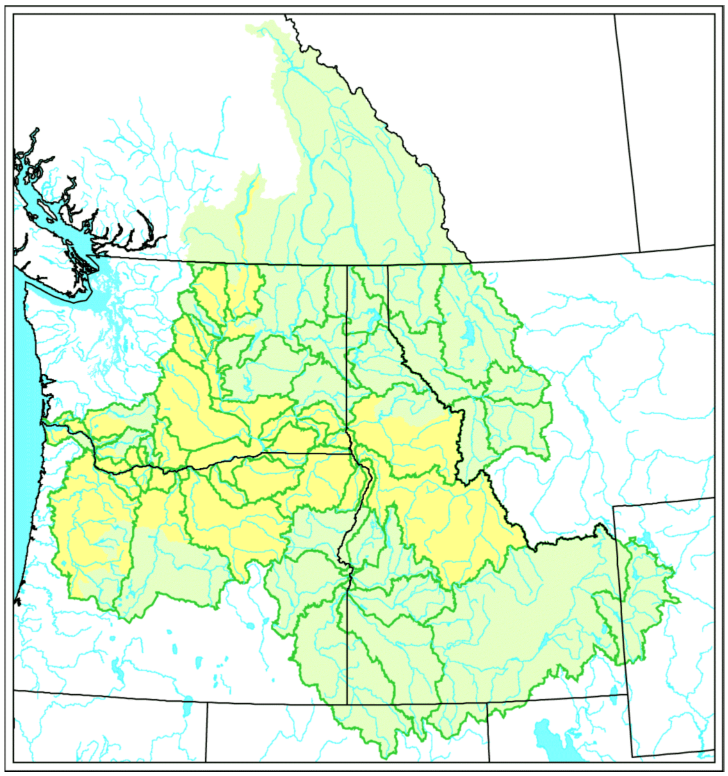
FY 2000 Draft
Annual Implementation Work Plan



Submitted by
Columbia Basin Fish and Wildlife Authority

to the
Northwest Power Planning Council

August 20, 1999

EXECUTIVE SUMMARY

The federal, state and tribal entities comprising the Columbia Basin Fish and Wildlife Authority (CBFWA) have responsibility under treaties and statutes for managing the fish and wildlife resources of the Columbia River Basin. The Northwest Power Act requires the Northwest Power Planning Council (Council) to request recommendations from the fish and wildlife managers when developing or modifying the Columbia River Basin Fish and Wildlife Program (Program). The Draft Annual Implementation Work Plan (DAIWP) is a formal recommendation to the Council for the FY 2000 budget and summary of the Manager's project evaluation process and, as revised, as recommendations to the Program Amendment process.

In carrying-out certain aspects of the Council's Program, the Managers have chosen to work through the processes of the Columbia Basin Fish and Wildlife Authority. In addition to providing administrative and technical support, CBFWA provides a neutral ground for the co-managers to address a variety of issues in an open and productive discussion. Among other things, the co-managers develop the Annual Implementation Workplan for activities in the Council's Program.

The CBFWA submitted the DAIWP to the Council on April 16, 1999. The document was reviewed by the Independent Scientific Review Panel (ISRP) and distributed for public comment. Revisions to the DAIWP are incorporated through a collaborative process with CBFWA, the Council, the Bonneville Power Administration (BPA) and the public. CBFWA will present the revised FY 2000 DAIWP incorporating responses to ISRP and the public to the Council on August 20, 1999. The Council adopts a final AIWP in September and submits its recommendations to BPA in October to begin the execution of contracts for the protection, mitigation and enhancement of the Columbia Basin's fish and wildlife resources.

For FY 2000, the DAIWP has incorporated several changes from past efforts. The format has changed to one with emphasis on the subbasin level and evaluation of fish and wildlife resource needs through an ecosystem approach. Projects and their costs have been organized by subregion and subbasin. In addition, CBFWA, the Council and Bonneville Power Administration (BPA) have agreed to incorporate other improvements listed below:

- revisions to subregion/subbasin summaries that reflect updated lists of goals, objectives and strategies for fish and wildlife management;
- summaries of past accomplishments and explanations of how these accomplishments result in recommendations;
- a reference list and summary of watershed assessments for use in describing current needs in subbasins;
- recommendations for projects for milestone-based evaluations; and
- descriptions of how individual projects in subbasins relate and contribute to strategies used to accomplish goals and objectives.

The FY 2000 recommended budget is preliminary because available funds are difficult to determine based, in part, on the uncertainties of the accounting processes of the BPA Budget

Memorandum of Agreement (MOA). CBFWA cannot be certain as to the exact amount of available funds in any given year but we continue to work with BPA and its contractor, Moss Adams and the Council, to improve the process. This collaborative process is essential to arrive at a final budget and list of project needs prior to the start of FY 2000.

Goal for Columbia Basin Fish and Wildlife Restoration

The tribal, state and federal entities of the Columbia Basin Fish and Wildlife Authority have responsibility under treaties and statutes for managing the fish and wildlife resources of the Columbia Basin and have explicitly set the following goal for fish and wildlife restoration:

Restore sustainable, naturally producing fish and wildlife populations to support tribal and non-tribal harvest and cultural and economic practices. This goal will be achieved by restoring the biological integrity and the genetic diversity of the Columbia River ecosystem and through other measures that are compatible with naturally producing fish and wildlife populations. This goal is intended to fulfill the nation's and the region's obligations under treaties and executive orders with Northwest Indian tribes, treaties with Canada, and applicable resource protection, restoration and enhancement statutes and regulations.

Context for the FY 2000 Draft Annual Implementation Work Plan

This FY 2000 Draft Annual Implementation Work Plan (DAIWP) details the actions (projects) that the managers recommend take place during Fiscal Year 2000 to work toward this goal. The actions recommended for FY 2000 carry out strategies developed for each subbasin. The managers developed the strategies to achieve specific objectives, guided by regional sub-goals and principles. This document summarizes these guiding sub-goals and principles and the subbasin objectives and strategies based on the Draft Multi-Year Implementation Plan (6/4/97) and the Draft Multi-Year Plan (2/7/98), and presents the subbasin strategies and the specific FY 2000 projects recommended to complete them.

To estimate the funds needed for fish and wildlife during the next BPA rate period, the managers developed a Ten-Year Fish and Wildlife Budget. This budget forecast is based on the actions needed to carry out the strategies developed in the plans above. The DAIWP is a detailed expression of the annual budget summarized in the Ten-Year Budget.

The FY 2000 CBFWA DAIWP represents but a portion of the fish and wildlife managers' regionwide activities. This portion of the fish and wildlife managers activities is funded by the BPA to mitigate the impacts of the Federal Columbia River Power System under the Pacific Northwest Electric Power Planning and Conservation Act of 1980 through the BPA direct Fish and Wildlife Program budget. In many cases, the BPA leverages additional funding from other sources for fish and wildlife protection, restoration, and enhancement.

Developing the Draft Annual Implementation Work Plan

The managers developed the FY 2000 DAIWP from several sources. First, BPA solicited proposals for FY 2000 activities from the managers and the public. BPA compiled the resulting 435 proposals in a common database, which was accessible to CBFWA, ISRP, NWPPC and the public. The total amount requested for funding, including all projects, was $229 million.

The managers divided the proposals into subregions and the subbasins within each subregion. The managers established Watershed and Non-Watershed Technical Work Groups to evaluate those groups of proposals using relevant criteria to determine technical feasibility (Appendix A).

The proposals were divided among the three caucuses for additional technical and management review. The management criteria used are an expression of the goals, principles, objectives and strategies summarized in Appendix A. The AFM sent the anadromous fish proposals to subregional teams for management review. The Resident Fish and Wildlife proposals were reviewed in separate caucuses. The managers then placed each proposal in one of three groups: Tier 1 – recommended for funding in FY 2000; Tier 2 – recommended for funding, pending sufficient additional funds; and Tier 3 – not recommended for funding in FY 2000.

As a final step, since the needs exceed the available funding, the managers recommended changes in the proposals to balance the budget, Appendix A. Management Evaluation Comments describe these modifications in the individual project summaries.

The managers are committed to multi-year budgeting for ongoing projects. However, additional work is needed on criteria for choosing appropriate projects and conditions that would trigger their review. The managers will work with the NWPPC, BPA, and others to develop suggestions for how multi-year budgeting might work most effectively.

Fish and Wildlife Balanced Budget

Consistent with the regional goals, objectives and strategies, the managers recommend a budget totaling $141,126, 857 for FY 2000. The MOA direct BPA budget amount of $127 million should be augmented with $2,593,000 from the Contingency/Inflation Reserve, $2,633,857 in un-obligated FY 1998/1999 project funds, and $2,000,000 in estimated interest on FY 1999 funds. The managers also recommend using $4,900,000 in unused Capital Investment funds from previous years. Moreover, the managers recommend that $2,000,000 from BPA's division of Fish and Wildlife be moved from the direct budget because anadromous fish activities are in support of programs from other parts of the MOA budget. The proposed budget allocates $101,425,681 to anadromous fish projects, $17,927,543 to resident fish projects, $14,473,634 to wildlife projects and $5,300,000 to support BPA and ISRP activities.

Although the BPA MOA Direct budget amount is currently set at $127 million, the increased burden to the Fish and Wildlife Program by listed species warrants a discussion between BPA, NWPPC and CBFWA on increasing the direct program allocation. The MOA under Section VIII (m) (Financial impact of new ESA measures and appropriations exceeding available funding) indicates that measures required by the ESA to address newly listed species that impose significant additional costs on Bonneville in any category will be considered an unforeseen event subject to the provisions of Section IX (c) of the agreement. Section IX (c) (Unforeseen events) acknowledges the possibility that the financial consequences of unforeseen events may exceed the capacity of the funds allocated and the contingencies envisioned in the MOA. "In this event the Parties will consult with the Council and the Tribes to determine how to provide for the financial consequences of this unforeseen event while assuring that the purposes of the Agreement continue to be fulfilled. If no agreement is reached among the Parties, the Council, the Tribes, and Bonneville shall make a written recommendation to the Office of Management and Budget and the Council on Environmental Quality on how to provide for the financial consequences of the unforeseen event...”. CBFWA Members may be consulting with the Parties under the MOA and the Council about the significant additional costs imposed by the new ESA listings on FY 2000 and FY 2001 activities and on how to provide for adequate funding. These consultations could lead to a change in the amount of BPA funding available for the remainder of the MOA time period.

In developing their annual fish and wildlife budget, the managers make assumptions regarding potential sources of funds and allocate those funds among the three caucus’ budgets. The estimation of future Fish and Wildlife Program budgets is subject to considerable uncertainty, both with regard to the sources of available funds and the timing and need for its being spent. The validity of the managers’ assumptions regarding the amounts of funds available for use in FY 2000 are currently under regional discussion. At stake is probably no more than $10 million.

The managers offer the following observations that more than balance the above risk. First, the managers show unallocated balances totaling $2.35 million in addition to $1 million in an ESA Steelhead placeholder. Thus a third of the at-risk balance is in hand now. Second, the managers’ recommended budget has large amounts of funds allocated to major construction projects with uncertain schedules. Prudent management requires full construction funds be budgeted, in order that these projects can move forward as soon as construction can proceed to assist the recovery of declining species. Several are in the initial stages of regional review and, based on past experience, may be delayed. Furthermore, several have substantial amounts of Carry Forward that may reduce the need for FY 2000 funds. Although the managers must budget for the most rapid schedule, experience shows that, in aggregate, as much as $15 million may not be needed by these projects in FY 2000, being needed instead in later years.

A preliminary analysis of the distribution of the managers’ funding recommendations among the subregions and subbasins, among major areas of program emphasis and project status or phase is also provided.

ISRP Peer Review

The Managers believe that scientific “peer” review is a critical part of the project review process. The FY 2000 ISRP reviews were, for the most part, helpful to the project sponsors and will be used to improve project implementation as well as to better prepare project sponsors for future reviews. However, there were some aspects of the ISRP review that are discussed so that future reviews can be more useful.

Of primary concern is the timing or sequencing of the project reviews. The ISRP provides a technical review of projects three months following CBFWA's technical, management and budgetary reviews. This sequence provides no “fix-it” time for the project sponsors to correct errors in their submissions. If the ISRP technical review occurred before CBFWA's review the ISRP Report could have been used by the Managers in their review process.

The ISRP report was received favorably by the Managers and was considered when reviewing their FY 2000 funding recommendations. Although the Managers did not change their recommendations for FY 2000 following the release of the ISRP Report, the comments raised by the ISRP were taken seriously and responses are provided in Appendix B of this document. The funding recommendations did not change for three reasons: 1) the ISRP did not consider budgetary and management priority in their evaluation process (many "technically sound" projects were not recommended for priority funding by CBFWA due to budget constraints or a lack of consistency with subbasin or subregional management plans or with the Fish and Wildlife Program), 2) the ISRP's interpretation of the Council's Program varies significantly from the Managers' interpretation (i.e. the interpretation of the Program regarding native fish restoration and resident fish substitution requirements appears to vary significantly between the ISRP and the Managers; and, the fundamental philosophy of hatchery applications clearly varies significantly between the ISRP and the Managers) and 3) the ISRP in several instances relied on incorrect assumptions during their review apparently because they were not familiar with the specific area being studied.

Specific programmatic issues raised by NWPPC regarding the ISRP report are discussed in detail in the DAIWP (i.e. watershed assessments, resident fish substitution, hatchery applications, etc.).

The remainder of the Draft Annual Implementation Work Plan (DAIWP) is comprised of ecosystem summaries by subbasins and subregions, and includes goals, objectives, and strategies; fish and wildlife status; habitat assessments; limiting factors; watershed assessments; past accomplishments; remaining work; recommended project lists; and budgets. By design, all project recommendations are justified based on goals, objectives, and strategies of each unique subbasin. The appendices, showing greater detail on the evaluation process by caucus, have been placed in a separate volume.

Acknowledgements

This multi-year plan and FY 2000 work plan would not have been possible without the many hours of volunteer effort by staff of the Columbia River Basin fish and wildlife managers. They worked together to compile, review and re-write the summaries of each of the subbasins within which they work. The co-managers also read and discussed each of the more than four hundred proposals evaluated for the FY 2000 work plan. Finally, the co-managers made a series of difficult, and often painful, budget choices affecting people and the fish and wildlife resources for which they are responsible.

Special thanks to: Eric Lowrance and Tom Pansky of the Bonnevile Power Administration GIS Department for creating the maps in this document; and, Christine Clark, Summer Apprentice in the Apprenticeships in Science and Engineering Program, for compiling the Entiat and Chelan Subbasin Summaries and helping to pull the document together.

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REGIONAL GOAL, PRINCIPLES AND OBJECTIVES

The managers' proposed framework for fish and wildlife recovery starts with a basinwide goal and principles, which guide fish and wildlife management. Sub-goals and regional objectives for anadromous and resident fish and wildlife provide more specific guidance. This framework includes information gleaned from the Council's Fish and Wildlife Program, Proposed Recovery Plan and Biological Opinions for Endangered Species, Wy-Kan-Ush-Mi Wa-Kish-Wit, and other tribal, state and federal plans and policies. It also responds to the points raised by the Independent Scientific Group in its report, "Return to the River." This section outlines goals and principles, and general strategies to accomplish the goals. More detailed objectives and strategies for each subregion and/or subbasin are outlined in the following sections.

The Goal for Columbia Basin Fish and Wildlife Restoration

Restore sustainable, naturally producing fish and wildlife populations to support tribal and non-tribal harvest and cultural and economic practices. This goal will be achieved by restoring the biological integrity and the genetic diversity of the Columbia River ecosystem and through other measures that are compatible with naturally producing fish and wildlife populations. This goal is intended to fulfill the nation's and the region's obligations under treaties and executive orders with Northwest Indian tribes, treaties with Canada, and applicable resource protection, restoration and enhancement statutes and regulations.

Regional Principles

<u>General Principle:</u> The scientific foundation of the fish and wildlife managers' Multi-Year Plan views ecosystems as dynamic networks of natural and human factors. While the Columbia River ecosystem can be described and studied, it is a constantly moving target, and opportunities for prediction and manipulation are limited. It is prudent to understand and utilize the natural physical and biological processes that create and maintain productive ecosystems. Species reflect their associated landscapes and ecosystems. Hence, the condition and abundance of desired species reflect the condition of the ecosystem. Technology should be used to foster needed ecosystem attributes rather than replace them.

<u>Specific Principles:</u> This general principle is consistent with three principles identified by the Independent Scientific Group. Fish and wildlife managers have added specific references to anadromous fish, resident fish, and wildlife to the ISG principles.

- Restoration of Columbia River fish and wildlife resources must address the entire natural and cultural ecosystem including upland, riparian, freshwater, estuarine and ocean habitats where appropriate. This consideration includes human developments, as well as natural habitats.
- Sustained natural productivity requires a network of complex and interconnected habitats, which are created, altered and maintained by natural physical processes in uplands, riparian, freshwater, the estuary and the ocean. These diverse and high-quality habitats are crucial for reproduction, rearing, migration, maintenance of food webs and predator avoidance.
- Life history diversity, genetic diversity and meta-population organization are ways fish and wildlife populations adapt to their complex and connected habitats. This bio-diversity and its

organization contribute to the ability of fish and wildlife populations to cope with the environmental variation that is typical of terrestrial, freshwater, and saltwater environments.

The members of the Columbia Basin Fish and Wildlife Authority agree with these basic tenets of the ISG and have incorporated them into their plan. The fish and wildlife managers have identified three additional principles which they believe are important for restoration activities.

- Salmonid species can function as keystone populations throughout their historic range. For example, the decay of large numbers of salmon carcasses effectively cycle nutrients from the ocean to freshwater ecosystems. Salmon probably had a key role in physically structuring the environment and providing an appreciable food base for terrestrial species. It is important to re-establish the nutrient cycle in those areas still accessible to salmon. The loss of that nutrient cycling in those areas now blocked to anadromous fish must be adjusted for when developing restoration plans.
- Restoration of fish and wildlife resources depends upon managing human impacts to achieve ecosystem conditions that allow natural development of suitable ecosystem functions. Suitable ecosystem conditions can be achieved by managing human impacts to allow natural development of needed characteristics. Technology should be used to foster the development of suitable conditions rather than replace natural functions.
- Salmonids, and other species, can function as indicator species to define desired environmental conditions. In those subbasins still accessible to anadromous fish, salmon are a suitable yardstick for defining normative conditions. In this sense the needs of salmon also describe the majority of needs of a particular assemblage of other native species which, historically, occupied the same freshwater habitat. In areas blocked to anadromous fish, other sensitive native fish and wildlife species such as Kootenai River white sturgeon, bull trout, and bald eagles can serve as indicators of ecosystem condition. We should strive to re-establish and maintain the bio-diversity represented by these historically co-evolved native fish and wildlife species assemblages.

Regional Anadromous Fish Objectives

The Anadromous Fish Managers have chosen some regional objectives, including:

- By 2005, implement actions sufficient to halt the declining trend in salmon and steelhead populations above Bonneville Dam.
- Restore healthy, naturally reproducing populations of salmon in each subregion accessible to salmon. Healthy populations are defined as having an 80 percent probability of maintaining themselves for 200 years at a level that can support harvest rates of at least 30 percent.
- By 2001, obtain the information necessary to manage and restore Pacific lamprey.
- By 2025, increase the total adult salmon and steelhead returns above Bonneville Dam to 5 million annually in a manner that supports tribal and non-tribal harvest.
- Fully mitigate for losses of anadromous fish, resident fish, and wildlife within 200 years.

Regional Resident Fish Sub-Goals and Objectives

The Resident Fish Managers have chosen several sub-goals and objectives to guide resident fish management, including:

- Mitigation efforts to address resident fish losses due to human caused impacts, including the construction and operation of the hydrosystem.
- Substitute lost anadromous populations with resident populations to address the loss of salmon and steelhead in those areas permanently blocked to anadromous fish as a result of the construction and operation of hydroelectric dams.
- Mitigate and compensate for resident and anadromous fish losses caused by the construction and operation of federally-operated and federally-regulated hydro-power projects.
- Ensure the continued persistence, health, and diversity of existing resident fish species by reducing or removing impacts caused by habitat degradation (including water quality, water quantity, and hydropower development), competition and/or hybridization with non-native species, and over-harvest (direct and incidental).
- Restore native resident fish species (subspecies, stocks and populations) to near historic abundance throughout their historic ranges where habitats exist and where habitats can be feasibly restored.
- Maintain and restore healthy ecosystems and watersheds which preserve functional links among biota to ensure the continued persistence, health and diversity of all species including game fish species, non-game fish species, and other organisms.
- Administer and increase opportunities for consumptive and non-consumptive resident fisheries for native, introduced, wild, and hatchery-reared stocks that are compatible with the continued persistence of native resident fish species and their restoration to near historic abundance (includes intensive fisheries within closed or isolated systems).

Regional Wildlife Sub-Goal and Objectives

The wildlife sub-goal is to achieve and sustain levels of habitat and species productivity in order to fully mitigate for the wildlife losses that have resulted from the construction and operation of the federal and nonfederal hydroelectric system in the Columbia River Basin.

- Develop mitigation plans that will fully mitigate for wildlife losses.
- Coordinate efforts within the Columbia Basin.
- Ensure that trust/settlement agreements and other mitigation programs demonstrate consistency with mitigation goals, objectives, and methods.
- Track mitigation goals and the gains in habitat units (HU) as a result of implemented mitigation plans.
- Ensure consistent application of Habitat Evaluation Process (HEP) methodology. Ensure baseline HEP estimates are completed as projects come on line.
- Conduct operational loss assessments.
- Develop a monitoring and evaluation plan that measures habitat and species response to management actions.
- Develop policy regarding substitution of habitat types.

PROGRAMMATIC ISSUES

Preface

The federal, state and tribal entities comprising the Columbia Basin Fish and Wildlife Authority (CBFWA) have responsibility under treaties and statutes for managing the fish and wildlife resources of the Columbia River Basin. The Northwest Power Act requires the Council to request recommendations from the fish and wildlife managers when developing or modifying the Columbia River Basin Fish and Wildlife Program (Program). The Draft Annual Implementation Work Plan (DAIWP) is a formal recommendation to the Council for the FY 2000 budget and summary of the Manager's project evaluation process and, as revised, as recommendations to the Program Amendment process.

The basis for the fish and wildlife Managers actions in fulfilling the requirements of the Northwest Power Act derives from a number of statutory and other legal sources, e.g. Fish and Wildlife Coordination Act 16 U.S.C. 661-666c; Fish and Wildlife Act, 16 U.S.C. 742; Endangered Species Act 16 U.S.C. 1531-1543; Federal Power Act §18, 16 U.S.C. 811; Migratory Bird Treaty Act, 16 U.S.C. 703-711; Revised Code of Washington, Titles 75 & 77; and treaties between the US Government and the Federally recognized Indian tribes of the Columbia River Basin. The Northwest Power Act did not amend these authorities, nor did the Act delegate the exercise of these authorities to the Council or other bodies. Instead, the Act supplemented these authorities including a focus on "fish and wildlife management coordination and research and development (including funding) …". 16 U.S.C. 839b (h)(2)(C).

In carrying out certain aspects of the Council's Program, the Managers have chosen to work through the processes of the Columbia Basin Fish and Wildlife Authority. In addition to providing administrative and technical support, CBFWA provides a neutral ground for the co-managers to address a variety of issues in an open and productive discussion. Among other things, the co-managers develop the DAIWP for activities in the Council's Program. The DAIWP incorporates project priorities of the co-managers in terms of the available budget under the BPA Fish and Wildlife Memorandum of Agreement. Tasks necessary to carry out this work include:

1. Assessments of current and future years' budget availability considering on going and completed projects. The budget analysis primarily occurs at the "obligations" level of specificity, with monitoring of "accruals" through MOA processes.
2. Budget recommendations for capital and expense portions of the BPA directly funded measures. Development of these recommendations generally requires review of individual project budgets for projects in question and decisions to sequence or delay implementation of measures.
3. Recommendations of measures/program areas where proposals should be solicited for project implementation. These recommendations have been provided in an attempt to better structure the annual BPA funding cycle and streamline processes.
4. Review of proposals submitted to the Bonneville Power Administration. Reviews include management review for consistency with federal, state, and tribal policies affecting the acceptability of proposals, independent peer review, and budget review.
5. Peer review among co-managers of projects for technical merit.

6. Implementation or coordination of major programmatic efforts such as, predator control, smolt passage monitoring, and coded wire tagging programs.

The CBFWA submitted the DAIWP to the Council on April 16, 1999. The document was reviewed by the Independent Scientific Review Panel (ISRP) and distributed for public comment. Revisions to the DAIWP are incorporated through a collaborative process with CBFWA, the Council, the Bonneville Power Administration (BPA) and the public. CBFWA will present the revised FY 2000 DAIWP incorporating responses to ISRP and the public to the Council on August 20, 1999. The Council adopts a final DAIWP in September and submits its recommendations to BPA in October to begin the execution of contracts for the protection, mitigation and enhancement of the Columbia Basin's fish and wildlife resources.

For FY 2000, the DAIWP has incorporated several changes from past efforts. The format has changed to one with emphasis on the subbasin level and evaluation of fish and wildlife resource needs through an ecosystem approach. Projects and their costs have been organized by subregion and subbasin.

The following comments are based on CBFWA's expectations that the Council and ISRP work in a collaborative manner to provide the best possible scientific and cost effective fish and wildlife program within the BPA Direct Program funding source. We expect the ISRP, through Council, to provide a comprehensive, credible technical review of the projects proposed for funding in FY 2000. For the most part, except as noted in the following review, this has been achieved for FY 2000. The expectation for the Council is to ground truth the Managers recommendations, using the ISRP Report to insure that the projects proposed for funding are scientifically adequate to meet their objectives. We also expect the Council to provide written comment to CBFWA where there are significant concerns raised by the ISRP that may jeopardize the recommendations made in the April 16, 1999, FY 2000 DAIWP. There is an inherent need for a commitment from the Council to work with CBFWA to productively resolve differences with the ISRP and BPA in order to maintain the best possible fish and wildlife program for FY 2000.

Review and General Impressions of FY 2000 ISRP Report

The Managers believe that scientific "peer" review is a critical part of the project review process. The ISRP reviews were, for the most part, helpful to the project sponsors and will be used to improve project implementation as well as to better prepare project sponsors for future reviews. In some instances, particularly the Upper Columbia Subregion proposals, the reviewers provided much needed advise on what specific information was missing from this year's proposals and how the proposals could be improved in the future. However, there were some aspects of the ISRP review that need to be discussed so that future reviews can be more useful.

Of primary concern is the timing or sequencing of the project reviews. The ISRP provides a technical review of projects three months following CBFWA's technical, management and budgetary reviews. This sequence provides no "fix-it" time for the project sponsors to correct errors in their submissions. If the ISRP technical review occurred before CBFWA's review the ISRP Report could have been used by the Managers in their review process. This would have greatly reduced the time that the Managers spent on their technical review and would have allowed them to spend more time evaluating management and budgetary priorities.

The ISRP report was received favorably by the Managers and was considered when reviewing their FY 2000 funding recommendations. Although the Managers did not change their recommendations for FY 2000 following the release of the ISRP Report, the comments raised by the ISRP were taken seriously and responses are provided in Appendix B of this document. The funding recommendations did not change for three reasons: 1) the ISRP did not consider budgetary and management priority in their evaluation process (many "technically sound" projects were not recommended for priority funding by CBFWA due to budget constraints or a lack of consistency with subbasin or subregional management plans or with the Fish and Wildlife Program), 2) the ISRP's interpretation of the Council's Program varies significantly from the Managers' interpretation i.e. the interpretation of the Program regarding native fish restoration and resident fish substitution requirements appears to vary significantly between the ISRP and the Managers; and, the fundamental philosophy of hatchery applications clearly varies significantly between the ISRP and the Managers and 3) the ISRP in several instances relied on incorrect assumptions during their review apparently because they were not familiar with the specific area being studied.

The Managers performed a comprehensive technical and management review of the project proposals before releasing the April 16, 1999 FY2000 DAIWP. Where technical concerns were raised during that review, the proposal sponsor was called upon to address the concerns. The ISRP identified many of the same concerns raised by the Managers during their review. However, we understand that the ISRP did not provide the sponsors with an opportunity to provide additional input. The Managers do not believe that this practice is the most effective method of determining which proposals should receive funding. We believe that there should be some means of communication, such as workshops, conference calls, written questions, etc., that would allow the project sponsors to respond to reviewers' questions regarding their projects, especially since some reviewers appear to be unfamiliar with local conditions and the background for some of the proposals they reviewed.

An example of where an inaccurate assumption was made by the ISRP reviewer, because of lack of background knowledge, is in the review of Project Number 9501300, Nez Perce Tribe Resident Fish Substitution Program. The ISRP commented: "The approach on its face seems infeasible because trout and bass are not compatible. This leads to a lack of confidence in the proposal and concern that the work is not based on sound science principles." In fact, both trout and bass live in this subbasin. The reviewers should have known this. In another example, the review of Project Number 9608600, Clearwater Subbasin Focus Watershed Program – ISCC, the ISRP commented: "The project needs a focus on increased flows that more closely approximate natural seasonal hydrographs." In fact, the flows in this tributary are natural, with no dams or irrigation diversions upstream of the intended sampling area. Therefore, the project is addressing the appropriate needs in this subbasin. These are only two examples where the reviewers relied on fundamentally inaccurate assumptions as a basis for their review of a project. Several other proposal reviews had similar difficulties. These examples are presented to explain why the Managers recommendations have not changed since the original version of this DAIWP. The Managers either had the local knowledge or contacted the proposal sponsor to be sure their assumptions were correct before making critical comments. This also highlights that the ISRP report is not infallible. All comments provided by the ISRP should not be considered evenly.

The ISRP review would be more useful if the reviewers would confine their comments to the technical aspects of the proposals rather than venturing into policy or programmatic issues. In several instances, the ISRP reviewers appear to make inappropriate comments, crossing the line of providing a technical review into providing personal opinion on aspects of the proposal that are not the responsibility of the ISRP. For example, there was an evident bias against artificial production throughout this peer review. Volume I of the ISRP Report states: “In the case of the Nez Perce Hatchery, the ISRP was concerned that the project is scientifically outdated, and would follow in the pathway of a technology that has largely failed the region.”. This statement is not supported by any references. Hatcheries have not been the only means for the recovery of depressed stocks of fish and are confronted with numerous obstacles in order to accomplish their objectives. This hatchery is applying the NATURES methodology, which is the most current science in regards to hatcheries in the subbasin, and ironically, is strongly supported by the ISRP. Another statement in Volume I states: “The many (50 some) Columbia River system hatcheries have failed to offset destruction of the basin’s fishery resources.” Statements such as these, particularly with the Artificial Production Review ongoing and the other factors impacting fish survival, demonstrate a bias against the use of hatcheries and a general lack of understanding that there have been both successes and failures with hatcheries and that each hatchery should be judged on its on merits. Instead of the hatcheries being reviewed according to their own technical merits, the hatchery projects were criticized for their use of supplementation as a means for fish recovery, even though supplementation is called for in the Program.

The ISRP Report could also be improved if the reviewers would refrain from making unprofessional comments about the proposal sponsors. The assumption of a peer reviewer should be that if information is missing from a project proposal, that the project sponsor must have overlooked its importance. The assumption several of the reviewers made, if they did not understand portions of a project proposal or did not find information that they felt was critical for the proposal, was that the project sponsor was incompetent and the entire proposal was scientifically unsound. We need to emphasize that the project sponsors are scientists and well qualified for the work they are performing. To imply that they are not is unproductive and impedes the constructive nature of a peer review process. Specific examples of unprofessional comments are plentiful in this document. For Project Number 9107300, Idaho Natural Production Monitoring and Evaluation, the ISRP comments that: “This is an ongoing study that is too huge, amorphous and multi-faceted to inspire confidence in the reviewers in the project’s future success or the competence of the project personnel.”. How does the size of the project reflect the competence of the sponsors to perform the work? What is the sponsor to do to address this concern? In another example, Project Number 20084, Protect and Restore the North Lochsa Face Analysis Area Watersheds, the ISRP comments “Is there sufficient expertise on the project team to assure that the medicine won’t be worse than the disease?” If the intent of the reviewers is to imply that the sponsor lacks the expertise to carry out the work it would be more helpful to comment on the qualifications that are listed for the personnel in the proposal summary. If the sponsors were not qualified to perform the work the Managers would not have supported the proposal.

Finally, for Project Number 20086, Rehabilitate Newsome Creek – S.F. Clearwater River, the ISRP had several comments relating to the competency of the staff: "Specifically, there is a real possibility that the road work could make the problem worse rather than better, and it does not appear that the project team has the proper qualifications to undertake this work…1) There seems to be over-reliance on the Rosgen method. Project personnel should get second-opinions on their hydrologic/geomorphic approach from qualified fluvial (and watershed) geomorphologists of the non-Rosgen school….3) The abstract mentions certain biological monitoring ("snorkel counts to document juvenile survival, and redd counts to document adult spawning success"), but such are not covered in the methods section—and the way they are expressed in the abstract leads one to believe the proposers probably don't know what they are talking about." Again the qualifications of the proposers is called into question in a manner that is not constructive. More importantly, the scientific methods are unfairly called into question. The Rosgen method is an approved and supported method throughout the region. Like many scientific methods, there are individuals that believe other methods may be more appropriate. This review does not acknowledge that there is currently a scientific dispute regarding methods for watershed evaluations. Also, because the scientists do not describe basic sampling techniques in the methods section of their proposal the reviewers assume that the proposers "don't know what they are talking about". In a limited proposal format, being reviewed by your peers, it is reasonable for the proposer to assume that the reviewer is familiar with basic, fundamental sampling procedures.

The reviewers have a very high standard for peer reviewed articles, as well they should. But they fail to acknowledge that much of the information in gray literature can be useful and "scientifically sound". In most cases, this is the only information available for decision-making. It should be well known to the reviewers that the peer review process for publications takes a considerable amount of time (from 2 to 5 years to get data from the field into a journal article), and for several projects the information the ISRP is looking for may currently be in the peer review publication process. The gray literature provides an avenue to release the results on an annual basis. It most instances these results are peer-reviewed by other scientists within the program where the work is being done. The time and funding is often not available for every project sponsor to submit results to a peer-reviewed journal each year. It also appears that the ISRP believes that nearly every project should be publishing its results in a peer reviewed journal, yet many of the projects are not creating new or different information that would be considered pertinent to the outside world. Nowhere in the Fish and Wildlife Program is journal publication a requirement for funding. Also, when the ISRP insinuates that there is information available in the peer reviewed literature that the project sponsor missed or does not know about, it would be helpful if the reviewer could provide the reference for articles pertinent to these projects.

Although the ISRP contends that it made a reasonable effort to insure consistency among reviewers, there were numerous occasions where extremely high standards were placed on a group of projects in one area while in another area, those standards are not apparent. In a technical evaluation the standards should be consistent across the board. For instance, there are statements that some proposals should not be funded due to inadequate goals and objectives, while other proposals are recommended for funding when the ISRP specifically states that no concrete goals and objectives have been established. One example of this is the recurring demand by the ISRP that all watershed restoration projects be tied to a watershed assessment. Yet for Project Number 20013, Restore Unobstructed Fish Passage to Duncan Creek, the ISRP recommended funding yet clearly states that “There is no evidence of a watershed assessment plan.”

The ISRP Report strongly supports funding new projects that are purely research oriented with no ties to management actions or needs. For one ongoing project, the research results are being directly tied into hatchery operations and are identified as necessary by the co-managers in this subbasin, yet the ISRP recommends not funding this component of the project. For Project Number 9703800, the ISRP recommends “Do not fund the portion to cryopreserve female genetic material, as this part of the proposal is too uncertain and experimental. While the objective appears worthwhile, other funding sources such as USDA or NSF may be more appropriate to support basic research and technology development.” This comment does not support the recommendations by the ISRP to provide funding for new and innovative projects. This is also a clear example that innovative work is not confined to new projects.

The ISRP recommended 36 proposals for funding that CBFWA ranked as Tier 3 (do not fund). Table 1 lists the basis for the CBFWA ranking. Refer to Appendix B for a complete response to the ISRP comments.

Table 1. Project review for CBFWA Tier 3 projects rated as "Fund" by the ISRP

Project ID	Title	Sponsor	ISRP Recom.	CBFWA Tier	ISRP-CBFWA comparison	Comments
20006	Yakima Basin Benthic Index Of Biotic Integrity (B-Ibi)	Washington Trout	Fund	3	Disagree-fund	This project has merit, but stands alone in its usefulness for management applications. A project is currently being funded through another source that provides similar information, making this project redundant in the region.
20012	Develop New Technology For Telemetry And Remote Sensing Of Fish Quality	Oregon Cooperative Fish and Wildlife Research Unit	Fund	3	Disagree-fund, but not high priority	The managers agree that this could be an innovative project, but the usefulness of the results to management is unclear. In light of other proposals in the basin, this project is not a management priority at this time.
20013	Restore Unobstructed Fish Passage To Duncan Creek	Skamania Landing Owners Association (SLOA)	Fund	3	Disagree-fund; strongly recommend	When compared to other projects proposed in this subbasin, this project is not a high priority management need. Due to budgetary constraints within the Fish and Wildlife Program, and alternative funding sources available for this project, this project is not a management priority within the basin. See Appendix B.
20014	Evaluate Songbird Use Of Riparian Areas During Fall Migration	Department of Biological Sciences, University of Idaho	Fund	3	Disagree-fund	Based upon review of this project in relationship to Wildlife Caucus research criteria, this project did not identify a specific need under the Council's program nor did it satisfy any identified data gap or need for continued implementation of mitigation projects.
20027	Electronic Columbia Basin Watershed Newsletter	Intermountain Communications	Delay Funding	3	Disagree-if deficiencies corrected	This project is not an essential element of the work plan and therefore is not a management priority in the basin.
20029	Electronic Columbia Basin Fish & Wildlife Research Report	Intermountain Communications	Fund	3	Disagree-fund, but not high priority	This project is not an essential element of the work plan and therefore is not a management priority in the basin. Publication opportunities for fish and wildlife results are abundant (North American Journal of Fisheries Management, Northwest Science, etc.) and are currently being used. More emphasis should be placed on the individual sponsors to publish their results in existing journals. This money is needed for on the ground work.
20033	Rehabilitate instream and riparian habitat on the Similkameen and Okanogan	U.S. Fish and Wildlife Service	Fund	3	Disagree-fund, but not high priority	This project is not a management priority in this subbasin. The proposed work has not been adequately justified and this particular location would more appropriately lend itself to passive restoration.
20034	Impact Of Flow Regulation On Riparian Cottonwood Ecosystems	BioQuest International Consulting Ltd.	Fund	3	Disagree-fund; strongly recommend if project is feasible (IKONOS imagery)	Based upon review of this project in relationship to Wildlife Caucus research criteria, this project did not identify a specific need under the Council's program nor did it satisfy any identified data gap or need for continued implementation of mitigation projects. There is a plethora of existing literature on this subject that has been used by the Basin's managers in the development and implementation of riparian cottonwood projects.
20040	Develop A Fish & Wildlife Management Plan For The	Shoshone-Paiute Tribes of the Duck	Fund for 1 YR	3	Disagree-fund	

Project ID	Title	Sponsor	ISRP Recom.	CBFWA Tier	ISRP-CBFWA comparison	Comments
	Owyhee Basin, D.V.I.R.	Valley Indian Reservation				
20041	Develop A Fish & Wildlife Conservation Law Enforcement Plan, D.V.I.R.	Shoshone-Paiute Tribes of the Duck Valley Indian Reservation	Fund for 1 YR	3	Disagree-fund	
20042	Integrating Okanogan And Methow Watershed Data For Salmonid Restoration	Okanogan Conservation District	Fund	3	Disagree-fund; strongly recommend	The framework for this information is currently being provided under another BPA project through Streamnet. This project has not been adequately coordinated with the local fish and wildlife managers to assure that the proposal is consistent with their management plans and therefore has little potential to assist in management decisions in the area.
20045	Analyzing Genetic And Behavioral Changes During Salmonid Domestication	Washington State University	Fund	3	Disagree-fund; strongly recommend	This project has merit, as a pure research project, but will not contribute to management decisions for fish and wildlife in the basin. This is not a management priority in the basin. These funds should be used for on the ground improvements.
20054	Evaluate Effects Of Hydraulic Turbulence On The Survival Of Migratory Fish	Oak Ridge National Laboratory	Fund in Part	3	Disagree-fund in part	The management application for this project is not clear. Proposal 20060 more clearly describes it's usefulness and is preferred over this project. This project has not been well coordinated with fish and wildlife managers to assure that the proposal is consistent with their management plans for this subbasin.
20056	Elucidate Traffic Patterns Of Ihn Virus In The Columbia River Basin	USGS-BRD, Western Fisheries Research Center	Fund	3	Disagree-fund; strongly recommend	This project has merit as a pure research project but will not contribute to management decisions for fish and wildlife in the basin. This is not a management priority in the basin and has not been tied to a management plan in the basin.
20057	Strategies For Riparian Recovery: Plant Succession & Salmon	Oregon State University	Fund	3	Disagree-fund; strongly recommend	This project has merit as a pure research project but will not contribute to management decisions for fish and wildlife in the basin. This is not a management priority in the basin and has not been tied to a management plan in the basin. Refer to Appendix B comments.
20062	Adaptive Management Of White Sturgeons	U.S. Geological Survey, Biological Resources Division, Columbia River Research Laboratory	Fund	3	Disagree-fund; strongly recommend	This project does not fall within the measures required for the Fish and Wildlife Program.
20063	Evaluate Effects Of Catch And Release Angling On White Sturgeon	U.S. Geological Survey, Columbia River Research Laboratory, Idaho Department of Fish and Game	Fund in Part	3	Disagree-fund in part	This project does not fall within the measures required for the Fish and Wildlife Program.
20067	Effects Of Supersaturated Water	U.S. Geological	Fund	3	Disagree-fund,	This project will not contribute to management actions to meet existing

Project ID	Title	Sponsor	ISRP Recom.	CBFWA Tier	ISRP-CBFWA comparison	Comments
	On Reproductive Success Of Adult Salmonids	Survey, Western Fisheries Research Center, Columbia River Research Laboratory			but not high priority	water quality standards and is not consistent with the fish and wildlife manager's management plan for the basin. This project is not a management priority.
20071	Restore Crab Lake And Adjacent Reaches Of Crab Creek.	Ducks Unlimited, Inc.	Fund for 1 YR	3	Disagree-fund, but not high priority	After lengthy review and subsequent contact with the proponent to get more information, this project was identified as failing at least one of the threshold criteria for funding (in-lieu). The Caucus determined that it was not in the best interest of the region to protect and develop habitat that would be used to generate income for a private group.
20076	Diet, Distribution & Life History of Neomysis Mercedis in John Day Pool	Unviersity of Montana	Fund	3	Disagree-fund	This project has merit as a pure research project but will not contribute to management decisions for fish and wildlife in the basin. This is not a management priority in the basin.
20083	Evaluate, restore and enhance 14 miles of instream and riparian habitat on	U.S. Fish and Wildlife Service	Fund	3	Disagree-fund; strongly recommend	This proposal was technically unsound. This project is not a management priority in this subbasin.
20092	Inventory Wildlife Species & Populations Of The Owyhee Basin, D.V.I.R	Shoshone-Paiute Tribes of the Duck Valley Indian Reservation	Fund for 1 YR	3	Disagree-fund	Based upon NWPPC staff input and review of the Council's program, it was determined that there was no provision within the existing wildlife section of the program to fund this sort of activity. There has been no request of this sort previously within the basin.
20093	Evaluate The Feasibility For Anadromous Fish Reintroduction In The Owyhee	Shoshone-Paiute Tribes of the Duck Valley Indian Reservation	Fund for 1 YR	3	Disagree-fund	This funding should be provided from other sources. This would support policy participation for an individual agency that should be absorbed through other projects.
20103	Indexing Salmon Carrying Capacity to Habitat, Population, & Physical Fitnes	Oregon State University	Fund	3	Disagree-fund; strongly recommend	This project was technically unsound. The proposers did not establish the need for this information or a tie to a direct management action. Portions of this project are being provided through PATH and would therefore be redundant in the basin.
20107	Reconnect The Westport Slough To The Clatskanie River	Lower Columbia River Watershed Council	Fund	3	Disagree-fund; strongly recommend	This proposal does not address a management priority in this subbasin. The problem being addressed is not a limiting factor at this time.
20109	Cedar Creek Natural Production and Watershed Monitoring Project	Washington Department of Fish and Wildlife	Fund	3	Disagree-fund; strongly recommend	This project has merit but should not be funded until the definition of watershed assessment is complete. The Managers are currently working collaboratively within the region to establish a definition and process for watershed assessments.
20113	Securing Wildlife Mitigation Sites - Oregon, South Fork Crooked River	Oregon Department of Fish and Wildlife	Fund	3	Disagree-fund	After review of the project, the Wildlife Caucus determined that the project scope was significantly different than that which was provided in the FY 2000 proposal. The project proponent withdrew the project for consideration in FY 2000.
20117	Yakima River Subbasin Assessment	Yakama Indian Nation	Delay Funding	3	Agree-DNF	This project has merit but should not be funded until the definition of watershed assessment is complete. The Managers are currently working collaboratively within the region to establish a definition and process for

Project ID	Title	Sponsor	ISRP Recom.	CBFWA Tier	ISRP-CBFWA comparison	Comments
						watershed assessments. Most of this information exists in the Yakima River Basin.
20122	Test guidance flows and strobe lights at a SBC to increase smolt FCE & FGE	Washington Department of Fish and Wildlife	Fund in Part	3	Disagree-fund in part	This project has merit but would not contribute to direct a management action. This project should be discussed under a FERC forum and funded in that realm.
20136	Burns Paiute Mitigation Coordinator	Burns Paiute Tribe	Fund	3	Agree-fold into other BPT proposals	Based upon NWPPC staff input and review of the Council's program, it was determined that there was no provision within the existing wildlife section of the program to fund this sort of activity. This project should be absorbed by other contracts within the Fish and Wildlife Program.
20156	Identification Of Redband And Rainbow Trout In The N F Clearwater Basin	Nez Perce Tribe	Fund	3	Disagree-fund, but not high priority	This project does not fall within the measures required for the Fish and Wildlife Program
20536	Develop Management Plan & Assess Fish &Wildlife - Owyhee Basin, D.V.I. R.	Shoshone-Paiute Tribes of the Duck Valley Indian Reservation	Fund for 1 YR	3	Agree fold into other DVIR proposals	
9105100	Monitoring And Evaluation Statistical Support	University of Washington	Fund for 1 YR	3	Disagree-fund; strongly recommend	This project fails to inform critical management decisions. This service should be absorbed within other projects.
9601900	Second Tier Database Support For Ecosystem Focus	Bonneville Power Administration	Fund for 1 YR	3	Disagree-fund	This project duplicates other data information management services.
9700300	Box Canyon Watershed Project	Kalispel Tribe of Indians - Kalispel Natural Resource Department	Fund for 1 YR	3	Disagree-fund, but not high priority	This project has met its objective of funding through another source and the proponent has withdrawn the project from consideration.
9803500	Watershed Scale Response Of Stream Habitat To Abandoned Mine Waste	University of Washington, College of Forest Resources, Center of Streamside Studies	Fund	3	Disagree-fund	This project has merit but does not make a direct link to salmon recovery. This information will not contribute to management decisions.

Subbasin Planning

Watershed assessments

Issue: In 1999, the Independent Science Review Panel recommended that watershed restoration projects should be conducted based upon a watershed assessment which described the overall condition of a watershed and identified the factors most directly affecting anadromous fish, resident fish, and wildlife. They stated that watershed restoration projects not tied to a watershed assessment should not be funded in the future unless this was resolved. They indicated, however, that there should be a 2-3 year grace period for the project sponsors to actively pursue completion of watershed assessments. We have made significant progress toward this goal. Present watershed restoration projects are broadly based upon the subbasin plans jointly developed by fishery managers in 1991. Local watershed groups have used those plans and have considered recent changes in the watershed. Existing subbasin plans, however, often do not explicitly address the needs of resident fish or wildlife.

In FY 2000, the ISRP again criticized projects for not being tied to a watershed assessment, and recommended not funding several projects for this reason.

The Council has not stated that the ISRP's contradiction in FY 1999 vs. FY 2000 is an issue for FY 2000. The issue for FY 2000 is whether the Council should solicit innovative proposals in the area of watershed assessment, with the particular goal of improving methods for watershed inventory and improving methods for evaluating outcomes of management practices at the watershed or subbasin level.

CBFWA Response: Watershed restoration efforts have been criticized for not being clearly linked to a description of expected measurable benefits. This is a valid criticism in two respects. First, tools for describing the response of anadromous fish, resident fish, and wildlife to watershed-scale changes in habitat conditions do not exist. Second, watershed projects to date have often focused on working with willing landowners and may have bypassed significantly damaged conditions in other areas. This is inevitable for a watershed restoration program while it establishes credibility in its early years and is severely limited by available resources. We are making significant strides in improving the watershed restoration program, however.

This workplan moves toward improving watershed restoration efforts in two ways. First, it includes anadromous fish, resident fish, and wildlife status and needs in a single document. Second, it provides a much more detailed description of problems in the context of past studies and restoration efforts conducted under a number of different funding sources. The Council spent several millions of dollars in the late 1980's to develop the first set of coordinated subbasin plans in the history of the Columbia River Basin. These plans were an interagency effort, involved public input in many cases, and identified the most serious habitat problems limiting anadromous fish production in each subbasin. The assessments of habitat conditions in each subbasin have been updated at least twice since 1990, in the draft Multi-Year Plan and this year in Volume 1 of the DAIWP. The managers have been updating assessments where they exist and are in the process of doing assessments where needed.

Fish and wildlife managers recognize that significant work remains before watershed assessments and restoration efforts will be fully integrated in updated subbasin plans for anadromous fish, resident fish, and wildlife. We feel the conceptual framework described in the 1998 Draft Annual Implementation Work Plan is the most effective method for achieving this. These concepts, and tools for their implementation are now being actively developed in the Multi-Species Framework discussions.

In 1999, the managers were told that they had two to three years to complete watershed assessments. This year recommendations have been made that are not consistent with that time frame. The regional understanding is 2-3 years grace period for providing watershed assessments and CBFWA intends to meet that schedule, either through using existing information or collecting new information as needed.

The Fish and Wildlife Managers also have a clear strategy for continuing and accelerating improvements in watershed assessment procedures, which specifically addresses the issue at hand for FY 2000. Proposals that included plans for conducting watershed assessments in FY 2000 were examined as a group and individually. The CRITFC proposal, Implement Wy-Kan-Ush-Mi Wa-Kish-Wit Watershed Assessment and Restoration Plan (Project 9803100), was the most technically advanced and the managers asked the project sponsor to coordinate development of consistent methodologies with the Yakama Indian Nation projects and McKenzie Watershed Council. The CRITFC has begun this process by convening, jointly with WSU, an interagency team to “promote the coordination and application of science-based, cost effective, watershed assessment methodologies to support natural resource management.” This Watershed Assessment Workgroup will invite interested regional coordinators to participate in future activities. It would be productive for the ISRP to also attend, if the Council so chooses.

The present approach will produce (by the end of 2000) 1) a watershed assessment handbook describing common methods needed in every subbasin, guidance on how to use other methods to customize the assessment to local conditions, and methods for assessing cultural needs and impacts; 2) a test of the handbook approach in four subbasins; 3) procedures for a basic monitoring program and 4) a coordinating forum to address common issues and share learning.

A parallel process exists in resident fish subbasins in the form of long-term mitigation plans, which identify fisheries losses, limiting factors, and priority areas for fisheries improvements and monitoring strategies. Examples include the Council-approved Hungry Horse Mitigation (1991) and Implementation Plans (1993) and the Libby Mitigation and Implementation Plan (1999). The Council should support and work with the Interagency Watershed Assessment Workgroup to address its concerns rather than creating an entirely new process which will simply add to the administrative costs of salmon restoration.

Subbasin perspectives on specific project recommendations in subbasins of concern

Issue: In certain subbasins, such as the John Day, Clearwater, Umatilla, Walla Walla, and others the ISRP raised serious concerns about Program direction and recommended against funds (or delayed funds) for many or most projects. The issue is whether the Council needs to consider whether some sort of a watershed planning/review effort and/or site review is needed to bring order to the Program in some subbasins. Of greater concern is whether the Council should require that planning and/or review effort in those areas must be complete before project proposals are re-designed and submitted again for review.

CBFWA Response: Before the Council concludes that projects in certain subbasins must undergo delays for more planning to occur, CBFWA believes they must demonstrate and note specifically how projects lack appropriate coordination and consistent direction towards addressing limiting factors and established restoration goals. In making this determination, CBFWA believes the Council must note how sponsors of specific projects in these subbasins responded to the poor coordination/direction issue expressed by ISRP. Most proposals and responses point out direct ties to subbasin limiting factors, multi-agency coordination, and/or existing fish restoration planning documents. These documents were referenced in the proposals and responses with basic findings summarized, but a full understanding of these planning efforts and their adequacy in addressing the ISRP planning concerns is not clear (due obviously to lack of ISRP time and ability to read all related planning/coordination efforts).

In all cases, there are existing subbasin/programmatic-planning documents that were developed cooperatively by various natural resource management entities. For example, a watershed assessment is currently being conducted in the Umatilla Basin to be completed in 2000. This effort follows five other separate fish restoration planning efforts in the past fifteen years. All these fisheries program reviews share the same recommended solutions to address agreed upon problems. The most recent of these efforts is the updated subbasin summaries found in the FY2000 DAIWP.

The Walla Walla Basin also has a watershed assessment under development (to be completed in late 1999) and numerous existing subbasin planning documents (including the FY 2000 DAIWP). The Council held up Walla Walla projects two years ago for almost the entire fiscal year until it gained better comfort with the overall subbasin direction and coordination towards established fish restoration objectives. After receiving all planning documents and conducting a subbasin meeting with states, tribes, irrigators, watershed council members, and sportsmen, the Council decided to let projects proceed and concluded that program coordination, direction and support was quite thorough.

CBFWA strongly suggests that the Council not initiate a new planning effort but instead utilize the recently drafted subbasin planning summaries in the FY 2000 DAIWP to address the ISRP concern regarding watershed planning/review. These documents define current resource status, restoration goals, fish limiting factors, recommended solutions/projects to address limiting factors and recommended monitoring and evaluation to track success in achieving subbasin fish restoration goals. Until the Council demonstrates that past planning efforts, the FY2000 DAIWP and ongoing watershed assessments do not constitute adequate project coordination and direct connection to documented limiting factors, CBFWA believes there should be no project delays. If the Council feels the DAIWP subbasin summaries are not sufficient, CBFWA will be glad to address and strengthen any specific stated weaknesses as part of a working process while valuable projects are allowed to proceed.

Due to the nature of the project review process, most watershed projects are well coordinated with each other and the local managers take it for granted that “peer” reviewers know this.

Coordination of projects within a watershed is crucial for a regional (subbasin) management framework. In addition to this, peer reviews performed by scientists with local knowledge of issues and needs are also crucial for constructive evaluations of proposals. By eliminating local knowledge, through the use of a review panel that may or may not contact project sponsors with their fundamental questions and concerns, the ISRP may inadvertently remove this site-specific knowledge and revert to a global perspective of management intent and biological methods. Most of the management concerns that the ISRP had with the watershed projects are currently being addressed through the CBFWA review process or local coordinating groups. These could have been corrected through a simple question and answer forum with the project sponsor.

Maintenance funds must be provided for ongoing projects to insure continuity, maintain community ties for these projects, and to retain local expertise. The risk of interrupting project activities such as habitat maintenance or monitoring activities must be considered.

Site reviews

Issue: The ISRP concluded that regular site reviews of related projects would contribute to enhanced program coordination and evaluation of progress toward meeting Program goals. The Panel noted that site reviews have been recommended by a sequence of advisory boards (SRG, ISG, ISAB) for nearly a decade. Thus the ISRP recommended that a plan for regular site reviews of related projects be developed and implemented in FY2000.

CBFWA Response: We fully agree that site reviews should be part of a subbasin collaborative review process involving Council (ISRP), CBFWA and BPA. Project reviewers should not only attend site visits but should also seek clarification for questions raised during proposal review from proposal sponsors. Some of the ISRP comments show a lack of understanding of the issues and/or subject matter. We encourage members of ISRP to participate directly in such site reviews to avoid making comments based on an incomplete understanding of project proposals.

Without exception, every manager is willing to participate in a site reviews, if these site reviews are scheduled far enough in advance for sponsors to be fully prepared and if they are attended by the individuals responsible for reviewing the projects.

The ISRP review process has proven to be imperfect with deficiencies displayed by all parties involved. CBFWA feels it is imperative that important work is not discontinued because of an inadequate review process. Although many of the ISRP’s comments are beneficial, some of them miss the mark, reflecting a lack of understanding of basin-specific life history characteristics, decision-making processes in the basin, and others. This is not to discredit the ISRP, but rather to note that the ISRP is no less fallible than the Managers. We believe that it would be imprudent to discontinue a project based solely on the ISRP’s judgement of the adequacy of the project proposal. Rather, discontinuation of funding should only occur following a defined process that includes one-on-one discourse with the ISRP, and if necessary the opportunity to address the Council. The ISRP is only one part of the process, the final decision is the responsibility of the Council. Certainly site reviews would help build a better context in which project proposals were reviewed.

Wildlife Specific Issues

Proposals for acquisition and management of land in the wildlife program and elsewhere

Issue: The ISRP recommended that no land be acquired unless a clear description of the land is produced and the priority of the land for the fish and wildlife program is demonstrated. This is needed, in the Panel's view, to justify the value of parcels of land to particular wildlife species and to make clear the cost-effectiveness of acquiring certain parcels.

CBFWA Response: The ISRP wants all proposed acquisitions to be completely defined and prioritized in the Program. First, there are occasionally opportunities that will be lost if complete definition is required. Second, the Wildlife Caucus, at the request of the Council has prioritized these acquisitions and continues to on an annual basis.

It appears from the comments of ISRP that they do not fully understand that the Council's Wildlife Program is a habitat-based approach to mitigate losses associated with the construction of the hydropower system. This program is not a set of loosely associated projects without regional focus, as inferred by ISRP comments. It is, on the contrary, an integrated set of projects aimed at mitigating for these habitat losses using a formally adopted set of common guidelines for mitigation activities set out in the Guidelines for Enhancement, Operation and Maintenance Activities for Wildlife Mitigation Projects (June 98). To implement this habitat-based approach, the Wildlife Managers are attempting to develop core habitat areas that can support locally adapted populations within "in-kind" habitats near where the impacts occurred. In doing so, the managers plan to effectively mitigate the loss of habitat in the areas where the impacts occurred with the expectation that the target species and the guilds they represent will be preserved as an important resource within the Columbia Basin.

It is the opinion of the Wildlife Caucus that, although not spelled out in detail in each proposal, each project proponent is acquiring habitat consistent with the ISRP conclusion that "no land acquisition be funded without a clear description of the land to be acquired and without demonstration of its priority for the Fish and Wildlife Program". Because of the project proposal submission schedule and the actual implementation of each project, it is very unlikely that a parcel of land identified in October of 1998 will still be available for purchase in FY 2000. Essentially the Caucus is scoping projects for implementation at least 18 months in advance of possible funding. The way in which projects are actually incorporated is that areas and habitats are prioritized using criteria judged to meet the intent of the Program. We believe that this approach is the most effective one for meeting the needs of the Council's Program given the constraints of the funding process.

The goals and objectives of each project are to be identified and met once the HEP and management plans are completed. This step is usually an additional year beyond purchase. During the proposal submission stage, the project contractor is still in the initial implementation stage and usually does not have any appreciable results to report. We hope that the ISRP understands that for project specific results they need to focus at least two years prior to the submission year (FY 1998 results were the latest available at the time of FY 2000 submittals).

Non-native plant control

Issue: The ISRP said many habitat and wildlife projects include substantial resources for control of non-native plants. Reviewers were concerned with the long-term commitment of funds for this purpose, and with the lack of consideration of the unwanted effects of herbicides, fire, and engineering methods for non-native plant control. Thus the ISRP recommended that the Council solicit innovative proposals for development, testing, and evaluation of cost-effective passive methods for control of non-native species.

CBFWA Response: The Managers share the concerns expressed by the ISRP over non-native plant control and only use artificial methods when no other practical options are available to bring the land back into productive use by native wildlife. Newly acquired grazing lands are normally allowed to rest for at least two years to determine the natural response of the ecosystem before any weed control measures are implemented. If it is then apparent that the land will not become productive within a reasonable period of time without some form of weed control, only the least invasive and most cost-effective measures are used. Information on the latest weed control techniques is shared at annual conferences regularly attended by those managers involved in weed-control activities. This, in essence, insures that the managers are aware of the most current and innovative methods for weed control. State and federal law also require many of the weed control activities.

Artificial Production

Artificial Production Review

Issue: In its first two years, the ISRP voiced a number of objections to the artificial production programs in the Council’s Program. However, the Panel deferred making any specific recommendations on artificial production projects until after the completion of the Council’s comprehensive review of artificial production. The Panel did not defer this year. In fact, it significantly criticized and recommended against funds for a number of artificial production projects well before completion of the Artificial Production Review. Should funding for hatcheries be based on the ISRP FY 2000 project review or the existing APR and Council Three Step Process?

CBFWA Response: Starting in 1997 the Council required a comprehensive 3-step review process for artificial production projects. This process includes several checkpoints and an independent review of a master plan to ensure all issues are adequately addressed and the production actions proposed are scientifically sound. Since initiation of this process, several projects have gone through or are currently going through the review requirements. As a response to the ISRP recommendation to delay all artificial projects in 1998, the Council defended its existing review process as adequate to ensure that sound projects are implemented. Since that decision, hatchery project proponents have continued to invest time and money in the current Council production project review process. CBFWA also supports the 3-step process as adequate for project review and strongly recommends the Council continue in the same established direction. The fact that ISRP does not even acknowledge this process and recommends “do not fund” for hatchery projects that have yet to complete the Council review process truly shows an ISRP bias towards production projects. The proponents of the projects in this process feel that they have been misled by the Council's use of the three-step process. Projects that have proceeded through the three-step process should be funded.

Two of the comments in the review of the Nez Perce Tribal Hatchery (innovative approaches and keeping releases within limits of carrying capacity) CBFWA feels are essentially a criticism of the guidelines recommended by the Science Review Team in their hatchery review. Those are discussed in responses to specific project comments. The other comments can all be described as opposition to hatchery production. They do not appear to be science based criticism of the proposal, or even aimed at NPTH in particular, but at policies related to hatcheries and supplementation programs in general.

If the underlying philosophy of the ISRP comments is an aversion to hatchery produced fish, then it is impossible to provide a satisfactory justification for developing a supplementation program (or continuing to operate an existing hatchery program). This path is especially troublesome because it will essentially prohibit any application of new knowledge developed on supplementation. As we discussed above, the ISRP dismissed guidelines adopted by an independent group charged with addressing hatchery policy. Recommendations and guidelines presented through this and other avenues (e.g. Regional Assessment of Supplementation Programs, NATURES, the Columbia River Fish Management Plan) will be moot, because they all pertain to an incorporation of hatchery fish into the naturally spawning population.

While we share the ISRP's concern over possible detrimental impacts to wild fish from past hatchery management practices, we are even more concerned with the loss of the resource as a whole. We have ample evidence in areas such as the Middle Fork Salmon, Minam and Wenaha, that have not had hatchery intervention yet continue to have a declining population. In contrast, wise use of supplementation in areas such as the Imnaha, South Fork Salmon and natural production areas affected by releases in the South Fork Clearwater and the Lochsa may well be forestalling extinction. Eliminating the use of hatcheries and the ability to improve the technology for those programs, because of a philosophical aversion to them, constitutes policy decisions that must be decided by the region as a whole and goes beyond the limited role that the Gorton Amendment contemplates for the ISRP.

Supplementation projects

Issue: The Panel has been especially concerned about the supplementation projects in the Council's Program. In the Panel's view, supplementation remains an unproven and potentially harmful technology, which should be implemented as a series of careful, small-scale experiments clearly linked to on-going or completed habitat restoration initiatives. The ISRP considers many of the supplementation projects in the Council's Program to be of a scale and magnitude beyond what sound science allows.

CBFWA Response: Supplementation projects are one of the management tools chosen to restore fish populations in the Basin. The use of supplementation, however, is presently controversial and has been the cause of considerable concern among the managers. Supplementation by its very nature requires several generations in order to be tested. The only true measure of supplementation's success is to observe an increased self-sustaining population in the target area. The spread of salmonid populations into areas that were barren through geologic events in the distant past is known, but the timeframe for this to occur naturally is probably very long. Man is trying to shorten this process and along with mainstem fish passage and ocean problems the difficulty has increased many-fold. We should continue to test this “rebuilding or restoring” approach but along with as many fixes, habitat or passage, that can be performed. Monitoring and evaluation must be for a sufficient duration to detect success or failure at the functional rather than experimental level.

CBFWA managers do not support treating their proposals as small-scale experiments. Current smolt-to-adult survivals in the Columbia Basin frequently result in below replacement parent-to-progeny returns. With this situation being the main factor causing numerous extinctions and ESA listings, and with no immediate significant survival improvements on the immediate horizon, CBFWA managers believe that proper application of the supplementation tool will help counter the currently severe man induced fish mortality rates and resultant deficit returns. At a minimum, additional extinctions may be forestalled until smolt to adult survivals are improved. Instead of being a small experiment, supplementation of depressed natural production should be a major component in a comprehensive fish restoration approach in some subbasins. If and when returns are sufficient to support self-sustaining natural runs with productive Indian and non-Indian fisheries, we would support downsizing or eliminating supplementation components as a result of updated subbasin restoration planning.

In addition to supporting the proposed supplementation in some subbasins, CBFWA supports a diversified hatchery approach, which also includes a more conservative genetic conservation driven approach in some subbasins and also a no hatchery intervention approach in other selected subbasins. All three scenarios should be treated as restoration approaches (not small experiments) which include appropriate habitat enhancement actions and monitoring and evaluation to track strategy and restoration success. With no restoration approaches currently having foolproof certainty, it makes good sense to spread the risk and implement a diversified hatchery approach.

