the CJDHP facilities and in the Okanogan subbasin will be accomplished by more than one monitoring and evaluation program, this table also aligns related monitoring and evaluation tasks to be completed by other monitoring and evaluation programs with the CJDHP performance standards and indicators.

Relationship of Conceptual Monitoring and Evaluation Program to CJDHP Guiding Principles

Accountability
- Annual reporting, data archiving, public access to data
- Contingency plans included

Best Available Science
- Use of clearly defined performance standards and indicators
- Measure effects of program within the hatchery walls and within the ecosystem
- Inclusion of new findings from other regional and local research and monitoring and evaluation programs

Cost-Effectiveness
- Complimentary coordination with Okanogan subbasin and Columbia Cascade Province monitoring and evaluation activities to eliminate duplication of effort

Flexibility
- Coordination with Okanogan/Similkameen Baseline Monitoring and Evaluation Program to round out full range of monitoring and evaluation activities

Innovation
- Anticipate direct link of monitoring and evaluation activities to adaptation of program size and implementation – from day one

10.1 CHIEF JOSEPH DAM HATCHERY PROGRAM MONITORING AND EVALUATION PROGRAM GOALS

The three primary goals of the CJDHP Conceptual Monitoring and Evaluation Program are to: 1) measure the relative success of the integrated recovery programs in restoring the abundance, distribution, and diversity of naturally-spawning populations of summer/fall Chinook in the Okanogan River and upper Columbia River above Wells Dam; 2) measure the relative success of the integrated harvest programs in providing a stable ceremonial and subsistence fishery for the Colville Tribes, and in providing for increased recreational fisheries in upper Columbia River above Wells Dam; and 3) provide information necessary to adapt the program in order to minimize deleterious effects and maximize desired results.

10.2 RELATIONSHIP TO OTHER LOCAL AND REGIONAL MONITORING AND EVALUATION PROGRAMS

The CJDHP Conceptual Monitoring and Evaluation Program will be integrally linked to another Okanogan subbasin monitoring and evaluation program, the Okanogan/Similkameen Baseline Monitoring and Evaluation Program (BPA project 200302200). The Okanogan/Similkameen Baseline Monitoring and Evaluation Program will collect baseline data in the Okanogan subbasin (including the Similkameen sub-watershed).

Four objectives are identified in the Okanogan/Similkameen Baseline Monitoring and Evaluation Program: 1) monitor the abundance, survival, timing and life history characteristics of summer/fall Chinook, spring Chinook, sockeye, and steelhead in the Okanogan subbasin; 2) determine if, as a result of actions implemented in the subbasin, there is a statistically significant increase in the harvest of targeted stocks; 3) measure the effectiveness of live-capture, selective fishing gears; and 4) collect data on existing and historical fish populations, habitat and passage conditions throughout the subbasin for use in EMAP site selection, EDT modeling, and recovery planning.

Substantial portions of the overall monitoring and evaluation activities associated with the CJDHP will be accomplished through the Okanogan/Similkameen Baseline Monitoring and Evaluation Program [see Appendix G for table aligning monitoring and evaluation actions completed under the two programs].

In addition to coordination with the Okanogan/Similkameen Baseline Monitoring and Evaluation Program, information from other existing and new monitoring and evaluation programs (i.e. Pacific Aquatic Monitoring Partnership), will be integrated into the design of the CJDHP Conceptual Monitoring and Evaluation Program as applicable.

10.3 DESCRIPTION OF CONCEPTUAL MONITORING AND EVALUATION PROGRAM

To accomplish the CJDHP goals identified above, the CJDHP monitoring and evaluation program is designed to measure progress against a set of performance standards. Those performance standards are summarized in eight categories: legal, harvest, conservation, life history, genetic characteristics, research activities, operation of artificial production facilities, and socio-economic effectiveness. Each performance standard has a corresponding set of performance indicators.

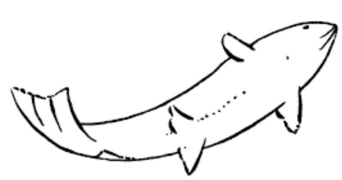
Table 15 provides examples of these performance standards and related performance indicators. A complete list of performance standards and related indicators is included in the Appendix G.

Table 15: Sample Performance Standards and Indicators (partial list)

PERFORMANCE STANDARDS	RELATED PERFORMANCE INDICATORS
LEGAL STANDARDS:	
Programs contribute to fulfilling tribal trust responsibilities and treaty rights. Annual ceremonial and subsistence summer/fall Chinook fisheries are conducted with a minimum harvest of 10,000 fish.	• Total number of fish harvested in Colville Tribes' summer/fall fisheries • Total number of days open to tribal fisheries • Unmet demand for ceremonial and subsistence fish for Colville Tribal members
Programs contribute to mitigation agreements, if any. Measured performance of the hatchery programs meet or exceed performance requirements of any mitigation agreement.	• Performance requirements within each mitigation agreement (number of fish released, returning, or caught) are measured and reported to parties of the agreement
HARVEST STANDARDS:	
Hatchery-origin fish are produced and released in a manner enabling effective harvest while avoiding over-harvest of non-target species. Tribal and recreational harvest is conducted within incidental mortality limitations of ESA permits or plans.	• Annual number of program's hatchery-origin summer/fall Chinook caught in all Columbia River fisheries (Zones 1-6 recreational, Zone 1-5 commercial, Zone 6 treaty, upper Columbia River recreational, Okanogan recreational, CCT Chief Joseph Dam Tailrace, and CCT Okanogan River) • Annual number of steelhead caught and released during summer/fall Chinook fisheries in the Columbia Cascade Province (CCT Chief Joseph Dam Tailrace, CCT Okanogan River, Okanogan recreational, upper Columbia River recreational) • Etc.
CONSERVATION STANDARDS:	
The Integrated Recovery Program on the Okanogan and Similkameen rivers contributes to an increasing number and distribution of spawners returning to the Okanogan, Similkameen, and Columbia Rivers. Natural-origin spawners make up at least 80% of spawning population. Minimum escapement objectives of 3,500 early-arriving and 1,200 later-arriving summer/fall Chinook are met.	• Annual number of summer/fall Chinook spawners in each spawning area, by age (Similkameen River, Okanogan River, Columbia River above Wells Dam) • Spawner-recruit ratios • Annual number of redds in selected natural production index areas • Annual ratio of natural-origin and hatchery-origin summer/fall Chinook on spawning grounds
LIFE-HISTORY CHARACTERISTICS:	
Fish collected for broodstock are taken throughout the return or spawning period in proportions approximating the timing and age distribution of the population from which broodstock is taken (once the later-arriving population component is rebuilt).	• Annual temporal distribution of summer/fall Chinook broodstock collection and of natural-origin Chinook at point of collection • Annual age composition of broodstock collected and of natural-origin fish at the point of collection

Table 15: Sample Performance Standards and Indicators (partial list) - cont.

PERFORMANCE STANDARDS	RELATED PERFORMANCE INDICATORS
GENETIC CHARACTERISTICS:	
Patterns of genetic variation within and among natural populations do not change significantly as a result of artificial production.	• Genetic profile of Okanogan basin natural-origin summer/fall Chinook, as measured at program's outset (e.g. through DNA or allozyme procedures) is compared to genetic profiles developed in subsequent generations
Collection of broodstock does not adversely impact the genetic diversity of the naturally-spawning population.	• Annual number of natural-origin summer/fall Chinook at point of broodstock collection • Annual escapement to spawning grounds compared to the minimum effective population size (when established) required for each spawning population • Timing of broodstock collection compared to overall run timing
RESEARCH ACTIVITIES:	
The artificial production program uses standard scientific procedures to evaluate various aspects of artificial propagation.	• All program research employs scientifically based experimental design, with measurable objectives and hypotheses
OPERATION OF ARTIFICIAL PRODUCTION FACILITIES:	
Artificial production facilities are operated in compliance with all applicable fish health guidelines and facility operation standards and protocols such as those described by IHOT, PNFHPC, the Co-Managers of Washington Fish Health Policy, and INAD.	• Compliance with guidelines, standards, and protocols are reported in annual reports • Periodic reviews and audits are conducted, particularly in the programs' early years
SOCIO-ECONOMIC EFFECTIVENESS:	
Cost of program operation does not exceed the net economic value of fisheries in dollars per fish for all fisheries targeting this population or does not exceed other available options to provide fish to satisfy tribal trust responsibilities.	• Total cost of program operations. • Sum of ex-vessel value of commercial catches and monetary value of recreational fisheries targeting these summer/fall Chinook (based on proportion of summer/fall Chinook in harvest) • Total Colville Tribal harvest and harvest by other tribes • Cost of feasible and available alternatives to provide similar or better tribal harvest for Colville and other tribes



10.3.1 SAMPLE CONSERVATION AND PERFORMANCE OBJECTIVES

Following are a sampling of preliminary objectives consistent with the CJDHP performance standards and performance indicators.

OBJECTIVE 1:

Program Coordination and Administration - Plan for, administer, and coordinate project activities

Methods:

Effective implementation and analysis of the monitoring and evaluation program and coordination with other regional monitoring and evaluation programs requires extensive coordination among co-managers. This will be achieved through regularly scheduled meetings, formal and informal consultations, and document preparation, submittal and review.

Monthly Technical Oversight Team meetings will be established to share information and develop solutions to problems. This Technical Oversight Team would include participation from team members, project partners and state and federal co-managers. Through these and other forums the CJDHP program monitoring and evaluation activities will be coordinated with activities of the Mid-Columbia Coordination Committee, Columbia Basin Fish and Wildlife Authority, HCP Hatchery Committee, and Canadian recovery efforts.

OBJECTIVE 2:

Integration with Okanogan River Baseline Monitoring and Evaluation Program - Coordinate activities, share staff, resources, and data to ensure that the objectives of these two closely linked Monitoring and Evaluation Programs objectives are achieved in the most comprehensive and cost effective manner.

Methods:

The CJDHP monitoring and evaluation plan will be closely coordinated with the Okanogan Baseline Monitoring and Evaluation Plan (scheduled to begin in 2004). Together the two complementary monitoring and evaluation plans will provide information about conditions within and outside of the hatchery walls. The Okanogan Baseline Monitoring and Evaluation Plan will use the Environmental Protection Agency's EMAP protocol. Project staff, resources, and data will be shared between the two monitoring and evaluation projects to the extent possible. If necessary, data collection protocols will be adjusted to fit the information needs of both efforts. Habitat assessment within the Okanogan subbasin will be conducted under the Okanogan/Similkameen Baseline Monitoring and Evaluation Program. A corresponding assessment will be continued under the Hatchery monitoring and evaluation plan in the Columbia River mainstem above Wells Dam and possibly to include Rufus Woods Lake.

OBJECTIVE 3:

Fish Marking - Mark release groups of hatchery origin juvenile summer/fall Chinook and representative numbers of natural-origin summer/fall Chinook in a manner sufficient to satisfy the information needs and protocols necessary to determine the impacts to natural- and hatchery-origin fish in terms of: fisheries, spawning escapement, juvenile outmigration timing, and relative survival rates.

Methods:

To facilitate program evaluations, all hatchery-origin summer/fall Chinook will be adipose fin clipped and about 40% coded wire tagged using standardized methods. Unique tag codes will be used for each treatment group. In addition, a minimum of 800 hatchery-origin summer/fall Chinook from each treatment group will be PIT tagged to allow comparisons of outmigration timing and survival. Similarly, a minimum of 800 naturally produced juvenile summer/fall Chinook will be PIT tagged to allow comparisons to hatchery treatment groups. PIT tagging will be conducted using standardized methods. Fish less than 60mm will not be PIT tagged.

OBJECTIVE 4:

Facility Operation and Fish Health - Monitor operation of artificial production facilities to ensure compliance with all applicable fish health guidelines and facility operation standards and protocols such as those described by IHOT, PNFHPC, the Co-Managers of Washington Fish Health Policy, and INAD.

Methods:

Artificial production facilities will be operated in accordance with established fish health guidelines and facility operational standards and compliance will be monitored. Protocols will be developed for weir/trapping operations to minimize stress, injury, and/or mortality to natural populations. A professional pathologist in accordance with established fish health guidelines will examine hatchery fish. Natural-origin fish will also be periodically sampled at traps/weirs for disease occurrence. Distribution of carcasses or other products for nutrient enhancement will be accomplished in compliance with appropriate disease control regulations and guidelines, including state, tribal, and federal carcass distribution guidelines. Spatial and temporal spawning distribution above and below weir/trap will be monitored through spawning surveys and compared to historical distribution to verify that adult brood stock collection does not significantly alter spatial and temporal distribution of any naturally produced population.

OBJECTIVE 5:

Habitat Assessment - Conduct assessment of habitat conditions and environmental factors affecting migration or survival of summer/fall Chinook in the mainstem Columbia River above Wells Dam and in the Okanogan River.

Methods:

Habitat assessment within the Okanogan subbasin will be conducted under the Okanogan Baseline Monitoring and Evaluation Program. Those areas relevant to the CJDHP that are not addressed through the Okanogan Baseline Monitoring and Evaluation Program (i.e. Wells Dam to Chief Joseph Dam) will be covered through a corresponding assessment conducted as part of the CJDHP monitoring and evaluation program.

OBJECTIVE 6:

Acclimated Juvenile Chinook Performance - Evaluate acclimated juvenile Chinook salmon performance in terms of juvenile growth, survival, and migration, as these are critical indicators of the success of hatchery supplementation in rebuilding natural populations of Chinook salmon.

Methods:

Approximately 100 fish from each Pond will be randomly sampled before release and fork lengths and weights recorded. Length and weight data for migrating Chinook salmon smolts will also be collected in screw traps downstream of acclimation facilities. At least 800 fish from each captive brood treatment group and 800 conventional- origin juveniles will be PIT tagged. Date and time of release for volitional-release and forced-release fish will be obtained using PIT tag readers on outlet pipes. Data on arrival timing of PIT-tagged wild and hatchery-origin smolts will be obtained from the PTAGIS database for all recovery locations downstream.

OBJECTIVE 7:

Natural Productivity and Species Interactions - Optimize natural production of Chinook salmon while managing adverse impacts from interactions between and within species and stocks. This objective includes maintaining Okanogan Chinook natural production and escapement at a level that would contribute an annual average of (XXX - to be determined through a combination of EDT analysis and recovery planning processes) adult fish to the Okanogan subbasin and consistently greater than (XXX- to be determined through a combination of EDT analysis and recovery planning processes) spawners per year.

Methods:

Local broodstocks of known natural component from the target population will be used for supplementation. Natural production (presmolt, smolt and adult numbers) and productivity (survival, life stage characteristics, pathogens, straying, and genetic composition) of supplemented populations will be monitored and compared to a baseline. Predation of naturally produced fish by artificially produced fish will also be evaluated.

OBJECTIVE 8:

Life History Characteristics - Monitor and evaluate life history characteristics of production fish to ensure that characteristics of the natural population are retained.

Methods:

Records will be maintained of the annual number of hatchery-origin juveniles released in natural rearing areas in the Okanogan subbasin, Columbia Cascade Province, and Columbia Basin by life stage to ensure that release numbers do not exceed estimated basinwide and local habitat capacity, including spawning, freshwater rearing, migration corridor, and estuarine and near-shore rearing. Spawning ground survey data will be collected through the Okanogan Baseline Monitoring and Evaluation Program including fork length, sex, percent spawned, scales, and marks.

OBJECTIVE 9:

Harvest - Monitor and evaluate harvest of hatchery-origin fish to ensure that production and release strategies allow effective harvest while avoiding over-harvest of non-target species.

Methods:

Juvenile hatchery-origin summer/fall Chinook will be marked (40% coded wire tagged and 100% fin clipped, Objective 3) to allow monitoring of the annual number of adults caught in all Columbia River and ocean fisheries. Non-target species (steelhead) will also be intercepted during these fisheries and information regarding steelhead catch and escapement will also be collected and assessed. Annual catch, catch per unit of effort, total effort, escapement, and mark recovery information will be collected through cooperation with established information sources (WDFW, ODFW, PSMFC, etc.).

OBJECTIVE 10:

Genetics - Monitor and evaluate changes in genetic composition of target and adjacent populations following supplementation to manage genetic risks (extinction, loss of within- and between population variability, and domestication selection) to all stocks and to conserve and/or expand Okanogan stocks of Chinook salmon (identify and minimize artificial mixing of genetic stocks in the Okanogan and Methow subbasins).

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Methods:

Tissue samples will be collected from target and adjacent populations to establish baseline genetic composition and evaluate long-term changes to establish that patterns of genetic variation within and among natural populations do not change significantly as a result of artificial production. Tissues samples will be analyzed to evaluate genetic differences that may occur over time within mainstem Okanogan and mainstem Columbia River Chinook populations and for comparison with other Chinook populations in the Columbia Basin and upper Columbia region.

OBJECTIVE 11:

Socio-economic effectiveness - Determine cost of program operation to verify that it does not exceed the net economic value of fisheries in dollars per fish for all fisheries targeting this population or does not exceed other available options to provide fish to satisfy tribal trust responsibilities.

Methods:

Total program and component costs will be determined and compared to monetary and non-monetary societal program benefits. Cost of feasible and available alternatives to provide similar or better tribal harvest for Colville Tribes and other tribes will also be evaluated. Juvenile production costs will be calculated and compared to other regional programs designed for similar objectives to verify program cost efficiency. Cost of providing increased harvest opportunities for all fishers consistent with requirements of genetic, natural production, and experimentation objectives will also be addressed.

OBJECTIVE 12:

Legal Standards - Operate CJDHP to be consistent with tribal trust responsibilities and treaty rights, mitigation agreements, and ESA responsibilities.

Methods:

Monitoring and evaluation activities will take into account total number of fish harvested, total fishing days, unmet demand for ceremonial and subsistence fish, total number of fish harvested in Zone 6 treaty fisheries.

10.3.2 RESEARCH

In the ISAB's 2000 report to the Council, ISAB members cite a number of unanswered, and critical, questions that persist around the topic of supplementation. Resolution of these questions will require formal and rigorous experimental design supported by substantial commitments of resources and infrastructure. Research to address a number of these critical questions is currently being conducted in the Imnaha, Yakima, Deschutes, Tucannon, and other river systems in the Columbia basin.

The CJDHP does not contain a major research component. Inclusion of a major research component in the CJDHP is cost-prohibitive. Furthermore, the current lack of baseline data for much of the Okanogan subbasin posses an impediment to some research (this lack of baseline data will be addressed through the Okanogan/Similkameen Baseline Monitoring and Evaluation Program). Instead, the CJDHP will focus on establishing an effective and thorough monitoring and evaluation program designed to answer the smaller-scale, but equally important uncertainties associated with the CJDHP. The Colville Tribes and others involved in the implementation of the CJDHP are following progress of supplementation research throughout the region with great interest and plan to incorporate relevant findings into the CJDHP as such information becomes available.

10.3.3 REPORTING, DATA DISSEMINATION, AND COORDINATION

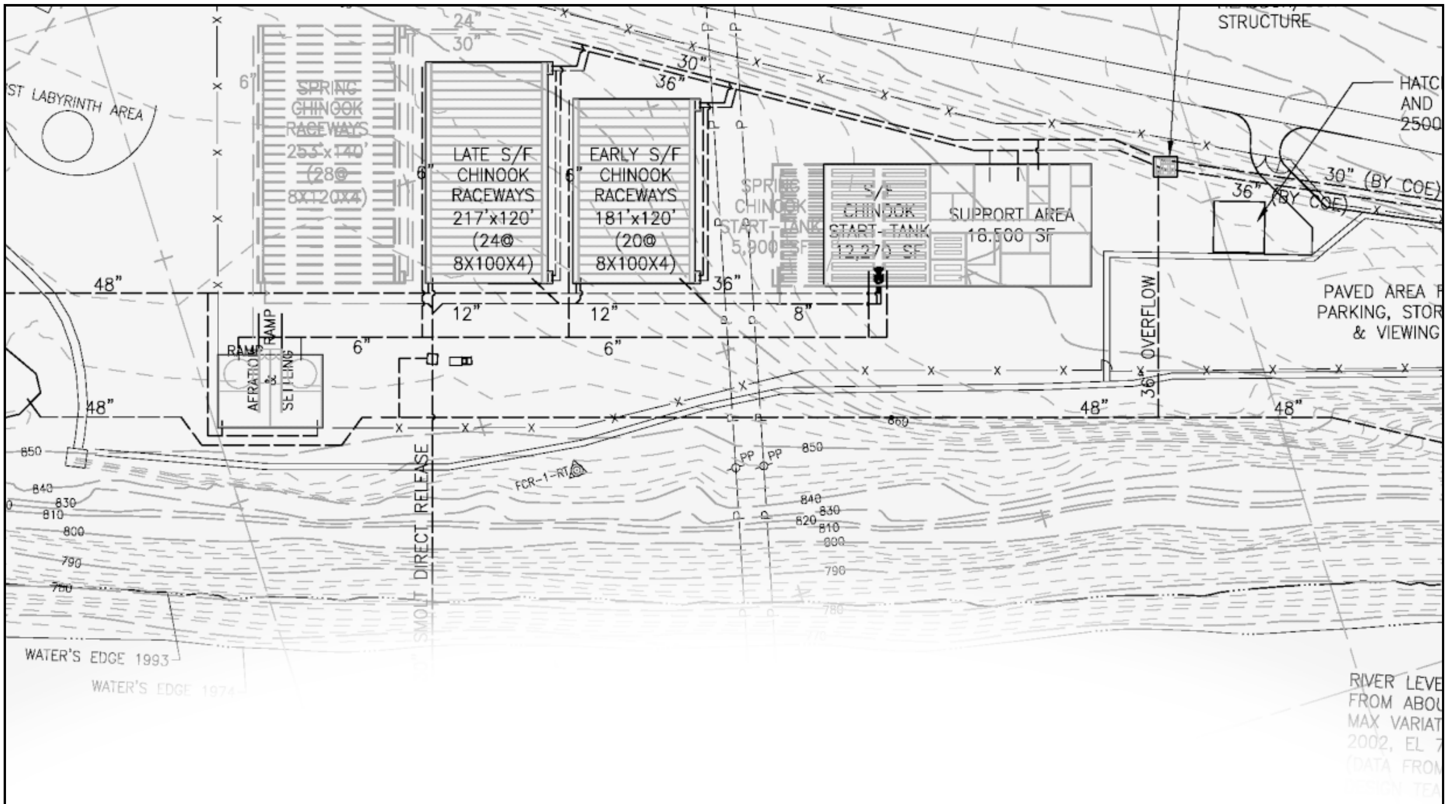
There are many uncertainties associated with salmon recovery at both the macro and micro scale. Research, monitoring and evaluation activities are essential to answering some of those uncertainties. In order to be most useful to decision-makers and program managers, the raw data and information obtained through monitoring and evaluation programs needs to be collected, analyzed, and broadly disseminated. Development of standardized data collection and reporting protocols, publicly accessible databases (particularly web-based), and coordination among monitoring and evaluation programs occurring at different scales and geographic areas is also vital to the short and long-term effectiveness of monitoring programs.

Data collected through the CJDHP Monitoring and Evaluation Program will be stored in an electronic data archive that is being developed as part of the Okanogan/Similkameen Baseline Monitoring and Evaluation Program. The data archive will consist of standardized Access/Excel database formats and will be compatible with similar database standards used by BPA and others. Access to this data will be unrestricted. Data collected in the CJDHP Monitoring and Evaluation Program and Okanogan/Similkameen Baseline Monitoring and Evaluation Program will be stored in the short-term in this system. In the long-term data will be delivered to other entities and programs for inclusion in larger regional monitoring and evaluation programs (i.e. PNAMP) and for inclusion in local and regional datasets (i.e. Upper Columbia Regional Technical Team, Columbia Basin Fish and Wildlife Authority, StreamNet, IBIS, and SSHIAP).

The Okanogan/Similkameen Baseline Monitoring and Evaluation Program will include development and maintenance of a project website. Information gathered as part of the CJDHP Monitoring and Evaluation Program will be incorporated on this website. The website will be password protected on the data entry side while also providing a public portal. An FTP transfer protocol and secure site will also be developed for interim data access and transfer.

The CJDHP Monitoring and Evaluation Program will also produce annual reports for BPA and other appropriate (i.e. Council, co-managers, Upper Columbia Regional Technical Team, Upper Columbia Salmon Recovery Board) entities to fulfill program requirements and provide additional levels of coordination and accountability. Where appropriate, reports will also be published in peer-reviewed journals.

Staff associated with the CJDHP Monitoring and Evaluation Program will also participate in annual monitoring and evaluation symposia and coordination meetings in the upper Columbia Basin (including coordination with Canadian entities) and coordinate with the oversight committee that will be established as part of the Okanogan/Similkameen Baseline Monitoring and Evaluation Program.



11.
Facility
Conceptual Design

Chief Joseph Dam Hatchery Program
MASTER PLAN

11

Facility Conceptual Design

The following chapter includes a summary of the conceptual design of the CJDHP facilities. The first section of this chapter includes an overview of the results of a preliminary hatchery water supply study, subsequent sections include an overview of the proposed Chief Joseph Dam Hatchery fish rearing facilities, new and existing acclimation ponds, and other necessary hatchery related facilities.

11.1 WATER SUPPLY

Water is the essential component of a hatchery facility. As part of the Step 1 conceptual facility design work for the CJDHP, the U.S. Army Corps of Engineers (COE) was contracted to perform a limited study of water sources for the hatchery facility. The purpose of the study was to evaluate and confirm potential water sources for the proposed hatchery at the Chief Joseph Dam site, evaluate and confirm the quality of those water sources, recommend a preferred water source(s), recommend possible water conveyance methods, and provide preliminary cost estimates associated with water conveyance. In addition, in their study the COE sought to determine if the necessary water could be provided in a manner that did not pose a risk to dam safety, and that would pose minimal cost to the federal government.

The COE's final report includes a summary of available water sources, the range of alternatives considered, groundwater, hydraulic analysis, structural require-

Relationship of Conceptual Design to CJDHP Guiding Principles

Accountability
- Use of inter-disciplinary planning team in design development to identify best approaches, and reduce uncertainty and inconsistencies later in the project

Best Available Science
- Facility design incorporates latest information related to disease control and early rearing environments
- Use of low density rearing in all facilities

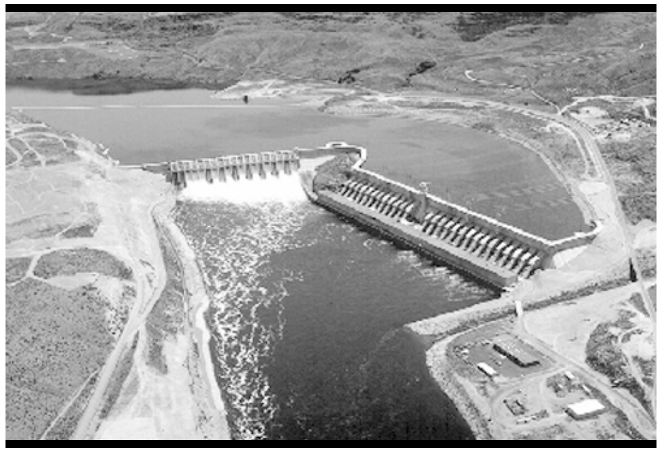
Cost-Effectiveness
- Inclusion of value analysis (value engineering) in preliminary planning design
- Use of existing irrigation ponds for acclimation facilities
- Potential for shared use of some facilities and staff (e.g. Colville Trout Hatchery)

Flexibility
- Variable water temperature management
- Variable release locations
- Inter- and intra-program adaptability
- Design allows for future changes related to brood collection, eggtake, incubation and rearing

Innovation
- Unique water supply (e.g. of water supplies at the dam allow for creative water temperature mixing to mimic natural environmental situations)
- Use of live-capture, selective fishing gear to collect broodstock

ments, water quality data, and a cost estimate to deliver water necessary to the operations of the Chief Joseph Dam Hatchery facility to the hatchery headbox [see Appendix F].

A more detailed investigation will be required in the next phase of design to confirm the assumptions and cost estimates developed in the COE study and to address dam safety issues. In particular, information regarding the availability, quantity and quality of the water supply in the aquifer above Chief Joseph Dam (possible wells near State park) will need to be further refined. The temperature of water at various depths near the Rufus Woods Lake intake will also need to be determined. Moreover, the water requirements for the hatchery facilities will be additionally refined in the next planning stages. These issues will need to be addressed in the Step 2 planning process.



Source: U.S. Army Corps of Engineers

FIGURE 27: Photo Chief Joseph Dam

The following sections summarize key findings of the water supply report. The complete COE Chief Joseph Dam Hatchery Water Supply report is presented in Appendix F. The complete discussion of the conceptual facility design is included in Appendix G.

11.1.1 BACKGROUND

Project consultants working with the Colville Tribes provided the COE with initial estimates of water requirements for the Chief Joseph Dam Hatchery facilities. These requirements included fish rearing and fish attraction water. Specific water requirements for fish rearing were later refined based on a bioengineering model developed by Tetra Tech/KCM to establish the quantities of each water source necessary to meet the various rearing program temperature and biological flow requirements.

Based on these preliminary estimates the COE reviewed a number of potential sources of water and narrowed the options down to three preferred sources. These preferred water sources include: a relief tunnel that extends approximately 1,000-feet from the northwest end of the Dam's Monolith 1, to below the right abutment Chief Joseph Dam; water from Rufus Woods Lake reservoir; and groundwater wells located in a State park approximately 2.5 miles upstream of the hatchery site. The COE's water report includes review of a number of other water sources that were considered and discussion of the reasons they were not deemed suitable choices.

The conceptual design of the Chief Joseph Dam Hatchery requires a combination of reservoir water from the Rufus Woods Lake and groundwater to meet the various rearing program temperature and biological flow requirements. The water from groundwater sources will be mixed with the reservoir water to cool or warm (depending on the season) the temperature of the reservoir water in order to meet optimal juvenile fish rearing conditions.

Reservoir water is desirable because it will allow fish to be reared on their home waters, as well as providing a readily available and reliable water supply. Water from the relief tunnel is desirable for hatchery operations because the water temperature is 6-months out of phase with the temperature of the surface water. Therefore, the relief tunnel water will be warm in the winter and cool in the summer relative to the temperature of the river or reservoir water. Similarly, water extracted from the right bank groundwater wells would provide similar temperature variations.

11.1.2 RECOMMENDED WATER SOURCES

The Colville Tribes' hatchery consultants identified the maximum flow requirement for summer/fall Chinook of 24.5 cfs from the relief tunnel and wells, and 22 cfs from the reservoir. (If spring Chinook are added these flow requirements increase to 36.5 cfs of groundwater and 44 cfs of reservoir water.) The hatchery design is ongoing and the flow requirements are subject to further revision.

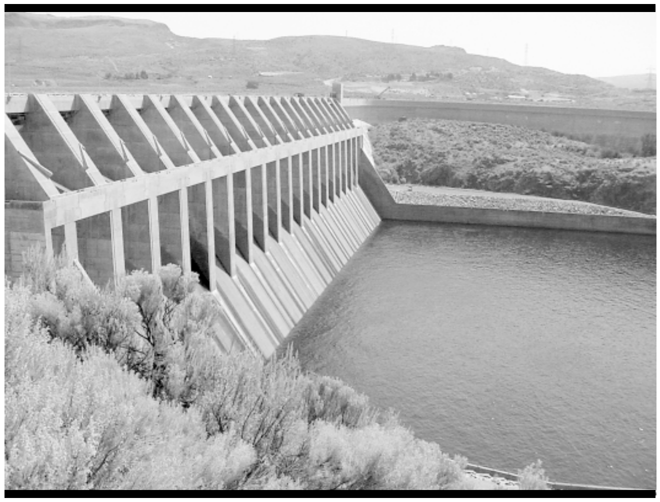

Bill Towey

FIGURE 28: Photo Chief Joseph Dam from Right Abutment

The COE's preliminary study determined that approximately 20 cfs could be supplied from the relief tunnel by enlarging the existing relief tunnel sump and installing a 450 HP pump. Approximately 45 cfs can be provided from the reservoir by opening an existing, but never used, irrigation inlet and outlet on the upstream and downstream faces of the dam, and installing a 30-inch diameter metal pipe with an emergency gate valve, trash rack, fish screen, and stoplogs. Additional groundwater could be obtained form the aquifer located above Chief Joseph Dam.

11.1.2.1 Relief Tunnel

The relief tunnel would be used to provide mixing water for the hatchery fish rearing facilities. As noted previously, the relief tunnel water is desirable because of its quality and because its temperature is approximately six months out of phase with river and reservoir water.

The relief tunnel at the Chief Joseph Dam extends approximately 1,000-feet from the northwest end of Monolith 1 past the right abutment. Access to the relief tunnel is provided via galleries located in the interior of the dam. The tunnel was designed to reduce pore pressure in the soil of the Dam's right abutment. Water drains into the relief tunnel through wells located in the floor of the tunnel. These wells are constructed of wood staves. Outflow from the tunnel was originally 95 cfs at the time of the relief tunnel's construction. For the past 20-30 years the outflow has been 20-25 cfs. The tunnel drains into a sump, which in turn connects to a 4-foot diameter conduit. This conduit exits through the spray wall north of spill bay number one. The elevation of the bottom of the sump is 777 feet. The tunnel is typically flooded with water because the elevation of the tail water is generally above the elevation of the relief tunnel outlet at elevation 783 feet [see Appendix F for additional detail including schematics].