CBFWA managers do not believe their projects are unproven with potentially harmful technology and therefore should be treated as small-scale experimental pilot projects. In the case of the proposed Umatilla Hatchery supplement, additional spring chinook production is called for because: 1) this species has demonstrated the most success (natural production, broodstock collection and fisheries) during the program’s first decade of spring chinook production; and 2) the original spring chinook goal was not met by the Umatilla Hatchery and was reduced even more with observed water shortages. With a decade of successful “pilot” efforts and the fact that spring chinook are reintroduced in the Umatilla River, it does not seem justified to halt doing more of a good thing based on concerns that no pilot efforts were attempted or that supplementation technology is harmful and carries too great a risk.

For example, in the case of the proposed Walla Walla Hatchery, the proven success of the “pilot” Umatilla spring chinook reintroduction program is proposed to be expanded in the Walla Walla Basin where spring chinook are also extirpated and where there is even more pristine habitat utilized by salmon. A steelhead supplementation component is also proposed in the Walla Walla as part of a comprehensive approach to restore the currently listed population in Oregon, which has fallen to 200-300 fish annually. The program will mimic the successful Umatilla (pilot) program but will be smaller (100K smolts) and more conservative (supplementation proposed only in Oregon and only in one of three steelhead production tributaries). Again it doesn't appear that ISRP "unproven" and "high risk" concerns are valid in these type cases, particularly when one acknowledges the existing Council 3-step review process requirements which are designed to ensure best science and low risk.

A supplementation evaluation project currently exists and provides feedback to the managers on the utility of supplementation. The Idaho Supplementation Studies, a cooperative project with the Nez Perce Tribe, Shoshone-Bannock Tribes, Idaho Fish and Game, and the US Fish and Wildlife Service, actively supplements some populations with the focus on the evaluation of supplementation. The purpose of this project is to perform exactly the analysis that the ISRP is requesting; the project gathers information to guide regional fish managers in making decisions regarding supplementation.

Captive broodstock

Issue: Since 1997 the ISRP and the Council have been concerned about the proliferation of captive broodstock proposals in the Program. As the Panel noted this year, these projects hold promise for maintaining populations and genetic diversity *while* other survival constraints are relaxed or removed. However, the technology has many risks and uncertainties and is extremely costly. As with the supplementation projects, the ISRP recommended that all captive brood projects in the basin undergo a coordinated programmatic level review by an independent scientific review panel. This panel should address uncertainties and differences among captive brood projects with respect to monitoring and evaluation protocols, project-specific as well as program goals, and the effectiveness of captive brood technology as a rebuilding tool. The ISRP also recommended that the Council terminate captive brood projects that do not provide convincing evidence that the problems causing depletion have been identified and that reasonable plans and effort are being applied to their resolution.

CBFWA Response: There is substantial scientific literature describing causes of decline in stocks. Captive programs are implemented because no substantive improvements in smolt-to-adult return rates have occurred since completion of the federal hydrosystem. If significant improvements had been made, captive programs would not be needed. Current captive programs are the only means available to maintain genetic resources into the future before stocks are extirpated. Also, current captive propagation activities in Idaho are experimental, not fully implemented captive programs.

Captive programs are not necessarily a rebuilding tool. Rather, captive propagation is a tool for conserving stocks and/or genetic diversity. Captive propagation may promote rebuilding when smolt to adult return rates improve.

Captive brood projects possess risks and uncertainties, but for the populations chosen, captive brood is probably the only means of preserving the basic genetic material for these populations. Captive brood projects are one of the management tools chosen to restore fish populations in the Basin.

Native and non-native stocks

Issue: The introduction of non-native fish, especially in the resident fish mitigation programs, is one of the ISRP's consistent concerns. The interpretation by the Panel and Council is that the Program has an emphasis and priority on rebuilding native stocks in native habitats. Thus the ISRP recommended that resident fish mitigation actions focus on native resident fish stocks, rather than substituting non-native stocks, wherever practicable. According to the ISRP, priority as indicated by the Program, should be given to projects that use or explore use of native stocks. The project-specific recommendations of the Panel reflect this programmatic recommendation.

CBFWA Response: The existing Council's Resident Fish Substitution Policy constitutes a consensus policy that has been developed through fish agency and Tribal cooperation/consultation and has been subject to extensive public review since 1980. The existing policy recognizes that blocked areas have habitats that have been irrevocably altered from their native species making "full in-kind mitigation" using native species impossible. Current substitution policy includes provisions for native species preservation/enhancement while utilizing non-native species/stock management in non-native habitats. The managers strive to minimize or avoid impacts to native fishes in carrying out this policy.

The Power Council has recognized the dilemma that faced the fish and wildlife managers in the "blocked area" and identified resident fish substitution (including utilization of non-native species) as a viable means of mitigating for lost anadromous fish resources (1995 Fish and Wildlife Program, section 10.1A, 10.1B, 10.8, 10.8A and section 16, page 73). Substitution projects were categorized as one of the two highest priorities in the Council's Resident Fish Program, slightly behind recovery of native populations injured by the hydropower system. The Council further delineates that the distinction between these two highest priorities was a narrow one, applicable only to marginal choices among such projects (1995 fish and wildlife Program, section 10.1B). The Council continued to elaborate in the 1995 Fish and Wildlife Program Findings regarding their position involving the two highest priorities in the Council's Resident Fish Program with the following. "The Council does not expect that the slightly hierarchical statement of highest priorities will lead to the funding of native fish rebuilding measures and not resident fish substitution measures, at least as related to the blockages above federally operated hydropower projects." (1995 Council Fish and Wildlife Program, Section 16, page 72). "The Council's clear intent is that resident fish substitution activities also be funded. If the Council's priority language is the funding of rebuilding efforts for weak but recoverable native fish populations and not of substitution measures (or vice versa), the Council will take action to address this situation." (1995 Council Fish and Wildlife Program, Section 16, page 72).

While the Council language in the 1995 Program clearly articulates the intent to fund substitution measures, including those utilizing non-native species, the Council also addressed the potential conflict with native species rebuilding efforts. The Council stresses that serious evaluation of resident fish substitution efforts using introduced fish to ensure activities do not undermine native population conservation. However they also stated that "resident fish substitution proposals using introduced fish have not and should not be terminated or de-ranked in prioritization on this basis alone, without further information demonstrating the conflicts." (Section 16, page 73).

The Managers main goal is to have native fish stocks used in all appropriate bodies of water. There are and can be sustainable populations of harvestable resident fish in the Columbia River Basin. However, there are also long established populations of non-native stocks that can provide harvest opportunities. These stocks reside in what could be determined “non-native” environments. Until the ecosystem is restored to natural conditions, it does not make sense to put native fish species into habitats where they cannot be productive.

The use of native species is highly desirable where the environment is suitable for their survival. In many cases environmental degradation has been so severe that the survival of native species will be at a minimal level at best. The use of non-native stocks is considered in conjunction with the habitat and ultimate use of the stocked animals; this apparently was not the case with the ISRP reviewers. The inability of native fish stocks to survive in an altered environment is the primary reason these projects have selected non-native species. For most of the projects criticized by the ISRP for using non-native species, the environment is not in its “native” condition and would not support native species.

Some parts of the Columbia River Basin contain naturalized stocks of nonnative fish species that in many cases are too well established to restore to a native species assemblage. In these areas, native species are encouraged and attempts are made to reduce negative interactions with nonnative species. Offsite, closed basin lakes can be restored as genetic reserves, or where natural reproduction is not possible, tribal and popular sports fisheries can be established. In the latter, harvest regulations, including liberal limits on non-native rainbow trout, have been used to support fishing opportunities to replace lost native fish production and to direct angler harvest away from native fish in critical recovery areas and reduce demands on our limited source of naturally reproduced native species.

Unfortunately, nonnative species will likely continue to be a component of mitigation due to the inability of native species to provide high-yield consumptive fisheries for anglers in the blocked areas. Native species in much of the Columbia River drainage are regulated by a mandatory catch and release regulation due to their reduced numbers. For example, bull trout fishing has been banned throughout Montana except in Swan Lake, where the limit has been set at one fish per day. The consumptive fishery argument can be made for off-site mitigation as well, because the critical habitat needed for native species has been degraded. Furthermore, habitat types required by native species can not support high use/ high yield fish populations that anglers are demanding.

The rationale for the ISRP comments regarding this issue appears to be the reviewers’ perception that these projects are in conflict with regional goals, have not addressed and monitored potential impacts to native biota and do not utilize local stocks of redband and cutthroat trout. In response to comments regarding conflict with regional goals, the resident fish managers believe that the Council's Fish and Wildlife Program is more than a native species recovery/enhancement program. The Northwest Power Act authorizes the Council to develop a program to protect, mitigate and enhance fish and wildlife populations affected by hydropower development. Many of the projects criticized by the ISRP provide fish stocking activities that support and enhance tribal subsistence and non-tribal recreational sport fisheries. These activities partially mitigate for the lost anadromous fish resources related to the construction of the federal hydropower system, including the complete extirpation of anadromous fish above Chief Joseph and Grand Coulee dams.

Although enhancement of weak but recoverable native stocks receives top priority in the Fish and Wildlife Program, substitution measures closely follow. This priority/policy is appropriate considering the magnitude of the anadromous fish losses in the blocked areas, the lack of native habitat/species assemblages available to mitigate for anadromous fish losses, the potential negative impacts to some blocked areas due to current anadromous fish enhancement measures (particularly flow augmentation), and no positive benefits realized to resident fish species in some blocked areas a result of anadromous fish measures. Any change in substitution policy that substantially limits production of non-native habitats will fall considerably short of any meaningful mitigation for anadromous fish losses in blocked areas (UCUT Technical Report Number 2, Appendix G, 1987 NWPPC Fish and Wildlife Program).

The Council has adopted resident fish substitution as a part of its program, and ranked it as the second highest priority. Grand Coulee/Chief Joseph, Dworshak, and Hells Canyon dams permanently and irrevocably blocked anadromous fish passage. In addition, these hydroprojects permanently and irrevocably altered the riverine habitat by creating slack water reservoirs with varying water retention times. These reservoirs are neither rivers nor lakes and constitute non-native habitat. The fish managers have a statutory responsibility to manage the fisheries in these areas and BPA has an obligation to mitigate for the loss of anadromous fish. Given that providing anadromous fish passage is very unlikely and that native fish are unable to survive in non-native habitat, the managers are left with only one alternative – manage non-native fish in non-native habitat.

Mainstem Issues

Smolt monitoring: programmatic review

Issue: The ISRP repeated its FY 1999 recommendation that all of the projects monitoring, evaluating, storing, using, etc. information on smolts be combined and subjected to a comprehensive programmatic review that gives special consideration to the complex interactions between the projects. The present umbrella proposals did not adequately connect the various smolt-monitoring projects.

CBFWA Response: It appears that some of the comments were precipitated by the format for the proposals, which did not allow adequate description of background and history. A programmatic review is suggested but the purpose of the Smolt Monitoring Program (SMP) does not appear to be clearly understood, leaving the purpose of a programmatic review unclear. In addition, the ISRP did not recognize or identify any problems or deficiencies in recent programmatic reviews of the SMP. In any case, since the SMP is reviewed annually, the difference between the annual review and the programmatic review is unclear.

The SMP has received programmatic review by the NWPPC Scientific Advisory Board. The SMP is designed to meet specific management needs identified in the NWPPC Program and the NMFS Biological Opinion. Although the SMP has been and will continue to be reviewed, it should be reviewed in the context of meeting the fish passage management needs of the region including the BIOP and the NWPPC Program as well as other management entity needs such as the state water quality agencies.

The "Comparative Survival Rate Study of Hatchery PIT Tagged Chinook" (CSS) study design, including all aspects of the design were reviewed and approved by the ISAB in 1997 and 1998. Extensive review and revision of the study design occurred. The Study was designed and discussed for an extended time frame with the ISAB. Although additional review is always possible, it should be considered in context of the comprehensive review by the ISAB in 1997 and 1998.

Data management

Issue: Concerned about duplication of effort, the ISRP specifically recommended an independent review of the data management efforts that are supported by the direct program before funds are continued beyond FY2000. This applies to PITAGIS, UW Data Center, Fish Passage Center and Streamnet.

CBFWA Response: The Managers do not feel that there is significant duplication of effort but will work to eliminate any duplication. The Managers will work with Council staff to determine an appropriate review procedure. The UW Data Center is a BPA non-discretionary project that is not used by the managers in their decision making process and in some cases provides redundant information to the other data management projects.

The CBFWA has identified a basic list of information needs in its 1998 work plan. We will work with Council staff, PATH participants, and the Multi-Species Framework to review, refine, and add to this list.

The Fish Passage Advisory Committee, composed of the anadromous and resident fish managers of the basin's fisheries agencies and tribes, holds a weekly conference call and a monthly meeting during the fish migration season. Management demand for data can be assessed at these weekly meetings. If management demand for data changes during fish migration season, it can be assessed at these weekly meetings, and data published or collected by the Fish Passage Data System (FPDS) can be changed as rapidly as possible to meet management demand. The salmon managers of the fisheries agencies and tribes in the basin therefore frequently assess the demand for data collected and published by the FPDS. Data needs that are critical to actual management questions are identified and met, as quickly as possible, in this existing forum.

The FPDS is the only data system in the basin that has been audited by independent accountants. The firm of Symonds, Evans, and Larson, P.C., Certified Public Accountants, performed the audit in late 1997. An example of the methodology used and the findings stated in the audit follows.

"On a judgmental basis, we selected 15 transactions during the year ended December 31, 1996 and 10 transactions during the seven month period ended July 31, 1997 to verify that errors in data that were detected by FPC were appropriately corrected." In their final submitted report, the auditors stated: "For the judgmentally selected transactions… we verified that all such errors in data that were detected by FPC were appropriately corrected."

The region, in addressing the issue of regional databases, recognized that the highest data accuracy is accomplished when data is maintained close to its origin and by those who are responsible for it's acquisition and use. No data is scientifically useful unless all the qualifications, annotations, and limitations of that data are published along with the data itself. All of the raw and historical data on fish passage and management is maintained at FPC and is available to all entities. The FPC is responsible for the actual acquisition of the data, the design of the data acquisition methodology, and uses the data in analyses. The consolidation of these three data functions in one entity make the FPC the most knowledgeable about the data it collects, publishes, and uses. This is of benefit to the region and all users.

The present state of technology and the advent of the World Wide Web as a cost effective means to publish and distribute data worldwide raises questions about the need for central data repositories. Since these data are more accurate, more useable and better understood near its origin and where the staff clearly understands it, the use of hyperlinks on the World Wide Web enables individual databases to remain near their origin and at the same time be available through a single portal or portals on the web. This type of data collecting and publishing framework results in higher quality data for users, and at lower cost. The hyperlinks that presently exist between the FPC, StreamNet, and PITAGIS enable each one of these web sites to be a single portal through which these other data are available. The issue of duplication between StreamNet, FPC and PITAGIS has been addressed in the past. Each of these projects serve a different purpose. Neither data nor effort is duplicated yet the information contained in each database is easily available through hyperlinks. The present system of hyperlinks is designed to avoid duplication, assure data accuracy by keeping databases near their origins, and to assure worldwide availability.

The FPDS Smolt Monitoring Project data collection and publishing system is designed for constant change in order to meet changing management needs during fish migration season. Inherently, large central data repositories are very difficult and expensive to change and modify. Each potential modification to the repository must be analyzed to determine its impact across a wide range of applications before any modification is actually done. As the size of the central repository grows, this task becomes increasingly complex, time consuming, and expensive. Small databases or "data marts" designed to meet specific needs and solve specific problems are much simpler and more cost effective to change and modify. Consequently, a single portal or data warehouse that is made up of linked smaller "data marts" or databases is more cost effective to maintain than a large central data repository which involves a large complex global data structure or model. Additionally, a data warehouse made up of smaller individual data marts can also respond to changing management needs much faster than a large central data repository. The present system of hyperlinks between the web sites of PITAGIS, Streamnet, and FPC has been developed and modified to meet regional needs in an efficient cost-effective manner.

PATH (Plan to Analyze and Test Hypotheses)

Issue: The ISRP concluded that PATH should be congratulated for a job well done and recommends that it be honorably retired. They feel that a simpler process could be created to meet the continuing need for evaluation of the limited data now available to address management questions relative to the hydrosystem Biological Opinion.

CBFWA Response: In our opinion, PATH has not completed its mission and will provide information needed for regional management decisions concerning salmon populations of the Columbia basin. The 25 PATH scientists cooperatively produced a high quality decision analysis that helps the region navigate through very complex questions. We agree with the ISRP recommendation to focus on the data required to resolve remaining uncertainties – in fact PATH proposed to do just that in the FY2000 work plans, through the design of research, monitoring and adaptive management experiments to resolve remaining uncertainties.

We believe the ISRP's main criticisms of the FY 2000 PATH proposals are due to misunderstanding of the objectives and process. The process the ISRP recommends to replace PATH is nearly identical to that in the FY 2000 proposals. PATH has three objectives in our FY2000 proposal page:

1. Determine the overall level of support for key alternative hypotheses, and propose other hypotheses and/or model improvements that are more consistent with existing data.
2. Advise regulatory agencies on management actions to restore endangered salmon stocks to self-sustaining levels of abundance.
3. Assess the ability to distinguish among competing hypotheses from future information, and advise agencies on research, monitoring and adaptive management experiments that would maximize learning.

The "key alternative hypotheses" examined by PATH under objectives 1 and 2 included more than just the competing passage models. PATH examined alternative hypotheses regarding climate influences, upstream-downstream stock differences in recruitment, the influence of hatcheries, habitat effects, harvest, estuarine bird predation, etc. (see PATH Weight of evidence report on Snake River spring and summer chinook; PATH final report for Fiscal Year 1998; and FY 1999 STUFA and ESSA proposals). Each of the key hypotheses was considered within a risk averse decision analysis framework that allowed comparison of the response of salmon populations to six different hydrosystem management scenarios.

The FY 2000 PATH proposals have the general support of the Implementation Team (IT). The IT is a group of state, tribal, and federal managers who advise the federal hydropower operators on issues related to implementing the federal hydropower system biological opinion. The proposals are consistent with the more specific priorities established this spring by the IT.

The ISRP statements indicate that the reviewers did not understand the primary function of the PATH process. The main purpose of PATH was not to "reconcile or decide between competing models". The 1995 NMFS Biological Opinion on operation of the federal Columbia River Power System (pg. 124, Rec.17) stated that "The BPA shall participate with NMFS in activities to coordinate the regional passage and life cycle models to test the hypotheses underlying those models." NMFS noted that the emphasis should shift to analyses that test the different assumptions underlying the models, rather than refining our understanding of how the models are different -- the genesis of PATH (objective 1). Rather than accept or reject key alternative hypotheses (passage models referenced by the ISRP represent one of the many hypotheses) PATH adopted a decision analysis approach. A decision analysis incorporates these uncertainties and the effect of management actions on salmon recovery is represented as a range of results. The range of results can be narrowed based on the level of support for each of the alternative hypotheses (objective 2). PATH completed a detailed sensitivity analysis to narrow down which hypotheses had the greatest effect on decisions, and a Weight of Evidence process for spring/summer chinook to examine the relative credibility of alternative hypotheses, given the data. The PATH decision analysis did not only give "*equal weight to the competing models and competing hypotheses*", it also explored the sensitivity of the decision to unequal weights, particularly those assigned by the Scientific Review Panel (SRP). The decision analysis showed that the ranking of actions was not sensitive to alternative hypotheses, a key finding. The primary focus of PATH was to provide the region with decision analysis tools. These tools were to be applied to populations outside of the Snake River in FY 2000 (under objectives 1 and 2 page 18 of 9600800). In addition, the majority of tasks in FY 2000 are directed at the design of research, monitoring and adaptive management experiments to resolve remaining uncertainties for Snake salmon populations (under objective 3 pages 18-20 of 9600800). It is therefore difficult to understand how the ISRP concluded that PATH was primarily concerned with deciding between competing models.

The purpose of adopting a biological decision analysis approach is to determine which management action is most likely (over the range of uncertainties) to ensure persistence and recovery of listed salmon populations. In other words, which are the most robust (least risky) management actions relative to salmon recovery. The ISRP suggest that PATH's main conclusion was "*that available data are insufficient and inadequate to resolve critical management questions about the effects of various hydrosystem operation alternatives on survival rates of listed Snake River stocks*". This was not a conclusion of PATH. However, one of the goals of PATH was to identify the most robust management alternatives for salmon recovery. These alternatives were identified for Snake River chinook in the PATH Final Report for Fiscal Year 1998.

PATH agrees with the ISRP that there is a need *"to examine the relevant ongoing data collection activities and re-design them so that they can, in the foreseeable future, deliver the types, quantity and quality of data that are required for decision making"*. In fact, evaluations and recommendations of experimental management approaches are the third objective described in the PATH FY 2000 proposal (under objective 3 pages 18-20 of 9600800). The ISRP review appears to have completely ignored PATH's work on its third objective. This is puzzling, as research, monitoring and experimental management were prominent features of the PATH FY2000 proposals. Also, the PATH SRP has repeatedly stressed the importance of designing management experiments and associated monitoring to resolve key uncertainties. In 1997 and 1998 we focused mainly on objectives 1 and 2 in support of the 1999 FCRPS decision, we began to plan work on experimental management in 1998 (Chapter 6 of the FY98 report), and described this work in the FY2000 proposals. Experimental management was endorsed as a major priority by the IT in the spring of 1999, and we have lately been making good progress at describing candidate experimental management actions, for review by the IT and other regional groups. Quantitative evaluation of such actions was proposed for late in FY99 and throughout FY2000, once the candidate actions have been narrowed down, and with full consideration of the 1999 decision.

A major objective for PATH in FY 2000, assigned by the IT, is to apply the biological decision analyses techniques to Upper and Lower Columbia River salmon and steelhead populations. Many of these newly listed populations will need to be evaluated relative to proposed alternative management actions. This will be accomplished through objectives 1 and 2 of the FY 2000 proposal (under objectives 1 and 2 page 18 of 9600800). We agree with the ISRP, that by the end of FY99 the work will have been finished on objectives 1 and 2 for Snake River chinook and modeling efforts for these populations should be wound down. However, we will be in the midst of these objectives for Upper Columbia populations and beginning work on Lower Columbia River populations in FY2000. Given this and the need for further development of objective 3 (experimental management) for Snake River populations, it seems premature for PATH to "be honorably retired".

In retrospect, many of the PATH analyses and their use of data seem intuitive, but a majority of the approaches were not seriously considered before the development of the PATH framework and SRP reviews of the approach. PATH provides a standard framework to discuss and evaluate key uncertainties for evaluating alternative management options. Key analytical advances include the development of a single Bayesian life cycle model (to replace three competing models), the use of spawner-recruit information and passage survival estimates to quantitatively define delayed mortality (and how it has varied over time), the use of transport:control studies and in-river survivals to estimate differential survival ('D' values), many approaches to incorporating climate/ocean effects, and the rigorous application of decision analysis (including the Weight of Evidence process). All these advances have provided the region with a currency and language to intelligently discuss key uncertainties concerning Snake River salmon recovery. Subsequent analyses (such as the A-Fish appendix) and research recommendations (A-Fish and Corps SCT process) are built upon the technical foundation laid out by the PATH process.

Currently, PATH is developing a rigorous method for assessing what future data can potentially contribute to resolving key uncertainties, and the possible tradeoffs between learning and conservation objectives (see Chapter 6 of FY98 report). This work builds on the results we have achieved to date, using simpler quantitative tools that capture the essential behavior of more complicated models. There seems to be a consensus in the region on the importance of PATH's third objective. PATH scientists are exploring what can be learned to resolve key uncertainties about extra mortality; and the tradeoffs involved in making a decision now versus estimating 'D' over the next five years, as highlighted by NMFS in the AFISH Appendix.

The PATH process identified the need for a simpler and more comprehensive approach to salmon recovery assessments (identified in the FY 2000 proposals), and is poised to accomplish this task. However, the number of ESA listed populations (over a wider geographic area) needing assessment is growing and it can be anticipated that so will the technical and coordination efforts. In light of what decisions lie ahead for the NWPPC and the region as a whole, PATH provides the analytical support necessary to ensure those decisions are based on the best science available. Without continued financial support for most or all of the PATH scientists, the region will lose their collective talents and experience. While there is vitality created when new people enter a problem, there is also a tremendous cost in money and time when a whole new cohort of scientists has to climb the Columbia River's steep learning curve. PATH is a facilitated, decision analysis process that incorporates internal and external review, and whose members are comprised of scientists from several management agencies experienced in Columbia River Basin salmon recovery efforts. The NWPPC needs to ensure that the processes providing analytical support to regional decisions are sufficient to meet the region's needs, without wasteful duplication of effort.

We believe that the NWPPC will find the ISRP conclusion, to not fund further PATH activities, to be inconsistent with the need to expand collaborative biological decision analysis to populations outside of the Snake River. Also, anadromous fish managers have requested that PATH assess management actions in addition to those for the Federal Columbia River Power System. Many of the regional fish management entities are relying on results from FY 2000 PATH activities. Continued PATH funding is essential given the strong need for the objectives identified in this proposal by the fish and wildlife management agencies.

Mainstem habitat

Issue: The ISRP continues to recommend that the Council place more emphasis on protection and enhancement of habitat of naturally reproducing salmon populations in the mainstem Columbia River.

CBFWA Response: The ISRP recommends two Tier 3 projects for funding (Project Numbers 20103 and 20057) in this category. Neither of these projects has been coordinated with Managers and would not contribute to a management action to benefit fish and wildlife. Within the group of six projects in this category, the Managers did recommend a Tier 2 for one project, however, due to funding limitations, this project was not deemed a high priority in the Basin at this time.

Conservation Enforcement

Issue: In 1997 the Council recommended ending Bonneville funding support for law enforcement, as then structured. Since then, CBFWA and the Council have had several discussions in an effort to reach agreement on criteria by which enforcement proposals could be judged to protect program investments. CBFWA members continued discussions until just recently and were not able to reach consensus on criteria and the priority for conservation enforcement funding. The Columbia River Inter-Tribal Fish Commission and the Nez Perce Tribe submitted conservation enforcement proposals for FY 2000. However, no funds were recommended by the SRTs or caucuses.

CBFWA Response: Support for these projects is evident, however, until the ongoing discussion is concluded the managers do not want to delay funding other critical projects without assurance that any funds assigned to the enforcement projects will be spent on enforcement.

Lower Columbia Tributary Projects -- Power Act Responsibility

Issue: The ISRP recommended funding for at least three projects that appear to concern habitat improvements in lower Columbia tributaries (Restore Unobstructed Fish Passage to Duncan Creek, No. 20013; Reconnect the Westport Slough to the Clatskanie River, No. 20107; and Cedar Creek Natural Production and Watershed Monitoring Project, 20109). The issue is Power Act/Bonneville responsibility for these lower Columbia projects. If the Council decides these are not appropriate for Bonneville funds, future project solicitations should be clear on the policy.

CBFWA Response: In its effort to fully mitigate for Columbia River hydropower losses associated with development and operation of the Federal facilities, BPA has funded “offsite mitigation.” This policy is consistent with the Power Act that allows for offsite mitigation and recognizes that it is highly unlikely that full mitigation can be achieved only in the mainstem of the Columbia. Accordingly there are numerous examples where the Fish and Wildlife Program has called for, and BPA has funded, projects aimed at repairing habitat degraded by causes other than can be directly related to hydropower. Examples include measures aimed at restoring habitat in tributaries, opening up new habitat above natural blockages, providing additional instream flows to ameliorate the impacts of irrigation diversion, screening irrigation diversions, the Young’s Bay artificial production project, etc. The examples are numerous.

While the projects in question are located below Bonneville Dam, they should be considered appropriate under the Act and eligible for BPA funds as long as they can be reasonably related to development and operation of the hydropower system. Development of Federal storage reservoirs altered the Columbia River hydrograph – storing part of the spring freshet for later releases for power production. Although there is not yet substantial information on the effects this significant change has had on the estuary and Columbia River plume, and therefore on juvenile salmon and steelhead survival, most scientists agree it has had an impact. That impact is likely an adverse one. Clearly more information is needed and some projects aimed at studying both the estuary and near-ocean plume have been initiated under the Fish and Wildlife Program. The estuary and near-ocean environment is known to be an important element in the survival of juvenile salmonids – likely effecting the survival of those stocks that originate below Bonneville dam.

In view of the fact that the change in hydrograph has likely adversely effected Lower Columbia River salmonids, and given the authority in the Act to provide for offsite mitigation (even if these stocks were not directly effected by the hydrosystem), we believe lower river projects are appropriate under the Act and appropriate for consideration by BPA for funding. We urge the Council to formally acknowledge these relationships and to endorse the consideration of lower Columbia River projects under the Act.

In addition, we respectfully ask the Council to view these projects in context of the entire Basin and respect the funding priorities applied to individual projects by CBFWA.

Experimental Methods/Implementation

Issue: The ISRP believes that many on-going management activities under the Program should be better understood as experimental and uncertain in effect, especially the supplementation and captive broodstock production programs. And on that basis, the Panel recommended that these experimental methods be identified and then implemented or tested first as pilot-scale projects designed to ascertain and evaluate feasibility, cost-effectiveness, and potential harm. This could mean significantly scaling back some of these projects and programs.

CBFWA Response: The managers believe that captive broodstock and supplementation strategies need to be tested at the scale of production trial levels with clearly articulated RM&E studies, but not to continue to be studied (refer to the Artificial Production sections in this document).

CBFWA believes the ISRP and Council should be reminded of adaptive management principles. In order to evaluate the effects of a management strategy, that strategy should be implemented on a scale that will cause a perturbation in the system of sufficient scale to produce a measurable and significant effect. Otherwise the management strategy cannot fully be evaluated. There is a basic disagreement as to the level of effort or trials required testing hypotheses. The Council has long criticized the Managers for doing too much research and not getting enough on the ground, yet in this case, the ISRP is calling for reduced on the ground efforts to provide specific research projects. There is no reason to stop useful projects when the research can be performed concurrently with existing projects through a strong RM&E program.

M&E Components of Projects

Issue: The Panel recommended that projects not be funded when their proposals fail to adequately include monitoring of results to measure success and evaluation to rate the success or lack thereof against the stated objectives. These elements may be included in a single proposal or identified in other proposals that may be devoted to monitoring and evaluation.

CBFWA Response: The Fish and Wildlife Managers do not agree with ISRP recommendations against funding projects because monitoring components are incompletely described. It is obvious in many instances that the problem was one of how a proposal was written rather than that it had a significant design flaw which made it technically unsound (e.g. the Umatilla River pumping project). Monitoring is an issue analogous to watershed assessments, in that everyone believes it should be done, but the methods are unclear. For these reasons the Fish and Wildlife Managers urge the Council to adopt an approach similar to their policy on watershed assessments. That is, allow a period of 2-3 years to develop a coordinated basin-wide monitoring program, before projects are judged against strict monitoring design requirements.

The Fish and Wildlife Managers note that they have been working with Council staff and others in a collaborative process to develop a coordinated research, monitoring, and evaluation program. Much progress has been made on developing a general framework for such a program within the multi-species framework approach. At this point there is broad agreement on the outlines of this plan, but it lacks the specific details necessary to connect individual project monitoring into a regional strategy.

We hope to have the first draft of a more detailed plan for regional review by February 2000. The CBFWA members plan to work with others to develop a generalized regional research, monitoring, and evaluation template by this fall. The template will be reviewed by Subregional Teams to inventory existing efforts and to identify additional subbasin/subregional research, monitoring, and evaluation needs. Subregional comments and inventory information will then be used to develop a more detailed draft basin-wide plan. The draft basin plan will provide a basis for another round of collaborative regional discussion of the issues. ISAB review of the R/M/E Plan would be appropriate after this round of regional review.

Research, monitoring, and evaluation needs have proven difficult to describe and address in the past. We expect that a final regional plan could take several iterations of review and modification to develop. Nevertheless, we anticipate that the plan can clearly identify R/M/E needs at a) the project level which should be incorporated into most projects, b) the subbasin level which may be appropriate for inclusion in umbrella proposals, and c) at the subregional and regional level which may be appropriate for umbrella proposals and/or directly funded R/M/E projects. The Fish and Wildlife Managers anticipate we will also be able to describe at least the major connections (in terms of information flow) between these different scales of the R/M/E plan.

It should be recognized that there are several tasks that must be accomplished prior to the development of an M&E plan. For example, in the case of wildlife habitat purchases, some proposed properties of interest have not yet been acquired. Landowner negotiations are occurring and whether or not the lands will be purchased is often unknown. Once lands are secured, existing habitat conditions will be assessed and a restoration plan will be developed and implemented. M&E plans cannot be developed until the restoration plan is known. Thus, for some wildlife projects it is premature to know exactly what will be monitored. Despite these unknowns, the Wildlife Caucus is currently in the process of developing a coordinated M&E program with standardized M&E protocols. This program, (see *Current Status of Monitoring and Evaluation in the Wildlife Program – Report to the ISRP, July 1999, CBFWA Wildlife Caucus*) will be applied to wildlife projects.

Publication of Results

Issue: The ISRP is concerned about the lack of publication of results from the projects in the Fish and Wildlife Program. In the ISRP's view, encouraging publication in peer reviewed journals promotes scientific quality and scientific progress and promotes adaptive management. Several research projects funded through the Program have had good, even outstanding publication records in peer reviewed journals (such as the predator reduction program). However, plans for peer-reviewed publication of project results are missing from most proposals. Thus the ISRP recommended efforts to encourage publication of results, especially the initiation of a Columbia River Basin Journal.

CBFWA Response: We concur with the ISRP in their view that more emphasis should be placed on publication of study results. The best method to evaluate results is to implement a comprehensive monitoring and evaluation plan. CBFWA's proposal to develop such a plan in FY 2000 was not recommended for funding by the Council. We are hopeful that the Council will fund our proposal to develop an M & E plan during FY 2001. Publication of results has not been a requirement of funding in the past and should be clarified if necessary for future funding. Not all projects produce publishable results.

We believe that the initiation of a new journal for publishing Columbia River research results is unnecessary and would divert already insufficient funds from the fish and wildlife program. There are several existing journals that can serve this purpose. Currently results are published in the Canadian Journal of Fisheries and Aquatic Sciences, North American Journal of Fisheries Management, NW Science and numerous other peer-reviewed scientific publications that serve to disperse the information to other researchers and managers.

Multi-year Review Approval

Issue: Last year, the Council, the ISRP and CBFWA all agreed on the need to shift to a multi-year review procedure in which on-going projects that are deemed to be of high quality and high priority would not require annual review. The Panel recommended that projects with multi-year approval have proposal reviews, site visits, and effectiveness evaluations at intervals of three to five years. More important, the ISRP also identified approximately 50 projects that it deems adequate for a multi-year review cycle, which means it does not intend to review these projects in FY2001 unless the project is significantly modified.

CBFWA Response: Although the Managers agree that qualifying projects should be placed on a multi-year review path as quickly as possible, a coordinated effort that is fair for all projects has not been enacted. We have established preliminary criteria for such a review and forwarded them to Council without response. We would like to receive a copy of the criteria that ISRP used to determine their list of 50 projects for multi-year review and are curious if those criteria were evenly applied to all projects. In absence of a response from Council, CBFWA is making an aggressive effort to pursue multi-year review approval for the FY 2001 CBFWA portion of the funding process.

Innovative Proposals

Issue: Last year, the ISRP recommended that the Council explicitly encourage “innovative” projects by earmarking a small percentage of the program budget each year as seed money. In response, the Council recommended that in FY2000, CBFWA and Bonneville reserve a small amount of the direct program budget, not more than $2 million, as seed money for “scoping grants” to investigate promising new ideas, under certain specified terms. In the draft workplan for this year, CBFWA did not recommend reserving a budget amount to be assigned to new innovative projects; instead CBFWA identified a number of on going and a couple of new projects as innovative. The ISRP did not approve of the way CBFWA handled this matter. Instead, the Panel identified 16 new project proposals as “innovative,” meaning that in the Panel’s view they “offer promising new concepts, address unexplored areas, and would likely benefit fish and wildlife.” The Panel then recommended funding for 13 of the 16 proposals. (CBFWA recommended funding for two.)

CBFWA Response: The CBFWA managers have and will continue to support funding for innovative projects that advance the state of the art in technology for addressing the fish and wildlife needs of the basin. Because the term innovative can be ambiguous, the managers have identified specific projects they consider innovative within the project recommendations for each subbasin.

CBFWA disagrees with reserving a certain amount of funding for new and innovative projects. While “new and innovative” proposals are welcomed within the process, CBFWA believes they must go through the same priority-setting process as all other projects and be rated sufficiently high within the entire program to warrant funding. This is particularly true given current budget constraints. Reserving funding for innovative projects would mean that the projects only need compete against other “innovative” projects and not with the program as a whole. Such a process would inject a number of new projects into the Fish and Wildlife Program each year that would be likely to require additional funds in future years. This process would effectively reduce the funds available for higher priority management needs in the basin.

CBFWA believes that it already has a number of innovative projects underway – as identified in the Draft Annual Implementation Work Plan. In addition, we have recommended implementation of two new innovative projects for FY2000. The role of the ISRP as set out in the amendment to the Power Act is to provide the Council with input and recommendations regarding the technical sufficiency of projects and proposals submitted for funding by BPA under the Act. The ISRP is well suited to do that. However, the assembly of a suite of recommendations that constitute a coordinated Fish and Wildlife Program consistent with the plans and programs of the agencies and tribes is still the responsibility of those management entities. Adoption of the projects recommended by the ISRP and rejected by CBFWA would constitute a usurpation of a Program responsibility by the ISRP and Council that is clearly reserved for the co-managers.

In one example, the ISRP recommended "Fund in part" for a project in FY 2000, with the following comments: "Do not fund the portion to cryopreserve female genetic material, as this part of the proposal is too uncertain and experimental. While the objective appears worthwhile, other funding sources such as USDA or NSF may be more appropriate to support basic research and technology development" (Project 9703800, Preserve Listed Salmonid Stocks Gametes). The results from this research are being directly tied into hatchery operations and are identified as necessary by the co-managers in this subbasin. However, the ISRP insists that other projects which represent more base "research and technology development", that are clearly not tied into any management action or decision, be funded strictly because they are new. This represents an inconsistency in how projects have been evaluated in terms of "innovative" and suggests that this funding placeholder should not be reserved for new projects only. This would also support the co-managers contention that innovative work is being performed where needed to supplement data and management needs within the subbasins. A specific placeholder will only reduce the amount of much needed funds that are available for on the ground projects in the Columbia and Snake River basins.

Additional Umbrella Proposals

Columbia River White Sturgeon Umbrella

Issue: The ISRP recommends that umbrella proposals be developed in FY2001 for all white sturgeon projects in the basin. Umbrella proposal content should provide the information needed to conduct peer review, facilitate regional coordination, and allow assessment of these closely-linked projects' progress toward fish and wildlife program goals.

CBFWA Response: The request for umbrella proposals for individual species such as white sturgeon is not consistent with how we manage this species. The management units are defined on a geographical basis (subbasin/watershed). Umbrella proposals for this species should be constructed on those terms.

Although there is no umbrella proposal covering all the white sturgeon projects in the Columbia River basin, work is well coordinated among these projects. Project 8605000, *White Sturgeon Mitigation and Restoration in the Columbia and Snake Rivers*, is the only one conducting field activities to restore populations in the Columbia River downstream from Lake Roosevelt, and in the Snake River downstream from Lower Granite Dam. Project 8806400, *Kootenai River White*

Sturgeon Studies and Conservation Aquaculture; Project 8806500, *Kootenai River Fisheries Investigations*; Project 9700900, *Evaluate Means of Rebuilding White Sturgeon Populations in the Lower Snake River*; and Project 20135, *Consumptive Sturgeon Fishery – Hells Canyon and Oxbow Reservoirs*; are all designed to study and restore sturgeon populations in distinct geographic areas; therefore, these projects are all complementary. Work on all these projects is complementary with that of Project 9902200, *Assessing Genetic Variation Among Columbia Basin White Sturgeon Populations*. Results from Project 9902200 will provide guidelines for the supplementation of white sturgeon populations.

Staffs from these projects communicate to compare techniques and prevent duplication of effort. For example, staff from Project 8605000 communicated with staff from Project 8806400 to ensure that propagation effort was not duplicated. Staffs from these projects have also participated in the technical work group for project 9603201, *Begin Implementation of Year 1 of the K-Pool Master Plan Program*.

Columbia Basin Pacific Lamprey Umbrella

Issue: The ISRP recommends that umbrella proposals be developed in FY2001 for Pacific lamprey projects in the basin. Umbrella proposal content should provide the information needed to conduct peer review, facilitate regional coordination, and allow assessment of these closely-linked projects' progress toward fish and wildlife program goals.

CBFWA Response: A status report for all existing Pacific lamprey projects has been developed and is provided in Appendix F. This report can serve as a precursor to a lamprey umbrella.

Severely declining Pacific lamprey populations throughout the Columbia River Basin has recently elevated the interest and concern of various entities. The tribes have expressed the most concern due to the cultural significance and lost traditional fishing opportunities.

In 1994, the Northwest Power Planning Council approved the first lamprey project in the Fish and Wildlife Program. The project proposed by the Confederated Tribes of the Umatilla Indian Reservation (CTUIR), called for research and restoration of Pacific lamprey throughout tribal ceded lands. In 1995, an initial product (Status Report of the Pacific Lamprey in the Columbia River Basin) was completed. Since that time, the CTUIR has continued the lamprey project with efforts directed at mainstem abundance monitoring, NE Oregon tributary population abundance documentation (past and present), development of genetic baseline information, basic migratory behavior, and artificial propagation techniques (capture, transport, holding, spawning). This information has been essential for development of a pilot pacific lamprey restoration plan in the Umatilla Basin. CTUIR hopes the plan, to be completed in 1999, will lead to lamprey restoration in the Umatilla and ultimately other subbasins.

Additional lamprey studies have been proposed for which has created uncertainties regarding what are priority lamprey needs and projects. The NWPPC approved FY 99 funding for the ongoing CTUIR project but not others that were proposed, due to these uncertainties and also due to potential project duplication.

Since the initiation of the CTUIR lamprey research and restoration project, a Columbia Basin Pacific lamprey technical work group has been formed to discuss current issues and findings, coordinate ongoing project efforts, and define future project needs. Numerous state, federal, university, and tribal entities have met approximately twice a year for the last three years. The most recent meeting (entitled “Columbia Basin Pacific Lamprey Workshop”) took place in Mission, Oregon on October 22 & 23, 1998. A Status Report on Columbia Basin Pacific Lamprey Projects and Needs is provided in Appendix F. This status report utilizes information presented at this meeting and information from FY 2000 proposals to discuss all ongoing and proposed Pacific lamprey research and restoration efforts and identifies what are believed to be priority needs.

RECOMMENDED FY 2000 FISH & WILDLIFE BUDGET

Fish and Wildlife Balanced Budget

Consistent with the regional goals, objectives and strategies, the managers recommend a budget totaling $141,126, 857 for FY 2000. The MOA direct BPA budget amount of $127 million should be augmented with $2,593,000 from the Contingency/Inflation Reserve, $2,633,857 in un-obligated FY 1998/1999 project funds, and $2,000,000 in estimated interest on FY 1999 funds. The managers also recommend using $4,900,000 in unused Capital Investment funds from previous years. Moreover, the managers recommend that $2,000,000 from BPA's division of Fish and Wildlife be moved from the direct budget because anadromous fish activities are in support of programs from other parts of the MOA budget. The proposed budget allocates $101,425,681 to anadromous fish projects, $17,927,543 to resident fish projects, $14,473,634 to wildlife projects and $5,300,000 to support BPA and ISRP activities.

Although the BPA MOA Direct budget amount is currently set at $127 million, the increased burden to the Fish and Wildlife Program by listed species warrants a discussion between BPA, NWPPC and CBFWA on increasing the direct program allocation. The MOA under Section VIII (m) (Financial impact of new ESA measures and appropriations exceeding available funding) indicates that measures required by the ESA to address newly listed species that impose significant additional costs on Bonneville in any category will be considered an unforeseen event subject to the provisions of Section IX (c) of the agreement. Section IX (c) (Unforeseen events) acknowledges the possibility that the financial consequences of unforeseen events may exceed the capacity of the funds allocated and the contingencies envisioned in the MOA. "In this event the Parties will consult with the Council and the Tribes to determine how to provide for the financial consequences of this unforeseen event while assuring that the purposes of the Agreement continue to be fulfilled. If no agreement is reached among the Parties, the Council, the Tribes, and Bonneville shall make a written recommendation to the Office of Management and Budget and the Council on Environmental Quality on how to provide for the financial consequences of the unforeseen event...". CBFWA Members may be consulting with the Parties under the MOA and the Council about the significant additional costs imposed by the new ESA listings on FY 2000 and FY 2001 activities and on how to provide for adequate funding. These consultations could lead to a change in the amount of BPA funding available for the remainder of the MOA time period.

Available Funds

In developing their annual fish and wildlife budget, the managers make assumptions regarding potential sources of funds and allocate those funds among the three caucus' budgets. The managers' recommended FY 2000 fish and wildlife budget is $141,126,857, based on eight assumptions. The main source of funds for FY 2000 is the $127 million that BPA budgets for Fish and Wildlife Direct Expenses under the Budget MOA.

<u>Assumption 1</u>. The managers estimate that about $2 million in interest on un-accrued FY 1999 funds will be available and recommend that it be used in FY 2000.

Assumption 2. The managers allocated $286,084 in FY 1998 interest in their recommended FY 2000 budget. The recommended allocation for the FY 1988 interest is summarized below (Table 1). These decisions leave $397,682 remaining available.

Table 1. Accounting for FY 1998 interest

Caucus Budget	Total Amount	Used in FY 1999	Remaining at Mar 99 QR	FY 2000 Recommended Allocation	Currently Unallocated
Anadromous (70%)	$1,436,084	($1,400,000)	$36,084	$0	$36,084
Resident (15%)	$307,732		$307,732	($153,866)	$153,866
Wildlife (15%)	$307,732		$307,732	($100,000)	$207,732
Total	$2,051,548	($1,400,000)	$651,548	($253,866)	$397,682

Assumption 3. The managers recommend using $1,255,766 in FY 1999 Carry Forward from projects that do not involve major construction. The source and current status of FY 1999 Carry Forward is summarized below (Table 2). These decisions will leave about $2 million un-allocated Carry Forward from non-construction projects.

Table 2. Accounting for FY 1999 carry forward

Caucus Budget	July Quarterly Review Balance	Other Un-obligated Project Balances Assumed*	FY 1999 Project Budget Adjust.**	Assumed in FY 2000 Recom-mendation	Currently Unallocated Total
Anadromous	$2,470,705	$0	($402,943)	($200,000)	$1,867,762
Resident	$402,447	$656,304	$0	($1,055,766)	$2,985
Wildlife	$86,378	$0	$0	$0	$86,378
Total	$2,959,530	$656,304	($402,943)	($1,255,766)	$1,957,125

* Associated with resident fish projects: #8605000; #9101904; #9700400; and, #9700900.

** CBFWA Members' Steering Group approved (8/4/99) changes to the FY 1999 budgets of the following anadromous fish projects:

- $132,250 to NMFS Manchester Marine Lab;
- $231,000 to Yakama Indian Nation Hatchery Training;
- $24,693 to ODFW Oxygen Supplementation Study; and,
- $15,000 to WDFW Tucannon Peer Review.

Assumption 4. The managers recommend using the entire remaining balance in the Contingency/Inflation Reserve of $2,593,000. Their assumption is that contingencies can be met during the last year of the MOA from carry-forward that becomes available, and if needed, by ending contracts for selected large projects on September 30, 2001 and by starting contracts for additional work on the projects on October 1, 2001 using FY 2002 funds.

Assumption 5. Recent accounts of the Direct portion of the Capital Investment budget under the MOA identified $4,900,000 that appeared not to be used in FY 1997. The managers recommend that these funds be used in FY 2000. BPA has indicated that this may be a misinterpretation of the figures. BPA and NWPPC staff indicate that if any funds are available, they will be funds obligated to projects in the past for which the contractors have not submitted billings ("un-accrued"). BPA is reviewing its records, and very early results indicate that at least $2 million is in this category and might be made available.

Assumption 6. BPA has identified approximately $1,124,225 carried forward from the $8 million allocated to BPA to cover its FY 1998 program and project support costs. Because of staff reductions and other efficiencies, BPA only needed about $6.9 million in FY 1998. The managers recommend that the BPA carry-forward be used in FY 2000. Further, the managers believe that this reduction represents a trend and have allocated in FY 2000 the same amount as BPA needed in FY 1998. The July Quarterly Review indicated that, with anticipated reimbursement for some outlays, this account will have $448,520.

Assumption 7. The managers estimate that about 30 percent of the BPA support costs are related to anadromous fish activities funded from other (than Direct) parts of the MOA budget. The managers recommend that about $2 million of BPA support costs be moved from the Direct budget.

Assumption 8. The Anadromous Fish Managers assumed that half of the work done by the Independent Scientific Advisory Board (ISAB) relates to areas other than the Direct portion of the MOA, and should be funded from those budget portions. This reduced the ISAB budget proposed for funding from the MOA Direct budget by $391,790. The managers anticipate that the other half of the ISAB budget will be paid from the other portions of the MOA budget. CBFWA has reviewed the ISAB billings for FY 1998 and FY 1999 (to-date) to estimate the proportion of their budget spent on activities under the Direct budget. The results indicate that the ISAB has spent about 20 percent of its time on Direct budget funded activities. This demonstrates that this assumption is conservative.

Caucus Allocation

The managers recommend that $101,425,681 be spent on Anadromous Fish projects, $17,927,543 be spent on Resident Fish projects, $14,473,634 be spent on Wildlife projects, and $5,300,000 be spent to support BPA and ISRP activities.

The estimation of future Fish and Wildlife Program budgets is subject to considerable uncertainty, both with regard to the sources of available funds and the timing and need for its being spent. The validity of the managers' assumptions regarding the amounts of funds available for use in FY 2000 are currently under regional discussion. At stake is probably no more than $10 million.

The managers offer the following observations that more than balance the above risk. First, the managers show unallocated balances in Tables 1 and 2 totaling $2.35 million in addition to $1 million in an ESA Steelhead placeholder. Thus a third of the at-risk balance is in hand now.

Second, the managers' recommended budget has large amounts of funds allocated to major construction projects with uncertain schedules. Prudent management requires full construction funds be budgeted, in order that these projects can move forward as soon as construction can proceed to assist the recovery of declining species. Table 3 identifies the major construction projects anticipated in the FY 2000 budget. Several are in the initial stages of regional review and, based on past experience, may be delayed. Furthermore, several have substantial amounts of Carry Forward that may reduce the need for FY 2000 funds. Finally, the largest of the scheduled construction projects, the Nez Perce Tribal Hatchery, is undergoing additional discussion of the phasing and size of its component facilities, which may reduce its FY 2000 funding needs. Although the managers must budget for the most rapid schedule, experience shows that, in aggregate, as much as $15 million may not be needed by these projects in FY 2000, being needed instead in later years.

Anadromous Fish Recommendations

For planning purposes, the AFM assumed an FY 2000 "target operating" budget of $98.1 million. This budget included the AFM share of the direct "base budget" (including ESA and contingency/reserve funds), capital surplus from previous years, carry forward from previous years, and interest on the carry forward from previous years. The sum total of Tier 1 projects recommended by the sub-regional teams (SRT) exceeded the anadromous FY 2000 target budget by $ 3.3 million. This circumstance is the result of several factors. One factor is simply inflation. Salaries and the cost of materials and supplies have gone up. Another, more significant factor is the increase in operation and maintenance costs associated with completion of projects required to maintain and protect prior investments. This component of the anadromous fish budget increased by about $5 million for FY 2000. Finally, some projects became priorities because of new ESA listings of salmon and steelhead by the National Marine Fisheries Service.

About $145 million in anadromous fish projects were forwarded to the Authority for review and evaluation. The AFM referred the projects to SRT for management review. Each SRT was given a "target" budget, based on the allocation of funds among the sub-regions in FY 1999, and was instructed to develop its project recommendations with that target in mind. Projects were evaluated and assigned a "tier" designation. For those projects assigned to Tier 1, each SRT reviewed the scope of work and budget and recommended adjustments they believed were warranted given available funds in FY 2000. These adjustments included deferring or eliminating specific tasks or objectives that did not warrant a high management priority. Some important projects were assigned to Tier 2, and were thus deferred until additional funding became available. The results of each SRT's work were forwarded to the AFM with one of three recommendations: fund (Tier 1); fund if sufficient money is available (Tier 2); or do not fund (Tier 3).

High priority (Tier 1) anadromous fish projects recommended by the SRTs and their associated budgets were scrutinized by AFM and appropriate adjustments were made during a three-day management review. During the management review, it became apparent that additional reductions in the scope of Tier 1 projects were not feasible given the critical and urgent nature of the projects. To "balance" the budget recommended by the SRTs with the "target operating" budget for AFM, some ongoing, high priority activities would need to be curtailed or important new projects deferred.

The AFM concluded that all projects designated as Tier 1 by the SRTs were core activities critical to sub-region management goals and objectives necessary to meet ESA requirements contained in the 1995 Biological Opinion and the 1998 Steelhead supplement. These projects also contemplated actions that are consistent with the recent salmon and steelhead listings and are likely to be embodied in forthcoming biological opinions in FY 2000.

Two actions were taken to increase the amount of FY 2000 funds available to AFM by $3,296,500. The first action involves "borrowing" the full contingency/inflation reserve set aside for FY 2001, with the condition that the Resident Fish Managers and Wildlife Managers retain their claims to those funds for FY 2001 and that the AFM commits to providing funds to cover those claims from its FY 2001 budget. This action increases the FY 2000 AFM budget by $1,296,500. The second action reduces the proportion of BPA's administrative budget funded under the Direct Program from 100% to 70%, with the assumption that 30% of BPA's administrative costs are directly related to anadromous fish capital project planning and management and should be funded from the Capital budget category of the MOA. This action increases the FY 2000 AFM budget by $2,000,000.

As reflected in the FY 2000 budget allocation table in the final version of the DAIWP, the FY 2000 budget under this proposal increases from $98,129,181 to $101,425,681 and is balanced.

Resident Fish Managers' Recommendations

For Fiscal Year 2000, the Resident Fish Managers (RFM) used a multi-phased process to evaluate proposals. The RFM applied a total of 3 screening criteria, 9 technical criteria, 8 programmatic criteria, and 5 milestone-based criteria (Appendix A). The Screening Criteria were intended to ensure that the proposed projects addressed the measures and priorities in the Council's Program and were consistent with the management objectives of the Agencies and Tribes. The Technical Criteria assessed the proposed project's technical merit, objectives, monitoring, and benefits. The Programmatic Criteria dealt with the broader scientific, regional and strategic aspects of the proposed projects. The Milestone-Based Evaluation Criteria addressed completion of milestone-based work plans, importance to regional plans, contractual performance record, and milestone-based goals, objectives and tasks.

The RFM evaluated 75 proposed resident fish projects (including 24 watershed projects). The step-wise process that the RFM used for this evaluation included:

- Reading all 75 individual proposals and scoring them "yes" or "no" for all pertinent criteria;
- Holding ten-minute question and answer sessions with the project sponsors and refining specific criteria evaluations based on the question and answer sessions;
- Condensing the refined criteria evaluations into the four criteria categories (screening, technical, management, and milestone-based);

- Achieving consensus on the “yes” and “no” ratings for the four criteria categories for each proposal without input from the project sponsors;
- Assigning each proposal to one of the four status categories: Status 1 - pass screening, technical and programmatic criteria (successful milestone-based proposals were noted); Status 2 – pass screening criteria and technical or programmatic criteria; Status 3 – fail screening criteria, not eligible for funding; Status 4 – withdrawn proposals and proposals referred to other caucus for evaluation; and
- Identifying projects that were ESA-related (Kootenai River white sturgeon, bull trout, NMFS BIOP for hydrosystem).

Subsequent to the primary evaluation session, the RFM met twice again to refine budgets and identify ESA-designated projects. ESA funding designations for bull trout were withdrawn due to absence of a Biological Opinion for this threatened species. The RFM recommends a balanced budget of $17,927,534 to fund all Status 1 proposals and the highest ranked ongoing Status 2 proposals. The final RFM recommendation constitutes a prioritized list of projects as follows: Tier 1: Recommended for FY 2000 funding. Tier 2: Merits funding when money becomes available in the future. Tier 3: Not recommended for funding.

The RFM have procedures and policies in place to process within-year budget actions and changes in scopes of work.

Wildlife Managers’ Recommendations

The goal of the CBFWA Wildlife Caucus is to achieve and sustain levels of habitat and species productivity in order to mitigate fully for the wildlife losses that have resulted from the construction and operation of the federal and nonfederal hydroelectric system in the Columbia River Basin. The hydropower-induced wildlife losses due to inundation have been quantified and are included in the NWPPC Fish and Wildlife Program. Specific objectives and strategies of the Wildlife Caucus include protecting and enhancing the habitat types indicated in the NWPPC Fish and Wildlife Program.

The Wildlife Caucus (WC) reviewed and scored each FY 2000 wildlife proposal using the Council-approved Wildlife Mitigation Criteria, which address both technical and management issues. Proposal sponsors were invited to attend one of two project evaluation sessions (January 27-28 in Portland, February 24-26 in Boise). Sponsors were provided with questions relating to how their proposal met the criteria and asked to respond to them in writing. Project sponsors were present during the evaluation to provide an overview of their project and answer questions from the caucus. Some wildlife proposals were also reviewed by the Watershed Technical Work Group (WTWG). Information generated in the WTWG review was considered on an advisory basis by the Wildlife Caucus.

Overall, the Wildlife Caucus evaluated 42 wildlife project proposals. The $14,473,634 FY 2000 Wildlife recommendation includes 21 projects that acquire, maintain, or coordinate the acquisition and maintenance of wildlife habitat units, as outlined in the goals and objectives of the Wildlife Plan. Operation and maintenance efforts continue where acquisitions or easements have been completed. Ongoing efforts directed at securing new easements and acquisitions continue to be funded on a year to year basis. Beginning in FY 1998, and continuing in FY 2000, the caucus will develop a monitoring and evaluation (M&E) plan. The M&E plan will incorporate community-based, species richness and diversity models and direct population monitoring into the program. The caucus will also continue efforts at identifying, quantifying, and addressing operational and secondary hydropower impacts to wildlife in FY 2000.

The result of this review is a prioritized list of projects in which:

All Tier 1 projects are recommended for funding because they meet the Caucus' and Council's goals of acquiring, protecting and enhancing wildlife habitat to mitigate hydropower-induced wildlife losses in the most biologically- and cost-effective manner.

- Tier 1a is for nondiscretionary projects where there is a long term memorandum of agreement with BPA for funding.

- Tier 1b is for ongoing operation, maintenance, and enhancement projects based on existing Habitat Evaluation Process (HEP), and management plans.

- Tier 1c is for first year operation and maintenance projects with contingencies for land acquisition and/or HEP or management plan completion.

- Tier 1d is for all new and ongoing acquisition projects which are funded according to the ranking process. The difference between the Amount Requested column and the FY00 Approved column is the amount donated by high priority projects for reallocation by the WC in an attempt to provide some level of funding for as many Tier 1 projects as possible. The Caucus will also reallocate funds that become available through the BPA Quarterly Review Process to try to make available to tier 1d projects.

Tier 2 projects are to receive funding only after fully funding all tier 1 projects.

Tier 3 projects are not recommended for funding because they are either inconsistent with the wildlife program and/or have technical deficiencies.

Through the approach taken by each caucus, we believe we can best accommodate the mutual desire of the Authority and the Council to provide the region the best program possible – one that recognizes the ISRP's recommendations and maximizes the efficient use of available funds. The Authority is committed to making these difficult choices in consultation with the Council and BPA.

The remainder of the Draft Annual Implementation Work Plan (DAIWP) is comprised of ecosystem summaries by subbasins and subregions, and includes goals, objectives, and strategies; fish and wildlife status; habitat assessments; limiting factors; watershed assessments; past accomplishments; remaining work; recommended project lists; and budgets. By design, all project recommendations are justified based on goals, objectives, and strategies of each unique subbasin. The appendices, showing greater detail on the evaluation process by caucus, have been placed in a separate volume.

Budget Distributions

CBFWA has made a preliminary analysis of the distribution of the managers' funding recommendations among the subregions and subbasins (Table 4), among major areas of program emphasis and project status or phase (Table 5).

Table 4 indicates that the Lower Snake Subregion is recommended to receive the largest proportion (30 percent) of the FY 2000 budget, with the Clearwater and Salmon Subbasins receiving 15 and 9 percent, respectively. This is followed by the Lower Mid-Columbia Subregion and the Mainstem Subbasin, each with about 17 percent. The area below Bonneville Dam (Lower Columbia Subregion) is recommended to receive the smallest percentage (2 percent) of the budget.

Table 5 displays the distribution of the recommended funding among areas of program emphasis. This preliminary analysis shows that about 50 percent of the budget goes to support a variety activities related to artificial production of fish (including supplementation), while another quarter of the budget will be spent on watershed or habitat related activities (including the purchase of lands to benefit wildlife). The lower part of Table 5 shows the approximate distribution of recommended funding among generalized project phases, from initial research and planning, through implementation or construction, to operations and monitoring. While a large proportion (37 percent) of the budget goes to activities that are arguably of less immediate benefit to fish and wildlife, such as research, monitoring and planning, 63 percent goes to more "on-the-ground" activities such as implementation and operations.

While these analyses are preliminary, they point the way. The managers have committed to re-examine the distribution of budget recommendations (e.g., priorities) among caucus budgets and among geographic areas.

Table 3. Major construction projects

Proj ID	Title	Sponsor	Subbasin	FY99 Recom.	FY00 Recom.	FY99 C/F	NWPPC Review
8811525	Yakima/Klickitat Fisheries Project Design and Construction	YIN	Yakima	4,516	1,565	671	Step 3 Complete
9107500	Yakima Phase II Screens – Construction	USBOR	Yakima	1,500	1,000	766	NA
9701000	PIT Tag System Transition	PSMFC	Mainstem	800	853		NA
8805305	Northeast Oregon Hatcheries Planning and Implementation – ODFW	ODFW	Grande Ronde	215	226		Step 1
20138	Design and Construct NEOH Walla Walla Hatchery	CTUIR	Walla Walla		250		Step 1
8335000	Nez Perce Tribal Hatchery	NPT	Clearwater	7,918	14,590	5,532	Step 3 (partial)
9604300	Johnson Creek Artificial Propagation Enhancement Project	NPT	Salmon	1,300	2,800	172	Step 2 (partial)
9601100	Walla Walla River Juvenile and Adult Passage Improvements	CTUIR	Walla Walla	2,600	2,840	1,119	NA
8805301	Northeast Oregon Hatchery Master Plan	NPT	Grande Ronde	2,300	1,217	1,998	Step 1
9705700	Salmon River Production Program	SBT	Salmon	220	931	220	Step 1
8805302	Plan, Site, Design and Construct NEOH Hatchery - Umatilla/Walla Walla Comp.	CTUIR	Umatilla	400	2,010		Step 1
	Total			21,769	28,282		

All figures displayed in thousands of dollars.

Table 4. Subbasin distribution

Subbasin/Subregion	FY2000 Recom.	FY2001	FY2002	FY2003	FY2004
Systemwide Program	**7,995**	**9,016**	**8,780**	**8,263**	**7,981**
Mainstem	**22,837**	**26,863**	**25,404**	**22,976**	**23,025**
Lower Columbia Subregion	**2,931**	**3,837**	**6,517**	**3,037**	**2,206**
Lower Columbia Mainstem	1,874	1,961	1,849	1,784	1,609
Willamette	1,057	1,877	4,668	1,253	597
Lower Mid-Columbia Subregion	**23,399**	**20,430**	**22,084**	**25,825**	**25,915**
Deschutes	5,035	7,520	9,086	12,985	13,075
Fifteenmile	274	283	292	301	309
Hood	1,754	1,375	1,412	1,456	1,494
John Day	3,624	2,200	2,151	1,897	1,958
Klickitat	411	300	260	230	200
Umatilla	8,031	6,754	6,997	7,076	7,081
Walla Walla	3,717	1,048	895	881	946
Wind	554	950	990	1,000	850
Upper Mid-Columbia Subregion	**18,711**	**23,165**	**24,617**	**20,829**	**18,243**
Crab	235	213	218	223	228
Okanogan	1,099	2,279	691	56	56
Wenatchee	260	1,650	2,550	2,850	1,850
Yakima	17,117	19,023	21,158	17,700	16,109
Upper Columbia Subregion	**14,986**	**17,017**	**15,511**	**15,115**	**15,213**
Coeur d'Alene	2,326	1,471	1,307	1,398	1,478
Flathead	1,492	891	888	538	544
Kootenai	3,171	3,894	2,945	2,859	2,924
Lower Pend Oreille	451	556	572	588	517
Upper Pend Oreille	2,574	4,898	4,620	4,620	4,620
Upper Columbia Mainstem	4,972	5,307	5,180	5,113	5,131
Lower Snake Subregion	**39,852**	**33,373**	**30,894**	**29,388**	**27,499**
Asotin	235	235	230	225	220
Clearwater	19,956	12,129	7,849	7,869	6,345
Grande Ronde	5,590	8,710	10,647	8,620	8,764
Lower Snake Mainstem	654	720	790	830	890
Salmon	12,735	10,723	10,513	10,964	10,405
Tucannon	682	855	865	881	875
Upper Snake Subregion	**3,115**	**5,742**	**5,590**	**5,049**	**4,432**
Malheur	315	517	348	228	232
Owyhee	636	670	682	694	673
Upper Snake	2,164	4,555	4,560	4,127	3,527
Grand Total	**133,827**	**139,443**	**139,397**	**130,481**	**124,514**

All figures displayed in thousands of dollars.

Table 5. Emphasis/phase

Emphasis/Phase		FY2000 Recom.	FY2001	FY2002	FY2003	FY2004
Program Emphasis						
Watershed & Habitat		32,576	44,652	46,295	44,349	40,959
Tributary Passage		9,099	6,846	6,303	4,959	4,828
Natural Production		4,396	4,581	3,979	3,441	3,066
Artificial Production		66,175	60,224	59,629	54,353	51,835
Mainstem Activities		8,006	9,012	8,882	8,909	9,142
Coordination & Planning		13,576	14,128	14,310	14,471	14,684
	Total	133,827	139,443	139,397	130,481	124,514
Project Phase/Status						
Research & Studies		18,917	22,126	19,428	16,218	15,325
Planning & Design		7,892	11,089	13,890	11,819	10,395
Implementation & Construction		73,582	70,477	69,588	65,370	61,148
Operations & Maintenance		11,266	12,969	13,569	14,067	14,631
Monitoring & Evaluation		22,170	22,781	22,922	23,006	23,015
	Total	133,827	139,443	139,397	130,481	124,514

All figures displayed in thousands of dollars.