The quality of the relief tunnel water is good due to the filtering effects of the granular media through which the water percolates to the relief tunnel. This filtration is assumed to remove parasitic organisms that could be detrimental to the health of juvenile fish.

Obtaining water from the relief tunnel will require physical changes near Chief Joseph Dam and may create dam safety impacts that will need to be investigated during the next phase of design. Structural modifications near the dam will be required to access the relief tunnel. The existing sump and part of the relief tunnel will have to be demolished and a new larger sump and weir installed. Pumps will be required to remove the water from the sump and lift this water to a pipeline that would be connected to the fish hatchery.

11.1.2.2 Irrigation Inlet

An existing irrigation inlet would be used to provide water for the hatchery from Rufus Woods Lake. The irrigation inlet is located in Monolith No. 2 on the right side of the dam. This inlet was built during the initial dam construction but has never been used. The irrigation inlet will require a new gate and construction of internal walls and decking before use. Water from the inlet will flow through a closed pipe to the hatchery site.

The elevation of the outlet is 920 feet. The water from the inlet would drop 50 feet over a distance of 2,700 feet to the hatchery headbox at elevation 870. The inlet has two openings that are 4-feet wide and 5-feet high.

There are a number of concerns that will need to be addressed in developing this water source. The right bank is composed of material that is easily eroded. In addition, the increase in the moisture in the soils that compose the right bank could result in a decrease in slope stability. Any pipeline constructed in the right bank must be free of leaks and placed in a lined trench that is well drained. Monitoring instruments, such as open standpipe, will be required along the alignment of the pipe to allow testing for the presence of pipe leakage or the presence of water in the trench due to infiltration of precipitation.

11.1.2.3 Right Bank Well Field

Water from the well fields would be used to provide additional mixing water for the fish rearing facilities at the hatchery. In addition to the water required for hatchery operations, the well water may be necessary to provide potable water for a small number of residences associated with the hatchery facilities.

At this stage of planning the COE study recommended installation of a well field approximately 2.5 miles upstream in a nearby state park. This location is upstream of an impermeable seepage blanket on the right bank. The subsurface geology and the presence of water bearing strata capable of providing the required hatchery flows will determine the size and design of the well field(s). Additional testing to determine the quantity, quality and accessibility of this water source will be necessary in Step 2.

11.1.3 WATER CONVEYANCE

In order to obtain hatchery water from either the relief tunnel or Rufus Woods Lake, pipelines approximately 3,000 feet long will need to be constructed on the north bank of the river from the base of the spillway.

Conveyance of the relief tunnel water to the hatchery site will require a 20-inch diameter metal pipe. Conveyance of the reservoir water will require a 30-inch diameter metal pipe. The pipes will need to be buried for seismic and security considerations and would run approximately 300 feet through the riprap on the embankment and approximately 2,400 feet under the existing road. This will require demolition and repaving the road and excavating a pipe trench 8-feet deep by 11-feet wide.

At this time, it is understood that the COE will be responsible for development of the water sources from both the Rufus Woods Lake and the relief tunnel to the hatchery site. The COE will design and construct the facilities necessary to convey the required water volumes from each source to an agreed upon location in the vicinity of the main hatchery headbox.

11.1.4 WATER QUALITY

Initial water quality testing of samples from the relief tunnel and the reservoir forebay at the elevation of the irrigation intake indicates good water quality at the relief tunnel and forebay locations. Neither the WDFW nor Washington Department of Ecology (WDOE) water quality criteria were exceeded in either case. The water quality parameters that were monitored show little difference between the relief tunnel and the forebay samples. Water quality samples will be collected at the relief tunnel, forebay, and hatchery well site in the spring and summer to determine if any seasonal variations in water quality exist for these source waters.

11.1.5 WATER REQUIREMENTS

11.1.5.1 Fish Rearing Water

Based on the size of the raceways, rearing densities, water mixing requirements (temperature) and other considerations, summer/fall Chinook flow requirements for the hatchery were identified as 24.5 cfs from the relief tunnel, and 22 cfs from the reservoir.

If spring Chinook facilities are included at the hatchery the required water quantities for water mixing to achieve desired temperatures would increase to a total of 36.5 cfs from the combined relief tunnel and well sources, and 44 cfs from Rufus Woods Lake.

11.1.5.2 Attraction Flow Water

In addition to the water requirement for fish rearing, approximately 500 cfs will need to be supplied from the Columbia River via low head pumps in order to provide adequate attraction flow at the fish ladder to the hatchery. Rearing water from the hatchery will provide the ladder flow from the adult holding ponds to the fishway entrance at the river bank.

11.1.5.3 Potable Water

Potable water is currently supplied to the nearby COE Visitor Orientation Center from the City of Bridgeport through a 2-inch water line that crosses the river attached to the SR-17 bridge. The City of Bridgeport has indicated that it cannot add more services to its water system until significant improvements are made to the system and approval is obtained from state agencies. If in the future Bridgeport has water available to provide service to the hatchery, a larger pipeline would need to be constructed across the bridge.

There does not appear to be sufficient groundwater available near the hatchery site to develop a well. If wells are developed in the nearby state park and water lines extended to the hatchery for fish production, the water could also be used for a potable source. Further analysis and design of a potable water system will be performed in Step 2 of the Council's three-step process.

11.2 MAJOR PROJECT ELEMENTS

The Council's Step 1 Master Planning process requires development of a conceptual design for artificial production facilities. Additional refinements of the facility design will be made at Step 2, and a final design would be presented at Step 3.

Table 16: Summary of Proposed CJDHP Summer/Fall Chinook Production Programs

Program Number[a]	Release Numbers	Release Age	Transfer Date	Transfer Size	Transfer/ Release Location	Release Date	Release Size
BASIC PROGRAMS							
Early Summer/Fall Chinook							
1.1	200,000	Sub-yearling	-	-	CJDH	6/15	40/lb
2.1	300,000	Yearling	-	-	CJDH	4/15	10/lb
2.2	400,000	Yearling	10/30	25/lb	Riverside Pond	4/15	10/lb
Late Summer/Fall Chinook							
3.1	300,000	Sub-yearling	4/15	100/lb	Omak Pond	6/15	50/lb
3.2	200,000	Sub-yearling	-	-	CJDH	6/15	50/lb
4.1	400,000	Yearling	10/30	25/lb	Omak Pond	4/15	10/lb
4.2	200,000	Yearling	-	-	CJDH	4/15	10/lb
Total	**2,000,000**						

a. Program numbers established in the bioengineering model.

The following sections describe the conceptual design for construction of all of the major new facilities associated with the Chief Joseph Dam Hatchery, and modifications that would be necessary to the existing acclimation ponds. Appendix G contains the complete conceptual design report. Table 16 summarizes the CJDHP summer/fall Chinook production programs.

Figure 29 shows the general layout of the facilities and major piping requirements for the Chief Joseph Dam Hatchery conceptual design. The major elements of the project are as follows:

- **Adult Fish Holding/Spawning** - The adult fish holding/spawning facilities will include a fish ladder with additional attraction water provided by a dedicated pumping station adjacent to the fish ladder entrance. The ladder will climb part way up the embankment to a series of holding/crowding structures and a spawning facility.
- **Incubation** - Within the hatchery building will be an incubation area containing two systems of egg incubation. One system will be a series of jar incubators and the other a series of vertical tray incubators.
- **Start Tanks** - A major portion of the hatchery building will be the start tank room. After the eggs have hatched and reached the "button-up" stage, the fry will be transferred from the incubators to the start tanks, where they will be started on an artificial diet and closely monitored for disease as they grow to a size acceptable for transfer out of the start tank room.
- **Raceways** - Exterior to the hatchery building will be concrete raceways used to extend the growth cycle of the fish rearing programs.
- **Acclimation Ponds** - Some of the rearing programs will be continued in off-site ponds. Water for the acclimation sites will be supplied from surface water sources.

11.3 DESIGN CRITERIA

The firm selected to develop the conceptual design, Tetra Tech/KCM, developed a bioengineering model to analyze each of the proposed fish rearing programs. Each production program was evaluated using the model with the criteria shown in Tables 17 to 21. The model uses a computer spreadsheet format that can be modified if changes in production programs or criteria are considered.

The rearing water sources are Rufus Woods Lake and the north embankment relief tunnel of the Chief Joseph Dam. The monthly average temperature data provided for these sources were converted into weekly average temperatures. The weekly temperature values were input into the bioengineering model to establish the water flow rates required of each source to meet the various rearing program temperature and biological flow requirements. Flow rates were established based upon single-pass systems with no reuse.

Table 17: Bioengineering Criteria for CJDHP – Summer/Fall Chinook Adults

ADULT FISH*

Number of Fish Required (Male and Female Combined)
- Early summer/fall Chinook 286
- Additional early summer/fall Chinook for Riverside option: 222
- Late summer/fall Chinook: 618

Fecundity
- Early and late arriving summer/fall Chinook: .... 5,000 eggs/female

Holding Survival from Capture to Spawning
- Early and late arriving summer/fall Chinook: 90%

Holding Requirements
- Average adult weight: .... 20 lbs
- Minimum flow requirements: .... 1.0 gpm/fish
- Minimum pond turnovers per hour: 1.0
- Density of adults: .... 10.0 cu. ft./fish

* Abbreviations: ctu = Celsius temperature unit; cu. ft. = cubic feet; ftu = Fahrenheit temperature unit; gpm = gallons per minute; K = condition factor; L = length in centimeters; W = weight in grams

Table 18: Bioengineering Criteria for CJDHP – Summer/Fall Chinook Incubation

INCUBATION*

Incubator Information
- Heath incubator half stacks: ..... 8 usable trays/stack
- Water flow per half stack: .... 7.0 gpm
- Incubation temperature: .... 48.0°F

Fertilized Egg Incubator Capacity
- Early and late arriving summer/fall Chinook: .... 5,000 eggs/tray

Estimated Egg Survivals
- Green to eye-up 95%
- Eye-up to ponding 95%

Egg Development
- Green to eye-up
  - Early and late arriving summer/fall Chinook: .... 750 ftu
- Green to ponding
  - Early and late arriving summer/fall Chinook: .... 1,700 ftu

Table 19: Bioengineering Criteria for CJDHP – Summer/Fall Chinook Early Rearing in Start Tanks

TEMPORARY REARING IN START TANKS*

Size at Initial Ponding in Start Tanks
- Early and late arriving summer/fall Chinook: .... 0.45 grams

Size at Transfer to Raceways
- Early and late arriving summer/fall Chinook: .... 0.50 grams

Start Tank Density and Loading Criteria (all fish)
- Water flow requirements: .... 1.0 lbs/in/gpm
- Minimum pond turnover rate/hour: 1.0
- Fish density requirements: .... 0.30 lbs/cu. ft.

Start Tank Size
- Width (ft) 3
- Length (ft) 40
- Depth (ft) 2.50
- Volume in cu ft 300

Survival from Ponding to Transfer to Raceways (fed fry) 95.0%

Expected Growth Rate .... 0.04 mm/ctu/day

Condition Factor Used to Compute Length in Centimeters (K in W=KL^3) 0.01

Table 20: Bioengineering Criteria for CJDHP – Summer/Fall Chinook Rearing in Raceways

REARING IN RACEWAYS*

Size at Transfer to Raceways (fed fry)
- Early and late arriving summer/fall Chinook: .... 0.50 grams

Raceway Density and Loading Criteria (all fish)
- Water flow requirements: .... 1.0 lbs/in/gpm
- Minimum pond turnover rate/hour: 1.0
- Fish density requirements: .... 0.75 lbs/cu. ft.

Raceway Size for Early/Late Summer/Fall Chinook
- Width 8
- Length (feet) 100
- Depth (feet) 3.25
- Volume in cu. ft. 2,600

Raceway Size for Spring Chinook
- Width 8
- Length (feet) 120
- Depth (feet) 4
- Volume in cu. ft. 3,800

Rearing Survivals (all fish)
- Fed fry to fingerling (~10 grams): 95.0%
- Fingerling to smolt (~45 grams): 95.0%

Expected Growth Rate: .... 0.04 mm/ctu/day

Condition Factor Used to Compute Length in Centimeters (K in W=KL^3) 0.01

Table 21: Bioengineering Criteria for CJDHP – Summer/Fall Chinook Rearing in Acclimation Ponds

REARING IN ACCLIMATION PONDS*

Size at Transfer to Acclimation Ponds
- Early and late arriving summer/fall Chinook: .... variable

Pond Density and Loading Criteria (all fish)
- Water flow: .... .7 lbs/in/gpm
- Pond turnover rate/hour: 1.35
- Fish density (maximum): .... 0.75 lbs/cu. ft.

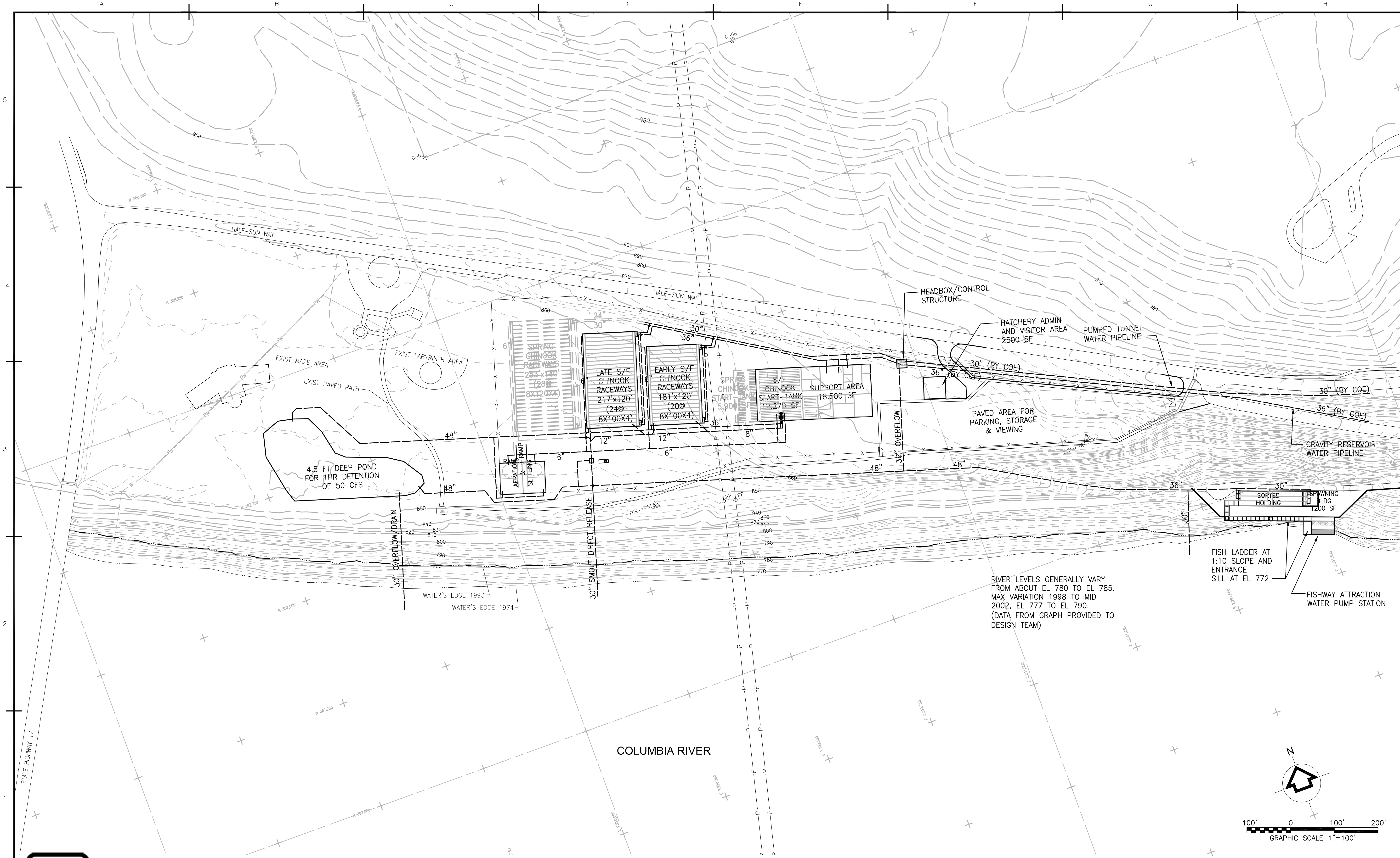
Pond Size Ratio (all fish)
- Width X
- Length 4X
- Depth (feet) 6.0
- Volume .... variable

Rearing Survivals (all fish), transfer to release 95.0%

Expected Growth Rate: .... 0.04 mm/ctu/day

Condition Factor Used to Compute Length in Centimeters (K in W=KL^3) 0.01

* Abbreviations: ctu = Celsius temperature unit; cu. ft. = cubic feet; ftu = Fahrenheit temperature unit; gpm = gallons per minute; K = condition factor; L = length in centimeters; W = weight in grams



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Colville Tribes
CHIEF JOSEPH DAM HATCHERY
CONCEPTUAL DESIGN

FIGURE 29
HATCHERY SITE PLAN

This drawing is full size when 22"x 34" or is reduced to half size when 11"x17"

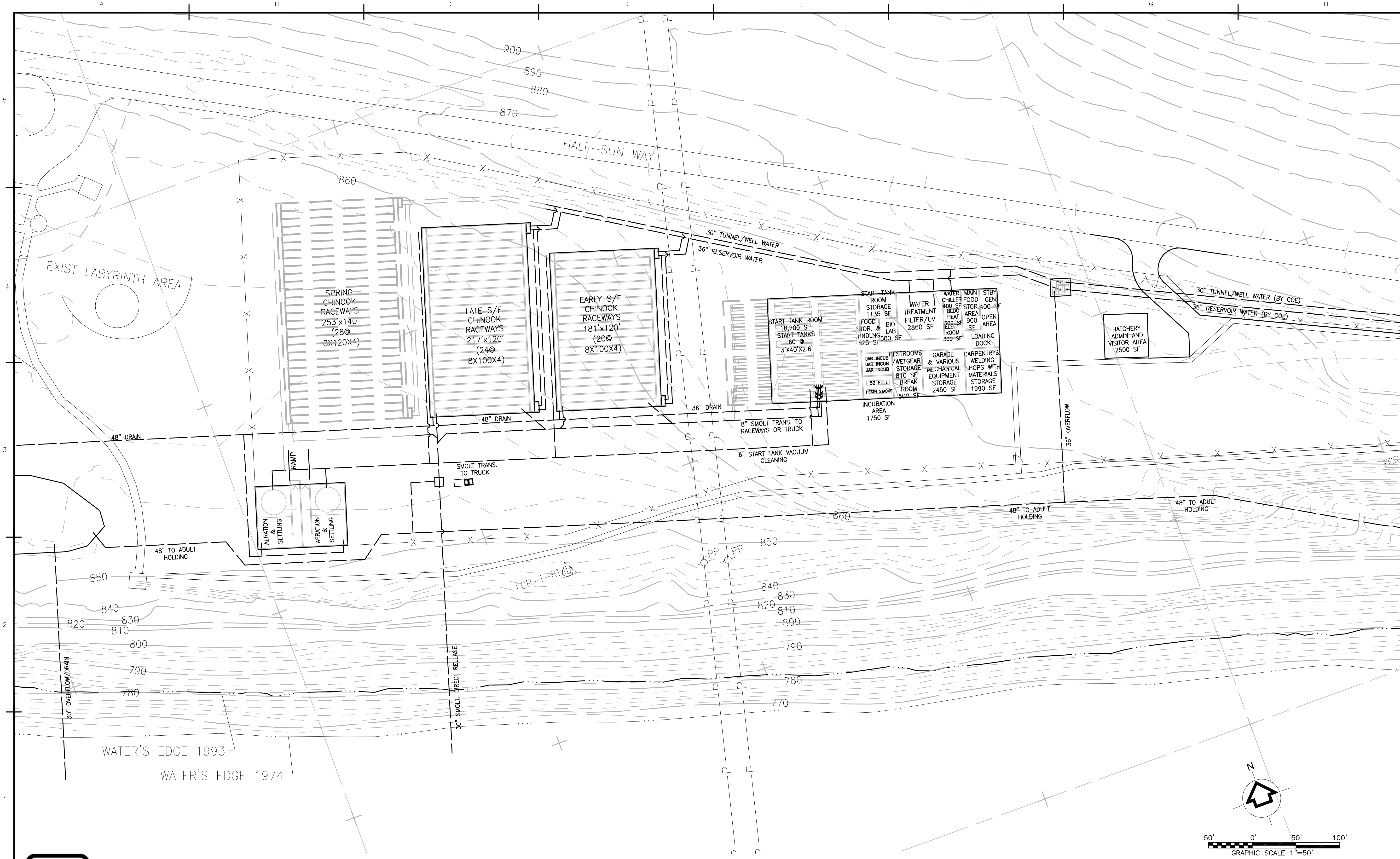

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FIGURE 30
HATCHERY SITE PLAN - ENLARGEMENT
RECEWAY AND HATCHERY BUILDING AREA

This drawing is full size when 22"x 34" or is reduced to half size when 11"x17"

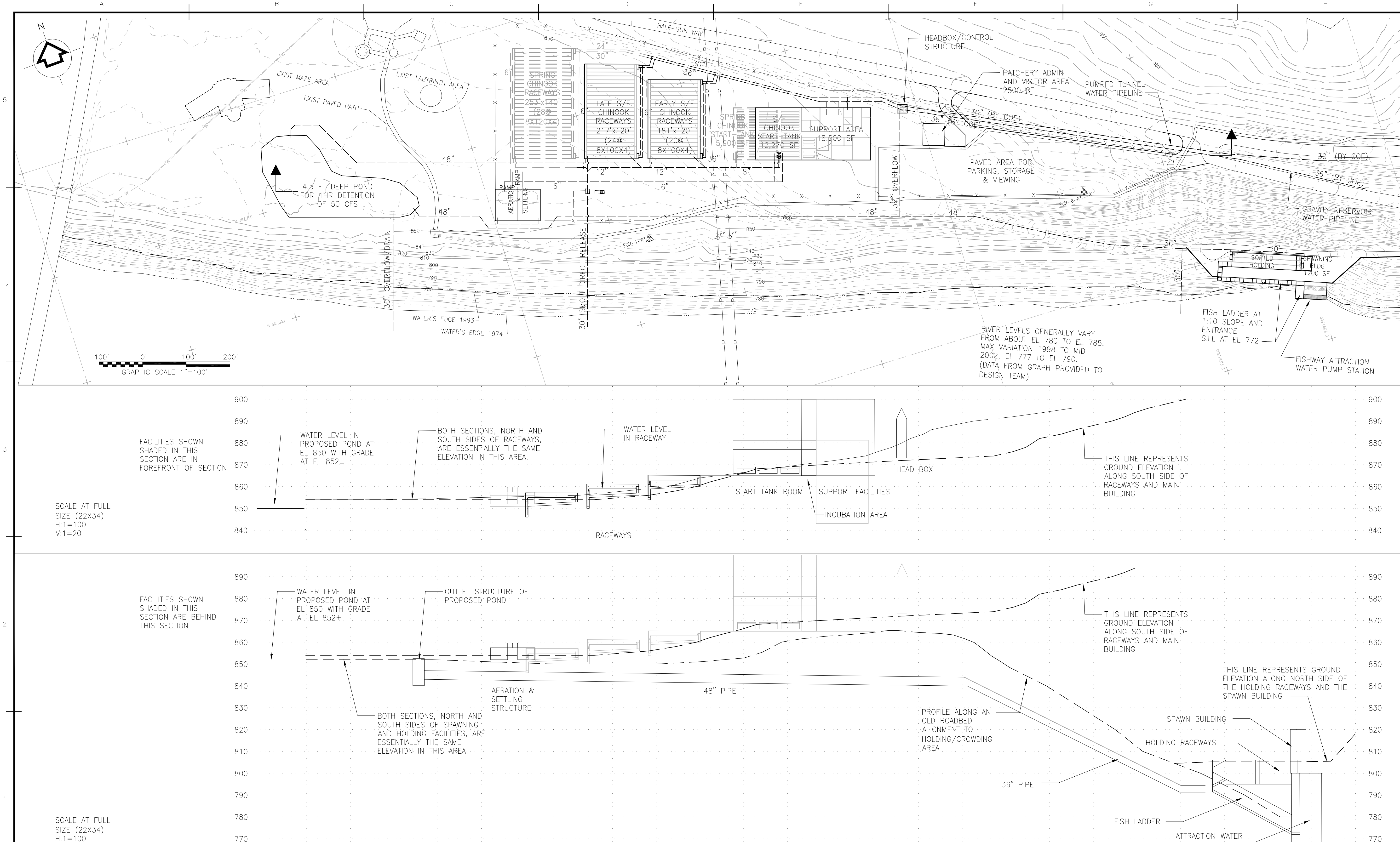

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FIGURE 31
HATCHERY AREA X-SECTIONS

This drawing is full size when 22"x 34" or is reduced to half size when 11"x17"

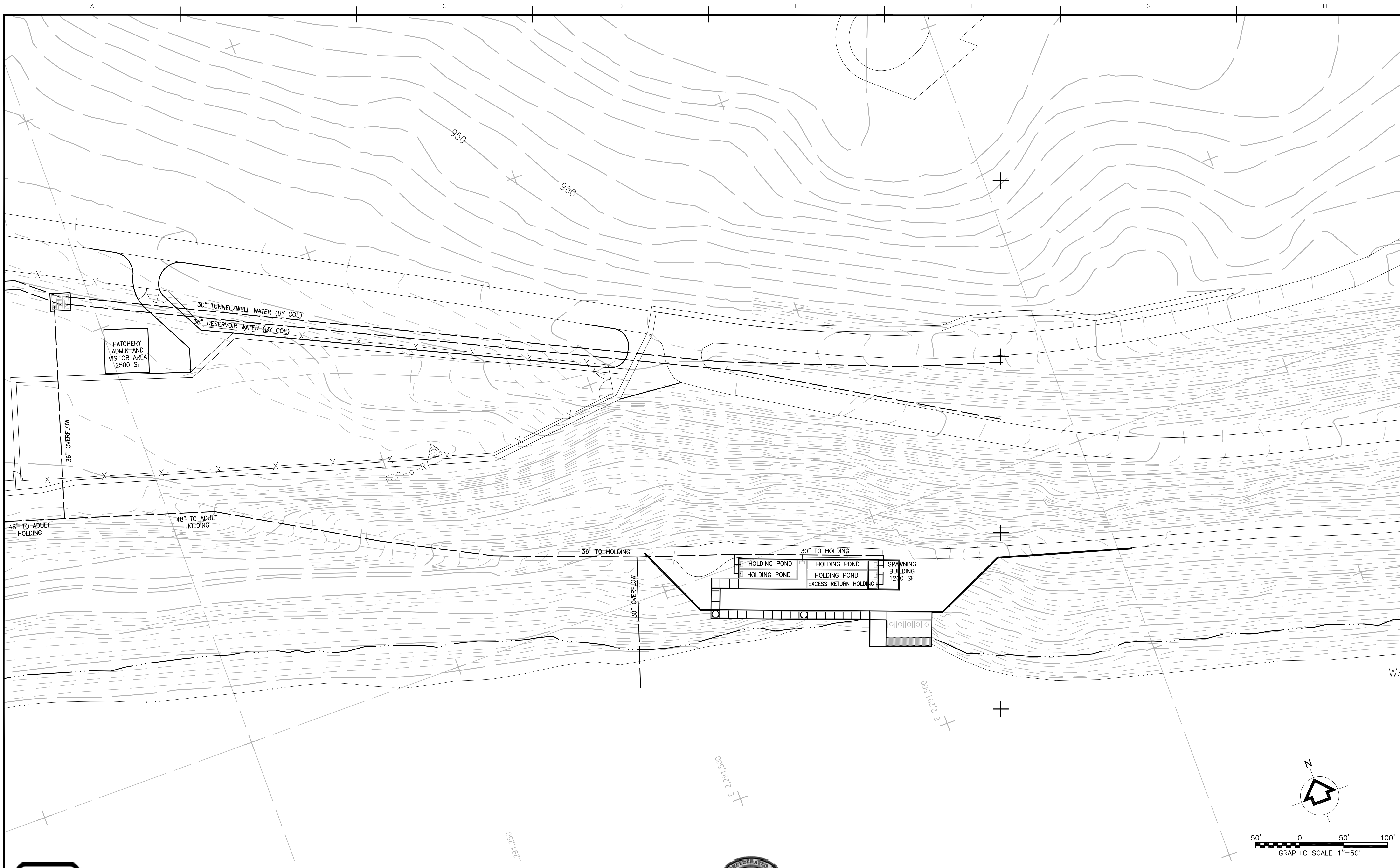

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FIGURE 32
HATCHERY SITE PLAN - ENLARGEMENT
SPAWN AREA AND FISH LADDER

This drawing is full size when 22"x 34" or is reduced to half size when 11"x17"

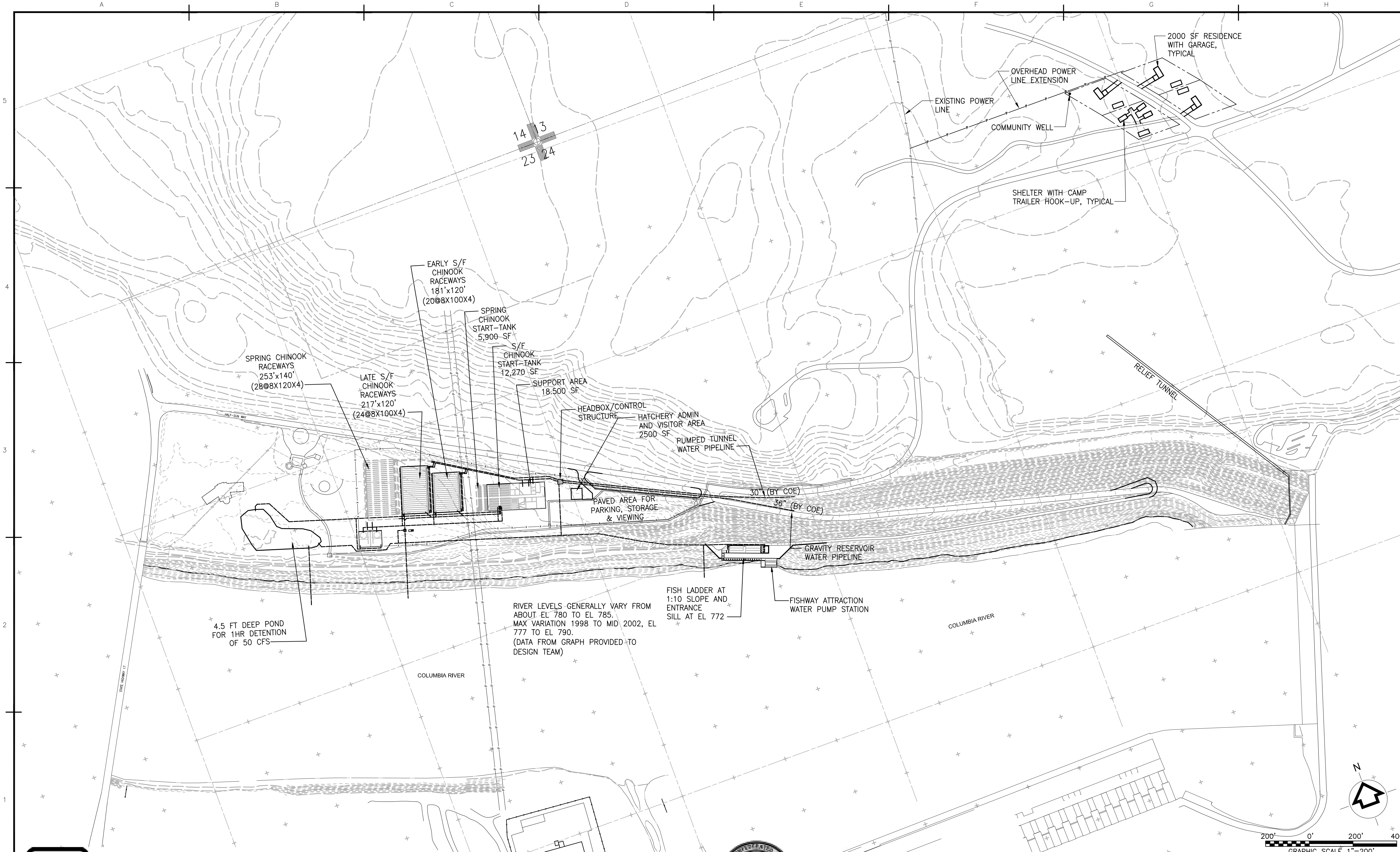

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FIGURE 33
HATCHERY AND HOUSING AREA
SITE PLAN

11.4 CHIEF JOSEPH DAM HATCHERY PROGRAM FACILITY OVERVIEW

11.4.1 HATCHERY SITE

The hatchery site, shown in Figure 29, is generally the plateau area along the right bank of the Columbia River between the Chief Joseph Dam and State Highway 17, extending northward to Half-Sun Way. At the west end of this 24.5-acre area is an existing COE visitor information and picnic area of about 13 acres. The area available for the hatchery development has a general slope from east to west, from elevation 900 feet to elevation 850 feet. The river bank drops from those elevations to the water's edge at about elevation 780 feet.