Columbia River Basin
BONNEVILLE POWER ADMINISTRATION
GEOGRAPHIC INFORMATION SYSTEM
N
WASHINGTON
OREGON
CALIFORNIA
NEVADA
IDAHO
MONTANA
WYOMING
UTAH
UPPER COLUMBIA SUBREGION
UPPER-MID COLUMBIA SUBREGION
LOWER SNAKE SUBREGION
LOWER-MID COLUMBIA SUBREGION
LOWER COLUMBIA SUBREGION
UPPER SNAKE SUBREGION
COLUMBIA RIVER
SNAKE RIVER
WILLAMETTE R
METHOW
OKANOGAN
UPPER COLUMBIA
PEND OREILLE
KOOTENAI
CHELAN
ENTIAT
WENATCHEE
SPOKANE
CLARK FORK
FLATHEAD
CRAB
PALOUSE
COEUR D'ALENE
BLACKFOOT
YAKIMA
COLUMBIA SNAKE-CH.
LOWER SNAKE
CLEARWATER
CLARK FORK
GRAYS RIVER
ELOCHOMAN
LOWER COLUMBIA
COWLITZ
KALAMA
LEWIS
WIND
WHITE SALMON
KLICKITAT
WASHOUGAL
SANDY
HOOD
FIFTEENMILE
COLUMBIA BON-SNAKE
WALLA WALLA
ASOTIN
BITTERROOT
UMATILLA
WILLOW CR
GRANDE RONDE
IMNAHA
WILLAMETTE
JOHN DAY
DESCHUTES
MID SNAKE-POWDER
WEISER
SALMON
PAYETTE
MALHEUR
SNAKE CLOSED BASIN
BOISE
SNAKE HEADWATERS
MID SNAKE-BOISE
UPPER SNAKE
OWYHEE

Systemwide

Anad fish 16 projects $7,995

Systemwide projects refer to projects that potentially affect the entire Columbia River Basin or ones that assist in coordination of activities basin wide. The Columbia River is one of the larger rivers in the world and its drainage basin covers over 220,000 square miles in the United States alone.

Systemwide Objectives and Strategies

The managers have further defined the regional goals, principles and objectives with the following systemwide management objective to make timely, effective, and informed decisions regarding management of Columbia River fish and wildlife. This objective has two key aspects: 1) information management and 2) coordination of activities.

To achieve the systemwide management objective, fish and wildlife managers have defined five strategies:

1. Set management goals, objectives and strategies and coordinate planning and implementation.

This strategy uses the existing processes to facilitate the communication and coordination necessary for planning and implementation on a basin-wide basis. These processes include those of the Columbia Basin Fish and Wildlife Authority, the Regional Forum (Biological Opinion implementation), and the Columbia River Fish Management Plan (harvest and production). These processes and their technical subcommittees provide much of the infrastructure necessary to coordinate biological and technical research, develop monitoring programs, identify priority needs, and allocate funding from a basin-wide perspective. These forums have grown exponentially in the past few years, and the CBFWA members have proposed increased funding in order to more effectively participate in these regional planning and implementation processes, as described in the CBFWA project description (project #8906200).

Coordinated management of Columbia River anadromous fish requires that program-level managers within the agencies and tribes be supported by staff dedicated to necessary regional activities. The two main regional support staffs are: the Fish Passage Center (#9403300) which monitors smolt migrations, analyzes fisheries and hydrological data, and interfaces with the operating agencies on hydroelectric operations; and, the Columbia Basin Fish and Wildlife Authority (#8906200) which provides logistical and analytical support for coordination, budget tracking, project prioritization, planning, and project implementation. Through CBWFA, the fish and wildlife managers develop the Annual Implementation Work Plan which reflects specific activities that are necessary to achieve certain goals and objectives and are consistent with agreed upon strategies to achieve them. These objectives integrate the requirements of the NWPPC's Columbia River Basin Fish and Wildlife Program, the NMFS's 1995 Biological Opinion on Hydropower Operations (as amended in 1998 for listed steelhead), and Wy-Kan-Ush-Mi Wa-Kish-Wit. The co-managers engage in a rigorous review and priority-setting process, using the facilities and staff of the CBFWA

A project titled "Implement Wy-Kan-Ush-Mi Wa-Kish-Wit Now" provides support for implementation of the Tribal Restoration Plan and watershed project selection process.

2. Provide a peer review capability.

The Northwest Power Act (Power Act) requires that the Columbia River Fish and Wildlife Program be based on the "best available science." A 1997 amendment to the Power Act established the Independent Scientific Review Panel, to provide recommendations on the scientific basis for the Program and its implementation. The Endangered Species Act has a parallel requirement. A number of efforts are necessary to define critical scientific uncertainties, develop a unified scientific framework for the Columbia Basin, and provide for independent scientific review of plans and programs. These efforts are funded under projects #9600500 and #8902701.

3. Conduct regional research and monitor progress and results.

Research, monitoring, and evaluation are topics about which there is broad agreement. That is, most people and entities agree these are important issues and that there should be a coordinated plan for implementing these activities. There is little agreement, however, on how to actually implement such activities. Many assessment and monitoring plans have been written, but they have generally been for specific *ad hoc* purposes and have not been successfully adapted to cover broad needs, such as those involved with restoring anadromous fish, resident fish, and wildlife in the Columbia River Basin. For instance, methods useful for small watersheds, become too cumbersome and expensive for implementation at a subbasin or regional scale. Other difficulties arise when we think of these very different activities as a group (e.g. research/monitoring/evaluation). A more specific, structured, and functional approach to thinking about these three issues is needed before they can be coordinated across the Columbia Basin and at various levels of spatial and temporal resolution.

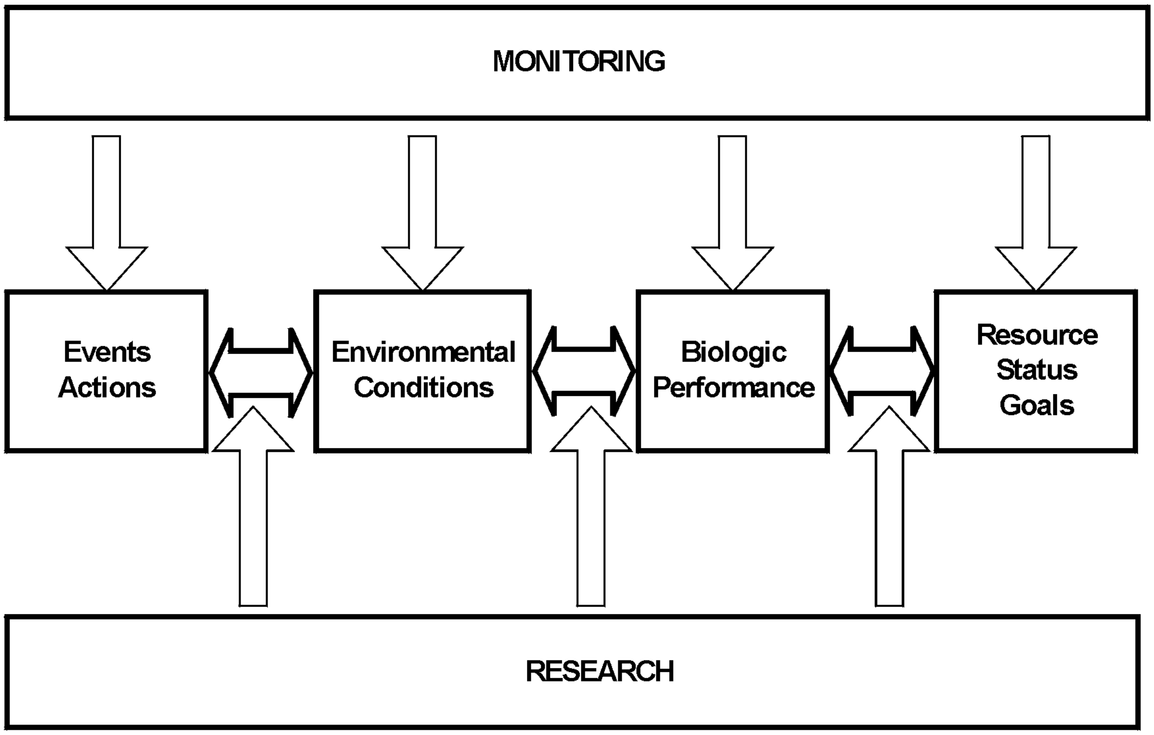
Fortunately we have a basis in place for doing this. The following descriptions will be applicable most of the time, but are not presented as definitive in all cases. The adaptive management framework provides the first level for dealing with research, monitoring, and evaluation from a functional and conceptual perspective. Adaptive monitoring can be described in terms of four steps:

1. Planning
2. Implementation
3. Learning
4. Adapting.

Research, monitoring, and evaluation are separate activities which, in aggregate, make up the "learning" portion of adaptive management and provide the basis for adapting a program over time. Each of these activities is different in the way they are conducted and in the infrastructure needed to implement them. Research, monitoring, and evaluation plans should first be developed individually before these activities can be integrated into a single plan.

The multi-species framework provides a second functional and conceptual basis for developing and integrating coordinated research, monitoring, and evaluation plans. The relationship between research and monitoring, within the framework context, was first described in the 1998 CBFWA Draft Annual Implementation Work Plan (following figure). From this perspective, monitoring measures the amount and characteristics of actions, environmental condition, biologic performance, and goals and/or resource status. In contrast, research focuses on understanding and describing the functional relationships between these features.

Evaluation is the first step in adaptive management and may be thought of as the interpretation of monitoring and research activities within the context of a described plan. Monitoring and research are different types of information gathering activities. Evaluation involves the integration, analysis, and interpretation of information to address questions and issues important to successfully managing a broader plan.



The relationship of research and monitoring within the proposed multi-species framework.

Discussions have, in fact, begun on developing monitoring, research, and evaluation plans along the lines described.

Preliminary discussions among individuals from various resource management entities, policy bodies, and interest groups indicate there is likely broad agreement about this way of characterizing monitoring, research, and evaluation activities. The CBFWA members will continue these discussions in a collaborative effort to develop and implement plans within the multi-year plan, multi-species framework, and adaptive management contexts.

Because of their scope, a number of research, monitoring, and implementation activities have basin-wide implications and require joint coordination by the co-managers. Several pieces are included here: production (captive broodstock and supplementation activities), fish marking for research and monitoring, and research directed at providing broad regional application.

The Captive Broodstock Assessment (#9305600) provides information on the effectiveness of captive broodstock programs and assists with setting objectives for individual captive broodstock implementation programs. Performance/Stock Production Impacts of Hatchery Supplementation, (#9005200) will provide continuing information to assist supplementation activities. Broader research activities include Evaluate Fall Chinook and Chum Spawning, Production and Habitat Use in the Columbia River (#9900300), Spring Chinook Salmon Early Life History (#9202604) and Pacific Lamprey Research and Restoration (#9402600).

The co-managers will continuously revisit current and planned activities in these areas to insure that they are providing useful information.

4. Develop tools and models needed to enhance decision-making ability.

Developing effective plans and projects to restore anadromous fish, resident fish, and wildlife requires policy makers to evaluate and make trade-offs between very different and complex competing interests. It is probably unrealistic to expect that a single decision-support tool can be developed to address all possible questions and issues. Certainly, such an approach would be slow to develop and would generate considerable argument and disagreement.

The CBFWA members feel that a less ambitious approach will foster greater collaboration and agreement, and ultimately may result in faster and more effective restoration actions. This approach would focus on reaching consensus on the conceptual framework, information bases, quality control criteria, etc. on which policy decisions would be based. These agreed-upon principles and information would form the basis upon which various decision support tools could be built to address specific policy questions. In fact, many of the elements of this approach already exist:

- A consistent, unifying framework (Multi-Species Framework)
- A common information base and coordinated information management (The StreamNet project is one prototype)
- Specialized tools for specific uses
    - PATH
    - Harvest analysis (PSC, PMFC, TAC)
    - Framework alternative analyses (multiple tools)

Activities include those associated with the Plan for Analyzing and Testing Hypothesis (PATH), which are described in the Mainstem Subbasin Summary.

5. Manage information (maintain and disseminate data) and report results to constituents and stakeholders.

The managers support the need to report results and progress routinely and to make information available to stakeholders and the public. The StreamNet project (#8810804) collects data by watershed and species throughout the Columbia River Basin and makes it available on the Internet. StreamNet consolidates data compilation and management activities that were historically conducted through the "Coordinated Information System" and the "Northwest Environmental Data Base." Still under development, this project creates, maintains, and enhances a high quality, regionally consistent set of data on fish and related aquatic resources and maintenance dedicated and knowledgeable staff to address specific regional information needs as they occur. Services are targeted to meet specific Fish and Wildlife Program needs.

The suite of projects categorized as system wide is fundamental to making broad regional decisions and implementing specific activities for anadromous fish management, recovery, and protection on a daily, weekly, annual, and longer term time-frame.

There are two Systemwide projects addressing Wildlife in more than one subregion: the Washington Interim Agreement and the Oregon Wildlife Coalition.

Washington Interim Agreement

Wildlife managers in the State of Washington reached an interim agreement with Bonneville in April 1993 for $45.5 million. The managers divided mitigation responsibility for the hydro projects in the state and implemented projects over a five-year period. In 1996, the Washington Department of Fish and Wildlife (WDFW) agreed to receive its share of the funds over a longer period of time. Ongoing project #9609400 is the FY 1999 portion due to WDFW under its Washington Interim Agreement allocation. The Washington Interim Agreement is almost fully implemented and provides an estimated 132,940 habitat units. Other projects funded under the agreement are noted in their appropriate subregions. Individual WDFW projects are located in the Upper Columbia, Upper Mid-Columbia, Lower Mid-Columbia, and Lower Columbia subregions.

Oregon Wildlife Coalition

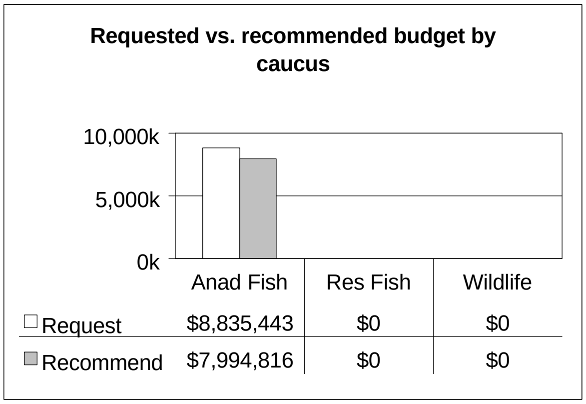
The Oregon Wildlife Managers have used GAP Analysis to plan and prioritize potential wildlife acquisitions and enhancements in the State of Oregon. FY 1999 marks the first year of full-scale implementation based on their prioritization. For detailed information, see the project description for "umbrella project" #9705900 and the individual project descriptions funded under the umbrella.

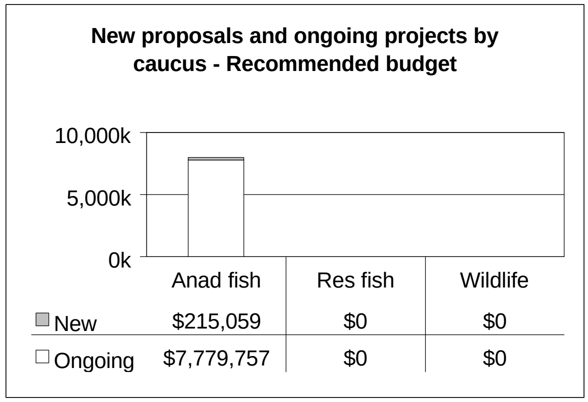
Recommendations

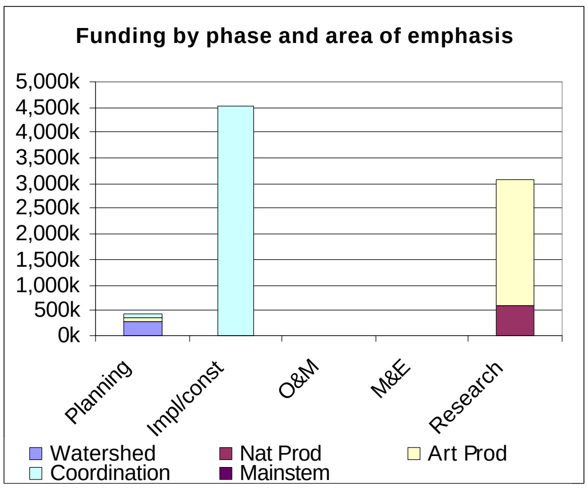
Projects and Budgets

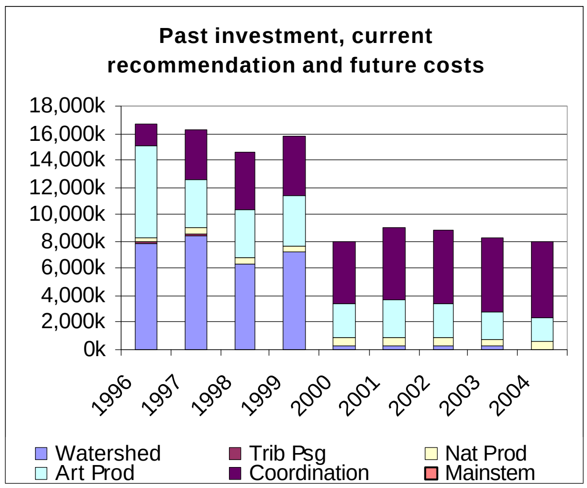
Based on the preceding subbasin description, the CBFWA fish and wildlife managers recommend funding a total of 16 anadromous fish projects at a cost of $7,994,816. The managers consider one of these projects, for $500,000, to be innovative in technique and application. Another 8 projects support ESA requirements for a total of $1,441,588.

Refer to the following figures for detail on: 1) total recommended and requested budget by caucus, 2) funding for new and ongoing work, 3) funding by project phase and emphasis, and 4) funding by time period (past, current and future). Individual projects are listed in the following table.









ProjectID		Title	Sponsor	FY99 recom.	FY00 recom.	Estimated Outyears FY01	FY02	FY03	FY04

Anadromous Fish Projects

ProjectID		Title	Sponsor	FY99 recom.	FY00 recom.	FY01	FY02	FY03	FY04
20025	*	Deschutes River Stray Summer Steelhead Assessment	ODFW		65	0	0	0	0
20059	*	Infrastructure to Complete FDA Registration of Erythromycin	U of I-FWR		71	70	0	0	0
20065		Identification of larval Pacific lampreys (Lampetra tridentata), river lamp	USGS-BRD, CRRL		79	74	43	0	0
8740100	*	Assessment of Smolt Condition: Biological and Environmental Interactions	USGS-BRD, CRRL	199	199	206	212	218	225
8810804		Streamnet: the Northwest Aquatic Information System	PSMFC	1,800	1,936	1,985	2,034	2,085	2,137
8906200		Fish and Wildlife Program Implementation	CBFWA	1,769	2,042	2,246	2,313	2,383	2,454
8907201	*	Independent Scientific Advisory Board Support	DOE/ORNL		50	100	100	0	0
9005200		Performance/Stock Productivity Impacts of Hatchery Supplementation	BRD	460	460	519	485	0	0
9009300	*	Genetic Analysis of Oncorhynchus Nerka (Modified to Include Chinook Salmon)	U of I	139	139	145	147	75	75
9105500	*†	N a T U R E S [Formerly Supplemental Fish Quality (Yakima)]	NMFS	500	500	500	500	600	600
9305600		Assessment of Captive Broodstock Technology	NMFS	1,200	1,237	1,400	1,300	1,200	1,000
9402600		Pacific Lamprey Research and Restoration	CTUIR	320	381	408	430	450	475
9600500	*	Independent Scientific Advisory Board	CBFWF	664	342	704	725	747	769
9800401		Electronic Fish and Wildlife Newsletter	Intermountain Communications		150	158	0	0	0
9800800	*	Regional Forum Facilitation Services	DS Consulting		75	200	215	230	245
9803100		Implement Wy-Kan-Ush-Mi Wa-Kish-Wit Watershed Assessment & Restoration Plan	CRITFC	121	267	300	275	275	0
			Anadromous Fish Totals	**$7,995**	**$9,016**	**$8,780**	**$8,263**	**$7,981**	
			SUBBASIN TOTALS	**$7,995**	**$9,016**	**$8,780**	**$8,263**	**$7,981**	

* indicates ESA project, † indicates 'Innovative work'
All figures in thousands of dollars


Columbia River Basin
BONNEVILLE POWER ADMINISTRATION
GEOGRAPHIC INFORMATION SYSTEM
WASHINGTON
OREGON
IDAHO
MONTANA
WYOMING
CALIFORNIA
NEVADA
UTAH
CORRA LINN
KEENLEYSIDE
BRILLIANT
SEVENMILE
WANETA
BOUNDARY
LIBBY
HUNGRY HORSE
CABINET GORGE
ALBENI FALLS
NOXON RAPIDS
KERR
CHIEF JOSEPH
WELLS
GRAND COULEE
ROCKY REACH
ROCK ISLAND
WANAPUM
ROZA
PRIEST RAPIDS
LOWER MONUMENTAL
LOWER GRANITE
LITTLE GOOSE
DWORSHAK
ICE HARBOR
CHANDLER
MCNARY
JOHN DAY
THE DALLES
BONNEVILLE
CONDIT
MOSSYROCK
MAYFIELD
SWIFT
YALE
MERWIN
HELLS CANYON
OXBOW
BROWNLEE
CASCADE
DEADWOOD
BLACK CANYON
BOISE DIVERSION
LUCKY PEAK
ANDERSON RANCH
OWYHEE
SWAN FALLS
C J STRIKE
UPPER SALMON FALLS
MILNER
MINIDOKA
AMERICAN FALLS
PALISADES
ISLAND PARK
BIG CLIFF
DETROIT
GREEN PETER
FOSTER
COUGAR
DEXTER
LOOKOUT POINT
HILLS CREEK
PELTON
ROUND BUTTE
COLUMBIA R.
KOOTENAI R.
CLARK FORK
FLATHEAD RIVER
SPOKANE RIVER
YAKIMA RIVER
COWLITZ RIVER
COLUMBIA RIVER
SNAKE RIVER
CLEARWATER R.
GRANDE RONDE RIVER
SALMON RIVER
JOHN DAY RIVER
DESCHUTES RIVER
WILLAMETTE RIVER
PAYETTE RIVER
BOISE RIVER
OWYHEE RIVER
HENRYS FORK
N

Columbia and Snake River Mainstem

Anad fish	38	projects	$19,532
Res fish	3		2,476
Wildlife	5		828
	46		$22,836

The Columbia and Snake rivers mainstem subbasin includes only the mainstem Snake River from Hells Canyon Dam to its confluence with the Columbia River and the mainstem Columbia River from Chief Joseph Dam to the Pacific Ocean. The subbasin includes 13 mainstem run-of-the-river dams and reservoirs. Projects that target activities solely in the mainstem Columbia or Snake rivers are grouped here. These projects typically deal with fish passage issues, predators, or water quality issues in these areas.

Fish and Wildlife Resources

Fish and wildlife resources utilizing the mainstem Columbia and Snake rivers constitute a fraction of historical numbers. Estimates of adult Pacific salmon historically returning to the Columbia River basin range from 7.5 to 16 million, but returns from 1990-94 averaged only 1.2 million fish. Currently, less than 25% of returning fish are wild in origin. Most spawning by summer chinook salmon historically occurred in the upper Columbia River and most spawning by fall chinook salmon occurred in the lower and mid-Columbia River, as well as the mainstem of the Snake River.

The subbasin management target includes all species of anadromous fish originating from upstream tributaries of Oregon, Washington and Idaho, which utilize this subbasin as a migration corridor. Target populations of each of these stocks include ESA listed components, unlisted components, and wild and hatchery populations. The majority of these populations are transient through this subbasin migrating as juveniles from the subbasin of origin or migrating back to their subbasin of origin as adults. Important populations of fall chinook salmon does spawn in the mainstem of the Columbia and Snake rivers.

Management objectives for these populations are primarily related to fish passage issues, passage and migration mortality, water quality and development of data to develop a basis for fish passage decisions. The target species include spring, summer and fall chinook salmon, sockeye salmon, coho salmon, chum salmon, winter steelhead, summer steelhead, Pacific lamprey, and white sturgeon. Mainstem management targets all races and origins of these stocks. ESA listed stocks which utilize this subbasin as a migration corridor are, Snake River spring, summer and fall chinook, sockeye, and steelhead; Mid-Columbia chinook and steelhead; Lower Columbia chinook, coho and chum salmon; and Willamette spring chinook and winter steelhead. Coho have been extirpated from the Snake River basin and sockeye populations in tributaries of the upper Columbia River are depressed.

Pacific Salmon

Spring/Summer Chinook – Spring and summer chinook utilize this subbasin as a migration corridor on their up and downstream migration to Snake and Columbia River tributary streams. Spring chinook is present, actively migrating in this subbasin, as juveniles and/or adults from March through June.

Fall Chinook - Mainstem spawning is currently limited to about 40,000 fall chinook salmon in the Hanford reach of the Columbia River, about 5,000 fall chinook salmon downstream from Bonneville Dam, about 1,900 fall chinook salmon in the Snake River between Asotin and Hells Canyon Dam.

Chum - Chum salmon spawning has been documented in the mainstem Columbia River between Ives and Hamilton islands, below Bonneville Dam.

Sockeye Salmon – Sockeye salmon utilize this subbasin as a migration corridor and originate in the Okanagon and Wenatchee rivers in the mid-Columbia and in Altruas and Redfish lakes in the Salmon River Basin.

Coho – Coho salmon utilize this subbasin primarily as a migration corridor. The stock is primarily of hatchery origin with a few naturally produced fish in tributary streams below and above Bonneville dam. The majority of coho production in Washington hatcheries is composed of early returning Toutle River stock and late returning Cowlitz

River Stock. Coho production in Oregon hatcheries is from an early returning stock. Some Coho production occurs in the Mid-Columbia River above Rock Island Dam.

Winter steelhead – Winter Steelhead utilize this subbasin as a migration corridor and are produced primarily in Columbia River tributaries from Fifteenmile Creek in Oregon, downstream to the mouth.

Summer Steelhead – Summer steelhead utilize this subbasin as a migration corridor. Summer steelhead return to all major tributaries of this subbasin. Approximately 25,000 steelhead spawn in the mainstem Snake River.

Other Anadromous Fish – Smelt populations downstream of Bonneville Dam, although not listed or proposed for listing, are currently depressed. Pacific lamprey use the mainstem as a migration corridor and are moderately to severely depressed in mid- and upper Columbia River tributaries. Sea-run cutthroat trout spawn in Columbia River tributaries above and below Bonneville Dam and are proposed to be listed under ESA as threatened.

Resident Fish

White Sturgeon **-** White sturgeon was also historically abundant throughout the Columbia and Snake rivers. Although white sturgeons downstream from Bonneville Dam are abundant enough to still support important recreational and commercial fisheries; populations upstream from Bonneville Dam have declined drastically and support limited or no harvest. Although listed as a resident fish for purposes of NWPPC program classification, white sturgeon are anadromous and the population downstream of Bonneville Dam supports coastal fisheries from Puget Sound to southern Oregon.

Wildlife

The Columbia River basin historically included habitat suitable for a diverse array of wildlife. The types of wildlife habitats vary along the Columbia and Snake River mainstems. A variety of wildlife species, including large and small mammals, waterfowl, passerines, raptors, herpetiles, and amphibians, are associated with riverine and adjacent riparian forest, wetland, island, mixed coniferous and deciduous forest, and shrub-steppe habitats. The status of wildlife species varies throughout the subbasin. Many species are listed or are depressed population levels. Species include Columbia River white tailed deer, bald eagles, peregrine falcons, Washington ground squirrel, and sharp-tailed grouse.

Habitat Areas and Quality

A key factor limiting fish and wildlife resources in the mainstem Columbia and Snake rivers has been development of the hydrosystem. The rapid decline of Pacific salmon after mass immigration of Europeans to the Columbia river basin has been associated with the cumulative effects of habitat loss and degradation, hatchery practices, overexploitation, and impediments to upstream and downstream movement due to dams. Dams and impoundments altered flow and temperature patterns, reduced available spawning habitat, and increased mortality of juvenile salmonids due to passage through turbines and predation. Habitat improvement programs and severe restrictions on commercial fishing allowed runs to rebound during the 1950’s and early 1960’s; however, continued habitat degradation and hydrosystem development during the 1970’s in the upper Columbia and lower Snake rivers caused major declines in upriver stocks.

Development of the hydrosystem has resulted in a white sturgeon population or collection of populations that are less productive than the population historically present. White sturgeon that once moved freely within the Columbia and Snake rivers and between the rivers and ocean are now at least partially blocked by dams. Habitat has been altered by flow regulation, channel modification, diking, and dredging. Reproduction and recruitment have been particularly vulnerable to changes caused by dams.

Development of the hydrosystem has also affected many species of wildlife. Habitat lost to the construction of hydroelectric facilities was home to many, interdependent species. Floodplain and riparian habitats important to wildlife were inundated when reservoirs were filled. Activities associated with hydroelectric development and operation, such as fluctuating water levels, have altered land and stream areas that affect wildlife. In some cases, dam operations have created barren vegetation zones, which expose wildlife to increased predation. Other activities related to hydroelectric development (e.g., road construction and the draining and filling of wetlands) have altered land and stream areas in ways that affect wildlife. In some cases, the construction and maintenance of power transmission corridors altered vegetation, increased access to and harassment of wildlife, and increased erosion and sedimentation in the Columbia River and its tributaries. Other impacts to wildlife and wildlife habitats along the mainstem river area caused by hydropower construction and operation include irrigation, agricultural practices, livestock management practices, human development, forest management practices, noxious weeds, and the loss of prey base for certain wildlife species. Any of these influences can be, and are, limiting factors to local wildlife populations. Changes in local populations can affect species integrity on a larger scale.

- With the exception of the tidewater area from the mouth of the Columbia to Bonneville Dam and the 50 miles of free-flowing river from Priest Rapids Dam to the head of the McNary Dam pool, the mainstem Columbia and Snake rivers have been converted into a series of dams and reservoirs.
- The operation of headwater storage dams for flood control and power production has substantially altered the natural hydrograph of the river, including the estuary and near ocean environments. This headwater storage capability has resulted in water being stored during the normal spring freshet for release during times when the demand for hydropower is greater and there is no requirement for flood control.
- The increase in cross sectional areas of the river with mainstem reservoir development has slowed water velocity and has converted the riverine environment with its seasonal freshets, high turbidities and water velocities to low velocities and clearer water. This has impacted the juvenile migration of salmon through the subbasin greatly increasing their travel time and mortality.
- There are 13 dams on the mainstem Columbia and Snake rivers, which present physical obstacles for migrating species and greatly modified habitats for resident species and wildlife.
- Major impacts of reservoir and dam development include loss of mainstem spawning and rearing habitat, juvenile and adult fish passage mortalities through dams and reservoirs. Modification of habitats in this subbasin has greatly increased the presence of predators and as a result the exposure of salmon and steelhead juveniles to predators.
- The operation of dams and reservoirs has degraded water quality in the subbasin. Flood control and power operations, which require high levels of spill at mainstem dams and reservoirs including upstream storage reservoirs result in high levels of dissolved gas, exceeding state and federal standards. This impacts resident and migratory species. In addition the increased surface areas of reservoirs has resulted in high summer and late spring water temperatures, exceeding state and federal water quality standards. This results in disease and mortality of resident and anadromous fish and benthic organisms.

Watershed Assessment

The Columbia and Snake rivers subbasin has been seriously degraded as a migration corridor and nearly all of the natural spawning and rearing areas have been destroyed. The impacts of development have been well documented through the years. The transformation of the subbasin from a riverine habitat to a serious of dams and reservoirs has dramatically altered the habitat for all fish and wildlife in every aspect. The state of development and limiting factors establishes an extremely high priority for protecting and enhancing habitats that are still capable of natural spawning production in this subbasin. The habitat degradation has been so extensive in this subbasin that support through artificial production for some populations of fish will be necessary. Wildlife corridors, habitat and supporting vegetation have been degraded by development. Resident and anadromous fish are continually impacted by the operation of the hydrosystem. Modification of the hydrosystem operation and configuration is necessary to recover fish and wildlife production and habitat in this subbasin. A list of references is included in appendix A.

Limiting Factors

- Juvenile fish incur direct mortality passing through turbines, bypasses and spill at dams.
- Dams have caused juvenile fish to be more vulnerable to predation by reducing water turbidity, creating hydraulic conditions at dams that favor predators, slowing velocities and increasing travel times which increases exposure to predators and delays ocean entry, increasing dissolved gas levels resulting in trauma to migratory and resident fish and benthic organisms, increasing water temperatures resulting in increase disease and mortality in all aquatic species.
- Uncontrolled spill at dams causes gas supersaturation, which causes mortalities to both juveniles and adult fish from gas bubble disease.
- Juvenile downstream migrants experience mortality and are delayed by dam passage.

- Adult experience delay and injury during upstream dam passage.
- Present operation of the hydropower system to meet power objectives is contrary to the spawning incubation and rearing needs of anadromous fish.
- The operations of the hydrosystem for flood control have substantially altered the estuary and near ocean environments to the detriment of anadromous fish and native wildlife.
- The construction of and operation agreements for dams in the US and Canada upstream of the subbasin on both the Columbia and Snake rivers has altered the natural flow through this subbasin greatly impacting the migration habitat. This has been to the detriment of downstream migrant survival and natural spawning and production in the mainstem. Federal and non-federal irrigation storage projects and irrigation withdrawals upstream of this subbasin have reduced flow through the subbasin particularly in the summer period.
- Irrigation withdrawals directly occurring in this subbasin and expansion of groundwater pumping are emerging as a potential limiting factor during the summer period.

Subbasin Management

Goals, Objectives, and Strategies

The management goals for the Columbia and Snake rivers mainstem subbasin are:

- To support tribal and non-tribal harvest, cultural and economic practices, and non-consumptive practices;
- Protect the biological integrity and the genetic diversity of the mainstem Columbia and Snake rivers.
- Maximize survival of juvenile and adult anadromous fish as they migrate through the mainstem Columbia and Snake rivers. Increase returns of hatchery and naturally produced salmonids to the Columbia River basin.
- Protect and improve, spawning, incubation, and rearing of anadromous fish in the mainstem Columbia River. Restore sustainable, naturally producing populations when possible, or mitigate for losses of naturally producing populations when necessary;
- Improve survival of Columbia River fish in the estuary and near the ocean plume.
- Utilize supplementation to increase natural production in the mainstem. Use hatchery releases to augment harvest in the mainstem and ocean and minimize impacts to weak or ESA listed fish in recreational and commercial fisheries.
- Maintain and restore production of resident fish, including white sturgeon, in the Columbia and Snake rivers.
- Maintain and restore populations of wildlife native to the Columbia River basin.
- Research, monitor and evaluate activities.

The management intent for anadromous fish, resident fish, and wildlife in the Columbia and Snake rivers subbasin is described in the following set of management objectives for key species by describing the set of strategies and actions taken to meet those objectives. The following lists individual projects that address the objectives and relates those projects to the objectives and each other through strategies. Individual projects address management issues in other subbasins as well, including the lower Columbia River mainstem subbasin and the Systemwide project category. Projects of these types are described further in the lower Columbia River mainstem subbasin and Systemwide summaries. Objectives for the mainstem Columbia and Snake rivers are:

1. Maximize survival of juvenile and adult anadromous fish as they migrate through the mainstem Columbia and Snake rivers. Increase returns of hatchery and naturally produced salmonids to the Columbia River basin.

Strategies to meet this objective are:

a) protect and restore migration, spawning and rearing habitat for salmonids by providing necessary flows through dam operations;
b) decrease predation on juvenile salmonids;
c) develop escapement goals necessary to protect listed or depressed stocks and ensure adequate hatchery escapement;
d) apply CWT mark to all major salmonid stocks released from Oregon hatcheries in the Columbia River basin;
e) develop fisheries in select areas of the Columbia River that target hatchery-produced salmonids while avoiding impact on listed stocks;

f) monitor fisheries harvesting listed or depressed stocks to ensure that harvest impacts do not exceed ESA limits;
g) use life cycle model to quantify effects of various management srategies on recovery of listed or depressed stocks,
h) use supplementation and artificial propagation to increase abundance of populations depressed by poor reproduction.

2. Maintain and restore production of resident fish, including white sturgeon, in the Columbia and Snake rivers.

Strategies to meet this objective are:

a) protect and restore habitat for resident fish, including white sturgeon, by providing necessary flows through dam operations;
b) use supplementation and artificial propagation to increase abundance of populations depressed by poor reproduction.

3. Maintain and restore populations of wildlife native to the Columbia River basin.

Strategies to meet this objective are:

a) acquire and ease riverine, riparian, wetland, and upland habitat suitable for native wildlife species;
b) restore habitat for native wildlife species through control of exotic plants, alteration of land use practices, and control of public access.

4. Research, monitor and evaluate activities.

Strategies to meet this objective are:

a) Implement data collection and monitoring systems and research, which address present and future hydrosystem and fish and wildlife management issues.

Past Accomplishments

Progress has been made in carrying out the subbasin strategies for the Columbia and Snake rivers subbasin. Past accomplishments are described in terms of contribution to and provision of a basis for short term, day-to-day fish passage management and hydrosystem management decisions, which include monitoring, and information necessary for long term mitigation decisions, which includes research. Included in both of these categories is information necessary for implementation of Biological Opinion measures on an annual basis and monitoring results of implementation of management actions. It is important to note that accomplishment of these subbasin objectives can only be on an incremental basis. The accomplishment of any of the subbasin objectives will be the result of the cumulative implementation of the combined strategies over long periods of time. Many individual projects together contribute to implementation of individual strategies or to several strategies.

Eight individual projects (8332300, 8712700, 8712702, 9602100, 940330, 8712703, 8401400, 9008000,9302900)[1] are conducted together to implement strategies for objectives 1 and 3. These projects have contributed to the strategies for provision of flows and spill for dam passage, and implementation of data collection and management systems for fish passage and hydrosystem management decisions. A long term consistent and continuous data base has been developed and provided to the region, including the public, on a daily basis to provide a basis for day-to-day fish passage and mitigation decisions. Specific data have been produced including, annual survival indices in specific river reaches, passage indices by species and by site, and passage timing and migration duration. Gas bubble

[1] 8332300 -Monitor Smolts at the Head of Lower Granite Reservoir, 8712700-Smolt Monitoring Program, 871702-Comparative Survival Rate Study, 9602100-Gas Bubble Disease Research and Monitoring of Juvenile Salmonids (one task), 940330-The Fish Passage Center, 8712703-Imnaha River Smolt Monitoring Program, 8401400-Smolt Monitoring Program Tagging, 9008000-Columbia Basin PIT Tag Information, 9302900- Survival Estimates for the Passage of Salmonids Through Dams and Reservoirs.

trauma symptom monitoring data have been produced which provide the basis for the spill for fish passage measures contained in the Biological Opinion. These data have provided a basis for longer-term analysis of mitigation decisions such as the NMFS Biological Opinion. These projects have also provided data to the life cycle modeling strategies to implement objectives 1 and 3. The data and analysis conducted through these projects also contribute to research and evaluation, specifically evaluating the response of the fish migration to implementation of hydrosystem mitigation measures, such as spill and flow. Data on smolt to adult return rates developed through these projects have contributed to life cycle modeling and assessment of mitigation measures now in place. Some of these projects such as the PIT Tag data system are utilized in implementing most of these strategies, wherever the PIT Tag data system is utilized. The long-term database has provided the foundation for management decisions on a daily and annual basis.

Three projects (9007700, 9007800, and 9702400)[2] have been implemented to meet objective 1 strategies to control predators on juvenile salmon and steelhead migrating through the subbasin. Through these projects, bird and fish predator populations have been assessed. These assessments have led to management actions, such as the Rice Island Caspian tern relocation project, and the northern pike minnow removal project to reduce and control the populations of predators and their impact on juvenile salmon and steelhead migrating through the subbasin.

Five projects (9701400, 9900300, 9406900,9801003, 9102900)[3] have been conducted to implement the subbasin objective to protect and improve mainstem spawning, rearing and incubation of fish in the mainstem Columbia and Snake rivers. These projects each target discreet targeted populations of naturally spawning salmon in the subbasin. These projects have collected life history, migration spawning and emergence data which are used to develop specific hydrosystem operations to provide access and protection of these stocks during spawning, incubation and emergence. Spawning elevations and emergence timing are used to enhance survival of naturally spawning stocks by eliminating or reducing the potential for dewatering redds and stranding emergent juveniles. Flow levels and fluctuation limits have been determined from the data developed through these projects. Strategies to improve production through hatchery and natural supplementation to increase natural production have been pursued through project 9603201 with acclimation and release of up to 700,000 Upriver Bright Fall Chinook in the Hanford Reach of the Columbia River.

Specific strategies to increase salmon and steelhead returns, implementing the subbasin objectives are broad in scope and incorporate a wide range of specific activities, which result directly or indirectly from many projects. They include:

- Monitoring of fisheries harvesting depressed and listed stocks will ensure that harvest impacts do not exceed limits set forth in the ESA, and therefore aid in the recovery of depressed and listed stocks, and help maintain healthy stocks;
- Developing escapement goals and monitoring escapement areas (natural and hatchery) will ensure that escapement is adequate to protect and rebuild depressed or listed stocks and maintain current production levels of hatchery stocks;
- Increasing returns of hatchery reared salmon and steelhead to mitigate for losses in natural production resulting from the development of the hydropower system in the Columbia River basin will support important consumptive and non-consumptive fisheries for both treaty Indian and non-Indian fishing communities;
- Increasing returns of hatchery reared stocks to areas that are devoid of naturally reproducing stocks allows development of fisheries that harvest naturally reared fish without impacting naturally produced fish;
- Development of survival rate indices will be necessary to evaluate the effect of migration mitigation measures and actions on the recovery of Columbia Basin listed stocks to determine if measures and actions are benefiting listed stocks;

[2] 907700-Northern Pike Minnow Management Program, 9007800-Evaluate Predator Removal: Large Scale Pattern, 9702400-Avian Predation on Juvenile Salmonids in the Lower Columbia River.
[3] 9801003-Spawning Distribution of Snake River Fall Chinook, 9900300-Evaluate Spawning of Salmon Below the Four Lowermost Columbia River dams, 9701400-Evaluation of Juvenile Fall Chinook Stranding on the Hanford Reach, 9406900-A Spawning Habitat Model to Aid Recovery Plans for Snake River Fall Chinook, 9102900-Life History and Survival of Fall Chinook in the Columbia River.

- Life cycle models will quantify effects of various management strategies on recovery of listed or depressed stocks for the purpose of determining which management strategies will be most effective in recovering listed or depressed stocks;
- Providing the region with the best available scientific data will reduce risks of making incorrect management decisions due to erroneous data;
- Providing stock status data to a wide variety of users will aid in monitoring status of Columbia Basin salmon and steelhead stocks by standardizing data sets used by management agencies.

Projects (9306000, 8906900, 8201300, 9600800),[4] all provide analysis and data utilized in implementing the subbasin objectives to increase returns of hatchery and naturally produced salmonids to the Columbia Basin. Life cycle analysis has provided valuable assessment of recovery options for ESA listed stocks. Coded Wire tagging has provided data for evaluating the return of hatchery and supplementation populations and provided data for run reconstruction analysis. PATH analysis has provided integration of basin-wide research, monitoring and a quantitative framework to assess future management and mitigation options.

A project (865000)[5] has been in place to implement the subbasin objective to maintain and restore production of native resident fish, including white sturgeon, in the Columbia and Snake rivers. Strategies to implement this objective include supplementation and artificial production, modified hydrosystem operations to provide adequate flows to protect and restore habitat. The white sturgeon project has determined that hydrosystem peaking at The Dalles Dam displaces sturgeon eggs and larvae from incubation areas. Sturgeon populations were assessed in the mid-Columbia, Snake and Lower Columbia rivers. Successful transplantation of sturgeon from below Bonneville Dam to the Dalles Reservoir was shown to be successful. White sturgeon populations were shown to be 10 to 100 times more abundant downstream from Bonneville Dam when compared to upstream populations. Data from the White sturgeon project has been a significant contribution to management of these stocks in the subbasin.

Various projects (20115,20116,20082,9009200,)[6] have been conducted to implement the subbasin objective of, maintaining and restoring populations of wildlife native to the Columbia River basin. Strategies to meet this objective include acquisition and easement of riverine, riparian, wetland, and shrub/steppe habitats, control of noxious weeds, alteration of grazing practices, and control of public access. Land acquisition for wildlife habitat, documentation of potential wildife mitigation sites, and negotiations for land acquisition have all been accomplished through these projects. Important partnerships with landowners, the Nature Conservancy, the Trust for Public Lands and the Bureau of Land Management have been developed through the implementation of these projects. Comprehensive Wildlife management and mitigation plans have been developed for wildlife areas.
Project 9202400 has maintained a program to eliminate unlawful fishing throughout this subbasin.

Research, Monitoring and Evaluation

Monitoring and evaluation are implemented in this subbasin through a group of system-wide programs of data collection and research. The Smolt Monitoring (SMP) program collects consistent and continuous adult and juvenile fish passage data on a daily basis. This provides an information base for short and long term hydrosystem and fish passage decisions. The SMP is closely coordinated with the Comparative Survival study of spring chinook, which is designed to produce smolt to adult survival data. Monitoring of management and mitigation activities through the Smolt Monitoring Program allows an assessment of the fish passage impact of specific hydrosystem operations such as flow and spill. Research projects are designed to determine the impact of specific hydrosystem operations on fish passage and spawning, emergence and rearing of naturally produced fish in the subbasin. Specific project research is conducted and funded by the Corps of Engineers. In addition to the short-term management applications, these data are applied to life cycle modeling analysis and retrospective analysis.

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[4] 9306000-Evaluate Columbia River Select Area Fisheries, 8906900-Annual Coded Wire Tag Program, 8201300-Coded Wire Tag Recovery Program, 9600800-PATH-Participation by State & Tribal Agencies, 8810804-Streamnet, Aquatic Information Network.
[5] 8605000-White Sturgeon Mitigation & Restoration in the Columbia and Snake Rivers.
[6] 20115-Securing Wildlife Mitigation Sites- Irrigon,20116-Securing Wildlife Mitigation Sites Horn Butte, 20082-Rainwater Wildlife Area,9009200-Wanaket Wildlife Mitigation Project.

Remaining Work

Work remains to be done in the assessment of smolt to adult survival for steelhead and other races of salmon. Smolt to adult returns need to be assessed in terms of the adequacy of management actions taken to protect these stocks. Natural production documentation in this subbasin which is limited to fall chinook and chum at this time needs to be assessed. Mainstem production of fall chinook as well as potential production of coho, steelhead and chum in very small direct tributaries to the mainstem should be assessed. Recent information indicates that mainstem production potential maybe present. The impacts of the hydrosystem including load following on mainstem natural spawning and emergence in known areas and potential areas needs to be determined. The unknown impacts of hydrosystem hourly operations such as load following and stranding need to be assessed for mainstem naturally reproducing stocks.

The options for resolving water quality and water withdrawals from this subbasin should be addressed. Means for reducing water temperature and dissolved gas should be implemented. Acquisition of wildlife corridors and habitat and water sources for specific areas need to be pursued as agriculture and other developments increase demand for land and water resources.

Subbasin Recommendations

Subbasin recommendations for anadromous fish, wildlife and resident fish are based upon information needed to make management decisions required to implement the subbasin objectives. Information required to make management decisions required to implement these subbasin objectives are emphasized in the following recommendations. The subbasin recommendations are based upon provision of information required to implement the subbasin strategies identified for each objective. This includes monitoring activities required for implementation of present mitigation measures such as those contained in the NMFS Biological Opinion and the NWPPC Fish and Wildlife Program. Although monitoring activities are modified annually to reflect the present state of knowledge and the management requirements.

Anadromous fish recommendations are aimed at increasing adult returns by decreasing travel time, increasing survival, decreasing predation and improving water quality. Monitoring and data collections are only emphasized to the degree they are necessary for management decisions to accomplish this goal. The explicit definition and description of each minute detail of an issue is de-emphasized in favor of determination of the management action required to mitigate the problem. To this end, dissolved gas monitoring, evaluation and extent of trauma are abandoned in favor of improvement of water quality and reduction of dissolved gas and temperature. Documentation and protection of mainstem spawning habitat relative to hydrosystem operations is emphasized rather than life history evaluations.

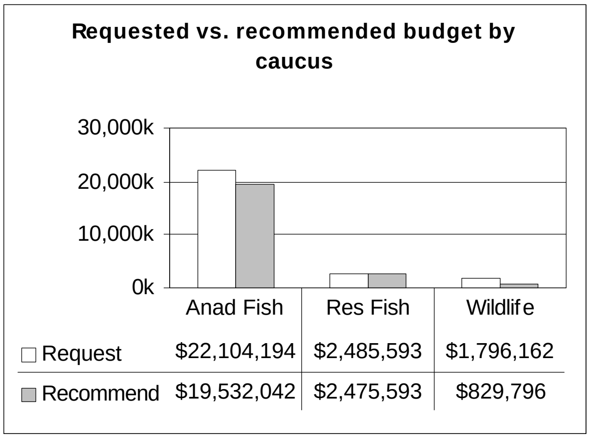
CBFWA developed and submitted the Smolt Monitoring Program (SMP) Umbrella proposal for 2000 in response to comments resulting from the ISRP review of the Annual Implementation Plan provided to the Northwest Power Planning Council. The SMP Umbrella proposal was intended to consolidate all of the basin-wide activities, which are part of the SMP regional database. The data resulting from the SMP is utilized together in analysis and in daily, as well as longer-term fish passage management decisions. The intent of the SMP Umbrella is to clearly illustrate how the program is designed and implemented as a single unit. The Umbrella proposal should demonstrate the objectives of development of a continuous, consistent fish passage data system to support management and analysis.

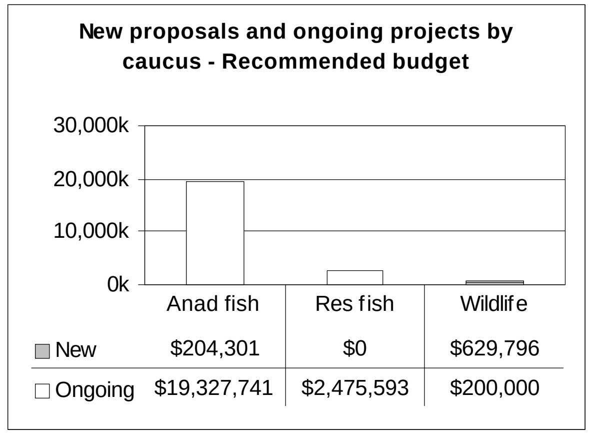
The Umbrella proposal for the SMP was intended to clearly and thoroughly address the previous ISRP comments. In addition, CBFWA believes that it would be useful to discuss the Umbrella proposal and any subsequent questions the ISRP may have with the technical staff responsible for the SMP Program. CBFWA invites the ISRP to meet informally with the technical staff and discuss the details of methodology, data collection, data management, or any other aspects of interest. CBFWA invites the ISRP to work collaboratively in discussions of the SMP Umbrella proposal.

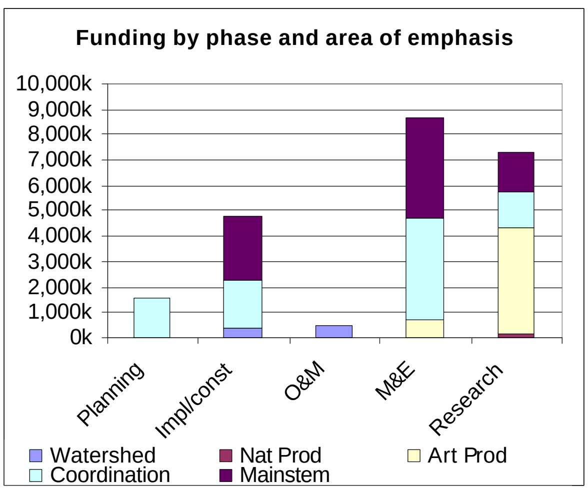
Projects and Budgets

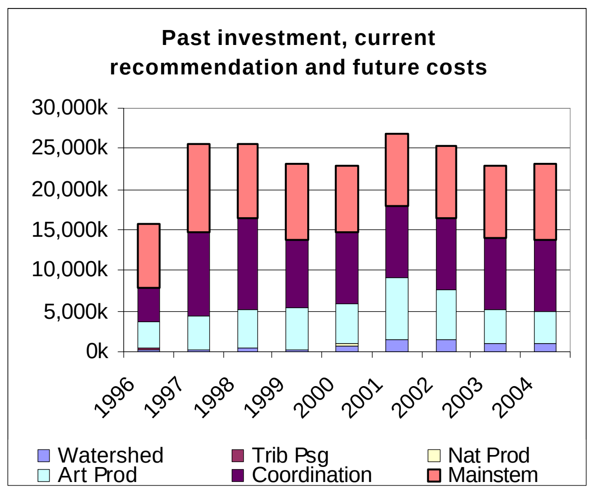
Based on the preceding subbasin description, the CBFWA fish and wildlife managers recommend funding a total of 46 projects at a cost of $22,837,431. Of the projects recommended, 38 focus on anadromous fish, 3 focus on resident fish, and 5 are directed at wildlife. The managers consider 6 of these projects, for $4,389,057, to be innovative in their technique and application. Another 20 projects support ESA requirements for a total of $11,078,818.

Refer to the following figures for detail on: 1) total recommended and requested budget by caucus, 2) funding for new and ongoing work, 3) funding by project phase and emphasis, and 4) funding by time period (past, current and future). Individual projects are listed in the following table.









ProjectID		Title	Sponsor	FY99 recom.	FY00 recom.	Estimated Outyears FY01	FY02	FY03	FY04

Anadromous Fish Projects

ProjectID		Title	Sponsor	FY99 recom.	FY00 recom.	FY01	FY02	FY03	FY04
20023	*	Hanford Reach Steelhead Stock Investigation	WDFW		92	99	90	84	0
20143		Monitor Symptoms of Gas Bubble Trauma in Adult Salmonids	CRITFC		113	118	124	131	137
20157		Gas Bubble Trauma Monitoring in the Clearwater River	IDFG		59	0	0	0	0
8201300		Coded-Wire Tag Recovery	PSMFC	1,731	1,923	2,020	2,121	2,227	2,338
8331900		New Fish tagging System	NMFS	1,202	1,389	1,450	1,400	1,300	1,100
8332300	*	Smolt Monitoring at the Head of Lwr. Granite Reservoir & Lwr. Granite Dam	IDFG	382	397	409	421	433	446
8401400	*	Smolt Monitoring Program Marking	USFWS	668	121	125	128	132	136
8712700	*	Smolt Monitoring by Federal and Non-Federal Agencies	PSMFC	1,262	1,870	2,177	2,242	2,310	2,379
8712702	*	Comparative Survival Rate Study (CSS) of Hatchery Pit Tagged Chinook	PSMFC	1,216	936	983	1,013	1,043	1,074
8712703	*	Imnaha River Smolt Monitoring Program Project	NPT	175	189	174	177	180	183
8906500		Annual Stock Assessment - CWT (USFWS)	USFWS	399	111	122	134	147	162
8906600		Annual Stock Assessment- Coded Wire Tag Program (WDFW)	WDFW	335	374	385	397	409	421
8906900		Annual Stock Assessment - CWT (ODFW)	ODFW	190	216	222	229	235	242
9007700	*†	Northern Pikeminnow Management Program	PSMFC	3,306	2,506	3,405	3,507	3,612	3,720
9007800	*	Evaluate Predator Removal: Large-Scale Patterns	USGS	40	118	0	0	0	0
9008000	*	Columbia River Basin Pit Tag Information System	PSMFC	1,041	1,365	1,420	1,476	1,535	1,597
9102900	†	Life History and Survival of Fall Chinook Salmon in Columbia River Basin	USGS	900	744	800	0	0	0
9202200	†	Physiological Assessment of wild and hatchery juvenile salmonids	NMFS	349	350	359	360	363	365
9204101		Lower Columbia River Adult Study	COE	200	0	1,576	1,655	0	0
9302900		Survival Estimates for the Passage of Juvenile Salmonids Through Dams and R	NMFS/NWFSC	1,081	1,199	1,200	1,200	1,200	1,200
9303701		Stochastic Life Cycle Model Technical Assistance	PER Ltd.	70	70	185	190	195	200
9403300	*	The Fish Passage Center (FPC)	PSMFC	1,060	1,079	1,120	1,154	1,188	1,224
9406900		A Spawning Habitat Model to Aid Recovery Plans for Snake River Fall Chinook	PNNL	165	150	340	110	0	0
9600600	*	Facilitation, Technical Assistance and Peer Review of Path	ESSA	450	450	450	450	450	450
9600800	*	Stufa Participation in a Plan for Analyzing and Testing Hypotheses (Path)	ODFW	698	745	746	750	788	788
9600801	*	Technical Support for Path	NMFS	75	75	75	75	0	0
9601700	*	Provide Technical Support for Path	BioAnalysts, Inc.	27	27	110	110	110	110
9602100		Gas bubble disease research and monitoring of juvenile salmonids	USGS-BRD, CRRL	652	44	45	46	48	49

ProjectID		Title	Sponsor	FY99 recom.	FY00 recom.	Estimated Outyears FY01	FY02	FY03	FY04
9700200	*	Path - UW Technical Support	UW	182	182	302	302	302	302
9701000		PIT Tag System Transition	COE; PSMFC; NMFS-CZES	800	853	0	0	0	0
9701400		Evaluation of Juvenile Fall Chinook Stranding on the Hanford Reach	WDFW	384	217	20	20	20	20
9702400		Avian Predation on Juvenile Salmonids in the Lower Columbia River	OSU/CRITFC	280	643	550	200	0	0
9702600	*	Ecology of Marine Predatory Fishes: Influence on Salmonid Ocean Survival	NMFS/NWFSC	0	0	180	180	180	180
9800100	*	Analytical Support-Path and ESA Biological Assessments	Hinrichsen Environmental Services	120	120	130	135	140	145
9801003	*	Spawning Distribution of Snake River Fall Chinook Salmon	USFWS	126	178	193	0	0	0
9801004	*	M&E of Yearling Snake R. Fall Chinook Released Upstream of Lower Granite	NPT	301	273	275	280	285	290
9801400		Ocean Survival of Juvenile Salmonids in the Columbia River Plume	NMFS/NWFSC	0	0	830	830	700	600
9900300	*†	Evaluate Spawning of Salmon Below the Four Lowermost Columbia River Dams	WDFW, ODFW, USFWS, PNNL		356	404	424	445	467
			Anadromous Fish Totals	**$19,532**	**$22,996**	**$21,929**	**$20,191**	**$20,325**	

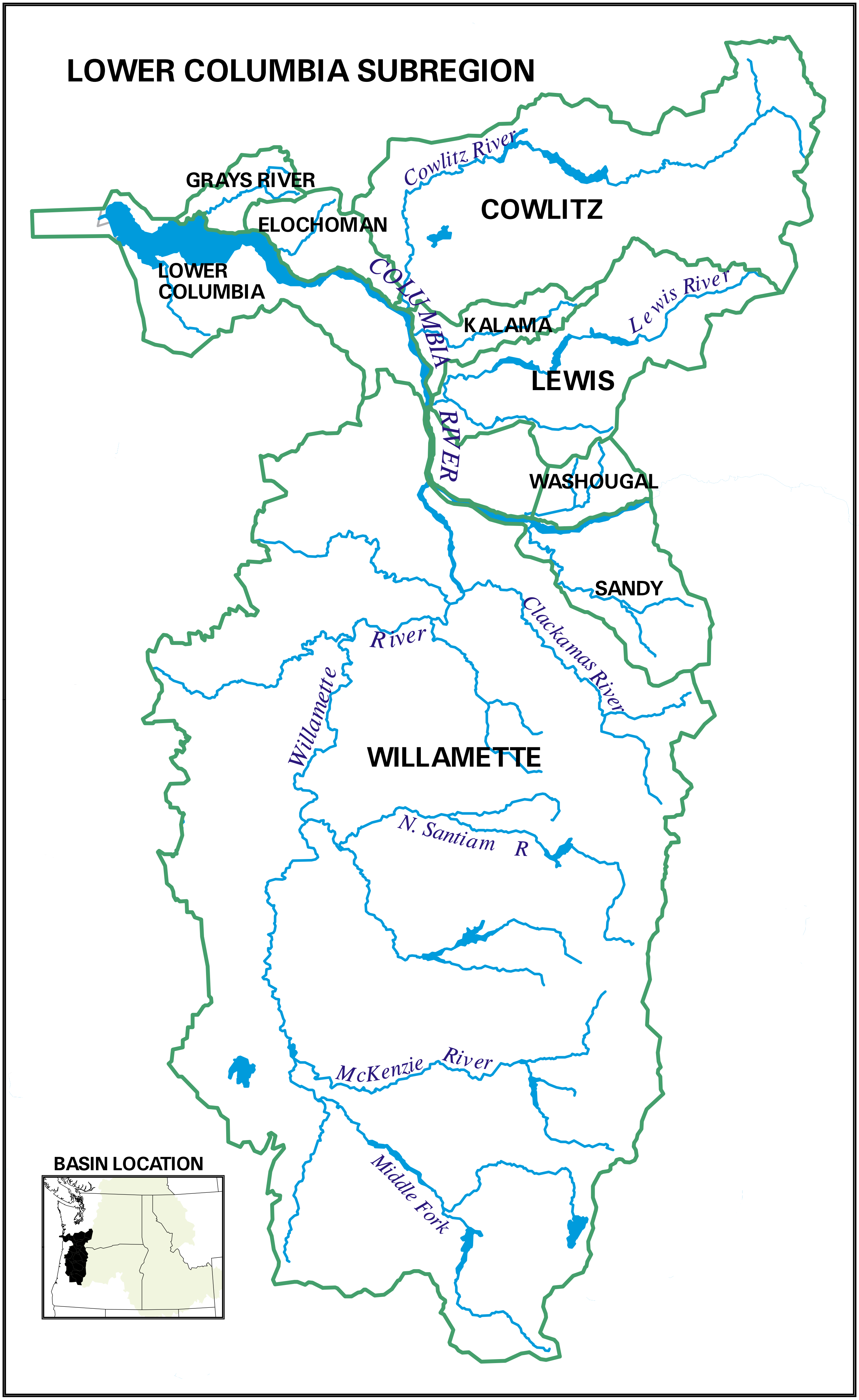
Resident Fish Projects

ProjectID		Title	Sponsor	FY99 recom.	FY00 recom.	FY01	FY02	FY03	FY04
8605000		White Sturgeon Mitigation and Restoration in the Columbia and Snake Rivers	ODFW	1,960	1,919	1,950	1,950	1,500	1,500
9700900		Evaluate Rebuilding the White Sturgeon Population in the Lower Snake Basin	NPT	400	409	410	150	250	260
9902200	†	Assessing Genetic Variation Among Columbia Basin White Sturgeon Populations	U of I		147	152	0	0	0
			Resident Fish Totals	**$2,476**	**$2,512**	**$2,100**	**$1,750**	**$1,760**	

Wildlife Projects

ProjectID		Title	Sponsor	FY99 recom.	FY00 recom.	FY01	FY02	FY03	FY04
20074	†	Eagle Lakes Ranch Acquisition and Restoration	USFWS		287	750	750	400	300
20082		Rainwater Wildlife Area Operations & Maintenance	CTUIR		275	287	301	315	330
20115		Securing Wildlife Mitigation Sites - Oregon, Irrigon WMA Additions	ODFW		25	17	17	15	12
20116		Securing Wildlife Mitigation Sites - Oregon, Horn Butte	ODFW		42	90	85	70	50
9009200		Wanaket Wildlife Mitigation Project Operations & Maintenance	CTUIR	150	200	211	222	235	247
			Wildlife Totals	**$830**	**$1,355**	**$1,375**	**$1,034**	**$939**	
			SUBBASIN TOTALS	**$22,837**	**$26,863**	**$25,404**	**$22,976**	**$23,025**	

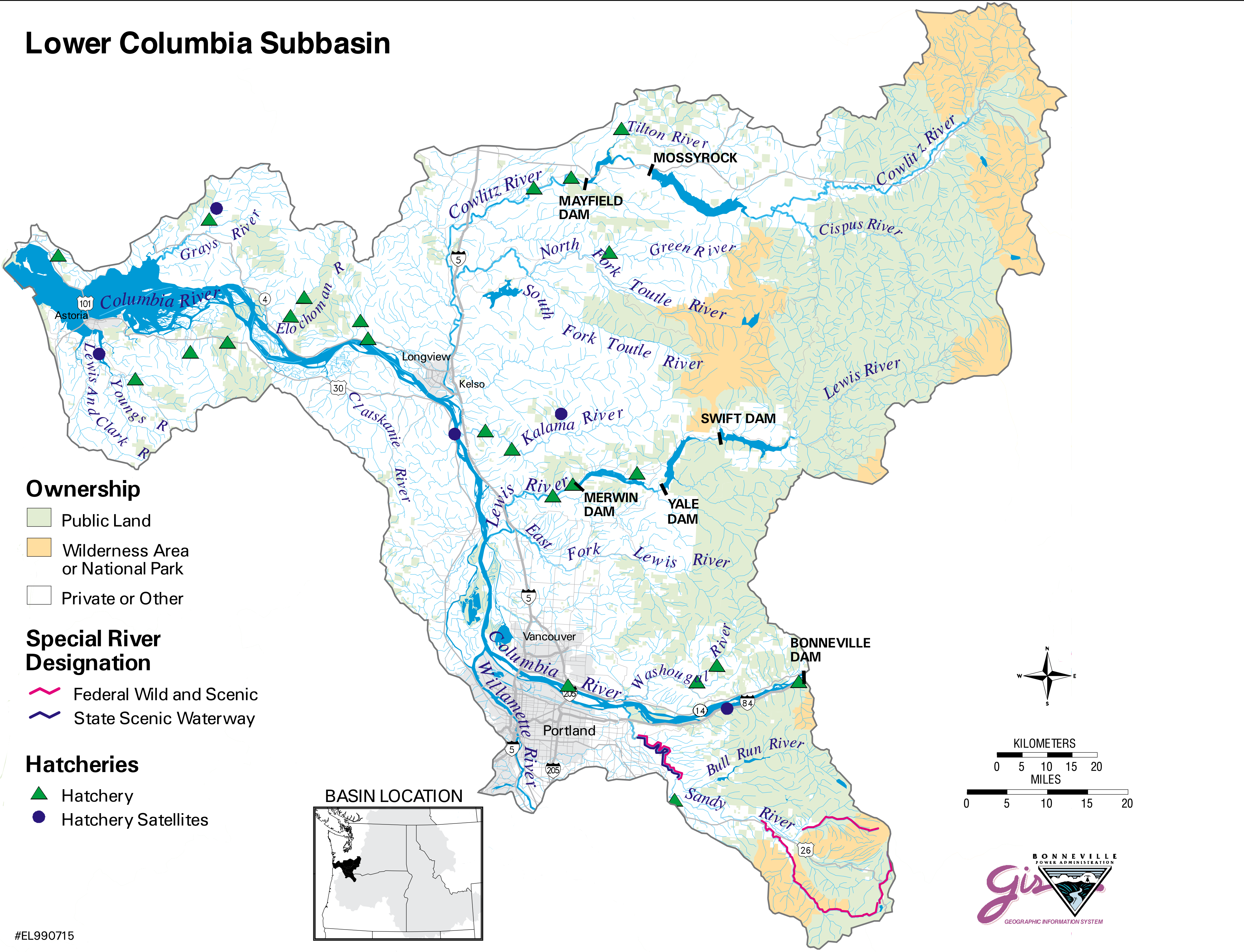
* indicates ESA project, † indicates 'Innovative work'
All figures in thousands of dollars


LOWER COLUMBIA SUBREGION
GRAYS RIVER
ELOCHOMAN
LOWER COLUMBIA
COWLITZ
Cowlitz River
COLUMBIA RIVER
KALAMA
Lewis River
LEWIS
WASHOUGAL
SANDY
Clackamas River
River
Willamette
WILLAMETTE
N. Santiam R
McKenzie River
Middle Fork
BASIN LOCATION

Lower Columbia Subregion

The Lower Columbia Subregion is defined as the Columbia River and its tributaries from the mouth of the Columbia to Bonneville Dam. This subregion covers approximately 17,700 square miles and includes the following subbasins: Lower Columbia Mainstem, Grays, Elochoman, Cowlitz, Kalama, Lewis, Willamette, Washougal, and Sandy.