Vehicle access is provided by Half-Sun Way, which connects to SR-17 about 1,000 feet west of the site. The nearest city is Bridgeport, approximately 1 mile to the southwest across the river.

11.4.2 HATCHERY PLAN

The hatchery plan shown in Figure 30 uses the ground slope to provide as much gravity flow of water as possible. Hatchery cross-sections are shown in Figure 31. The headbox will be located at the site's upper elevation. It will receive water by gravity flow from Rufus Woods Lake above the Chief Joseph Dam and pumped water from the dam's relief tunnel (or a COE-developed well field). Both of those water supplies will be delivered to the headbox by the COE.

Adjacent to the headbox will be the hatchery building, which will contain the incubation area, a start tank room, and water treatment facilities as needed (it is anticipated that this will include a water chilling system for incubation water and drum filters and UV sterilization for treatment of Rufus Woods Lake water). The hatchery building will also contain support facilities such as a food storage room, maintenance shop, vehicle storage, associated storage room, a biological/pathology laboratory, crew restrooms and wet gear storage, crew break room, an electrical power room, a building heat/boiler room, a standby generator room and a general overhead storage area above the start tank room.

Downhill of the hatchery building will be groups of raceways, designed to receive fry by gravity from the start tank room. Each group of raceways will be a concrete structure with a common supply channel and a common drain channel. The common supply channel is anticipated to have multiple channel slots and to have both water sources supplied to each end. This will allow the supply channel to be divided into two segments of variable lengths so that each group of raceways can be used for two separate rearing programs of different temperature requirements. The process is designed for single pass flow with no re-use, although re-use capability could be installed for emergencies or other future needs.

Wastes vacuum cleaned from the start tank room and the raceways will be discharged to an aeration/settling structure located southwest of the raceways. This cleaning system will be operated by gravity. The aeration/settling structure will also receive the drum filter backwash. Normal rearing and drainage flows from the hatchery building and the raceways will go to a detention pond, bypassing the aeration/settling structure. This pond will be sized to provide one hour of detention at the facility's peak flow. Due to the slope and limited area of the hatchery site, the detention pond will be located west of the present COE visitor trail between the information/picnic area and the shoreline-viewing platform. This pond will be incorporated into a constructed wetland to shield the pond and to enhance the visitor experience.

Flow from the detention pond can be released directly to the Columbia River or be directed to the adult holding/spawning area, which will drain down the fish ladder to the river.

The adult holding and spawning facilities shown in Figure 32 will be located along the river bank about 900 feet east of the hatchery building and at an elevation of approximately 810 feet. This will place these facilities above the probable maximum river level while keeping the fish ladder reasonably short. It also will separate the adult/spawning facilities from the incubation and rearing facilities to provide better disease control. Vehicle access to these facilities, shown in Figure 33, will be from a paved road down to the face of the dam and along an existing gravel road that intersects the paved road at an acute angle. Improvements will be required on this access route to provide a flat bed/fish hauling truck turn-around at both the junction of the gravel road with the paved road and at the spawning facility.

A 2,000-square-foot administration and visitor facility will be located at the east end of the hatchery complex. Adjacent to this building will be an area that can be developed for significant parking, including visitor buses and motor home spaces.

Housing for some of the permanent staff, and camp trailer spaces for temporary staff will be provided in a location northeast of the hatchery as shown in Figure 33.

11.4.3 ACCLIMATION PONDS AND RELEASE SITES

In addition to the hatchery facility, the CJDHP will rely on four summer/fall Chinook acclimation sites (plus one contingency pond). These include two new acclimation ponds, and three existing acclimation ponds. The three existing ponds are Similkameen, Bonaparte, and a contingency pond, Tonasket Pond. The Similkameen Pond is operated by WDFW and will require no modifications. A typical design for the new acclimation ponds is shown in Figures 34 and 35. Some of the existing ponds will require modifications. A site plan of each acclimation pond is included with the full conceptual design report in Appendix G. The individual summer/fall Chinook sites that require new construction of modifications are described below.

11.4.4 GENERAL DESIGN REQUIREMENTS

The design or modification of the acclimation ponds will take into account icing issues. Experience gained from Washington Department of Fish and Wildlife (WDFW) operations at Similkameen Pond and the Colville Tribes' operations at Ellisforde and Bonaparte Ponds will be used to help guide design or necessary modifications. Design considerations will be given to pond intakes, outlets, and winter operational requirements.

New acclimation ponds supplied by river water will be designed to have their outlets downstream of the water supply intakes to avoid subjecting released fish to the intake screens. The Bonaparte and Tonasket ponds have telemetry systems with telephone links to the offices and cell phones of Irrigation District employees to warn of flow or surface level anomalies. Similar telemetry systems should be installed for all acclimation ponds to warn of potential flow, temperature, dissolved oxygen, and security anomalies.

All acclimation facilities will be fitted with netting and electrical fencing to prevent avian predation and entry of land-based predators.

Integration of rearing techniques similar to the NATURES system will be considered for the acclimation facilities. Consideration will also be given to adding structure and subsurface feeders to emulate natural conditions. The research on NATURES will be reviewed prior to final acclimation pond design to determine if survival advantages justify these types of facility additions.

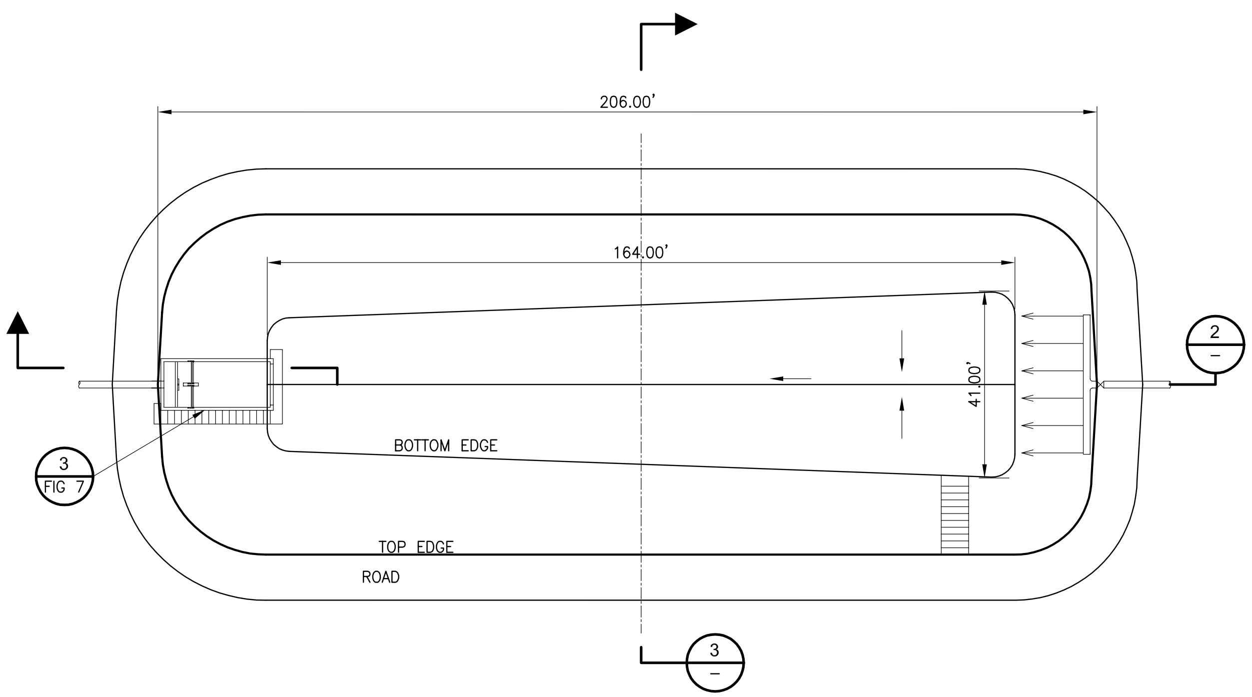
11.4.5 NEW ACCLIMATION PONDS

11.4.5.1 Riverside Pond

The Riverside Pond site is located on the left bank of the Okanogan River near river mile 49, approximately 7 miles downstream of the town of Tonasket. This pond will be constructed with a volume of 53,000 cubic feet and will be supplied with 20 cfs of water from the river. There is no existing pond at this site. Development of the pond will require construction of access, power, piping, a pump station, the pond, and a structure for volitional release of fish, predator protection, controls and telemetry. Consideration will be given to the addition of a pole-supported roof structure. The Riverside acclimation pond site is shown in Figure 36.

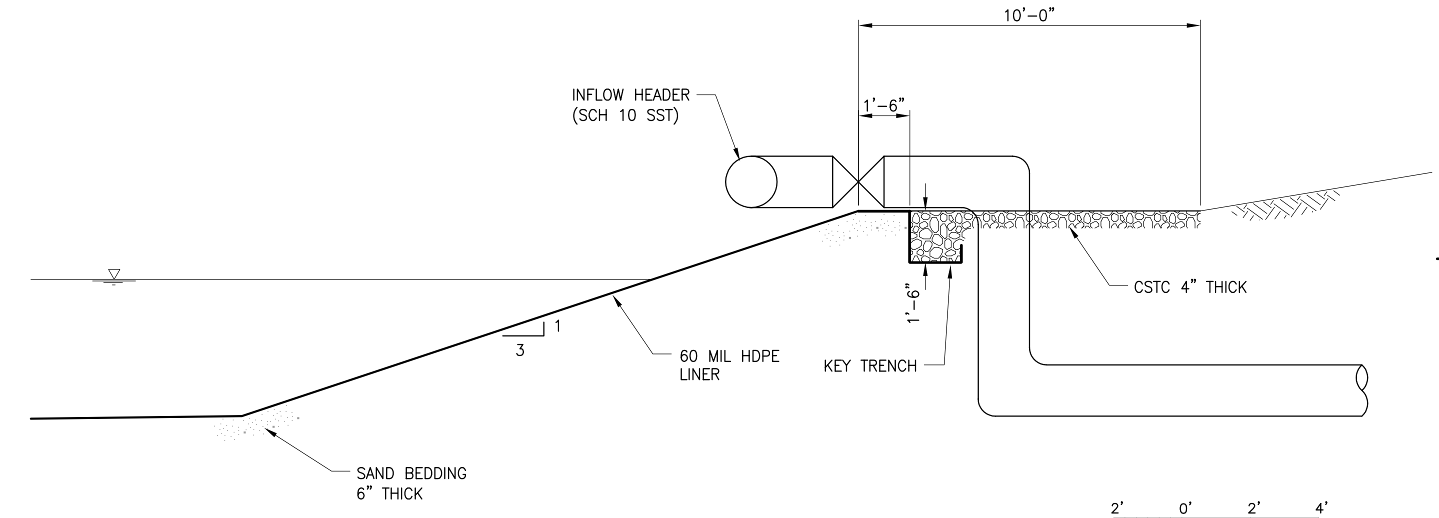
11.4.5.2 Omak Pond

The Omak Pond site is located on the left bank of the Okanogan River near river mile 32, in the town of Omak near the confluence of Omak Creek. The pond will be constructed with a volume of 53,000 cubic feet and supplied with 20 cfs of water from the river. Development of this new pond will require construction of a water supply system, the pond, site access, power, piping, a structure for volitional release of fish, predator protection, controls and telemetry. Consid-



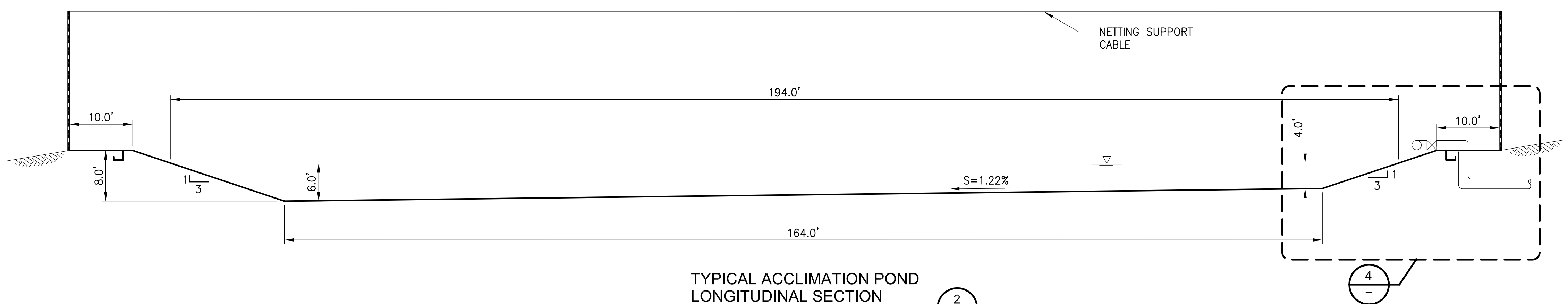
TYPICAL ACCLIMATION POND
PLAN VIEW
1" = 20'
1

20' 0' 20' 40'
GRAPHIC SCALE 1"=20'



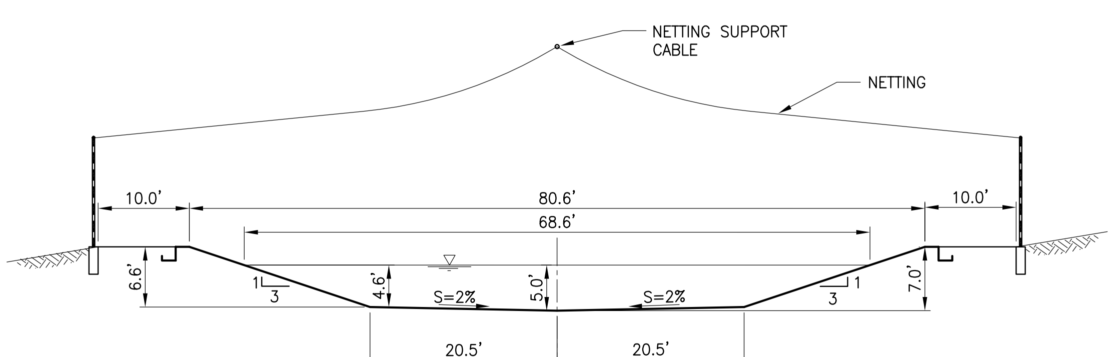
POND EDGE ENLARGEMENT
3/8" = 1'-0"
4

2' 0' 2' 4'
GRAPHIC SCALE 3/8"=1'-0"



TYPICAL ACCLIMATION POND
LONGITUDINAL SECTION
1" = 10'
2

10' 0' 10' 20'
GRAPHIC SCALE 1"=10'



TYPICAL ACCLIMATION POND
CROSS SECTION
1" = 10'
3

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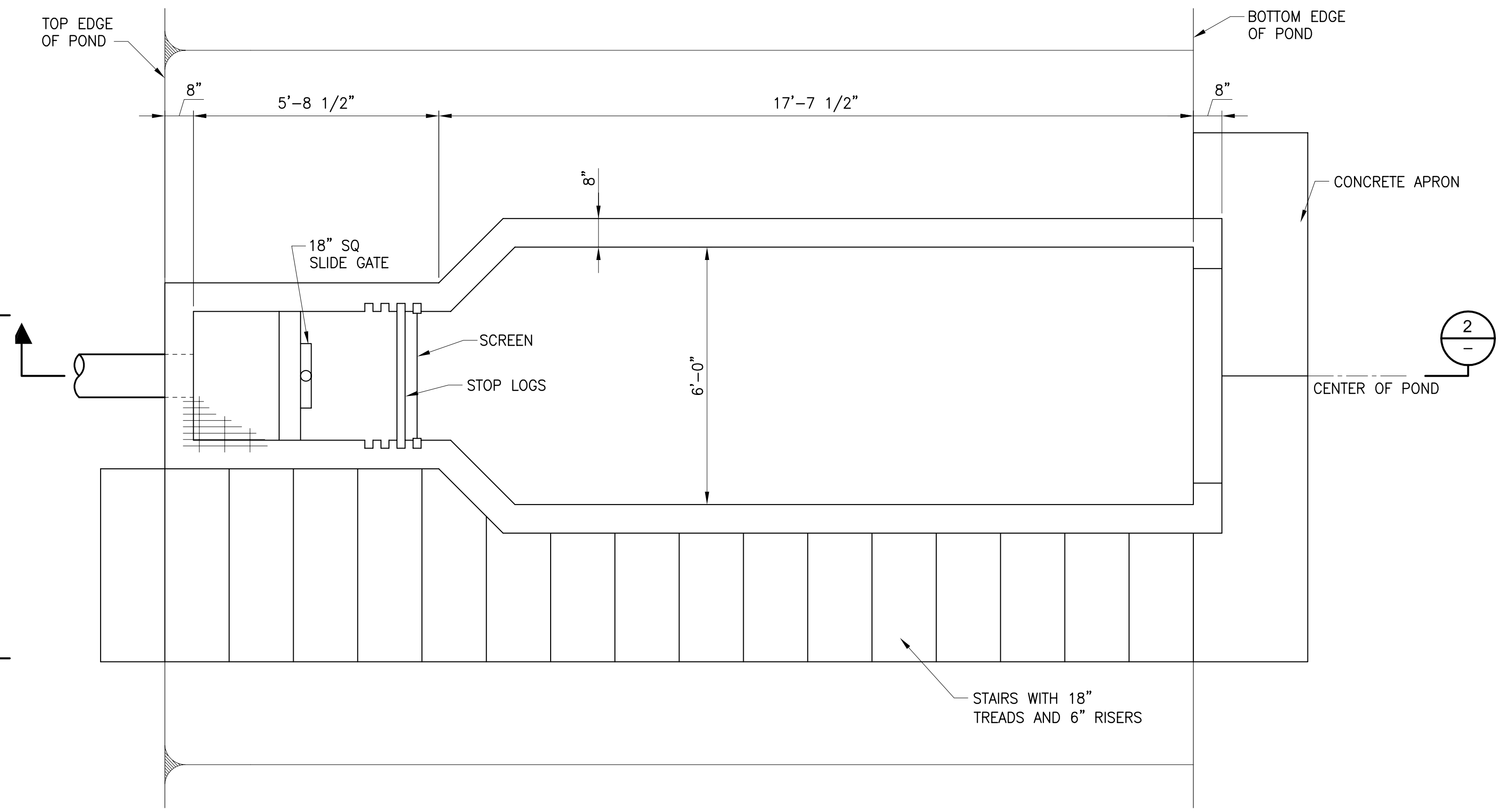
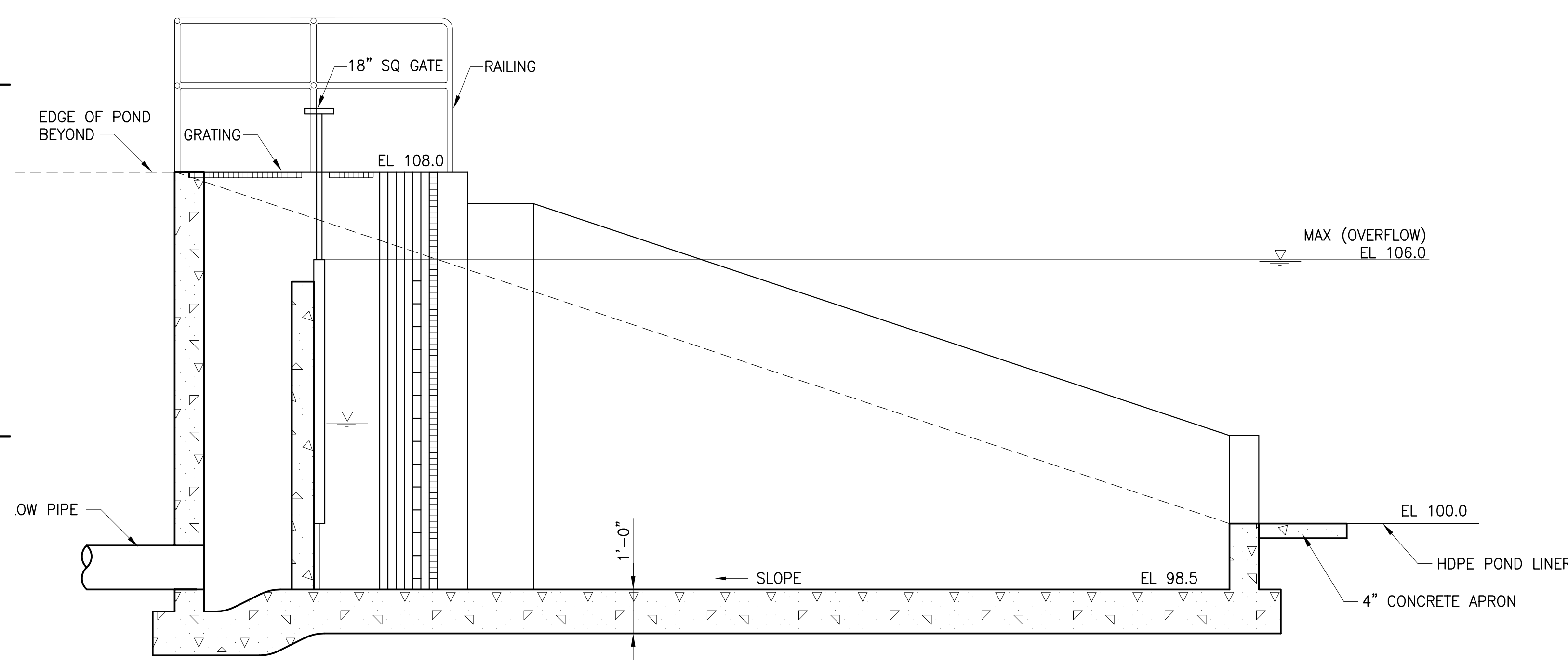
FIGURE 34
ACCLIMATION POND - 40,000 CF
TYPICAL PLAN AND SECTIONS

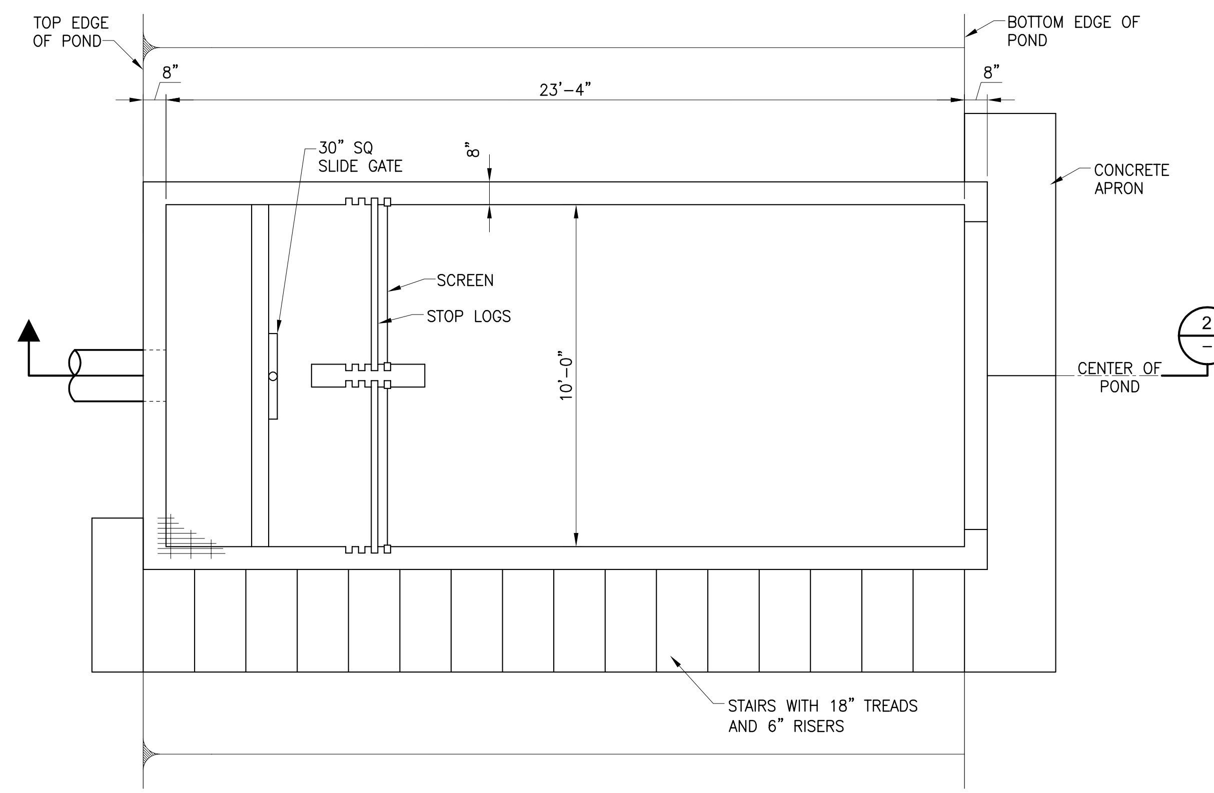


KETTLE PLAN VIEW
1/2" = 1'-0"



KETTLE SECTION
1/2" = 1'-0"

GRAPHIC SCALE 1/2"=1'-0"



KETTLE (HIGH FLOW) PLAN VIEW
3/8" = 1'-0"

GRAPHIC SCALE 3/8"=1'-0"

ACCLIMATION POND OUTLET KETTLE
TYPICAL PLAN AND SECTION

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Colville Tribes
CHIEF JOSEPH DAM HATCHERY
CONCEPTUAL DESIGN

FIGURE 35
ACCLIMATION POND OUTLET KETTLE
TYPICAL PLAN AND SECTION

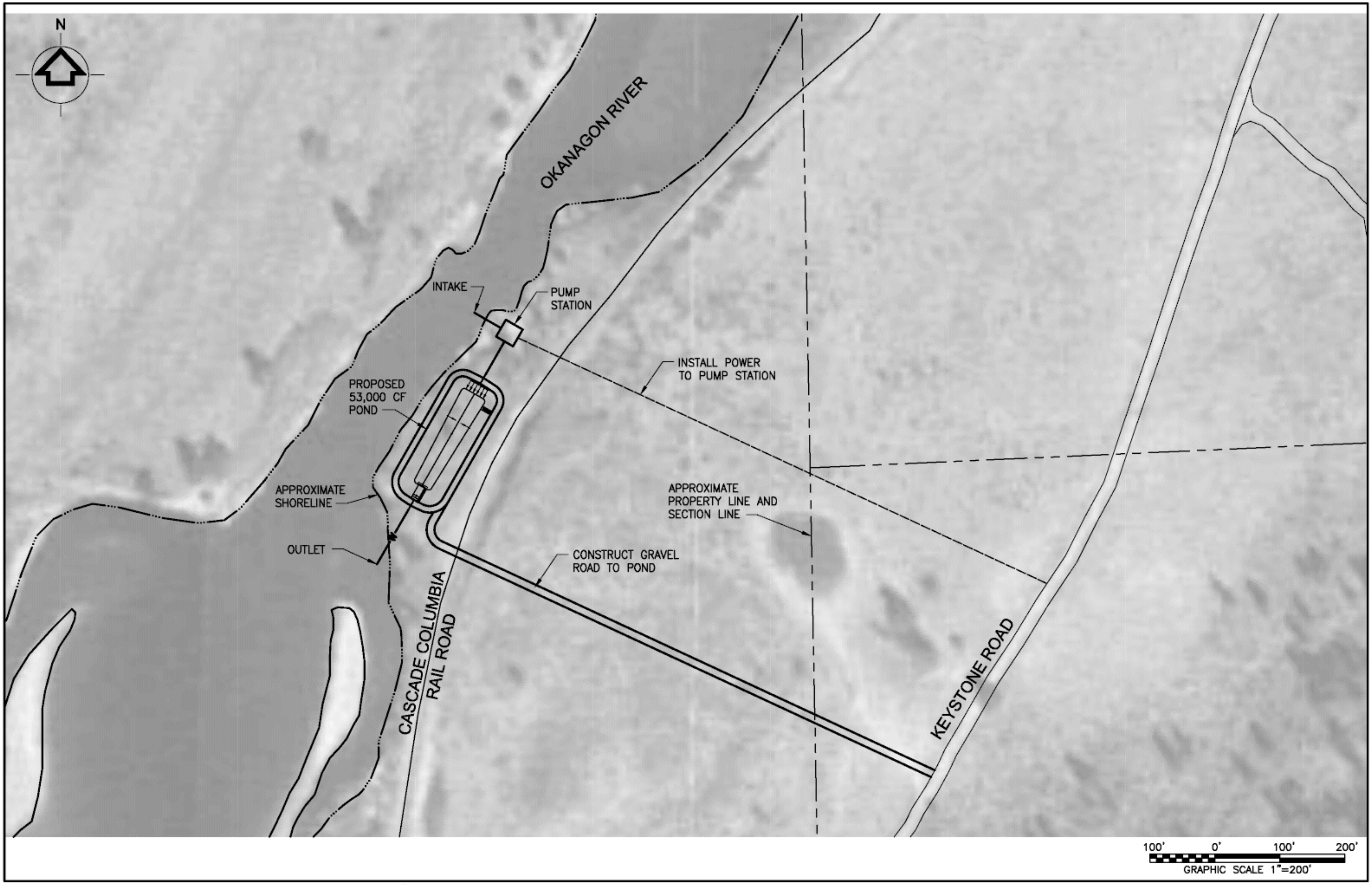

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FIGURE 36
ACCLIMATION POND SITE PLAN
PROPOSED RIVERSIDE POND

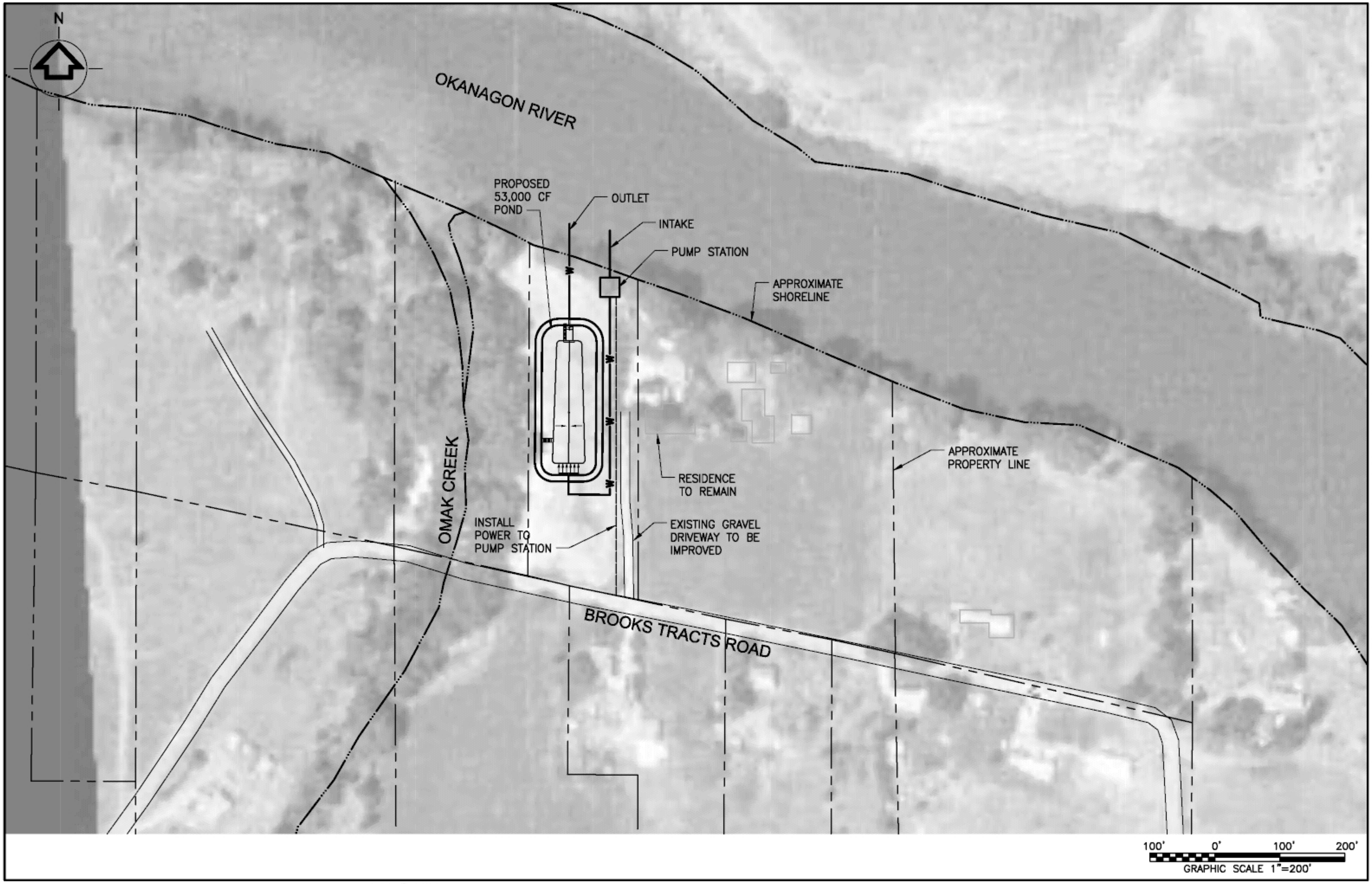

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FIGURE 37
ACCLIMATION POND SITE PLAN
PROPOSED OMAK POND

eration will be given to the addition of a pole-supported roof structure. The Omak acclimation pond site is shown in Figure 37.

11.4.6 EXISTING ACCLIMATION PONDS

11.4.6.1 Tonasket Pond (Contingency Pond)

Tonasket Pond is on the right bank immediately upstream from the town of Tonasket. The pond is an open-air pond with a useable rearing volume of 74,300 cubic feet and is supplied with 25 cfs of water from the Okanogan River. The OTID owns and operates the pond for irrigation purposes. The pond is proposed to be a contingency pond for the summer/fall program should the Riverside Pond site not be available or construction not be feasible.

Improvements that will be required are modifications to inlet piping, enhanced access for operation and maintenance, installation of an outlet structure with modifications to outlet piping for volitional release of fish and for easier cleaning, and netting for predator protection. Consideration should also be given to enhancing the existing telemetry system to include monitoring and notification of desired fish rearing parameters to Chief Joseph Dam Hatchery staff when fish monitoring is needed.

11.4.6.2 Bonaparte Pond

Bonaparte Pond is located on the left bank immediately downstream from the town of Tonasket. The pond is an existing open-air pond supplied with 25 cfs of water from the Okanogan River, with a useable rearing volume of 65,300 cubic feet at an operating depth of 5 feet.

OTID owns and operates the pond for irrigation purposes. The pond has been modified for fish acclimation and no further modifications are required for rearing purposes. However, to improve ease of operation and maintenance, drainage and cleaning improvements may need to be considered. Consideration should also be given to enhancing the existing telemetry system to include monitoring and notification of rearing parameters to Chief Joseph Dam Hatchery staff when fish monitoring is needed.

11.4.7 RELEASE FROM THE CHIEF JOSEPH DAM HATCHERY SITE

Release of juvenile summer/fall Chinook from the Chief Joseph Dam Hatchery will be from the raceways through a pipe running directly from the raceway area to the river. The pipe can be either temporary or permanent.

11.5 HATCHERY SITE CONSIDERATIONS

11.5.1 POWER

Nespelem Valley Electric Cooperative currently has power lines crossing the site and supplying power to two irrigation pumps near the proposed hatchery facilities. This power source can be used to supply the hatchery. A new service, a transformer, and several hundred feet of power line will be required. Future power for the new project would be through 125kv/480v transformers, with further reduction transformers as required.

The cross-site power lines are about 50 feet above grade at the poles at the top of the river bank. The lines gain in elevation as they cross the site to the next set of poles on the top of the hillside (elevation 1,050 feet) north of Half-Sun Way. Existing power lines should not pose any insurmountable problems with the site planning. The original agreement between the COE and the power company, dated 1960 and expiring in 2010, appears to indicate that the COE could require the lines to be moved if needed, however the site plan is being developed with these lines remaining in place.

Consideration was given to using the dam electrical system as a source of power, but at this time the COE will not sell or provide power to the hatchery. The COE does not even supply station power to its own administrative facilities.

11.5.2 TELEPHONE

Telephone service is available at the existing visitor center approximately 1,000 feet west along Half-Sun Way. Service will have to be extended along Half-Sun Way to the hatchery.

11.5.3 SANITARY SEWER

The nearby COE Visitor Orientation Center has an on-site sewer system that cannot be expanded for use by the hatchery. Development of the hatchery and support facilities at this site will require construction of an on-site sanitary wastewater system or a force main across the SR-17 bridge to connect to the Bridgeport sewage system. The City of Bridgeport has indicated that its sanitary sewer system is at 80% capacity and the EPA has imposed a moratorium on sewer connections until a sewer capacity study is performed. Further analysis and design of a sanitary sewer system for the hatchery will be required in Step 2 of the Council's three-step process.

11.6 CHIEF JOSEPH DAM HATCHERY FACILITY COMPONENTS

11.6.1 FISH-REARING WATER SUPPLY

It is planned that fish-rearing water will be supplied from the Rufus Woods Lake and the dam's north embankment relief tunnel. Both of these water supplies will be delivered to the hatchery headbox by the COE. A hatchery flow schematic, provided in Figure 38, shows the distribution of water through the facilities. The relief tunnel water may need to be augmented by additional well development if that source is not able to produce 20 cfs.

The bioengineering model used historical water temperatures given for these two sources and calculated the quantities needed from each source to meet fish biological needs at proposed design temperatures. When the proposed water temperature was between the two source temperatures, the model calculated how much of each source would be blended to meet the fish requirements at the proposed temperature.

11.6.2 RUFUS WOODS LAKE

The bioengineering model showed that the maximum Rufus Woods Lake flow needed to rear the summer/fall Chinook programs is 22 cfs, based upon fish biological needs. It is assumed that Rufus Woods Lake water will need to pass through water treatment facilities, as it is subject to possible disease pathogens and waterborne contaminants from up-reservoir sources. This treatment is anticipated to be sand filtration and ultraviolet light exposure.

The intake for the hatchery supply may include a multiport intake at different levels within the reservoir so that a selection of temperatures or water quality may be drawn off for hatchery use.
With the proposed spring Chinook program, the maximum Rufus Woods Lake supply requirements would increase to 44 cfs, based upon fish biological needs.

The COE has indicated that it will be able to release as much Rufus Woods Lake water as needed to meet the program requirements.

11.6.3 RELIEF TUNNEL

The bioengineering model showed that the maximum relief tunnel flow needed to rear the summer/fall Chinook programs is 24.5 cfs, based on fish biological needs. The peak flow for relief tunnel water would be required in the first week of November when there is a need for a large quantity of this cool source of water to offset the high Rufus Woods Lake water temperatures. In addition, 1.1 cfs of this flow is needed for the incubation of eggs. It is proposed that the incubation process use relief tunnel water because of its higher water quality and more suitable temperature.

The COE has stated that it will develop a means of supplying a minimum of 20 cfs of relief tunnel water to the hatchery headbox, which may be up to 4.5 cfs less than what the model shows to be needed. The time period when more than 20 cfs is needed is estimated to be the last three weeks of October. The difference between program needs and the available supply may be reduced or eliminated by a combination of the following: changes in the rearing programs (such as reduced numbers or change of release size); earlier transfer to acclimation ponds; refinement of calcula-

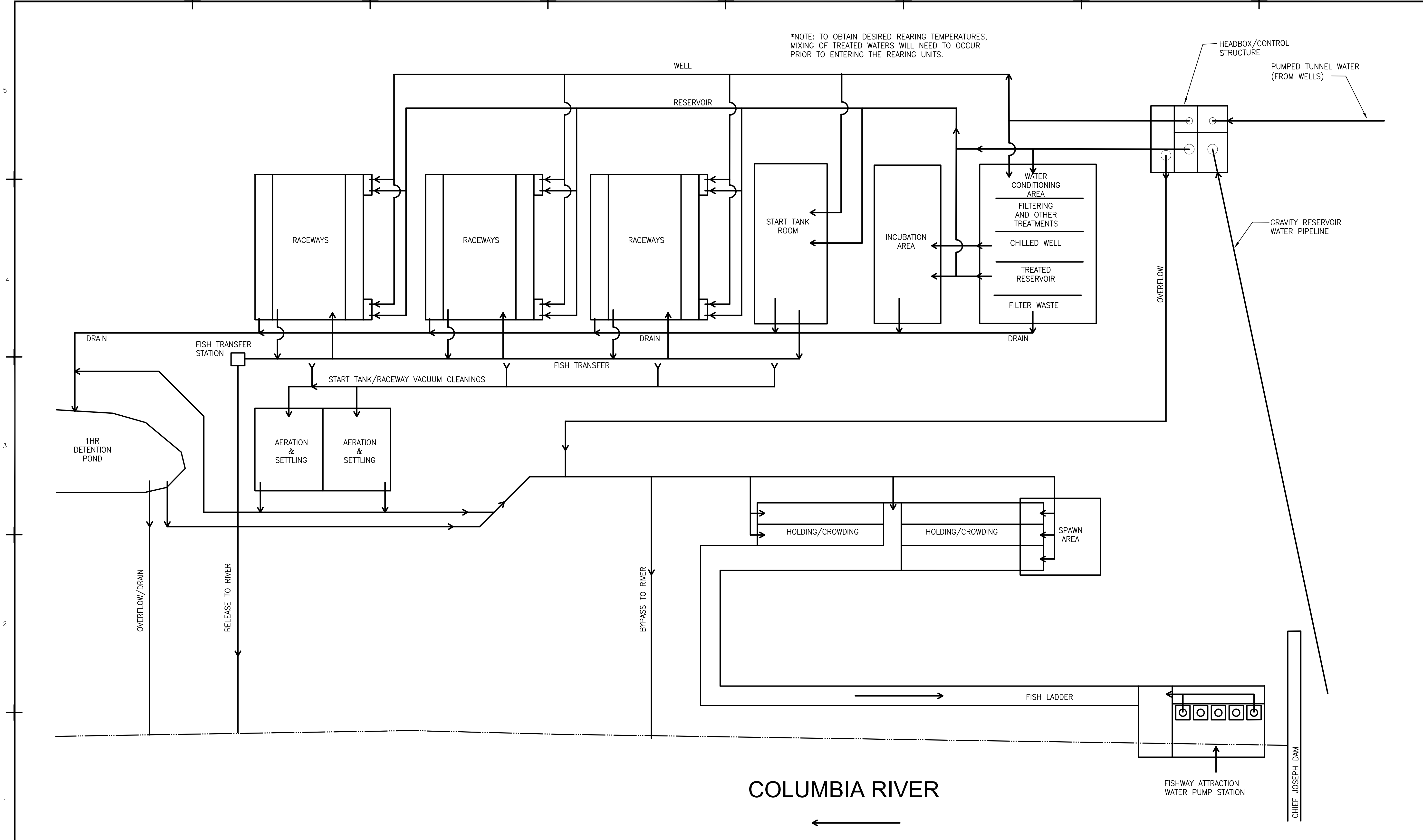

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FIGURE 38
HATCHERY FLOW SCHEMATIC

This drawing is full size when 22"x 34" or is reduced to half size when 11"x17"

tions or development of an additional well water source.

11.7 INCUBATION AND START TANK ROOMS

11.7.1 INCUBATION ROOMS

This portion of the main hatchery building will include two rooms. The first room will be a jar incubation area where jars (of various sizes if needed) will be filled with eggs and agitated with sufficient upwelling water to gently suspend and circulate them until they are transferred to the vertical tray incubators. Due to the constant motion of the eggs, initial incubation in jars reduces fungal growth that can be spread from dead eggs to live eggs. This provides for single-family incubation.

The second room will contain the vertical tray incubators. The room will be sized for 52 full stacks (16 trays each) of incubators. The summer/fall Chinook programs require 35.5 full stacks of incubators. The spring Chinook programs require 16.5 full stacks of incubators.

11.7.2 START TANK ROOM

After the eggs hatch and the fry develop to the button-up stage, they will be distributed to the start tanks in the start tank room. The start tanks will be units 3 feet wide by 40 feet long operating at an average depth of 2.5 feet. Forty units will be required for the summer/fall Chinook programs and an additional 20 start tanks will be needed for the spring Chinook programs. The tanks will be mounted in pairs (back to back) with access for feeding, cleaning and inspection from one side only. The downstream end of the start tanks will have a short portion screened off to contain the fish in the tanks. A second outlet from each tank will be used to transfer the fish to the raceways. Feeding of fry in the start tanks will be by hand. A room adjacent to the start tank room will be designated as a start tank feed storage room where feed from the bulk feed storage room will be proportioned and mixed.

A second room adjacent to the start tank room will be a storage room for equipment normally used only in the start tank room, such as tank screens, scales, buckets, etc.

11.7.3 OUTDOOR RACEWAYS

The groups of outdoor raceways will be constructed of concrete with uniformly sloped bottoms. The head end of each group of raceways will have a head channel with mixing boxes at each end to allow two separate water temperatures to be developed in the head channel (separated by drop-in stop gates). Both Rufus Woods Lake water and relief tunnel water is to be supplied to each of the mixing boxes, with separate control valves to facilitate the mixing.

The details of raceway screens and baffles will be determined during subsequent design phases. It is anticipated that each raceway will have screens to prevent fish from entering the inlet and outlet channels, as well as screen and baffle guides throughout to allow for isolating raceway segments and inducing scouring currents to move sediment.

At the downstream end of each group of raceways will be a common drain channel that receives all normal rearing water flows after they have passed through the raceways. This flow will be directed to a detention pond. Upstream of the common drain channel, flow from the rearing area of the raceway will pass through a screened area where plugged outlets to the fish transfer piping and to the cleaning waste piping will be located. When these outlets are plugged, the water will overflow a weir into the drain channel. The weir will be used to establish and maintain the normal rearing depth of each raceway. Fish can be released from the raceway either by pumping (using fish pumps) or gravity draining through the fish transfer outlet mentioned above. The cleaning waste outlet will be piped to the aeration/settling structure and will be used for vacuum cleaning of the raceway. Not all raceways will need a cleaning waste outlet, as the hose used for vacuum cleaning can span several raceways.

It is anticipated that the fish in each raceway will be fed using a combination of hand feeding and demand feeders. Hand feeding is anticipated to be more prevalent during the early raceway-rearing period, with augmentation feeding from two demand feeders per raceway in the later rearing period.

The summer/fall Chinook raceways will be 8 feet wide, with a rearing length of 100 feet and an average depth of 3.25 feet, resulting in an individual raceway rearing volume of 2,600 cubic feet. The bioengineering model indicates that the early summer/fall Chinook programs will require about 20 raceways of this size and the late summer/fall Chinook programs will require about 24 raceways. (The spring Chinook program would require 28 additional raceways that are 8-feet wide, 120-feet long, and 4-feet deep [see Chapter 13 for additional detail on spring Chinook components.])

11.8 SUPPORT FACILITIES

11.8.1 WATER TREATMENT

Water quality data available for the two proposed water sources shows that the proposed rearing programs appear to be feasible by using one source or the other, or a mix of the two to obtain the growth desired after the eggs have hatched. However, analysis of the production programs demonstrates a need to chill relief tunnel water for incubation. The analysis shows an incubation temperature of 48°F from the beginning of October to the end of April. During this seven-month period the relief tunnel temperature data varies from about 49.5°F to 55.5°F.

It is possible chilling of a 500 gpm incubation flow for the summer/fall programs may require a 200-ton chiller and associated chilling tower. It may be possible to reduce chilling costs by cooling the relief tunnel water with a heat exchanger and Rufus Woods Lake water during portions of the incubation period.

The Rufus Woods Lake water may need sand filtration and ultraviolet purification due to contamination from human or natural sources or from up-reservoir water uses such as the existing net pen fisheries operations. Based on the biological needs of the various programs, the sand filtration/UV system should be designed to treat 22 cfs for the summer/fall Chinook.

11.8.2 FOOD STORAGE AND HANDLING

At the east end of the hatchery building will be the main food storage area. It will have a capacity to store the maximum amount of food required in an eight-week period plus a one-week overlap for delivery schedule. There will also be a room for sorting pallets of different-sized feeds. Food refrigeration will be provided through use of existing facilities at the Colville Trout Hatchery.

An estimate of 67,200 pounds of feed will be consumed during the peak eight-week period. At 40 pounds per cubic feet, this requires a storage volume of 1,670 cubic feet. With pallets of feed being 4 feet high, the space required for feed storage would be about 400 square feet. With an allowance for pallet maneuvering, an area for empty pallets and bags and an area for bucket loading, the total area could be twice that of the palletized feed storage area. An area of 900 square feet is shown for the main food storage area. A second food storage area will be provided adjacent to the start tank room where finer starter feeds will be prepared for delivery to the start tank room.

11.8.3 BIOLOGICAL LABORATORY

A small laboratory, to be used for all on-site biological and rearing water analysis, will be located between the start tank room and the water treatment room. This laboratory area will provide space for storage of all chemicals and equipment needed to perform the various tests and analysis desired by the hatchery staff.

11.8.4 SHOPS, GARAGE/EQUIPMENT STORAGE AND LOADING DOCK

The southeast portion of the hatchery building will contain areas for storage up to four vehicles and other mechanical equipment (shown as 2,450 square feet), an area to be divided into a carpentry shop and a separate welding shop (shown as 1,990 square feet), a loading dock, a standby generator room and an open air covered storage area. Upon further study, these and other areas of the building may be redesigned to reduce or optimize the size and shape of the overall building.

11.8.5 CREW AREAS

Crew accommodations will include a break/lunch/ meeting room, a pair of restrooms with showers and lockers, and a wet gear storage area.

11.9 FISH TRANSFER AND OUTMIGRATION FACILITY

11.9.1 FISH TAGGING/CLIPPING

The Colville Tribes presently own a portable trailer containing several coded wire tagging machines. There are plans to update the trailer with the purchase of additional tagging machines and revamping of the equipment layout.

Fin clipping is planned to be a manual operation requiring several crews to process all of the fish being reared at this facility, whether released directly from the Chief Joseph Dam Hatchery or from the acclimation ponds along the Okanogan River.

Both fin clipping and tagging will be conducted with portable trailers, so no permanent facilities are shown on the site plans or included in the facility construction cost estimate.

11.9.2 FISH TRANSFER FACILITIES

With the hatchery building floor level being above the water level of the rearing raceways, the transfer of fish from the start tanks to the raceways is anticipated to be a gravity process through either portable or permanently installed piping. The fish transfer truck loading station will be located low enough to receive fish from the raceways by gravity.

11.9.3 ON-SITE RELEASE

Fish to be released directly from the Chief Joseph Dam Hatchery site will be drained through the truck loading station to the river in a pipe system that will be too steep for fish to swim up.

11.9.4 ADULT FISH ATTRACTION AND FISH LADDER

The location shown for these facilities is tentative. The Colville Tribes are presently undertaking a study to establish the best location for the fish ladder entrance.

11.9.5 ATTRACTION WATER SOURCES

The fish ladder attraction water supply will be separate from the fish-rearing water supply. Due to the high flows that may be released through the power generating turbines on the left bank of the river or released over the spillway, a fairly large quantity of water may need to be released from the fish ladder to attract adult fish to that structure. The quantity of fish ladder release flow for attraction purposes has been estimated at 500 cfs. This quantity of flow is available from two sources, either the Rufus Woods Lake reservoir (gravity) or the Chief Joseph Dam tailrace pool (pumped). The COE is not likely to release this flow from the reservoir as this water can produce more power going through the turbines than the power required to pump this amount from the tailrace.

Attraction water will therefore be provided from an adjacent pump station using up to five 200-hp pumps to discharge the 500 cfs into the ladder entrance. The discharge will use upwelling through a bottom grate in the fish ladder entry section to reduce fish disorientation to the flow coming down the ladder.

11.9.6 FISH LADDER DESIGN

The fish ladder is proposed to be similar in design to the ladder constructed at the Ice Harbor Dam, except that this ladder will only be a "half structure," being about one-half as wide and having one ladder weir and orifice opening per ladder step. Each ladder step will rise at a rate of one foot per 10 feet of length from the ladder sill entrance elevation.

The ladder sill elevation is proposed to be at elevation 772 feet, based on a minimum water depth in the ladder of 5 feet and the minimum tailrace elevation during the period of 1998 to mid 2002 of 777 feet.

The ladder will run parallel to the river and rise to a bottom elevation of 790 feet before turning 90 degrees and rising an additional 3 feet, at which point it will again turn 90 degrees to again run parallel to the river at a minimum distance of 20 feet from the first ladder section. The ladder will continue to rise to a bottom elevation of 795 feet where it will change into the main holding/crowding channel. Water flowing down the ladder will originate at the upstream end of the various holding ponds that will come together in the main holding/crowding channel.

11.9.7 ADULT FISH HOLDING/ CROWDING/SORTING AREAS

The bioengineering model shows that the minimum holding volume for the summer/fall Chinook would be about 9,700 cubic feet. Water will be supplied through an upwelling sump at the head end of each holding/ crowding/sorting raceway. This water will be supplied from the detention pond and any excess (overflow) water draining from the headbox.

These facilities are shown adjacent to an existing single lane road at an elevation of about 805 feet, which is about 15 feet above the maximum tailrace elevation recorded during the 1998 to mid-2002 period. The main holding/crowding channel, at the end of the fish ladder, will extend to a location where it is adjacent to five holding/sorting raceways. The number and configuration of raceways may change during subsequent design, but the five raceways shown can be used as follows: two for early summer/fall Chinook, two for late summer/fall Chinook, and one for excess returning fish and to acclimate broodstock coming from remote sites with 10 degree to 15 degree warmer water. Most of this summer/fall broodstock will be trucked in from remote collection sites. (The late summer/fall Chinook raceways can also be used for spring Chinook earlier in the year should that program be implemented.)

Each of the holding/crowding/sorting raceways is 10 feet wide and 65 to 80 feet long. With a holding depth of 5 feet, these raceways, including the distribution channel, provide a total volume of about 23,000 cubic feet. It is anticipated that the holding depth would be lowered during crowding and sorting to allow crews in the holding raceways to select and handle the fish.

11.9.8 SPAWNING AND EGG-TAKE FACILITIES

The spawning and egg-take facilities shown in Figure 31 include a 1,200-square-foot enclosed structure that overlaps the east end of three of the holding/sorting raceways by 10 feet to allow easy access to the crowded fish during the spawning process. Carcasses resulting from the spawning operation will be stored adjacent to the spawn building in covered totes until transported off-site. The carcass storage area can also be used as a harvest area or a transfer area for excess returning fish.

For the proposed egg-takes, the volume of fish to be spawned is not excessive (less than 200 per week). However, use of a live fish lift such as a "pescalator" may result in improved handling efficiency of these fish as well as allow for moving large numbers of excess adult returns. A portable unit that can be moved from raceway to raceway would provide the greatest flexibility.

Spawned eggs will be briefly stored in buckets or other containers within the structure until transported to the incubation room of the hatchery building.

11.10 EFFLUENT TREATMENT FACILITIES

11.10.1 EFFLUENT QUALITY REQUIREMENTS

Discharge from the Chief Joseph Dam Hatchery site to the Columbia River must meet the requirements of the Washington State Administrative Code (WAC) Section 173-221A.

Under the requirements in the WAC, an off-line treatment process of vacuumed start tank or raceway cleaning wastes must meet the following:

- Total suspended solids–Average monthly removal of 85 percent.
- Settleable solids–Average monthly removal of 90 percent.
- Instantaneous maximum total suspended solids concentration–Not in excess of 100 milligrams per liter of effluent.

- Instantaneous maximum settleable solids concentration in the off-line settling basin effluent–not in excess of 1.0 milliliter per liter of effluent.
- Flows that pass through the normal hatchery flow path (over start tank and raceway water level control weirs or stand pipes) must meet the following:
- The instantaneous maximum total suspended solids concentration in the effluent at the point of discharge to the receiving environment shall not exceed 15 milligrams per liter of effluent.
- The average total suspended solids concentration in the effluent at the point of discharge to the receiving environment shall not exceed 5 milligrams per liter of effluent.
- The average settleable solids concentration in the effluent at the point of discharge to the receiving environment shall not exceed 0.1 milliliter per liter of effluent.
- Effluent limitations shall apply as net values, provided the criteria contained in 40 CFR 122.45 (net gross allowance) are met.

11.10.2 AERATION AND SETTLING FACILITY

The aeration and settling facility will be a concrete structure near the downstream end of the spring Chinook group of raceways. This offline facility will receive the vacuum cleanings from the start tanks and raceways at a rate of less than 50 gpm. The structure will be split into two sections, each having a floating aerator and a ramp entry for access to remove solids (sludge). Supernatant from the settling process can be drained to either the detention pond or directly to the outfall pipe. Drain-down for solids removal will be drained to the detention pond.

FIGURE 39: Photo at General Location of Chief Joseph Dam Hatchery

11.10.3 DETENTION POND

A 1989 report by the Washington State Department of Ecology recommended that "whole effluent should be allowed to settle at least one-hour before discharge" where whole effluent would include the vacuum cleaning wastes. Although this conceptual design includes offline treatment of cleaning wastes as indicated above, a detention pond providing 1 hour of detention at a peak flow of 50 cfs should still be planned for. The detention pond will be lined with a plastic liner covered with suitable soil to maintain wetland plants.

11.11 ADMINISTRATION AND VISITOR AREAS

11.11.1 ADMINISTRATION BUILDING

The COE previously performed a study to locate a new visitor center building within the area now designated for the hatchery. One option developed for the Chief Joseph Dam Hatchery conceptual design combined this future COE facility with the hatchery administration and visitor building in a two-story, 12,500-square-foot building, but that option was not carried forward. Instead, a 2,000-square-foot administration and visitor facility for the Chief Joseph Dam Hatchery will be located at the east end of the hatchery complex.

It will contain the following spaces:

- Offices (Two @ 120 square feet) .... 240 SF
- Lobby/Display Area .... 576 SF
- Conference Room .... 480 SF
- Dry Storage .... 144 SF
- Wet Gear Lockers .... 160 SF
- Restroom .... 100 SF
- Janitor Closet .... 64 SF
- General Circulation @ 12% of space .... 212 SF

Total 1,976 SF

11.11.2 SITE ACCESS AND PARKING

Two site entry points are planned for the main hatchery area and a third entry point needs to be developed to access the proposed adult holding and spawning facilities.

Adjacent to the administration and visitor building will be an area that can be developed for significant parking, including visitor buses and motor home spaces. This area can also be used for miscellaneous covered storage. The two entry points off Half-Sun Way will provide multiple entries into this area. These entry points presently allow a circular path for large trucks, buses and private motor homes, with no backing up required.

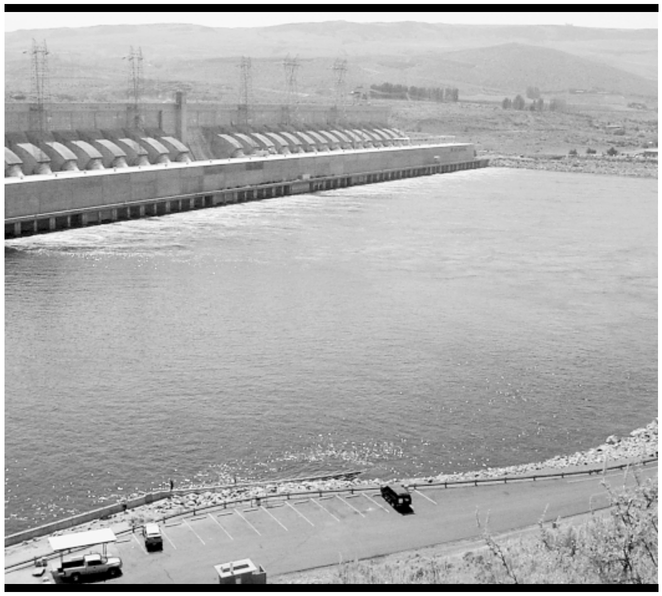

Bill Towey

FIGURE 40: Photo Looking Down at Current Parking Facility at Chief Joseph Dam

Access to the adult holding and spawning facilities, by single-axle flat bed trucks for carcass tote hauling, adult fish transport trucks, and various vehicles needed to service the attraction water pumping station, will require that a new turn-around be developed at the junction of the COE's road to the face of the dam and the gravel service road to this area. The new turn-around will probably require a short wall to retain the uphill slope.

At the adult holding and spawning facilities, vehicle access will be developed so that the single axle flat bed truck and adult fish transport trucks can loop around the complex by driving across the short section of the ladder that is oriented perpendicular to the river. Vehicles servicing the attraction water pumping station will also use this access loop.

11.11.3 COE TRAIL

About 700 linear feet of the existing asphalt walking trail will be relocated southward to stay along the edge of the river bank. This relocation will allow a larger area to be developed for the large vehicle travel loop and the parking area associated with staff and visitor needs. A chain link fence surrounds the project area and parallels a major portion of the trail along the river bank.

11.12 STAFF HOUSING

11.12.1 LOCATION

Several locations for hatchery staff housing were reviewed. COE staff indicated that residential housing at the hatchery site is not compatible with COE land use requirements. A location that is approximately 0.8 miles to the northeast on Half-Sun Way was selected and is proposed for hatchery staff housing. The location, shown in Figure 33, is uphill from the hatchery on the upper bench at an elevation of 1,050 feet.

At the housing site, extension of power and telephone from overhead lines approximately 1,000 feet away will be required. The exact location of power and telephone has not been verified. Water and sewer service will require development of a common well and on-site septic systems. Figure 33 is a site plan of the hatchery staff housing site.

Three permanent residences are proposed. Each residence will be 2,000 square feet, with a two-car attached garage. The lot size for each residence will be about 1 acre. In addition, a one-acre parcel will be used for temporary housing for three covered camp trailer sites with utility hookups.

11.13 ALTERNATIVES CONSIDERED IN DEVELOPMENT OF CONCEPTUAL DESIGN

The Colville Tribes, the COE, and consultant Tetra Tech/KCM, Inc developed the conceptual design for the Chief Joseph Dam Hatchery collaboratively. The process included the consideration of several alternatives that were identified and fleshed out during site visits and review meetings.


Bill Towey

FIGURE 41: Photo Vicinity of Proposed Chief Joseph Dam Hatchery Site

Discussion was devoted to the problems associated with developing a conceptual plan for summer/fall Chinook, while also attempting to provide the necessary information for separable spring Chinook facilities.

The following sections describe some of the alternatives and concerns that were broached in the development of the Step 1 conceptual plan.

11.13.1 HATCHERY FACILITY LOCATION

In development of the initial hatchery site plans, three issues posed recurrent challenges: 1) the location of the hatchery relative to cross-site power lines, 2) the location of resident housing related to the hatchery facility, and 3) the size and location of a possible visitor center.

11.13.1.1 General Site Issues

Based on information provided in the request for proposal for the hatchery, a pre-bid site visit and various communications, two site plans were developed for the Steering and Design Committee Meeting in January 2004. The initial plan located all of the hatchery facilities, except the water supply headworks and the fish ladder entrance, at the west end of the hatchery site, in the widest and flattest portion of the plateau. This plan incorporated a portion of the existing COE visitor information area into the general public entry to the hatchery site. The second plan placed all of the facilities, except the aeration/settling structures and the detention ponds, east of the cross-site power lines. Both of these plans located the hatchery resident housing on the hillside north of Half-Sun Way.

Tetra Tech/KCM was advised to plan the placement of as many of the hatchery facilities as possible east of the cross-site power lines. The placement of the hatchery facilities relative to the power lines, and in deference to requests from the COE (see below), had impacted the possible layout of raceways, holding ponds, visitor and other facilities.

11.13.1.2 Visitor Center

At the first Steering and Design Committee Meeting in January, COE personnel mentioned that a previous visitor center study determined that the best site for a visitor facility was near the center of the western end of the lower plateau.

At a tour of the site in early February of 2004, much of the site visit discussion revolved around the location of the planned COE visitor center, the views of the dam, maintaining the existing visitor information area facilities, and proposed facility relationships. Two optional site plans were presented to the Colville Tribes at the February Steering and Design Committee meeting. The two plans differed mainly in the size and location of the administration and visitor building. In the first option the administration and visitor building was 2,500 square feet and located adjacent to one of the site entry points. This building contained a general visitor information/reception area sized for occupancy by about 35 people. This option had the proposed COE visitor center at the planned location near the existing maze and visitor information facilities. In the second option, the hatchery's administration and visitor building was a two-story facility with a total floor area of 12,500 square feet. The 12,500-square-foot building combined the proposed COE visitor center with the hatchery administration and visitor building. This combined building was shown close to the river bank and atop a portion of the fish ladder, with basement level side-window observation into the fish ladder.

However, neither of these proposed plans could be developed with all of the hatchery facilities east of the cross-site power lines due to the eastward narrowing of the site and the westward drop in grade. The plans showed the hatchery building and administration/ visitor building east of the power lines, and the rearing raceways, aeration and settling structure, detention pond, holding and sorting area, and spawn house all west of the power lines. Both of these plans also showed the residences on the hillside, adjacent to a second COE visitor viewing area.

11.13.1.3 Hatchery Residences

At the first Steering and Design Committee Meeting in January, upon review of the initial site plans, the COE expressed a preference to have the resident housing located at the existing Colville Tribes' trout hatchery site, about 3 miles west of the proposed Chief Joseph Dam Hatchery site.

During a site visit in February of 2004, it was agreed that the residences would be located somewhere on top of the hill north of the Chief Joseph Dam, with the exact location undetermined. At the Steering and Design Committee Meeting in February, the COE indicated that the residences must be located further east, adjacent to the intersection of Jack Wells Road and Half-Sun Way. The COE also indicated that the project team should consider developing a series of wells to intercept the groundwater going to the relief tunnel as they are presently experiencing deterioration of that facility.

The hatchery plan presented at the March 2004 Steering and Design Committee meeting showed the residences and a dormitory for temporary staff located along Jack Wells Road. The plan also showed a series of 20 wells along the general alignment of the relief tunnel.

11.13.2 USE OF COLVILLE TRIBAL TROUT HATCHERY FACILITIES

In early February of 2004, representatives of the Colville Tribes, the COE and Tetra Tech/KCM held a joint site visit. The site visit included a visit to the nearby Colville Tribes' trout hatchery to evaluate if the Chief Joseph Dam Hatchery residences could conveniently be located at this facility. This hatchery visit also allowed the representatives to review the possibilities of expanding existing facilities such as feed storage and of adding new facilities such as vehicle storage and maintenance areas that would be used in conjunction with the operation of Chief Joseph Dam Hatchery facilities.