Lower Columbia Subbasin



Lower Columbia Mainstem Subbasin

Anad fish	3	projects	$1,724
Wildlife	2		149
	5		$1,873

Fish and Wildlife Resources

Subbasin Description

The Lower Columbia River Mainstem Subbasin includes the lower Columbia River mainstem from Bonneville Dam to the mouth; a number of major tributaries north of the Columbia River flowing from the Washington Coast Range and Cascades; a number of smaller tributaries south of the Columbia River flowing from the Oregon Coast Range; small steep gradient streams in the Columbia River Gorge; and the Sandy River flowing from Mount Hood in Oregon, north to the Columbia River. While the smaller tributaries entering the Columbia River from Oregon provide important habitat to a number of fish and wildlife species, only the mainstem, Washington tributaries, and the Sandy River in Oregon are addressed in this summary.

The mainstem from Bonneville Dam to the ocean has a very low gradient and is subject to tidal action. The daily tidal influence on water levels under low water conditions is one to two feet at Bonneville Dam and seven to nine feet at Astoria. The lower mainstem is one of only two free flowing sections of the Columbia River. This portion of the Columbia River is used by all populations of Columbia Basin adult and juvenile salmonids as a migration corridor. The mainstem of the Columbia is an important production area for white sturgeon, fall chinook and chum salmon, and eulachon (Columbia River smelt). The estuary is an important rearing area for many species of fish. Numerous islands in the mainstem provide important shoreline aquatic habitat and wintering and nesting habitat for waterfowl and other birds. Major urban metropolitan areas exist on both shores of the lower Columbia, including extensive marine industrial development. The main channel is routinely dredged to maintain access to deep draught port facilities.

Major tributaries in Washington include the Grays, Elochoman, Cowlitz, Kalama, Lewis and Washougal rivers. The Grays and Elochoman rivers originate in the rugged steep canyons of the Willapa Hills, which are a part of the Washington Coast Range. These streams enter the Columbia River from river mile (RM) 21 to 38. The combined basins encompass a drainage area of approximately 200 square miles. To the east are the Cowlitz, Kalama, and Lewis subbasins, which drain the west slopes of the Cascade Mountains. These systems enter the Columbia River from river mile (RM) 68 to 88. The combined drainage area of these subbasins is approximately 4,000 square miles. Finally, the Washougal River flowing from the Cascade foothills enters the Columbia River at RM 121. The drainage area is approximately 240 square miles.

The Sandy River is located in Multnomah and Clackamas counties in northwest Oregon and originates from the Reid, Sandy, and Zigzag glaciers on the west slope of Mount Hood and joins the Columbia River at RM 121. The river flows for 55 miles from a watershed encompassing 508 square miles. The upper reaches of the Sandy and its tributaries flow from mountainous terrain forested by coniferous trees. Important species of fish in the Sandy Basin include winter steelhead, coho, spring and fall runs of chinook salmon, and cutthroat trout.

Fish and Wildlife Status

With the beginning of large-scale logging, farming and urban development in the early 1900s and continuing to the present and the development of major hydroelectric dams from the 1930s to the 1960s, came the decline of wild anadromous and resident fish populations. Hatcheries in these river systems have replaced most of the natural salmonid production under a federal mitigation plan known as the Mitchell Act. Major hatchery complexes have been constructed which produce chinook, coho, steelhead, cutthroat, kokanee and catchable trout, to compensate for lost natural production. Funding is primarily by private and public utilities but also includes federal and state sources. In 1992 the state of Washington Department of Fish and Wildlife published the Washington State Salmon and Steelhead Stock inventory which classified most wild lower Columbia River salmonid stocks as “depressed”. In the 1990s a combination of ocean environmental and in-stream habitat factors come together to further depress anadromous populations to the point, where in 1998 and 1999, four lower Columbia River stocks were listed as “threatened”.

The subbasin management targets include all species of anadromous fish originating from upstream tributaries of Oregon, Washington and Idaho, which utilize this subbasin as a migration corridor. These include spring, summer and fall chinook salmon, sockeye salmon, coho salmon, chum salmon, winter steelhead, summer steelhead, Pacific lamprey, and white sturgeon. Mainstem management targets all races and origins of these stocks. ESA listed stocks which utilize this subbasin as a migration corridor are Snake River spring, summer, and fall chinook and Snake River steelhead; Mid-Columbia chinook and steelhead; Lower Columbia chinook, coho, and chum salmon; and Willamette River spring chinook and winter steelhead.

Anadromous fish

Spring/Summer Chinook – Spring and summer chinook utilize this subbasin as a migration corridor on their up- and downstream migration to Snake and Columbia river tributary streams. Spring chinook are present, actively migrating in this subbasin as juveniles and/or adults, from March through June. Snake River spring/summer chinook salmon and Willamette River spring chinook salmon are listed as threatened under ESA. Upper Columbia River spring chinook salmon are listed as endangered.

Fall Chinook - While most mainstem spawning occurs above Bonneville Dam, an important population spawns below Bonneville Dam. Fall chinook Columbia mainstem spawning is currently limited to about 5,000 fall chinook salmon downstream from Bonneville Dam. Snake River and lower Columbia River fall chinook are listed as threatened under ESA.

Chum - Historically, chum salmon were abundant in the lower reaches of the Columbia River and may have spawned as far upstream as the Walla Walla River (over 500 km inland) (Nehlsen et al. 1991). Columbia River chum salmon currently are primarily limited to the tributaries downstream of Bonneville Dam, with the majority of the fish (less than a thousand annually) spawning on the Washington side of the Columbia River. Chum salmon spawning has been documented in the mainstem Columbia River between Ives and Hamilton islands, below Bonneville Dam. Known natural chum salmon production occurs in Grays River (Gorley Creek), Hamilton Creek, and Hardy Creek. Hardy and Hamilton Creeks are the farthest upstream chum populations at RM 142 (Bonneville Dam is RM 145). Chum salmon are listed under ESA as threatened.

Sockeye Salmon – Sockeye salmon utilize this subbasin as a migration corridor and originate in the Okanagon and Wenatchee rivers in the mid-Columbia and in Altruas and Redfish lakes in the Salmon River Basin. Snake River sockeye salmon are listed as endangered under ESA. Okanagon and Wenatchee populations are depressed.

Coho – Coho salmon utilize this subbasin primarily as a migration corridor. The stock is primarily of hatchery origin with a few naturally produced fish in tributary streams below and above Bonneville dam. For Washington hatcheries, the majority of hatchery coho production is composed of early returning Toutle River stock and late returning Cowlitz River stock. Oregon hatcheries produce an early returning stock of coho. Naturally produced lower Columbia River coho populations are being reviewed for listing status and have high potential to be listed under ESA.

Winter steelhead – Winter Steelhead utilize the mainstem as a migration corridor and spawn and rear in lower mainstem tributaries. Lower Columbia, mid Columbia, and upper Willamette winter steelhead have been listed as threatened under ESA.

Summer Steelhead – Summer steelhead utilize this subbasin as a migration corridor. Mid Columbia and Snake River populations have been listed as threatened under ESA. Upper Columbia River summer steelhead populations have been listed under ESA as endangered.

Other anadromous fish - Smelt populations, although not listed or proposed for listing are currently depressed. Pacific Lamprey use the lower mainstem as a migration corridor. Status of Pacific lamprey populations in tributaries of the lower mainstem is unknown. Sea-run cutthroat trout spawn in lower mainstem tributaries and are proposed to be listed under ESA as threatened.

Resident fish

The white sturgeon population below Bonneville Dam is stable and supports important recreational and commercial fisheries. This population also supports a capture and relocation program to maintain depressed populations above Bonneville Dam. Although listed as a resident fish for the purpose of NWPPC program classification, lower Columbia River white sturgeon are anadromous and support coastal fisheries from Puget Sound to southern Oregon. A transitory population of green sturgeon is present in the lower Columbia River. Bull trout inhabit the Lewis River in Washington and are listed as threatened under ESA.

Wildlife

A variety of wildlife species, including large and small mammals, waterfowl, passerines, raptors, reptiles, and amphibians, are associated with the Lower Columbia mainstem subbasin riverine/riparian, wetland, and upland habitats. The status of wildlife populations vary throughout the basin and by species. Many species are listed as Federal and/or State Threatened, Endangered, Sensitive or At-Risk. For example, Columbian white-tailed deer (*Odocoileus virginianus leucurusn*) populations, historically abundant in Lower Columbia River mainstem riparian deciduous forest habitat, are currently very low. Certain populations of wildlife species are being managed by federal and state wildlife managers throughout the subbasin, including big game, furbearers, upland birds, and waterfowl species. For example, tern populations in the Lower Mainstem Columbia River area have recently been on the rise due to the increases in the amount of suitable breeding and nesting habitat. The Sandy River Delta River area in Oregon supports a large population of herpetiles.

In Washington, deer observation counts were conducted August-September 1998. As in past years, fawn:doe ratios increased as summer progressed. The mean value of fawns/doe was similar to 1997. The 1998 mean is well below historical productivity data for the subbasin.

The 1998 duck production survey data indicated a six percent decrease in total number of broods seen over 1997. The total number of nests found on the Lower Columbia has remained stable since about 1988. The geese populations at Bonneville have been on the decline. The 1997-98 midwinter waterfowl inventory was completed by WDFW and U.S. Fish and Wildlife Service personnel. During the 1980s, ducks declined in the Pacific Flyway midwinter survey from about 7,000,000 in the 1970s. This year's numbers increased from 5,473,691 in 1996-97 to 6,607,263 in 1997-98.

Habitat Areas and Quality

A key factor limiting fish and wildlife resources in the mainstem lower Columbia River has been development of the hydrosystem further upstream. The rapid decline of Pacific salmon after mass immigration of Europeans to the Columbia River basin has been associated with the cumulative effects of habitat loss and degradation, hatchery practices, overexploitation, and impediments to upstream and downstream movement from dams. Dams and impoundments altered flow and temperature patterns, reduced available spawning habitat, and increased mortality of juvenile salmonids due to passage through turbines and predation. Habitat improvement programs and severe restrictions on commercial fishing allowed runs to rebound during the 1950s and early 1960s; however, continued habitat degradation and hydrosystem development during the 1970s in the upper Columbia and lower Snake rivers caused major declines in upriver stocks. Development of the hydrosystem has resulted in a white sturgeon population or collection of populations that are less productive than the population was historically. White sturgeon that once moved freely within the Columbia and Snake rivers and between the rivers and ocean are now at least partially blocked by dams.

In the lower Columbia mainstem, habitat has been altered by flow regulation, channel modification, diking, dredging, and point and non-point sources of pollution. Fish are impacted below Bonneville Dam by gas supersaturation caused by uncontrolled spill and daily and seasonal fluctuations in flows. Fall chinook and chum salmon are negatively impacted when flows are regulated in a way that dewaters spawning grounds and strands juveniles. Upstream passage of all adult salmon and steelhead is affected by water temperatures and dam operations. Mainstem sturgeon habitat is negatively affected by maintenance of shipping lanes through dredging. Recruitment of large woody debris to the Columbia River estuary has decreased due to dam construction, forestry practices, and flood control in the mainstem and its tributaries, diminishing the quality of juvenile rearing habitat, production of forage, and refuge from predation. The Columbia River plume has been impacted by operation of the Federal Columbia River Hydro System.

Most of the historic range of anadromous fish including, chinook, coho, chum, steelhead, and cutthroat remains accessible in the Grays, Elochoman, Kalama, and Washougal rivers in Washington, and the Sandy River in Oregon, although habitat has been degraded due to extensive logging in the headwater areas, and farming and urban development in the lowlands. Only a small fraction of the historical anadromous fish habitat remains accessible in the Cowlitz and Lewis rivers, by far the largest tributaries in the lower Columbia mainstem subbasin, due to the construction of six major hydroelectric dams. The eruption of Mt. St. Helens in 1980 and the resulting devastation of habitat in the North Toutle River, followed by the construction of the Sediment Retention Dam by the Corp of Engineers, has severely impacted natural salmonid production. Small drainages supporting naturally produced anadromous and resident fish populations within the subbasin include Skamokawa, Mill, Abernathy, Germany and Salmon Creeks in the westerly and central areas of the sub-region and Hardy and Hamilton Creeks near Bonneville Dam, at the eastern border. These streams suffer variously from the effects of logging, farming, and urbanization.

In lower Columbia tributaries, the decrease in vegetative ground cover as a result of logging, roadbuilding, cattle grazing, and development allows rapid runoff of rain and snow causing erosion and increased sedimentation and temperature in most fish bearing streams. Increases in peak runoff also causes substantial stream bedload movement, channel changes, and flushing of large woody debris from the stream systems . Construction of hydroelectric dams on the Cowlitz and Lewis Rivers has blocked access to historic anadromous fish habitat and has created reservoirs that contribute to increases in water temperature. Relatively good anadromous salmonid production habitat remains in the Lewis River subbasin including Cedar Creek, a tributary of the mainstem Lewis River (also known as the North Fork) and the upper East Fork Lewis River. Although presently not volitionally accessible by anadromous salmonids, the upper Cowlitz River and the Cispus River upstream of hydro-dam development have generally been described as having good remaining spawning and rearing habitat. Spawning channels to boost chum production have been constructed in the Grays River subbasin (Gorley Creek) and in Hamilton Creek (spring channel) near Bonneville Dam. USFWS is developing a plan for chum spawning area enhancement in Hardy Creek.

Development of the hydrosystem has also affected many species of wildlife. Wildlife are associated with riverine and adjacent riparian forest, wetland, island, mixed coniferous and deciduous forest, and agricultural habitats in the Lower Columbia River mainstem subbasin. Although the quality of these habitats varies throughout the basin and within habitat type, habitat has generally been degraded due to hydropower development, past and present land management activities, the spread of non-native plant species, and urban expansion. Bottomlands and riverine habitats along the mainstem Columbia River have been dramatically altered through dredging, dikes, and flood control levees. Habitat lost to the construction of hydroelectric facilities was home to many interdependent species. Floodplain and riparian habitats important to wildlife were inundated when reservoirs were filled. Activities associated with hydroelectric development and operation, such as fluctuating water levels, have altered land and stream areas that affect wildlife. In some cases, dam operations have created barren vegetation zones, which expose wildlife to increased predation. Other activities related to hydroelectric development (e.g., road construction, the draining and filling of wetlands) have altered land and stream areas in ways that affect wildlife. In some cases, the construction and maintenance of power transmission corridors altered vegetation, increased access to and harassment of wildlife, and increased erosion and sedimentation in the Columbia River and its tributaries. Other impacts to wildlife and wildlife habitats along the mainstem river area caused by hydropower construction and operation include irrigation, agricultural practices, livestock management practices, human development, forest management practices, noxious weeds, and the loss of prey base for certain wildlife species. Any of these influences can be, and are, limiting factors to local wildlife populations. Changes in local populations can affect species integrity on a larger scale.

Increasing urbanization is resulting in a loss of quality deer habitat and an increase in deer/human conflicts. An increase in residential development along the Lewis River drainage is degrading the quality of black-tailed deer winter range. This winter range loss is being addressed in both the WDFW's Integrated Land Management program for the Lewis River watershed, and in mitigation agreements concerning the three major hydroelectric projects (Merwin, Yale and Swift reservoirs) on the Lewis River. The WDFW's Cowlitz Wildlife Area has on-going, long-term management practices designed to benefit black-tailed deer habitat.

The Lower Columbia Mainstem subbasin faces significant loss of elk habitat through a number of different avenues: (1) loss of both summering and wintering habitat on U.S. Forest Service lands due to establishment of extensive Late Successional Reserve (LSR) areas; and (2) loss of additional winter range along the Lewis River watershed, due to increased residential development along Merwin, Yale and Swift reservoirs. Loss of elk habitat due to LSR establishment is expected to approach 41 percent.

Mitigation for the loss of winter range along the Lewis River watershed has been addressed in the Merwin Wildlife Management Plan. The plan is a cooperative management agreement for Merwin Reservoir between Pacificorp and WDFW. Degradation of significant wintering habitat is also occurring along the North Fork of the Toutle River, specifically along the mudflow within the St. Helens Wildlife Area.

Watershed Assessment

Many reports and projects have been initiated to characterize the state of natural resources within the Lower Columbia River mainstem subbasin. The Columbia Tributaries East Watershed Analysis (USFS 1998) shows that Bonneville Dam inundated most of the floodplain habitat in the Columbia Gorge. A watershed analysis of the Sandy River Delta (USFW 1994) determined that floods in the 200,000 cfs range are uncommon in the delta area. The area's natural disturbance regime was altered by the dam system, and the land has been cleared, drained, diked, grazed, seeded, and invaded by undesirable species. Studies conducted by Ducks Unlimited also show that an increasing trend has been the conversion of remaining flat alluvial plains to hardwood crops, trees grown for commercial purposes. The Oregon Trust Agreement Planning Project (BPA 1994) and GAP Analysis Project (ODFW 1997) identified gaps in biodiversity, needs for habitat protection, and a prioritized project list of potential habitat restoration opportunities in the Lower Columbia Mainstem Subbasin. In the mid 1980s, BPA funded assessments to measure the losses of wildlife and wildlife habitat caused by the dam construction and reservoir inundation. This involved the characterization of habitats in the vicinity of Bonneville Dam and Reservoir (Rasmussen and Wright, 1990). These assessments, based on Habitat Evaluation Procedures, take into account habitat quality and quantity, showed that many acres of lands and river were inundated, altered, or affected, and that 12,317 Habitat Units were lost as a result of Bonneville Dam construction and inundation.

In Washington, limited watershed assessments using varying techniques have been conducted. The U.S. Forest Service (USFS) has conducted watershed analyses on the upper Cowlitz and Cispus Rivers. Weyerhaeuser timber company has conducted an assessment of the upper Coweeman River. Washington Department of Fish and Wildlife (WDFW) has conducted very limited watershed assessment in the Kalama and Lewis subbasin that did not include in-stream habitat. The Cowlitz-Wahkiakum County Conservation District has conducted stream-reach analyses. Clark County has conducted fish passage surveys primarily to identify problem road culverts. Surveys of Washington state highway culverts have also been conducted.

The WDFW, the USFS, and Clark County Conservation District are planning to conduct fish passage surveys in the Lewis River watershed during the summer of 1999. The WDFW is planning to conduct fish (snorkel), in-stream and riparian habitat surveys in the East Fork of the Lewis River during this same time frame.

Watershed assessments have also been conducted for the Sandy River system and other Oregon streams tributary to the Columbia River. The USFS has completed watershed analyses for the Sandy River Delta, the upper Sandy River, and the Salmon River. ODFW's Sandy River Basin Fish Management Plan summarizes information on fish populations and habitat in the system, and lists needed actions for effective management of these populations. The USFS has also completed watershed analyses for Oregon streams in the Columbia River Gorge National Scenic Area.

Limiting Factors

Dams have caused juvenile fish to be more vulnerable to predation by reducing water turbidity, creating hydraulic conditions at dams that favor predators, slowing velocities and increasing travel times which increases exposure to predators and delay ocean entry. Increasing dissolved gas levels result in trauma to migratory and resident fish, and benthic organisms. Increased water temperatures result in increased disease and mortality in all aquatic species.

Adult fish experience delay and injury during upstream dam passage. Operation of the hydropower system to meet power objectives is contrary to the spawning incubation and rearing needs of anadromous fish. The operations of the hydrosystem for flood control have substantially altered the estuary and near ocean environments to the detriment of anadromous fish and native wildlife.

The construction of and operation agreements for dams in the United States and Canada upstream of the subbasin has altered the natural flow through this subbasin, greatly impacting the migration habitat. This has been to the detriment of downstream migrant survival and natural spawning and production in the mainstem. Federal and non-federal irrigation storage projects and irrigation withdrawals upstream of this subbasin have reduced flow through the subbasin particularly in the summer period. Irrigation withdrawals directly occurring in this subbasin and expansion of groundwater pumping are emerging as a potential limiting factor during the summer period.

In lower mainstem tributaries, lack of access to historical spawning and rearing habitat due to road culvert blockages and hydroelectric dam construction and operation is one of the primary limiting factors for anadromous fish production, particularly for fall chinook and chum salmon in the Ives and Pierce Island area. Additionally identified, has been excessive fine sediment; high winter and low summer flows; high stream temperature; lack of channel and floodplain complexity; and reduced riparian habitat. Chum salmon populations are limited by the amount of spawning habitat available to them. For example, a U.S. Fish and Wildlife Service (USFWS) watershed analysis has identified the total spawning length of the spawning area in Hardy Creek to be <0.4 mi.

Wildlife abundance is currently limited by the results of past hydropower development (e.g., habitat loss and degradation, the decrease in fish abundance), past and current land management practices (e.g., irrigation, logging, livestock and agricultural practices, road constructions, mining), the spread of non-native plant and wildlife species, and urban expansion. For example, increasing development in the Portland-Metro area continues to eliminate remaining wildlife habitats. Land prices continue to rise, making it more economically difficult to preserve remaining undeveloped lands for wildlife. Existing wetlands are often choked by reed canary grass, a non-native species that reduces the diversity and quality of habitat, negatively impacting many species of wildlife. Continued water use practices affect water quality and quantity, also limiting wildlife. Continued declines in salmon and other fish species results in a loss of overall biomass being contributed to the subbasin. This reduction has negative effects on wildlife abundance.

Subbasin Management

Goals, Objectives and Strategies

<u>Fish</u>

The primary native anadromous fish species targeted for active management in the lower Columbia mainstem subbasin include all chinook, coho, and chum salmon, winter and summer steelhead, sea-run cutthroat trout, Pacific lamprey, smelt, and white sturgeon that use the mainstem as a migration corridor, spawn and rear in the mainstem, and spawn in the tributaries. The primary native resident fish species targeted for active management include bull trout, rainbow trout, cutthroat trout, and whitefish. The goal for these fish species is to restore sustainable, naturally producing populations to support tribal and non-tribal harvest and cultural and economic practices while protecting the biological integrity and the genetic diversity of the watershed. Objectives for the lower mainstem Columbia subbasin are: (1) improve survival for resident and anadromous adult fish; (2) improve survival for resident and anadromous juvenile fish; and (3) restore depressed populations to productive levels.

Strategies to meet these objectives are: (1) protect and restore habitat for salmonids by providing necessary flows through dam operations, (2) decrease predation on juvenile salmonids, (3) develop escapement goals necessary to protect listed or depressed stocks and ensure adequate hatchery escapement, (4) apply CWT marks to all major salmonid stocks released from hatcheries in the Columbia River basin, (5) develop fisheries in select areas of the Columbia River that target hatchery-produced salmonids while avoiding impact on listed stocks, (6) monitor fisheries harvesting listed or depressed stocks to ensure that harvest impacts do not exceed ESA limits, (7) use life cycle model to quantify effects of various management strategies on recovery of listed or depressed stocks, (8) protect and restore habitat for resident fish, including white sturgeon, by providing necessary flows through dam operations, and (9) use supplementation and artificial propagation to increase abundance of populations depressed by poor reproduction.

Wildlife

The overall wildlife mitigation goal for the Columbia River Basin is to achieve and sustain levels of habitat and species productivity in order to fully mitigate for all wildlife and wildlife habitat losses caused by the development and operation of the hydropower system (NWPPC 1995). This goal applies to the Lower Columbia Mainstem Subbasin. Within this subbasin, the wildlife mitigation goal is to be achieved by fully mitigating for losses associated with Bonneville Dam.

The wildlife mitigation objective is to maintain and restore populations of wildlife native to the Lower Columbia Mainstem Subbasin. Inherent in this objective is the need to address those target species selected to represent the cover types within the subbasin, and those habitat types considered priorities within the subbasin (i.e., riverine/ riparian, old growth forest, wetlands, coniferous forest). The wildlife mitigation objective is based on the Northwest Power Planning Council's accepted wildlife losses measured in Habitat Units (HUs) for Bonneville Dam (12, 317 HUs) for selected target/indicator species linked to priority habitats. The priority habitat types for wildlife are riparian/riverine, wetlands and old growth forest.

The following strategies will achieve wildlife mitigation objectives within the Lower Columbia Mainstem subbasin:

- Identify potential protection and enhancement projects within the Lower Columbia Mainstem subbasin through the GAP Analysis and coordinate implementation of activities through the Oregon Wildlife Coalition.
- Implement land acquisition and easements of priority habitats.
- Implement enhancement and restoration activities (e.g., control of non-native plant species, management of livestock grazing practices for native plant communities).
- Monitor and evaluate wildlife habitat and wildlife species' response to implemented enhancement activities within the Lower Columbia Mainstem subbasin.

Tributaries in Washington

Goals and objectives specific to legal and policy mandates in the State of Washington guide management activities in Washington tributaries. As expressed in the recently adopted WDFW Wild Salmonid Policy (WSP), the goal is to "protect, restore, and enhance the productivity, production and diversity of wild salmonids and their ecosystems to sustain ceremonial, subsistence, commercial and recreational fisheries, non-consumptive fish benefits and other related cultural and ecological values." Further the WSP identities 16 policy components to help achieve this goal including, harvest, habitat, hatchery, genetic diversity, ecological, access and passage. Similarly the WDFW Lower Columbia Steelhead Conservation Initiative (LCSCI), has a goal " to restore healthy salmon, steelhead and trout populations by improving those habitats on which the fish rely." This Initiative has identified and prioritized specific objectives under the headings of habitat, fish management, dams/hydropower, and local governments and other partners. The LCSCI was created by the Washington Joint Natural Resources Cabinet and local partners after the proposed listing of steelhead on the lower Columbia. It forms the recovery plan for steelhead and other listed and at-risk salmonids. Local partners in salmon recovery including representatives of the five southwest Washington counties (Clark, Cowltiz, Wahkiakum, Lewis and Skamania) have formed the Lower Columbia Fish Recovery Board. This group solicits and reviews proposals for habitat-based fish restoration projects for funding with state and federal based salmon restoration funds.

Past Efforts

Progress has been made in carrying out the subbasin strategies for the Columbia and Snake rivers subbasin. Past accomplishments are described in terms of contribution to and provision for a basis for short term, day-to-day fish passage management and hydrosystem management decisions, which include monitoring, and information necessary for long term mitigation decisions, including research. Included in both of these categories is information necessary for implementation of Biological Opinion measures on an annual basis and monitoring results of implementation of management actions. It is important to note that accomplishment of these subbasin objectives can only be on an incremental basis. The accomplishment of any of the subbasin objectives will be the result of the cumulative implementation of the combined strategies over long periods of time. Many individual projects together contribute to implementation of individual strategies or to several strategies. Some of the projects described below are implemented in both the Lower Columbia River Mainstem Subbasin and reaches upstream of Bonneville Dam. These projects are also described in the Mainstem and Systemwide summaries

Individual projects (9602100, 940330, 8401400, 9008000,)[7] have contributed to the strategies for provision of flows and spill for dam passage, and implementation of data collection and management systems for fish passage and hydrosystem management decisions. A long term consistent and continuous data base has been developed and provided to the region, including the public, on a daily basis to provide a basis for day-to-day fish passage and mitigation decisions. Gas bubble trauma symptom monitoring data has been produced which provides the basis for the spill for fish passage measures contained in the Biological Opinion. These data have provided a basis for longer-term analysis of mitigation decisions such as the NMFS Biological Opinion. These projects have also provided data to the life cycle modeling strategies to implement objectives 1 and 3. The data and analysis conducted through these projects also contribute to research and evaluation, specifically evaluating the response of the fish migration to implementation of hydrosystem mitigation measures, such as spill and flow. Data on smolt to adult return rates developed through these projects has contributed to life cycle modeling and assessment of mitigation measures now in place. Some of these projects such as the PIT Tag data system are utilized in implementing most of these strategies, wherever the PIT Tag data system is utilized. The long-term database has provided the foundation for management decisions on a daily and annual basis.

Three projects (#9007700, #9007800, and #9702400)[8] have been implemented to control predators on juvenile salmon and steelhead migrating through the subbasin. Through these projects, bird and fish predator populations have been assessed. These assessments have led to management actions, such as the Rice Island Caspian tern relocation project and the northern pike minnow removal project to reduce and control the populations of predators and their impact on juvenile salmon and steelhead migrating through the subbasin.

One project (#9900300)[9] has been conducted to implement the subbasin objective to protect and improve mainstem spawning, rearing and incubation of fish in the lower mainstem Columbia River. This project targets discreet populations of naturally spawning salmon in the subbasin. This project has collected life history, migration spawning and emergence data which are used to develop specific hydrosystem operations to provide access and protection of these stocks during spawning, incubation and emergence. Spawning elevations and emergence timing are used to enhance survival of naturally spawning stocks by eliminating or reducing the potential for dewatering and stranding redds and emergent juveniles. Flow levels and fluctuation limits have been determined from the data developed through these projects.

Six projects (#9306000, #8906900, #8201300, #9600800, #8712702, #8810804)[10] provide analyses and data utilized in implementing the subbasin objectives to increase returns of hatchery and naturally produced salmonids to the Columbia Basin. Development and monitoring of select open fisheries contributes to recreational and commercial fisheries, while minimizing harvest impacts to weak and listed populations. Comparative survival rate studies evaluate stock performance in selected reaches of the Columbia and Snake basins, including the Lower Columbia River Mainstem (represented by Cowlitz Hatchery spring chinook). Life cycle analysis has provided valuable assessment of recovery options for ESA listed stocks. Coded Wire tagging has provided data for evaluating the return of hatchery and supplementation populations and provided data for run reconstruction analysis. PATH analysis has provided integration of basin-wide research, monitoring and a quantitative framework to assess future management and mitigation options.

Numerous management activities have been occurring in the Lower Columbia Mainstem subbasin, many of which are sponsored by agencies and organizations other than BPA. For example, the Lower Columbia River Ecoregion has the highest concentration of Ducks Unlimited (DU) projects in Oregon and Washington combined. DU projects have focused on expanding public refuges in both Oregon and Washington, and developing seasonal and permanent

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[7] 871207-Comparative Survival Rate Study, 9602100-Gas Bubble Disease Research and Monitoring of Juvenile Salmonids (one task), 940330 The Fish Passage Center, 8401400-Smolt Monitoring Program Tagging, 9008000-Columbia Basin PIT Tag Information.

[8] 9007700-Northern Pike Minnow Management Program, 9007800-Evaluate Predator Removal: Large Scale Pattern,9702400-Avian Predation on Juvenile Salmonids in the Lower Columbia River.

[9] 9900300-Evaluate Spawning of Salmon Below the Four Lowermost Columbia River dams.

[10] 9306000-Evaluate Columbia River Select Area Fisheries, 8906900-Annual Coded Wire Tag Program, 8201300-Coded Wire Tag Recovery Program, 9600800-PATH-Participation by State & Tribal Agencies, 8810804-Streamnet, Aquatic Information Network.

marshes on refuges. Since 1988, DU has invested $151,800 in the Vancouver Bottoms and floodplain habitat in Oregon and Washington. These dollars have leveraged $529,700 and have helped restore and enhance nearly 3,570 acres. The USFS and DU are working with BPA to restore wetland and riparian forest habitats in the Sandy River Delta area. In January, 1999, the USFS developed a habitat management plan for this project area. Site preparation began in October, 1998, and vegetation planting began in December 1998. BPA will receive Habitat Units from this work to be credited against wildlife losses at Bonneville Dam.

The Oregon Wildlife Coalition is implementing a programmatic mitigation project that may result in the implementation of mitigation projects within the subbasin. The goal of this project, Securing Wildlife Mitigation Sites in Oregon (Project No. 9705900), is to:

- Fund project coordination activities to identify, plan, propose, and implement wildlife mitigation projects within the Lower Columbia mainstem subbasin.
- Prioritize potential mitigation projects within Lower Columbia mainstem subbasin.
- Acquire or ease lands with priority habitats within Lower Columbia mainstem subbasin.
- Enhance acquired or eased lands through alteration of land management practices, active restoration of habitats, control of noxious weeds, control of public access, etc. to provide benefits to target/indicator wildlife species and priority habitats within the Lower Columbia mainstem subbasin.

In Washington's portion of the Lower Columbia Mainstem Subbasin, BPA is providing funding for one wildlife mitigation project, the Vancouver Lowlands Wildlife Area. WDFW's mitigation objective for this project is to restore and enhance habitat lost by the construction of John Day, The Dalles and Bonneville hydroelectric dams. It is estimated BPA will receive 1,524 Habitat Units as credit against their mitigation debt at Bonneville Dam. WDFW is required to prepare a mitigation plan identifying the specific restoration strategies. The Plan will be developed during FY2000. In 1993, WDFW conducted HEP to measure the habitat quality for selected indicator species on the Vancouver Lowlands Wildlife Mitigation Area. A preliminary Environmental Assessment (EA) (DOE/EA-0964) was prepared in March 1995 to determine whether any impacts might be significant. The EA showed that impacts could be significant on the cultural resources known to exist within the Vancouver Lowlands. Therefore BPA determined that and Environmental Impact Statement (EIS) was required. In March 1996, BPA published a Notice of Intent to prepare an EIS on the Vancouver Lowlands Wildlife Mitigation project. In August 1996, BPA issued an environment clearance memorandum allowing WDFW to proceed with acquisition of properties in the Lowlands. The EIS for the Vancouver Lowlands Mitigation Project was halted and the project was subsequently included in the Wildlife Mitigation Program EIS (DOE/EA-2046) with the Record of Decision published in March 1997. A cultural resource survey was completed in August 1997 and was filed with BPA and the Washington State Office of Archaeology and Historic Preservation. One acquisition was completed in 1998. Two other properties are in the process of being appraised

Research, Monitoring and Evaluation

Monitoring and evaluation are implemented in this subbasin through a group of system-wide programs of data collection and research. The Smolt Monitoring program (Project No. 8712700) collects consistent and continuous adult and juvenile fish passage data on a daily basis. This provides an information base for short- and long-term hydrosystem and fish passage decisions. The SMP is closely coordinated with the Comparative Survival (Project No. 8712702) study of spring chinook, which is designed to produce smolt to adult survival data. Monitoring of management and mitigation activities through the Smolt Monitoring Program allows an assessment of the fish passage impact of specific hydrosystem operations such as flow and spill. Research projects are designed to determine the impact of specific hydrosytem operations on fish passage and spawning, emergence and rearing of naturally produced fish in the subbasin. Specific project research is conducted and funded by the Corps of Engineers. In addition to the short-term management applications, these data are applied to life cycle modeling analysis and retrospective analysis.

Currently four BPA funded fish and wildlife programs operate within the Lower Columbia mainstem subbasin; Northern Pike Minnow, Coded-wire Tag Recovery, Select Area Fisheries Evaluation, and Fall chinook and chum evaluation below Bonneville Dam. An additional non-fish and wildlife BPA-funded project, the Cowlitz Falls Anadromous Fish Reintroduction Program, funds most of the effort to reintroduce anadromous salmonids into the upper Cowlitz watershed. Additional wild and hatchery interaction salmonid stock assessment projects are funded through federal (Mitchell Act-USFS) private (Pacific Corp), public utility (Tacoma Power, Clark PUD) and state sources. Currently studies associated with relicensing of FERC hydropower dams are under way in the Cowlitz and Lewis River subbasins. State and federal (Wallop-Breaux) funds area used to study sturgeon and smelt in the lower Columbia. A major focus of studies has been mainly on collecting basic stock assessment information such as abundance, age and stock composition, which is necessary to perform basic fish management functions such as run size predictions and fishery and escapement modeling. Evaluation of natural production of fall chinook and bull trout is on-going in the Lewis River. Monitoring and assessment of steelhead, coho, chinook and cutthroat was started on Cedar Creek, tributary of the Lewis River.

There are numerous past and current efforts to study game and non-game wildlife species undertaken by federal, state, and tribal biologists as well as university scientists and private individuals and organizations. Wildlife population trends, hunter harvest rates, wildlife habitat use and selection are only a few of the many different types of research and M&E efforts that are being conducted in the subbasin. Efforts to classify vegetation types have occurred (e.g., Gap Analysis), bird surveys are conducted (e.g., neo-tropical birds counts), and aerial big game surveys occur on a regular basis. For example, tern habitat selection and use, movement patterns, and population trends have been studied as they pertain to the birds' predation on juvenile salmonids (Project No. 9702400).

Remaining Work

Work remains to be done in the assessment of smolt to adult survival for steelhead and other races of salmon. Smolt to adult returns need to be assessed in terms of the adequacy of management actions taken to protect these stocks. Natural production documentation in this subbasin, which is limited to fall chinook and chum at this time needs to be assessed. Mainstem production of fall chinook as well as potential production of coho, steelhead and chum in very small direct tributaries to the mainstem should be assessed. The impacts of the hydrosystem including load following and stranding on mainstem natural spawning and emergence in known areas and potential areas needs to be determined.

The options for resolving water quality and water withdrawal issues from this subbasin should be addressed. Means for reducing water temperature and dissolved gas should be implemented. Acquisition of wildlife corridors and habitat and water sources for specific areas need to be pursued as agriculture and other developments increase demand for land and water resources.

Wildlife losses associated with the construction of Bonneville Dam were measured at 12,317 Habitat Units (NWPPC 1995). Only about 10 percent of the Oregon’s HU losses at Bonneville Dam have been mitigated for to date.

Securing Wildlife Mitigation Sites in Oregon (Project No. 9705900): The Oregon Wildlife Coalition will continue to implement this programmatic mitigation project to identify and eventually implement other potential wildlife protection and enhancement projects within the Columbia River Basin. Implementation of projects within the subbasin would help offset the wildlife Habitat Unit (HU) losses still remaining at Bonneville Dam.

Sandy River Delta Riparian Reforestation (Project No. 9902600)/Lower Columbia Wetlands Restoration (Project No. 9902500): The USFS will continue to implement the habitat management plan for the project area. Project tasks include site-preparation, vegetation planting, maintenance and monitoring of seedlings, monitoring of wildlife, and completion of the long-term restoration plan.

The mitigation management plan for the Vancouver Lowlands Wildlife Mitigation project will be completed in FY2000. Once the Plan has been approved by BPA, enhancement efforts will begin. Enhancement activities will be focused on the restoration of wetland, riparian and associated upland habitat as well as restoration of Shillapoo Lake. It is anticipated the two remaining parcels will be acquired in 1999.

Other remaining work tasks within the Lower Columbia mainstem subbasin include assessment and mitigation of hydropower system operational losses, development and implementation of a Monitoring and Evaluation Plan, and development of both HEP-based and non HEP-based monitoring success criteria.

Subbasin Recommendations

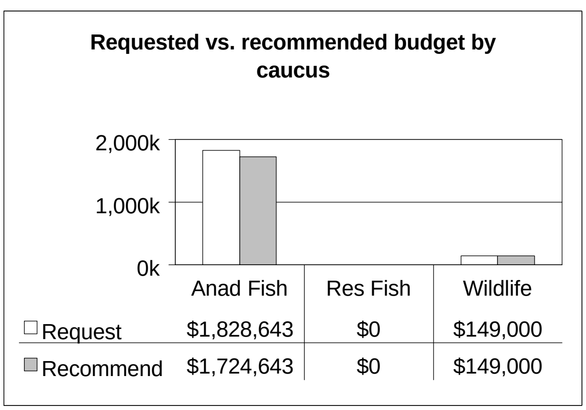
Subbasin recommendations for anadromous fish, wildlife and resident fish are based upon information needed to make management decisions required to implement the subbasin objectives. Information required to make management decisions required to implement these subbasin objectives are emphasized in the following recommendations. The subbasin recommendations are based upon provision of information required to implement the subbasin strategies identified for each objective. This includes monitoring activities required for implementation of present mitigation measures such as those contained in the NMFS Biological Opinion and the NWPPC Fish and Wildlife Program. Monitoring activities are modified annually to reflect the present state of knowledge and the management requirements.

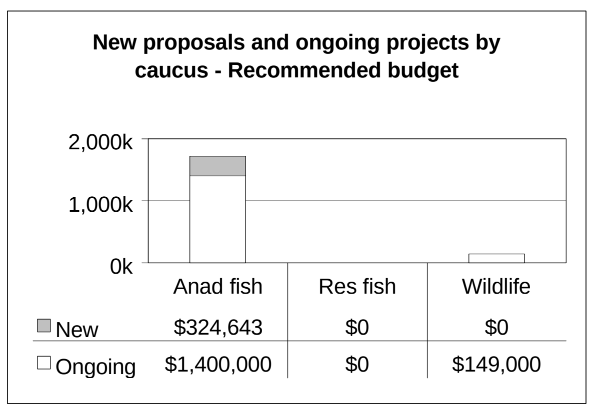
Anadromous fish recommendations are aimed at increasing adult returns by decreasing travel time, increasing survival, decreasing predation and improving water quality. Monitoring and data collections are only emphasized to the degree they are necessary for management decisions to accomplish this goal. The explicit definition and description of each minute detail of an issue is de-emphasized in favor of determination of the management action required to mitigate the problem. To this end, dissolved gas monitoring, evaluation and extent of trauma are abandoned in favor of improvement of water quality and reduction of dissolved gas and temperature. Documentation and protection of mainstem spawning habitat relative to hydrosystem operations is emphasized rather than life history evaluations.

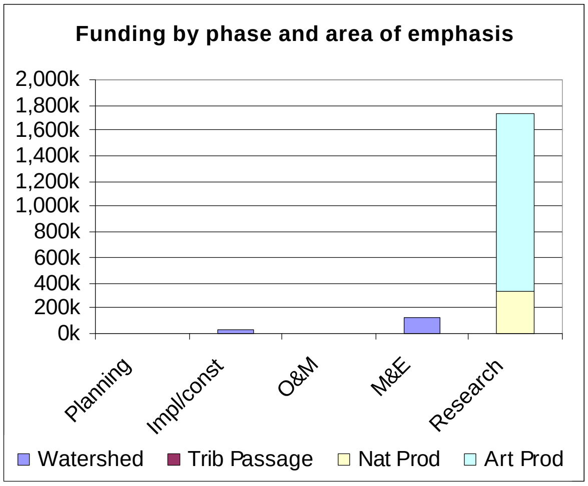
Projects and Budgets

Based on the preceding subbasin description, the CBFWA fish and wildlife managers recommend funding a total of 5 projects at a cost of $1,873,643. Of the projects recommended, 3 focus on anadromous fish, and 2 are directed at wildlife. The managers consider one of these projects, for $1,400,000, to be innovative in technique and application. Another project supports ESA requirements for a total of $189,853.

Refer to the following figures for detail on: 1) total recommended and requested budget by caucus, 2) funding for new and ongoing work, 3) funding by project phase and emphasis, and 4) funding by time period (past, current and future). Individual projects are listed in the following table.






Funding by phase and area of emphasis
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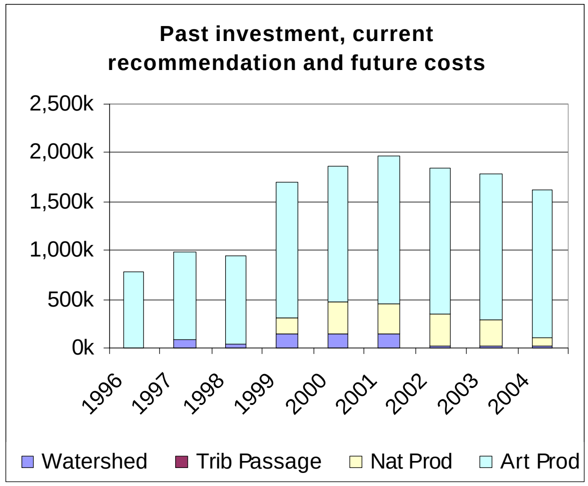
1,800k
1,600k
1,400k
1,200k
1,000k
800k
600k
400k
200k
0k
Planning
Impl/const
O&M
M&E
Research
Watershed
Trib Passage
Nat Prod
Art Prod


Past investment, current recommendation and future costs
2,500k
2,000k
1,500k
1,000k
500k
0k
1996
1997
1998
1999
2000
2001
2002
2003
2004
Watershed
Trib Passage
Nat Prod
Art Prod

ProjectID		Title	Sponsor	FY99 recom.	FY00 recom.	Estimated Outyears FY01	FY02	FY03	FY04
Anadromous Fish Projects									
20120	*	Evaluate Factors Limiting Columbia River Gorge Chum Salmon Populations	USFWS		190	154	157	83	87
20121		Evaluate Habitat Use and Population Dynamics of Lampreys in Cedar Creek	USFWS	151	135	160	170	180	0
9306000	†	Select Area Fishery Evaluation Project	ODFW, WDFW, CEDC	1,400	1,400	1,500	1,500	1,500	1,500
			Anadromous Fish Totals	**$1,725**	**$1,814**	**$1,827**	**$1,763**	**$1,587**	
Wildlife Projects									
9902500		Lower Columbia River Wetlands Restoration and Evaluation Program	USFS-CRGNSA	125	125	125	0	0	0
9902600		Sandy River Delta Riparian Reforestation	USFS-CRGNSA	22	24	22	22	22	22
			Wildlife Totals	**$149**	**$147**	**$22**	**$22**	**$22**	
		* indicates ESA project, † indicates 'Innovative work'	**SUBBASIN TOTALS**	**$1,874**	**$1,961**	**$1,849**	**$1,784**	**$1,609**	

All figures in thousands of dollars

Needed Future Actions

Additional information and stock assessment tools are needed to determine escapement goals and manage fish populations in the lower Columbia Mainstem Subbasin. Green sturgeon life history in the lower Columbia River is poorly understood. Population dynamics and abundance of smelt populations need to be evaluated. Information on the distribution and life histories of lamprey species in lower river tributaries is needed. Estimates of abundance and freshwater habitat use of chum salmon and searun cutthroat need to be determined. The interactions between exotic juvenile shad and resident and anadromous native juvenile fish should be better understood.

Opportunities to provide benefits to wildlife and wildlife habitat will be pursued through the Oregon Wildlife Coalition's programmatic project. Continued implementation of this project may identify potential wildlife protection and enhancement projects within the Lower Columbia Mainstem Subbasin. Implementation of wildlife mitigation projects within the subbasin will benefit wildlife and help BPA meet their wildlife mitigation obligations at Bonneville Dam.

Actions by Others

County plans to manage the impacts of urban growth to fish and wildlife need to be completed.

Over the past several years, WDFW's acquisition (through BPA and other sources) as well as more active land management have led to the formation of several regional partnerships. These partners include: BPA, U.S. Army Corps of Engineers, USFWS, ODFW, Vancouver Clark Parks, Ducks Unlimited, The Pacific Coast Joint Venture, Portland Metropolitan Services District, the Port of Vancouver, Vancouver Wildlife League, the Natural Resources Conservation Service (NRCS), and Clark County Weed Management. Some of these partnerships have directly resulted in major funding for enhancement projects on the Vancouver Lowlands Wildlife Area and other lands within the subbasin. The most notable is the Lower Columbia River Ecoregion Restoration Project. Phase 1 was funded in 1995 under the North American Wetlands Conservation Act (NAWCA). A Phase 2 NAWCA proposal has been prepared and included Wetland Reserve Program funds from NRCS as part of the project. The Corps of Engineers is undertaking the restoration of Shillapoo Lake as an ecosystem restoration component of another project. This effort is currently in the study phase and may result in the basic hydrologic restoration of the lakebed area.

The Cowlitz River Project was licensed by the Federal Energy Regulatory Commission (FERC) in 1951. The project includes Mossyrock Dam and Mayfield Dam, on the Cowlitz and Lewis rivers. In 1966, the WDFW and USFWS, in conjunction with Tacoma Public Utilities (TPU), studied the project's impact to wildlife habitat. Over the years, a number of wildlife enhancement measures were mutually implemented on project lands under the direction of the resource agencies.

In the 1980s, TPU began funding full-time WDFW employees to help plan additional and more intensive habitat enhancement programs. In 1985 TPU conducted a Habitat Evaluation Procedure on the project lands to further assess the impact of the Cowlitz Project on wildlife. In 1997, WDFW and TPU reached mutual agreement on a package of activities TPU would undertake to mitigate for wildlife impacts.. The resulting Settlement Agreement identifies and credits existing wildlife mitigation undertaken by TPU and identifies new and additional projects TPU shall undertake in satisfaction of the Settlement.

There are opportunities for private and public landowners, as well as non-profit organizations (e.g., watershed councils, The Nature Conservancy) to work together to benefit wildlife and wildlife habitat within the subbasin through the protection and enhancement of lands for wildlife.

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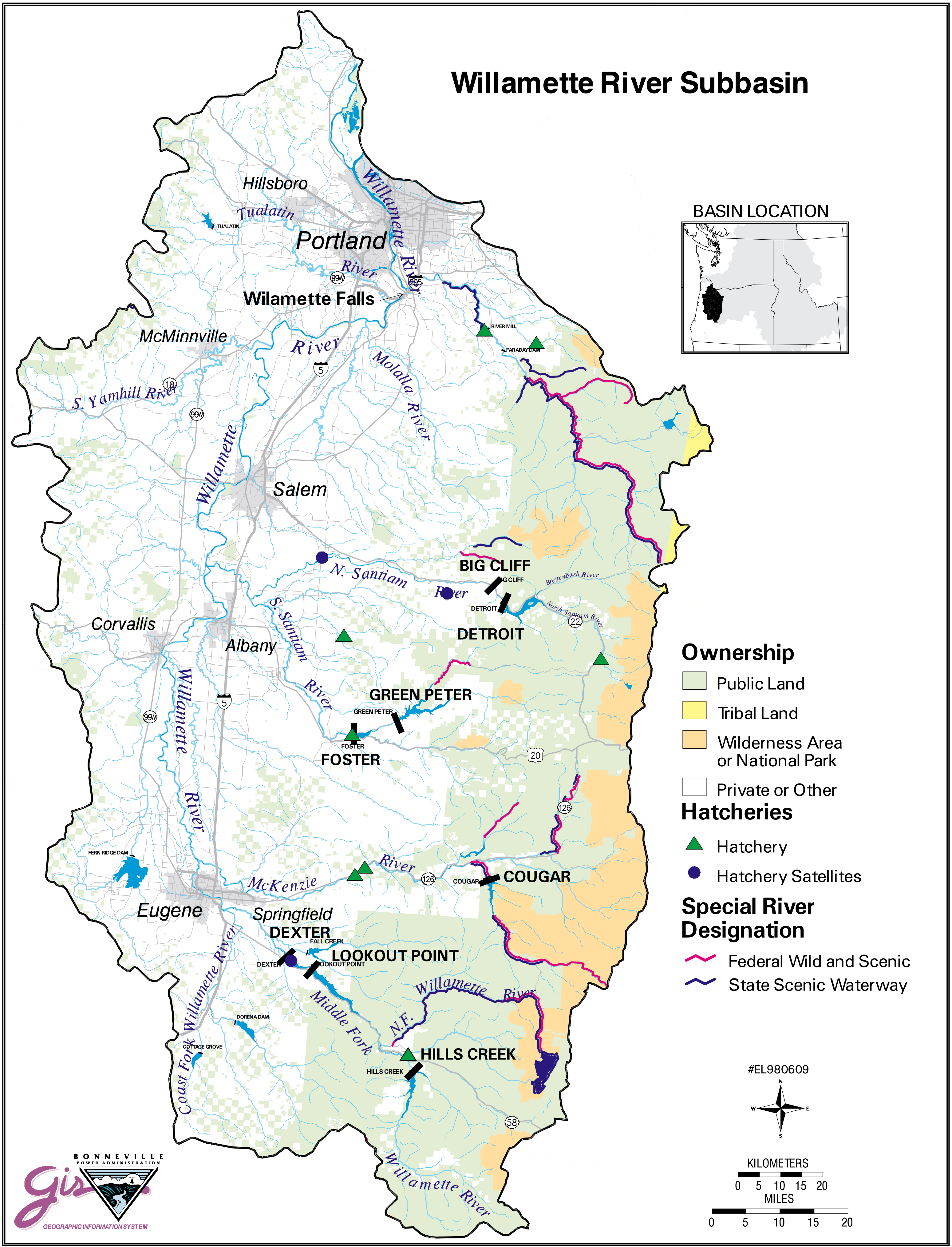
Willamette River Subbasin



Willamette Subbasin

Anad fish	3	projects	$321
Res fish	1		59
Wildlife	5		677
	9		$1,057

Fish and Wildlife Resources

Subbasin Description

The Willamette River subbasin is located in western Oregon and covers about 11,250 square miles. The mainstem of the Willamette River is formed by the confluence of the Coast Fork and Middle Fork near the southern end of the subbasin. The river then flows northward for 187 miles to its confluence with the Columbia River at river mile (RM) 101.5. In terms of discharge, the mainstem Willamette River is the twelfth largest river in the United States.
The Willamette River subbasin is roughly rectangular in shape with a north-south dimension of approximately 150 miles and an average width of 75 miles. It is bounded on the east by the Cascade Mountains, on the south by the Calapooya Mountains, and on the west by the Coast Range. Elevations range from less than 10 feet along the Columbia to 400 feet on the valley floor, and up to 10,000 feet in the Cascade Mountains. Historically, Willamette Falls (RM 26.5) was the most serious physical obstacle to salmonid migration in the subbasin. Winter steelhead and spring chinook salmon were the only anadromous fish that had access above the falls, but passage improvements and hatchery programs allowed other species to become established in the subbasin. U.S. Army Corps of Engineers projects such as Detroit, Foster, Cougar and Lookout Point on tributaries of the Willamette all contribute to temperature problems that affect fish and wildlife. The hydroelectric complex at Willamette Falls is the only generation on the mainstem Willamette.

The majority of land along the mainstem Willamette River is in private ownership. Agriculture is the predominant land use along the mainstem, although Oregon's largest cities, including Portland, Eugene, and Salem are also along the river. Among major tributaries, private ownership ranges from less than 20 percent of land in the Middle Fork Willamette system to about 93 percent of land in the Tualatin system. Over 70 percent of the land in the Clackamas, McKenzie, and Middle Fork Willamette systems are owned by the federal government.

Fish and Wildlife Status

Anadromous salmonids present in the Willamette River subbasin include spring chinook salmon, coho salmon, winter steelhead, summer steelhead, and cutthroat trout. Other anadromous fish include Pacific lamprey, white sturgeon and American shad. Resident species of note include bull trout, rainbow trout, and cutthroat trout. Wild spring chinook salmon and winter steelhead have recently been listed by the National Marine Fisheries Service as threatened under the Endangered Species Act. Bull trout have recently been listed as threatened by the U.S. Fish and Wildlife Service.

Spring chinook salmon historically spawned in the Middle Fork Willamette, McKenzie, South and North Santiam, Calapooya, Molalla, and Clackamas rivers, and in Abiqua Creek, a tributary of the Pudding River. By 1968, dams had blocked or inundated most spawning areas. Spawning of wild spring chinook salmon is now limited to the McKenzie, North Santiam, and Clackamas rivers. Endangered wild fish are believed to comprise about 5-15 percent of the total run of spring chinook salmon, which numbered 34,460 fish at Willamette Falls in 1998, up from 21,605 in 1996 and 26,885 in 1997, but down from over 70,000 in 1990. To help protect this threatened run, ODFW has closed the McKenzie and upper Clackamas rivers to harvest.

Winter steelhead passage at Willamette Falls numbered only 3,678 fish in 1998, down from 4,544 in 1997, and down even further from counts of over 20,000 in the 1980s. Passage at North Fork Dam on the Clackamas River was 531 fish in 1997, much lower than the 1985-91 average of 1,349. To help protect threatened winter steelhead, ODFW has eliminated releases of hatchery winter steelhead in the Clackamas and Santiam systems, eliminated releases of hatchery summer steelhead in the Mollala system, and stopped stocking trout where winter steelhead occur.

Other anadromous salmonids were introduced above Willamette Falls. Fall chinook salmon was introduced above the falls in 1964. Efforts to establish coho salmon above the falls began in 1952, but were discontinued in 1988. Summer steelhead was introduced above the falls in the 1960s. Sockeye salmon were introduced into the Santiam system in the late 1960s, and returning adults were allowed to reproduce naturally. Passage at Willamette Falls in 1998 included 11,560 summer steelhead. Counts of fall chinook and coho salmon were unavailable in 1998 because of construction, however passage in 1997 included 4,492 fall chinook and 1,835 coho salmon. Sockeye salmon have not been observed at Willamette Falls since 1995.

Bull trout were once found in the Clackamas, Santiam, McKenzie, and Middle Fork Willamette systems. Bull trout numbers have declined because of over-harvest, land management practices (timber harvest, road construction, etc.), and active fish removal. Bull trout have probably been extirpated from the Willamette River subbasin except for the McKenzie River system, and possibly the Middle Fork Willamette system.

A variety of wildlife species, including large and small mammals, waterfowl, passerines, raptors, reptiles, and amphibians, are associated with Willamette subbasin riverine, wetland, and upland habitats. Although the status of wildlife populations varies throughout the subbasin and by species, many wildlife species within the subbasin are listed as threatened, endangered, sensitive, or at-risk (e.g., bald eagle and western pond turtle). Wildlife populations have been and are directly and indirectly affected by hydropower development, past and present land management practices (irrigation, timber harvest, livestock and agricultural practices, road construction, mining, etc.), the spread of non-native plant and wildlife species, and urbanization.

Habitat Areas and Quality

The quantity and quality of habitat available for spawning and rearing anadromous salmonids in the Willamette River subbasin varies among species and location within the subbasin (Table 1). Potential bull trout habitat remains in the Willamette River subbasin, particularly in spring-fed streams, and other streams of the Clackamas, Santiam, McKenzie, and Middle Fork Willamette systems that meet the temperature requirements for this species.

Table 1. River miles of available habitat, and percentage of habitat rated good, fair, and poor for naturally producing anadromous salmonids in river systems of the Willamette River subbasin.

Species, system	Miles	% Good	%Fair	% Poor
Spring Chinook				
Mainstem	15.2	0	100	0
Clackamas	116.1	84	16	0
Santiam	176.2	16	76	8
McKenzie	133.0	88	12	0
Middle Fork	66.8	80	20	0
Others	65.5	68	4	28
Fall Chinook				
Mainstem	126.2	51	37	12
Clackamas	26.5	12	16	72
Santiam	71.5	78	22	0
McKenzie	14.0	0	0	100
Middle Fork	0.0	--	--	--
Others	38.3	68	11	21
Coho				
Mainstem	45.1	31	40	29
Clackamas	204.1	73	27	0
Santiam	26.0	0	100	0
McKenzie	0.0	--	--	--
Middle Fork	0.0	--	--	--
Others	511.2	54	41	5
Winter Steelhead				
Mainstem	42.1	27	42	31
Clackamas	253.9	92	8	0
Santiam	288.4	22	71	7
McKenzie	7	100	0	0
Middle Fork	98.0	82	18	0
Others	494.6	67	27	6

Species, system	Miles	% Good	%Fair	% Poor
Summer Steelhead				
Mainstem	15.2	0	100	0
Clackamas	82.9	95	4	1
Santiam	87.8	23	77	0
McKenzie	62	85	15	0
Middle Fork	67.5	74	26	0
Others	0.0	--	--	--

Wildlife is associated with riverine and adjacent riparian forest, wetland, island mixed coniferous and deciduous forest, and agricultural habitats in the Willamette subbasin. Although the quality of these habitats varies throughout the subbasin and within habitat type, habitat has generally been degraded due to hydropower development, past and present land management activities, the spread of non-native plant species, and urban expansion. Hydropower development has altered riverine and riparian habitats through flow regulation, channel modification, diking, and dredging. Floodplain and riparian habitats were inundated when reservoirs were filled. Fluctuating water levels create barren vegetation zones. Other activities related to hydroelectric development (e.g., road construction, the draining and filling of wetlands) have altered land and stream areas in ways that affect wildlife. In some cases, the construction and maintenance of power transmission corridors altered vegetation, increased access to and harassment of wildlife, and increased erosion and sedimentation in the Willamette River and its tributaries.

Both the USFWS and ODFW own and manage lands for the purpose of benefiting fish and wildlife and their habitats. For example, the Tualatin River National Wildlife Refuge, located in the northern Willamette River subbasin, was established in 1992 to restore, protect, and manage wetlands, riparian, and upland habitats for a variety of migratory birds, anadromous and resident fish, threatened and endangered species, and waters of the Tualatin River watershed. ODFW has three designated wildlife areas in the basin: Sauvie Island Wildlife Area, E.E. Wilson Wildlife Area, and Fern Ridge Wildlife Area. Each of these areas is managed to protect and enhance Oregon's fish and wildlife and their habitats for use and enjoyment by present and future generations.

Watershed Assessment

Numerous projects and reports have been initiated to characterize the state of Willamette subbasin natural resource features, including fish and wildlife habitat. For example, *The Coast Fork/Middle Fork Willamette River Confluence Area: An Atlas*, identifies land ownerships, topography, existing trail systems, transmission corridors, soil types, designated wetlands, vegetation communities, and cover types of the Willamette confluence area. In addition to characterizing the current status of watershed features, existing studies also show how there have been dramatic changes to the subbasin's forests, rivers, wetlands, and uplands. Some projects, such as the Oregon Trust Agreement Planning Project and Gap Analysis Project resulted in a list of potential restoration opportunities by priority.

In the mid-1980s, BPA funded wildlife loss assessments to measure the hydroelectric facility construction and inundation impacts on wildlife and wildlife habitat. Assessments were completed for Big Cliff, Detroit, Green Peter, Foster, Cougar, Dexter, Lookout Point, and Hills Creeks Dams and reservoirs. These assessments, based on Habitat Evaluation Procedures (HEP), concluded that about 33,400 acres of land and river were inundated, altered, or affected and about 94,000 Habitat Units were lost by the eight Willamette subbasin dams and reservoirs.

Assessments for specific watersheds include the McKenzie Watershed Council's *Technical Report for Water Quality and Fish and Wildlife Habitat*, and the Tualatin River Watershed Council's *Gales Creek Watershed Assessment Project.* These assessments provide the framework for the goals, objectives, actions, and specific tasks outlined by watershed council action plans, contain specific information about past and present conditions, identify data gaps, suggest further information gathering, and recommend restoration activities.

Limiting Factors

Myriad factors have constrained production of salmonids and other native fish in the Willamette River subbasin. Dams currently block access to more than 80 percent of the historic spring chinook salmon spawning habitat in the Middle Fork system, and also block access in the McKenzie, North and South Santiam, and Clackamas rivers. These dams also inundated spawning and rearing areas, cause injury or mortality to downstream-migrating juveniles, and reversed the natural flow and temperature patterns from spring through fall. Dams also restricted migrations of bull trout to and from spawning grounds. Extensive timber management and road building practices damaged bull trout spawning and rearing habitat and also precluded access to suitable habitat.

Agricultural, industrial and residential uses have also constrained fish production. Agricultural use has severely impacted riparian habitat and water quality in the mainstem Willamette and Tualatin rivers. Urban and residential development have also decreased available habitat and affected water quality, primarily in the mainstem Willamette, Tualatin, and Pudding rivers. Water withdrawal for agriculture, industrial, or urban use has also affected the McKenzie River. Summer low flows in Coast Range tributaries and the Tualatin River are aggravated by water withdrawal.

Wildlife abundance is currently limited by the results of past hydropower development (through habitat loss and degradation, and the decrease in fish abundance), past and current land management practices, the spread of non-native plant and wildlife species, and urban expansion. Water quality and quantity are also factors limiting to wildlife. Any of these influences can, and are, limiting factors to local populations. Changes in local populations can affect species integrity on a larger scale. Opportunities to restore wildlife populations and improve wildlife habitats within the Willamette subbasin diminish as habitat loss and degradation continues. Land prices and human populations continue to increase within the Willamette subbasin, further limiting restoration opportunities.

Subbasin Management

Goals, Objectives and Strategies

The primary native anadromous fish species targeted for active management in the Willamette Subbasin includes spring chinook, winter and summer steelhead, Pacific lamprey, and white sturgeon. The goal for these species is to restore sustainable, naturally producing populations to support tribal and non-tribal harvest and cultural economic practices while protecting the biological integrity and the genetic diversity of the watershed.

To acccomplish this goal the managers have adopted the following objectives: 1) improve adult passage survival; 2) improve adult prespawing survival; 3) improve juvenile passage survival; 4) improve juvenile rearing survival; 5) re-establish extirpated populations; and 6) restore depressed populations to productive levels.

The primary native resident fish species targeted for active management in the Willamette Subbasin include white sturgeon, bull trout, rainbow trout, cutthroat trout, whitefish, and Oregon chub. Two strategies capture the management intent for these populations: 1) protect and enhance production and distribution of these species throughout their historical range; and, 2) provide fisheries and harvest opportunities. Each of these strategies have been further defined by measures that describe population numbers and dynamic rate functions, areas of distribution, fishery characteristics, and harvest levels. These measures are described in the Multi-Year Implementation Plan (CBFWA June 4, 1997) and in a series of fish management plans for subbasins throughout the Willamette Valley developed by the Oregon Department of Fish and Wildlife.

To achieve management objectives for the fish species of interest in the Willamette Subbasin, fish managers have defined several broad strategies. From a population perspective, the strategic intent is to maintain and enhance production, maintain genetic diversity and adaptiveness, and re-establish populations where appropriate. From a managers perspective, the strategic intent focuses on learning more about the condition of existing fish populations and the habitat, protecting and enhancing the habitat, creating harvest opportunities, and managing angling demand consistent with healthy fish populations.

The wildlife mitigation goal for the Willamette subbasin is to achieve and sustain levels of habitat and species productivity to fully mitigate for all wildlife and wildlife habitat losses caused by the development and the operation of the Willamette subbasin hydrosystem. The wildlife mitigation objective is to maintain and restore populations of wildlife native to the Willamette River subbasin, including those target species selected to represent the cover types within the subbasin, and those habitat types considered priorities within the subbasin (i.e., riverine/riparian, old growth forest, wetlands, coniferous forest). The wildlife mitigation objective is based on the Northwest Power Planning Council's accepted wildlife losses measured in Habitat Units (HUs) for selected target/indicator species linked to priority habitats (Table 2). Strategies to achieve this objective include acquisition and easement of riverine/riparian, wetland, and forested habitats and enhancement of such habitat (e.g., control of non-native plant species, management of livestock grazing practices for native plant communities, regulation of public access).

The priority habitat types for wildlife in this subbasin are riverine/riparian, old growth forest and wetlands.

Past Efforts

Relatively few management, restoration, or mitigation actions in the Willamette River subbasin have been funded by the Bonneville Power Administration (BPA). Two BPA-funded projects for anadromous fish have been:
(1) Willamette Hatchery Oxygen Supplementation, which began in 1988 and is scheduled to end in 2000, and
(2) McKenzie River Focus Watershed Coordination, which began in 1996. The oxygen supplementation project was designed to determine if spring chinook salmon could be reared at increased densities with oxygen supplementation, without detrimental effects on returns of adult salmon. Preliminary results from adult returns suggest that survival may indeed be inversely related to rearing density. The goal of the McKenzie watershed coordination project is to improve resource stewardship and to protect fish and wildlife resources in the McKenzie watershed. To date, project staff have secured funding from other public and private sources, planned and sponsored a water quality and watershed health forum, and coordinated planning and implementation for multiple assessment, monitoring, and acquisition projects.

Only one BPA-funded project for resident fish currently exists, Bull Trout Assessment – Willamette/McKenzie, which began in 1994. To date, over 100 miles of stream have been surveyed for bull trout. The project has focused on learning about population status, distribution, and habitat utilization, and is also assessing the potential for expanding bull trout distribution by re-introducing naturally-produced bull trout to recently opened habitat. Information collected has allowed ODFW to complete a risk assessment, rehabilitation plan, and monitoring program for bull trout in the Middle Fork Willamette River. The expected outcome of this project is a program that protects and restores production of bull trout in the upper Willamette subbasin, and augments or re-introduces bull trout in the Middle Fork Willamette River.

Numerous management activities for wildlife are occurring in the Willamette subbasin. To date, three BPA-funded projects have been initiated; Burlington Bottoms, Willow Creek/Amazon Basin, and the Willamette Basin Mitigation Program. These projects have focused on the restoration of riparian/riverine, wetland, and associated upland habitats. An estimated 2,300 Habitat Units have been generated from BPA-funded wildlife mitigation projects.

Many other management, restoration, and mitigation actions have been implemented in the Willamette River subbasin. Habitat restoration projects have been completed in cooperation with ODFW, the Oregon Division of State Lands, the Oregon Department of Forestry, the Oregon Department of Transportation, the U.S. Forest Service, the U.S. Bureau of Land Management, the U.S. Army Corps of Engineers, numerous counties, utility companies, and others. Monitoring of fish passage at Willamette Falls by ODFW has been partially funded through the Federal Aid in Sport Fish Restoration Program. The Clackamas River Fisheries Working Group, which includes various federal, state, and local management agencies, and Portland General Electric, has developed action plans for directing fish restoration activities in the Clackamas River system, and implemented projects to carry out the action plans. The upper Willamette Bull Trout Working Group, which also includes numerous agencies and private groups, helped coordinate and implement activities to protect and restore bull trout in the Willamette and McKenzie rivers. Information on the status of fish populations and habitat in the Portland metropolitan area has been collected by ODFW, through funding provided by the Port of Portland, Clackamas County, and the Unified Sewerage Agency of Washington County.

Other activities occurring in the basin for the benefit of wildlife include Metro’s restoration of riparian/riverine and wetland habitats along Multnomah Channel, the USFWS’s expansion of the Tualatin River National Wildlife Refuge, and ODFW’s three wildlife areas. Various watershed councils (e.g., McKenzie River Watershed Council), non-profit organizations (e.g., Tualatin Riverkeepers, Mt. Pisgah Arboretum), and private landowners are acting to protect and restore wildlife and wildlife habitat.

Research, Monitoring and Evaluation

Current work includes the ongoing BPA-funded projects; (1) McKenzie River Focus Watershed Coordination, (2) Bull Trout Assessment – Willamette/McKenzie, (3) Burlington Bottoms, (4) Willow Creek/Amazon Basin, and (5) Willamette Basin Mitigation Program. These projects will result in a better understanding of bull trout status and needs in the subbasin, coordinated efforts (among BPA and non-BPA funded projects) in the McKenzie system, and improved habitat for wildlife.

Many projects funded by non-BPA sources are ongoing. Projects funded through the Clackamas River working group will increase understanding of the status of winter steelhead, coho salmon, and spring chinook salmon in the Clackamas River. Surveys being conducted by ODFW through funding from Clackamas County will document use of urban streams by salmonids and other native fish species, and lead to protection of important habitat. Continued monitoring of passage at Willamette Falls allows for real-time, adaptive management of salmonids in the subbasin.

Remaining Work

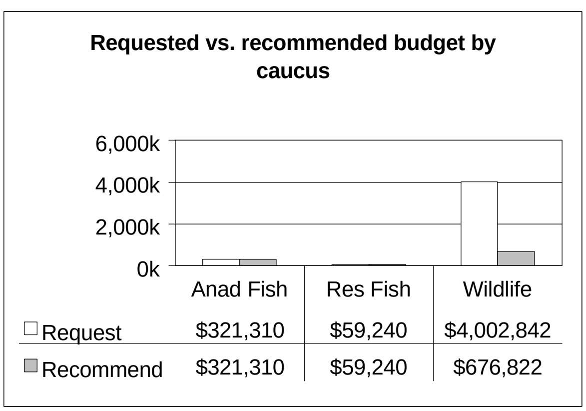
Remaining work includes completion of the ongoing projects. Completion of the bull trout project will lead to implementation of a program to protect and restore production of bull trout in the upper Willamette subbasin, and to augment or re-introduce bull trout in the Middle Fork Willamette River. Completion of the wildlife projects will further increase available habitat.

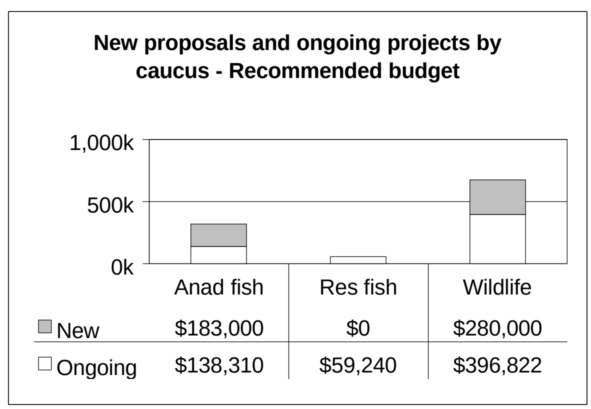
Subbasin Recommendations

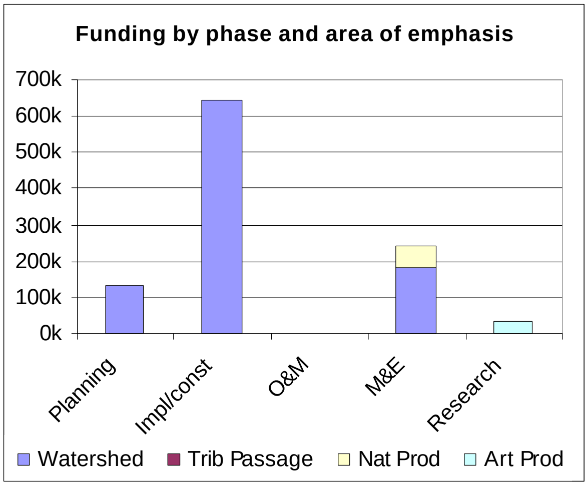
Projects and Budgets

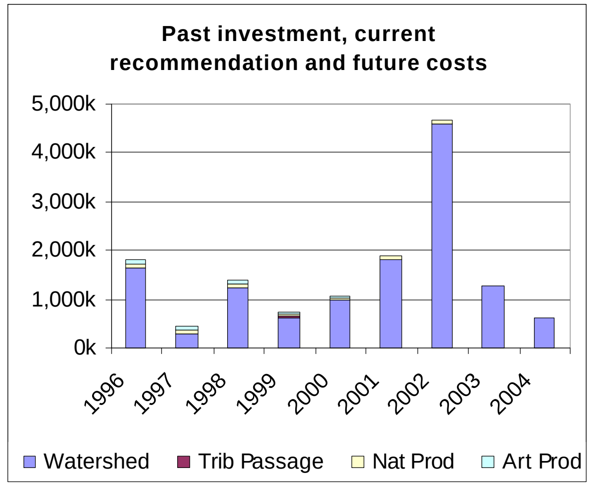
Based on the preceding subbasin description, the CBFWA fish and wildlife managers recommend funding a total of 9 projects at a cost of $1,057,372. Of the projects recommended, 3 focus on anadromous fish, 1 focuses on resident fish, and 5 are directed at wildlife. 1 project supports ESA requirements for a total of $59,240.

Refer to the following figures for detail on: 1) total recommended and requested budget by caucus, 2) funding for new and ongoing work, 3) funding by project phase and emphasis, and 4) funding by time period (past, current and future). Individual projects are listed in the following table.






Funding by phase and area of emphasis
700k
600k
500k
400k
300k
200k
100k
0k
Planning
Impl/const
O&M
M&E
Research
Watershed
Trib Passage
Nat Prod
Art Prod


Past investment, current recommendation and future costs
5,000k
4,000k
3,000k
2,000k
1,000k
0k
1996
1997
1998
1999
2000
2001
2002
2003
2004
Watershed
Trib Passage
Nat Prod
Art Prod

ProjectID		Title	Sponsor	FY99 recom.	FY00 recom.	Estimated Outyears FY01	FY02	FY03	FY04
Anadromous Fish Projects									
20088		Assess Mckenzie Watershed Habitat and Prioritize Projects	McKenzie Watershed Council		183	0	0	0	0
8816000		Willamette Hatchery Oxygen Supplementation	ODFW	43	33	0	0	0	0
9607000		Mckenzie River Focus Watershed Coordination	McKenzie Watershed Council	105	105	100	95	90	85
			Anadromous Fish Totals		**$321**	**$100**	**$95**	**$90**	**$85**
Resident Fish Projects									
9405300	*	Bull Trout Assessment - Willamette/Mckenzie	ODFW	46	59	63	66	0	0
			Resident Fish Totals		**$59**	**$63**	**$66**	**$0**	**$0**
Wildlife Projects									
20128		Riparian Restoration and Enhancement Planning for Multnomah Channel	Metro		30	25	15	15	10
20140		Tualatin River National Wildlife Refuge Additions	USFWS		250	1,350	1,350	500	150
9107800		Burlington Bottoms Wildlife Mitigation	ODFW	58	117	69	71	74	77
9205900		Amazon Basin/Eugene Wetlands Phase Two	TNC	50	50	70	72	74	75
9206800		Implement Willamette Basin Mitigation Program	ODFW	400	230	200	3,000	500	200
			Wildlife Totals		**$677**	**$1,714**	**$4,508**	**$1,163**	**$512**
		* indicates ESA project, † indicates 'Innovative work'	**SUBBASIN TOTALS**		**$1,057**	**$1,877**	**$4,668**	**$1,253**	**$597**

All figures in thousands of dollars

Needed Future Actions

Much work remains to restore fish and wildlife populations in the Willamette River subbasin. Potential BPA-funded projects should include work to restore lost spring chinook salmon and winter steelhead production caused by federal hydropower projects. Lost production of Pacific lamprey should be evaluated. Another potential project would be funding bull trout expansions/re-introductions where feasible, and where extirpation was a result of hydropower. Watershed assessments should also be completed. Additional wildlife projects should include, but not be limited to additions to the Tualatin River National Wildlife Refuge, and riparian restoration and enhancement projects. All projects should be coordinated among management agencies and private landowners.

Actions by Others

Projects funded by sources other than BPA should also be implemented. Complete assessments of hydropower impacts on fish and wildlife should be completed before projects are re-licensed. Passage facilities at dams for adult and juvenile anadromous fish should be improved. Necessary in-stream flows for fish production should be provided. Stream habitat for fish production should be protected and restored where possible. Surveys to determine the presence of bull trout should be completed to ensure protection where they still exist, and to determine the feasibility of re-introduction to areas from which they have been extirpated. Monitoring as part of Oregon's Willamette Restoration Initiative will help serve as a gauge of restoration activities.

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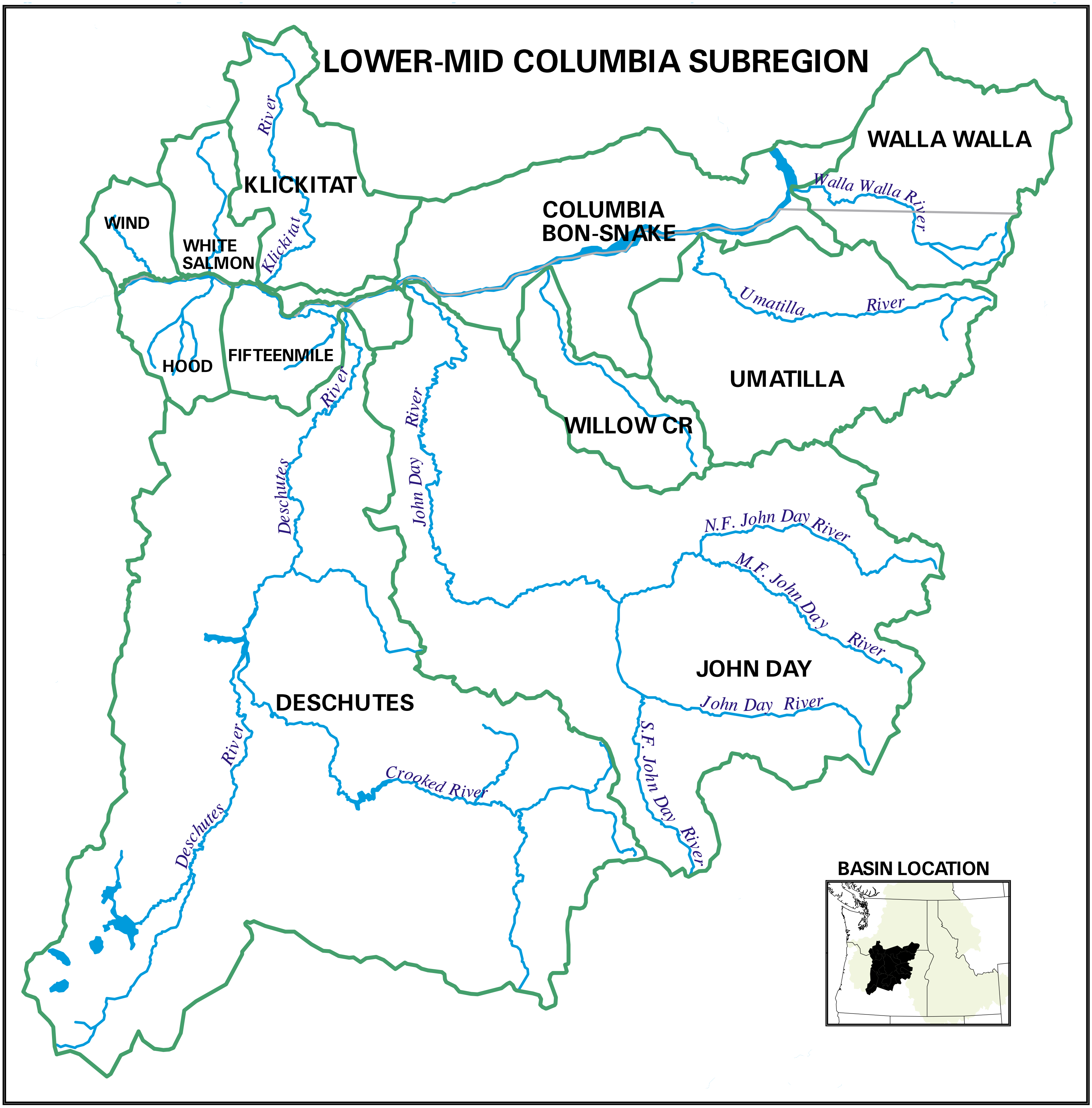
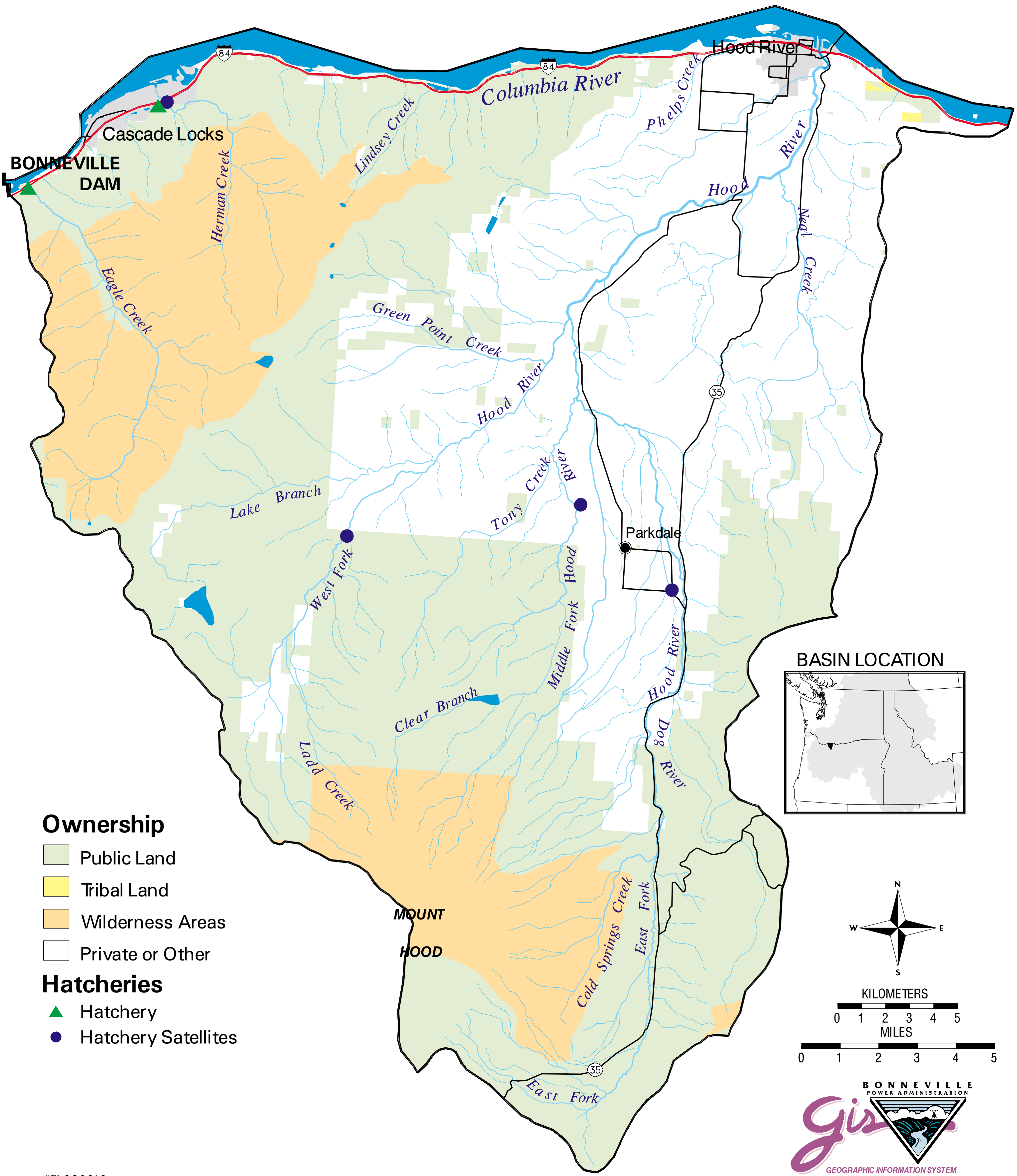

LOWER-MID COLUMBIA SUBREGION
WALLA WALLA
Walla Walla River
KLICKITAT
River
Klickitat
WIND
WHITE
SALMON
COLUMBIA
BON-SNAKE
Umatilla River
UMATILLA
HOOD
FIFTEENMILE
River
River
WILLOW CR
John Day
Deschutes
N.F. John Day River
M.F. John Day River
JOHN DAY
DESCHUTES
John Day River
River
S.F. John Day River
Crooked River
Deschutes
BASIN LOCATION

Lower Mid-Columbia Subregion

The Lower Mid Columbia Subregion is defined as the Columbia River and its tributaries from Bonneville Dam to Priest Rapids Dam (excluding the Snake River and its tributaries). This subregion covers approximately 38,100 square miles and includes the following subbasins: Lower Mid Columbia Mainstem, Wind, Big White Salmon, Little White Salmon, Hood, Klickitat, Fifteenmile, Deschutes, John Day, Umatilla, Walla Walla, and Yakima.

The Lower Mid-Columbia Subregion consists of the Columbia River and its tributaries from Bonneville Dam upriver to Priest Rapids Dam. The major tributaries, for which anadromous fish subbasin plans exist, are the Wind, Big White Salmon, Klickitat, Hood, Fifteenmile Creek, Deschutes, John Day, Umatilla, Walla Walla, and Yakima. The Anadromous Fish Managers are refining objectives, strategies and actions for the Lower Mid-Columbia Subregion. This report does not summarize the Wind and Big White Salmon subbasins.

Hood River Subbasin



#EL980612

Hood Subbasin

Anad fish 5 projects $1,753

Fish and Wildlife Resources

Subbasin Description

The Hood River Subbasin in north-central Oregon covers approximately 352 square miles. The Hood River flows northeasterly into the Columbia River. The river's mainstem and its Middle and East forks experience high turbidity and heavy siltation from glacial runoff from Mount Hood.

Federal, state, tribal and county agencies own or manage lands in the subbasin. The U.S. Forest Service (USFS) and Hood River County own or manage a significant amount of acreage. Private lands are used for agriculture, as well as timber production. The predominant type of agriculture is irrigated farming. The city of Hood River is the only municipality in the subbasin.

Fish and Wildlife Status

Spring Chinook The native population of spring chinook was extirpated in the late 1960s. Deschutes stock spring chinook have been used to re-establish a self-sustaining Hood subbasin population. Five years of information has shown the natural population to be less than 50 fish. The hatchery component of adult spring chinook returns has averaged 240 individuals. The spring chinook population is located primarily in the West Fork Hood River and Lake Branch Creek, tributary to the West Fork Hood River. Hood River brood stock will be collected from Deschutes stock returning to the Hood River and naturally produced adults (Deschutes stock). The first collection of brood stock from Hood River returns was made in 1997.

Fall Chinook **-** Managers believe that the bulk of the fall chinook production in the subbasin is located downstream from Powerdale Dam. Average escapement of fall chinook (adults and jacks) to Powerdale Dam is 20 fish for the period of record. Between one quarter and one third of escapement to Powerdale Dam is made up of stray hatchery origin individuals. Production of fall chinook in the subbasin is constrained by lack of suitable spawning gravel and the high gradient nature of the system resulting in little available juvenile rearing habitat.

Summer Steelhead (Threatened Species under ESA) This population is distributed in the West Fork and tributaries and is currently at extremely low numbers. Escapement of summer steelhead to Powerdale Dam in 1998 included 172 wild and 1,041 Skamania stock hatchery origin adults. Production of summer steelhead in the subbasin is thought to be constrained by low natural stream productivity, high stream gradients and flashy run off patterns that result in little in-stream structure and reduced spawning gravel availability, past and present land management practices resulting in impacted water quality, and less than effective screening at mainstem diversions.

Winter Steelhead (Threatened Species under ESA) Managers believe this population is largely limited to the East Fork Hood River although some production takes place in the mainstem Hood River, lower mainstem Hood River tributaries, and the Middle Fork Hood River. Escapement of winter steelhead over Powerdale Dam has averaged 692 for the last six years, including 367 wild and 274 hatchery origin adults. Releases of non-native, hatchery origin winter steelhead was eliminated and development of a Hood River broodstock was first initiated in 1992. Both wild and Hood River stock hatchery returns are used in the hatchery broodstock in compliance with Oregon’s Wild Fish Management Policy and the Hood River Production Master Plan. Winter steelhead production in the Hood River subbasin is believed to be constrained by natural glacial sediments, the flashy nature of the high gradient streams, past unscreened and inadequately screened diversions, artificial barriers blocking access to spawning and rearing areas, water withdrawals, and loss of flood plain function caused by Highway 35.

Coho **-** Production is likely limited to the mainstem Hood River and tributaries both upstream and downstream from Powerdale Dam and the East Fork Hood River. Escapement of adult and jack coho to Powerdale Dam has averaged 54 individuals for the last 5 years. This escapement is composed primarily of stray hatchery origin fish with the naturally produced population averaging 20 percent of the total escapement. Managers believe coho production is constrained by lack of suitable spawning and rearing habitats, high gradient streams, past out-of-subbasin harvest, and low wild escapement.

Table 1. Stocks, history and management goals

Stock	Genetic History / Management Intent	Spawn Escape	Hatchery Take	Harvest	Recent Total Escape
CHS	Supplement natural production with Deschutes stock using hatchery and natural returns to Powerdale Dam.	400	110	1300	300
CHF	Maintain wild stock. Evaluate potential for supplementation.	250	0	50	30[1]
STS	Manage for wild and hatchery usign Hood River broodstock	2400	165	5435	1450[1]
STW	Manage for wild and hatchery using Hood River broodstock	1200	110	2490	641
Coho	Maintain population	50	0	10	54[2]
Lamprey	Maintain population – No goals (management under discussion, continue present inventory. Determine status and distribution.)				

[1] Escapement to Powerdale Dam.
[2] Averages 80 percent hatchery origin strays.

The Hood Subbasin also supports a variety of resident fish species, including: rainbow, bull, cutthroat, brown, and brook trout. The bull trout are currently listed as a Threatened Species under ESA.

A variety of wildlife species, including large and small mammals, waterfowl, passerines, raptors, reptiles, and amphibians, are associated with Hood River riverine, wetland, and upland habitats. Although the status of wildlife populations varies throughout the basin and by species, many wildlife species within the basin are listed as Federal and/or State Threatened, Endangered, Sensitive, or At-Risk (Puchy and Marshall 1993). For example, several pairs of peregrine falcons [*Falco peregrinus*]) are known to occur within the subbasin. Cliffs along the Columbia River provide nesting habitat and nearby riverine and open orchard lands provide foraging areas. Other avifauna associated with cliffs at the Columbia River/Hood River confluence include red-tailed hawk, prairie falcon, American kestrel, and rock dove. Certain populations of wildlife species are being managed by federal and state wildlife managers throughout the subbasin, including big game, furbearers, upland birds, and waterfowl species. Primary wildlife management functions focus on deer and elk winter range. Wolverines are present in the upper subbasin and their status is unknown. The Hood Subbasin lies within one of the principal migratory waterfowl lanes of the Pacific flyway. Waterfowl use the open water of the Bonneville Pool as resting areas, and some nesting occurs along the shores and on island habitat.

Habitat Areas and Quality

East Fork Hood River

This drainage is relatively accessible to fish, but is generally lacking in juvenile and adult holding water, and in-stream structure. This stream has a major irrigation diversion that has significantly impacted populations of anadromous salmonids, but is now screened. This river is impacted by sedimentation from glacial runoff, and has been impacted by realignment, construction and maintenance of Highway 35. Habitat is primarily suitable for winter steelhead and resident trout production.

Table 2. Production Program Description

Stock	Mgmt Intent	Initial Brood stock	Operating Brood stock	Adult Collection & Holding	Central Facility (Incubation & Rearing)	Acclimation &/or Release Sites	Status	Funding
ChS	Supplemt	Deschutes	Hood	Collect @ Powerdale; Hold @ Parkdale (M.Fk)	Round Butte/Pelton Ladder	East Fork I.D. Hdwks, Parkdale (M.Fk), West Fork	On-going	NWPPC
StS(A)	Supplemt	Hood	Hood	Collect @ Powerdale; Hold @ Parkdale (M.Fk)	Oak Springs	East Fork I.D. Hdwks, Parkdale (M.Fk), West Fork	On-going	NWPPC
StW	Supplemt	Hood	Hood	Collect @ Powerdale; Hold @ Parkdale (M.Fk)	Oak Springs	Hood R	On-going	NWPPC

West Fork Hood River.

This drainage has a higher density of forest roads and has experienced more timber harvest than the East Fork. A wide variation in stream flow and past timber management activities have result in the loss of most of the in-stream habitat diversity. Spawning gravel is usually associated with the stream margins and may not be readily available to late spring or fall spawning fish. There has been a concerted effort to assure that all irrigation diversions are screened and a potential natural fish passage barrier at Moving Falls (RM 3.7) has been eliminated by a Bonneville Power Administration funded and ODFW designed fish ladder project.

Middle Fork Hood River

This drainage includes the irrigation and hydroelectric power reservoir (Laurance Lake), which was built and is now operated under a USFS Special Use Permit by the Middle Fork Irrigation District. The Clear Branch Dam (Laurance Lake) blocks natural upstream fish migration beyond that point. Coe and Elliot branches, two Middle Fork tributaries, consistently introduce large amounts of glacial sand and silt into this stream during the summer and fall months.

Hood River (mainstem)

This river is generally confined to a narrow basalt canyon. The stream is high gradient with a wide range in annual stream flow. The river typically carries glacial sand, silt, and flour during the warm summer and fall months. PacifiCorp operates a hydroelectric diversion dam at rivermile 4.0. This dam is equipped with a fish ladder and a bank of vertically traveling fish screens.

Wildlife

Wildlife are associated with riverine and adjacent riparian forest, wetland, mixed coniferous and deciduous forest, cliff, and agricultural habitats in the Hood River subbasin. Wildlife habitat from the lower Hood Subbasin to the headwaters transitions from urban development, through orchard land, into coniferous forests up into the headwaters. Although the quality of these habitats varies throughout the basin and within habitat type, habitat has generally been degraded due to hydropower development (i.e., by Bonneville and The Dalles Dams), past and present land management activities, the spread of non-native plant species, and urban expansion in the Hood River area. Wintering range for deer and elk diminishes in quality in the lower portions of the subbasin. Agricultural lands (e.g., fruit orchards) are widespread and provide limited habitat for wildlife. Bottomlands and riverine habitats at the Columbia River Hood River confluence area have also been dramatically altered by dredging, dikes, and flood control activities in the upstream Dalles Dam project area and the downstream Bonneville Dam project area. Hydropower development has altered riverine and riparian habitats through flow regulation, channel modification, diking, and dredging. Other activities related to hydroelectric development (e.g., road construction) have altered land and stream areas in ways that affect wildlife. In some cases, the construction and maintenance of power transmission corridors altered vegetation, increased access to and harassment of wildlife, and increased erosion and sedimentation in Hood River. Forest management practices on both public and private lands has also affected wildlife habitat quantity and quality.

Little land is protected and managed specifically for wildlife in the Hood Subbasin. The USFS Mount Hood Wilderness Area and Columbia Wilderness Area occur within the subbasin; these areas provide relatively intact habitats that benefit wildlife.

Watershed Assessment

A number of reports have been completed that characterize the nature of the Hood River watershed in general and specifically address fish and wildlife resources. The most comprehensive documents include the USFS West Fork Hood River Watershed Analysis (1996), the USFS East Fork Hood River and Middle Fork Hood River Watershed Analysis (1996). In addition ODFW and CTWSRO prepared the Hood River Master Plan (anadromous and resident fish), and BPA prepared the Hood River Production Program EIS. There have also been comprehensive physical and biological surveys conducted on most streams in the subbasin.

In the mid 1990s, PacifiCorp initiated the FERC relicensing process for the Powerdale Hydroelectric Project on Hood River. This process lead to the accumulation of detailed fish and wildlife information for the mainstem Hood River, including fish passage, fish stream flow requirements, and water quality.

The Hood River Watershed Group (Council) is currently assembling a Hood River Watershed assessment that will include the identification of factors limiting fish production and water quality within the subbasin. This completed assessment will ultimately lead to the development of goals, objectives, actions, tasks, as well as identification of data gaps, suggest additional information gathering, and recommend restoration activities.

The Natural Heritage Program maintains a database on habitats and species occurrences throughout the State of Oregon. The Oregon Trust Agreement Planning Project (BPA 1993) and Oregon GAP Analysis Project (ODFW 1997) identified gaps in bio-diversity and needs for terrestrial habitat restoration, and resulted in a prioritized list of potential habitat restoration opportunities in the Lower Mid-Columbia subregion, including the Hood Subbasin.

A Columbia Basin wide losses assessment was conducted to quantify habitat impacts from hydrosystem development. Wildlife mitigation objectives for the Deschutes Subbasin are based on this losses assessment (see Table 3). These losses were amended into the Northwest Power Planning Council's Fish and Wildlife Program as accepted wildlife losses caused by the construction of the hydrosystem. Losses were measured in Habitat Units (HUs) for selected target/indicator species and are linked to priority habitats. (Note: all or part of the wildlife losses for Lower Mid-Columbia Subregion may be mitigated for in the Deschutes Subbasin, though it is unlikely that it would be proposed or could occur).

A Columbia Basin wide losses assessment was conducted to quantify habitat impacts from hydrosystem development. Wildlife mitigation objectives for the Hood River subbasin are based on this losses assessment (see Table 3). These losses were amended into the Northwest Power Planning Council's Fish and Wildlife Program as accepted wildlife losses caused by the construction of the hydrosystem. Losses were measured in Habitat Units (HUs) for selected target/indicator species and are linked to priority habitats. (Note: all or part of the wildlife losses for Lower Mid-Columbia Subregion may be mitigated for in the Hood Subbasin, though it is unlikely that it would be proposed or could occur).

Limiting Factors

Anadromous fish populations are depressed in the Hood Subbasin due to a combination of causes. The limiting factors include the use of non-native/out-of-subbasin hatchery fish programs in the Hood Subbasin; basin-wide over-harvest of wild stocks; habitat degradation including both natural causes, such as turbidity from melting glaciers on Mount Hood, and man-caused, such as unscreened or inadequately screened diversions, water quality degradation, artificial barriers, diverted stream flows in the mainstem and tributaries, and other land management practices. Stream channelization associated with road construction, and the loss of instream habitat complexity through the loss of large woody debris, have also limited fish production within the subbasin.

Wildlife abundance is currently limited by the results of past hydropower development (e.g., habitat loss and degradation, the decrease in fish abundance), past and current land management practices (e.g., irrigation, logging, livestock and agricultural practices, road construction), the spread of non-native plant and wildlife species, and urban expansion. Increasing development in the Hood River metro area continues to eliminate remaining wildlife habitats. Loss of wintering range for deer and elk due to conversion of historic ranges to urban and agricultural use limits big game populations. Land prices continue to rise, making it more economically difficult to preserve remaining undeveloped lands for wildlife. Water use practices (e.g., irrigation) can negatively affect quality and quantity; thus, are also factors limiting to wildlife. Continued declines in salmon and other fish species results in a loss of overall biomass being contributed to the subbasin. This reduction has negative effects on wildlife abundance. Any of these influences can be, and are, limiting factors to local populations. Changes in local populations can affect species integrity on a larger scale. Opportunities to restore wildlife populations and improve wildlife habitat diminish over time as habitat loss and degradation continues.

Subbasin management

Goals, Objectives and Strategies

Fish

The indigenous anadromous fish species targeted for management in the Hood Subbasin are spring and fall chinook, winter and summer steelhead, coho, and Pacific lamprey. The goal for these species is to restore sustainable, naturally producing populations to support tribal and non-tribal harvest and cultural economic practices while protecting the biological integrity and the genetic diversity of the watershed. The fishery co-managers ODFW and CTWSRO fisheries resources are co-managed by the Tribes and the Oregon Department of Fish and Wildlife) have adopted the following outcome-based objectives:

1. Re-establish naturally sustaining spring chinook using Deschutes stock in the Hood River subbasin.
2. Rebuild naturally sustaining runs of summer and winter steelhead in the Hood River subbasin.
3. Maintain the genetic characteristics of the population.
4. Contribute to tribal and non-tribal fisheries, ocean fisheries, and the Northwest Power Planning Council's interim goal of doubling salmon runs.
5. Provide optimum habitat for all freshwater life history stages of anadromous salmonids.
6. Maintain or improve passage for upstream and downstream migrant salmonids.

The co-managers have defined several strategies that are aimed at meeting the objectives, including supplementing spawning populations with local broodstock to enhance natural production (Objectives 1, 2, 3, & 4) accompanied by intensive monitoring and evaluation for adaptive management purposes; and improving habitat through the use of in-stream structures, water quality and quantity optimization, riparian management, passage improvements at barriers and the screening of irrigation diversions (Objectives 5 and 6).

The co-managers believe that subbasin habitat improvements, including fish passage will also aide in accomplishing the goal of maintaining or enhancing the resident Hood River fish populations. The specific strategies listed above will also help managers to achieve their resident fish goal.

Wildlife

The overall wildlife mitigation goal for the Columbia River Basin is to achieve and sustain levels of habitat and species productivity in order to fully mitigate for all wildlife and wildlife habitat losses caused by the development and operation of the hydropower system (NWPPC 1995). This goal applies to the Lower Mid-Columbia Subregion, including the Hood Subbasin. Within the Lower Mid-Columbia Subregion, including the Hood Subbasin, the wildlife mitigation goal is to be achieved by fully mitigating for losses associated with Bonneville, The Dalles, John Day, and McNary dams.

The wildlife mitigation objective is to maintain and restore populations of wildlife native to the Hood Subbasin, including those target species selected to represent the cover types within the subbasin, and those habitat types considered priorities within the subbasin (i.e., riverine/riparian, old growth forest, wetlands, coniferous forest). The wildlife mitigation objective is based on the Northwest Power Planning Council's accepted wildlife losses measured in Habitat Units (HUs) for selected target/indicator species linked to priority habitats.

The priority habitat types for wildlife in this subbasin are riparian/riverine, wetlands and shrub-steppe. Islands are medium priority, agricultural lands low priority.

The following strategies will achieve wildlife mitigation objectives within the Hood Subbasin:

- Identify potential protection and enhancement projects within the Hood Subbasin through the GAP Analysis and coordinate implementation of activities through the Oregon Wildlife Coalition.
- Implement land acquisition and easements of priority habitats.
- Implement enhancement and restoration activities (e.g., control of non-native plant species, management of livestock grazing practices for native plant communities).

- Monitor and evaluate wildlife habitat and wildlife species response to implemented enhancement activities within the Hood Subbasin.

Past Efforts

Specific actions intended to carry out the management strategies include the following: Project No. 9301900 is to re-establish spring chinook and winter and summer steelhead. Project No. 8902900 was initially a construction project for Pelton ladder rearing facility which was converted to a production project for spring chinook in 1995. Project No. 9500700 funds PGE for O&M at the Pelton Ladder rearing facility for spring chinook. Project No. 8805303 funds CTWSRO for monitoring and evaluation and Project No. 8805304 funds ODFW for monitoring and evaluation. Project 9301900 funded design and construction of adult trapping at Powerdale Dam and design and construction of the Parkdale holding and spawning facilities and expansion of hatching and rearing facilities at Oak Springs Hatchery. Project No. 980210 consists of several habitat improvement components, including: construction of a fish ladder on Tony Creek eliminating a man-made barrier which will restore access to three miles of winter steelhead, coho, and resident trout spawning and rearing habitat; construction of two water diversion fish screens, eliminating direct fish mortality; and fencing one-half mile of riparian, allowing recovery from livestock.

The managers completed an in-stream structure and improved adult passage at Moving Falls on the West Fork. A major diversion on the East Fork (East Fork Canal) was screened by the East Fork Irrigation District.

Although no site-specific wildlife mitigation projects have been funded by BPA in the Hood Subbasin, the Oregon Wildlife Coalition is implementing a programmatic mitigation project that may result in the implementation of mitigation projects within the subbasin. The goal of this project, *Securing Wildlife Mitigation Sites- Oregon (Project No. 9705900)*, is to:

- Fund project coordination activities to identify, plan, propose, and implement wildlife mitigation projects within the Lower Mid-Columbia Subregion, including the Hood Subbasin
- Prioritize potential mitigation projects within Lower Mid-Columbia Subregion, including the Hood Subbasin.
- Acquire or ease lands with priority habitats within Lower Mid-Columbia Subregion, including the Hood Subbasin
- Enhance acquired or eased lands through alteration of land management practices, active restoration of habitats, control of noxious weeds, control of public access, etc. to provide benefits to target/indicator wildlife species and priority habitats within the Lower Mid-Columbia Subregion, including Hood Subbasin
- Develop and implement a Monitoring and Evaluation Plan with both HEP-based and non HEP-based monitoring criteria within the Lower Mid-Columbia Subregion, including Hood Subbasin

One of the wildlife mitigation opportunities identified by the GAP Analysis Project was proposed within the Oregon Wildlife Coalition's programmatic project for FY1999 funds. The project, *Securing Wildlife Mitigation Sites in Oregon – Mitchell Point (Project #9705909)*, was recommended by the Northwest Power Planning Council for funding in FY1999.

Research, Monitoring and Evaluation

The co-managers (ODFW and CTWS) are actively involved in intensive monitoring and evaluation of the implementation of the Hood River Production Program. This work is being done to: (1) determine any post-project impacts on indigenous populations of resident fish, (2) estimate natural production of juvenile and smolt rainbow/steelhead at selected sites in the subbasin, (3) monitor life history characteristics and escapements of wild, natural, and hatchery produced anadromous salmonids, (4) estimate harvest of anadromous salmonids in the subbasin, (5) monitor anadromous escapement and smolt to adult survival, (6) identify the population genetic characteristics, systematics, and distribution of genetically unique steelhead, cutthroat, and resident trout populations in the Hood River subbasin, and (7) correlate stream flow with subbasin natural fish production.

Wildlife surveys and inventories are conducted within the Hood River regularly by USFS, CTWSRO, and ODFW. Deer and elk are radio collared to better delineate winter and summer ranges. Research to better understand the status of wolverines is being conducted. The USFS conducts searches to identify whether lynxes are present in the

Cascades. Standard big game and upland surveys are not conducted in the Hood River subbasin due to poor visibility through brushy cover.

Remaining Work

Assumptions that were used to establish anadromous escapement and harvest goals need to be tested and verified. Biologically based fish management recommendations need to be developed for most efficient implementation of the Hood River Production Program that will also protect indigenous fish populations. There are opportunities to implement in-stream and riparian habitat restoration work at a number of sites within the subbasin.

Although the *Securing Wildlife Mitigation Sites* **-** *Oregon; Mitchell Point (Project No. 9705909)*, was recommended by the Northwest Power Planning Council for funding in FY1999, it has not yet been implemented. This potential mitigation opportunity may or may not still exist and should be determined.

Continued implementation of the Oregon Wildlife Coalition’s programmatic mitigation project, *Securing Wildlife Mitigation Sites* **-** *Oregon (Project No. 9705900)*, may identify other potential wildlife protection and enhancement projects within the Hood Subbasin. Implementation of projects within the subbasin would help offset the wildlife Habitat Unit (HU) losses still remaining at Bonneville, The Dalles, John Day, and McNary dams. For example, only about 10 percent of the Oregon’s HU losses at Bonneville Dam have been mitigated for to date.

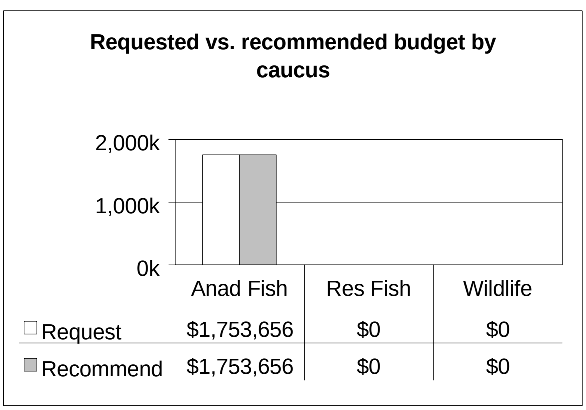
Other remaining wildlife related work tasks within the Hood Subbasin include assessment and mitigation of hydropower system operational and secondary losses, development and implementation of a regional Monitoring and Evaluation Plan, and development of both HEP-based and non HEP-based monitoring success criteria.

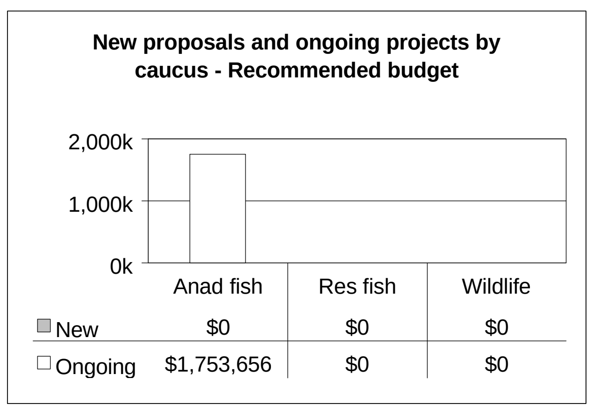
Subbasin Recommendations

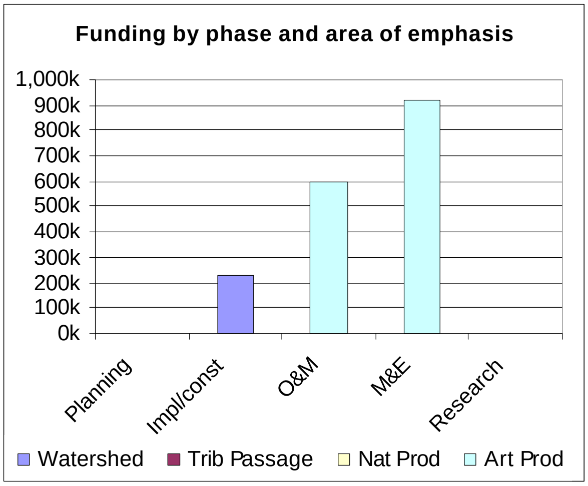
Projects and Budgets

Based on the preceding subbasin description, the CBFWA fish and wildlife managers recommend funding a total of 5 anadromous fish projects at a cost of $1,753,656.

Refer to the following figures for detail on: 1) total recommended and requested budget by caucus, 2) funding for new and ongoing work, 3) funding by project phase and emphasis, and 4) funding by time period (past, current and future). Individual projects are listed in the following table.






Funding by phase and area of emphasis
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O&M
M&E
Research
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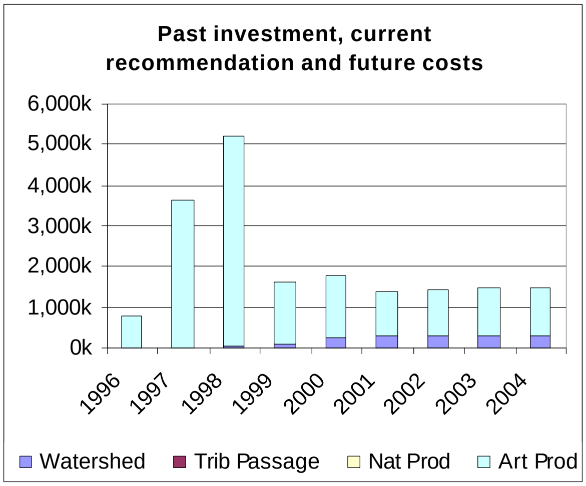
Trib Passage
Nat Prod
Art Prod


Past investment, current recommendation and future costs
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5,000k
4,000k
3,000k
2,000k
1,000k
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1996
1997
1998
1999
2000
2001
2002
2003
2004
Watershed
Trib Passage
Nat Prod
Art Prod

ProjectID	Title	Sponsor	FY99 recom.	FY00 recom.	Estimated Outyears FY01	FY02	FY03	FY04
Anadromous Fish Projects								
8805303	Hood River Production Program - M&E	CTWSRO	500	500	520	540	560	580
8805304	Hood River Production Program - ODFW M&E	ODFW	412	424	437	450	462	476
8902900	Hood River Production Program-Pelton Ladder-Hatchery	ODFW	132	115	118	122	134	138
9301900	Powerdale, Parkdale, and Oak Springs O&M	ODFW and CTWSRO	468	487	0	0	0	0
9802100	Hood River Fish Habitat Project	CTWSRO	117	228	300	300	300	300
		Anadromous Fish Totals	**$1,754**	**$1,375**	**$1,412**	**$1,456**	**$1,494**	
	* indicates ESA project, † indicates 'Innovative work'	**SUBBASIN TOTALS**	**$1,754**	**$1,375**	**$1,412**	**$1,456**	**$1,494**	

All figures in thousands of dollars

Needed Future Actions

The Hood River subbasin is a very biologically complex system supporting a wide variety of salmonids, which may directly or indirectly be impacted by the Hood River Production Program. Due to the species diversity and the multiplicity of freshwater and ocean life history patterns of the species being supplemented, considerable work remains to fully implement the monitoring and evaluation program. Data collected to date has helped to provide resource managers with a better understanding of indigenous fish populations, but a much longer data set will be required to (1) estimate parameters such as carrying capacity and smolt to adult survival rates; (2) determine what impact the HRPP may be having on indigenous populations of fish and what measures need to be taken to minimize the program impact; (3) develop predictive tools for estimating future run sizes; and (4) evaluate the HRPP.

Opportunities to provide benefits to wildlife and wildlife habitat should be pursued through the Oregon Wildlife Coalition's programmatic project. Continued implementation of this project may identify potential wildlife protection and enhancement projects within the Hood Subbasin. Implementation of wildlife mitigation projects within the subbasin will benefit wildlife and help BPA meet their wildlife mitigation obligations at Bonneville, The Dalles, John Day and McNary Dams.

Opportunities to provide benefits to wildlife and wildlife habitat will be pursued through the Oregon Wildlife Coalition's programmatic project. Continued implementation of this project may identify potential wildlife protection and enhancement projects within the Lower Mid-Columbia Subregion, including the Deschutes Subbasin. Implementation of wildlife mitigation projects within the subregion will benefit wildlife and help BPA meet their wildlife mitigation obligations.

Other negative impacts to fish and wildlife caused by the hydropower system that fish and wildlife managers are currently not aware of may need to be addressed in the future as they become apparent. For example, impacts to TES species may require mitigative action.

Actions by Others

The USFS will continue to improve in-stream and streamside habitat on streams within the national forest. Forest road density will be reduced and forest road drainage systems will be upgraded to reduce high sediment loading and catastrophic debris torrents. PacifiCorp will install state of the art fish screens at their Powerdale diversion and work with ODFW, Oregon Water Resources, and Oregon Department of Environmental Quality to improve low summer stream flows and water quality in Hood River. Hood River irrigation districts will improve diversion screening and increase irrigation water efficiency through conversion of canals to pipe as well as more efficient irrigation techniques. County and private forest managers will adhere to state forest practices rules to protect stream habitat and reduce sediment delivery from forest roads and other management activities. Private agriculture will reduce farm chemical and nutrient delivery to subbasin streams. State and county road departments will work to eliminate fish passage obstacles at road crossings, as well as sediment delivery to streams from road drainage systems.

There are numerous planning and policy development processes presently occurring as part of the effort to address fish and wildlife needs within the Columbia River Basin. These processes, as well as the number of oversight agencies, have expanded over the recent years, subsequently affecting the amount of restoration work being performed on the ground. Additional staff and funding are needed to meet the obligations to the changing process and the resources.

There are opportunities for private and public landowners, as well as non-profit organizations (e.g., watershed councils, The Nature Conservancy), to work together to benefit wildlife and wildlife habitat within the subbasin through the protection and enhancement of lands for wildlife.

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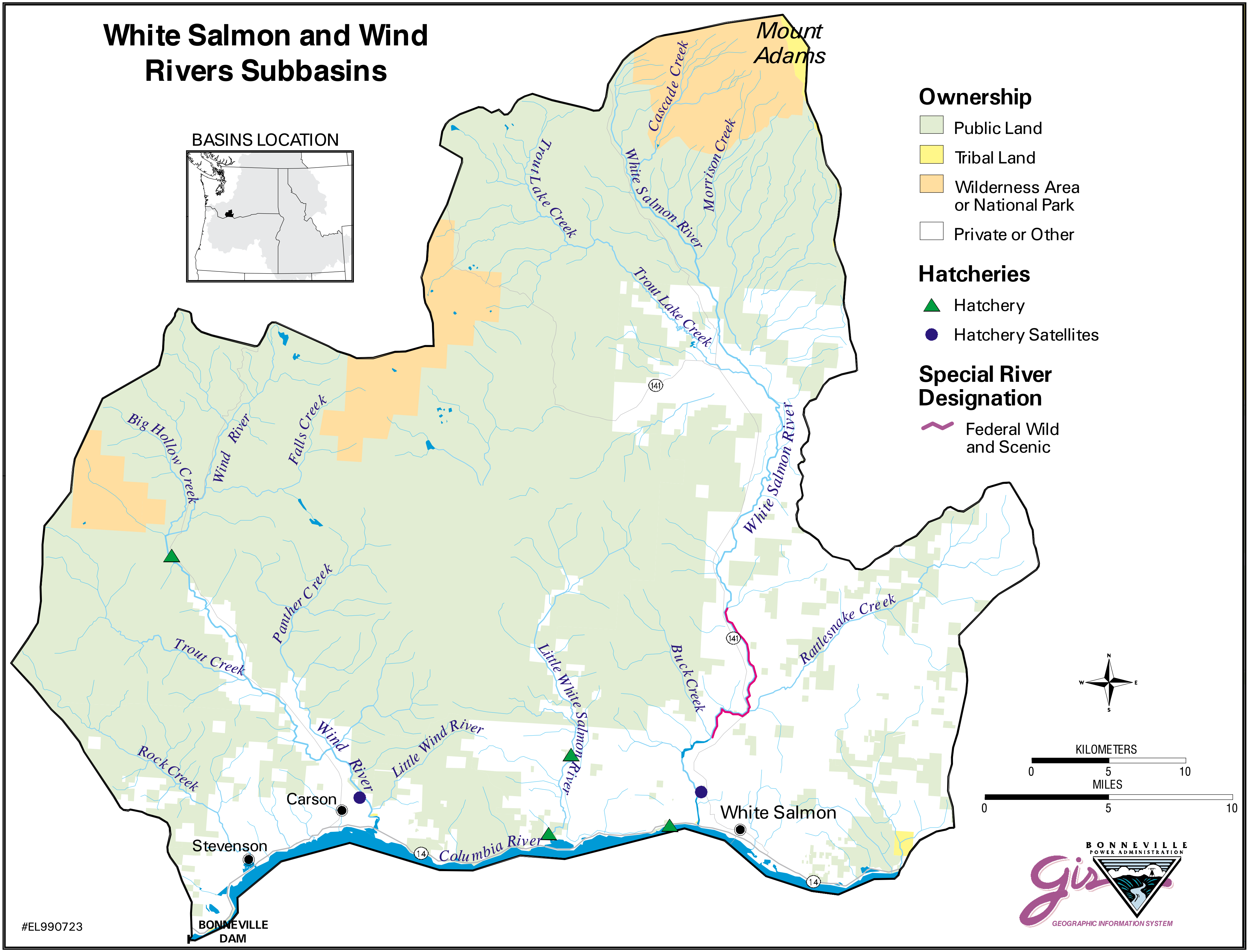


White Salmon and Wind Rivers Subbasins
BASINS LOCATION
Ownership
Public Land
Tribal Land
Wilderness Area or National Park
Private or Other
Hatcheries
Hatchery
Hatchery Satellites
Special River Designation
Federal Wild and Scenic
Mount Adams
Cascade Creek
Morrison Creek
White Salmon River
Trout Lake Creek
Big Hollow Creek
Wind River
Falls Creek
Panther Creek
Trout Creek
Rock Creek
Little Wind River
Little White Salmon River
Buck Creek
Rattlesnake Creek
Columbia River
Carson
Stevenson
White Salmon
BONNEVILLE DAM
141
14
KILOMETERS
0
5
10
MILES
0
5
10
N
S
E
W
#EL990723
BONNEVILLE POWER ADMINISTRATION
GEOGRAPHIC INFORMATION SYSTEM

Wind Subbasin

Anad fish 1 project $554

Fish and Wildlife Resources

Subbasin Description

The Wind River originates in the Gifford Pinchot National Forest in southwestern Washington. It is approximately 30.5 miles long and drains about 225 square miles. The subbasin is in the Cascade Mountains with elevation changes ranging from 3,200 feet at the source to 72 feet at the mouth (WDW, et. al., 1990). It flows southward and enters the Columbia River near Carson, Washington. Principal tributaries include Panther Creek, Trout Creek, Little Wind River, Bear Creek, and Paradise Creek.

Fish and Wildlife Status

Bull Trout (Threatened, 1998) – Status is unknown, there is insufficient information to make an assessment. Bull trout have been reported in the past. However, managers believe that this system currently does not support a reproducing population.

Coastal cutthroat (ESA candidate) – Historically present throughout the watershed. Currently extirpated.

Chinook salmon (Threatened, Lower Columbia ESU, 3/99)
Natural spawning of spring chinook in the upper Wind River did not occur until passage facilities were built at Shipherd Falls in 1956. As passage was restored and a spring chinook run established at the Carson National Fish Hatchery, natural spawning began in habitats above and below the hatchery. Naturally spawning fish are considered hatchery strays, and not a self-sustaining population. Juvenile chinook have been found in tributaries of the Wind River including Compass, Crater, Planting, Trout, and Trapper creeks. Existing habitat is in relatively good condition in the mainstem Wind River, although some tributaries have been rated fair to poor.

Natural spawning of tule fall chinook in the Wind River occurs in the mainstem below Shipherd Falls. Spawning also may occur in the Little Wind River, but surveys have not been completed for this tributary. Completion of Bonneville Dam inundated some habitats in the lower Wind River. Because tule fall chinook in the Columbia Basin are managed for hatchery production, any contribution from the natural production is minimal.
Straying from the Spring Creek National Fish Hatchery is also likely occurring.

Steelhead (Threatened, Lower Columbia ESU, 3/98)
Natural spawning of summer and winter steelhead in the Wind River occurs primarily in the mainstem, but spawning also occurs in Trout Creek and Panther Creek and in the lower reaches of nearly every tributary. Juvenile steelhead have been found in most tributaries, including Trout, Panther, Bear, Trapper, Dry, and Paradise creeks. Prior to the passage at Shipherd Falls, only steelhead were known to pass the falls successfully. Exact locations and sizes of spawning populations are not well documented. The historic run size was estimated at 2,500 fish, while the present population is approximately 370 fish. Examination of steelhead hatchery release records reveals that steelhead from Beaver Creek, Goldendale, Skamania, and Vancouver hatcheries have been released nearly every year since 1957. Releases were stopped in 1980 when an outbreak of infectious hematapoietic necrosis virus (IHN) at the Skamania Hatchery eliminated the program. Releases have been, and continue to be, mostly smolts, even though the naturally spawning steelhead population is otherwise managed as a wild stock. Natural runs probably consist of offspring from the annual releases and the original stock that inhabited the system.

Coho (ESA candidate, Lower Columbia ESU, 7/95)
A small spawning population of coho persists in the Wind River. No attempt is being made to increase the natural spawning populations of coho in the Wind River. Straying from hatcheries is most likely the primary source of any natural production.

Most populations of salmonids that historically occupied the Wind River watershed are considered depressed (WDF et al. 1993). According to a report by the American Fisheries Society, the Wind River winter steelhead are at high risk for extinction, the summer steelhead are at a moderate risk for extinction, and the Wind River sea-run cutthroat are extinct (Nehlsen et al. 1991). Because Shipherd Falls, which is 4.3 miles upstream from the historic mouth of the Wind River, was a natural barrier to all anadromous fish except steelhead (Bryant 1949), summer steelhead were dominant and numerous above this barrier. USFWS (1951) estimated the summer steelhead run size was 3,250 with an escapement of 2,500 spawners. The current number of wild summer steelhead spawning in the Wind River subbasin has been reduced to approximately 100 adults in recent years (Rawding 1997). In addition, a fall race of chinook that dominated the lower reach of the Wind River is depressed and composed of a substantial number of stray hatchery fish (WDF et al. 1993).

Salmonid stock inventory: bull trout/Dolly Varden. Washington Department of Fish and Wildlife. Olympia, Washington). Limited information exists for bull trout in the Wind subbasin. Observations of bull trout in this subbasin are rare. Currently, it is thought that bull trout do not inhabit this subbasin except as adults and that the adults observed are possibly of Hood River origin.

Habitat Areas and Quality

Anadromous fish losses have been attributed to the construction of Bonneville Dam, timber harvest, and rural development of the upper watershed (WDW et al. 1990). These activities in the upper watershed have severely impacted riparian areas and stream channels in several key steelhead subbasins. This is evidenced by maximum water temperatures exceeding 24° C (75° F), risk of increased peak flows and increased sedimentation (USFS 1995). There is also concern about the ecological and genetic risks posed by the anadromous hatchery programs (NMFS 1996). Carson National Fish Hatchery was constructed in 1938 to mitigate for the construction of Bonneville Dam and currently produces 1.8 million spring chinook smolts. A fish ladder at Shipherd Falls was constructed to allow salmon access to the hatchery at river mile 18. Hatchery steelhead smolts were released in the basin from the 1960's until 1998 when WDFW stopped stocking due to the risk of hybridization.

Watershed Assessment

In 1992 the Trout Creek watershed was assessed and several habitat restoration projects were initiated in 1994. The USFS completed a watershed analysis for the Wind River in 1995, which included descriptions of the watershed's past and current condition, identified land ownership, topography, soil types, transmission corridors, designated wetlands, vegetation communities, fish and wildlife communities, stream channel conditions, and stream cover types (USFS 1995). The analysis identified the Trout Creek watershed as the top priority for steelhead conservation due to the historic productivity and potential for recovery. In 1996 and 1997 the US Forest Service, US Fish and Wildlife Service and Underwood Conservation District began rehabilitation of the Trout Creek sub-watershed. These efforts have resulted in the development of bio-technical methods to improve steelhead habitat by stabilizing stream banks, improving channel complexity, reconnecting flood plains, and rebuilding riparian areas (Bair 1997). Adult fish passage problems at Hemlock Dam identified by Orsborn et al. (1987) were partially corrected in 1996 by increasing adult attraction flow at the ladder entrance and eliminating false attraction flow from the Wind River Nursery. Lethal maximum water temperatures, juvenile passage and recreation impacts at this facility remain unresolved.

The Wind River Restoration Team (WRRT) was formed in 1994 in response to the decline of steelhead within the Wind River. The team includes technical specialists from the Underwood Conservation District (UCD), USFWS, WDFW, USGS, Washington Trout (WT) and the Yakama Indian Nation (YIN).

Limiting Factors

Stream surveys, sub-basin assessments and watershed analysis were used to evaluate limiting factors in the Wind River. Fish habitat and water quality have been negatively impacted by past riparian timber harvest, stream clean-outs, road building and regeneration harvest within the rain on snow zone. Alluvial reaches within the main-stem Wind River and tributaries which contain the majority of steelhead spawning habitat have been significantly impacted. Many of these reaches were disturbed over eighty years ago, yet habitat and water quality have not recovered and in some cases are getting worse. Table 1 summarizes the fisheries synthesis of the 1996 Wind River Watershed Analysis that prioritizes restoration by sub-watershed.