11.13.3 FISH REARING FACILITIES

Tetra Tech/KCM presented facility designs for both a summer/fall Chinook hatchery, and a spring and summer/fall Chinook facility [see Chapter 13 for spring Chinook program and facility details]. At the March 2004 Steering and Design Committee meeting Tetra Tech/KCM presented a refinement of a plan (Option A) presented at a previous review meeting. The hatchery facilities needed for the summer/fall Chinook programs were shown in darker ink on the schematics than those needed for the spring Chinook programs, in order to distinguish the physical impacts of adding the spring Chinook programs. The most notable impacts are the lengthening of the start tank room of the hatchery building and the addition of the group of raceways for spring Chinook rearing.

The bioengineering model was refined, resulting in the updated numbers and sizes of the rearing facilities. The largest change was in the raceway volume, previously estimated at 115,000 cubic feet, which was calculated to be about twice that amount. Further evaluation of rearing requirements will occur during future phases of the facility design.

The March facility design incorporated an adult holding area that allows mechanical crowding of fish out of the holding channels into a common channel leading to the spawn building. Fish could also be mechanically crowded from this common channel. This facility was designed to allow visitor viewing of some of the channels and window viewing of spawn house activities.

11.13.4 FISH LADDER

The COE is currently developing a contract to reshape and re-armor some of the river embankment in the area of the fish ladder entrance. This work will be completed during the design of the Chief Joseph Dam Hatchery and may affect the location of the ladder entrance. A study is also now being conducted to determine where adult fish are swimming along this portion of the river in order to try to assess the best fish ladder entrance location.

Members of the Steering and Design Committee raised concerns about the length of the fish ladder. The fish ladder entrance is located in an apparent indent along the embankment, about 1,500 feet upstream of the adult holding area. The ladder is shown to climb along an old road grade at a 1:10 slope, requiring about 70 weir steps to rise to an open channel that continues along the embankment to the adult holding area. Tetra Tech/KCM was directed to relocate the adult holding area to an elevation of about 810 feet near the fish ladder entrance.

11.13.5 TAGGING/FIN CLIP BUILDING

At the third Steering and Design Committee Meeting in March, a decision was made to eliminate the tagging/fin clip building in lieu of portable trailers holding the required equipment. This decision was based on potential cost savings and flexibility.

12.
Cost Estimates

Chief Joseph Dam Hatchery Program
MASTER PLAN

12

Cost Estimates

12.1 OVERVIEW OF COST ESTIMATES

Consistent with the Council's requirements for Master Plans, the following chapter presents the CJDHP cost estimates for 10 fiscal years including: planning and design (conceptual, preliminary and final), construction, operations and maintenance, and monitoring and evaluation.

The tables in this chapter provide summaries of very detailed cost information presented in Appendix B (the print version of Appendix B contains a set of spreadsheets which document the basis of these cost estimates, the electronic version provided on CD also contains complete budget workbooks). These Step 1 cost estimates are based on significant tangible detail. Reviewers are encouraged to look at the information provided in Appendix B to gain a deeper appreciation of the assumptions and systematic cost analysis structure imbedded in the CJDHP cost estimates. While these estimates are preliminary, they should provide an accurate baseline from which to refine costs, evaluate alternatives, and protect against budget inflation as project planning progresses.

Relationship of Estimated Program Costs to CJDHP Guiding Principles

Accountability
- Clear break down of the work required in each area of the CJDHP is provided
- Significant detail about source of cost estimates
- Detailed budgets illustrate assumptions and associated costs

Best Available Science
- Business (project management) principals applied in development of cost estimates

Cost-Effectiveness
- Interdisciplinary team review provided in cost estimates
- Inclusion of value analysis (value engineering) in early planning stages supports identification of potential cost-savings and assures compliance with project requirements
- Detailed cost estimates developed in planning stage serve as a control point during later planning stages

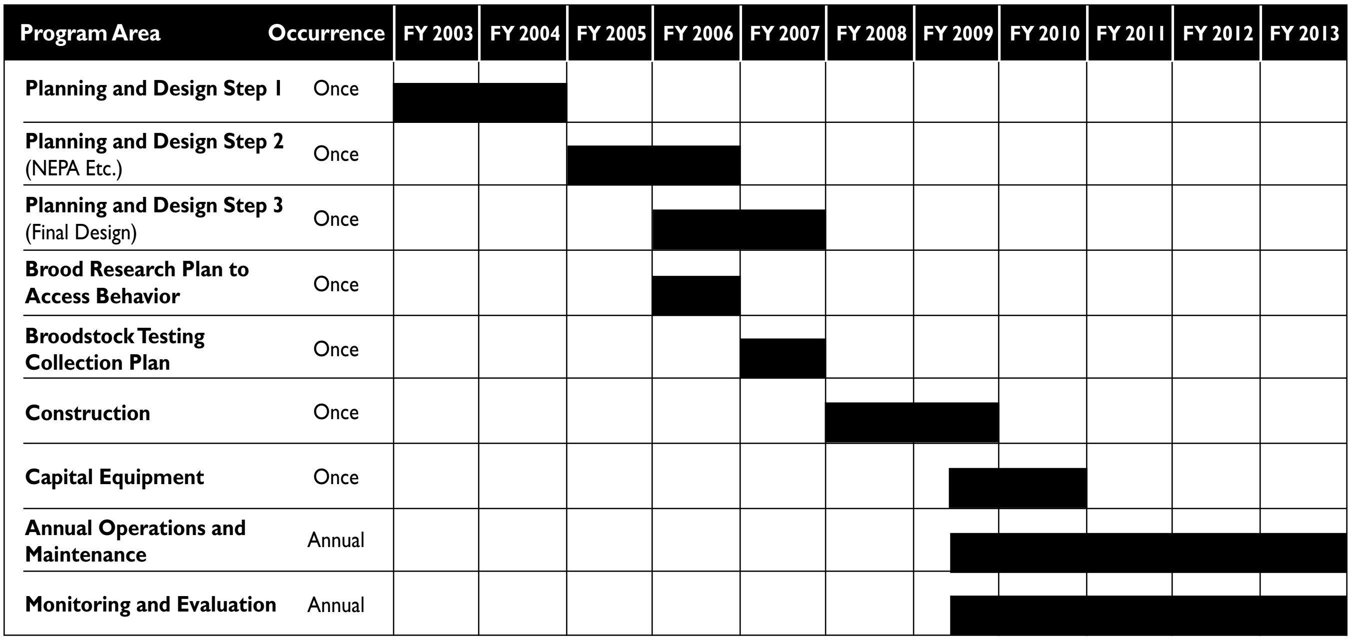
Flexibility
- Detailed understanding of costs allows for early analysis of the feasibility of alternatives

Innovation
- More thorough cost spreadsheets and complete level of detail than generally presented at the Step 1 Master Plan stage

12.1.1 PROGRAM AREAS AND MAJOR MILESTONES

The Council's three-step review process may take as much as five or six years to complete. In the mean time, extensive planning, development and analysis of alternatives will occur. Figure 42 provides a generalized list of program areas and a tentative time line linking costs to planning, initial critical research, construction, operations and maintenance, and monitoring and evaluation.

Figure 42: CJDHP Tentative Timeline for Key Milestones and Expenditures



Notes and Assumptions; Assumes Step 2 and Step 3 funding is available in FY 2005 and FY 2006
Assumes BPA will provide services for NEPA work in FY 2005

The roll ups of costs that follow in this chapter are presented by program area including: planning and facility design, critical research, construction, capital equipment, operations and maintenance, and monitoring and evaluation. Table 22 provides a summary of the key program areas, frequency of cost occurrence, and level of certainty reflected in these estimates.

12.1.2 DEVELOPMENT OF COST ESTIMATES FOR CJDHP

The Colville Tribes utilized professional program/project management approaches during all stages of the Step 1 planning and design. The principles and practices used in formal program/project management

Table 22: Cost Summary for CJDHP Summer/ Fall Chinook Programs by Program Area

PROGRAM AREA	TOTAL COST	OCCURRENCE	LEVEL OF CERTAINTY
Planning and Design Step 1	$ 426,179	One Time	100% (Includes Step 1 and summer/ fall Chinook HGMP Development)
Planning and Design Step 2	$ 425,000	One Time	Placeholder (less than concept)
Planning and Design Step 3	$ 2,400,000	One Time	Placeholder (less than concept)
Brood Research Plan to Access Behavior	$ 397,300	One Time	Concept (+/- 30%)
Broodstock Testing Collection Plan	$ 495,000	One Time	Concept (+/- 40%)
Construction	$ 17,370,000	One Time	30% built into figure
Capital Equipment	$ 584,000	One Time	Concept (+/- 30%)
Annual Operations and Maintenance	$ 857,780	Annual	Concept (+/- 30%)
Monitoring and Evaluation	$ 345,000	Annual	Concept (+/- 30%)

Notes and assumptions: Figures are based on FY 2004 dollars. Placeholder assumes no backup budget work completed.

have been successfully applied in government and private organizations since the early 1980s in order to ensure that goals and objectives are reached on schedule and within budget.

Cost management begins in the planning stages. To facilitate planning and implementation, work must be broken into easily understandable and defined components. These principles were applied to the development of cost estimates for the CJDHP. A major consideration in any planning and decision process is relative cost. Estimates must be developed and refined at each milestone. However, the level of cost estimate accuracy is of necessity tied to the level of completion of project planning. Development of realistic, well-documented cost estimates at the outset provides an important control point for use during all future stages of planning and implementation. Additionally, while control of capital costs is critical, long-term operating and maintenance, and monitoring and evaluation costs must also be considered from the outset.

12.2 COST ESTIMATES FOR FACILITY PLANNING AND DESIGN

As major projects, such as the CJDHP, evolve from a conceptual to a finished product, increasingly detailed plans to meet operational, facility or programmatic requirements are developed. In order to reduce potential late-stage design or programmatic changes, the Colville Tribes assembled a Steering and Design Committee to provide review and input during the very early Step 1 conceptual planning. The objective is to validate program parts and cost estimates to the maximum extent possible through early review.

Gathering comprehensive input in the early planning stages is important to meeting the project proponent's requirements, ensuring the facility can be constructed to meet expectations and remain consistent with cost projections. Such detailed cooperative planning also yields an improved understanding of desired future operations and associated maintenance, as well as monitoring and evaluation. The Colville Tribes plan to continue to solicit input and review from a broad team of knowledgeable individuals throughout the Step 2 and 3 processes.

12.2.1 STEP 1 CONCEPTUAL PLANNING AND DESIGN

The total budget for the CJDHP conceptual planning and design work is $426,179. This figure includes $386,799 for Step 1 planning (BPA Project 2003-023-00) and $39,380 for development of the summer/fall HGMP (BPA Project 2003-005-00). Conceptual planning and design work was initiated in June of 2003. All deliverables will be met or exceeded within the current budget and identified time lines. Additional specific detail for this budget is included in Appendix B.

12.2.2 STEP 2 PRELIMINARY PLANNING AND DESIGN

The preliminary planning and design stage is intended to meet the Council's Step 2 requirements. This phase is designed to identify any major difficulties or concerns with the program or facility design. Step 2 design work should provide sufficient detail and specifics to assure the intent and scope of Step 1 conceptual design work can be met, and to further refine the anticipate cost estimates. Step 2 includes completed NEPA and ESA review.

As previously noted, the detailed budget workbooks provided in Appendix B will provide a basis for future refinement and development of cost estimates in Step 2.

A placeholder of $425,000 has been identified for Step 2 preliminary planning and design. Initiation of this work is proposed for FY 2005. Details of the Step 2 budget have not been developed, even to a conceptual stage. More specific refinement of this budget is pending the Council's decision on this Step 1 proposal.

A Steering and Design Committee with membership similar to that developed during the Step 1 process will be assembled in Step 2 to provide comprehensive review, design input, and critique throughout the planning and design process. In addition, the Colville Tribes will recommend that implementation of a value

Table 23: Summary Capital Construction Costs For Summer/Fall Chinook Programs

DESCRIPTION OF AREA	ESTIMATED COST
Total costs summer/fall Chinook programs at CJDH with COE supplied rearing water	$ 16,220,361
Total costs summer/fall Chinook acclimation ponds	$ 1,150,019
Total: for Summer/Fall Chinook Program	**$ 17,370,380**

Notes and assumptions: Costs are at conceptual stage and incorporate a 30% contingency. Costs are based on FY 2004 dollars.

analysis (also known as value engineering) be considered at as part of the Step 2 preliminary planning and design work for the CJDHP[5]. Value analysis methods are currently applied across many disciplines and project types during design and development stages. Early application of a value analysis study may result in identification of cost effective alternatives that still meet the goals and objectives of the project. The Colville Tribes will recommend that the value analysis not only address the concept design, but also take into account all aspects of the program, including review or identification of alternatives for – facilities, operations, and monitoring and evaluation.

12.2.3 STEP 3 FINAL PLANNING AND DESIGN

To ensure comprehensive input, the Colville Tribes will continue to rely on a team approach at the final planning and design stage. The team composition would be similar to the Steering and Design Committee assembled for Step 1 and Step 2 and would include: planners, hatchery managers, fish biologists, scientists from other disciplines, and individuals with engineering and construction expertise. The purpose of this committee will be to contribute review and knowledge that will help to reduce levels of uncertainty, identify opportunities for cost reductions, identify new research or state of the art equipment that should be considered, and to carefully review all aspects of the final design and related cost estimates. This approach will support a well-developed project plan and will reduce risks related to future project cost control. A refined level of detail and associated relative certainty will be particularly valuable during the bid solicitation and bid break down processes.

A placeholder of $2,400,000 has been identified for the Step 3 final planning and design stage. Initiation of this work is proposed for FY 2006. Details of the Step 3 budget have not been developed, even to a conceptual stage. More specific refinement of this budget is not appropriate at this juncture.

12.3 CONSTRUCTION COST ESTIMATES

The current estimate for capital construction, including both the Chief Joseph Dam Hatchery facility, and development and modification of acclimation ponds, is $17.3 million. These costs are preliminary estimates, based on a conceptual design. Due to the level of certainty, a 30% contingency is applied to the overall costs. However, contingency is largely dependent on the quantity of uncertainties associated with the project and the amount of pre-investigation work completed. It is expected that the estimated construction costs represent a maximum range and that cost reductions would be identified in future planning stages through analysis of alternatives and elimination of many uncertainties.

[5] For large civil, commercial and military engineering projects such as buildings, highways, and factory construction that tend to represent large one-time capital expenditures, value analysis is often applied early in the design cycle. Incorporating value analysis at the earliest stages of design and planning affords opportunities to make necessary changes in direction or design without incurring the large costs that can be associated with late-stage redesign work or construction changes. Typically for large construction projects specific value analysis studies are conducted during the schematic stage, and then again at the design development stage (i.e. up to 45% of completion). Additional value analysis studies are also sometimes conducted during the construction or build phase (Save International: http://www.value-eng.org/).

Table 24: Capital Construction Costs for Summer/Fall Chinook Program

DESCRIPTION OF AREA	ESTIMATED COST
Water Supply from Headbox	
Piping based upon COE termination at 10 feet from headbox	$ 60,350
Headbox with drum filter on reservoir supply	$ 678,578
Piping from headbox to summer/fall Chinook raceways	$ 335,400
500 cfs pumped fish ladder attraction water	$ 870,900
Raceways	
Early summer/fall Chinook raceways (bank of 20 units)	$ 534,525
Late summer/fall Chinook raceways (bank of 24 units)	$ 639,174
Brood Holding and Eggtakes	
Spawn house	$ 86,440
Fish ladder and holding/sorting tanks	$ 316,550
Rearing Building	
Start tank building for summer/fall Chinook raceways	$ 956,525
Support Building	
Support building (includes start tank store room, bio lab, incubation rooms, crew restrooms, crew room, water treatment room, larger food storage area, start tank feed storage room, garage and shop spaces - total foot print area of 18,500 sq.ft.)	$ 2,003,300
Water Treatment Influent and Effluent	
Aeration/settling structure	$ 101,100
Detention pond	$ 211,600
Office and Other	
Hatchery office and small visitor display building	$ 200,000
Site Work and Utilities	
Site work and utilities	$ 1,807,725
Housing	
Chief Joseph Dam Hatchery housing complex - 3 residences and 3 trailer shelters w/utilities	$ 434,100
Markups and Other Direct Costs	
Subtotal Raw Costs Hatchery Site with 15% O & 15% P	
Mobilization/demobilization	$ 270,000
Sales Tax @ 9%	$ 831,264
Contingency @ 30%	$ 2,770,880
TOTAL ESTIMATED COST FOR SUMMER/FALL CHINOOK PROGRAMS AT CJDH SITE WITHOUT COE SUPPLIED REARING WATER	**$ 13,108,411**

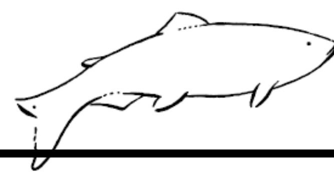
Table 24 (cont.)

DESCRIPTION OF AREA	ESTIMATED COST
COE Water Supply	
Well and reservoir water will be supplied to the hatchery site per COE. Cost shown is for relief tunnel revisions, intake diversion revisions, pipeline(s) from dam to hatchery and includes contractor mark-ups for mobilization and demobilization, site and home office bonds	$ 3,111,950
TOTAL ESTIMATED COST FOR SUMMER/FALL CHINOOK PROGRAMS AT CJDH SITE WITH COE SUPPLIED REARING WATER	**$ 16,220,361**

Notes and assumptions: Figures are based on FY 2004 dollars. Costs are at a concept stage and incorporate a 30% contingency.

Table 25: Costs of Acclimation Ponds for Summer/Fall Chinook Program

ACCLIMATION PONDS	COST
Riverside Pond - new 53,000 cubic feet acclimation pond	$ 365,400
Omak Pond - new 53,000 cubic feet acclimation pond	$ 349,125
Bonaparte Pond - modify an existing 65,300 cubic feet acclimation pond	$ 57,300
Markups and Other Direct Costs	
Subtotal acclimation ponds with 15% O & 15% P	$ 771,825
Mobilization/demobilization	$ 77,183
Sales Tax @ 9%	$ 69,464
Contingency @ 30%	$ 231,548
TOTAL SUMMER/FALL CHINOOK ACCLIMATION PONDS	**$ 1,150,019**



Notes and assumptions: Figures are based on FY 2004 dollars. Costs are at a concept stage and incorporate a 30% contingency.

Table 23 provides a summary of capital construction costs for Chief Joseph Dam Hatchery Facility and associated acclimation ponds for the CJDHP summer/fall Chinook programs. Additional detail supporting these figures is provided in Appendix B. Expenditures for this portion of the program would be likely to occur in FY 2008 and FY 2009.

12.3.1 CHIEF JOSEPH DAM HATCHERY COMPONENTS

Table 24 provides the breakdown of capital construction costs by area for each component of the proposed Chief Joseph Dam Hatchery facility.

12.3.2 ACCLIMATION POND COMPONENTS

Table 25 provides the breakdown of capital construction costs and costs for modifications, for each of the proposed summer/fall Chinook acclimation Ponds. Further breakdown and details of these costs are provided as Appendix B.

12.3.3 CAPITAL EQUIPMENT COSTS

A budget for capital equipment was identified for each functional area of the proposed program. Equipment needs for operations and maintenance, and the CJDHP monitoring and evaluation program were considered.

Table 26: Conceptual Capital Equipment Budget by Facility/Hatchery Functional Area

DESCRIPTION	TOTAL COST
Office equipment	$ 1,600
Computers and printers	$ 7,000
Office furniture and cabinets	$ 2,450
Communications equipment	$ 15,728
Housing equipment and furniture / permanent / temporary staff housing	$ 63,900
Shop equipment	$ 5,100
Buildings / facilities needs	$ 8,000
Transportation	$ 0
Water system operation	$ 0
Brood collection / hatchery and remote	$ 3,200
Eggtake	$ 11,000
Incubation	$ 15,200
Fish transport	$ 170,500
Summer/fall Chinook rearing at hatchery	$ 10,700
Summer/fall Chinook rearing at acclimation ponds	$ 11,200
Coded wire tagging / other tagging	$ 91,400
Monitoring and evaluation equipment	$ 133,200
Technical / lab equipment	$ 6,100
Disinfection equipment (disease and pathology needs)	$ 2,500
Other	$ 25,200
TOTAL	**$ 583,978**

Notes and assumptions: Costs should be considered as conceptual. Items are not duplicated in the capital construction budget. No contingency is necessary.

These items are not included in the capital construction estimates. Some items may not meet the specific criteria for capitalization but are identified as a need in this equipment budget. Cost estimates should be considered as conceptual, however no contingency is added since the total budget should provide an accurate estimate of the upper end cost range for necessary equipment (based on current assumptions). Table 26 provides a summary of the proposed capital equipment by area. An additional break out of these costs under each area listed is provided in Appendix B. These costs likely would likely occur in FY 2009 and FY 2010.

12.3.4 ONE-TIME COSTS ASSOCIATED WITH CRITICAL RESEARCH NEEDS

It has been noted previously that research to determine the effectiveness and best deployment locations for selective, life-harvest fishing gear for broodstock collection, as well as complementary radio-telemetry studies are critical to the next stages of planning for the CJDHP and to the overall success of the summer/fall Chinook programs. This research budget item is a one-time expense; however it represents a critical need to the CJDHP.

Table 27: Budget Summary for Broodstock Collection Testing

AREA	TOTAL
Equipment	$ 182,000
Field Labor	$ 265,800
Travel/Per Diem	$ 34,250
Report Writing/Data Analysis	$ 13,900
TOTAL	**$ 495,950**

Table 27 provides an estimate for one-time costs associated with broodstock collection testing and radio-telemetry research. Supporting detail for the cost estimates in Table 27 is provided in Appendix E. These costs should be considered as conceptual. However, no contingency is applied since these costs are assumed to represent the upper range of cost estimates. Expenditures for this portion of the program would likely occur in FY 2007.

A number of assumptions are incorporated into these research cost estimates. It is assumed that researchers will purchase and test all gears described in the study plan over a single migration season. The accuracy of this assumption will not be known until the results of the proposed adult radio-tagging study is completed 1-year prior to the first broodstock collection effort. Field staff will be seasonal employees recruited to conduct the study. Thus, costs for hotels and food need to be accounted for in the budget. These costs can be reduced significantly, or possibly eliminated, if researchers are able to hire locally based field technicians. The trucks needed to haul captured adults to holding facilities, and the holding facilities themselves, will be provided by state, tribal or federal agencies. Therefore, no monies have been allocated to these items. Fuel costs and labor to operate transport trucks are included in the cost estimate. Colville Tribal biologists or anglers would be available to assist in the broodstock collection effort. Colville staff and equipment (boats, trucks, etc) will be required to help in the placement of traps and fish wheels, assist in adult capture activities, and to identify key fishing areas. Hourly rates are based on typical consulting firm rates for the level of professional staff proposed. Plans to rent rather than purchase some equipment is also anticipated to result in some cost savings.

Table 28: Budget Summary for Chief Joseph Dam Adult Summer/Fall Chinook Telemetry Study 2005

AREA	TOTAL
Personnel	$ 165,206
Expenses, travel, equipment rental, charters	$ 48,296
Equipment purchases	$ 143,698
Miscellaneous	$ 34,200
Project sub-total	*$ 391,399*
Washington State B&O Tax	$ 5,871
TOTAL	**$ 397,270**

Notes and assumptions: Personnel are at contractor rates. Expenses include travel, rental air charters. Potential budget reductions in equipment purchase costs may be achieve by renting equipment. Miscellaneous category includes subcontract for $30,000.

Table 28 provides a cost for the broodstock behavior and testing study, a detailed budget is provided in Appendix E. These costs should be considered as conceptual, however this is deemed a maximum estimate, thus no contingency is applied. Expenditures for this portion of the program would likely occur in FY 2006.

12.4 TEN-YEAR COST ESTIMATES FOR OPERATIONS AND MAINTENANCE

12.4.1 CHIEF JOSEPH DAM HATCHERY COMPONENTS

Costs were investigated in detail for each operational area of the proposed CJDHP. These costs should be considered conceptual. However, no contingency is needed at this stage of planning since these costs should represent an upper limit. Annual costs, based

Table 29: Annual Operating Expenses Summer/Fall Chinook Program

OPERATIONAL AREA	QUARTER				YEAR
	Q1	Q2	Q3	Q4	
Payroll (taxes, benefits, mark-ups)	$154,600	$89,232	$95,138	$128,873	$467,843
Vehicles (fuel, oil, maintenance, mileage, insurance)	$5,750	$9,350	$5,750	$6,974	$27,824
Repairs and maintenance (site, buildings, equipment)	$1,870	$3,010	$3,100	$2,050	$10,030
Rent and lease (equipment, vehicles)	$4,800	$4,800	$4,800	$4,800	$19,200
Program supplies (shop, office)	$3,500	$3,500	$3,500	$3,500	$13,999
Program supplies (lab, water system, eggtake, incubation)	$3,208	$3,125	$3,375	$3,875	$13,583
Program supplies (rearing and release)	$18,500	$18,500	$18,500	$18,500	$74,000
Program supplies (tagging, tag recovery)	$0	$0	$25,000	$75,000	$100,000
Utilities (electrical, telephone)	$23,616	$23,616	$23,616	$23,616	$94,462
Travel costs (mileage, lodging, per diem)	$1,235	$1,235	$1,235	$1,235	$4,939
Education and training	$375	$375	$375	$375	$1,500
Subcontracts (professional fees, testing, sampling)	$3,875	$4,875	$6,875	$4,875	$20,500
Facility insurance	$2,475	$2,475	$2,475	$2,475	$9,900
TOTALS	**$223,803**	**$164,092**	**$193,738**	**$276,147**	**$857,780**

Notes and assumptions: Expenses are based on 2004 dollars. Budget includes costs for operating acclimation ponds.

on 2004 dollars are shown as Table 29. Detailed backup documentation for these cost estimates are provided in Appendix G. The total budgeted amount is likely to be incurred on an annual basis starting in 2009. However, the Colville Tribes recommend that key managers be involved during construction, on a part time basis going to full time, during project start-up and training.

An important budget note with potential programmatic or policy implications is the proportional cost of coded wire tagging. In these preliminary cost estimates, fish tagging (including tags, personnel costs and estimated portions of the facility costs, associated with tagging operations), accounts for roughly 30% of the total operating budget. While the importance of marking protocols in artificial production programs is incontrovertible, the costs associated with these programs can be substantial. At the very least, there is a clear need to develop more cost-effective mechanisms or to establish adequate representative samples. Additional less obvious, but also substantial, costs are also associated with the resultant need to process, record and analyze information collected through these programs.

A ten-year projection based on FY 2004 dollars and an assumed 3.4 % annual increase in all operational areas is shown as Table 30.

Table 30: Operating Expenses Summer/Fall Chinook Program 10-Year Projection

OPERATIONAL AREA	FY 2004	FY 2005	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013
Payroll (taxes, benefits, markups)	$467,843	$483,750	$500,197	$517,204	$534,789	$552,971	$571,772	$591,213	$611,314	$632,099
Vehicles (fuel, oil, maintenance, mileage, insurance)	$27,824	$28,770	$29,748	$30,759	$31,805	$32,887	$34,005	$35,161	$36,356	$37,592
Repairs and maintenance (site, buildings, equipment)	$10,030	$10,371	$10,723	$11,088	$11,465	$11,855	$12,258	$12,675	$13,105	$13,551
Rent and lease (equipment, vehicles)	$19,200	$19,853	$20,528	$21,226	$21,947	$22,694	$23,465	$24,263	$25,088	$25,941
Program supplies (shop, office)	$13,999	$14,475	$14,968	$15,476	$16,003	$16,547	$17,109	$17,691	$18,293	$18,915
Program Supplies (lab, water system, eggtake, incubation)	$13,583	$14,045	$14,522	$15,016	$15,527	$16,055	$16,600	$17,165	$17,748	$18,352
Program supplies (rearing and release)	$74,000	$76,516	$79,117	$81,807	$84,589	$87,465	$90,438	$93,513	$96,693	$99,980
Program supplies (tagging, tag recovery)	$100,000	$103,400	$106,916	$110,551	$114,309	$118,196	$122,215	$126,370	$130,667	$135,109
Utilities (electrical, telephone)	$94,462	$97,674	$100,995	$104,429	$107,979	$111,651	$115,447	$119,372	$123,430	$127,627
Travel costs (mileage, lodging, per diem)	$4,939	$5,107	$5,281	$5,460	$5,646	$5,838	$6,036	$6,242	$6,454	$6,673
Education and training	$1,500	$1,551	$1,604	$1,658	$1,715	$1,773	$1,833	$1,896	$1,960	$2,027
Subcontracts (professional fees, testing, sampling)	$20,500	$21,197	$21,918	$22,663	$23,433	$24,230	$25,054	$25,906	$26,787	$27,697
Facility insurance	$9,900	$10,237	$10,585	$10,944	$11,317	$11,701	$12,099	$12,511	$12,936	$13,376
TOTALS	**$857,780**	**$886,944**	**$917,100**	**$948,282**	**$980,524**	**$1,013,861**	**$1,048,333**	**$1,083,976**	**$1,120,831**	**$1,158,939**

Notes and assumptions: Projection is based on annual increase of 3.4% in all operational areas. Acclimation pond operational costs are included.

12.4.2 ACCLIMATION POND COMPONENTS

Table 31 provides a very rough estimate of annual operational costs for the Riverside, Omak and Bonaparte acclimation ponds. These costs are already included in the overall budget (Table 30) but are broken out here for ease of review. Costs would be incurred on an annual basis as part of the full program operations budget.

12.5 COST ESTIMATES FOR CONCEPTUAL MONITORING AND EVALUATION PROGRAM

12.5.1 ANNUAL MONITORING AND EVALUATION PROGRAM EXPENSES

Annual monitoring and evaluation expenses based on 2004 dollars are shown in Table 32. Program design details related to these costs are provided in Appendix H. Tagging costs at the Chief Joseph Dam Hatchery facility are included in the operations budgets, not in the annual monitoring and evaluation costs. While these monitoring and evaluation expenses are conceptual, no contingency is planned at this stage since the estimates are assumed to be at the upper range of potential costs. The budgeted amount would begin to be incurred on an annual basis starting in FY 2010. However, some expenditure of allocated budgets to

Table 31: Estimated Costs for Operation of Summer/Fall Chinook Acclimation Ponds

POND NAME	PUMPING	FEED	PERSONNEL	VEHICLES	TRANSPORT	TOTAL
Riverside	$14,750	$36,875	$28,500	$2,000	$800	$82,925
Omak	$16,900	$42,250	$33,000	$1,000	$500	$93,650
Bonaparte	$14,750	$36,875	$28,500	$2,000	$800	$82,925
TOTALS	**$46,400**	**$116,000**	**$90,000**	**$5,000**	**$2,100**	**$259,500**

Notes and assumptions: Costs are all approximate estimations based on pounds of production. Costs are included in operating estimates for summer/fall Chinook.

Table 32: Monitoring and Evaluation Expenses Summer/Fall Chinook Program

OPERATIONAL AREA	QUARTER				FY 2004 TOTAL
	Q1	Q2	Q3	Q4	
Payroll (taxes, benefits, markups)	$45,479	$80,275	$100,895	$41,791	$268,440
Vehicles (fuel, oil, maintenance, mileage, insurance)	$3,651	$3,651	$3,651	$5,188	$16,142
Repairs and maintenance (site, buildings, equipment)	$154	$5,266	$4,190	$384	$9,994
Rent and lease (equipment, vehicles)	$2,306	$8,764	$3,536	$1,537	$16,143
Program supplies (shop, office, lab)	$2,883	$3,651	$3,651	$2,883	$13,067
Program supplies (tagging & tag recovery)	$0	$0	$384	$1153	$1,537
Utilities (electrical, telephone)	$1,345	$1,345	$1,345	$1,345	$5,381
Travel costs (mileage, lodging, per diem)	$2,023	$2,585	$2,585	$2,023	$9,217
Education and training	$576	$576	$576	$576	$2,306
Subcontracts (professional fees, testing, sampling)	$0	$307	$922	$307	$1,537
Postage, dues and subscriptions	$384	$384	$384	$384	$1,538
TOTALS	**$58,802**	**$106,806**	**$122,122**	**$57,573**	**$345,303**

Table 33: Operating Expenses Associated with Summer/Fall Chinook Coded Wire Tagging

AREA	QUARTER				YEAR
	Q1	Q2	Q3	Q4	
Payroll (taxes, benefits, markups)	$82,178	$4,999	$4,999	$56,452	$148,628
Vehicles (fuel, oil, maintenance, mileage, insurance)	$75	$75	$75	$151	$376
Repairs and maintenance (site, buildings, equipment)	$175	$175	$175	$175	$700
Rent and lease (equipment, vehicles)	$900	$900	$900	$900	$3,600
Program supplies (shop, office)	$200	$200	$200	$200	$800
Program supplies (lab, water system, eggtake, incubation)	$100	$100	$100	$100	$400
Program supplies (rearing and release)	$50	$50	$50	$50	$200
Program supplies (tagging, tag recovery)	$0	$0	$25,000	$75,000	$100,000
Utilities (electrical, telephone)	$262	$262	$262	$262	$1,050
Travel costs (mileage, lodging, per diem)	$36	$36	$36	$36	$146
Education and training	$0	$0	$0	$0	$0
Subcontracts (professional fees, testing, sampling)	$50	$50	$50	$50	$200
Facility insurance	$21	$21	$21	$21	$82
TOTALS	**$84,047**	**$6,868**	**$31,868**	**$133,397**	**$256,181**

Notes and assumptions: Identifies all direct costs for tagging about 47% of the production. Figures are based on estimated portions of the operations budget associated with tagging.

address critical uncertainties may be necessary as early as FY 2008 and FY 2009.