Table 1. Sub-watershed restoration risk factor analysis and prioritization, Wind River, Skamania County, Washington

Aquatic Impacts Index	H2O ID	Sub-Watershed	Project Area	Steelhead Biological "Hot Spots" Ranked	Potential Disease and Competition	High Risk of Increased Peakflows	High Risk of Sedimentation Impacts	High Risk of Increased Maximum Water Temperature	Extremely Poor Habitat Conditions (Riparian Veg, LWD, Pools, W/D)	Migration Barriers Subterranean Flows, Dams or Culverts
80	N	Lower Trout	Trout	4	X	X	X	X	X	X
78	J	Middle Wind	Middle Wind	1	X		X	X	X	
72	M	Layout	Trout	2	X	X	X	X	X	X
66	I	Upper Trout	Trout	3	X	X	X	X	X	
56	F	Dry	Middle Wind	6	X				X	X
54	H	Compass/Crater	Trout	5	X	X	X	X	X	X
42	V	Upper Wind	Upper Wind	7	X	X	X		X	
24	T	Lower Panther	Panther	8	X		X		X	X
15	D	Trapper	Middle Wind	9	X					
12	Z	Lower Wind	Lower Wind	11	X		X			
6	B	Headwaters Wind	Upper Wind			X	X	X	X	X
5	C	Lower Falls	Upper Wind	15	X	X	X	X		
4	W	Pete's	Upper Wind		X			X	X	
4	U	Little Wind	Lower Wind	10						
3	G	Nine-mile	Middle Wind	13	X	X				
3	A	Paradise	Upper Wind	12	X					
3	L	Upper Panther	Panther		X	X	X			
3	K	Eight-mile	Panther	8	X	X				
3	O	Lower Bear	Panther		X	X				
2	R	Mouse	Panther	8			X			
2	S	Cedar	Panther	14						
1	P	Upper Falls	Upper Wind		X					
1	Q	NF Bear	Panther		X					
1	X	EF Bear	Panther		X					
1	Y	Brush	Lower Wind			X				
0	E	Big Hollow	Middle Wind							
			X	=	High Risk of Negatively Impacting Steelhead Productivty					

Habitat problems noted in the subbasin plan are mainly related to timber harvesting practices. Throughout the subbasin there continues to be a need to restore riparian vegetation, reduce sediment delivery to streams, and ensure continuous recruitment of large woody debris into the system.

Management of fish resources for hatchery production has delayed restoration of natural populations. Hatchery production programs for the system were developed following construction of the fish passage device at Shipherd Falls. Spring chinook broodstock for Carson hatchery was trapped at Bonneville Dam. Programs to restore fish to natural habitats have been limited, improperly designed, or non-existent. Losses of some species have not been mitigated in any manner (for example, tule fall chinook and coho).

Subbasin Management

Goals, Objectives and Strategies

The goal for anadromous fish in this subbasin is to restore sustainable, naturally producing populations to support tribal and non-tribal harvest and cultural and economic practices while protecting the biological integrity and the genetic diversity of the watershed.

To accomplish this goal the managers have adopted the following objectives: 1) improve adult passage survival; 2) improve adult prespawning survival; 3) improve juvenile rearing survival; and 4) restore depressed populations to productive levels.

To accomplish these objectives the managers have developed strategies of accelerating the recovery of habitat and water quality by reducing road densities, reforestation, and rehabilitation of riparian areas, flood plains, and stream channels. The US Forest Service and partners such as the US Fish and Wildlife Service and Underwood Conservation District have made significant progress in restoring hydraulic processes and rehabilitation of critical habitat since 1992.

The Columbia River bull trout population segment distributed throughout the Columbia River Basin is currently listed as Threatened by the U.S. Fish and Wildlife Service under the Endangered Species Act of 1973. The Washington Department of Fish and Wildlife has completed an inventory of the existing information for native char in Washington and published these results (Washington Department of Fish and Wildlife. 1998. Washington State. We need to determine the presence or absence of juveniles and adults in the subbasin. The product of this determination will be geographically based assessments of the distribution and abundance estimates of bull trout in the subbasin by critical life history stages. If bull trout are present, the genetic make up of the char found will be assessed relative to bull trout stocks in the region. Additionally, limiting factors for bull trout production will be determined. Identification of limiting factors will be used to develop a management plan for bull trout in the subbasin.

Past Efforts

The US Forest Service and partners such as the US Fish and Wildlife Service and Underwood Conservation District have made significant progress in restoring hydraulic processes and rehabilitation of critical habitat since 1992. From that time approximately 75 miles of road have been stabilized or “storm-proofed”, 35 miles have been decommissioned, 120 acres of flood plain have been reclaimed, 300 riparian acres have been planted and 2,000 pieces of LWD have been placed back in 6 river miles of stream. Table 2 provides a detailed list of restoration projects completed in the Wind River watershed (1991-1998).

Research, Monitoring and Evaluation

Completion of initial survey and evaluation work is required to determine future direction. Additionally, Wind River Watershed Restoration, project #980190 may impact limiting factors affecting bull trout allowing modification of management plans.

Remaining Work

Limiting factors analysis is required to develop a management plan for bull trout.

The Tribal Recovery Plan (Wy-Kan-Ush-Mi Wa-Kish-Wit) contains the following eleven recommendations for the subbasin:

1. A diversion on Trout Creek is used to provide water for Wind River Nursery. The diversion dam has created fish passage problems, low water flows, and high water temperatures. The diversion dam should be removed and a well installed.
2. Logging and development have impacted riparian vegetation throughout the watershed. The riparian vegetation should be restored. Logging and development in the riparian areas should be eliminated or restricted to maintain water temperature, bank stability, nutrient delivery, and channel stability.
3. Large woody debris is removed during logging and clearing of the riparian area. Large woody debris should be retained or restored to help maintain stream integrity.
4. Sedimentation due to logging occurs throughout the system. Roads, yarding of logs, and mass wasting from timber harvest all contribute to sediment delivery. Other types of streamside development also may introduce substantial amounts of sediment to streams. Logging practices should be made to conform to strict water quality standards or else logging must be prohibited from the watershed.
5. Runoff from the Wind River Nursery creates water quality problems in Martha Creek. The runoff from the nursery should be treated.
6. Establish naturally spawning populations of chinook, coho, and steelhead through supplementation. The existing hatchery program should be changed to begin developing a broodstock source from naturally spawning populations in the Wind River. Adult holding capabilities at Carson hatchery must be modified to allow separation of adults. The use of the existing hatchery trap should be compatible with maintaining the existing genetic make-up of spring chinook above that location because the naturally spawning fish are derived from hatchery strays. Final rearing and/or acclimation facilities should be constructed in the natural production areas above and below the hatchery.
7. Reprogram Spring Creek National Fish Hatchery to provide tule fall chinook for release into the natural production area of the lower Wind River. An annual release of up to 1,000,000 smolts should be started. Broodstock should continue to be acquired from the Spring Creek hatchery return.
8. Reprogram Skamania Trout Hatchery to use Wind River broodstock for supplementation of the naturally spawning summer steelhead population. The hatchery located on the North Fork of the Washougal River near Washougal, Washington was the first steelhead hatchery constructed as part of the Mitchell Act mitigation program for the Corps of Engineers mainstem dams. The facility is operated by the Washington Department of Fish and Wildlife and currently has the capacity to rear 650,000 smolts. National Marine Fisheries Service provides funding for the operation. The Vancouver Hatchery, located near the I-205 Bridge in Vancouver, Washington, is operated as a satellite for the Skamania facility which allows the National Marine Fisheries

Service to also fund that facility. Smolts are released in the Wind River. Broodstock for the program originated mainly from trapping adults in the Washougal River. The existing broodstock collection does not provide for the use of naturally spawning stocks. To ensure the program is more responsive to the natural runs, new adult traps and final rearing and/or acclimation facilities should be constructed in natural production areas of the Wind River. These facilities could be used in conjunction with the spring chinook program.

9. Release up to 500,000 juvenile coho from the Willard National Fish Hatchery. This program is to be coordinated with other proposals for Willard coho. Utilize final rearing and/or acclimation facilities for the release program in the natural production areas. Develop adult recapture facilities in the Wind River.
10. The Carson hatchery water supply should be improved to expand hatchery capacity by 1,800,000 spring chinook yearling smolts.
11. A program to restore lamprey should be developed by the relevant fishery managers. This program should be under the overall leadership of the tribes.

Table 2. Watershed restoration summary for completed projects within the Wind River, Skamania County, WA

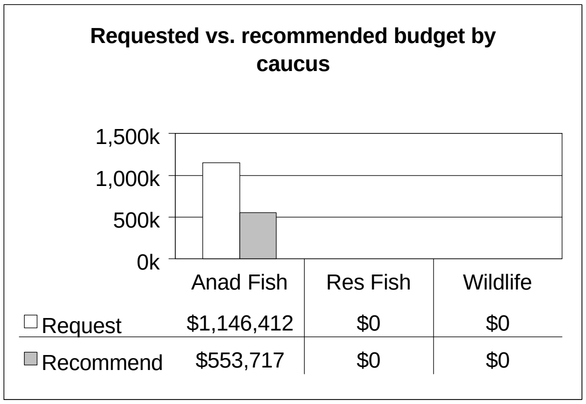
Project	Award	Location		Activity	Miles Complete	Total	Project	Implementaion	Funding
Lead	Year	(watershed)	Project Name	Type		Amt Funded	Planning		Source
Fish	91	M/L Wind	Little Soda Springs	Channel Work	0.4	$ 35,306	$ 17,950	$ 17,356	P & M
Fish	92	Trout	Trout Creek Riparian Rehab	Riparian Planting	2.3	$ 8,954	$ 1,708	$ 7,246	P & M
Fish	93	M/L Wind	Little Soda Springs	Channel Work	0.4	$ 15,338	$ 6,050	$ 9,288	P & M
Fish	93	Trout	Layout Cr Riparian Rehab	Riparian Planting	1.6	$ 6,379	$ 945	$ 5,434	P & M
Fish	94	Trout	Trout/Layout Soil Bio-Engr	Bank Stabilization	1.2	$ 55,281	$ 7,624	$ 47,657	USFWS, USFS & UCD
Fish	94	Trout	Trout/Compass/Crater	Riparian Planting	2.5	$ 19,114	$ 2,660	$ 16,454	USFWS & USFS
Fish	94	U Wind	Mining Reach	Riparian Planting	3.1	$ 20,220	$ 1,660	$ 18,560	USFWS & USFS
Eng	95	Wind	Decomissioning in Key (95.11.0	Decommissioning	4.3	$ 41,400	$ 6,900	$ 34,500	JITW
Fish	96	Trout	Trout Creek Instream Phase 1 a	Channel Work	3	$ 119,800	$ 23,800	$ 96,000	JITW, USFWS & UCD
Eng	96	Trout	Upper Trout Ck Roads	Decommissioning	5	$ 48,000	$ 8,000	$ 40,000	JITW
Eng	96	Up Wind	Rd 3100106 Decomissioning	Decommissioning	4.8	$ 46,500	$ 7,750	$ 38,750	JITW
Eng	96	Wind	Mid Wind, Nine Mi., Eight Mi Rd	Decommissioning	5	$ 48,000	$ 8,000	$ 40,000	JITW
Fish	96	Trout	Trout Creek Fish Ladder	Fish Passage Improvement		$ 90,000	$ 15,000	$ 75,000	JITW
Eng	96	Trout	Riparian Restoration (96.09.08)	Riparian Planting		$ 27,000	$ 4,500	$ 22,500	JITW
Eng	96	Wind	Wind River Rd Stormproffing	Stabilization	5	$ 48,000	$ 8,000	$ 40,000	JITW
Hydro	97	Panther	H94 Panther Cr. Bank Stab	Bank Stabilization		$ 1,320	$ 396	$ 924	Flood
Rec	97	Dry/Falls	Falls & Dry Cr. Trail Bridges	Bridge Repair		$ 19,050	$ 2,800	$ 16,250	JITW
Rec	97	M Wind	PCT Trail Bridge	Bridge Repair		$ 28,800	$ 4,800	$ 24,000	JITW
Rec	97	Panther	Panther Cr. Dispersed Site Reh	Camp Site Rehab		$ 25,000	$ 4,500	$ 20,500	JITW
Fish	97	Trout	Layout Cr Structure Renovation	Channel Work	0.1	$ 14,160	$ 2,000	$ 12,160	JITW
Fish	97	Up Wind	Hatchery Reach	Channel Work	1.6	$ 67,000	$ 11,900	$ 55,100	JITW & USFWS
Eng	97	Panther	Panther Cr. Rd Decomm.	Decommissioning	15	$ 132,000	$ 5,500	$ 126,500	JITW
Hydro	97	Trout	Road 4101 Oblit	Decommissioning	4.6	$ 43,560	$ 6,534	$ 37,026	Flood
Hydro	97	Trout	Road 4101402 Oblit	Decommissioning	0.2	$ 1,450	$ 218	$ 1,233	Flood
Eng	97	Up Wind	Black Cr. Swamp Rd Decom	Decommissioning	2.9	$ 24,000	$ 1,000	$ 23,000	JITW
Hydro	97	L Wind	Road 68 Bear Cr. Slide, MP 16.	Erosion Control	0.375	$ 3,750	$ 750	$ 3,000	JITW
Fish	97	M/L Wind	J3 Tyee Springs	Erosion Control		$ 3,960	$ 1,188	$ 2,772	Flood
Hydro	97	M/L Wind	Landslide Stab (9 slides)	Erosion Control		$ 3,960	$ 1,188	$ 2,772	Flood
Hydro	97	Panther	H7 Road 6063090 Reveg	Erosion Control	0.06	$ 740	$ 222	$ 518	Flood
Hydro	97	Trout	Road 5400 (mp 8.1)	Erosion Control	0.06	$ 660	$ 198	$ 462	Flood
Hydro	97	Trout	Road 5400 ID #8540	Erosion Control	0.11	$ 1,310	$ 393	$ 917	Flood
Hydro	97	Up Wind	H10 Road 3056 Reveg	Erosion Control	0.05	$ 530	$ 159	$ 371	Flood
Hydro	97	Up Wind	Road 6401 Reveg	Erosion Control	0.05	$ 530	$ 159	$ 371	Flood
Fish	97	Trout	Trout Ck. Fish Ladder Aux. Flow	Fish Passage Improvem	0.02	$ 40,500	$ 3,500	$ 37,000	JITW
Fish	97	M/L Wind	G1 9-Mile Cr Slide Rest	Riparian Planting		$ 10,877	$ 756	$ 10,121	Flood
Fish	97	M/L Wind	G2 9-Mile Cr. Slide Rest	Riparian Planting		$ 8,200	$ 2,460	$ 5,740	Flood
Fish	97	M/L Wind	Mouse Cr. Stabilization	Slide Restoration		$ 1,644	$ 744	$ 900	JITW
Fish	97	Panther	Panther Cr. Slide Stabilization	Slide Restoration		$ 1,400	$ 200	$ 1,200	JITW
Fish	97	Trout	Compass Cr Slide Rehab	Slide Restoration		$ 30,000	$ 4,000	$ 26,000	JITW
Eng	97	M/L Wind	GMS Road Repair	Stabilization	2.7	$ 25,080	$ 3,762	$ 21,318	Flood
Rec	97	M Wind	Trail Damage Repair (Dry & Big	Trail Repair		$ 3,550	$ 700	$ 2,850	JITW
Bot	97	Wind	SSC Noxious Weed Control	Weed Control		$ 24,000	$ 1,500	$ 22,500	JITW
Fish	98	M/L Wind	J4 PCT Bridge Protection	Channel Work	0.3	$ 9,925	$ 2,182	$ 7,743	Flood
Fish	98	Panther	Q2 Panther Cr Channel Repair	Channel Work	0.2	$ 7,770	$ 2,331	$ 5,439	Flood
Fish	98	Trout	I3 Trout/Compass confluence	Channel Work	1.58	$ 7,920	$ 2,376	$ 5,544	Flood
Fish	98	Panther	K4 Panther Cr. Trib Slide Resto	Riparian Planting		$ 8,955	$ 723	$ 8,232	Flood
Fish	98	Panther	K2 Eightmile Cr Planting	Riparian Planting		$ 8,270	$ 2,481	$ 5,789	Flood
Fish	98	Panther	K3 Eightmile Cr Bank Prot	Slide Restoration		$ 9,539	$ 774	$ 8,765	Flood
Fish	98	Up Wind	A1 Paradise Slide #1	Slide Restoration		$ 10,560	$ 3,168	$ 7,392	Flood
Fish	98	Up Wind	A2 Paradise Slide #2	Slide Restoration		$ 530	$ 159	$ 371	Flood
Eng	98	M/L Wind	General Storm Proofing	Stabilization	6.6	$ 62,440	$ 9,366	$ 53,074	Flood
Eng			Traveling Screen/ Enclosure Mo	Fish Passage Improvement		$ 2,500		$ 2,500	JITW
Fish	98	Dry	Dry Cr Roads, 65202-3	Decommissioning	4.4	$ 109,000	$ 21,800	$ 87,200	BPA & JITW
Totals						$ 1,274,732	$ 205,634	$ 1,069,099	

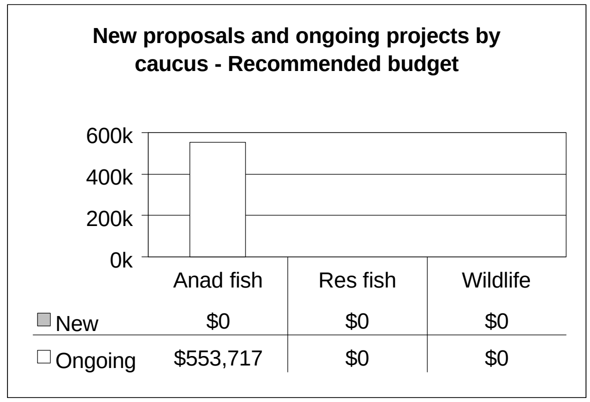
Subbasin Recommendations

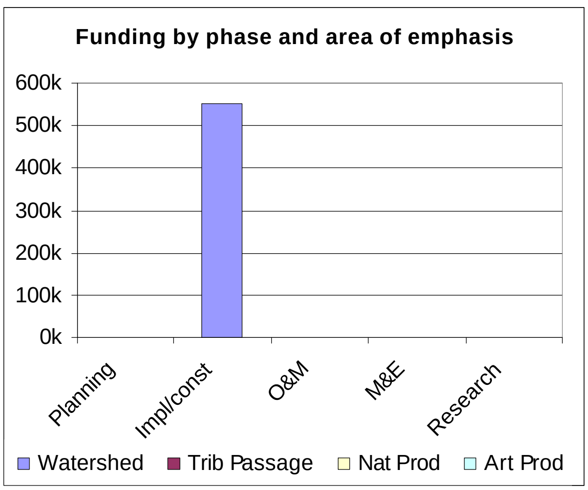
Projects and Budgets

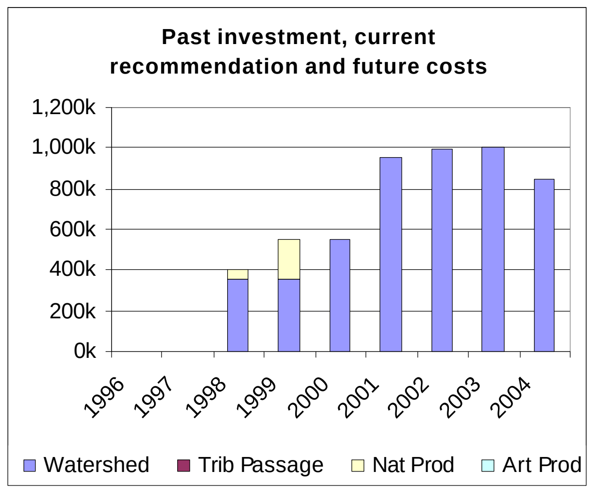
Based on the preceding subbasin description, the CBFWA fish and wildlife managers recommend funding one anadromous fish project at a cost of $553,717.

Refer to the following figures for detail on: 1) total recommended and requested budget by caucus, 2) funding for new and ongoing work, 3) funding by project phase and emphasis, and 4) funding by time period (past, current and future). Individual projects are listed in the following table.









ProjectID	Title	Sponsor	FY99 recom.	FY00 recom.	Estimated Outyears FY01	FY02	FY03	FY04

Anadromous Fish Projects

ProjectID	Title	Sponsor	FY99 recom.	FY00 recom.	FY01	FY02	FY03	FY04
9801900	Wind River Watershed Restoration	UCD, USFS, USGS, WDFW	350	554	950	990	1,000	850
			Anadromous Fish Totals	**$554**	**$950**	**$990**	**$1,000**	**$850**
	* indicates ESA project, † indicates 'Innovative work'		**SUBBASIN TOTALS**	**$554**	**$950**	**$990**	**$1,000**	**$850**

All figures in thousands of dollars

Needed Future Actions

Additional funding will be required through FY 2008 to acquire sufficient information to develop a management plan for bull trout. Outyear budget projections are for $200,000 per fiscal year. Assessment of wildlife impacts from hydropower development.

Actions by Others

Significant progress has been made toward restoration goals. However there is still an enormous amount of valuable habitat that is in serious need of rehabilitation, which will help to increase the overall production of the basin.

Table 3. U.S.F.S. Out year riparian and channel restoration project priorities and cost estimates for the Wind River Watershed, Skamania County, Washington.

			Limiting Factors										
Priority	***Stream Segment or Reach***	***River Miles***	***Riparian***	***Pools***	***LWD***	***W/D***	***Banks***	***Flood Plain***	***Migration***	***Over Head***	***Cost Est.***	***Cost/River Mile***	***Status***
11a	Compass 1	0.4	X	X	X	X				$9,500	$38,000	$95,000	Surveyed
11b	Compass 2	0.9		X	X					$10,350	$41,400	$46,000	Surveyed
11c	Compass 3	1.2		X	X					$13,800	$55,200	$46,000	Surveyed
11d	Compass 5	1							X	$5,000	$20,000	$20,000	Surveyed
		3.5									**$193,250**		
10a	Crater 1	0.3	X	X	X	X				$7,125	$28,500	$95,000	Surveyed
10b	Crater 2	0.2	X			X	X			$4,700	$18,800	$94,000	Surveyed
10c	Crater 3	0.3	X		X	X				$7,050	$28,200	$94,000	Surveyed
12b	Crater 4	0.3	X			X	X			$7,050	$28,200	$94,000	Surveyed
12c	Crater 5	0.4			X					$4,500	$18,000	$45,000	Surveyed
12a	Crater 6	0.4			X				X	$9,500	$38,000	$95,000	Surveyed
		1.9									**$199,625**		
9b	Dry 1	1.8	X	X	X	X	X			$43,200	$172,800	$96,000	Planning
9a	Dry 3	0.6	X		X			X		$14,100	$56,400	$94,000	Planning
		2.4									**$286,500**		
17b	Eightmile 1	**0.8**	X							$500	**$2,000**	$2,500	Planned
3	Layout 1	1.1	X	X	X	X	X	X		$26,675	$106,700	$97,000	Complete
7	Layout 2	0.6	X	X	X	X				$14,250	$57,000	$95,000	Surveyed
		1.7									**$204,625**		
6c	Middle Wind 1	2.2			X			X		$24,750	$99,000	$45,000	Planned
6b	Middle Wind 2	1.5			X			X		$16,875	$67,500	$45,000	Complete
6a	Middle Wind 3	1.6	X		X		X			$37,600	$150,400	$94,000	Planned
		5.3									**$396,125**		
14a	Oldman 1	1.1	X		X				X	$25,850	$103,400	$94,000	Surveyed
14c	Oldman 2	0.5	X	X	X	X			X	$11,750	$47,000	$94,000	Surveyed
14d	Oldman 3	0.5		X	X	X			X	$5,750	$23,000	$46,000	Surveyed
		2.1									**$216,750**		
26	Panther 2	1.1	X							$550	$2,200	$2,000	Surveyed
30	Panther 4	0.6			X					$6,900	$27,600	$46,000	Surveyed
31	Panther 5	0.8			X					$9,200	$36,800	$46,000	Surveyed
		2.5									**$83,250**		
16b	Pete's Gulch 1	0.8	X		X					$1,040	$4,160	$5,200	Surveyed
16a	Petes Gulch 2	0.9	X		X					$1,170	$4,680	$5,200	Surveyed
		1.7									**$11,050**		
15a	Planting 1	0.4			X					$4,600	$18,400	$46,000	Surveyed
15b	Planting 2	0.5			X					$5,750	$23,000	$46,000	Surveyed
		0.9								$10,350	$41,400		
18	Proverbial 1	**1.5**	X		X					$2,438	**$9,750**	$6,500	Surveyed
13	Trapper 1	**1.9**			X					$27,313	**$109,250**	$57,500	Surveyed
1	Hemlock Dam	**0.1**							X	$93,750	**$375,000**	$3,750,000	Planning
17a	Trout 3	0.4	X							$200	$800	$2,000	Surveyed
4	Trout 4	1.8	X		X					$23,400	$93,600	$52,000	Planned
2	Trout 5	2.2	X		X		X	X		$28,600	$114,400	$52,000	Complete
8	Trout 6	1.9	X		X		X	X		$24,700	$98,800	$52,000	Surveyed
8	Trout 7	0.7	X				X			$9,100	$36,400	$52,000	Surveyed
		7									**$430,000**		
5	Upper Wind 3	0.9	X	X		X	X			$11,700	$46,800	$52,000	Planned
5	Upper Wind 4	0.6	X	X		X	X			$7,800	$31,200	$52,000	Planned
		1.5									**$97,500**		
14b	Youngman 1	**0.9**		X		X	X		X	$12,938	**$51,750**	$57,500	Surveyed
	Total	**66.2**									**$2,666,425**		

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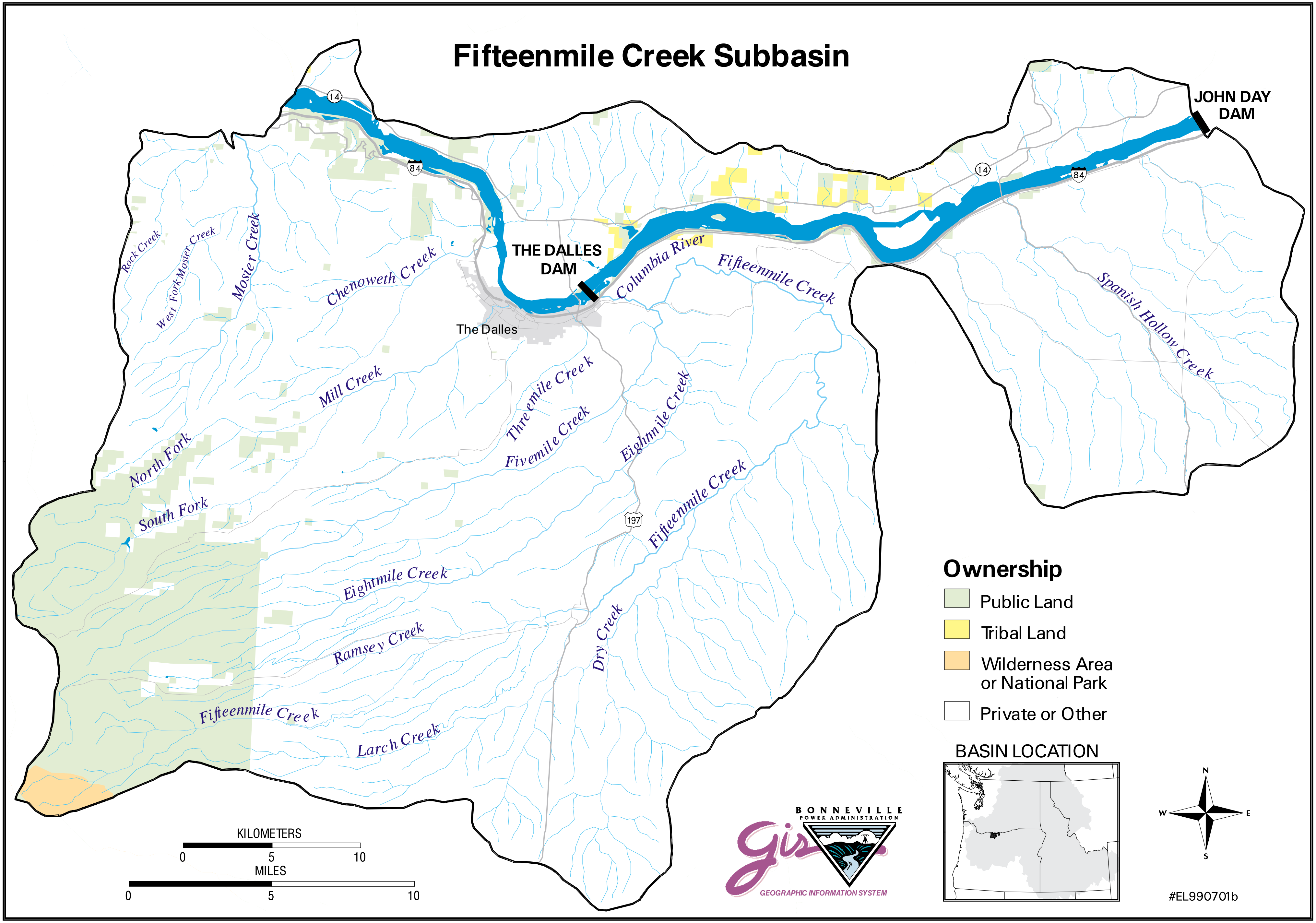


Fifteenmile Creek Subbasin
JOHN DAY DAM
THE DALLES DAM
The Dalles
Columbia River
Fifteenmile Creek
Spanish Hollow Creek
Rock Creek
West Fork Mosier Creek
Mosier Creek
Chenoweth Creek
Mill Creek
Threemile Creek
Fivemile Creek
Eightmile Creek
North Fork
South Fork
Eightmile Creek
Ramsey Creek
Fifteenmile Creek
Larch Creek
Dry Creek
Fifteenmile Creek
14
84
197
Ownership
Public Land
Tribal Land
Wilderness Area or National Park
Private or Other
BASIN LOCATION
KILOMETERS
0 5 10
MILES
0 5 10
BONNEVILLE POWER ADMINISTRATION
GEOGRAPHIC INFORMATION SYSTEM
N
W
E
S
#EL990701b

Fifteenmile Subbasin

Anad fish 2 projects $274

Fish and Wildlife Resources

Subbasin Description

The Fifteenmile Creek Subbasin in north central Oregon covers approximately 373 square miles. Fifteenmile Creek flows northeast out of the Mount Hood National Forest and then circles north through dry land wheat country southeast of The Dalles before dropping down to the Columbia River immediately downstream from The Dalles Dam. The U.S. Forest Service (USFS) is the primary land manager, administering approximately 19 percent of the subbasin. Timber production is the major land use. Private lands occupy most of the remainder of the watershed and are used for a variety of agricultural purposes, with dry land grain farming the dominant type of agriculture.

Fish and Wildlife Status

The Fifteenmile Creek drainage supports the eastern most population of wild winter steelhead in the Columbia River system. Since hatchery winter steelhead have never been released into the drainage biologists believe that the existing population is a unique stock. This population was listed as a Threatened Species under the Endangered Species Act in the spring of 1999. No quantitative and very little qualitative life history information exists for this stock of steelhead. It is assumed that the wild run has a life history similar to that of winter steelhead in lower Columbia River subbasins. Winter steelhead return to this drainage from March through April, primarily as 1-salt and 2-salt fish, spawn from late March through April, emerge from early June through mid July, and migrate as smolts during April and May, primarily as age-2+ and age-3+ juveniles. No data are available on age structure, sex ratio, length-weight ratio, fecundity, and egg-to-smolt and smolt-to-adult survival rates for this subbasin.

It is assumed that the run is presently depressed at a very low level. Based on what limited information is available on the spatial distribution of the population, managers believe that approximately 91 linear miles of suitable spawning habitat and 44 linear miles of suitable rearing habitat are currently available for use by winter steelhead. The annual run may be 200 to 300 fish.

Spring chinook salmon are known to have been present in this subbasin during at least the past three years. These fish have successfully spawned and chinook smolts have been observed emigrating from the stream system. Pacific lamprey spawn and rear in the subbasin and were historically and are currently of significant cultural value to the Confederated Tribes of the Warms Springs Reservation of Oregon.

Stock	Genetic History / Management Intent	Spawn Escape	Hatchery Take	Harvest	Recent Total Escape
StW	Manage for natural production	(1,500)			300
ChS	Incidental natural spawning.				
Lamprey	Management under discussion.				

The Fifteenmile Subbasin also supports populations of resident rainbow trout and the eastern most population of coastal cutthroat in the Columbia River Basin. The cutthroat population proposed has been for listing as a Threatened Species under ESA.

The Fifteenmile Subbasin is in the transition zone between western and eastern Oregon. A wide range of climatic conditions favors a wide variety of wildlife species, including big game, fur bearers, upland birds, waterfowl, nongame birds and wildlife. The bald eagle, a threatened species frequently winters in the subbasin and is commonly found in close proximity to wintering herds of migratory blacktailed deer.

A variety of wildlife species, including large and small mammals, waterfowl, passerines, raptors, reptiles, and amphibians, are associated with Fifteenmile Creek riverine, wetland, and upland habitats. Although the status of wildlife populations varies throughout the basin and by species, many wildlife species within the basin are listed as listed as Federal and/or State Threatened, Endangered, Sensitive, or At-Risk (e.g., peregrine falcon [*Falco peregrinus*]) (Puchy and Marshall 1993). Certain populations of wildlife species are being managed by federal and state wildlife managers throughout the subbasin, including big game, furbearers, upland birds, and waterfowl species. The chukar is the most abundant and widespread upland game bird in the area. Avifauna associated with cliffs at the Columbia River/Fifteenmile Creek confluence include red-tailed hawk, prairie falcon, American kestrel, and rock dove.

Habitat Areas and Quality

Fifteenmile Creek now has 50 miles of stream where livestock are excluded by fences. In addition, 7.5 unfenced miles of stream are protected by lease agreements with landowners to exclude livestock grazing. To date ODFW has installed 1,000 instream fish habitat structures and maintains six fish screens with BPA funding. ODFW has also used Mitchell Act funding to install and maintain 100 rotary pump fish protection screens and six gravity diversion fish protection screens.

The Fifteenmile Creek system typically has high quality water flowing off the national forest in higher gradient stream reaches. The stream gradient transitions to a more gentle grade at approximately the private lands-national forest land interface. This area typically has good spawning habitat for salmonids. As the streams in this subbasin continue to flow downstream through private agricultural land stream flows are reduced by irrigation withdrawls, sediment input increases with runoff from annually cultivated cropland, and stream temperature extremes are accentuated.

Habitat areas are characterized by urban and orchard lands in the lower subbasin, shrub steppe lands, along the valley walls, dry land grain fields on the uplands, transitioning into Shrub Steppe, oak, oak-pine, and pine-fir forests towards the headwaters. Wildlife are associated with riverine and adjacent riparian forest, wetland, mixed coniferous and deciduous forest, Shrub Steppe, and agricultural habitats in the Fifteenmile subbasin. Habitat quality is variable depending on the degree to which habitats have been converted into other land uses or impacted by human activities and invasion of noxious weeds. Habitat has generally been degraded by hydropower development (i.e., by The Dalles Dam), past and present land management activities, the spread of non-native plant species, and urban expansion. Agricultural lands (e.g., fruit orchards and dryland farming) are widespread and provide limited habitat for wildlife. Bottomlands and riverine habitats along Fifteenmile Creek have also been dramatically altered by dredging, dikes, and flood control activities in the upstream Dalles Dam project area. However, restoration activities occurring along the Fifteenmile Creek main stem and major tributaries for winter steelhead spawning and rearing habitat are improving the quality of riparian habitat for wildlife. Hydropower development has altered riverine and riparian habitats through flow regulation, channel modification, diking, and dredging. Other activities related to hydroelectric development (e.g., road construction) have altered land and stream areas in ways that affect wildlife. In some cases, the construction and maintenance of power transmission corridors altered vegetation, increased access to and harassment of wildlife, and increased erosion and sedimentation in Fifteenmile Creek.

Little land is protected and managed specifically for wildlife in the Fifteenmile Subbasin. Headwater tributaries of Fifteenmile Creek lie within the USFS's Mount Hood National Forest.

Watershed Assessment

The Fifteenmile Creek Subbasin is a small geographic area. The Confederated Tribes of the Warm Springs Reservation (CTWS), the Oregon Department of Fish and Wildlife (ODFW), and the Mt. Hood National Forest (USFS) cooperated in the development of the Fifteenmile Subbasin Fish Improvement Implementation Plan in 1986. This plan identifies the fish species present in the watershed, as well as their limiting factors. The plan identifies goals, objectives, and strategies for restoration of the subbasin's fishery resources. The plan objectives include the logical "top down" habitat restoration approach, which is designed to build on restoration successes by starting work near the USFS boundary and then proceeding downstream. This strategy has generally been followed during the implementation of the Fifteenmile Creek Habitat Restoration Project.

The USFS recently completed a watershed assessment for the "Miles Creek Drainage". Most of the emphasis is on lands within the national forest, but off-forest private lands are also discussed. The Fifteenmile Creek Watershed

Council, working in cooperation with the Wasco County SWCD and the Natural Resource Conservation Service has been developing a watershed assessment for the subbasin. The Oregon Department of Agriculture is currently leading the process of developing an agriculture water quality plan that will meet state and federal water quality standards for the Fifteenmile Creek subbasin and some adjacent drainages.

The Natural Heritage Program maintains a data base on habitats and species occurrences throughout the State of Oregon. The Oregon Trust Agreement Planning Project (BPA 1993) and Oregon GAP Analysis Project (ODFW 1997) identified gaps in bio-diversity and needs for terrestrial habitat restoration, and resulted in a prioritized list of potential habitat restoration opportunities in the Lower Mid-Columbia Subregion, including the Fifteenmile Subbasin.

A Columbia Basin wide losses assessment was conducted to quantify habitat impacts from hydrosystem development. Wildlife mitigation objectives for the Fifteenmile subbasin are based on this losses assessment (see Table 1). These losses were amended into the Northwest Power Planning Council's Fish and Wildlife Program as accepted wildlife losses caused by the construction of the hydrosystem. Losses were measured in Habitat Units (HUs) for selected target/indicator species and area linked to priority habitats. (Note: all or part of the wildlife losses for Lower Mid-Columbia Subregion may be mitigated for in the Fifteenmile Subbasin, though it is unlikely that it would be proposed or could occur).

Limiting Factors

Fish production is limited primarily by water quality (i.e. temperature extremes and high sediment levels) and low flows aggravated by irrigation withdrawals and degradation of riparian zones from channelization, intensive agricultural practices, and overgrazing.

- Dry land farming and extensive livestock grazing of open rangeland have been responsible for the elimination and degradation of the riparian zone throughout much of the middle and lower stream drainages.
- Logging practices on forest lands in the upper drainage have decreased the ability of the upper watershed to store water and regulate runoff which has contributed to stream channel shifts throughout the subbasin during frequent high runoff events and aggravated by farming practices within the floodplains of most streams.
- Degraded riparian stream corridors, stream isolation from the flood plain, and water withdrawals for irrigation reduce the flow in many streams by late spring or early summer.

Juvenile salmonids were lost where irrigation diversions were formerly either unscreened or inadequately screened. These diversions have now been screened to protect fish. Fish production in the subbasin is limited by water quality, low flows caused by irrigation withdrawals, and water temperature extremes associated with degradation of riparian zones caused by channelization, overgrazing and agricultural practices. Dry land farming and grazing on open rangeland have eliminated and degraded the riparian zone throughout much of the middle and lower stream drainages. Logging practices on forestlands in the upper drainage have decreased the ability of the upper watershed to store water and regulate runoff resulting in frequent high runoff events and channel shifts. Irrigation withdrawals deplete many streams by late spring or early summer, and juvenile resident salmonids are lost where irrigation diversions are either unscreened or inadequately screened.

Wildlife abundance is currently limited by the results of past hydropower development (e.g., habitat loss and degradation, the decrease in fish abundance), past and current land management practices (e.g., irrigation, logging, livestock and agricultural practices, road construction), the spread of non-native plant and wildlife species, and urban expansion. For example, increasing development in The Dalles metro area continues to eliminate remaining wildlife habitats. Limiting factors to deer and elk wintering range include conversion of historic winter range and Shrub Steppe habitat to other uses, and competition with native plant assemblages by noxious weeds. Land prices continue to rise, making it more economically difficult to preserve remaining undeveloped lands for wildlife. Water use practices (e.g., irrigation) can negatively affect quality and quantity, and are also factors limiting to wildlife. Continued declines in salmon and other fish species results in a loss of overall biomass being contributed to the subbasin. This reduction has negative effects on wildlife abundance. Any of these influences can be, and are, limiting factors to local populations. Changes in local populations can affect species integrity on a larger scale. Opportunities to restore wildlife populations and improve wildlife habitat diminish over time as habitat loss and degradation continues. Shrub Steppe habitats in the Fifteenmile Subbasin are particularly sensitive to additional loss as the vast majority of Columbia Plateau Shrub Steppe has been converted to agriculture. Many of the State TES species are Shrub Steppe dependent.

Subbasin Management

Goals, Objectives and Strategies

Fish

The anadromous fish species most actively targeted for management in the Fifteenmile Subbasin is the native winter steelhead. There is only incidental natural production of spring chinook, and the management intent for Pacific lamprey is under discussion because little is known about their abundance. The goal for these species is to restore sustainable, naturally producing populations to support tribal and non-tribal harvest and cultural economic practices while protecting the biological integrity and the genetic diversity of the watershed.

The strategy for resident salmonids is to maintain the populations through stream and riparian habitat protection and/or restoration. There are no plans to supplement these populations with hatchery fish. Many of the measures designed to restore anadromous fish populations will also directly benefit resident fish.

The co-managers have adopted the following outcome-based objectives to address these problems: 1) improve adult pre-spawning survival and 2) improve juvenile rearing and passage survival.

The strategic approach to achieving these objectives includes improving habitat through riparian fencing, fish screens at irrigation diversions, instream structures, and passage improvements.

Wildlife

The overall wildlife mitigation goal for the Columbia River Basin is to achieve and sustain levels of habitat and species productivity in order to fully mitigate for all wildlife and wildlife habitat losses caused by the development and operation of the hydropower system (NWPPC 1995). This goal applies to the Lower Mid-Columbia Subregion, including the Fifteenmile Subbasin. Within the Lower Mid-Columbia Subregion, the wildlife mitigation goal is to be achieved by fully mitigating for losses associated with Bonneville, The Dalles, John Day, and McNary dams.

The wildlife mitigation objective is to maintain and restore populations of wildlife native to the Fifteenmile Subbasin, including those target species selected to represent the cover types within the subbasin, and those habitat types considered priorities within the subbasin (i.e., riverine/riparian, old growth forest, wetlands, coniferous forest). The wildlife mitigation objective is based on the Northwest Power Planning Council’s accepted wildlife losses measured in Habitat Units (HUs) for selected target/indicator species linked to priority habitats.

The priority habitat types for wildlife in this subbasin are riparian/riverine, wetlands and shrub-steppe. Islands are medium priority, agricultural lands low priority.

The following strategies will achieve wildlife mitigation objectives within the Fifteenmile Subbasin:

- Identify potential protection and enhancement projects within the Fifteenmile Subbasin through the GAP Analysis and coordinate implementation of activities through the Oregon Wildlife Coalition.
- Implement land acquisition and easements of priority habitats.
- Implement enhancement and restoration activities (e.g., control of non-native plant species, management of livestock grazing practices for native plant communities).
- Monitor and evaluate wildlife habitat and wildlife species response to implemented enhancement activities within the Fifteenmile Subbasin.

Past Efforts

Currently, the specific actions funded under the NWPPC Fish and Wildlife Program are in Project No. 9304000, which initially implemented habitat improvements, but now provides operations and maintenance of past investments.
Fencing excludes livestock from 50 miles of Fifteenmile Creek. Seven and one half unfenced miles of stream are protected by lease agreements with landowners to exclude livestock grazing. To date ODFW has installed 1,000

instream fish habitat structures and maintains six fish screens with BPA funding. ODFW has also used Mitchell Act funding to install and maintain 100 rotary pump fish protection screens and six gravity diversion fish protection screens. All high priority diversions have been screened.

The USFS has implemented instream habitat restoration projects on Fifteenmile, Ramsey, Eightmile, and the South Fork of Fivemile Creeks. This work has included improving fish passage at road crossings, installation of large woody debris, and assistance with fish screening. In addition, the USFS has closed and scarified roads to reduce erosion and stream sedimentation.

The Wasco County Soil and Water Conservation District (SWCD), the Fifteenmile Watershed Council, and the Natural Resource Conservation Service (NRCS) have all been working cooperatively with subbasin private land managers to resolve some of the serious cropland erosion and resulting stream water quality. This work has included working with landowners and operators to develop and implement farm conservation plans.

Although no site-specific wildlife mitigation projects have been funded by BPA in the Fifteenmile subbasin, the Oregon Wildlife Coalition is implementing a programmatic mitigation project that may result in the implementation of mitigation projects within the subbasin. The goal of this project, *Securing Wildlife Mitigation Sites* **-** *Oregon (Project No. 9705900)*, is to:

- Fund project coordination activities to identify, plan, propose, and implement wildlife mitigation projects within the Lower Mid-Columbia Subregion, including the Fifteenmile Creek Subbasin
- Prioritize potential mitigation projects within the Fifteenmile Creek Subbasin.
- Acquire or ease lands with priority habitats within the Fifteenmile Creek Subbasin
- Enhance acquired or eased lands through alteration of land management practices, active restoration of habitats, control of noxious weeds, control of public access, etc. to provide benefits to target/indicator wildlife species within the Fifteenmile Creek Subbasin
- Develop and implement a Monitoring and Evaluation Plan with both HEP based and non-HEP based monitoring criteria within the Fifteenmile Creek Subbasin

Research, Monitoring and Evaluation

Currently monitoring and evaluation activities within the subbasin include maintenance of riparian photopoints, collection of stream temperature data, steelhead spawning surveys on index stream reaches, monitoring smolt migration, and monitoring of habitat restoration developments (i.e. riparian fences, off-channel livestock watering sites, fish screens, fish passage facilities, and instream habitat structures).

Wildlife surveys and inventories (e.g., big-game aerial surveys) are conducted within the Fifteenmile Subbasin regularly by CTWSRO and ODFW.

Remaining Work

There are opportunities to expand upon the riparian restoration projects completed to date by extending the livestock exclosure fencing along the lower reaches of Fifteenmile and Eightmile creeks. Fivemile Creek has not received any restoration work to date outside the national forest because it was identified as a lower priority. However, Fivemile Creek does support a remnant steelhead population, as well as resident rainbow and cutthroat trout. Other restoration work could be implemented on a number of smaller tributaries that have an important affect on the water quality in the existing fish bearing streams.

Continued implementation of the Oregon Wildlife Coalition's programmatic mitigation project, *Securing Wildlife Mitigation Sites* **-** *Oregon (Project No. 9705900)*, may identify other potential wildlife protection and enhancement projects within the Fifteenmile Subbasin. Implementation of projects within the subbasin would help offset the wildlife Habitat Unit (HU) losses still remaining at the Bonneville, The Dalles, John Day, and McNary Dams. For example, none of Oregon's wildlife losses at The Dalles Dam have been mitigated for to date.

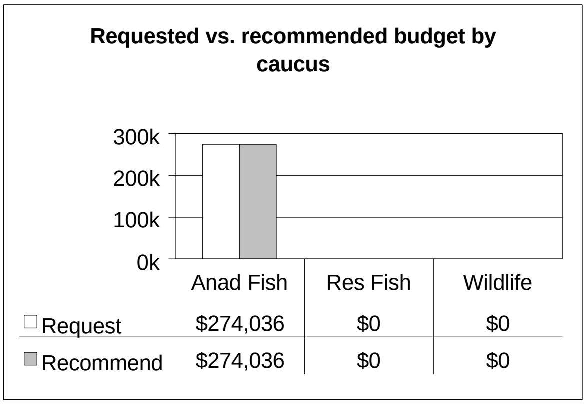
Other remaining wildlife related work tasks within the Fifteenmile Subbasin include assessment and mitigation of hydropower system operational and secondary losses, development and implementation of a regional Monitoring and Evaluation Plan, and development of both HEP-based and non HEP-based monitoring success criteria.

Subbasin Recommendation

Projects and Budgets

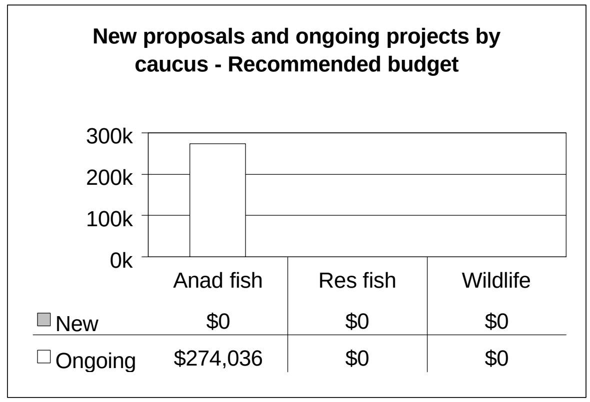
Based on the preceding subbasin description, the CBFWA fish and wildlife managers recommend funding a total of 2 projects at a cost of $274,036. Of the projects recommended, 2 focus on anadromous fish, 0 focus on resident fish, and 0 are directed at wildlife.

Refer to the following figures for detail on: 1) total recommended and requested budget by caucus, 2) funding for new and ongoing work, 3) funding by project phase and emphasis, and 4) funding by time period (past, current and future). Individual projects are listed in the following table.



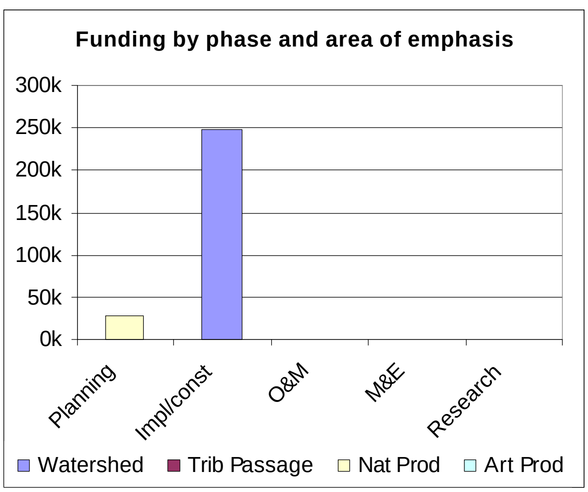
Requested vs. recommended budget by caucus

	Anad Fish	Res Fish	Wildlife
Request	$274,036	$0	$0
Recommend	$274,036	$0	$0

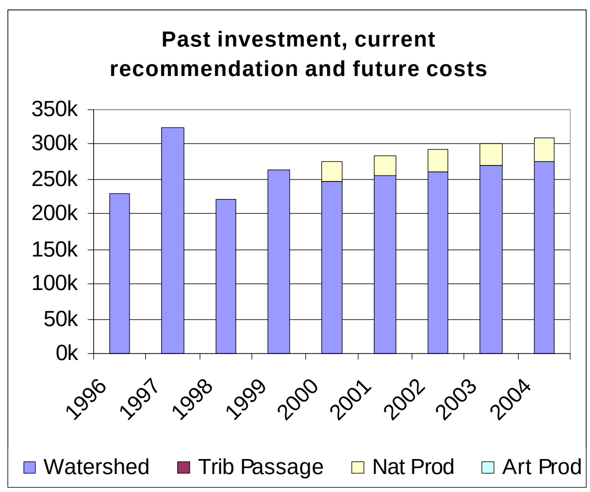


New proposals and ongoing projects by caucus - Recommended budget

	Anad fish	Res fish	Wildlife
New	$0	$0	$0
Ongoing	$274,036	$0	$0



Funding by phase and area of emphasis



Past investment, current recommendation and future costs

ProjectID	Title	Sponsor	FY99 recom.	FY00 recom.	Estimated Outyears FY01	FY02	FY03	FY04
Anadromous Fish Projects								
9304000	Fifteenmile Creek Habitat Restoration Project (Request Multi-Year Funding)	ODFW	220	247	255	262	269	276
9304001	Fifteenmile Creek Wild Steelhead Smolt Production	ODFW		27	29	30	32	33
			Anadromous Fish Totals	**$274**	**$283**	**$292**	**$301**	**$309**
	* indicates ESA project, † indicates 'Innovative work'		**SUBBASIN TOTALS**	**$274**	**$283**	**$292**	**$301**	**$309**

All figures in thousands of dollars

Needed Future Actions

There are opportunities to buy or lease water rights that can then be converted to instream water rights. This action would help address limiting factors associated with low stream flow. There are additional opportunities for riparian stream corridor restoration.

Opportunities to provide benefits to wildlife and wildlife habitat will be pursued through the Oregon Wildlife Coalition's programmatic project. Continued implementation of this project may identify potential wildlife protection and enhancement projects within the Lower Mid-Columbia Subregion, including the Fifteenmile Subbasin. Implementation of wildlife mitigation projects within the subregion will benefit wildlife and help BPA meet their wildlife mitigation obligations at Bonneville, The Dalles, John Day, and McNary dams. Other negative impacts to fish and wildlife caused by the hydropower system that fish and wildlife managers are currently not aware of may need to be addressed in the future as they become apparent. For example, impacts to TES species may require mitigative action.

Actions by Others

There are numerous planning and policy development processes presently occurring as part of the effort to address fish and wildlife needs within the Columbia River Basin. These processes, as well as the number of oversight agencies, have expanded over the recent years, subsequently affecting the amount of restoration work being performed on the ground. Additional staff and funding are needed to meet the obligations to the changing process and the resources.

Private landowners, working with the Fifteenmile Watershed Council, Wasco County SWCD, Farm Services Agency, and Natural Resource Conservation Service need to effectively address the cropland erosion problem, as well as the riparian degradation problem. There are opportunities for private and public landowners, as well as non-profit organizations (e.g., watershed councils, The Nature Conservancy) to work together to benefit wildlife and wildlife habitat within the subbasin through the protection and enhancement of lands for wildlife.

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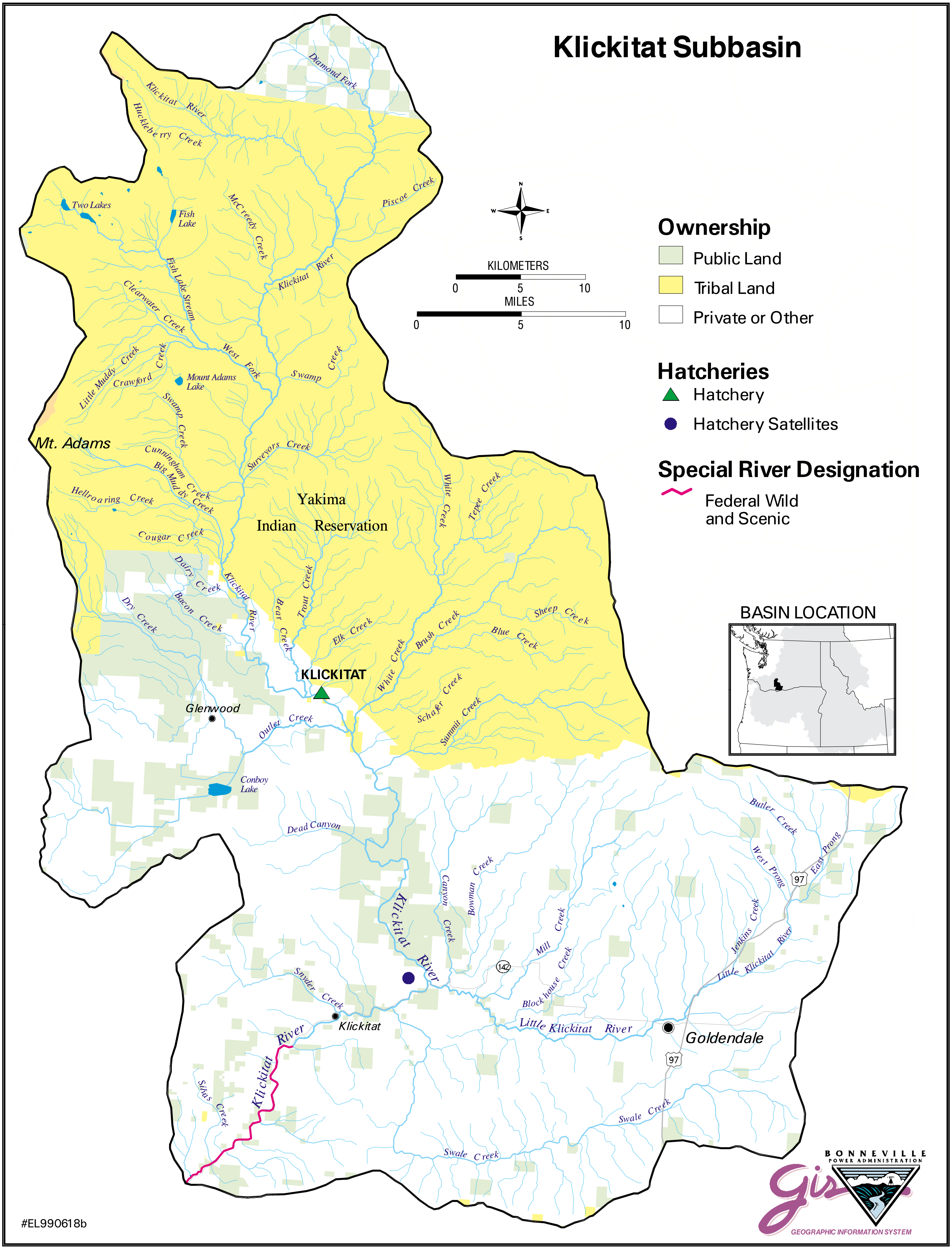
Rasmussen, L. and P. Wright. 1990. Wildlife impact assessment, McNary Project, Oregon and Washington. Prepared by USFWS for U.S. Dept. of Energy, BPA, Portland, OR. 46 pp.

Rasmussen, L. and P. Wright. 1990. Wildlife impact assessment, John Day Project, Oregon and Washington. Prepared by USFWS for U.S. Dept. of Energy, BPA, Portland, OR. 47 pp.

Rasmussen, L. and P. Wright. 1990. Wildlife impact assessment, The Dalles Project, Oregon and Washington. Prepared by USFWS for U.S. Dept. of Energy, BPA, Portland, OR. 34 pp.

Roger Smith, Dave Heller, Jim Newton, Harv Forsgren, Ron Boyce, Ken MacDonald. September 1987. Fifteenmile Basin Fish Improvement Implementation Plan. Funded by Bonneville Power Administration Project #86-79-01,1986.



Klickitat Subbasin
Ownership
Public Land
Tribal Land
Private or Other
Hatcheries
Hatchery
Hatchery Satellites
Special River Designation
Federal Wild and Scenic
KILOMETERS
0 5 10
MILES
0 5 10
BASIN LOCATION
Yakima Indian Reservation
Mt. Adams
KLICKITAT
Glenwood
Klickitat
Goldendale
Klickitat River
Diamond Fork
Huckleberry Creek
Two Lakes
Fish Lake
McCreedy Creek
Piscoe Creek
Fish Lake Stream
Clearwater Creek
West Fork
Swamp Creek
Little Muddy Creek
Crawford Creek
Mount Adams Lake
Surveyors Creek
Cunningham Creek
Big Muddy Creek
Hellroaring Creek
Cougar Creek
White Creek
Tepee Creek
Dairy Creek
Dry Creek
Bacon Creek
Bear Creek
Trout Creek
Elk Creek
Brush Creek
Sheep Creek
Blue Creek
Schafer Creek
Summit Creek
Outlet Creek
Conboy Lake
Dead Canyon
Butler Creek
West Prong
East Prong
Canyon Creek
Bowman Creek
Mill Creek
Blockhouse Creek
Jenkins Creek
Little Klickitat River
Snyder Creek
Silas Creek
Swale Creek
97
142
BONNEVILLE POWER ADMINISTRATION
GEOGRAPHIC INFORMATION SYSTEM
#EL990618b

Klickitat Subbasin

Anad fish 2 projects $410

Fish and Wildlife Resources

Subbasin Description

The Klickitat River Subbasin on the east slope of the Cascade Mountains in south-central Washington covers approximately 1,350 square miles. The Klickitat River originates in Yakima County and runs generally southward for 95.7 miles to the Columbia River. The topography ranges from rolling hills and plateaus in the south to rugged mountains in the northwest.

About 75 percent of the subbasin is forested. Forestry and agriculture dominate the economy. The Yakama Indian Nation, private individuals, and the state of Washington are the major landowners.

Fish and Wildlife Status

Spring chinook - Spawning has been documented in the mainstem as far upstream as RM 84, although little spawning occurs above Castile Falls at RM 64. Tributary spawning by spring chinook is not known to occur, although juveniles have been found in the lower reaches of several tributaries.

Natural production of spring chinook generally occurs from below Castile Falls complex to the confluence with Big Muddy Creek (RM 53.8).

Fall chinook – Self-sustaining natural production of hatchery-origin fall chinook evidently occurs in the Klickitat River. Since the termination of tule releases from the Klickitat Hatchery (WDFW) in 1987, slightly over half of this run appears to have been upriver brights and half tules. Studies to determine the natural production contribution for fall chinook are underway by the Yakima and Klickitat Fisheries Plan (YKFP). Hatchery production and temporal distribution of spawn timing indicates that upriver brights comprise over 80% of the spawning in the Klickitat Basin.

Summer steelhead - The Klickitat River is one of the major steelhead rivers in this section of the Columbia River. A large spawning population is believed to have been present in the river historically. Wild origin escapements today probably average less then 1,000 adults. On an annual basis approximately 125,000 Skamania Hatchery smolts are release in the lower Klickitat River mainstem. From limited sample data winter steelhead have been documented in the Klickitat basin.

Coho - There is a small spawning population of coho in the subbasin, probably derived from hatchery releases. Currently, no attempt is being made to increase the natural spawning populations. Coho production is based upon releases of yearling progeny from the Klickitat Hatchery. Historically natural production of coho was limited by Lyle Falls to the lower 2 miles of the drainage. The potential exists to increase wild production in Little Klickitat through tributary enhancements in passage and habitat, sediment reduction etc.

Recent spawner survey results indicate an increasing escapement. Up to 4.2 million smolts are released annually into the Klickitat basin. Acclimation of ¼ of these takes place at the Klickitat Hatchery. The remaining ¾ are released directly into the river at a few locations from RM 17 to RM 36.0. Acclimation site development is currently being explored through the YKFP.

Stock	Genetic History / Management Intent	Spawn Escape	Hatchery Take	Harvest	Recent Total Escape
Spring chinook	Manage for wild and hatchery using Klickitat stock	(20,000)		(1,200)	2,027
Fall chinook	Manage for natural and hatchery production using Klickitat stock	(40,000)			2,179

Stock	Genetic History / Management Intent	Spawn Escape	Hatchery Take	Harvest	Recent Total Escape
Summer Steelhead	Manage for wild and hatchery using Klickitat stock	(25,000)			3,876
Coho	Manage for hatchery production	(50,000)			7,054

Bull trout – The abundance and distribution of the stock is poorly known. Bull trout are listed as threatened under ESA. There are insufficient data to make an assessment. However, it appears that there are very few bull trout in the lower to mid-Klickitat drainage. Bull trout appear to be more abundant in the upper drainage where habitat conditions are more favorable than in the lower drainage. Four bull trout up to 10 inches in length were observed during snorkel surveys in the upper mainstem (RM 64, above the West Fork), and 23 bull trout (three to seven inches in length) were observed during electrofishing surveys in Trappers Creek. Additional surveys need to be conducted in this upper drainage to determine the distribution and abundance of bull trout in the subbasin (Washington Department of Fish and Wildlife. 1998. Washington State Salmonid stock inventory: bull trout/Dolly Varden. Washington Department of Fish and Wildlife. Olympia, Washington).

Habitat Areas and Quality

Little Klickitat River. This drainage is heavily logged and roaded in its upper reaches and grazed and diverted further downstream. Riparian areas are insufficient to provide large woody debris. Grazing causes channel instability. Pump diversions in the Little Klickitat limit fish production. Falls are a barrier to anadromous fish.

Steelhead have been observed spawning at RM 25.0 of the Little Klickitat River, well above the passage obstruction at RM 6. Development as described above has reduced watershed function, resulting in a more "flashy" system with decreasing base flows.

Lower Klickitat River. The Lower Klickitat River canyon has remained relatively isolated and has few of the problems such as diking, channelization, shoreline development, or irrigation withdrawal that are common to rivers east of the Cascades. The lower 10 miles of this section are designated " wild & scenic" under the National Wild and Scenic Rivers Act. The adequacy of this protection should be reviewed as current conditions appear limiting.

The lower 19 miles of the Klickitat River are bordered by highway SR 141 and an old BNR railroad embankment, confining the river from its natural floodplain. The recently abandoned rail system is proposed for rail-to-trails development. Rail crossings on lower river tributaries cause passage barriers and obstructions to upstream steelhead migration. The Lower Klickitat River and In-Channel Riparian Restoration Protect (Project #9705600) funded by BPA, is working with Washington State Park & Recreation to remedy this situation.

Upper Klickitat River. Much of the subbasin is forested and most of that lies within the Yakama Indian Reservation. On the reservation, logging, construction and use of logging roads, and cattle grazing are the principal activities affecting the river and its tributaries. Streams in the forested portion of the subbasin, both on and off the reservation, have suffered from past and present forest practices, including timber harvest and road construction in riparian areas, poor design and maintenance of roads and crossings, skidding on steep slopes and upstream channels, off season use of wet roads with resulting erosion, and overgrazing by cattle in riparian areas.

The Klickitat River, Diamond Fork and Piscoe Creek contain nearly 30 miles of accessible fish habitat, most of it in the Klickitat River. Castile Falls is an important barrier to anadromous fish. However, opening passage over a natural barrier may be very controversial in terms of competition with other "resident" species and the tribal designation as a "closed" area. The Upper Klickitat River flows through McCormick Meadow in the tribal designated Primitive Area, which has been heavily grazed for many years.

Castile Falls is a natural obstruction to adult steelhead and spring chinook upstream migration. There are historic and recent accounts of spawning above the falls pre-and post-1960 ladder installation. At Castile Falls, the river drops 24.3 meters in 960 meters past a series of 11 falls. In the early 1960s, fishways were constructed around the falls; two are tunneled fishways of 262 meters and 61 meters, and one an open concrete fishway. In addition, three falls were blasted to facilitate passage. Lack of maintenance, design flaws and installation of the headwork dam which delivers water to the upper most tunnel have exacerbated the passage problem.

Big Muddy and Little Muddy creeks. These streams drain glaciers on the east slope of Mount Adams. During the warmest months, the sediment plume from these tributaries colors the Klickitat River from the West Fork to the Columbia River 63 miles downstream. Glacial melt and landslides in the Big Muddy Creek watershed add significant amounts of fine particles to gravels during the summer when velocities in the river are too low to flush fine particles and when spring chinook are ascending the river to spawn.

Big Muddy Creek is thought to significantly limit natural production in the mainstem Klickitat below its confluence. Sediment studies will be initiated in the summer of 1999 under the YKFP to determine the impact to natural production of salmonids.

Outlet Creek (Conboy Lake). Dredging practices by USFWS create excessive sedimentation in the Klickitat River.

Snyder Creek. A barrier is present at Champion mill. Habitat exists above mill pond for anadromous species.

Watershed Assessment

Ecosystem Diagnosis and Treatment (EDT) modeling is currently underway for spring chinook in the Klickitat basin under the YKFP.

A FY 2000 proposal to conduct watershed assessment (WA) in the entire Klickitat basin was submitted by YIN through BPA to fast track the Washington process and identify limiting factors, and develop management strategies, and guide habitat restoration activities.

Limiting Factors

Flash flows in winter and the runoff coefficient have been significantly altered through land-use. Several ecosystem problems are present in the Klickitat Subbasin. For example: spring chinook access to habitat in the upper Klickitat River is impacted by a barrier dam at Klickitat Hatchery and passage is impeded at Castile Falls (RM 64). Poor design and maintenance of forest road crossings in the Little Klickitat River inhibits passage of steelhead and resident salmonids in tributaries and inhibits winter rearing and egg-fry survival for various species of salmonids (especially in the Little Klickitat and left-bank tributaries of the Klickitat). Summer flows are low in low elevation tributaries which have over appropriated water rights. Nutrients from farming and a sewage treatment outfall on the Little Klickitat River cause excessive algal growth, and other small tributaries share similar problems. Sediment from glacial runoff from Mt. Adams, combined with insufficient large woody debris and stream channel complexity reduces holding areas and rearing success.

The principle factors limiting bull trout production within the Klickitat subbasin are as follows. Warm water temperatures due to natural low flows are a concern for adult bull trout that may spawn in the mainstem or in the lower reaches of tributaries as well as for juveniles that rear in the area. Irrigation water withdrawals from the Little Klickitat River and other lower river tributaries exacerbate natural low river flows and warm water temperatures. Riprap along the banks of the lower river eliminates riparian vegetation and also contributes to higher water temperatures. Turbid water conditions and sedimentation during peak discharge periods from natural sources as well as grazing, logging and roads impair fish health and impede fish growth and development. Human development within the floodplain and in riparian areas (particularly in the Little Klickitat drainage) reduces bank protection and overhead cover, elevates water temperatures and increases sediment loads in the river. Most areas of the upper drainage where development has not occurred appear to be in excellent condition (Washington Department of Fish and Wildlife. 1998. Washington State salmonid stock inventory: bull trout/Dolly Varden. Washington Department of Fish and Wildlife. Olympia, Washington).

Subbasin Management

Goals, Objectives and Strategies

The primary native anadromous fish species targeted for active management in the Klickitat Subbasin are spring and fall chinook, summer steelhead, and coho. The goal for these species is to restore sustainable, naturally producing populations to support tribal and non-tribal harvest and cultural and economic practices while protecting the biological integrity and the genetic diversity of the watershed.

The following outcome-based objectives have been defined for the Klickitat Subbasin: 1) improve adult pre-spawning survival; 2) improve juvenile rearing survival; 3) improve adult and juvenile passage survival; and 4) restore depressed fish populations to productive levels.

Several broad strategies have been defined to achieve these objectives. These include placing a higher emphasis on passage, water quality and quantity, and other long-term tangible habitat improvement measures as well as continuing releases of genetically-appropriate salmon. The YKFP serves as a management structure for planning supplementation projects to restore and enhance stock, and stock status, focusing on areas made accessible by habitat improvements.

Past Efforts

Specific actions needed to carry out the management strategy include habitat improvement through inventory of culverts and diversions, passage improvements (e.g., Little Klickitat and Castile Falls), habitat restoration projects, and monitoring and evaluation. Project #9506800 provides funding for an integrated watershed analysis and EDT species specific modeling under the YKFP to produce information needed to identify necessary passage and habitat improvements including design and construction of identified projects. Project #9705600 is a riparian and in-channel habitat enhancement project. The anadromous fish co-managers (WDFW and YIN) continue discussions to develop and implement a water conservation plan for the Klickitat Subbasin including strategies to purchase water rights. Using artificial production to supplement natural production and to increase harvest opportunities is being implemented under the YKFP.

The ongoing work continues to provide critical information for the planning and implementation of strategic actions to achieve the objectives. Project #8903000 (ended in FY 1998) evaluated the effect of acclimation on spring chinook smolt survival – supporting the use of acclimation for supplementation actions.

Resident Fish Project #9902400 was initiated in FY 1999 to assess bull trout populations.

Research, Monitoring and Evaluation

The Washington Department of Fish and Wildlife has completed an inventory of the existing information for native char in Washington and published these results (Washington Department of Fish and Wildlife. 1998. Washington State Salmonid stock inventory: bull trout/Dolly Varden. Washington Department of Fish and Wildlife. Olympia, Washington).

Project #9506800
Continuation of baseline data collection to populate the species specific EDT models under the YKFP. Collect salmonid life history data and physical habitat data throughout the Klickitat basin.

Project #9705600
Conduct local watershed assessments on selected lower basin tributaries to identify restoration sites.
Monitor and evaluate riparian restoration success in Swale Creek and LKR Basin from previously implemented projects.

Remaining Work

Completion of initial bull trout survey and evaluation work is required to determine future direction.
Limiting factors analysis is required to develop a management plan for bull trout in the subbasin.

Limited information exists for bull trout in the Klickitat subbasin. We need to determine the presence or absence of juveniles in the subbasin. The product of this determination will be geographically based assessments of the distribution and abundance estimates of bull trout in the subbasin by critical life history stages. The genetic make up of the char will be assessed relative to bull trout stocks in the region. Additionally, limiting factors for bull trout production must be determined. Identification of limiting factors will be used to develop a management plan for bull trout in the subbasin.

Using information generated from the EDT model develop a suite of supplementation strategies to guide YKFP activities in the Klickitat basin. Incorporate WDFW Klickitat Spring Chinook Hatchery in to a YKFP directed supplementation facility. Using industry excepted passage criteria, modify Lyle and Castile Falls to pass adult salmonids more effectively. Completion of engineering design work to develop broodstock collection capabilities at Lyle Falls for supplementation activities.

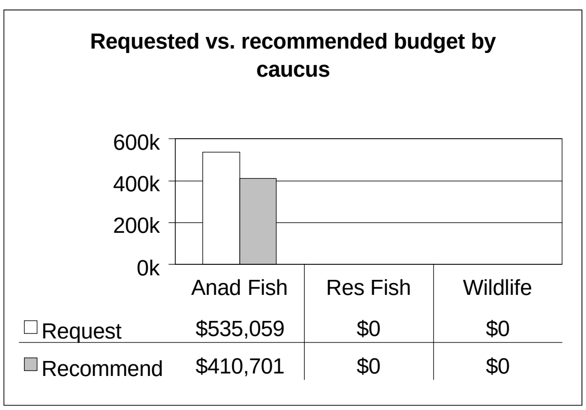
Using information generated continue to restore degraded riparian habitat on lower basin tributaries (Project #9705600). Where appropriate, design and construct in-channel structures to trap spawning gravels and collect debris to encourage proper hydraulic function.

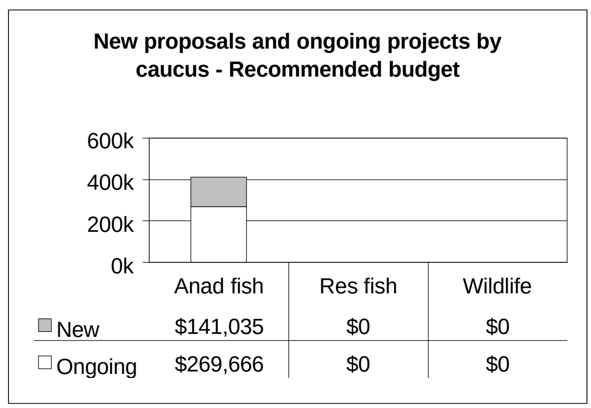
Subbasin Recommendations

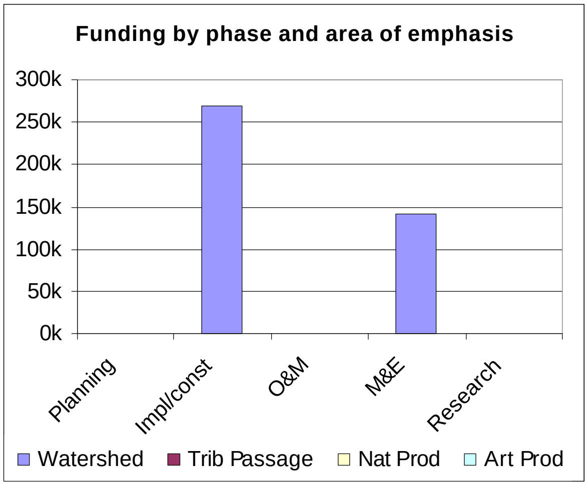
Projects and Budgets

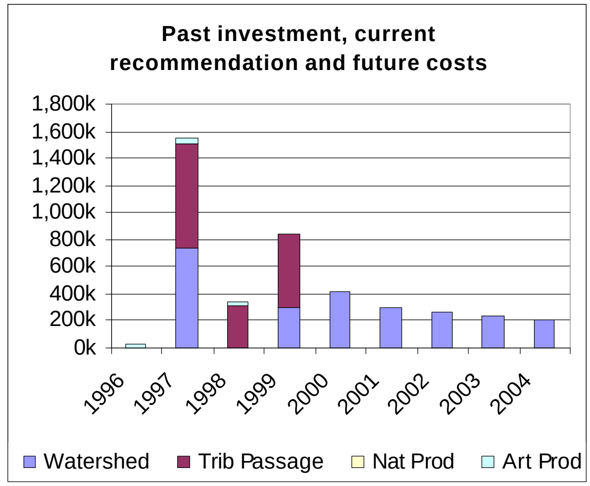
Based on the preceding subbasin description, the CBFWA fish and wildlife managers recommend funding a total of 2 anadromous fish projects at a cost of $410,701.

Refer to the following figures for detail on: 1) total recommended and requested budget by caucus, 2) funding for new and ongoing work, 3) funding by project phase and emphasis, and 4) funding by time period (past, current and future). Individual projects are listed in the following table.






Funding by phase and area of emphasis
300k
250k
200k
150k
100k
50k
0k
Planning
Impl/const
O&M
M&E
Research
Watershed
Trib Passage
Nat Prod
Art Prod


Past investment, current recommendation and future costs
1,800k
1,600k
1,400k
1,200k
1,000k
800k
600k
400k
200k
0k
1996
1997
1998
1999
2000
2001
2002
2003
2004
Watershed
Trib Passage
Nat Prod
Art Prod

ProjectID	Title	Sponsor	FY99 recom.	FY00 recom.	Estimated Outyears FY01	FY02	FY03	FY04

Anadromous Fish Projects

ProjectID	Title	Sponsor	FY99 recom.	FY00 recom.	FY01	FY02	FY03	FY04
20118	Klickitat River Subbasin Assessment	YIN		141	0	0	0	0
9705600	Lower Klickitat River Riparian & In-Channel Habitat Enhancement Project	YIN	296	270	300	260	230	200
			Anadromous Fish Totals	**$411**	**$300**	**$260**	**$230**	**$200**
	* indicates ESA project, † indicates 'Innovative work'		**SUBBASIN TOTALS**	**$411**	**$300**	**$260**	**$230**	**$200**

All figures in thousands of dollars

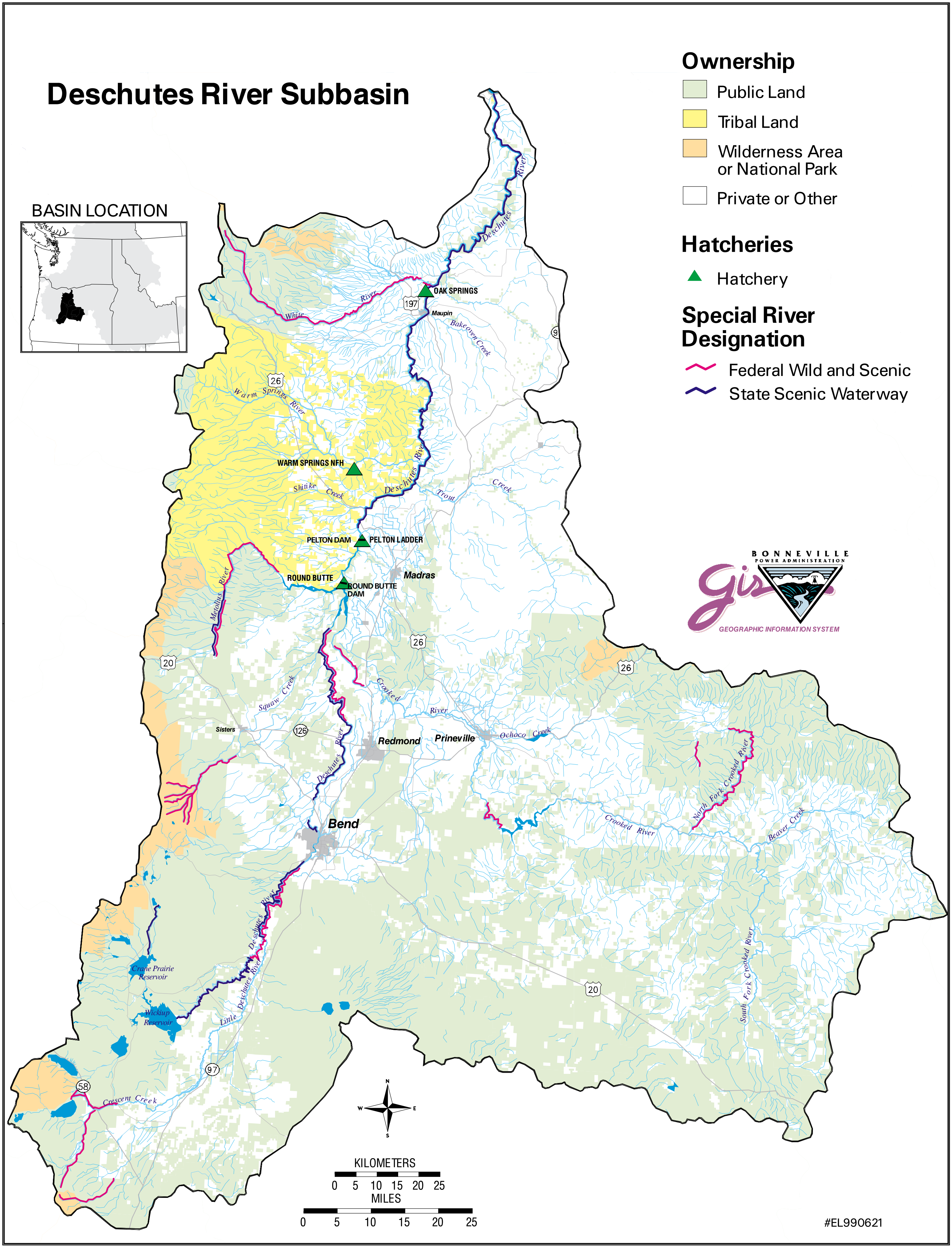
Needed Future Actions

Additional funding will be required through FY 2008 to acquire sufficient information to develop a management plan for bull trout in the subbasin.

Watershed References

Columbia River Inter-Tribal Fish Commission 1995. WY-KAN-USH-MI WA-KISH-WIT Spirit of the Salmon. The Columbia River Anadromous Fish Restoration Plan of the Nez Perce, Umatilla, Warm Springs and Yakama Tribes. 145 pp.

Washington Forest Practices Board, Standard Methodology for Conducting Watershed Analysis, Under Chapter 222-22 WAC, Version 3.0 November 1995


Deschutes River Subbasin
BASIN LOCATION
Ownership
Public Land
Tribal Land
Wilderness Area
or National Park
Private or Other
Hatcheries
Hatchery
Special River
Designation
Federal Wild and Scenic
State Scenic Waterway
BONNEVILLE
POWER ADMINISTRATION
GIS
GEOGRAPHIC INFORMATION SYSTEM
Deschutes River
White River
OAK SPRINGS
197
Maupin
Bakeoven Creek
97
26
Warm Springs River
WARM SPRINGS NFH
Shitike Creek
Deschutes River
Trout Creek
PELTON DAM
PELTON LADDER
ROUND BUTTE
ROUND BUTTE DAM
Madras
Metolius River
26
20
Squaw Creek
Crooked River
Sisters
126
Redmond
Prineville
Ochoco Creek
Deschutes River
North Fork Crooked River
Bend
Crooked River
Beaver Creek
Deschutes River
Crane Prairie Reservoir
Wickiup Reservoir
Little Deschutes River
South Fork Crooked River
20
97
58
Crescent Creek
N
W
E
S
KILOMETERS
0 5 10 15 20 25
MILES
0 5 10 15 20 25
#EL990621

Deschutes Subbasin

Anad fish	5	projects	$755
Res fish	1		$380
Wildlife	1		$3,900
	7		$5,035

Fish and Wildlife Resources

Subbasin Description

The Deschutes River Subbasin in north-central Oregon is the second largest watershed in the state, covering approximately 10,500 square miles. The Deschutes River flows north through central Oregon and enters the Columbia River 205 miles from the Pacific Ocean.

About 62 percent of the land is privately owned; federal ownership (U.S. Forest Service [USFS] and Bureau of Land Management [BLM]) accounts for 15 percent; and 21 percent are Tribal lands (Confederated Tribes of the Warm Springs Reservation [CTWSRO]). Forestry, timber production, grazing and agriculture (dry land farming) are major land uses. Portland General Electric's Pelton-Round Butte project and the CTWSRO's Pelton Re-regulation Dam are the only hydroelectric facilities.

Fish and Wildlife Status

Spring chinook **-** Pre-dam spawning occurred in Squaw and Shitike Creeks, and in the Metolius and Warm Springs Rivers. Currently, natural production is limited to the Warm Springs River and Shitike Creek, both located on the Warm Springs Reservation. The spring chinook run is augmented with hatchery releases for harvest. Round Butte Hatchery was constructed by Portland General Electric to mitigate for lost production above the Pelton-Round Butte hydroelectric project. The U.S. Fish and Wildlife Service operates Warm Springs National Fish Hatchery, located on the Warm Springs River at RM 9. The Warm Springs River above the WSNFH is currently managed for natural fish only. All fish released from both hatcheries are marked to allow escapement of only natural fish above the hatchery. The wild run is considered to be depressed.

Summer steelhead **-** These fish spawned historically in the mainstem up to Steelhead Falls, in Squaw Creek and the Crooked Rivers. Currently, natural production is limited to the mainstem below the Pelton Re-regulation Dam and tributaries. This run is augmented with hatchery releases for harvest. The wild run is considered to be depressed and at risk for potential genetic impacts from out-of-subbasin hatchery fish. These fish were listed as a threatened species in 1999.

Summer/Fall chinook - The historic distribution of these stocks is unknown. Currently, natural production occurs in the mainstem from the mouth up to Pelton Re-regulation Dam. This run is not supplemented with hatchery releases and is considered to be in good condition. These fish have been proposed for listing as a threatened species. The final decision on the proposed listing will be made in the fall of 1999.

Sockeye **-** Sockeye spawned historically in Suttle Lake. Construction of a small power dam and installation of screen at the outlet of Suttle Lake in the 1930s reduced passage of sockeye salmon to and from the lake, but did not eliminate the run in the Deschutes River. Currently a small run is maintained by incidental passage of smolts through the dam turbines.

Pacific lamprey – The historic distribution is believed to be similar to that of summer steelhead in the Deschutes basin. Pacific lamprey were historically and are currently of significant cultural value to the Confederated Tribes of the Warm Springs Reservation of Oregon.

Stock	Genetic History / Management Intent	Spawn Escape	Hatchery Take	Harvest	Recent Total Escape
ChS	Managed as wild and hatchery in mainstem Deschutes and as wild only above WSNFH on Warm Springs River	(1300)	RBH 600 WSNFH 700	85	W 1160 H 2210
ChSu/F	Managed as wild production only	(4000)	N/A		10,925
StS	Managed as wild and hatchery except wild only above WSNFH on Warm Springs River	(6575)	(550)		W 3790 H 4350
Sockeye					104
Lamprey	Management under discussion.				

The subbasin supports a variety of resident fish species, including redband trout, bull trout, brown trout, mountain whitefish, and a number of nongame species. The bull trout is currently listed as a threatened species under the Endangered Species Act.

A variety of wildlife species, including large and small mammals, waterfowl, passerines, raptors, reptiles, and amphibians, are associated with Deschutes Subbasin riverine, wetland, and upland habitats. Although the status of wildlife populations varies throughout the basin and by species, many wildlife species within the basin are listed as Federal and/or State Threatened, Endangered, Sensitive, or At-Risk (Puchy and Marshall 1993). Cliffs at the Columbia River/Deschutes River confluence are provide nesting and perching habitat for many species of birds, including red-tailed hawk, prairie falcon, American kestrel, and rock dove. Certain populations of wildlife species are being managed by federal and state wildlife managers throughout the subbasin, including big game, furbearers, upland birds, and waterfowl species. California bighorn sheep have been reintroduced into the lower Deschutes Subbasin and number approximately 150. Other large mammals include pronghorns, mule deer, and elk. Beaver, otter, mink, and muskrat use ponds, sloughs, and embayments near the mouth of the Deshutes River.

Habitat Areas and Quality

<u>Deschutes River above Pelton Re-regulation Dam.</u> The river above this point has been lost to anadromous fish production because of the inability of juveniles to emigrate from Lake Billy Chinook in sufficient numbers to sustain natural runs. Construction and operation of Round Butte Hatchery are mitigating lost natural production.

<u>Principal east side tributaries below Pelton Re-regulation Dam.</u> (Buck Hollow, Bakeoven, and Trout Creeks) Bakeoven and Buckhollow creeks are fed by rainfall and springs and tend to have low flow aggravated by watershed and stream corridor degradation. Irrigation withdrawal in Trout Creek and loss of riparian vegetation due to grazing and agricultural practices has aggravated low stream flow problems.

<u>Principal west side tributaries below Pelton Re-regulation Dam.</u> (White and Warm Springs Rivers and Shitike Creek). These streams are fed primarily by snowmelt and are somewhat less impacted by irrigation withdrawal and riparian habitat degradation than the east side streams. Only the lower two miles of the White River are accessible to anadromous fish but it remains important for quality and temperature.

Habitat areas in the Deschutes Subbasin upstream to Pelton re-regulation Dam are characterized as riparian areas along the river mainstem and major tributaries and steep canyonous basalt walls with shrub steppe vegetation. Above the canyons, shrub-steppe habitat continues into areas of extensive dry land grain fields. Upper reaches of west bank tributaries flow from forested areas of the Cascades. Wildlife are associated with riverine and adjacent riparian forest, wetland, mixed coniferous and deciduous forest, cliff, and agricultural habitats in the Deschutes

Subbasin. Habitat quality is variable depending on the degree to which habitats have been converted into other land uses or impacted by human activities and invasion of noxious weeds. Habitat has generally been degraded due to hydropower development (i.e., by The Dalles and John Day Dams), past and present land management activities, the spread of non-native plant species, and human development in the Deschutes Subbasin area. Agricultural lands (e.g., dry-land farming) are widespread and provide limited habitat value for wildlife. Bottomlands and riverine habitats at the Columbia River/Deschutes River Subbasin confluence area have also been dramatically altered by dredging, dikes, and flood control activities in the upstream John Day Dam project area and the downstream The Dalles Dam project area. Hydropower development has altered riverine and riparian habitats through flow regulation, channel modification, diking, and dredging. Other activities related to hydroelectric development (e.g., road construction) have altered land and stream areas in ways that affect wildlife. In some cases, the construction and maintenance of power transmission corridors altered vegetation, increased access to and harassment of wildlife, and increased erosion and sedimentation in the Deschutes subbasin. Forest management practices on both public and private lands has also affected wildlife habitat quantity and quality.

Little land is protected and managed specifically for wildlife in the Deschutes Subbasin. Only about 7 percent of the current land base within the subbasin has a high level of protection for wildlife. ODFW's White River Wildlife Management Area encompasses 40,877 acres and is managed primarily for black tailed deer and elk winter range. It also provides habitat for many other species with special emphasis on turkeys, gray squirrels, and non-game species. The Lower Deschutes River Wildlife Area encompasses 8,358 acres of riverine and riparian habitat that continues to improve since the time it was acquired.

Watershed Assessment

A number of reports have been completed for areas within the Deschutes Subbasin that include substantial information that characterizes the state of the subbasin natural resources, including fish and wildlife habitat. The Lower Deschutes River Subbasin Management Plan (ODFW 1997) identifies land ownership, climate, topography, land use, and fish and wildlife resources and their limiting factors. In addition to characterizing the current status of watersheds, information is also presented on changes to the subbasin's forests, rangeland, streams and lakes and reservoirs.

Other documents that contain a wealth of watershed assessment information include: the White River Fish Passage Evaluation Report, the Upper Deschutes River Subbasin, the Crooked River Subbasin, and the Metolius River management plans. These plans include information on fish species present, limiting factors, as well as goals, objectives and strategies for addressing these factors. The Ecosystem Diagnosis and Treatment (EDT) methodology (Mobrand et al.) is currently being applied to the entire Deschutes watershed and is funded by the CTWSRO. The EDT consists of a reach by reach diagnosis of the quality and quantity of fish habitat in the basin and will generate restoration recommendations. Results are due in 1999.

In the early 1980s, BPA funded the Trout Creek Fish Habitat Restoration Project. The initial phase of this project included the preparation of the Trout Creek Restoration Plan, which included a resource assessment and strategies for implementing remedial measures.

The Natural Heritage Program maintains a database on habitats and species occurrences throughout the State of Oregon. The Oregon Trust Agreement Planning Project (BPA 1993) and Oregon GAP Analysis Project (ODFW 1997) identified gaps in bio-diversity and needs for terrestrial habitat restoration, and resulted in a prioritized list of potential habitat restoration opportunities in the Lower Mid-Columbia Subregion, including the Deschutes Subbasin.

A Columbia Basin wide losses assessment was conducted to quantify habitat impacts from hydrosystem development. Wildlife mitigation objectives for the Deschutes Subbasin are based on this losses assessment (see Table 1). These losses were amended into the Northwest Power Planning Council's Fish and Wildlife Program as accepted wildlife losses caused by the construction of the hydrosystem. Losses were measured in Habitat Units (HUs) for selected target/indicator species and are linked to priority habitats. (Note: all or part of the wildlife losses for Lower Mid-Columbia Subregion may be mitigated for in the Deschutes Subbasin, though it is unlikely that it would be proposed or could occur).

Limiting Factors

Few juvenile anadromous fish are lost at unscreened irrigation diversions. All irrigation diversions on anadromous streams have fish screens, except for two small Trout Creek tributaries. Anadromous fish populations are depressed due primarily to the impacts of mainstem Columbia and Deschutes dam construction, out-of-subbasin harvest, in-stream and riparian habitat degradation, water quality and quantity reductions and potential genetic impacts to wild stocks from release and straying of out-of-subbasin hatchery fish. Riparian areas on tributaries are degraded from overgrazing, which has impacted flow, water quality, and cover. Low stream flows and high water temperatures cause low juvenile survival in east side tributaries from water withdrawals for irrigation and degradation of riparian habitat from overgrazing. The loss of riparian vegetation has resulted in the general loss of hiding cover in most tributary streams, making predation as major survival issue. Round Butte and Pelton dams, constructed in 1958 and 1964 (respectively) have eliminated spawning and rearing habitat for spring chinook, sockeye, and summer steelhead. Juvenile resident fish are also lost at unscreened irrigation diversions at a number of locations in the upper Deschutes, Crooked, and White Rivers.

Wildlife abundance is currently limited by the results of past hydropower development (e.g., habitat loss and degradation, the decrease in fish abundance), past and current land management practices (e.g., irrigation, logging, livestock and agricultural practices, road construction), the spread of non-native plant and wildlife species, and urban expansion. Increasing development along the Deschutes River continues to eliminate remaining wildlife habitats. Loss of wintering range for deer and elk due to conversion of historic ranges to agricultural use limits big game populations. Conversion of shrub steppe habitat to other uses and competition with native plant assemblages by noxious weeds limit populations of wildlife dependent on that habitat type. Bigorn sheep are susceptible to diseases borne by domestic sheep. Land prices continue to rise, making it more economically difficult to preserve remaining undeveloped lands for wildlife. Water use practices (e.g., irrigation) can negatively affect quality and quantity, and are factors limiting to wildlife. Continued declines in salmon and other fish species result in a loss of overall biomass being contributed to the subbasin. This reduction has negative effects on wildlife abundance. Any of these influences can be, and are, limiting factors to local populations. Changes in local populations can affect species integrity on a larger scale. Opportunities to restore wildlife populations and improve wildlife habitat diminish over time as habitat loss and degradation continues.

Subbasin Management

Goals, Objectives and Strategies

Fish

The anadromous fish species most actively targeted for management in the Deschutes Subbasin are native spring chinook and summer steelhead. Summer/fall chinook are managed for wild production, and a small remnant run of sockeye persists. Pacific lamprey is also a species of concern in the Deschutes River. The goal for these species is to restore sustainable, naturally producing populations to support tribal and non-tribal harvest and cultural economic practices while protecting the biological integrity and the genetic diversity of the watershed.

The co-managers have adopted the following outcome-based objectives to address these problems: 1) improve the quantity and quality of aquatic and riparian habitat; 2) maintain and improve upland watershed conditions to sustain high water quality; 3) maintain the genetic diversity and abundance of the indigenous wild fish; 4) provide opportunities to harvest anadromous species, while maintaining adequate wild spawning escapement and hatchery broodstock; and 5) increase harvest opportunity for hatchery-origin summer steelhead and spring chinook through the use of acclimation and adult capture facilities.

The co-managers have defined the following strategies to help achieve the objectives. These strategies include improving habitat through the use of riparian fencing, grazing management and in-stream structures; improving screens on irrigation diversions; and increasing harvest opportunities for tribal and non-tribal fisheries using artificial production while maintaining the genetic integrity of the wild fish by not allowing hatchery fish to spawn above the hatcheries.

Wildlife

The overall wildlife mitigation goal for the Columbia River Basin is to achieve and sustain levels of habitat and species productivity in order to fully mitigate for all wildlife and wildlife habitat losses caused by the development and operation of the hydropower system (NWPPC 1995). This goal applies to the Lower Mid-Columbia Subregion, including the Deschutes Subbasin. Within the Lower Mid-Columbia Subregion, the wildlife mitigation goal is to be achieved by fully mitigating for losses associated with the Bonneville, The Dalles, John Day, and McNary Dams.

The wildlife mitigation objective is to maintain and restore populations of wildlife native to the Deschutes Subbasin, including those target species selected to represent the cover types within the subbasin, and those habitat types considered priorities within the subbasin (i.e., riverine/riparian, old growth forest, wetlands, coniferous forest). The wildlife mitigation objective is based on the Northwest Power Planning Council's accepted wildlife losses measured in Habitat Units (HUs) for selected target/indicator species linked to priority habitats.

The priority habitat types for wildlife in this subbasin are riparian/riverine, wetlands and shrub-steppe. Islands are medium priority, agricultural lands low priority.

The following strategies will achieve wildlife mitigation objectives within the Deschutes Subbasin:

- Identify potential protection and enhancement projects within the Deschutes Subbasin through the GAP Analysis and coordinate implementation of activities through the Oregon Wildlife Coalition.
- Implement land acquisition and easements of priority habitats.
- Implement enhancement and restoration activities (e.g., control of non-native plant species, management of livestock grazing practices for native plant communities).
- Monitor and evaluate wildlife habitat and wildlife species response to implemented enhancement activities within the Deschutes Subbasin.

Past Efforts

Project No. 9404200 funds the operations and maintenance for the Trout Creek Habitat Improvement Project, which started in 1982 and targeted steelhead. The Trout Creek watershed is nearly fully screened (41 diversions), and maintenance of the screens is funded by with Mitchell Act funds. BPA funds will be used to aid in the removal of the gravel push-up diversion dams in the Trout Creek system. Watershed enhancement activities on the Warm Springs Reservation have been funded by BPA in conjunction with activities funded by CTWSRO, BIA, NRCS and other entities. Other BPA funding will provide start-up funds for riparian restoration and enhancement projects, and for working with private landowners and resource managers to improve livestock management aimed at reducing the impacts on riparian vegetation. Push-up dams will be consolidated by constructing cement diversions and/or infiltration sump/pump systems. Project No. 9802800 (Middle Deschutes Watershed Coordinator) will coordinate with the Willow Creek & Trout Creek Watershed Councils to complete watershed assessments and develop goals, objectives, priority lists, action plans, and a work plan to actively seek funding for on-the-ground projects in both watersheds. Project No. 9900600 will initiate riparian work as the second phase of a comprehensive watershed treatment approach, and will construct 1.5 miles of riparian exclosure fencing as a demonstration project.

Projects funded by PGE (under FERC license conditions) and USFWS (under BPA MOA-Reimbursables) cover the cost of hatchery production for the Deschutes River Subbasin. ODFW and CTWSRO have instituted "catch and release" harvest regulations on naturally produced spring salmon and steelhead. Acclimation and release locations allow directed harvest of hatchery produced fish. Hatchery fish are not allowed above the Warm Springs National Fish Hatchery in order to protect wild spring chinook and steelhead. No hatchery production of summer/fall chinook occurs to protect those wild stocks.

Stock	Initial Broodstock	Central Facility	Release Sites	Status	Funding
ChS	Deschutes	Warm Springs NFH/Round Butte	Hatchery	On-going	USFWS/PGE
StS(A)	Deschutes	Round Butte Fish Hatchery	Pelton Regulation Dam tailrace	On-going	FERC-PGE

Over the past several years, fencing has excluded livestock from the lower 25 miles of the mainstem Deschutes.

Although no site-specific wildlife mitigation projects have been funded by BPA in the Deschutes subbasin, the Oregon Wildlife Coalition is implementing a programmatic mitigation project that may result in the implementation of mitigation projects within the subbasin. This goal of this project, *Securing Wildlife Mitigation Sites - Oregon (Project No. 9705900)*, is to:

- Fund project coordination activities to identify, plan, propose, and implement wildlife mitigation projects within the Lower Mid-Columbia subregion, including the Deschutes Subbasin
- Prioritize potential mitigation projects within Lower Mid-Columbia Subregion, including the Deschutes Subbasin.
- Acquire or ease lands with priority habitats within Lower Mid-Columbia subregion, including the Deschutes subbasin
- Enhance acquired or eased lands through alteration of land management practices, active restoration of habitats, control of noxious weeds, control of public access, etc. to provide benefits to target/indicator wildlife species and priority habitats within the Lower Mid-Columbia Subregion, including the Deschutes Subbasin.
- Develop and implement a Monitoring and Evaluation Plan with both HEP-based and non HEP-based monitoring criteria within the Lower Mid-Columbia Subregion, including the Deschutes Subbasin.

Two wildlife mitigation opportunities identified by the GAP Analysis Project were proposed within the Oregon Wildlife Coalition's programmatic project for FY 1999 funds. The projects, *Securing Wildlife Mitigation Sites – Oregon; Trout Creek Canyon (Project No. 9705910)*, and *Securing Wildlife Mitigation Sites – Oregon; South Fork Crooked River (Project No. 9705913)*, were recommended by the Northwest Power Planning Council for funding in FY 1999. The FY 1999 Trout Creek Canyon project proposed to benefit wildlife through the acquisition and enhancement of riparian wetland, grassland, shrub steppe, and rocky cliff habitats. The South Fork Crooked River project proposed to benefit wildlife through the easement and enhancement of wetland, shrub steppe, grassland, riparian wetland, and salt-desert habitats in the headwaters area of the South Fork Crooked River.

NRCS and local soil and water conservation districts have worked with private landowners to convert agricultural land back to native habitat (i.e., enrollment of lands into the Conservation Reserve Program). These efforts have benefited wildlife by improving upland habitat conditions, improving water quality and quantity, and restoring vegetation to more native conditions.

Research, Monitoring and Evaluation

BPA funds are being used to monitor smolt out-migration from the Trout Creek system. Riparian photopoints are regularly duplicated in the Trout Creek system. Stream temperature data are collected throughout the Trout Creek system. Steelhead spawning surveys are conducted annually on selected stream reaches within the Trout Creek system. Other sources, including ODFW license dollars, and Sport Fish Restoration Funds support anadromous spawning surveys, resident trout population surveys, and anadromous harvest surveys within the lower Deschutes subbasin. Other funding sources are used to restore riparian habitat along the lower Deschutes River and tributaries. These funds originate with the Bureau of Land Management, the Governor's Watershed Enhancement Board, Oregon Water Trust, Farm Services Agency, Natural Resource Conservation Service, the Confederated Tribes of the Warm Springs Reservation, and individual private landowners.

CTWSRO funds the monitoring of smolt outmigration from the Warm Springs River and Shitike Creek and with assistance from BPA, implemented a monitoring program for adult anadromous and resident fish in Shitike Creek. CTWSRO also conducts spawning surveys annually for spring chinook salmon, summer steelhead, and fall chinook salmon in the Deschutes River and its tributaries on the Reservation. BPA funds are used to conduct research for bull trout on the reservation. Data is collected on distribution and abundance, migration timing, and genetic makeup. CTWSRO partners in watershed restoration include BPA, BIA, NRCS, Oregon Trout, Trout Unlimited, The Deschutes Resources Conservancy, and the Environmental Protection Agency.

Wildlife surveys and inventories are routinely conducted in the Deschutes Subbasin by U.S. Forest Service (USFS), CTWSRO, and the ODFW wildlife managers. For example, transplanted bighorn sheep are radio collared and monitored.

Remaining Work

There continue to be numerous opportunities to restore streams and their riparian corridors in areas throughout this subbasin. It will be extremely difficult to restore natural production of the Deschutes River anadromous and resident fish populations without significant stream habitat restoration. It is also critical that existing stream habitat projects be adequately maintained. The lack of timely maintenance can result in the loss of years of vegetative recovery in a very short period of time. The CTWS and ODFW have considered off-site acclimation for Deschutes River anadromous smolts in order to reduce potential concerns about hatchery adults spawning with wild adults. However, the large numbers of out-of-basin stray hatchery origin steelhead, and to a lesser degree spring chinook, present the greatest potential genetic threat to the Deschutes River populations. This stray hatchery fish issue will have to be addressed outside the Deschutes River Subbasin.

Although the *Securing Wildlife Mitigation Sites – Oregon; Trout Creek Canyon (Project No. 9705910)* and *Securing Wildlife Mitigation Sites – Oregon; South Fork Crooked River (Project No. 9705913)* were recommended by the Northwest Power Planning Council for funding in FY1999, neither has been implemented. These potential mitigation opportunities may or may not still exist and should be determined by the Oregon Wildlife Coalition.

Continued implementation of the Oregon Wildlife Coalition's programmatic mitigation project, *Securing Wildlife Mitigation Sites-n Oregon (Project No. 9705900)*, may identify other potential wildlife protection and enhancement projects within the Deschutes Subbasin. Implementation of projects within the subbasin would help offset the wildlife Habitat Unit (HU) losses still remaining at the Bonneville, The Dalles, John Day, and McNary Dams. For example, only about 10 percent of the Oregon's HU losses at John Day Dam have been mitigated for to date.

Other remaining wildlife related work tasks within the Deschutes Subbasin include assessment and mitigation of hydropower system operational and secondary losses, development and implementation of a regional Monitoring and Evaluation Plan, and development of both HEP-based and non HEP-based monitoring success criteria.

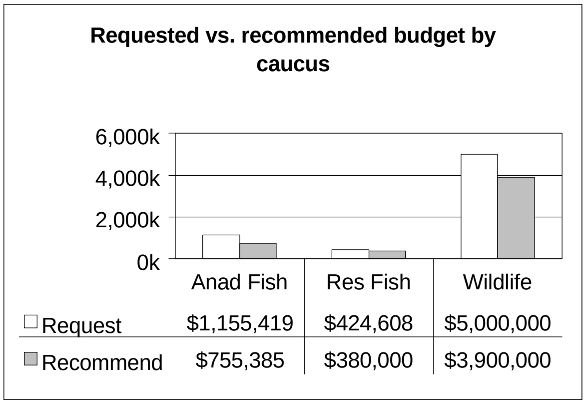
Subbasin Recommendations

Proposed projects for the Deschutes River Subbasin are focusing on the stream habitat restoration issue, as well as restoration of stream watersheds. Ultimately any long-term stream habitat restoration project must also see that there is significant progress made in the restoration of the upland watershed. Stream restoration opportunities include maintaining existing habitat and structural measures (i.e. screens, fences, fish ladders, off-channel livestock watering developments).

Projects and Budgets

Based on the preceding subbasin description, the CBFWA fish and wildlife managers recommend funding a total of 7 projects at a cost of $5,035,385. Of the projects recommended, 5 focus on anadromous fish, 1 focuses on resident fish, and 1 is directed at wildlife. The managers consider 1 of these projects, for $380,000, to be innovative in their technique and application. Another 1 project supports ESA requirements for a total of $380,000.

Refer to the following figures for detail on: 1) total recommended and requested budget by caucus, 2) funding for new and ongoing work, 3) funding by project phase and emphasis, and 4) funding by time period (past, current and future). Individual projects are listed in the following table.


Requested vs. recommended budget by caucus
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4,000k
2,000k
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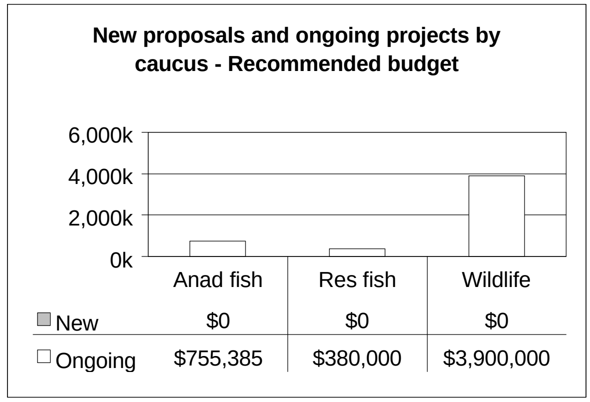
Anad Fish
Res Fish
Wildlife
Request $1,155,419 $424,608 $5,000,000
Recommend $755,385 $380,000 $3,900,000


New proposals and ongoing projects by caucus - Recommended budget
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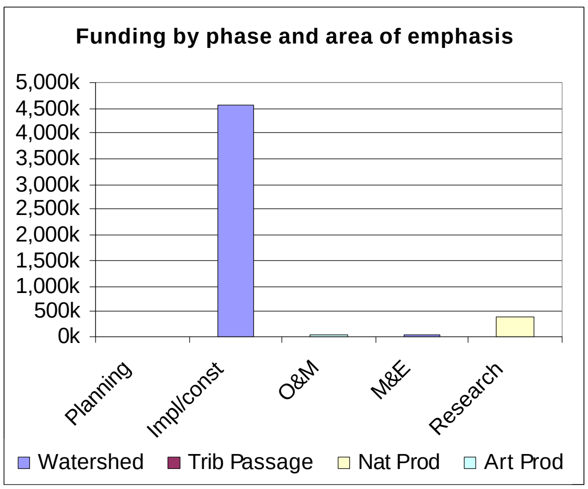
4,000k
2,000k
0k
Anad fish
Res fish
Wildlife
New $0 $0 $0
Ongoing $755,385 $380,000 $3,900,000


Funding by phase and area of emphasis
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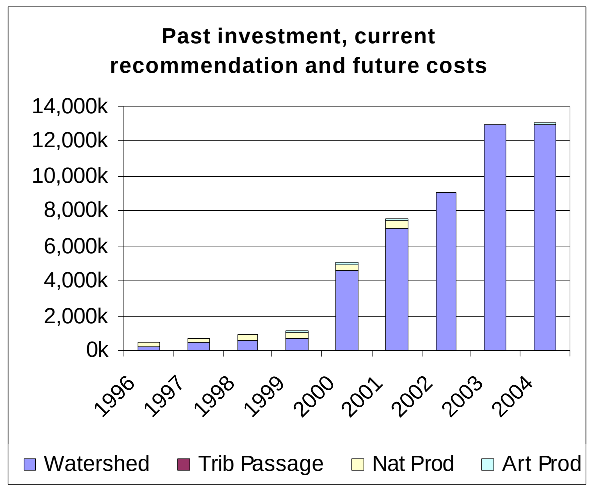
4,000k
3,500k
3,000k
2,500k
2,000k
1,500k
1,000k
500k
0k
Planning
Impl/const
O&M
M&E
Research
Watershed
Trib Passage
Nat Prod
Art Prod


Past investment, current recommendation and future costs
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12,000k
10,000k
8,000k
6,000k
4,000k
2,000k
0k
1996
1997
1998
1999
2000
2001
2002
2003
2004
Watershed
Trib Passage
Nat Prod
Art Prod

ProjectID	Title	Sponsor	FY99 recom.	FY00 recom.	Estimated Outyears FY01	FY02	FY03	FY04
Anadromous Fish Projects								
9404200	Trout Creek Habitat Restoration Project Multi Year Funding Proposal	ODFW	298	359	390	361	308	308
9500700	Hood River Production Program - Pge: O&M	PGE	95	50	90	60	65	80
9802400	Monitor Watershed Conditions on the Warm Springs Reservation	CTWSRO		35	200	200	200	250
9802800	Trout Creek Watershed Improvement Project Multi Year Funding Proposal	JCSWCD		231	350	375	400	425
9900600	Restoration of Riparian Habitat in Bakeoven / Deep Creeks	WCSWCD	35	80	110	90	12	12
		Anadromous Fish Totals		**$755**	**$1,140**	**$1,086**	**$985**	**$1,075**
Resident Fish Projects								
9405400	*† Bull Trout Genetics, Habitat Needs, L.H., etc. in Central and N.E. Oregon	ODFW	340	380	380	0	0	0
		Resident Fish Totals		**$380**	**$380**	**$0**	**$0**	**$0**
Wildlife Projects								
9705900	Securing Wildlife Mitigation Sites - Oregon	ODFW, CTWS, CTUIR, BPT…	4,000	3,900	6,000	8,000	12,000	12,000
		Wildlife Totals		**$3,900**	**$6,000**	**$8,000**	**$12,000**	**$12,000**
		SUBBASIN TOTALS		**$5,035**	**$7,520**	**$9,086**	**$12,985**	**$13,075**

* indicates ESA project, † indicates 'Innovative work'

All figures in thousands of dollars

Needed Future Actions

Restoration of stream habitat is essential to the recovery of native fish populations within the subbasin. Continued funding for operation and maintenance of fish passage and habitat structures is necessary to protect the investment that has already been made in habitat recovery and protection. Little is known about Pacific lamprey abundance and specific use of the subbasin. More needs to be understood in order to establish escapement goals.

Opportunities to provide benefits to wildlife and wildlife habitat will be pursued through the Oregon Wildlife Coalition's programmatic project. Continued implementation of this project may identify potential wildlife protection and enhancement projects within the Lower Mid-Columbia Subregion, including the Deschutes Subbasin. Implementation of wildlife mitigation projects within the subregion will benefit wildlife and help BPA meet their wildlife mitigation obligations at Bonneville, The Dalles, John Day, and McNary Dams. Other negative impacts to fish and wildlife caused by the hydropower system that fish and wildlife managers are currently not aware of may need to be addressed in the future as they become apparent. For example, impacts to TES species may require mitigative action.

Opportunities to implement the approved habitat acquisition proposals made for areas along the South Fork Crooked River and Trout Creek Canyon may exist.

Actions by Others

Restoration of depressed or listed populations of resident and anadromous fish within the subbasin would benefit from modifications in livestock grazing within riparian stream corridors on USFS, BLM, Tribal, and private lands. Juvenile and adult anadromous and resident fish passage at the PGE/CTWS Pelton–Round Butte Hydroelectric complex could re-open access to historic fish habitat in the upper Deschutes River and tributaries. Regular monitoring of consumptive water use, along with water conservation activities, within the subbasin could result in enhanced flows in some subbasin streams. Better upland land management on private lands could be encouraged with incentive payments from the Farm Service Agency or other local, state or federal agencies. The CTWS has opportunities to improve/restore/protect riparian stream habitat and upland watershed conditions. Private forest landowners could improve and protect stream corridors and upland watersheds by modifying forest practices and livestock grazing programs. Private, state, federal, and Tribal entities could help improve stream water quality by inventorying road systems and potential drainage issues that could introduce silt and sediment and other contaminants into subbasin streams.

There are numerous planning and policy development processes presently occurring as part of the effort to address fish and wildlife needs within the Columbia River Basin. These processes, as well as the number of oversight agencies, have expanded over the recent years, subsequently affecting the amount of restoration work being performed on the ground. Additional staff and funding are needed to meet the obligations to the changing process and the resources.

There are opportunities for private and public landowners, as well as non-profit organizations (e.g., watershed councils, The Nature Conservancy) to work together to benefit wildlife and wildlife habitat within the subbasin through the protection and enhancement of lands for wildlife.

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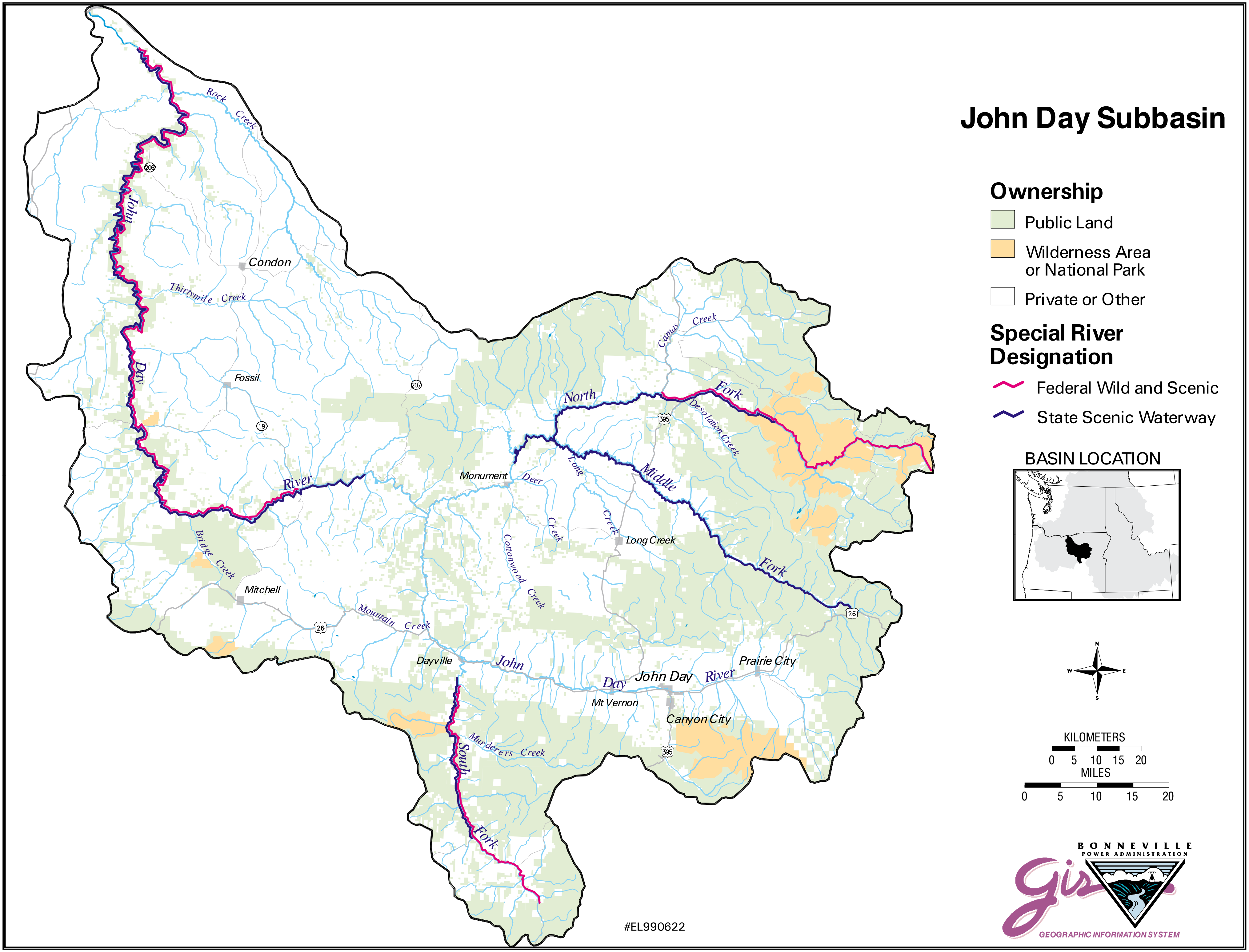


John Day Subbasin
Ownership
Public Land
Wilderness Area or National Park
Private or Other
Special River Designation
Federal Wild and Scenic
State Scenic Waterway
BASIN LOCATION
KILOMETERS
0 5 10 15 20
MILES
0 5 10 15 20
BONNEVILLE POWER ADMINISTRATION
GEOGRAPHIC INFORMATION SYSTEM
#EL990622
Rock Creek
John Day River
Condon
Thirtymile Creek
Fossil
Mitchell
Bridge Creek
Mountain Creek
Dayville
Monument
Deer Creek
Cottonwood Creek
Long Creek
North Fork
Middle Fork
Desolation Creek
Camas Creek
Mt Vernon
John Day
Canyon City
Prairie City
Murderers Creek
South Fork

John Day Subbasin

Anad fish	11	projects	$3,528
Wildlife	1		94
	12		$3,623

Fish and Wildlife Resources

Subbasin Description

The John Day River Subbasin in east-central Oregon includes 11 counties and covers nearly 8,100 square miles. The John Day River is the longest free-flowing river solely containing wild salmon and steelhead in the Columbia Basin. The upper part of the subbasin is one of Oregon's most physiographically diverse regions with mountains, rugged hills, and plateaus cut by streams and valleys. The lower part of the subbasin is a plateau of nearly level to rolling land deeply dissected by the river and its tributaries. The mainstem John Day River flows 284 miles from its source in the Strawberry Mountains to the Columbia.

Land cover in the subbasin is predominantly forest and range lands, with a small amount of cropland. More than 60 percent of the subbasin is privately owned. The U.S. Forest Service (USFS) owns approximately 30 percent, and the Bureau of Land Management (BLM) 7 percent. Recreation and tourism are increasing and becoming a complement to the agriculture and forest products sectors of the economy.

Fish and Wildlife Status

The John Day River Subbasin supports wild runs of spring and fall chinook, summer steelhead, and Pacific lamprey. No hatchery releases of anadromous fish have been made in this subbasin. Current runs are depressed to a fraction of their former abundance with 2,000 to 5,000 spring chinook and 5,000 to 40,000 summer steelhead in recent years.

Stock	Genetic History / Management Intent	Spawn Escape	Hatchery Take	Harvest	Recent Total Escape
ChS	Natural spawning only.		0.00		*2000-5000*
ChF	Natural spawning only.		0.00		?
StS	Natural spawning only.		0.00		*5000-40000*

Other Species of Concern include westslope cutthroat and bull trout which are still found in the upper reaches of the John Day River. Subbasin. Pacific lamprey were historically and are currently of significant cultural value to the Confederated Tribes of the Warm Springs Reservation of Oregon (CTWSRO).

A variety of wildlife species, including large and small mammals, waterfowl, passerines, raptors, reptiles, and amphibians, are associated with John Day subbasin riverine, wetland, and upland habitats. Although the status of wildlife populations varies throughout the basin and by species, many wildlife species within the basin are listed as listed as Federal and/or State Threatened, Endangered, Sensitive, or At-Risk (Puchy and Marshall 1993). For example, long-billed curlew, ferruginous hawk, Swainson's hawk, burrowing owl, loggerhead shrike, grasshopper sparrow, sagebrush lizard, and Washington ground squirrel occur within the subbasin in association with Shrub Steppe habitat. These Shrub Steppe wildlife assemblages are in a state of decline due to loss of habitat. Certain populations of wildlife species are being managed by federal and state wildlife managers throughout the subbasin, including big game, fur bearers, upland birds, and waterfowl species. Waterfowl do not nest in the Columbia River/John Day River confluence area because of the absence of suitable habitat. Many raptors (e.g., golden eagle, American kestrel, prairie falcon) occur in the subbasin. Beaver, otter, mink, and muskrat occur along the John Day River and its tributaries. Mule deer use brushy canyons and ridge areas.

Habitat Areas and Quality

Riparian habitat degradation from overgrazing and excessive withdrawal of water for irrigation are the most serious problems in the basin. Approximately 600 miles of stream with degraded fish habitat have been identified and are characterized by high spring flows, low summer flows, high summer and low winter water temperatures, depressed beaver populations, accelerated streambank erosion, excessive stream sedimentation, and reduced instream cover. The basin's ability to naturally repair itself from these impacts is limited by the semiarid climate. Some areas are still being impacted by activities (such as mining) which ceased long ago. In other cases, poor land management practices continue and problems are escalating. In many tributary streams, excessive runoff due to land clearing and overgrazing leads to deepening channels, thus lowering water tables. Managers believe that irrigation system efficiency improvements, along with uplands and riparian zone restoration, would provide the greatest long-term benefits for fish and wildlife while improving late season stream flow for other purposes as well.

Because of the physiographic diversity of the subbasin and its land uses, habitat quality varies by area.

<u>Lower John Day Mainstem (Service Creek. to Columbia)</u> **-** High water temps, low flows, pollutants. This section is designated a Federal and State Wild and Scenic River from Tumwater Falls to Service Creek. Fish have been identified as an Outstandingly Remarkable Value (ORV).

<u>North Fork</u> **-** Fifty-four miles upstream of Camas Creek are designated federal and an additional 40 miles from RM 20 to the headwaters has been designated a state wild and scenic. Fish are identified as an ORV. Some "good" habitat remains in designated wilderness and should be protected. Past dredge mining has destroyed in-stream structure in parts of the upper North Fork and tributaries.

<u>Middle Fork</u> **-** High temps, sediment and livestock waste due to over-grazing, clearing and road building and historic mining activity. Designated state scenic waterway.

<u>South Fork</u> **-** High temps, sediment and livestock waste due to over-grazing, clearing and road building in upper South Fork and tributaries. Designated as a Federal and State Wild and Scenic Area from the north P.W. Schneider Wildlife Management Area Boundary to the Forest Boundary.

<u>Upper John Day (Service Creek. to Headwaters)</u> **-** High temps, sediment and livestock waste due to over-grazing, clearing and road building in upper John Day mainstem. These problems generally have limited spring chinook spawning/rearing in the mainstem to areas above Prairie City. Some "good" habitat remains and should be protected.

Habitat areas in the John Day Subbasin upstream to McNary Dam are characterized as riparian areas along the river mainstem and major tributaries, rising upland terraces and plateaus with Shrub Steppe vegetation interspersed with irrigated cropland in the lower reaches, and mixed and conifer forest in the upper river reaches. Less than 1 percent of the native Shrub Steppe habitat remains in the Columbia Plateau Eco-region within Oregon. This is primarily due to irrigated and dry-land agricultural conversion, but also to inundation of the Columbia River and associated urban expansions. Wildlife are associated with riverine and adjacent riparian forest, wetland, mixed coniferous and deciduous forest, cliff, and agricultural habitats in the John Day Subbasin. Habitat quality is variable depending on the degree to which habitats have been converted into other land uses and impacted by human activities and invasion of noxious weeds. Habitat has generally been degraded due to hydropower development (i.e., by John Day Dam), past and present land management activities, the spread of non-native plant species, and human development. Agricultural lands provide limited habitat value for wildlife. Bottomlands and riverine habitats at the Columbia River/John Day River Subbasin confluence area have also been dramatically altered by dredging, dikes, and flood control activities at the downstream John Day Dam project area. Hydropower development has altered riverine and riparian habitats through flow regulation, channel modification, diking, and dredging. Other activities related to hydroelectric development (e.g., road construction) have altered land and stream areas in ways that affect wildlife. In some cases, the construction and maintenance of power transmission corridors altered vegetation, increased access to and harassment of wildlife, and increased erosion and sedimentation in John Day Subbasin. Forest management practices on both public and private lands has also affected wildlife habitat quantity and quality.

A moderate portion of the John Day Subbasin is protected and managed specifically for wildlife. About 20 percent of the current land base within the subbasin has a high level of protection for wildlife. ODFW's Bridge Creek and

Murderer's Creek Wildlife Management Areas encompass about 55,500 acres and are managed as elk wintering range. The Army Corps of Engineers (ACOE) manages approximately 30,940 acres of land and water for fish and wildlife conservation as mitigation for John Day Dam. Some of this land falls within the John Day Subbasin. Bridge Creek Wilderness and Black Canyon Wilderness areas in the Ochoco Mountains National Forest and the Strawberry Mountain Wilderness area in the Malheur National Forest have relatively intact habitat values, thus providing some benefit to wildlife.

Watershed Assessment

A number of watershed assessments have been conducted, including USFS Watershed analysis for Camas Creek, North Fork John Day River, Granite Creek, Wall Creek, South Fork John Day River, Middle Fork John Day River; Bureau of Reclamation Water Optimization studies for Upper South Fork John Day River, Upper Mainstem John Day River; Oregon Water Resources Department Stream Restoration Program for North Fork John Day River and Middle Fork John Day River. ODFW and Tribal John Day River salmon and steelhead production plan. NWPPC Subbasin Management Plan, ODFW John Day District Stream Restoration Priority List.

The Natural Heritage Program maintains a database on habitats and species occurrences throughout the State of Oregon. The Oregon Trust Agreement Planning Project (BPA 1993) and Oregon GAP Analysis Project (ODFW 1997) identified gaps in bio-diversity and needs for terrestrial habitat restoration, and resulted in a prioritized list of potential habitat restoration opportunities in the Lower Mid-Columbia Subregion, including the John Day Subbasin. The GAP Analysis Project concluded that of the current land base within the John Day Subbasin, 49 percent is in a low protected status for wildlife, 31 percent is in a moderate protected status for wildlife, and 20 percent is in a high protected status for wildlife.

A Columbia Basin wide loss assessment was conducted to quantify habitat impacts from hydrosystem development. Wildlife mitigation objectives for the John Day Subbasin are based on this losses assessment (see Table 1). These losses were amended into the Northwest Power Planning Council’s Fish and Wildlife Program as accepted wildlife losses caused by the construction of the hydrosystem. Losses were measured in Habitat Units (HUs) for selected target/indicator species linked to priority habitats. (Note: all or part of the wildlife losses for Lower Mid-Columbia Subregion may be mitigated for in the John Day Subbasin, though it is unlikely that it would be proposed or could occur).

Limiting Factors

- Inter-related water quantity and quality problems (e.g., low flows/high temperatures and pollutants) result in poor survival during juvenile rearing and migration and contribute to higher than historic spring chinook prespawning mortality. These factors have reduced the historic range of spawning and rearing habitat.
- Low flows and irrigation diversion barriers restrict adult and juvenile migration.
- Several streams do not meet NMFS specifications.
- Unscreened diversions in lower tributaries.
- Flow modifications due to irrigation withdrawals.
- Riparian degradation, loss of large woody debris and lack of pools reduces adult holding and juvenile rearing survival.
- Water quantity, quality, and sediment problems reduce spawning success.

Wildlife abundance is currently limited by the results of past hydropower development (e.g., habitat loss and degradation, the decrease in fish abundance), past and current land management practices (e.g., irrigation, logging, livestock and agricultural practices, road construction), the spread of non-native plant and wildlife species, and urban expansion. Increasing development within the John Day River Subbasin continues to eliminate remaining wildlife habitats. Loss of wintering range for deer and elk due to conversion of historic ranges to agricultural use limits big game populations. Conversion of shrub steppe habitat to other uses and competition with native plant assemblages by noxious weeds limit populations of wildlife dependent on that habitat type. Land prices continue to rise, making it more economically difficult to preserve remaining undeveloped lands for wildlife. Water use practices (e.g., irrigation) can negatively affect quality and quantity; and are factors limiting to wildlife. Continued declines in salmon and other fish species results in a loss of overall biomass being contributed to the subbasin. This reduction has negative effects on wildlife abundance. Any of these influences can be, and are, limiting factors to local populations. Changes in local populations can affect species integrity on a larger scale. Opportunities to restore wildlife populations and improve wildlife habitat diminish over time as habitat loss and degradation continues.

Subbasin Management

Goals, Objectives and Strategies

Fish

The indigenous anadromous fish species most actively targeted for management in the John Day Subbasin are spring chinook and summer steelhead. Wild fall chinook are also thought to be present in the lower river, but no escapement estimates are available. Pacific lamprey, bull trout, and westslope cutthroat are also a species of concern in the John Day River. The goal for these species is to restore sustainable, naturally producing populations to support tribal and non-tribal harvest and cultural and economic practices while protecting the biological integrity and the genetic diversity of the watershed.

The co-managers have adopted the following outcome-based objectives in order to address the problems that anadromous fish face while in the John Day Subbasin: 1) improve juvenile salmonid rearing survival; 2) improve adult and juvenile passage survival and 3) improve pre-spawning survival for adults.

Several broad strategies have been identified to achieve these objectives. These include improving instream and riparian habitat, improving stream flows and adult and juvenile passage at irrigation diversions and monitoring habitat improvements to determine if physical and biological objectives are being met. All releases of hatchery fish into flowing waters were terminated in 1997.

Wildlife

The overall wildlife mitigation goal for the Columbia River Basin is to achieve and sustain levels of habitat and species productivity in order to fully mitigate for all wildlife and wildlife habitat losses caused by the development and operation of the hydropower system (NWPPC 1995). This goal applies to the Lower Mid-Columbia Subregion, including the John Day Subbasin. Within the Lower Mid-Columbia Subregion, the wildlife mitigation goal is to be achieved by fully mitigating for losses associated with the Bonneville, The Dalles, John Day, and McNary Dams.

The wildlife mitigation objective is to maintain and restore populations of wildlife native to the John Day Subbasin, including those target species selected to represent the cover types within the subbasin, and those habitat types considered priorities within the subbasin (i.e., riverine/riparian, old growth forest, wetlands, coniferous forest). The wildlife mitigation objective is based on the Northwest Power Planning Council's accepted wildlife losses measured in Habitat Units (HUs) for selected target/indicator species linked to priority habitats. The priority habitat types for wildlife in this subbasin are riparian/riverine, wetlands and shrub-steppe. Islands are medium priority, agricultural lands low priority.