Assumptions associated with Table 32 include: coded wire tagging costs are included in the facility operations and maintenance costs; hatchery fish will be tagged at the Chief Joseph Dam Hatchery; equipment costs for both facility tagging operations and monitoring and evaluation are addressed in Table 24. Wild fish will be tagged at trapping facilities in Okanogan River with all costs covered by the monitoring and evaluation program; a portable PIT tag station and trailer is included in monitoring and evaluation capital expenses; the Colville Tribes will use the trailer and equipment at both the Chief Joseph Dam Hatchery facility (PIT tag hatchery fish) and in the field (wild tagging). The Okanogan/Similkameen Baseline Monitoring and Evaluation Program will fund the first year of wild fish tagging (to establish a baseline) and the CJDHP monitoring and evaluation program will cover costs after that.

12.5.2 OPERATING EXPENSES ASSOCIATED WITH SUMMER/FALL CHINOOK TAGGING

As noted previously, a major portion of the overall CJDHP operating costs are associated with on-site tagging. Table 33 provides an estimate of the annual operational cost associated with on-site tagging for the main Chief Joseph Dam Hatchery facility.

Table 34: Monitoring and Evaluation Expenses Summer/Fall Chinook Program 10-Year Projection

OPERATIONAL AREA	FY 2004	FY 2005	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013
Payroll (taxes, benefits, mark-ups)	$268,440	$277,567	$287,004	$296,762	$306,852	$317,285	$328,073	$339,227	$350,761	$362,687
Vehicles (fuel, oil, maintenance, mileage, insurance)	$16,142	$16,691	$17,259	$17,846	$18,452	$19,080	$19,728	$20,399	$21,093	$21,810
Repairs and maintenance (site, buildings, equipment)	$9,994	$10,334	$10,685	$11,048	$11,424	$11,813	$12,214	$12,629	$13,059	$13,503
Rent and lease (equipment, vehicles)	$16,143	$16,692	$17,259	$17,846	$18,453	$19,080	$19,729	$20,400	$21,093	$21,811
Program supplies (shop, office)	$13,067	$13,512	$13,971	$14,446	$14,937	$15,445	$15,970	$16,513	$17,075	$17,655
Program Supplies (tagging, tag recovery)	$1,537	$1,589	$1,643	$1,699	$1,757	$1,817	$1,878	$1,942	$2,008	$2,077
Utilities (electrical, telephone)	$5,381	$5,564	$5,753	$5,949	$6,151	$6,360	$6,576	$6,800	$7,031	$7,270
Travel costs (mileage, lodging, per diem)	$9,217	$9,530	$9,854	$10,189	$10,536	$10,894	$11,264	$11,647	$12,043	$12,453
Education and training	$2,306	$2,384	$2,465	$2,549	$2,636	$2,726	$2,818	$2,914	$3,013	$3,116
Subcontracts (professional fees, testing, sampling)	$1,537	$1,589	$1,643	$1,699	$1,757	$1,817	$1,878	$1,942	$2,008	$2,077
Postage, Dues, Subscriptoins	$1,538	$1,590	$1,644	$1,700	$1,758	$1,818	$1,880	$1,943	$2,010	$2,078
TOTALS	**$345,303**	**$357,043**	**$369,182**	**$381,735**	**$394,713**	**$408,134**	**$422,010**	**$436,359**	**$451,195**	**$466,535**

Notes and assumptions: Out years projected at 3.4%. Coded wire tagging costs are included in the facility O& M costs.

12.5.3 TEN-YEAR MONITORING AND EVALUATION PROGRAM COSTS

A projection of monitoring and evaluation costs for ten years based on FY 2004 dollars with an projected annual increase of 3.4 % in all operational areas is shown as Table 34.

Table 35 provides a summary by area of CJDHP budget totals and budget portions associated with monitoring and evaluation.

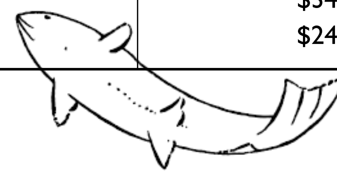
12.6 COSTS SUMMARY

Costs estimates at the Step 1 planning stage are very preliminary. However, as noted previously, in developing these cost estimates the Colville Tribes and the CJDHP project manager developed a very thorough cost structure on which to base these estimates. The Colville Tribes' look forward to further refining these cost estimates in Step 2 and through the use of value analysis at Step 2 and Step 3.

Table 35: Summer/Fall Chinook Program Tagging and Monitoring and Evaluation Costs

AREA	BUDGET TOTAL	PORTION OF BUDGET FOR TAGGING AND OTHER M&E
Annual Operational Costs	$857,780	$256,181
Annual M &E Costs	$345,000	$345,000
Capital Equipment Budget	$613,978	$244,600

Notes and assumptions: All Figures in FY 2004 Dollars



13.
Proposed Spring Chinook Salmon Programs

Chief Joseph Dam Hatchery Program

MASTER PLAN

13

Proposed Spring Chinook Salmon Programs

13.1 CHAPTER OVERVIEW

This chapter describes the proposed spring Chinook components of the CJDHP. As noted at the beginning of this Master Plan document, Council staff and representatives from the BPA agreed to include review of the proposed CJDHP spring Chinook salmon components as a separable piece of the Step 1 CJDHP Master Plan since it was possible to include at very little additional cost. Information pertinent to the CJDHP spring Chinook programs is summarized in this chapter. Much of the information already presented in this document, including the legal and historical background, regional and local context, and conceptual monitoring and evaluation overview is equally relevant to the spring Chinook components of this proposal and is not repeated again in this chapter.

Spring Chinook were once abundant in the Okanogan subbasin and provided an important fishery to the Colville Tribes in the months of May, June and early July. A central objective of the Colville Tribes' long-term anadromous fish management plan is the restoration of Chinook salmon to their historical habitat in the waters around the Colville Reservation, particularly to the Okanogan subbasin. Given the Colville Tribes' almost non-existent remaining salmon fisheries, and the singular cultural importance of the spring Chinook (i.e. the impetus for the First Salmon Ceremony), restoration of a stable ceremonial and subsistence spring Chinook fishery is particularly significant to the Colville Tribes. As noted previously, the Colville Tribes' current limited ceremonial and subsistence salmon fisheries are entirely inadequate to meet even the most cursory needs.

Relationship of Spring Chinook Programs to CJDHP Guiding Principles

Accountability
- Measure program performance against specific performance standards and indicators
- All spring Chinook marked

Best Available Science
- Program designed to address ecological context of subbasin it will be implemented within
- Testing feasibility with Carson stock prior to transitioning to endangered species
- Use of local broodstocks
- Production facilities designed for low density rearing and acclimation on home waters
- Use of marking protocols

Cost-Effectiveness
- Use and modification of existing irrigation ponds for acclimation facilities

Flexibility
- Use of combination of acclimation and hatchery facilities
- Integration of the recovery and isolated harvest programs
- Built-in adaptation and feed-back loops

Innovation
- Use of live-capture, selective-fishing gear for broodstock collection, ceremonial and subsistence harvest, and escapement management
- Experimental program

The following sections of this chapter include: a review of the ecological rationale for including spring Chinook in the CJDHP, an overview of proposed spring Chinook management programs in the Okanogan, notable issues related to local or regional context, a description of the CJDHP spring Chinook programs and facilities, and estimated costs for those specific components. Substantial additional detail regarding all aspect of the spring Chinook programs can be found in the Okanogan River spring Chinook HGMP in Appendix D, a more integrated picture of the summer/fall and spring Chinook facility is presented in the facility conceptual design report in Appendix H. Additional specific detail on costs is included in the cost estimates provided in Appendix B.

13.2 OVERVIEW ECOLOGICAL RATIONALE FOR INCLUSION OF SPRING CHINOOK

13.2.1 STATUS OF SPRING CHINOOK IN UPPER COLUMBIA RIVER AND OKANOGAN SUBBASIN

Upper Columbia River Spring Chinook were listed as endangered on March 24, 1999. The listed ESU includes all naturally-spawning populations of spring Chinook in accessible reaches of Columbia River tributaries between Rock Island and Chief Joseph dams, *excluding* the Okanogan River. Several hatchery populations from the Methow and Wenatchee subbasins were also included in the listed ESU.

The Upper Columbia River Spring Chinook ESU includes stream-type Chinook salmon that spawn above Rock Island Dam in the Wenatchee, Entiat, and Methow rivers. Native spring Chinook salmon are considered extirpated from the Okanogan River. All Chinook salmon in the Okanogan River are now believed to be ocean-type and are considered part of the Upper Columbia River Summer/Fall Chinook ESU (Talayco 2002).

Although populations of the Upper Columbia River Spring Chinook ESU are in general dangerously depressed, in 2000, 2001, and 2002 the returning runs increased significantly. Spring Chinook escapement to the Columbia Cascade Province from 1990 through 2003 is summarized in Table 36. Based on the numbers of natural-origin fish returning to the Wenatchee, Entiat, and Methow rivers, the proportion of the Upper Columbia River Spring Chinook passing Priest Rapids Dam was estimated to average 13% from 1990 to 1999 [see SP HGMP, pp. 31-33].

13.2.2 OVERVIEW LIFE HISTORY

Adult spring Chinook destined for the Columbia Cascade Province enter the Columbia River beginning in March, reaching peak abundance in the lower Columbia River in April and early May (Chapman et al. 1995). From 1985 to 1993, the average 10th, 50th, and 90th percentile passage at Rock Island Dam was April 21st, May 10th, and June 3rd, respectively (Chapman et al. 1995). Although these percentages are strongly influenced by releases from Leavenworth National Fish Hatchery, Chapman et al. (1995) suggest the naturally produced migrants have a run timing similar to the hatchery component. Spring Chinook enter the Columbia Cascade Province tributaries from late-April to July, with spawning occurring from late-July through September and generally peaking in mid to late August (Chapman et al. 1995).

Analysis of data from post-spawn spring Chinook adults collected and sampled in the mid-Columbia tributaries from 1986 to 1993 shows that on average, 5% of males return at age 3, 58% at age 4, and 37% at age 5. Female averages are 58% at age 4, and 42%

Table 36: Spring Chinook – Adult Counts at Rock Island and Wells Dams. Source: Fish Passage Center.

YEAR	ROCK ISLAND	WELLS
2003	16,881	4,504
2002	24,017	7,587
2001	39,785	9,989
2000	14,850	2,130
1990 - 1999 average	6,568	753
1980 - 1989 average	13,315	2,581

Note: Numbers include endangered Upper Columbia River Spring Chinook and unlisted Carson-stock Fish return at age 5 (Chapman et al. 1995). Once on the spawning grounds, Chapman et al. (1995) indicated that females may dominate the males in numbers. The actual ratio, however, may be closer to 1:1 since females are more likely to be recovered than males (Chapman et al. 1994).

Wild juvenile spring Chinook salmon originating in the Columbia Cascade Province generally emigrate towards the ocean during their second year (Chapman et al. 1995). However, Okanogan spring Chinook may have historically exhibited an ocean-type life history with juveniles migrating out of the warming waters of the Okanogan subbasin as 0-age pre-smolts or smolts. Such a life history adaptation is thought to have occurred in other Columbia River subbasins with similar ecological characteristics. It is also likely that Okanogan spring Chinook that spawned above Osoyoos Lake, reared in Osoyoos Lake prior to smoltification. This is a life history strategy that has proven effective for both sockeye and coho salmon. A similar life history strategy occurred historically in Idaho, where spring Chinook salmon spawned above Redfish Lake with the juveniles rearing in the lake alongside sockeye salmon prior to their ocean migration. In another example, it is probable that juvenile spring Chinook from the White and Little Wenatchee rivers, rear in Lake Wenatchee (Bugert, 1998). Reservoir rearing of juvenile spring Chinook was also a successful strategy in Fall Creek and Green Peter reservoirs in the Willamette subbasin, where large smolts and sizeable adult runs have been produced. In recent years large juvenile, or residual Chinook, were once captured in gill nets in upper Osoyoos Lake [see SP HGMP, p. 11].

13.2.3 HISTORICAL AND CURRENT ARTIFICIAL PRODUCTION

Artificial production of spring Chinook began in the Columbia Cascade Province in 1939 under the auspices of the Grand Coulee Fish Maintenance Project (Bugert 1998). Under this program fish from three USFWS hatcheries were reared and released in the Wenatchee, Entiat, and Methow rivers. It is generally assumed that operation of the Grand Coulee Fish Maintenance Project through the 1930s and early 1940s resulted in substantial homogenization of Upper Columbia River Spring Chinook (Myers et al. 1998).

Beginning in the 1950s, the Carson National Fish Hatchery established the Carson spring Chinook stock through collection of brood from the spring Chinook run-at-large at Bonneville Dam. The majority of fish collected for the Carson broodstock were most likely Snake River subbasin-origin fish, although populations from tributaries in the upper and middle Columbia River regions were also significantly represented (Myers et al. 1998, quoting Hymer et al. 1992).

The initial spring Chinook artificial production programs in the Wenatchee, Entiat, and Methow rivers proved only marginally successful. In very little time the managers resorted to importing broodstock from other downstream hatchery locations. Production programs using these downstream imported broodstocks continued into the 1960s, were suspended briefly, and were then reinitiated in the 1970s using Carson stock brood. In recent years broodstock have been collected from these three Cascade Columbia Province hatcheries, with particular dependence on the Leavenworth National Fish Hatchery.

Leavenworth National Fish Hatchery is presently used to collect, rear, and release non-listed spring Chinook salmon into Icicle Creek, a tributary of the Wenatchee River. Leavenworth National Fish Hatchery spring Chinook are derived primarily from the Carson lineage spring Chinook broodstocks (Marshall et al. 1995). In addition to the transfers of Carson National Fish Hatchery stocks, the broodstocks used at Leavenworth were established through large transfers of spring stocks from other non-local sources, including the Little White Salmon National Fish Hatchery, WDFW's Klickitat Hatchery, and WDFW's Cowlitz Hatchery. Genetic evaluations by WDFW determined that the Leavenworth stock is derived primarily from Carson National Fish Hatchery stocks (Marshall et al. 1995) [see SP HGMP, pp. 57-58].

In its, *Status Review of Chinook Salmon from Washington, Idaho, Oregon, and California*, NOAA Fisheries (formerly NMFS) concluded that indigenous spring Chinook in the Upper Columbia River tributaries still represent an important genetic resource since they contain the last remnant gene pools for Columbia River headwater populations (Myers et al. 1998).

The potential for adverse genetic introgression resulting from the widespread transplants of non-native Carson stock spring Chinook in the Columbia Cascade Province is a significant source of concern. In 1999, a work group associated with the Northwest Fishery Science Center's Conservation Biology Division concluded that Carson-origin stocks propagated at the Leavenworth, Entiat and Winthrop National Fish Hatcheries were not biologically part of the Upper Columbia River Spring Chinook ESU. In its listing decision for that ESU, NOAA Fisheries stated that the Leavenworth National Fish Hatchery spring Chinook salmon stock is non-local, and not part of the Upper Columbia River ESU [see SP HGMP, p. 57].

13.2.4 HISTORICAL AND CURRENT DISTRIBUTION

Spring Chinook are known to have historically inhabited both Salmon and Omak creeks. They may also have occurred in the Similkameen River, although there is some disagreement regarding historical levels of production in the Similkameen. Chapman (1995) stated, "No reliable information indicates that spring Chinook ever used the Similkameen River." It is possible that a 15-foot fall, located near the current site of Enloe Dam (RM 8.8) may historically have posed a barrier to anadromous fish passage. The Similkameen River is presently impassable to all anadromous salmonids at Enloe Dam.

Spring Chinook also are known to have migrated above Osoyoos Lake into Canada and spawned in the upper Okanogan River and other tributaries. Up through the late 1950s and early 1960s, spring Chinook were observed in the Okanogan River as far upstream as Okanagan Falls. In particular, spring Chinook have been observed spawning from Okanagan Falls downstream to the town of Oliver, with concentrated spawning occurring primarily in a reach about 1 mile above the town of Oliver near Vasseaux Creek. In recent years, there are reports of small numbers of spring Chinook spawning in the Okanogan River above Osoyoos Lake (Bartlett, 2001 personal communication). However, it is likely that these remnant runs may now be summer/fall Chinook.

13.2.5 HISTORICAL AND CURRENT HARVEST

Okanogan subbasin tribal salmon fisheries occurred historically in May, June, and early July. Based on this timing it is most likely that these were spring Chinook fisheries. In 1811, Alexander Ross described Southern Okanagans assembling in large bands in the month of June for the summer fishing season (Ray 1972).

Spring Chinook bound for the Okanogan and the Columbia River above its confluence pass through Columbia River fisheries managed pursuant to the Columbia River Compact and *U.S. v Oregon*. The Okanogan River fisheries are not yet included in any existing harvest plan or regulations because the existing and proposed programs are too recent.

Between 1988 and 1999, 86% of the harvest of Carson stock spring Chinook returning to Leavenworth National Fish Hatchery occurred in the Wenatchee subbasin while 14% occurred in all other fisheries [SP HGMP, p. 41].

13.2.6 LIMITING FACTORS AND HABITAT CAPACITY

Over the years, substantial degradation of tributary and mainstem Okanogan River habitat, combined with downstream hydroelectric development, and historical over-fishing on the ocean and Columbia River, have resulted in the decimation of the Okanogan subbasin runs of spring Chinook.

A review of larger out-of-subbasin limiting factors, such as the impacts of Columbia River operations for electricity, flood control and spill; changing ocean conditions; uncertainty related to the carrying capacity of the Columbia River and estuary; and other out-of-subbasin variables was presented in Chapter 6. As presented in previous chapters, actions to improve juvenile and adult salmon passage through the hydroelectric system are critical to the long-term viability of natural-origin Upper Columbia River spring Chinook populations.

Because spring Chinook were extirpated from the Okanogan subbasin so many years ago, critical information on the viability and likely performance of

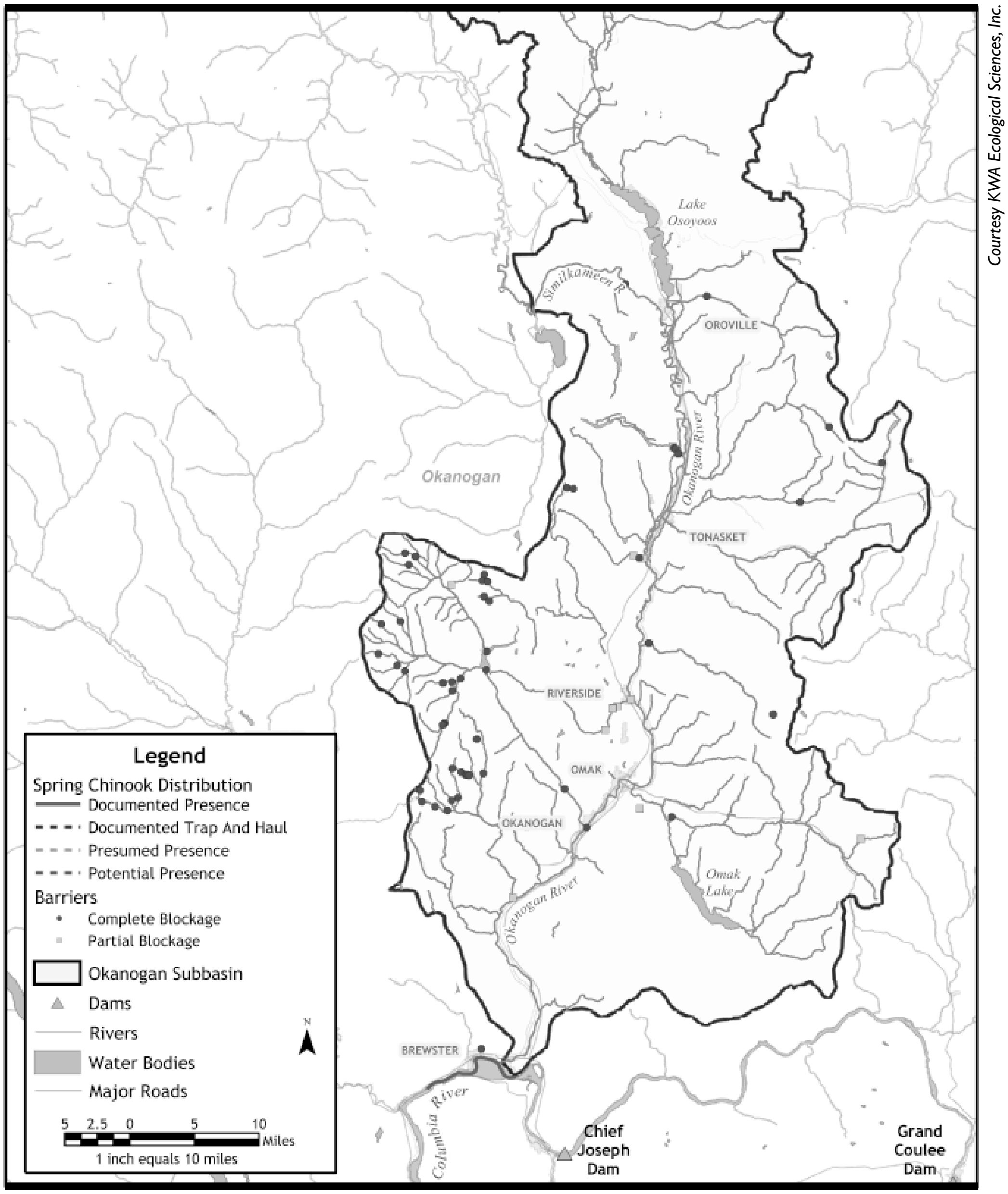


FIGURE 43: Spring Chinook Distribution

spring Chinook in the Okanogan subbasin does not exist. Adequate information to determine with much certainty the historical, or current, carrying capacity of the Okanogan subbasin habitat for spring Chinook simply does not exist.

The carrying capacity of the Okanogan River and the effect of spring Chinook re-introduction programs will be an important focus of both the CJDHP monitoring and evaluation program and the Okanogan/Similkameen Baseline Monitoring and Evaluation Program.

The primary limiting factors for spring Chinook in the Okanogan subbasin in order of descending importance are: agricultural water withdrawals from Okanogan tributaries and the mainstem Okanogan River, elevated summer water temperatures, sedimentation, the loss of riparian vegetation along tributaries and the Okanogan mainstem, and passage barriers on some tributaries. Lesser, but nevertheless significant, factors include water quality and quality of in-channel habitat. Rehabilitation of historical spring Chinook habitat has occurred in select tributaries, primarily Omak and Salmon creeks. However, on a subbasin scale, rehabilitation efforts are still in their infancy.

13.3 LOCAL AND REGIONAL CONTEXT RELATIVE TO SPRING CHINOOK COMPONENTS

Please refer to the description of the Okanogan subbasin, the status of current environmental assessments, coordinated planning, current and planned management activities, and highlights of projects and activities relevant to both summer/fall and spring Chinook presented in Chapter 6.

13.3.1 CURRENT MANAGEMENT ACTIVITIES SPECIFIC TO SPRING CHINOOK

A comprehensive ESU-wide plan for propagation of spring Chinook in the Columbia Cascade Province does not presently exist. Spring Chinook management in the Okanogan River and in the Columbia River above its confluence was omitted from many of the recent salmon management plans and agreements addressing the Columbia River Basin and the Mid-Columbia River region.

The Mid-Columbia BAMP did not include any activities related to spring Chinook in the Okanogan subbasin. However, the BAMP provides a framework for managing spring Chinook in the Wenatchee, Entiat, and Methow rivers. Given the precarious state of the endangered spring Chinook populations, the BAMP recommended an artificial production "spread the risk" strategy [see SP HGMP, p. 39].

Spring Chinook management in the Okanogan River and in the Columbia River above its confluence was not addressed in the draft Mid-Columbia River Hatchery Program or the HCPs for the Wells, Rocky Reach, and Rock Island hydroelectric projects.

The Colville Tribes will be using the Okanogan River spring Chinook HGMP [Appendix D] as a basis for renegotiating mitigation agreements with the PUDs and the Bureau of Reclamation to recover and rebuild the Colville Tribes' historical trust resources and fisheries.

There is no ESA recovery plan addressing spring Chinook in the Okanogan subbasin. The Okanogan River and the Columbia River above its confluence was not included as critical habitat in the ESA listing of Upper Columbia River Spring Chinook.

Spring Chinook management in the Okanogan River and in the Columbia River above its confluence was also not addressed in the now expired Columbia River Fish Management Plan adopted pursuant to *U.S. v Oregon*. In the future, negotiations for harvest management in *U.S. v Oregon* will need to specifically account for the Colville Tribes' ceremonial and subsistence harvest as well as recreational harvest in the Columbia Cascade Province [see also SP HGMP, p. 41].

13.3.2 AD HOC EXPERIMENTAL SPRING CHINOOK RELEASES

Since 2001, experimental releases of spring Chinook have been undertaken on an ad hoc basis in the Okanogan subbasin. The Carson stock fish used for these releases were made available from existing mitigation programs to test rearing habitat on the Okanogan River and Omak Creek and to reduce risks to listed spring Chinook in the Methow River.

13.3.2.1 Experimental Integrated Recovery Releases

In 2001, the Colville Tribes' released Carson stock spring Chinook into Omak Creek for the first time. This release was part of an agreement to reduce the release of Carson stock fish in the Methow subbasin (and eliminate the destruction of surplus stock). This initial release consisted of 40,000 BY'99 smolts, which were scatter-planted in Omak Creek below Mission Falls.

In 2002, another 48,000 BY'00 smolts were scatter-planted in Omak Creek below Mission Falls.

In 2003, construction of the new St. Mary's Mission (RM 32) acclimation pond on Omak Creek was completed. Later that year 44,000 smolts were acclimated in the pond. Unfortunately, 10,000 yearlings were lost prior to release when the pond's water supply failed (modifications to the Pond to address this problem are proposed as part of the CJDHP).

In 2004, 45,000 juveniles being acclimated in St. Mary's Mission Pond were lost when an auxiliary pump failed resulting in a complete fish kill.

An additional proposed release in Salmon Creek has been indefinitely deferred pending completion of an agreement with the Okanogan Irrigation District.

13.3.2.2 Experimental Isolated Harvest Releases

In 2002, 254,000 BY'00 smolts were released in the Okanogan subbasin from the Ellisforde Pond (RM61.7). These releases were the result of negotiations to address excess Carson stock returning to the Methow subbasin.

In 2003, 100,000 BY'01 smolts were released from Bonaparte Pond.

In 2004, 100,000 yearling spring Chinook will be released from Ellisforde Pond.

13.4 ALTERNATIVES CONSIDERED IN DEVELOPING SPRING CHINOOK COMPONENTS

In identifying the best alternative(s) for long-term re-introduction of spring Chinook in the Okanogan subbasin, two basic alternatives were given consideration: natural re-colonization, and assisted relocation. In addition, consideration was given to the appropriate spring Chinook stock(s) to use.

Use of Carson, Methow composite, and Wenatchee stocks were considered. The Methow composite and the Wenatchee stocks are components of the endangered Upper Columbia River Spring Chinook ESU. Carson stock was selected for use in the initial phase of the spring Chinook programs because it is available in the Columbia Cascade Province and has a history of relative success in the hatchery environment. The stock has been propagated for over 50 years in the Columbia Cascade Province. Its productivity rate varies substantially based on the spring migration conditions at the Columbia River dams and with conditions in the marine environment. It is an early returning spring Chinook, a trait that will be critical to recovery in the Okanogan where the mainstem water temperatures reach excessive levels in July.

Natural re-colonization is not deemed a viable alternative due to the low rates of straying into the Okanogan River basin over the past 50 years, and due to the low smolt-to-adult survival rates in the Columbia Cascade Province. The Colville Tribes' combined objectives of restoring naturally-spawning populations, creating stable ceremonial and subsistence fisheries, providing recreational fisheries, and assisting in recovery of this listed ESU, cannot be met solely by natural re-colonization.

A number of options are available to implement assisted relocation, depending on the life stage used, and the area of relocation. Relocation can be accomplished by 1) transplanting adult fish into spawning habitat, 2) placing fertilized eggs into the spawning habitat, 3) planting unfed fry, 4) planting fingerlings or pre-smolts, and/or 5) planting acclimated or un-acclimated smolts. These options are further differentiated by which stock(s) are used.

Six strategic options were considered. These options are described in the Okanogan River spring Chinook HGMP [pp. 89-94]. The options considered were:

1. Isolated harvest program using Carson stock released at 1-5 locations.
2. Integrated harvest program using Carson stock released at 1-5+ locations.
3. Integrated recovery program using Methow Composite stock released at 1-5+ locations.
4. Dual isolated harvest and integrated recovery programs using Carson stock and Methow Composite stock, respectively, released at 1-3 sites for each program.
5. Dual integrated recovery and isolated harvest programs using Carson stock initially, transitioning to Methow Composite stock when available. Fish would be released at 1-2+ sites for the recovery program and 1-3+ sites for the harvest program.
6. Dual integrated recovery and isolated harvest programs using an, as yet to be determined, stock of spring Chinook.

The CJDHP proposal is based on alternative number five above. This preferred approach combines comprehensive integrated recovery and isolated harvest programs using Carson stock initially, and then transitioning to Methow composite stock when it becomes available. This option was selected because is has the greatest likelihood of meeting both the recovery and harvest goals of the Colville Tribes, while also presenting the least risk to other fishery resources and objectives in the Columbia Cascade Province.

13.5 FRAMEWORK FOR OKANOGAN SUBBASIN SPRING CHINOOK PROGRAMS

Based on the alternative identified above, the Colville Tribes are proposing implementation of what is designed to be a long-term, two-phase plan for spring Chinook in the Okanogan subbasin, and in the Columbia River from Chief Joseph Dam downstream to the confluence of the Okanogan River. This framework for a two-phase approach addresses both recovery and mitigation goals and is described in substantial detail in the Okanogan River spring Chinook HGMP [Appendix D].

The **recovery goal** of the spring Chinook programs is restoration of naturally-spawning populations to historical habitats in the waters around the Colville Reservation - waters that once contributed significant fisheries to the Colville Tribes. Spring Chinook produced in the second phase of these programs may also provide benefit in the recovery of the Upper Columbia River Spring Chinook ESU. The **mitigation goal** of these spring Chinook programs is to replace runs in the Okanogan River and the upper Columbia River lost due to the construction and operation of Grand Coulee, Chief Joseph, Wells, Rocky Reach, Rock Island, Wanapum, Priest Rapids, McNary, John Day, The Dalles, and Bonneville dams. The proposed CJDHP will provide necessary expansion of the interim Phase I spring Chinook programs described below.

13.5.1 HGMP PHASE I SPRING CHINOOK PROGRAMS

Under Phase I, the Okanogan subbasin spring Chinook programs will use Carson stock spring Chinook commonly propagated in the Columbia Cascade Province. The Phase I plan includes an integrated recovery program and an isolated harvest program.

The Phase I programs will be implemented in two steps, described in the Okanogan River spring Chinook HGMP, as Phase I: Step A, and Step B. Step A, includes the interim (pre-Chief Joseph Dam Hatchery) programs currently being implemented by the Colville Tribes. These preliminary actions are described briefly in the next section. The proposed CJDHP will implement the expanded Phase I, Step B programs.

The overall goal of the Phase I **integrated recovery program** is to demonstrate the viability of spring Chinook in historical Okanogan subbasin habitat and to provide information to guide rehabilitation of that habitat. In Phase I, Carson composite stock will be used to test the suitability of historical spawning, rearing, and migration habitats in the Okanogan subbasin, to once again produce and support natural-origin populations of spring Chinook. Considerable effort is under way to restore tributary and mainstem habitat quality in the Okanogan subbasin. This program is designed to re-establish naturally-spawning (self-sustaining or supplemented), populations in suitable habitat using Carson stock. This program will initially make use of Carson stock from excess broodstock collected at Leavenworth National Fish Hatchery.

The goal of the **isolated harvest program** is to restore the Colville Tribes' spring Chinook ceremonial and subsistence harvest, and to provide an opportunity for recreational anglers in the Columbia Cascade Province, in a manner compatible with recovery of Upper Columbia River Spring Chinook. The program is designed to create a hatchery-origin run to support tribal and recreational selective fisheries, using Carson stock. This program will be located and operated to minimize interaction with spring Chinook produced from the integrated recovery program, as well as minimizing interaction with summer/fall Chinook. All returning adults will be targeted for selective harvest or collected for brood stock. The program will use Carson stock initially until Methow Composite stock is available on a frequent basis (see Phase II below).

13.5.2 HGMP PHASE II SPRING CHINOOK PROGRAMS

The Phase II programs will transition to use of Methow composite stock from the adjacent Methow subbasin. The Methow composite stock is part of the

Upper Columbia River Spring Chinook ESU, which is currently listed as endangered. Phase II will be initiated once Methow stock, surplus to the recovery programs in the Methow subbasin, is available on a regular basis. The Phase II programs include both an integrated recovery and an integrated harvest program.

The goal of the Phase II **integrated recovery program** will be to aid the recovery, and possibly eventual de-listing, of the ESA-listed Upper Columbia River Spring Chinook by increasing its abundance, productivity, distribution, and diversity. The Phase II program will operate to re-establish, and if necessary, supplement natural spawning populations of spring Chinook. Methow Composite stock will be introduced into the Okanogan only as an "experimental population", with lesser take prohibitions, to avoid significant limitations to tribal and recreational fishing, and other economic activities.

The goals of the Phase II **integrated harvest program** will be to continue to support a spring Chinook ceremonial and subsistence fishery for the Colville Tribes, support an increased recreational fishery targeting hatchery-origin fish, and provide a genetic reserve for the de-listing and recovery of Upper Columbia River Spring Chinook. Spring Chinook destined for harvest under this program will be differentially marked to distinguish them from hatchery-origin fish used in the recovery program.

13.5.3 PHASE 1, STEP A SPRING CHINOOK PROGRAMS

Figure 44 summarizes the Phase I, Step A Okanogan subbasin spring Chinook integrated recovery and isolated harvest program releases that will be implemented prior to the addition of the proposed CJDHP components.

The Phase 1, Step A - **integrated recovery** program is designed to re-introduce spring Chinook into Omak Creek and possibly at a later time, Salmon Creek. Under this program, 50,000 Carson stock spring Chinook fingerling will be obtained from USFWS' Leavenworth National Fish Hatchery. These fish will be transported to St. Mary's Mission Pond in October for over-winter rearing and acclimation. Release will occur in mid-April of the following year.

An additional proposed release in Salmon Creek has been indefinitely deferred pending completion of an agreement with the Okanogan Irrigation District.

Under the Phase 1, Step A - **isolated harvest** program, surplus Carson broodstock will be held at Leavenworth National Fish Hatchery. Fish will be spawned and eggs initially incubated at this hatchery in the Wenatchee subbasin. Eyed eggs will then be transported to USFWS' Willard/Little White Salmon National Fish Hatchery on the Little White Salmon River in the Columbia Gorge Province. The subsequent pre-smolts would then be transported back in to the Okanogan subbasin in October, at which point 200,000 fingerlings would be over-winter reared in Ellisforde Pond, and another 200,000 fingerlings would be acclimated at Colville Trout Hatchery for release as yearlings the following spring.

It is important to note that relatively little is known yet about the short- or long-term effectiveness or potential risks of these spring Chinook programs. The first returns from experimental releases of spring Chinook in Omak Creek should occur in 2004. In order to minimize potential risks, the initial levels of these spring Chinook releases are very conservative, and will remain so until results from the monitoring and evaluation programs can be collected and evaluated. In addition, as mentioned numerous times in this document, understanding the capabilities of live-capture, selective fishing gears is essential to identifying the appropriate size of the programs, and to the success of subsequent broodstock collection.

13.6 OVERVIEW OF CHIEF JOSEPH DAM HATCHERY PROGRAM SPRING CHINOOK PROGRAMS (PHASE I, STEP B)

The proposed CJDHP spring Chinook programs are designed to implement Step B of the Phase I integrated recovery and isolated harvest programs identified above. Both the Step A, and Step B, Phase I programs are sized to optimize collection of information about the potential viability of Okanogan spring Chinook and their habitats in the Okanogan subbasin,

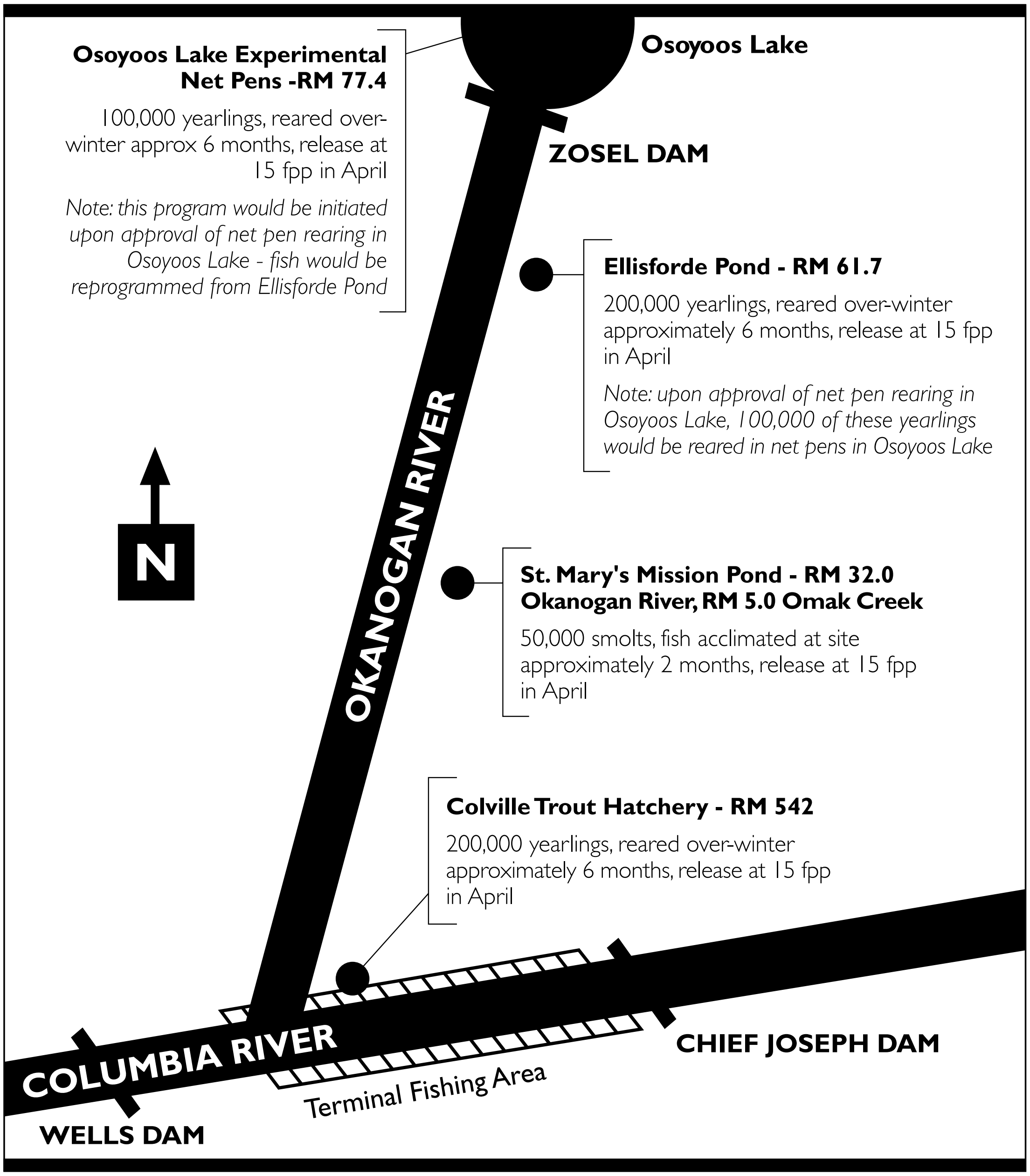


FIGURE 44: Spring Chinook Releases Phase I (Step A)

and the Columbia River Basin. The program objectives are designed to identify any potentially adverse interactions with summer/fall Chinook and steelhead populations, and to document the extent of tribal and recreational harvest. Scientific information collected from these experimental Phase I activities will be used to refine the proposed Phase II programs. At this time the CJDHP spring Chinook component is designed to implement the Phase I actions. However, the proposed facilities should be adequate to implement the Phase II programs.

If, at any time during implementation these programs, irresolvable conflicts arise which threaten the viability of Upper Columbia Summer/Fall Chinook ESU, Upper Columbia Steelhead ESU, or Upper Columbia Spring Chinook ESU; the programs would be discontinued and returning, adult spring Chinook would be collected at Wells Dam, or by other means, to eliminate the conflict.

Like the summer/fall Chinook programs, the spring Chinook CJDHP component relies on a combination of new and existing facilities, and includes innovative

Table 37: Proposed CJDHP Spring Chinook New and Existing Facilities

HATCHERIES:	
Leavenworth National Fish Hatchery (existing facility)	USFWS facility located on Icicle Creek at RM 2.8, near the town of Leavenworth.
Chief Joseph Dam Hatchery (new facility)	To be constructed on the right bank of the Columbia River at approximately RM 543 (Reservation side) immediately below Chief Joseph Dam (Chief Joseph Dam located at RM 544.6).
ACCLIMATION FACILITIES:	
St. Mary's Mission Pond (existing facility)	Located on Omak Creek at RM 5.0, below Mission Falls, near the town of Omak.
Ellisforde Pond (existing facility)	Located on the right bank of the Okanogan River at RM 61.7 near the town of Tonasket
Salmon Creek Diversion (existing facility)	Acclimation waters located on Salmon Creek at RM 3.8, at the Okanogan Irrigation District's diversion dam and channel near Okanogan.
Osoyoos Lake Net Pens (possible site)	Floating net pens located in Osoyoos Lake immediately above Zosel Dam at RM 77.4 on the Okanogan River.
ADULT COLLECTION FACILITIES:	
Leavenworth National Fish Hatchery (existing)	USFWS facility located on Icicle Creek at RM 2.8, near the town of Leavenworth.
Chief Joseph Dam Hatchery (new facility)	To be constructed on the right bank at approximately RM 543 (Reservation side) of the Columbia River immediately below Chief Joseph Dam (Chief Joseph Dam located at RM 544.6).
Omak Creek Weir (new - to be constructed with other funds)	To be constructed on Omak Creek at RM 5.0, below Mission Falls on Omak Creek
Zosel Dam (existing)	Potential future collection site on the Okanogan River at RM 77.4 near Oroville.
Live-Capture Gear (contingency collection)	Fishing will occur in the Okanogan River and in the Columbia River from above the confluence with the Okanogan (RM 533.5) to the area below Chief Joseph Dam.

partnerships with local irrigation districts as part of the overall program. Table 37 summarizes the new and existing facilities associated with implementation of the proposed CJDHP spring Chinook programs.

The CJDHP spring Chinook programs will increase the production of Carson stock spring Chinook destined for the Okanogan subbasin to 900,000 smolts. This increased production level is expected to result in an average adult return to the waters around the Colville Reservation, of about 2,700 spring Chinook. These production levels are intended to support the integrated recovery and isolated harvest programs described below. Broodstock for these programs will be collected at the Chief Joseph Dam

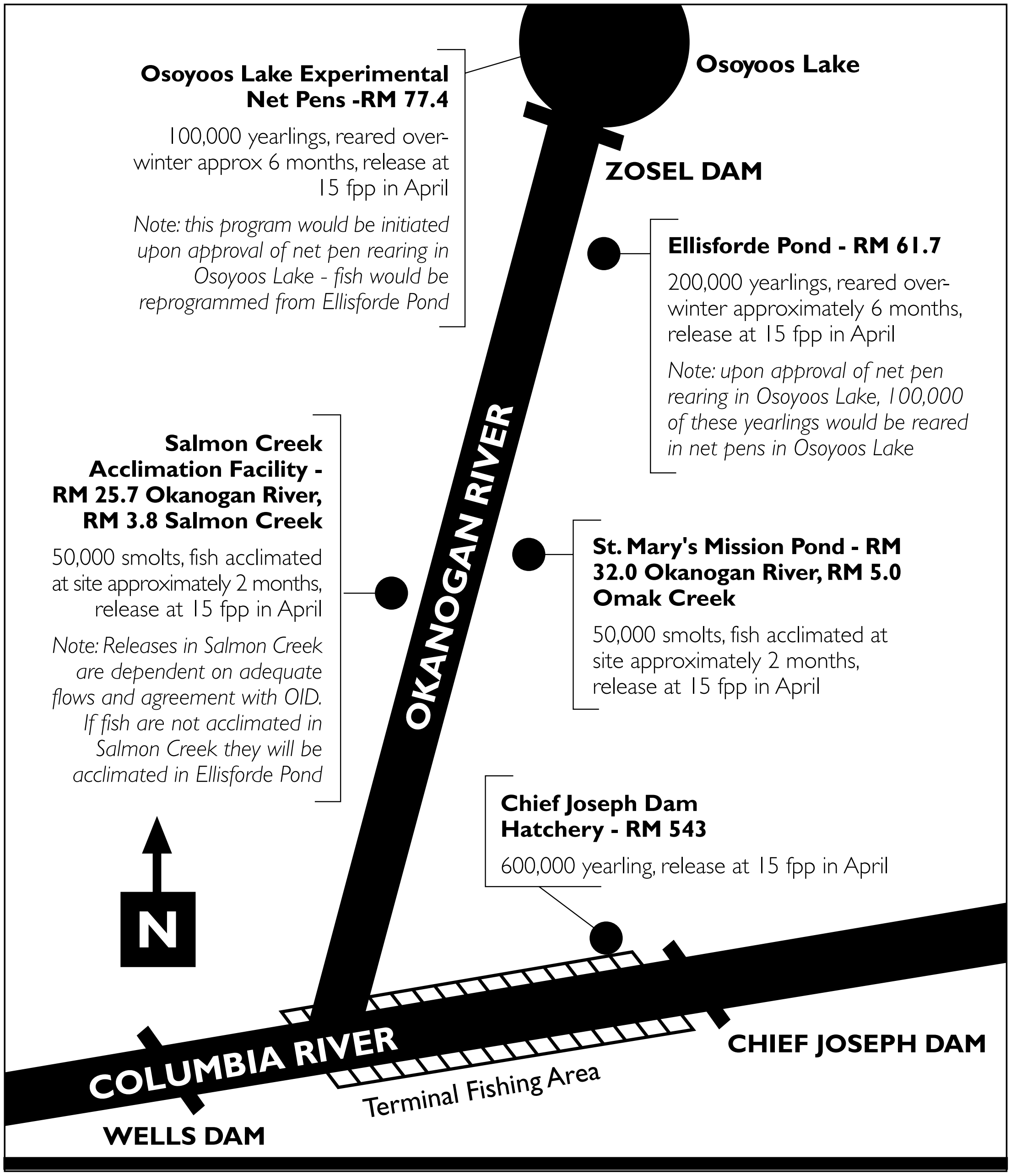


FIGURE 45: Spring Chinook Releases Phase I (Step B)

Hatchery, and supplemented as necessary, with broodstock from the Leavenworth National Fish Hatchery. All 900,000 of the smolts will be reared at the Chief Joseph Dam Hatchery. Figure 45 provides and overview of the program releases that would be associated with these spring Chinook programs.

13.6.1 CHIEF JOSEPH DAM HATCHERY PROGRAM SPRING CHINOOK INTEGRATED RECOVERY PROGRAM

The CJDHP spring Chinook integrated recovery program will re-introduce naturally-spawning populations of Carson stock spring Chinook into Omak Creek and possibly later, in Salmon Creek. This program is sized initially to return an average of 300 adults to the Okanogan subbasin (200-700). This program size should be sufficient to allow for critical survival parameters to be determined and allow assessment of habitat health in Omak Creek and later, Salmon Creek.

The program goals for the Spring Chinook integrated recovery program are:
Smolt - adult survival rate: 0.3%
Total adult production number: 300
Escapement: 300

All spring Chinook released as part of the integrated recovery program will not be adipose fin clipped, but will be coded wire tagged. This marking protocol will protect these fish from the selective fisheries, but allow them to be differentiated from natural-origin fish returning to the Okanogan River.

Under this integrated recovery program, 50,000 yearling spring Chinook will be transported from the Chief Joseph Dam Hatchery to the St. Mary's Mission acclimation pond in late February to early March, depending on fish size and water temperatures. The fish will be acclimated on a mixture of creek and well water, and reared at low densities, until mid-April when they will be allowed volitional migration. In the period immediately prior to release, fish will be acclimated solely on creek water. Fish would be release at 15 fpp in April. After volitional release, any remaining fish will be forced from the facility.

Pending agreement with the Okanogan Irrigation District on the use of their facility, and dependent on adequate water flows in Salmon Creek, 50,000 yearling smolts will be transferred to the Salmon Creek Diversion facility in late February to early March, depending on fish size and water temperatures. These fish would be acclimated on creek water in the ladder pools and upper irrigation canal until mid-April when they would be allowed volitional migration. Fish would be released at 15 fpp. Later, any remaining fish in will be forced from the canal.

13.6.2 CJDHP SPRING CHINOOK ISOLATED HARVEST PROGRAM

The primary purpose of the isolated harvest program is to re-establish the Colville Tribes' ceremonial and subsistence fisheries, and to provide recreational fisheries in the Okanogan subbasin and upper Columbia River. The isolated harvest program is design to create selective fisheries in the Okanogan and Similkameen rivers, in the tailrace of Chief Joseph Dam and in the Wells Pool, and near the confluence of the Okanogan River, which will target these Carson-stock spring Chinook fish. The goal of the harvest activities will be to remove all adult fish from the waters of the Okanogan subbasin for ceremonial, subsistence, and recreational purposes and to collect broodstock to support production activities at Chief Joseph Dam Hatchery.

The primary management tool for this program is the marking protocols. All spring Chinook for the isolated harvest program will be adipose fin clipped – these will be the only adipose fin clipped spring Chinook returning to the areas above Wells Dam. Spring Chinook will also be coded wire tagged (42%) for monitoring and evaluation purposes. The adipose fin clip will allow these fish to be distinguished from hatchery-origin and natural-origin Upper Columbia River Spring Chinook that are ESA-listed.

The isolated harvest program is sized to return 600 adults on average to the Okanogan subbasin (400 - 1,400) and 1,800 adults to the vicinity of Chief Joseph Dam (1,200 - 4,200). This program size should be sufficient to determine critical survival parameters pertaining to viability and to support assessment of the suitability of Okanogan River habitat. This program size should also be sufficient to provide for tribal ceremonial and subsistence and recreational fisheries; as well as providing adequate returns to test selective, live-capture fishing gear. Risks of incidental take and program thresholds are described in the Okanogan River spring Chinook HGMP in Appendix D [pp. 42-44].

The program goals for spring Chinook isolated harvest program (hatchery-origin fish) are:
Smolt - adult survival rate: 0.30%
Total adult production number: 2,400
Escapement: 0

To provide a fishery selective fishery in the tailrace of Chief Joseph Dam, in the Wells Pool, and near the confluence of the Okanogan River, and to provide broodstock for the Chief Joseph Dam Hatchery: 600,000 spring Chinook will be reared and released from the Chief Joseph Dam Hatchery facility as yearlings. Prior to release, fish will be reared on a mix of relief tunnel water from Chief Joseph Dam and water from Rufus Woods Lake to promote homing back to the hatchery site and terminal fisheries. Prior to release, acclimation will be solely in river water.

To provide a fishery in the Okanogan River, 200,000 subyearling Chinook will be transported to the Ellisforde acclimation pond in October, depending on fish size and temperature of the Okanogan River. Fish will be reared over the winter for six months in the pond. Fish will be reared on pumped Okanogan River water, at low densities, until release in approximately mid-April, providing a six-month acclimation period.

On approval of a tentative net pen program in Osoyoos Lake, 100,000 of the Ellisforde Pond fish would be reprogrammed to Osoyoos Lake. The fish would be reared over the winter for approximately six months and released in April. Nets would be dropped allowing the spring Chinook to migrate naturally to the lake outlet at Zosel Dam.

The Ellisforde pond site and the Osoyoos Lake net pen program would also support the Colville Tribes' efforts to restore in-lieu fishing sites located at sites of important historical tribal fisheries.

13.7 DESCRIPTION OF THE CJDHP SPRING CHINOOK PRODUCTION PROGRAM

Elements of the proposed spring Chinook CJDHP programs are described in substantial detail in the Okanogan spring Chinook HGMP located in Appendix D.

The discussion of facilities presented in the following sections provides an abbreviated overview. Complete descriptions of the Chief Joseph Dam Hatchery water supply and the conceptual design of the Chief Joseph Dam Hatchery summer/fall and spring Chinook facilities, are included in Appendices F and G, respectively.

13.7.1 BROODSTOCK

The CJDHP production objective of 900,000 smolts will require 644 fish for broodstock. This includes 74 fish for the integrated recovery program, and 570 fish for the isolated harvest program. Broodstock for the integrated recovery program will be collected from fish returning to Omak Creek, supplemented as necessary, with spring Chinook captured (in priority order) at Zosel Dam, in the Okanogan River with live-capture gear, or at the Chief Joseph Dam Hatchery. A weir is being constructed in Omak Creek for Chinook and steelhead management.

Broodstock for the isolated harvest program will be collected by three means. Chinook will enter a fishway and trap at the Chief Joseph Dam Hatchery, be trapped at proposed facilities at Zosel Dam, or be taken by live-capture fishing gear in the Okanogan and Columbia rivers. The ladder at the hatchery will be operated from May through November to allow entry of spring and summer/fall Chinook. Fish excess to spawning needs will be distributed to tribal members.

13.7.2 INCUBATION AND REARING

Incubation and rearing of all spring Chinook will occur at the Chief Joseph Dam Hatchery. Water will be supplied from the Chief Joseph Dam relief tunnel, wells, and from Rufus Woods Lake. Waters from all three sources will be mixed to achieve desired temperatures.

Pre-smolt rearing and acclimation will continue at St Mary's Mission and Ellisforde ponds. Acclimation might also occur, on an experimental basis, in Osoyoos Lake immediately above Zosel Dam, from late October until early April using floating net pens. Flow through the net pens would depend on currents derived from flows past Zosel Dam. Water quality would be ambient in the lake.

Pre-smolt rearing and acclimation may also occur at a future date in Salmon Creek at the Okanogan Irrigation District diversion. Fish would be acclimated to Salmon Creek surface waters.

13.8 POTENTIAL ECOLOGICAL AND GENETIC EFFECTS

The following section summarizes potential ecological interactions and genetic effects associated with implementation of the CJDHP [see SP HGMP, pp. 31-39].

13.8.1 POTENTIAL RISKS ASSOCIATED WITH BROODSTOCK COLLECTION

There are no risks to listed natural fish in the Okanogan subbasin associated with broodstock selection since spring Chinook are at present extinct in the Okanogan subbasin. However, the use of Carson stock could pose genetic risks to listed populations of spring Chinook in the Methow River. The Carson stock from the Okanogan programs could stray into the Methow and spawn with listed Chinook. Straying could also be caused by inadequate acclimation in Okanogan waters, or excessive water temperature in the Okanogan that could cause Carson stock to seek other holding and spawning habitat. Secondly, Carson stock from the Okanogan could be misidentified and included in Methow broodstock if collected at Wells Dam [see SF HGMP, pp. 31-39, and 83].

These risks will be minimized by 1) initiating the Okanogan programs with smaller releases to gather risk and other information prior to ramping up to full production levels, 2) marking all hatchery-origin Carson stock, 3) emphasizing early-arriving adults in the broodstock to build the isolated harvest program with fish that will likely return prior to occurrence of excessive water temperatures at the mouth of the Okanogan, 4) using trap nets near the mouth of the Okanogan to harvest hatchery-origin fish and collect broodstock, thereby preventing later straying, 5) acclimating all hatchery-origin fish to Okanogan and upper Columbia waters for a minimum of 150 days prior to release, and finally 6) transitioning over to Methow Composite stock upon its availability.

Naturally produced Carson stock originating from the small integrated recovery program in the Omak Creek will not be readily distinguishable from Methow stock at Wells Dam. Risks of these fish being included in Methow broodstock will be minimized by 1) eventually collecting Methow broodstock in the Methow basin, 2) monitoring the success of natural spawning in the Okanogan basin and marking natural-origin smolts should their numbers become excessive, and 3) transitioning to Methow Composite stock upon its availability. Initially, the numbers of unmarked, adult, natural-origin Carson stock Chinook arising from the Omak Creek program should be very small in comparison to numbers of returning Chinook to the Methow basin [see SP HGMP, pp. 59-60].

13.8.2 ECOLOGICAL RISKS TO ESA-LISTED FISH

No ESA-listed population would be affected directly by the proposed CJDHP spring Chinook Phase I programs since spring Chinook are extinct in the Okanogan River and do not spawn or rear in the Columbia River immediately below Chief Joseph Dam.

Spring Chinook from the Okanogan River and Columbia River immediately below Chief Joseph Dam would share the lower Columbia River, estuary and ocean environments with a number of other listed species, but with inconsequential effects.

The Upper Columbia River Summer Steelhead currently in the Okanogan are primarily a product of a supplementation program that uses Wells Hatchery stock. No steelhead would be expected to reside in the Columbia River upstream from the confluence with the Okanogan. Fishery managers in the Okanogan subbasin are re-directing steelhead programs toward the development of locally adapted broodstocks (BAMP 1998).

Steelhead adults migrate into the Mid-Columbia tributaries in the fall and spring months after spending 1-3 years in the ocean, although most spend 1-2 years in the ocean. Spawning occurs primarily in May, but may extend to later in the season. Eggs incubate from late March through July, and fry emerge in early summer to September. Fry and smolts disperse downstream in late summer and fall. Smolts typically leave the sub-basins in March to early June after spending 1-7 years (mostly 2-3 years) in rearing waters.

CONDITION:	CONTINGENCY RESPONSE ACTION:
Excessive introgression of spring Chinook with Okanogan River summer/fall Chinook	• Increase selective fishing pressure; shift some or all of the juvenile releases from Ellisforde Pond to Chief Joseph Dam Hatchery or Colville Trout Hatchery • Reduce production numbers; or change some spring Chinook production to summer/fall Chinook
Excessive introgression of Carson stock spring Chinook with Methow fish	• Improve homing to acclimation sites • Reduce production • Deploy selective harvest capability to the Methow River
Significant adverse ecological interactions with endemic populations	• Improve rearing and release protocols to reduce juvenile residency time • Reduce production • Shift some or all of the production from Ellisforde Pond to Chief Joseph Dam Hatchery
Unsatisfied harvest demand of tribal or recreational fishermen	• Increase smolt quality or passage survival to increase adult returns • Increase production; increase selective fishing capability • Adjust harvest allocation between fishing sectors
Underutilized supply of harvestable spring Chinook	• Reduce production • Develop new release sites to expand fishing opportunity • Open access to fishery for other tribes
Excessive harvest mortality to non-target species or natural-origin spring Chinook	• Improve or restrict selective fishing gears • Alter timing or location of fisheries • Reduce production • Shift releases to other acclimation sites
Inadequate broodstock collection at Chief Joseph Dam Hatchery	• Increase homing signal to the hatchery • Shift production from Ellisforde Pond to the hatchery • Use live-capture fishing gear to supplement hatchery broodstock returns • Supplement with surplus broodstock from Leavenworth NFH
Insufficient escapement to Omak Creek	• Improve smolt quality • Reallocate production from the isolated harvest program to the recovery program • Reduce incidental harvest mortalities • Increase habitat improvements • Initiate adult supplementation
Inadequate natural production in Omak Creek	• Increase habitat improvements • Adjust broodstock collection and juvenile rearing protocols • Suspend integrated recovery program until Phase II.

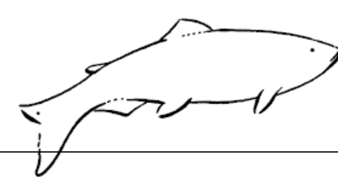


Table 38: Summary of Proposed CJDHP Spring Chinook Production Programs

Program Number[a]	Release Numbers	Release Age	Transfer Date	Transfer Size	Transfer/Release Location	Release Date	Release Size
Spring Chinook							
5.1	200,000	Yearling	10/30	25/lb	Ellisforde Pond	4/15	15/lb
6.1	50,000	Yearling	10/30	25/lb	St. Mary's Mission Pond	4/15	15/lb
6.2	50,000	Yearling	10/30	25/lb	Salmon Creek	4/15	15/lb
7.3	600,000	Yearling	–	–	CJDH	4/15	15/lb
Total	**900,000**						

[a] Program numbers established in the bioengineering model.

Implementation of the spring Chinook programs in the Okanogan subbasin will indirectly affect listed steelhead in Omak Creek, possibly Salmon Creek (depending on if the program is implemented there), and in the Okanogan River. Adult steelhead enter these tributaries in the early spring to spawn and may co-habit these waters with returning adult spring Chinook. Again, this co-habitation is a natural occurrence. Trapping and collection activities associated with the spring Chinook program will encounter adult and juvenile steelhead.

Natural-origin spring Chinook juveniles will co-habit rearing waters with natural-origin juvenile steelhead. This co-habitation is a natural occurrence. The two species minimize competition for food and space largely by occupying different rearing habitats.

Hatchery-origin spring Chinook will also occupy waters with juvenile steelhead, but interactions should be minimized by acclimation procedures and volitional releases. Chinook smolts are expected to migrate promptly out of the creeks and Okanogan River on their downstream migration.

13.9 CONCEPTUAL MONITORING AND EVALUATION COMPONENTS SPECIFIC TO SPRING CHINOOK

Rebuilding a spring Chinook population in Omak Creek and other historical habitats in the Okanogan subbasin will best be accomplished by eventually creating a spawning population consisting primarily of natural-origin fish. Until better knowledge exists about the relative reproductive success of hatchery-origin and natural-origin salmon, the spawning population will be managed to maximize the proportion of natural-origin fish in the escapement.

The CJDHP monitoring and evaluation program described in Chapter 10 in combination with other Okanogan subbasin monitoring and evaluation activities will be designed specifically to collect this information. The CJDHP conceptual monitoring and evaluation program includes performance standards and indicators derived from the spring Chinook HGMP [see SP HGMP, pp. 14- 21]. For a complete list of sample tasks associated with measuring progress against these performance standards see Appendix H.

13.9.1 CONTINGENCY ACTIONS

The collection and evaluation of performance information gathered from the CJDHP monitoring and evaluation program is likely to result in some modifications to the spring Chinook program. Such actions might be directed towards increasing benefits or minimizing risks. The actions described on the previous page describe potential adaptations that could be implemented to optimize program performance based on evaluation of performance indicators. These actions do not include a plethora of changes that might also be made within the hatchery to improve fish culture.

13.10 CONCEPTUAL DESIGN OF SEPARABLE SPRING CHINOOK COMPONENTS

The conceptual design of the CJDHP is described in detail in Appendix G. The following section summarizes necessary modifications and additional new construction associated with the separable CJDHP spring Chinook components.

Tetra Tech/TCM developed a bioengineering model to analyze each of the proposed CJDHP fish rearing programs. Each production program was evaluated using the model (the full list of variables is in Appendix G). Table 38 summarizes the total production numbers for the spring Chinook programs around which the facilities were designed.

Figure 46 indicates the location of the two spring Chinook acclimation facilities that will require modifications as part of the CJDHP.

13.10.1 EXISTING ACCLIMATION PONDS

In addition to the Chief Joseph Dam Hatchery facility, the CJDHP spring Chinook programs will use two existing rearing and acclimation ponds. In addition, two non-pond sites may be used to implement the programs. These include a site at Okanogan Irrigation District's diversion dam on Salmon Creek, and the possible use of floating net pens in Osoyoos Lake. Neither the Salmon Creek nor Osoyoos Lake sites will require modifications under this proposal. Necessary modifications to the three existing ponds are described below.

13.10.1.1 St. Mary's Mission Pond

The St. Mary's Mission rearing pond, is an existing Colville Tribes' owned acclimation pond constructed on Omak Creek below Mission Falls near Omak, Washington. Surface water is supplied to the pond from Omak Creek.

To avoid future fish losses, the pond requires intake modifications. These will include adding a wing wall, removing grating and supports on the pond, installation of chain link fence around the perimeter of site, installation of bird netting, installation of channels with tail and head screens in the pond, and installation of a water level alarm system with reliable radio telemetry.

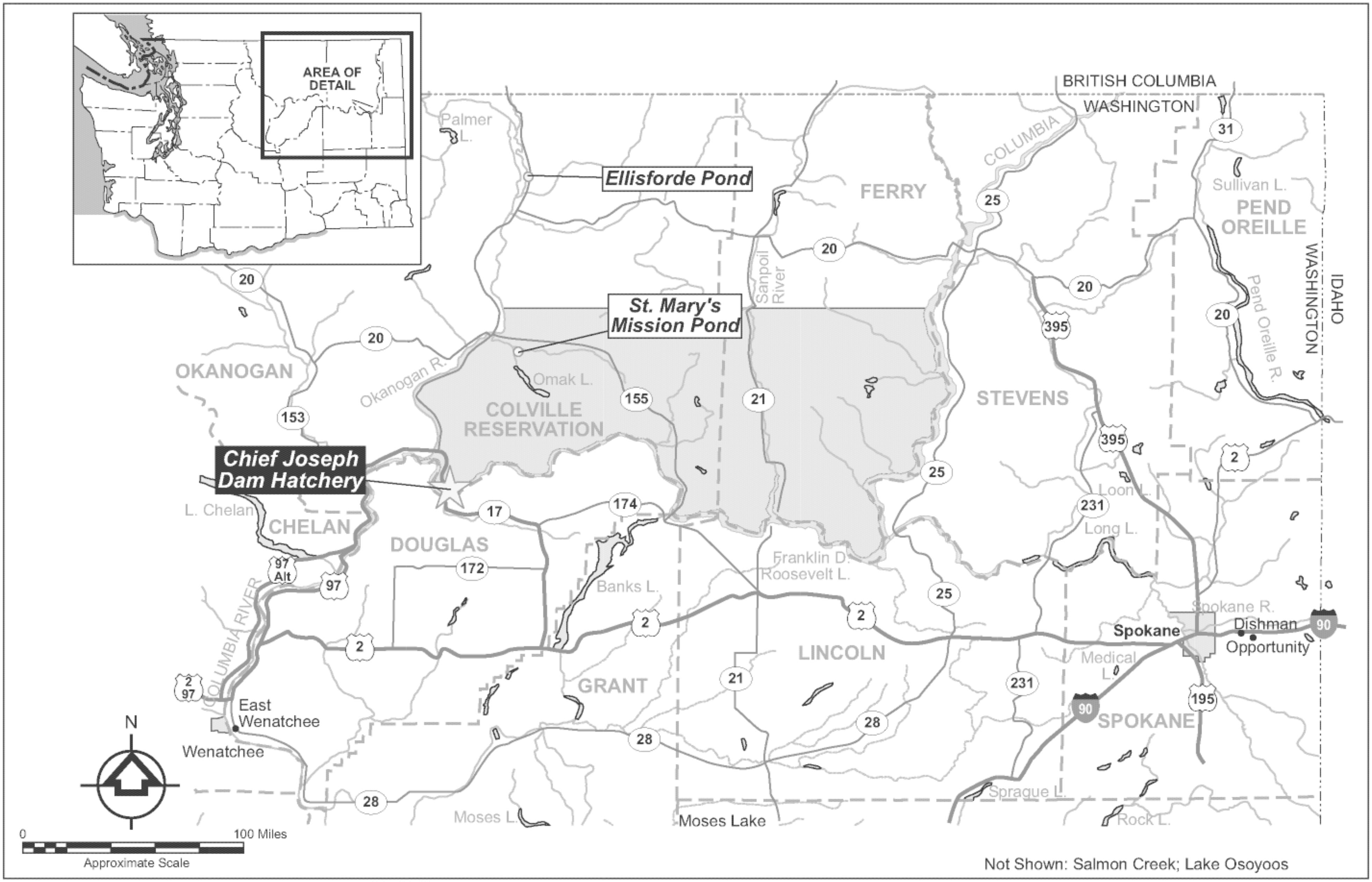
13.10.1.2 Ellisforde Pond

Ellisforde Pond is located on the left bank of the Okanogan River at river mile 62, near the community of Ellisforde. It is an existing open-air pond with a useable rearing volume of 121,500 cubic feet and is supplied with 30 cfs of water from the Okanogan River.

OTID owns and operates the pond for irrigation purposes. The pond has been modified for fish acclimation and has been used for that purpose. However, improvements to the outlet are required to provide for complete drainage of the pond. This will improve release of the fish and ease of operation and maintenance. Installation of a telemetry system with water level alarms and monitoring of other fish rearing parameters is needed.

13.10.2 RELEASE FROM THE CHIEF JOSEPH DAM HATCHERY SITE

Release of juvenile spring Chinook from the Chief Joseph Dam Hatchery will be from the raceways through a pipe running directly from the raceway area to the river. The pipe can be either temporary or permanent.



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Colville Tribes
CHIEF JOSEPH DAM HATCHERY
CONCEPTUAL DESIGN

FIGURE 46
ACCLIMATION POND SITES
FOR SPRING CHINOOK

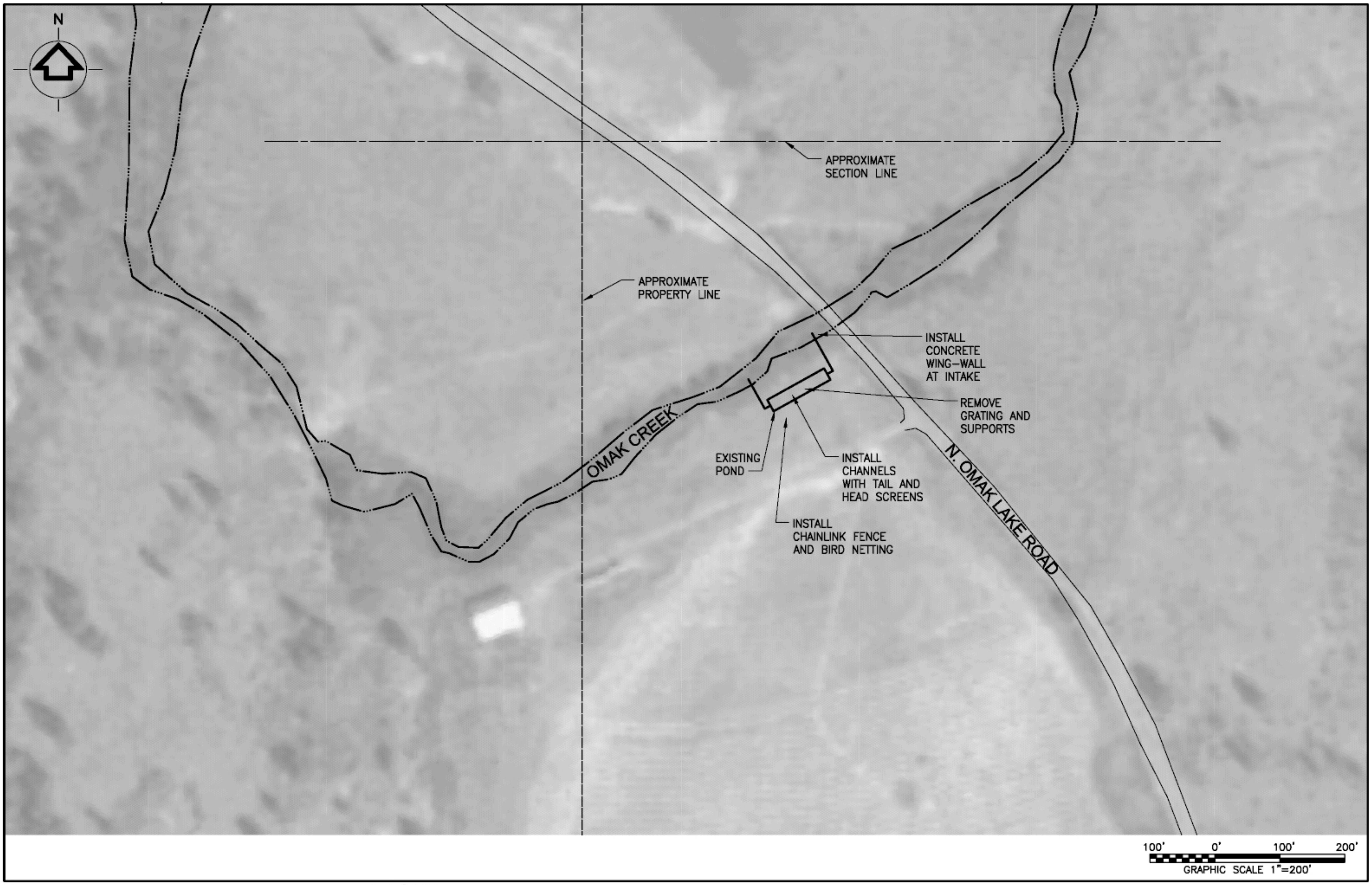

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FIGURE 47
ACCLIMATION POND SITE PLAN
MODIFICATIONS TO ST MARY'S MISSION POND

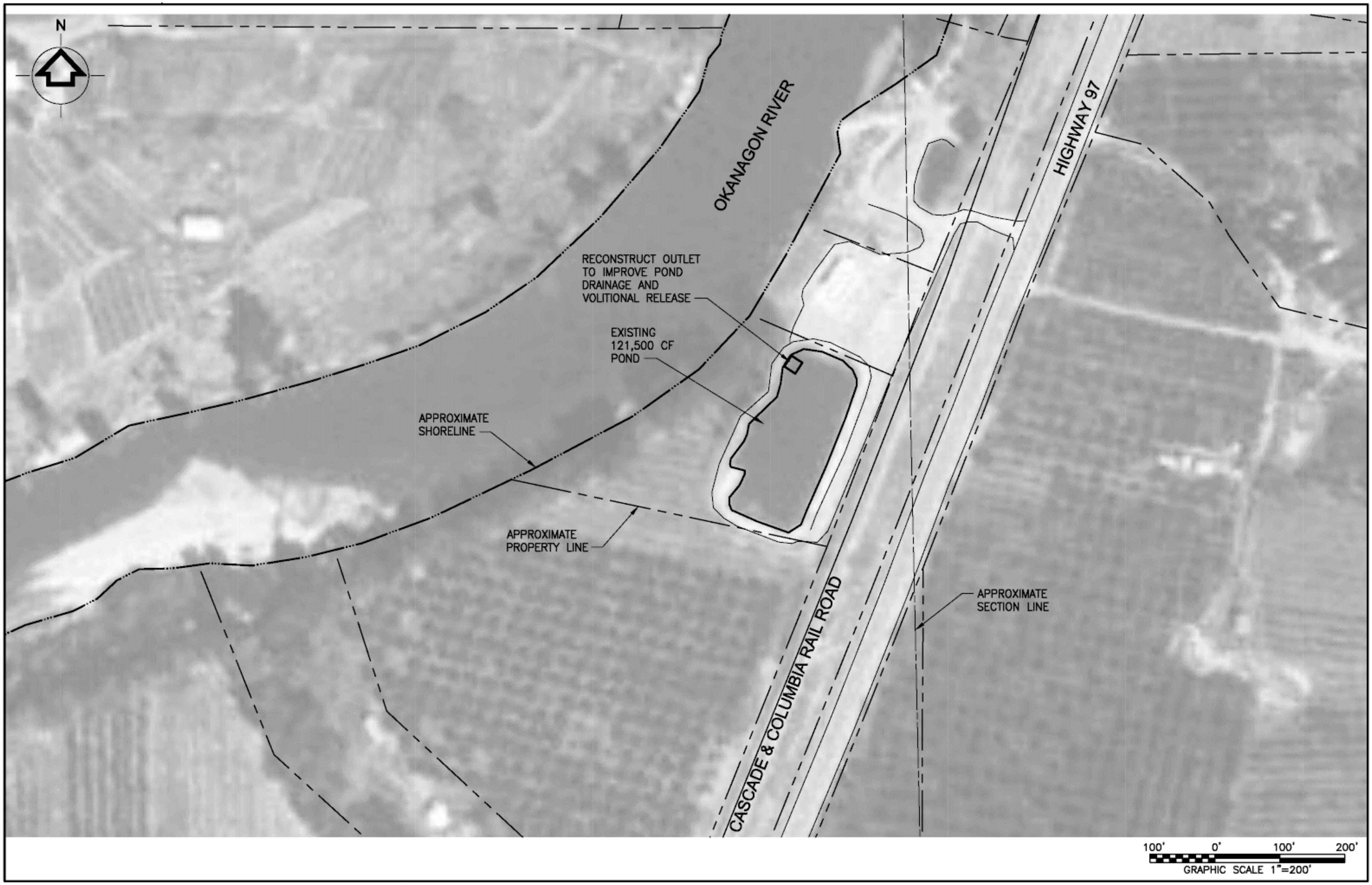

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FIGURE 48
ACCLIMATION POND SITE PLAN
MODIFICATIONS TO ELLISFORDE POND

13.10.3 OUTDOOR RACEWAYS

The spring Chinook raceways will be 8 feet wide. Their rearing length will be 120 feet and their average depth will be 4-feet, resulting in an individual raceway rearing volume of 3,800 cubic feet. Design analysis using the bioengineering model indicates that if these were the same size as the summer/fall Chinook raceways, about 40 raceways would be required. With the 3,800-cubic-foot raceways, only 28 raceways are required.

13.11 SUPPORT FACILITIES SPECIFIC TO THE SPRING CHINOOK COMPONENTS

The following specific additional support facilities would be required for the spring Chinook components of the CJDHP.

13.11.1 WATER TREATMENT

With the proposed spring Chinook program, the maximum relief tunnel flow requirement would increase to 36.5 cfs, based on fish biological needs. This peak requirement would occur at the end of October, just prior to the transfer of 300,000 sub-yearling spring Chinook to the acclimation ponds. The difference between the required 36.5 cfs and the 20 cfs to be supplied by the COE is not likely to be made up by minor adjustments in the rearing programs.

With the inclusion of the spring Chinook programs at the hatchery facility, the incubation flow would increase to 730 gpm, which might require a 250-ton chiller and tower. It may be possible to reduce chilling costs by cooling the relief tunnel water with a heat exchanger and Rufus Woods Lake water during portions of the incubation period.

13.11.2 ADULT FISH HOLDING/ CROWDING/SORTING AREAS

To include the spring Chinook programs, the minimum holding volume would need to be increased to about 10,700 cubic feet to hold the spring Chinook along with the summer/fall Chinook. The increase of only 1,000 cubic feet occurs because most of the spring Chinook will be spawned before all of the summer/fall Chinook enter the facility. The calculated volume for adult holding should be increased to allow space for sorting, excess fish holding and program revision. Water will be supplied through an upwelling sump at the head end of each holding/crowding/sorting raceway.

13.12 COST ESTIMATES FOR SPRING CHINOOK COMPONENTS

All costs estimates and discussion in this section are based on the supposition, that the spring Chinook programs' costs components would be added to the summer/fall Chinook CJDHP costs (i.e. that spring Chinook components would not be constructed without the summer/fall components).

The following sections include separable rollups of estimated costs for the construction of unique facilities, modifications to existing facilities, operations, and monitoring and evaluation activities that would be associated with the additional spring Chinook programs. In many of the following tables the costs associated with the spring Chinook components are shown in relation to the costs of the summer/fall Chinook elements. Substantial additional detail is presented in Appendix B.

13.12.1 COST ESTIMATES FOR SPRING CHINOOK CONSTRUCTION COMPONENTS

The total construction costs to add facilities necessary for the spring Chinook programs to the Chief Joseph Dam Hatchery and to modify the two existing acclimation ponds that would be used for the program is approximately $5.57 million dollars. These costs, as is true of other costs presented in this Master Plan, are preliminary estimates based on a conceptual planning and design. A 30% contingency is added as a line item in recognition of the substantial degree of uncertainty at this stage of design planning.

Constructing the spring Chinook facilities and the summer/fall Chinook facilities at the same time is anticipated to result in cost savings of approximately

5%, or $280,000. This does not take into account additional expenses that would be associated with modifying existing facilities at a later date to incorporate spring Chinook or increase materials costs.

Table 39 provides a summary of capital construction costs for the spring Chinook additions to the Chief Joseph Dam Hatchery facility and for the acclimation pond modifications that would be required for those additional programs.

Table 39: Capital Construction Costs For Spring Chinook Programs

DESCRIPTION	ESTIMATED COST
Water Supply	
Develop well water supply from park 2.5 miles upstream	$ 2,482,000
Piping from summer/fall raceways to spring raceways	$ 183,100
Raceways	
Spring Chinook raceways (bank of 28 units)	$ 664,866
Rearing and incubation additional building space	
Start tank building & incubation area for spring Chinook	$ 533,350
Markups and Other Direct Costs	
Subtotal raw costs with 15% O & 15% P	
Mobilization/demobilization	$ 30,000
Sales tax @ 9%	$ 347,698
Contingency @ 30%	$ 1,158,995
Additional Costs for CJDH Facility Spring Chinook Programs	**$ 5,400,009**
Acclimation Ponds for Spring Chinook Programs	
Saint Mary's Mission Pond - modify existing acclimation pond	$ 56,800
Ellisforde Pond - modifications to an existing 121,500 cubic feet acclimation pond	$ 57,300
Markups and Other Direct Costs	
Sales Tax @ 9%	$ 10,269
Mobilization/demobilization	$ 11,410
Contingency @ 30%	$ 34,230
Additional Cost for Acclimation Ponds for Spring Chinook Programs	**$ 170,009**
TOTAL FOR SPRING CHINOOK PROGRAMS WITH COE SUPPLIED WATER SYSTEMS	**$ 5,570,018**

Chief Joseph Dam Hatchery operational costs for the spring Chinook programs, would add about $222,000 (FY 2004 dollars) to the overall operational costs associated with the summer/fall Chinook programs. Table 40 provides a summery of the anticipated cost increases by operations area.

A 10-year projection for operational areas of the combined summer/fall and spring Chinook programs is presented in Table 41. This 10-year projection includes annual increases of 3.4%.

Table 42 provides a rough estimate of annual operational costs for Ellisforde and St. Mary's Mission acclimation ponds. These costs are included in the overall budget (Tables 40 and 41). Costs would be incurred on an annual basis as part of the full program operations budget.

Table 40: Comparison of Operating Expenses Combined Summer/Fall Base Less Summer/Fall Chinook Budget

OPERATIONAL AREA	SUMMER/FALL AND SPRING CHINOOK BUDGET	SUMMER/FALL CHINOOK BUDGET	DIFFERENCE IN OPERATING BUDGETS
	FY 2004	FY 2004	FY 2004
Payroll (taxes, benefits, mark-ups)	$534,528	$467,843	$66,685
Vehicles (fuel, oil, maintenance, mileage, and insurance)	$27,824	$27,824	$0
Repairs and maintenance (site, buildings, equipment)	$10,000	$10,000	$0
Rent and lease (equipment, vehicles)	$19,200	$19,200	$0
Program supplies (shop, office)	$15,999	$13,999	$2,000
Program supplies (lab, water system, eggtake, incubation)	$15,583	$13,583	$2,000
Program supplies (rearing and release)	$133,999	$74,000	$60,000
Program supplies (tagging, tag recovery)	$150,000	$100,000	$50,000
Utilities (electrical, telephone)	$134,446	$94,462	$39,984
Travel Costs (mileage, lodging, per diem)	$4,939	$4,939	$0
Education and training	$1,500	$1,500	$0
Subcontracts (professional fees, testing, sampling)	$21,500	$20,500	$1,000
Facility insurance	$9,900	$9,900	$0
TOTALS	**$1,079,419**	**$857,780**	**$221,669**

Notes and assumptions: Estimates in FY 2004 Dollars.

Table 41: Operating Expenses Summer/Fall Chinook with Spring Chinook Program Addition 10-Year Projection

OPERATIONAL AREA	FY 2004	FY 2005	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013
Payroll (taxes, benefits, mark-ups)	$534,528	$552,702	$571,494	$590,925	$611,016	$631,791	$653,272	$675,483	$698,449	$722,197
Vehicles (fuel, oil, maintenance, mileage, insurance)	$27,824	$28,770	$29,748	$30,759	$31,805	$32,887	$34,005	$35,161	$36,356	$37,592
Repairs and maintenance (site, buildings, equipment)	$10,000	$10,340	$10,691	$11,055	$11,431	$11,819	$12,221	$12,637	$13,066	$13,511
Rent and lease (equipment, vehicles)	$19,200	$19,853	$20,528	$21,226	$21,947	$22,694	$23,465	$24,263	$25,088	$25,941
Program supplies (shop, office)	$15,999	$16,543	$17,106	$17,687	$18,289	$18,911	$19,554	$20,218	$20,906	$21,617
Program Supplies (lab, water system, eggtake, incubation)	$15,583	$16,113	$16,661	$17,227	$17,813	$18,418	$19,045	$19,692	$20,362	$21,054
Program supplies (rearing and release)	$133,999	$138,555	$143,266	$148,137	$153,174	$158,382	$163,767	$169,335	$175,092	$181,046
Program supplies (tagging, tag recovery)	$150,000	$155,100	$160,373	$165,826	$171,464	$177,294	$183,322	$189,555	$196,000	$202,664
Utilities (electrical, telephone)	$134,446	$139,017	$143,744	$148,631	$153,685	$158,910	$164,313	$169,900	$175,676	$181,649
Travel costs (mileage, lodging, per diem)	$4,939	$5,107	$5,281	$5,460	$5,646	$5,838	$6,036	$6,242	$6,454	$6,673
Education and training	$1,500	$1,551	$1,604	$1,658	$1,715	$1,773	$1,833	$1,896	$1,960	$2,027
Subcontracts (professional fees, testing, sampling)	$21,500	$22,231	$22,987	$23,768	$24,576	$25,412	$26,276	$27,169	$28,093	$29,048
Facility insurance	$9,900	$10,237	$10,585	$10,944	$11,317	$11,701	$12,099	$12,511	$12,936	$13,376
TOTALS	**$1,079,419**	**$1,116,119**	**$1,154,067**	**$1,193,305**	**$1,233,878**	**$1,275,830**	**$1,319,208**	**$1,364,061**	**$1,410,439**	**$1,458,394**

Notes and assumptions: Projection is based on annual increase of 3.4% in all operational areas. Acclimation pond operational costs are included.

Table 42: Estimated Costs for Operation of Acclimation Ponds Spring Chinook

Pond Name	Pumping	Feed	Personnel	Vehicles	Transport	Total
Ellisforde	$3,000	$7,000	$5,800	$2,000	$800	$18,600
St. Mary's Mission	$600	$1,500	$1,100	$1,000	$500	$4,700
TOTALS	**$3,600**	**$8,500**	**$6,900**	**$3,000**	**$1,300**	**$23,300**

Notes and assumptions: These costs are approximate estimates based on pounds of production. These costs are included in operating estimates for spring Chinook.

13.12.2 COST ESTIMATES FOR CONCEPTUAL MONITORING AND EVALUATION PROGRAM

Additional monitoring and evaluation costs that would be incurred for the spring Chinook portions of the CJDHP monitoring and evaluation program include:

- Costs associated with the base CJDHP monitoring and evaluation program;
- Annual costs of tagging at the base facility; and
- Capital equipment needs.

Table 43 shows the annual monitoring and evaluation costs for the spring Chinook program components projected out ten years. These figures are based on FY 2004 dollars and assume a 3.4% annual increase in all operational areas.

Table 43: Monitoring and Evaluation Expenses Spring Chinook Program 10-Year Projection

OPERATIONAL AREA	FY 2004	FY 2005	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013
Payroll (taxes, benefits, mark-ups)	$120,797	$124,904	$129,151	$133,542	$138,083	$142,777	$147,632	$152,651	$157,841	$163,208
Vehicles (fuel, oil, maintenance, mileage, insurance)	$8,687	$8,982	$9,287	$9,603	$9,930	$10,267	$10,616	$10,977	$11,351	$11,737
Repairs and maintenance (site, buildings, equipment)	$5,377	$5,560	$5,749	$5,944	$6,146	$6,355	$6,571	$6,795	$7,026	$7,265
Rent and lease (equipment, vehicles)	$8,533	$8,823	$9,123	$9,433	$9,754	$10,086	$10,429	$10,783	$11,150	$11,529
Program supplies (shop, office)	$7,031	$7,270	$7,517	$7,773	$8,037	$8,310	$8,593	$8,885	$9,187	$9,499
Program Supplies (tagging, tag recovery)	$827	$855	$884	$914	$945	$977	$1,011	$1,045	$1,081	$1,117
Utilities (electrical, telephone)	$2,895	$2,993	$3,095	$3,200	$3,309	$3,422	$3,538	$3,658	$3,783	$3,911
Travel costs (mileage, lodging, per diem)	$1,250	$2,060								
Education and training	$4,956	$5,124	$5,299	$5,479	$5,665	$5,858	$6,057	$6,263	$6,476	$6,696
Subcontracts (professional fees, testing, sampling)	$1,241	$1,283	$1,327	$1,372	$1,419	$1,467	$1,517	$1,568	$1,622	$1,677
Postage, Dues, Subscriptoins	$827	$855	$884	$914	$945	$977	$1,011	$1,045	$1,081	$1,117
TOTALS	**$161,998**	**$167,506**	**$173,201**	**$179,090**	**$185,179**	**$191,476**	**$197,986**	**$204,717**	**$211,678**	**$218,875**

Notes and assumptions: Hatchery fish are tagged at the Chief Joseph Dam Hatchery facility. Some costs of monitoring and evaluation labor is added, but all equipment costs are covered in the monitoring and evaluation program. Wild fish are tagged at trapping facilities in Okanogan River. All costs covered in the monitoring and evaluation program. Portable PIT tag station and trailer is included in the monitoring and evaluation capital costs. Colville Tribes will use the trailer and equipment at both central facility (PIT tag hatchery fish) and in the field (wild tagging). The Okanogan/Similkameen Baseline Monitoring and Evaluation Program will cover costs during the first year of wild fish tagging (establish a baseline). The hatchery monitoring and evaluation program will cover costs thereafter. Spring Chinook monitoring and evaluation labor and PIT tagging costs are calculated at .45 of summer/falls.

Tagging costs at the proposed main facility are included in the operating expenses budget (Tables 40 and 41). Estimated annual operating expenses for the Chief Joseph Dam Hatchery related to on-site tagging for both the summer/fall and spring Chinook programs are presented in Table 44. A comparison of operating expenses associated with tagging, and with monitoring and evaluation, for the combined summer/fall and spring Chinook programs, as compared to the summer/fall Chinook program, is provided in Table 45. The cost estimate for on-site tagging associated with the spring Chinook programs is approximately $71,000.

Table 44: Operating Expenses Spring Chinook Program Coded Wire Tagging Costs

AREA	QUARTER				YEAR
	Q1	Q2	Q3	Q4	
Payroll (taxes, benefits, markups)	$93,972	$5,694	$5,694	$64,546	$169,906
Vehicles (fuel, oil, maintenance, mileage, insurance)	$75	$75	$75	$151	$376
Repairs and maintenance (site, buildings, equipment)	$175	$175	$175	$175	$700
Rent and lease (equipment, vehicles)	$900	$900	$900	$900	$3,600
Program supplies (shop, office)	$225	$225	$225	$225	$900
Program supplies (lab, water system, eggtake, incubation)	$125	$125	$125	$125	$500
Program supplies (rearing and release)	$50	$50	$50	$50	$200
Program supplies (tagging, tag recovery)	$0	$0	$37,500	$112,500	$150,000
Utilities (electrical, telephone)	$312	$312	$312	$312	$1,250
Travel costs (mileage, lodging, per diem)	$46	$46	$46	$46	$182
Education and training	$0	$0	$0	$0	$0
Subcontracts (professional fees, testing, sampling)	$50	$50	$50	$50	$200
Facility insurance	$21	$21	$21	$21	$82
TOTALS	**$95,951**	**$7,673**	**$45,173**	**$179,100**	**$327,896**

Table 45: Operating Expenses for Tagging and Monitoring and Evaluation Cost for Summer/Fall and Spring Chinook Programs

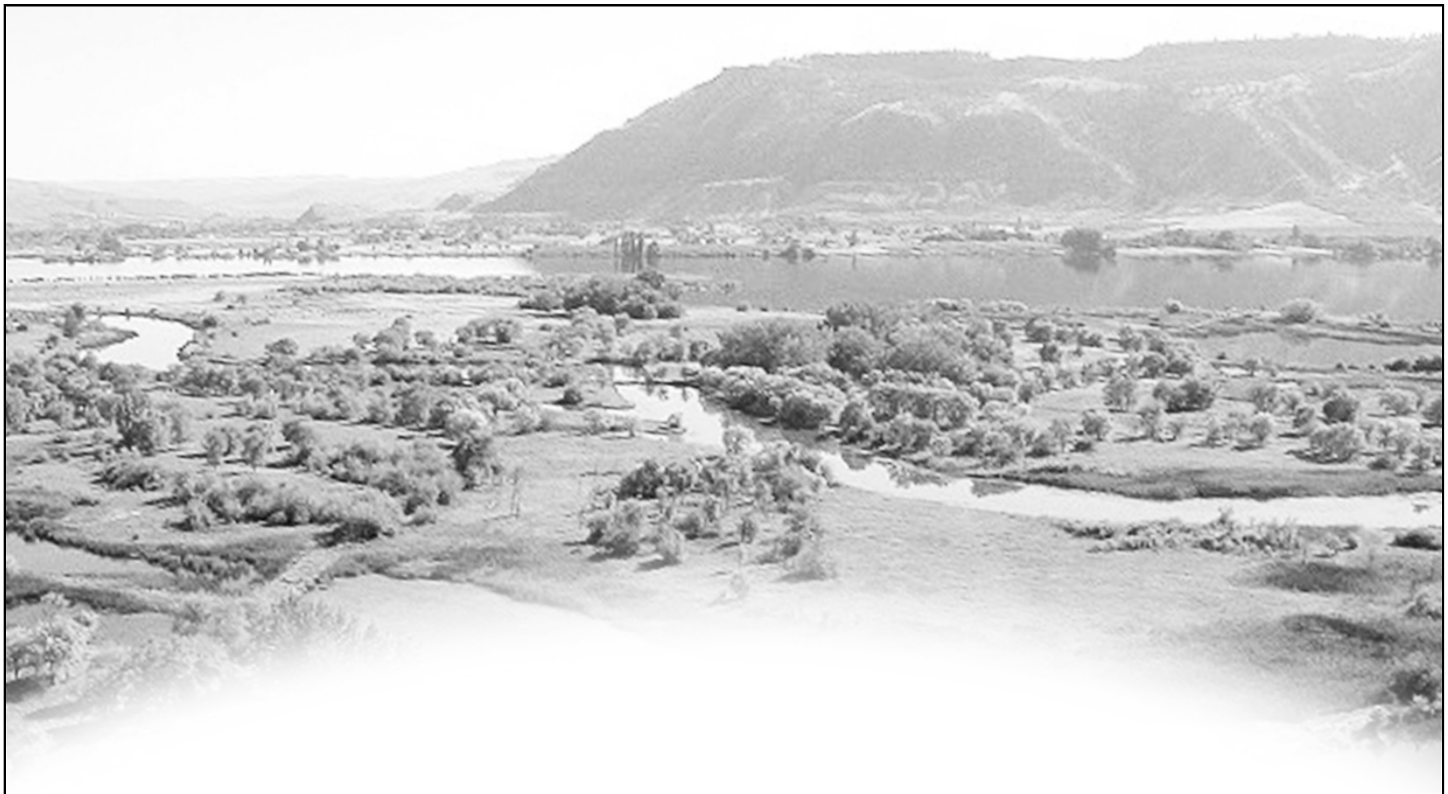
AREA	BUDGET TOTAL	BUDGET ADDITION	TOTAL BUDGET
	SUMMER/FALL PROGRAM	SPRING CHINOOK PROGRAM	ALL PROGRAMS
Annual Operational Costs	$857,780	$221,639	$1,079,419
Annual M &E Costs	$345,000	$161,988	$506,988
Capital Equipment Budget	$613,978	$0	$613,978

Notes and assumptions: All Figures in FY 2004 Dollars.

13.13 SUMMARY DISCUSSION

Additional construction costs associated with adding and modifying facilities necessary for the spring Chinook programs is $5.57 million dollars. Additional operational costs for the proposed spring Chinook programs add about $222,000 to the operational costs of the hatchery facility, which includes about $22,000 for the operations and maintenance of the acclimation ponds.

Implementing a long-term spring Chinook program is vital to the anadromous fish management goals, as well as the ceremonial and subsistence requirements, of the Colville Tribes. Including the production components described in the previous chapter in the next phases of Step 2 and Step 3 planning, as well as in the eventual construction of Chief Joseph Dam Hatchery would be cost effective. In Step 2, the Colville Tribes will be seeking cost share partners to implement the spring Chinook component of the CJDHP. However, as articulated in this Master Plan, inclusion of spring Chinook production as mitigation for the devastating effects of the Federal Columbia River Hydropower System is clearly justified.



14.
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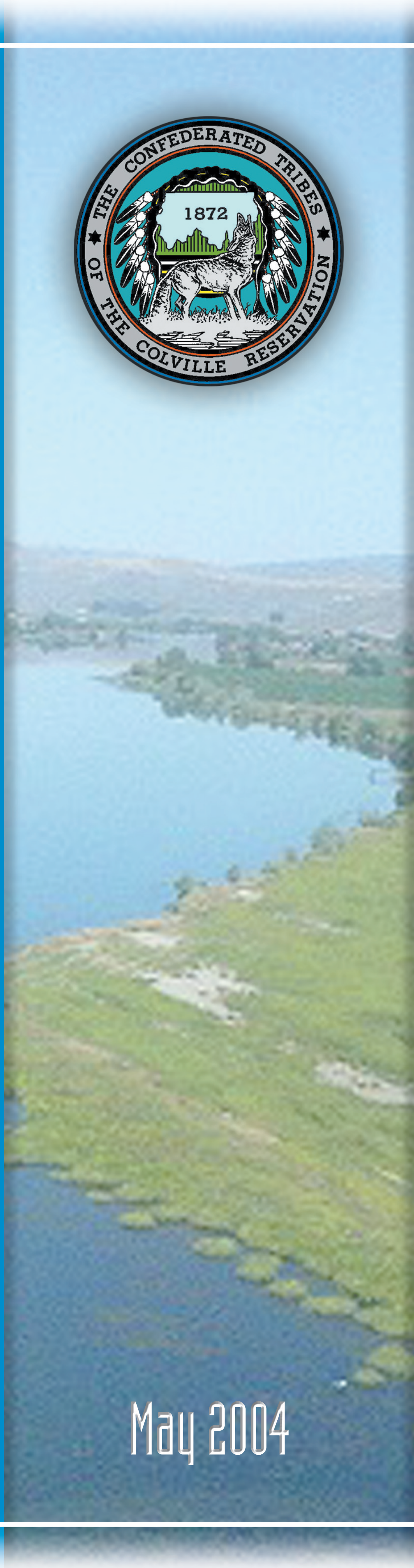

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