The following strategies will achieve wildlife mitigation objectives within the John Day Subbasin:

- Identify potential protection and enhancement projects within the John Day Subbasin through the GAP Analysis and coordinate implementation of activities through the Oregon Wildlife Coalition.
- Implement land acquisition and easements of priority habitats.
- Implement enhancement and restoration activities (e.g., control of non-native plant species, management of livestock grazing practices for native plant communities).
- Monitor and evaluate wildlife habitat and wildlife species response to implemented enhancement activities within the John Day Subbasin.

Past Efforts

The John Day River Implementation Plan involves several agencies, private landowners, and tribes in an ambitious fish habitat protection and improvement program on private lands that began in 1984, including extending juvenile rearing habitat further downstream through riparian fencing. Specific actions which implement the management strategies include Project No. 8402100 which provides long term protection, maintenance and restoration of fish habitat on private lands in the John Day Subbasin through landowner agreements, 132 miles of fencing, instream structures, riparian plantings, critical stream bank stabilization and passage structures. Since 1993, about 76 miles of seasonal electric livestock exclosure fence has been constructed under Project No. 9303800 to protect and restore approximately 60 miles of riparian habitat. Monitoring results indicate that the fences are 98 percent effective in excluding livestock. The *Oregon Fish Screening Project* (Project No. 9306600) cost shares with Mitchell Act funding to fabricate and maintain juvenile fish screens. Project No. 9605300 is the continuation of a multi-year project to restore the floodplain of the North Fork John Day River and its tributaries that were severly impacted by dredge gold mining in the late 1930s through the early 1950s. This project re-deposits the tailings allowing the river to flow over portions of the floodplain previously unavailable. Channel complexity and fish habitat quality and quantity increase as the river reclaims its floodplain, dissipating the energy of high flow events and depositing sediment that promotes riparian vegetation growth.

Project No. 980180 (cost-shared with the USBOR, Grant Soil and Water Conservation District and private landowners) increases in-season river flows through a combination of irrigation efficiency measures, reduces bank instability, sedimentation, and bedload movement thereby improving water quality, reducing or eliminating migratory delays from passage impediments, improving riparian condition and will implement an annual monitoring program. Project No. 980170 will eliminate gravel push-up dams on the lower North Fork John Day over the next four years in order to remove impediments to anadromous fish migration, improve water quality and habitat for both anadromous and resident fish, reduce sediment load from construction and washouts, and shrink surface area of water during annual periods of highest temperatures and solar radiation. Project No. 990100 is intended to slow runoff during the peak flow events, allowing the slow, safe release of water during the summer and further allowing buildup of sediment and riparian vegetation in order to improve spawning and rearing habitat by increasing flow during critical months, reducing damage to riparian vegetation, reducing summer water temperatures, and allowing recovery of channel morphology.

To meet the data needs for an index stock for PATH and other analyses, Project No. 980160 will provide sufficient annual estimates of spring chinook spawner escapement, age-structure, and smolt-to-adult survival. Project No. 9703400 will measure surface fine sediment and overwinter sedimentation in salmon spawning habitat during the incubation period in portions of the Grande Ronde and John Day Rivers. The BPA has provided most of the funding for the implementation of the John Day River Implementation Plan, including Project No. 82002900, No. 8338400, No. 8339400&500, No. 8347300, No. 8400800, No. 8402100&200, No. 8507100, No. 9303800, and No.9605300.

Two wildlife projects funded by BPA have been conducted in the John Day Subbasin to date. The *Acquisition of Pine Creek Ranch (Project No. 980220*), a watershed project, was first recommended for funding by the Northwest Power Planning Council in 1998. FY 1998 and FY 1999 BPA watershed and wildlife funds have been allocated towards this implementation of this project. This project will allow protection and restoration of a more normative ecosystem condition in the Pine Creek watershed. Objectives for managing the Pine Creek acquisition include: removing livestock from damaged riparian and upland areas, fencing, controlling noxious weeds, and burning to remove juniper. An appraisal was recently completed and landowner negotiations are progressing. Proposed alteration of livestock grazing practices, fencing, and noxious weed control will improve wildlife habitat values and benefit many species of wildlife.

Acquisition of the Oxbow Ranch – Middle Fork John Day River (Project No. 20134) was submitted as a watershed project for the FY2000 prioritization process. This piece of property was historically managed exclusively for summer long livestock grazing and had degraded riparian conditions. Implementation of this project will benefit fish and wildlife by improving riparian habitat conditions, water quality, and water quantity. The Nature Conservancy (TNC) has recently purchased the 1,000-acre project site and discussions are occurring between TNC, ODFW, and CTWSRO to determine how TNC will be reimbursed for the property and how the proposed project will be implemented.

The Oregon Wildlife Coalition is implementing a programmatic mitigation project that may result in the implementation of mitigation projects within the subbasin. This goals of this project, *Securing Wildlife Mitigation Sites in Oregon (Project #9705900)*, are to:

- Fund project coordination activities to identify, plan, propose, and implement wildlife mitigation projects within the Lower Mid-Columbia subregion, including the John Day Subbasin.

- Prioritize potential mitigation projects within Lower Mid-Columbia Subregion, including the John Day Subbasin.
- Acquire or ease lands with priority habitats within Lower Mid-Columbia subregion, including the John Day Subbasin.
- Enhance acquired or eased lands through alteration of land management practices, active restoration of habitats, control of noxious weeds, control of public access, etc. to provide benefits to target/indicator wildlife species and priority habitats within the Lower Mid-Columbia Subregion, including the John Day Subbasin.
- Develop and implement a Monitoring and Evaluation Plan with both HEP-based and non HEP-based monitoring criteria within the Lower Mid-Columbia Subregion, including the John Day Subbasin.

NRCS and local soil and water conservation districts have worked with private landowners to convert agricultural land back to native habitat (i.e., enrollment of lands into the Conservation Reserve Program). These efforts have benefited wildlife by improving upland habitat conditions, improving water quality and quantity, and restoring vegetation to more native conditions.

The recently developed Oregon Plan emphasizes treating the entire watershed rather than just riparian areas and accountability of state agencies for implementing watershed improvement projects. This will result in a more ecosystem based management strategy that should pay long term benefits to all residents of the watershed (wildlife, fish, plants, soils, and people).

Research, Monitoring and Evaluation

The PATH Project, annual spring chinook and summer steelhead spawning surveys, water temperature monitoring by Grant SWCD and watershed councils (Pinehollow Canyon, North Fork, South Fork, Wheeler Point, Grass Valley Canyon, Bridge Creek) all contribute to research, monitoring, and evaluation in the John Day subbasin. TNC monitoring of vegetative recovery, channel profile, water table restoration and instream flow restoration on the Middle Fork Salmon Preserve, USFS, BLM, CTWSRO, and ODFW temperature monitoring. More adequate monitoring of steelhead spawning escapement numbers and effectiveness of restoration of flows is needed. Existing streamflow gages and Water Resources Department personnel numbers are insufficient to adequately monitor irrigation efficiency projects and restoration of instream flows. An additional 14 gauge sites are needed for this monitoring.

Wildlife surveys and inventories (e.g., big-game aerial surveys) are conducted regularly within the John Day Subbasin regularly by ODFW, CTWSRO, and USFS wildlife managers. Wildlife mitigation projects are habitat based and use the USFWS's Habitat Evaluation Procedure (HEP) as a means of tracking project progress. Treatment specific monitoring may also be employed to evaluate methods. Additionally, population monitoring throughout is conducted to address species response to project implementation and for setting of harvest regulations.

Remaining Work

Remaining work includes: expansion of riparian fencing program, additional floodplain restoration projects (Oxbow, Middle Fork near Galena, Granite Creek, Clear Creek, Tencent Creek), identification of separate populations of salmonids (genetic profile on chinook salmon, westslope cutthroat and summer steelhead), and identification of lamprey population status.

The *Acquisition of Pine Creek Ranch (Project No. 980220):* Landowner negotiations will continue and a purchase agreement will hopefully be reached. Baseline habitat surveys will be completed, management plans will be developed, and enhancement activities will be initiated. Protection and enhancement habitat units will be used to offset wildlife losses.

Securing Wildlife Mitigation Sites - Oregon (Project No. 9705900): The Oregon Wildlife Coalition will continue to implement this programmatic mitigation project to identify and eventually implement other potential wildlife protection and enhancement projects within the Columbia River Basin, including the John day Subbasin until remaining wildlife Habitat Unit (HU) losses are mitigated. Implementation of projects within the subbasin would help offset the wildlife HU losses still remaining at the Bonneville, The Dalles, John Day, and McNary Dams. For example, only about 10 percent of the Oregon's HU losses at John Day Dam have been mitigated for to date.

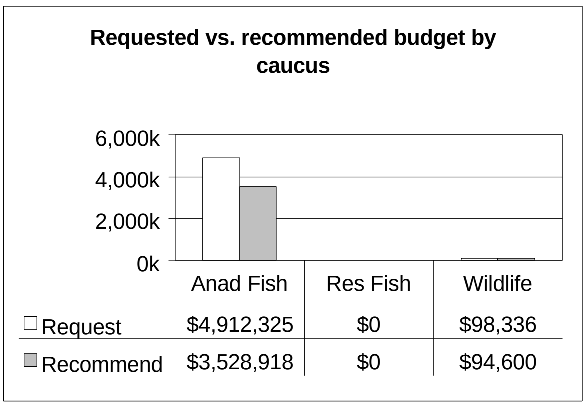
Other remaining wildlife related work tasks within the John Day Subbasin include assessment and mitigation of hydropower system operational and secondary losses, development and implementation of a regional Monitoring and Evaluation Plan, and development of both HEP-based and non HEP-based monitoring success criteria.

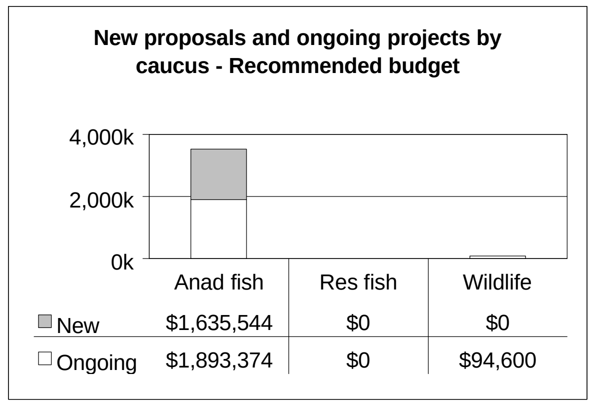
Subbasin Recommendations

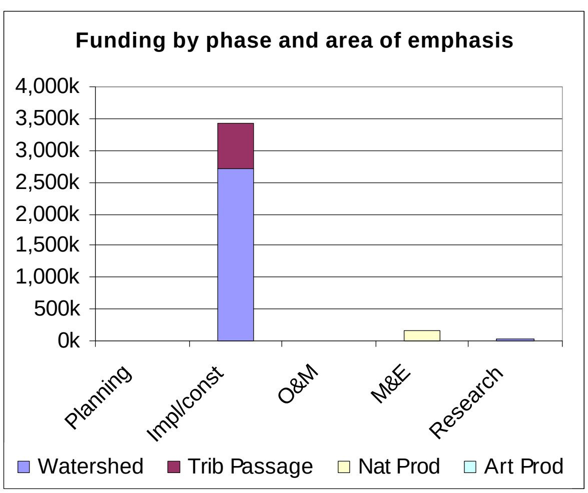
Projects and Budgets

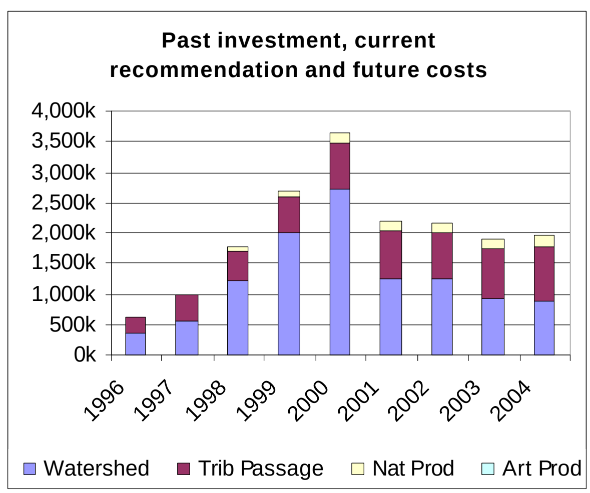
Based on the preceding subbasin description, the CBFWA fish and wildlife managers recommend funding a total of 12 projects at a cost of $3,623,518. Of the projects recommended, 11 focus on anadromous fish, and 1 is directed at wildlife.

Refer to the following figures for detail on: 1) total recommended and requested budget by caucus, 2) funding for new and ongoing work, 3) funding by project phase and emphasis, and 4) funding by time period (past, current and future). Individual projects are listed in the following table.









ProjectID	Title	Sponsor	FY99 recom.	FY00 recom.	Estimated Outyears FY01	FY02	FY03	FY04
Anadromous Fish Projects								
20035	Water Right Acquisition Program (Multi-Year Fy 2000-2002)	Oregon Water Trust		130	255	310	0	0
20131	Enhance North Fork John Day River Subbasin Anadromous Fish Habitat	CTUIR		206	210	215	220	225
20134	Acquire Oxbow Ranch -- Middle Fork John Day River	CTWSRO		1,300	75	79	35	37
8402100	Protect and Enhance Anadromous Fish Habitat in the John Day Subbasin	ODFW	380	426	440	455	470	485
9306600	Oregon Fish Screening Project - Fy'00 Proposal	ODFW	523	642	672	740	813	895
9605300	Upper Clear Creek Dredge Tailings Restoration	USFS/CTUIR	75	85	85	25	15	0
9703400	Monitor Fine Sediment and Sedimentation in John Day and Grande Ronde Rivers	CRITFC	30	32	33	35	36	0
9801600	Monitor Natural Escapement & Productivity of John Day Basin Spring Chinook	ODFW	125	160	157	165	173	182
9801700	Eliminate Gravel Push-Up Dams on Lower North Fork John Day	NFJDWC	67	90	140	0	0	0
9801800	John Day Watershed Restoration	CTWSRO	215	425	0	0	0	0
9901000	Mitigate Effects of Runoff & Erosion on Salmonid Habitat in Pine Hollow	Sherman SWCD	27	34	30	20	20	15
			Anadromous Fish Totals	**$3,529**	**$2,097**	**$2,043**	**$1,783**	**$1,839**
Wildlife Projects								
9802200	Pine Creek Ranch Acquisition	CTWSRO		95	103	108	114	120
			Wildlife Totals	**$95**	**$103**	**$108**	**$114**	**$120**
	* indicates ESA project, † indicates 'Innovative work'		**SUBBASIN TOTALS**	**$3,624**	**$2,200**	**$2,151**	**$1,897**	**$1,958**

All figures in thousands of dollars

Needed Future Actions

Opportunities to provide benefits to wildlife and wildlife habitat will be pursued through the Oregon Wildlife Coalition's programmatic project. Continued implementation of this project may identify potential wildlife protection and enhancement projects within the Lower Mid-Columbia Subregion, including the John Day Subbasin. Implementation of wildlife mitigation projects within the subregion will benefit wildlife and help BPA meet their wildlife mitigation obligations at Bonneville, The Dalles, John Day, and McNary Dams. Other negative impacts to fish and wildlife caused by the hydropower system that fish and wildlife managers are currently not aware of may need to be addressed in the future as they become apparent. For example, impacts to TES species may require mitigative action.

Actions by Others

Develop and monitor grazing management plans on federal allotments, CREP, CRP, R&E Fencing stockpile, A&H, GWEB, Bates Pond project, TNC land acquisition in critical spawning and rearing habitat (where this is not possible seek riparian fencing agreements with willing landowners), acquire consumptive water rights and convert to instream rights, file for additional instream water rights.

There are numerous planning and policy development processes presently occurring as part of the effort to address fish and wildlife needs within the Columbia River Basin. These processes, as well as the number of oversight agencies, have expanded over the recent years, subsequently affecting the amount of restoration work being performed on the ground. Additional staff and funding are needed to meet the obligations to the changing process and the resources.

There are opportunities for private and public landowners, as well as non-profit organizations (e.g., watershed councils, The Nature Conservancy) to work together to benefit wildlife and wildlife habitat within the subbasin through the protection and enhancement of lands for wildlife.

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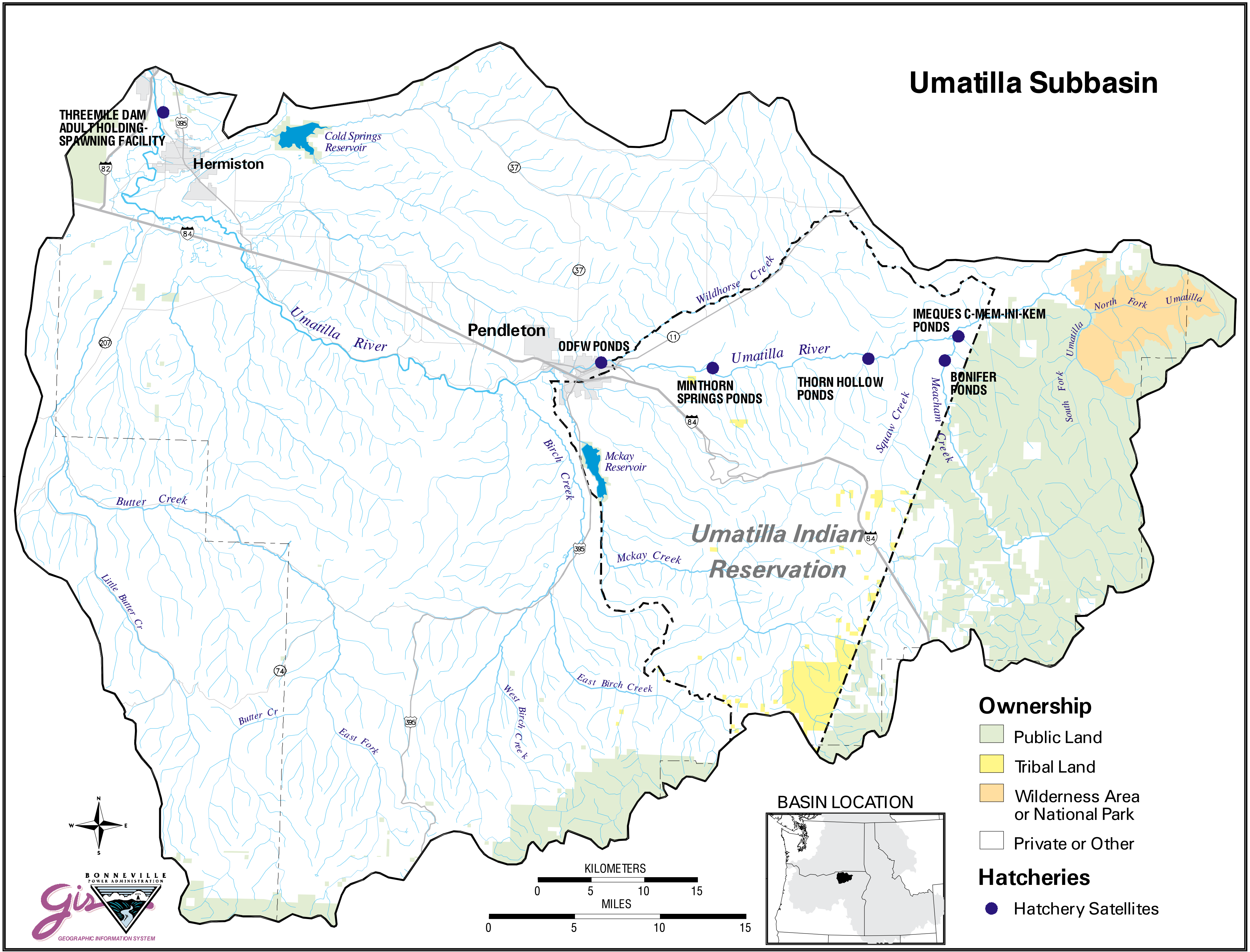

Umatilla Subbasin
THREEMILE DAM ADULT HOLDING-SPAWNING FACILITY
Hermiston
Cold Springs Reservoir
Pendleton
ODFW PONDS
MINTHORN SPRINGS PONDS
THORN HOLLOW PONDS
IMEQUES C-MEM-INI-KEM PONDS
BONIFER PONDS
Umatilla River
Wildhorse Creek
Squaw Creek
Meacham Creek
North Fork Umatilla
South Fork Umatilla
Mckay Reservoir
Mckay Creek
Birch Creek
East Birch Creek
West Birch Creek
Butter Creek
Little Butter Cr
Butter Cr
East Fork
Umatilla Indian Reservation
Ownership
Public Land
Tribal Land
Wilderness Area or National Park
Private or Other
Hatcheries
Hatchery Satellites
BASIN LOCATION
KILOMETERS
0 5 10 15
MILES
0 5 10 15
BONNEVILLE POWER ADMINISTRATION
GEOGRAPHIC INFORMATION SYSTEM

Umatilla Subbasin

Anad fish	11	projects	$7,831
Wildlife	1		200
	12		$8,031

Fish and Wildlife Resources

Subbasin Description

The Umatilla River Subbasin is located in Umatilla County in northeast Oregon and covers 2,290 square miles. The Umatilla River originates on the west slope of the Blue Mountains in the Umatilla National Forest and flows northwesterly about 115 miles to the Columbia at RM 289. The subbasin consists of the high relief Blue Mountains region, and the Deschutes-Umatilla Plateau, a broad upland plain that slopes northward from the Blue Mountains to the Columbia River with elevations from 500 to 5,000 feet.

Approximately 51 percent of the Umatilla subbasin is privately owned; 37 percent is managed by federal agencies, principally the U.S. Forest Service (USFS); 1 percent is owned by the state of Oregon; and about 11 percent lies within the boundaries of the Umatilla Indian Reservation. Forestlands in the subbasin are managed for timber harvest, grazing and recreation. Much of the mid-subbasin is used for dry land wheat farming. Irrigation is the largest use of surface and groundwater in the subbasin, and many of the streams are over-appropriated. Seven irrigation diversion dams on the mainstem Umatilla River obstruct upstream and downstream migration of anadromous fish. Passage improvements are planned or completed at all of these.

Fish and Wildlife Status

Chinook and coho were extirpated from the Umatilla Subbasin early in the twentieth century due to low flows, high temperatures, and passage problems resulting from large-scale irrigation withdrawals. Summer steelhead managed to persist, with about one-third of the production occurring in Birch Creek. The management intent is to re-establish natural spawning populations of spring and fall chinook and coho and eventually to use naturally spawning populations to develop a “relocalized” broodstock. The co-managers intend to supplement natural production of chinook, steelhead and coho and increase opportunities for harvest. Currently, upriver bright (URB), fall chinook, spring chinook, lower columbia coho, and Group A steelhead hatchery releases occur in the subbasin.

Both redband trout and bull trout are endemic to the Umatilla basin. Redband trout are widely distributed throughout the basin in mid to upper elevation streams while bull trout are limited to primarily the upper mainstem and North Fork of the Umatilla River. Redband trout are listed as a state Sensitive Species and Bull Trout are listed as threatened under the Federal Endangered Species Act. Degradation of in-stream habitat and water quality, and passage barriers are the primary impacts affecting these species. The Oregon Department of Fish and Wildlife (ODFW) is currently developing conservation strategies for the recovery of bull trout.

See Table 1 for Adult Fish Return and Harvest Information.

A variety of wildlife species, including upland game birds, waterfowl, fur bearers, big game, raptors, neotropical migrant song birds, reptiles and amphibians, are associated with the Umatilla subbasin terrestrial and aquatic habitats. Many populations have been impacted by habitat loss and degradation, hydro system and other development, and out of basin effects. The status of populations varies throughout the subbasin and by species. Many wildlife species are listed as threatened, endangered, sensitive, or at-risk. Sensitive species include burrowing owls, grasshopper and sage sparrows, the Washington ground squirrel, and Ferruginous and Swainson's hawks. Sharp tail grouse have been extirpated. Big game, upland game bird and waterfowl species are monitored by state and tribal managers for establishment of seasons of harvest and bag limits. Shrub steppe wildlife assemblages are in a state of decline due to loss of habitat.

Table 1. Umatilla Basin Fish Return, Harvest, and Spawning Escapement Summary

Species (years of data)	Genetic History/Management Intent	Spawning Escapement (available for spawning) Mean (range)	Harvest Total Kept* Mean (range)	Adults Trapped at Three Mile Dam Mean (range)	Adults Taken for Brood Mean (range)
Spring Chinook (years)	Extirpated; Carson re-introduced Supplementation for natural spawning & outplanting for harvest. Broodstock-local Umatilla	717 (207-1759) (92-98)	109 (0-373) (93-97)	1169 (263-2194) (90-98)	334 (200-600) (90, 97, 98)
Fall Chinook (years)	Extirpated; Upriver Brights re-introduced. Supplementation for natural spawning & outplanting for harvest. Broodstock-local Umatilla.	395 (33-958) ** (90-98)	90 (9-192) (92-97)	449 (239-688) (90-98)	285 (201-576) (91-93, 96-98)
Coho (years)	Umatilla native; Supplementation for natural spawning & outplanting for harvest. Broodstock-local Umatilla	895 (105-2870) (90-98)	78 (33-134) (92-97)	1148 (355-3081) (90-98)	720 (580-860) (93, 95)
Steelhead (years)	Extirpated; Early Coho re-introduced. Supplementation for natural spawning & outplanting for harvest. Broodstock-local Umatilla and lower Columbia.	1561 (857-2322) (90-98)	84 (19-127) (93-97)	1845 (1112-2769) (90-98)	166 (92-332) (90-98)
Lamprey	Functionally. Re-introductions to be initiated in 1999 with broodstock from neighboring John Day Basin.	0	0	0	0

* Does not include catch and release or out of basin catch
** Includes adults hauled from Priest Rapids (708 in 1996, 916 in 1997, 200 in 1998).

Table 2. Production Program Description

Stock	Mgmt Intent	Initial Broodstock	Operating Broodstock	Adult Collection & Holding	Central Facility (Incubation & Rearing)	Acclimation &/or Release Sites	Status	Funding
ChS	Supplemt	Carson	Umatilla	Collect @ 3-Mile Dam; Hold @ S. Fk. Walla Walla	Little White Salmon/ Umatilla	Imecques, Thorn Hollow	On-going	NWPPC
ChS	Supplemt				S.F. Walla Walla		Step 1- 10/99?	NWPPC
ChF	Supplemt	Up River Bright	Umatilla	3-Mile Dam	Little White Salmon/ Umatilla	Umatilla R.-direct?	On-going	NWPPC
StS(A)	Supplemt	Umatilla	Umatilla	Minthorn	Umatilla	Bonifer, Minthorn	On-going	NWPPC
Coho	Harvest Mitig.	Early	Umatilla	3-Mile Dam	Cascade/Herman Cr	Umatilla R.-direct?	On-going	NWPPC
Coho	Harvest Mitig.	Early	Umatilla	3-Mile Dam	Cascade/Herman Cr	New Facility @ Pendleton (RM56)	Planning	NWPPC

Habitat Areas and Quality

Historically, deciduous trees were abundant in riparian areas on the valley floor. However, land-use practices during the last hundred years have cleared most of these areas for irrigated agricultural and urban uses. Riparian vegetation on reaches of the mainstem Umatilla and many tributary streams is in poor condition. Approximately 70 percent of 422 miles of stream in the Umatilla inventoried by the ODFW (Reeve et al. 1988) would benefit from riparian improvement. During extensive habitat surveys throughout the Umatilla Basin, Confederated Tribes of the Umatilla Indian Reservation (CTUIR) fisheries researchers frequently observed channelized streams, excess sediment from croplands, eroded banks, an absence of suitable riparian vegetation, and chemical, industrial and municipal pollutants (Contor et al. 1995, 1996 and 1997). Headwater areas are generally well shaded by a conifer canopy. On the mainstem Umatilla between the forks (RM 90) and Meacham Creek (RM 79) a mixture of deciduous trees and conifers provides a moderate amount of shading. Below Meacham Creek, the river channel widens and deciduous trees, shrubs, and grasses provide little shading. Much of the Umatilla River from the Highway 11 bridge in Pendleton (RM 55.4) down stream to Echo (RM 26.3) has been channelized and straightened. As a result there are few meanders, lateral scour pools or oxbows.

<u>Lower Umatilla mainstem (32 stream miles):</u> Reduced migration success, rearing and survival due to irrigation withdrawals resulting in low flows from late spring until fall, with high temps (> 80°F) and migration passage problems.

<u>Birch Creek (33 stream miles):</u> Reduced spawning, rearing and survival due to irrigation withdrawals resulting in low summer flows, lack of pools, high temps, and passage problems, with sedimentation from bank cutting in the lower part.

<u>McKay Creek (6 miles):</u> Anadromous fish extirpated. Reservoir blocks migration at RM 6. Creek dewatered below dam during annual refill.

<u>Mid-Upper Umatilla tributaries (>60 stream miles):</u> Primary tributaries include: Squaw Creek, Wildhorse Creek, Mission Creek, Buckaroo Creek, and Meacham Creek. Reduced juvenile survival, rearing, over-wintering, and limited adult holding success due to low summer flows, lack of pools and high temps (due to riparian damage, grazing, timber harvest and channelization by the railroad). Alluvial deposits at mouth cause low flows to go underground.

<u>North Fork Umatilla (10 stream miles):</u> A 190 square mile wilderness area provides pristine in-stream and riparian habitat for spring chinook, summer steelhead, and bull trout spawning and rearing.

Wildlife habitat types vary within the Umatilla River Subbasin. Several terrestrial habitats including Shrub Steppe and wetlands have been greatly reduced in the subbasin and are considered limiting to dependent populations of wildlife. A variety of wildlife species, including large and small mammals, waterfowl, passerines, raptors, reptiles, and amphibians, are associated with riverine and adjacent riparian forest, wetland, island, mixed coniferous and deciduous forest, shrub steppe, and agricultural habitats.

The development of the hydropower system in the Lower Mid-Columbia River Subregion has affected many species of wildlife within the subregion, including the Umatilla River subbasin. Habitat lost to the construction of the hydroelectric facilities was home to many, interdependent species. Floodplain and riparian habitats important to wildlife were inundated when reservoirs were filled. Activities associated with hydroelectric development and operation, such as fluctuating water levels, have altered land and stream areas that affect wildlife. In some cases, dam operations have created barren vegetation zones, which expose wildlife to increased predation. Other activities related to hydroelectric development (e.g., road construction, the draining and filling of wetlands) have altered land and streams areas in ways that affect wildlife. Shrub steppe and savannah prairie habitats have been lost due to conversion to irrigated cropland. In some cases, the construction and maintenance of power transmission corridors altered vegetation, increased access to and harassment of wildlife, and increased erosion and sedimentation in the Columbia River and its tributaries. Other impacts to wildlife and wildlife habitats in the Umatilla River subbasin caused by hydropower construction and operation include irrigation, agricultural practices, livestock management practices, human development, forest management practices, noxious weeds, and the loss of prey base for certain wildlife species. Any of these influences can, and are, limiting factors to local wildlife populations. Changes in local populations can affect species integrity on a larger scale.

Relatively little land is protected and managed specifically for wildlife in the Umatilla Subbasin. The U.S. Fish and Wildlife Service (USFWS) manages two wildlife areas, the McKay Creek National Wildlife Refuge south of Pendleton and the Cold Springs National Wildlife Refuge east of Hermiston. CTUIR manages the Wanaket Wildlife Area on the Columbia River and the Squaw Creek Watershed on the Umatilla Indian Reservation for fish and wildlife benefits. The State manages Power City Wildlife area near Umatilla, Oregon.

Watershed Assessment

By a joint effort of the ODFW, CTUIR, and the Umatilla National Forest in 1987-88, a plan/assessment for the implementation of fish habitat projects was developed (Reeve et al. 1988). The development of this plan involved a comprehensive habitat survey of known anadromous fish production streams. From these surveys and existing information on habitat conditions (Boyce 1986) habitat-limiting factors were developed. A prioritized list of streams needing habitat improvement was created based on habitat condition (those areas most likely to recover in a cost-effective manner), fish use, fish species present, and logistical constraints (accessibility, technical feasibility, etc.). The surveys were the basis for determining where habitat improvement work was needed.

A comprehensive updated summary watershed assessment is currently under development and scheduled for completion in early 2000. The effort is being coordinated among all natural resource managers and various interest groups. The assessment will provide a consolidated update of habitat conditions, limiting factors, strongholds, and recommendations for protection and enhancement of water quality, quantity, and general watershed health.

The Natural Heritage Program maintains a database on habitats and species occurrences throughout the State of Oregon. The Oregon Trust Agreement Planning Project (BPA 1993) and Oregon GAP Analysis Project (ODFW 1997) identified gaps in bio-diversity and needs for terrestrial habitat restoration, and resulted in a prioritized list of potential habitat restoration opportunities within the Umatilla Subbasin. The GAP Analysis Project found that of the current land base, about 87 percent is in a low protected status for wildlife, 12 percent is in a moderate protected status for wildlife, and about 1 percent is in a high protected status for wildlife.

A Columbia Basin wide losses assessment was conducted to quantify habitat impacts from hydrosystem development. Wildlife mitigation objectives for the Umatilla River Subbasin are based on this losses assessment (see Table 3). These losses were amended into the Northwest Power Planning Council's Fish and Wildlife Program as accepted wildlife losses measured in Habitat Units (HUs) for selected target/indicator species linked to priority habitats. (Note: all or part of the wildlife losses for Lower Mid-Columbia Subregion may be mitigated for in the Umatilla Subbasin, though it is unlikely that it would be proposed or could occur).

Limiting Factors

<u>Fish</u>

The following factors are limiting for fish:

- Inter-related water quantity and quality problems (e.g., low flows/high temps & pollutants) result in poor survival during juvenile rearing and migration in the lower Umatilla River.
- Low flows and diversion barriers restrict adult migration.
- Riparian degradation and lack of pools reduces adult holding and juvenile rearing survival in the upper reaches of the Umatilla subbasin.
- Water quantity, quality, and sediment problems reduce the success of salmonid spawning and rearing.

These problems have caused major habitat fragmentation and resulting poor connectivity. Combined with out-of-subbasin problems (e.g., Columbia mainstem passage and harvest), these problems have lead to the extirpation of spring and fall chinook, and coho, and reduced populations of summer steelhead. This has greatly reduced production and lead to loss of harvest opportunities. Water quantity and quality problems (e.g., low flows and high temperatures) result in poor survival during juvenile rearing and migration in the lower Umatilla River. Low flows and diversion barriers restrict adult migration and riparian degradation and lack of pools reduces adult holding and juvenile rearing survival in the upper reaches of the Umatilla Subbasin. Sediment problems in the mid-lower drainage reduce the success of salmonid spawning

Wildlife

The following factors are limiting to wildlife:

- Past hydropower development has resulted in the loss and degradation of wildlife habitats and a decrease in fish abundance, both negatively affecting wildlife abundance.
- Past and current land management practices (e.g., irrigation, logging, livestock and agricultural practices, road constructions, mining) has resulted in the loss and degradation of wildlife habitats and decrease in water quality and quantity, also negatively affecting and limiting wildlife abundance.
- The spread of non-native plant and wildlife species reduces the habitat diversity and quality, negatively impacting many species of wildlife. For example, wetlands are often choked by reed canary grass.
- Urban expansion continues to eliminate remaining wildlife habitats. For example, increasing development and increasing land prices in the Portland-Metro area are making it more economically difficult to preserve remaining undeveloped lands for wildlife.
- Certain water use practices affect water quality and quantity, also limiting wildlife.
- Continued declines in salmon and other fish species results in a loss of overall biomass being contributed to the subbasin. This reduction has negative effects on wildlife abundance.

Wildlife abundance is currently limited by the results of past hydropower development (through habitat loss and degradation, and the decrease in fish abundance), past and current land management practices, the spread of non-native plant and wildlife species, and urban expansion. Water quality and quantity are also factors limiting to wildlife. Any of these influences can be, and are, limiting factors to local populations. Changes in local populations can affect species integrity on a larger scale. Opportunities to restore wildlife populations and improve wildlife habitat diminish over time as land prices, human population expansion and associated habitat loss and degradation continue. Shrub steppe habitats are particularly sensitive to additional loss as the vast majority of Columbia Plateau shrub steppe and savannah has been converted to agriculture. Many of the State TES species are shrub steppe dependent.

Subbasin Management

CTUIR, ODFW and BOR managers have been planning and coordinating the restoration of salmon and steelhead in the Umatilla River Basin for several decades. Umatilla River Basin Fisheries Restoration Master Plan (CTUIR 1984, ODFW 1986) was developed specifically to coordinate and give direction to the overall rehabilitation effort. Many of the management plans and strategies outlined in the Master Plan came to fruition through the use of BPA funded programs during the past 10 to 12 years. These continuing projects were and are in accordance with the Pacific Northwest Electric Power Planning and Conservation Act of 1980 (P.L. 96-501), and measures outlined in the Northwest Power Planning Council's (NWPPC) Columbia River Basin Fish and Wildlife Program (NWPPC 1994). Planning and coordinating the rehabilitation of the basin began with an assessment of the watershed's current conditions and potential. Limiting factors and critical uncertainties were identified in the planning process. Projects were then developed to address both the limiting factors and the uncertainties. Planning, coordination, and adaptive management is facilitated through monthly and annual meetings. Annually, projects are reviewed and examined to ensure they dovetail with other projects in the Basin without duplication and address either limiting factors or critical uncertainties.

Goals, Objectives and Strategies

Fish

Umatilla restoration planning began after adoption of the first Fish and Wildlife Program (FWP, NWPPC 1987 and 1994) called for by the Northwest Power Planning and Conservation Act of 1980. This led to development of a number of planning documents (Boyce 1986; CTUIR and ODFW 1989 and 1990; USBR and BPA 1989).

Restoration planning identified six strategies to restore Umatilla basin anadromous fish production (Boyce 1986; CRITFC 1996; CTUIR and ODFW 1989; USBR and BPA 1989). These strategies include: 1) improving Umatilla flow; 2) improving passage at Umatilla River irrigation diversions; 3) improving riparian communities and in-stream habitat; 4) reestablishing salmon production through hatchery releases; 5) supplementing steelhead populations using endemic broodstock; and, 6) monitoring and evaluation.

The Umatilla Basin Restoration Project has clear goals, objectives, and strategies. The goals include the restoration of spring chinook salmon, coho salmon, fall chinook salmon and Pacific lamprey in the Umatilla River Basin. In addition, the goals include the enhancement of natural steelhead through supplementation to fully seed the available habitat. The general goal for these species is to restore sustainable, naturally producing populations to support tribal and non-tribal harvest and cultural and economic practices while protecting the biological integrity and the genetic diversity of the watershed. The specific goal included returning 10,000 hatchery spring chinook, 10,000 hatchery fall chinook, 6,000 hatchery coho salmon, and 6000 hatchery summer steelhead. Goal for natural production included 1,000 natural spring chinook, 11,000 natural fall chinook, and 4,000 natural summer steelhead. An initial coho salmon natural production goal was not identified and was to be defined following monitoring and evaluation. The Umatilla Restoration Master Plan was completed in 1990 and included the following five objectives.

To accomplish these goals the managers have adopted the following objectives: 1) improve adult passage survival; 2) improve adult prespawning survival; (3 improve juvenile rearing survival 4) improve juvenile passage survival; and restore depressed populations to productive levels.

In order to address the above objectives, a comprehensive fisheries restoration program was developed based on five broad strategies. These include: 1) improving flows in the mainstem; 2) improving upstream/downstream passage at mainstem diversions; 3) reducing high water temperatures, sedimentation, and increasing the pool-to-riffle ratio through watershed protection and riparian and in-stream enhancements; 4) providing hatchery production (with acclimation/release near natural spawning areas) using Umatilla broodstock (with satellite adult capture/holding) and natural production; and 5) assessing progress and adapting strategies through monitoring and evaluation (addressing subbasin information needs). This coordinated multi-faceted strategy requires numerous multi-year activities and projects which are detailed below under subbasin recommendations.

Wildlife

The overall wildlife mitigation goal within Columbia River Basin is to achieve and sustain levels of habitat and species productivity in order to fully mitigate for all wildlife and wildlife habitat losses caused by the development and operation of the hydropower system. This goal applies to the Lower Mid-Columbia Subregion, and more specifically, to the Umatilla Subbasin. This goal is to be achieved by fully mitigating for losses associated with the Bonneville, The Dalles, John Day, and McNary Dams.

The wildlife mitigation objective is to maintain and restore populations of wildlife native to the Umatilla Subbasin, including those target species selected to represent the cover types within the subbasin, and those habitat types considered priorities within the subbasin. The wildlife mitigation objective is based on NWPPC's accepted wildlife losses measured in Habitat Units (HUs) for selected target/indicator species linked to priority habitats. The priority habitat types for wildlife in this subbasin are riparian/riverine, wetlands and shrub-steppe. Islands are medium priority, agricultural lands low priority.

The following strategies will achieve wildlife mitigation objectives within the Umatilla Subbasin:

- Identify potential protection and enhancement projects within the Umatilla River Subbasin through the GAP Analysis and coordinate implementation of activities through the Oregon Wildlife Coalition.
- Implement land acquisition and easements of priority habitats.
- Implement enhancement and restoration activities (e.g., control of non-native plant species, management of livestock grazing practices for native plant communities).
- Monitor and evaluate wildlife habitat and wildlife species response to implemented enhancement activities within the Umatilla Subbasin.

Past Efforts

Specific actions to implement strategies include improving flows in the Umatilla mainstem by exchanging the West Extension Irrigation District (WEID) withdrawal at Three Mile Dam with Columbia River water with operating costs funded by BPA under the Power Repay Umatilla Basin Project (No. 8902700). This project also funds operating costs for exchanging mainstem Umatilla water that was withdrawn at Stanfield to refill Cold Springs Reservoir, with water pumped from the Columbia River allowing formerly diverted flows to remain in the Umatilla (Columbia River Pumping Plan - Phase II). The query for Congressional appropriations to develop water exchange with Westland Irrigation District (Columbia River Pumping Plan - Phase III) continues. Coordination of the Umatilla Basin Project exchange program and flow enhancement efforts is conducted under the Umatilla River Fish Passage Operations project (No. 8802200). This project also monitors the operation of juvenile screen and adult ladder passage facilities in the basin. Improvements to upstream/downstream fish passage at Umatilla mainstem diversions have largely been implemented and are now in O&M mode. On-going screens & ladder O&M is implemented under the Umatilla Passage facility O&M project (No. 8343600), and on-going trap-and-haul operations to move adults and juveniles around thermal and low flow blocks that remain is implemented under The Passage Operations Project No. 8802200.

Projects to protect and Enhance Anadromous Fish Habitat (No. 8710001 and No. 8710002), implement stream and riparian habitat improvements (fencing, in-stream structures for pools, bank stabilization and riparian plantings on private and federal land). Project No. 9092 will augment the CTUIR enforcement program in order to enforce land and water use practices, and other harvest restrictions in order to protect these investments.

Production actions implemented include construction and operation of Umatilla Hatchery using BPA funding. Umatilla Hatchery provides juvenile salmon and steelhead for acclimation/release in the Umatilla River. The production actions also include BPA funded construction and operation of juvenile acclimation/release facilities at Bonifer, Minthorn Springs, Thornhollow and Imeques C-mem-ini-kem and adult holding/spawning facilities at Minthorn, Three Mile Dam and South Fork Walla Walla. All satellite facilities are operated under the Umatilla Hatchery Satellite Facilities Operation and Maintenance (UHSFO/M) project (No. 8903500). BPA is also funding construction and operation of a fifth acclimation/release facility near Pendleton. It is scheduled for completion in 1999 and will also be operated under UHSFO/M.

Other hatcheries also provide juvenile salmon and steelhead for release in the Umatilla River. With Mitchell Act funding, coho salmon are provided from Cascade and Oxbow hatcheries and spring chinook salmon are provided by Carson National Fish Hatchery. Bonneville Hatchery, with Corps of Engineers funding, provides chinook salmon and Little White Salmon Hatchery, using BPA funding, also provides chinook salmon.

Several actions are being implemented in order to assess progress and adapt strategies through monitoring and evaluation (addressing subbasin information needs). Monitoring and evaluation of screen facilities and juvenile and adult passage was conducted under Project No. 8902401; hatchery operations and releases under Project No. 9000500; and, natural production under Project No. 9000501.

BPA funded Project No. 8902701 to determine the feasibility of releasing 6,000 acre-feet of unallocated storage in McKay Reservoir for fish passage and temperature control in the Umatilla mainstem – this action is not being pursued at this time. The BPA funded the COE to blast a channel below Three Mile Dam to concentrate in-stream flows for improved fish passage. BPA funded new state-of-the-art screens and ladders at Stanfield, Maxwell, Three Mile, Westland, Feed/Cold Springs, and other diversions. Habitat improvement work has included projects Project No. 9604500, Project No. 9606800, and Project No. 8710000 (which funded the removal of low flow blockage of Meacham Creek due to alluvial deposits).

The Squaw Creek riparian habitat is protected through land purchase, jointly funded from Anadromous Fish and Wildlife budgets (Project No. 9506001).

The Oregon Wildlife Coalition is implementing a programmatic mitigation project, *Securing Wildlife Mitigation Sites - Oregon* (Project No. 9705900) to plan and implement of mitigation projects within the Lower Mid-Columbia Subregion, including the Umatilla Subbasin. The goals of this project are to:

- Fund project coordination activities to identify, plan, propose, and implement wildlife mitigation projects.
- Prioritize potential mitigation projects.
- Acquire or ease lands with priority habitats.
- Enhance acquired or eased lands through alteration of land management practices, active restoration of habitats, control of noxious weeds, control of public access, etc. to provide benefits to target/indicator wildlife species.

- Develop and implement a Monitoring and Evaluation Plan with both HEP based and non-HEP based monitoring criteria.

The CTUIR is protecting, enhancing, and mitigating in-kind and in-place wildlife and wildlife habitat impacted by the construction of the McNary hydroelectric project by implementing *the Wanaket Wildlife Mitigation Project* (Project No. 9009200). Mitigation is occurring through the protection and enhancement of upland and wetland habitat types. Noxious weed control, flood irrigation and moist-soil management of the McNary Potholes to provide wetland and wetland associated habitats is occurring. Exclusion of livestock grazing, restrictions on motorized access, and regulation of recreational access also occur.

The CTUIR is protecting, enhancing, and mitigating wildlife and wildlife habitat in the Squaw Creek watershed with *the Enhance Squaw Creek Watershed for Anadromous Fish & Wildlife Habitat Project* (Project No. 9506001). Noxious weed control, maintenance of range allotment fencing, access management, livestock grazing management, and native shrub and grass seed collection, propagation, and planting are occurring.

Research, Monitoring and Evaluation

Past and ongoing research, monitoring and evaluation activities have been coordinated through the Annual Operation Plan (AOP) and the Umatilla Management, Monitoring and Evaluation Oversight Committee (UMMEOC). The research, monitoring and evaluation activities are coordinated through a number of projects. Adult returns are identified and enumerated by the Fish Passage Operations Project. Harvest is monitored by CTUIR (BIA funding), ODFW and the *Umatilla Basin Natural Production Monitoring and Evaluation Project* (UBNPME). ODFW has completed extensive research on the juvenile passage facilities. CTUIR completed three years of intensive evaluation of the adult passage facilities through the UBNPME with radio telemetry. The Lamprey Restoration Project includes restoration as well as research and monitoring activities. Intensive stream and riparian habitat surveys were coordinated and conducted by ODFW, USFS and CTUIR. CTUIR habitat data has been incorporated into a GIS database. Stream temperature monitoring is coordinated among four CTUIR projects (UBNPME, Habitat, Artificial Production and Passage), ODFW, USFS, DEQ and BOR. CTUIR temperature data is available on an FTP site. Spawning, rearing and out-migration of salmon and steelhead is monitored and evaluated by the UBNPME project. UBNPME project conducts spawning surveys throughout the year to evaluate steelhead, spring chinook salmon, bull trout, coho salmon and fall chinook salmon spawning. The survival and timing of smolts is monitored through PIT tags. UBNPME also monitors age and growth, natural rearing densities, distribution and abundance of natural salmonids throughout the basin. ODFW Hatchery Monitoring and Evaluation Project conducts marking studies to determine the success of both production and research groups. Included in their activities are the routine monitoring of growth and general health of fish in the hatcheries. They also conduct controlled experiments on various rearing strategies and techniques such as oxygen supplementation. The ODFW Project entitled, *Evaluation of Juvenile Salmonid Outmigration and Survival in the Lower Umatilla River Basin*, studies the survival of out-migrating juvenile salmonids using PIT tags.

Monitoring and Evaluation activities implemented since the late 1980s have greatly increased knowledge of salmonid habitat fish populations within the basin. A Research and Management Review was held in 1998 which provided a summary of significant findings to date.

Wildlife surveys and inventories (e.g., big-game aerial surveys) are conducted regularly within the Umatilla Subbasin regularly by ODFW and CTUIR. Wildlife mitigation projects are habitat based and use the USFWS's Habitat Evaluation Procedure (HEP) as a means of tracking project progress. Treatment specific monitoring may also be employed to evaluate methods. Additionally, population monitoring throughout is conducted to address species response to project implementation and for setting of harvest regulations.

Remaining Work

Most of the limiting factors and management strategies for salmonid restoration in the Umatilla Subbasin have been completed or initiated. Several strategies such as passage, hatchery operations, flow augmentation and habitat rehabilitation will require continued efforts to realize the benefits of past and current investments. However, the mitigation of some limiting factors and the evaluation of some critical uncertainties remains. Feed Canal Dam was determined to be a passage impediment to migrating adult salmon and steelhead during each of three years of evaluation. In addition, Feed Canal Dam, and Westland Dam interrupt natural bed-load transport processes and have created extensive floodplain and riparian habitat instability and damage. BOR and CTUIR are developing a managing and monitoring plan to maximize the benefit of water stored in McKay reservoir specifically allocated for fisheries enhancement. This will include flows for adult and smolt migration as well as enhance summer rearing conditions in the mainstem Umatilla River. Genetic monitoring and supplementation evaluations of steelhead have been delayed because of the costs. These critical uncertainties while outlined in the Master Plan remain to be formally evaluated. Incubation/juvenile rearing capabilities at the existing South Fork Walla Walla satellite facility to rear additional spring chinook and relocate current production for acclimation/release in the Umatilla River to help achieve Umatilla basin adult return goals are needed. Using BPA funding, the proposed facility will be designed and constructed under the “Design and Construct Umatilla Hatchery Supplement” project. O&M will be provided by the UHSFO/M project, also with funding from BPA. Through monthly and annual coordination and project review processes, restoration efforts will continue to be refined and improved through adaptive management.

Securing Wildlife Mitigation Sites - Oregon (Project No. 9705900): The Oregon Wildlife Coalition will continue to implement this programmatic mitigation project to identify and implement other potential wildlife protection and enhancement projects within the Umatilla Subbasin until remaining wildlife Habitat Unit (HU) losses are mitigated for.

Wanaket Wildlife Mitigation Project (Project No. 9009200). The updated management plan will be administered to continue to provide Habitat Units. Habitat values for selected target species will be maintained through continued flood irrigation and noxious weed control. Monitoring and Evaluation will occur to ensure mitigation goals are met.

Enhance Squaw Creek Watershed for Anadromous Fish & Wildlife Habitat (Project No. 9506001). HEP studies and the management plan will be completed in FY 1999. Enhancements will begin in FY 2000 and should be largely completed by FY 2004. Additional properties will be purchased over time and incorporated into the project as regional funding permits.

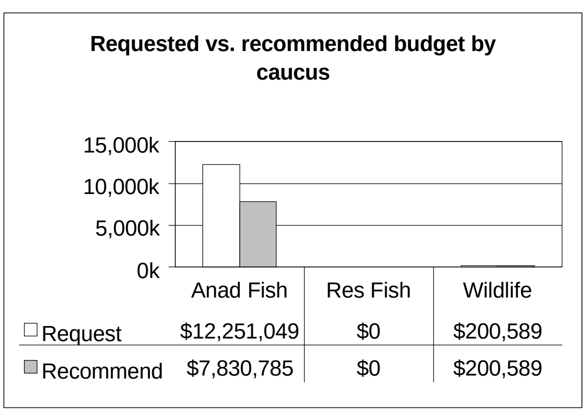
Other remaining wildlife related work tasks within the Umatilla Subbasin include assessment and mitigation of hydropower system operational and secondary losses, development and implementation of a regional Monitoring and Evaluation Plan, and development of both HEP-based and non HEP-based monitoring success criteria.

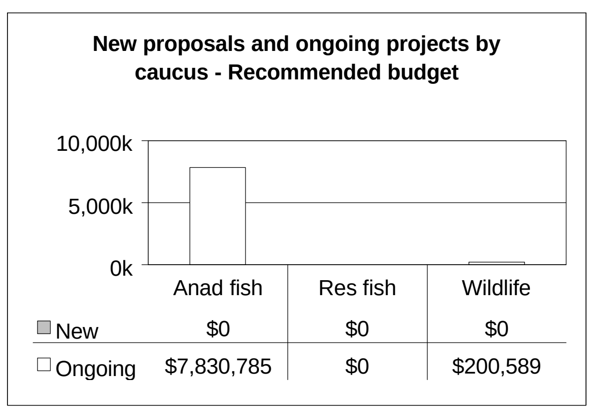
Subbasin Recommendations

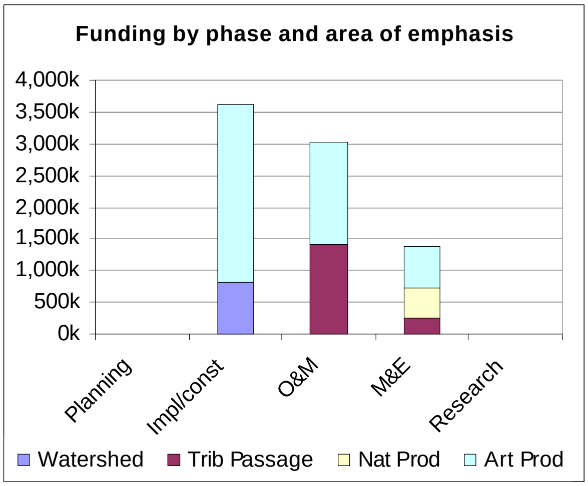
Projects and Budgets

Based on the preceding subbasin description, the CBFWA fish and wildlife managers recommend funding a total of 12 projects at a cost of $8,031,374. Of the projects recommended, 11 focus on anadromous fish, and 1 is directed at wildlife.

Refer to the following figures for detail on: 1) total recommended and requested budget by caucus, 2) funding for new and ongoing work, 3) funding by project phase and emphasis, and 4) funding by time period (past, current and future). Individual projects are listed in the following table.






Funding by phase and area of emphasis
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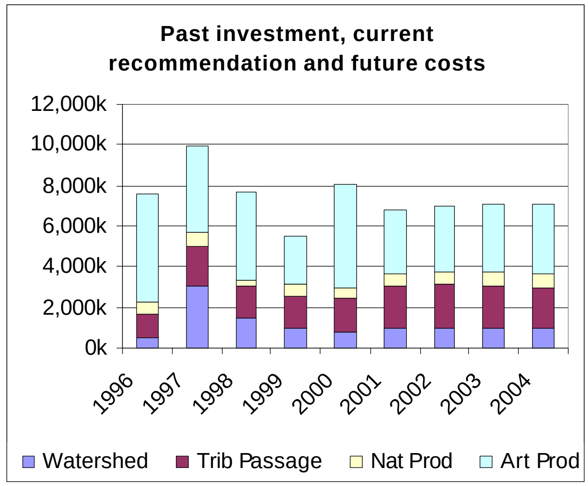
3,500k
3,000k
2,500k
2,000k
1,500k
1,000k
500k
0k
Planning
Impl/const
O&M
M&E
Research
Watershed
Trib Passage
Nat Prod
Art Prod


Past investment, current recommendation and future costs
12,000k
10,000k
8,000k
6,000k
4,000k
2,000k
0k
1996
1997
1998
1999
2000
2001
2002
2003
2004
Watershed
Trib Passage
Nat Prod
Art Prod

ProjectID	Title	Sponsor	FY99 recom.	FY00 recom.	Estimated Outyears FY01	FY02	FY03	FY04
Anadromous Fish Projects								
8343500	Operate and Maintain Umatilla Hatchery Satellite Facilities	CTUIR	735	775	1,486	1,550	1,613	1,676
8343600	Umatilla Passage Facilities O & M	Westland Irrigation District	400	502	724	746	768	791
8710001	Enhance Umatilla River Basin Anadromous Fish Habitat	CTUIR	270	260	315	325	335	345
8710002	Protect and Enhance Anadromous Fish Habitat in the Umatilla River Subbasin	ODFW	481	353	450	450	468	468
8802200	Umatilla River Fish Passage Operations	CTUIR	420	360	398	418	439	461
8805302	Plan, Site, Design and Construct Neoh Hatchery - Umatilla/Walla Walla Comp.	CTUIR	400	2,800	0	0	0	0
8902401	Evaluate Juvenile Salmonid Outmigration and Survival in the Lower Umatilla	ODFW	240	251	299	308	181	0
8902700	Power Repay Umatilla Basin Project	BPA	500	550	650	650	650	650
8903500	Umatilla Hatchery Operation and Maintenance	ODFW	797	850	882	918	944	972
9000500	Umatilla Hatchery Monitoring and Evaluation	ODFW	616	650	743	766	788	812
9000501	Umatilla River Basin Natural Production Monitoring and Evaluation	CTUIR	611	480	586	625	660	695
		Anadromous Fish Totals	**$7,831**	**$6,533**	**$6,755**	**$6,846**	**$6,870**	
Wildlife Projects								
9506001	Protect & Enhance Wildlife Habitats in the Squaw Creek Watershed.	CTUIR	200	201	221	242	229	211
		Wildlife Totals	**$201**	**$221**	**$242**	**$229**	**$211**	
	* indicates ESA project, † indicates 'Innovative work'	**SUBBASIN TOTALS**	**$8,031**	**$6,754**	**$6,997**	**$7,076**	**$7,081**	

All figures in thousands of dollars

Needed Future Actions

There is a need to secure additional anadromous fish habitat strongholds in the watershed for permanent protection and restoration. Opportunities to provide benefits to wildlife and wildlife habitat will be pursued through the Oregon Wildlife Coalition's programmatic project. Continued implementation of this project may identify potential wildlife protection and enhancement projects within the Lower Mid-Columbia Subregion, including the Umatilla Subbasin. Implementation of wildlife mitigation projects within the subregion will benefit wildlife and help BPA meet their wildlife mitigation obligations at Bonneville, The Dalles, John Day, and McNary Dams. Other negative impacts to fish and wildlife caused by the hydropower system that fish and wildlife managers are currently not aware of may need to be addressed in the future as they become apparent. For example, impacts to TES species may require mitigative action.

Actions by Others

Various entities in the Umatilla Subbasin coordinate with fisheries managers to assist in accomplishment of fisheries restoration goals. The Umatilla Basin Watershed Council, comprised of a group of local volunteers, provides public outreach and functions as a coordinating body in promotion of watershed restoration. The U.S. Bureau of Reclamation and several irrigation districts in the lower basin have been involved in cooperative efforts to remove fish passage impediments and enhance in-stream flows. Specific examples have included construction of new fish ladders and screens at Feed Canal Dam, Stanfield Dam and Westland Dam and maintenance of in-stream flows through water exchange (implementation of phases 1 and 2 of the Umatilla Basin Project). The Natural Resource Conservation Service, Umatilla County Farm Service Agency and Oregon State University Extension Office develop cooperative agreements with landowners to remedy agricultural land use practices (cropland erosion, overgrazing, etc.) impacting stream water quality and fish survival. The Umatilla Basin Regulatory Work Group, comprised of the Oregon Division of State Lands, U.S. Army Corps of Engineers and various resource agencies, provides technical assistance to landowners, prior to approval of in-stream permit (Federal Clean Water Act 401 and 404 activities) requests. This approach provides a more streamlined permit review process and attempts to address in-stream activities by stream reach, rather than as individual projects.

There are numerous planning and policy development processes presently occurring as part of the effort to address fish and wildlife needs within the Columbia River Basin. These processes, as well as the number of oversight agencies, have expanded over the recent years, subsequently affecting the amount of restoration work being performed on the ground. Additional staff and funding are needed to meet the obligations to the changing process and the resources.

There are opportunities for private and public landowners, as well as non-profit organizations (e.g., The Nature Conservancy) to work together to benefit wildlife and wildlife habitats within the subbasin through the protection and enhancement of lands for wildlife.

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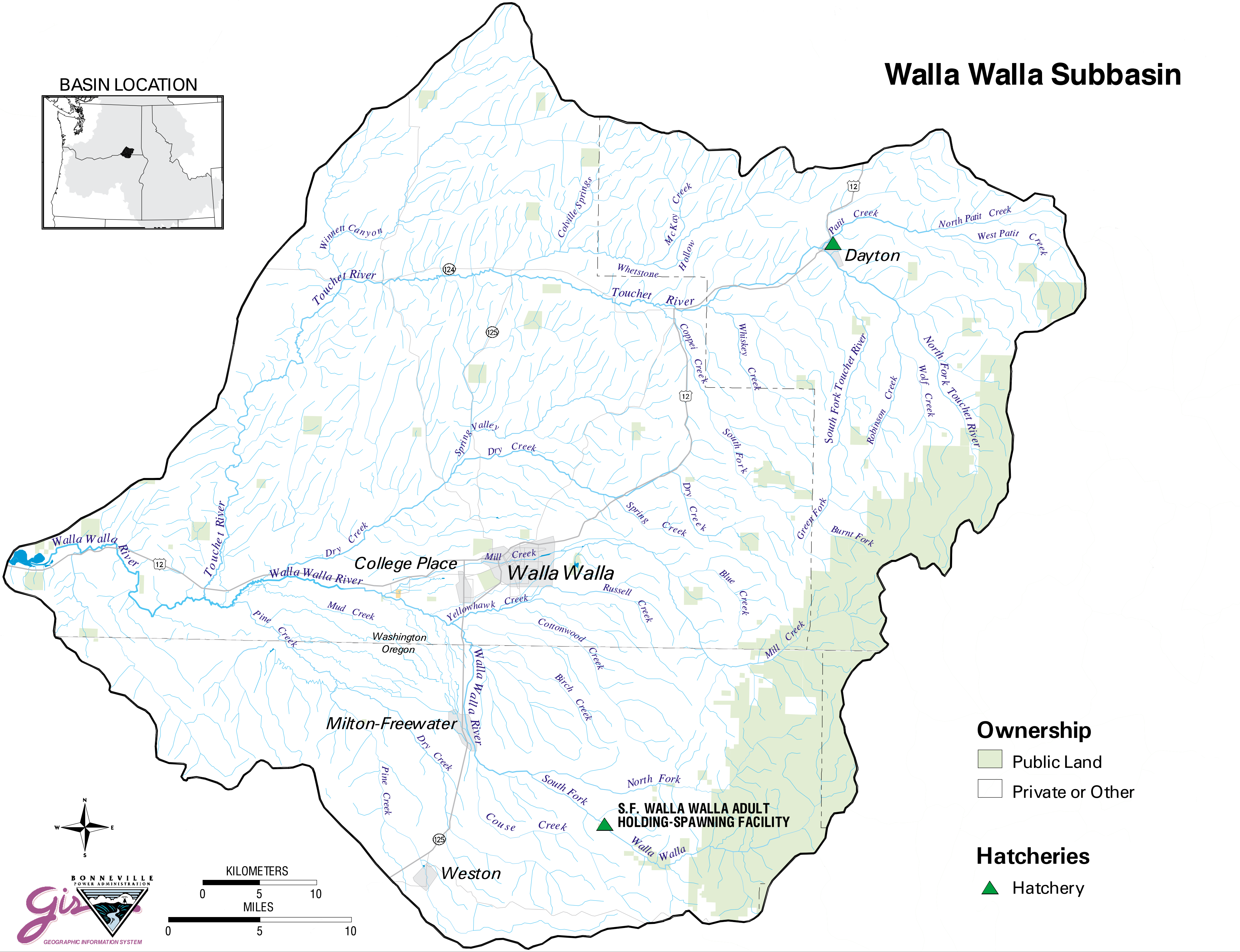
Walla Walla Subbasin



Walla Walla Subbasin

Anad fish 7 projects $3,716

Fish And Wildlife Resources

Subbasin Description

The Walla Walla River Subbasin covers approximately 1,758 square miles in northeastern Oregon and southeastern Washington; about 73 percent of the drainage lies within Washington. The Walla Walla River originates in the Blue Mountains in northeast Oregon and flows west and north into Washington to the Columbia River. Elevations in the subbasin range from about 270 feet at the Columbia River, to about 3,000 feet in the Blue Mountains, to 6,000 feet at mountain crests.

Most of the land is privately owned, including about 96 percent of the subbasin lands in Washington. The higher elevation areas are managed for multiple uses, including timber harvest, livestock grazing, and motorized recreation. Mid-elevation lands are devoted to dry land farming and grazing, and urban development. The Walla Walla River Valley is extensively and intensively irrigated. Irrigation is the largest use of surface and groundwater in the subbasin.

Fish and Wildlife Status

Currently summer steelhead, which spawn throughout the system, are the only naturally reproducing anadromous salmonid in the Walla Walla Subbasin. Nonendemic Steelhead are produced at Lyons Ferry Hatchery under the LSRCP for release in the Touchet and mainstem Walla Walla Rivers. Bull trout exist throughout much of the upper watershed. Several bull trout populations appear moderately healthy but are isolated and consequently at risk. Genetic information on bull trout is limited.

Historically, spring chinook, and possibly coho and chum utilized the river system. Natural production of spring chinook occurred in the middle and upper mainstem and its major tributaries. Because spring chinook were eliminated from the system in the early to mid 1900s, detailed information on their use of the river is limited.

Table 1. Stocks, history and management goals

Stock	Status/Genetic History / Management Intent	Spawn Escape	Hatchery Take	Harvest 1989-97	Total Escape
ChS	Extirpated. Re-introduction under discussion.	0	0	0	0.00
StS (A)	Threatened (ESA). Genetic information is limited. LSRCP mitigation to augment harvest in the lower river segments in WA continues with non-endemic stock – may phase to endemic stocks.	NA	None	1,000-2,400	NA

A variety of wildlife species, including upland game birds, waterfowl, fur bearers, big game, raptors, neotropical migrant song birds, reptiles and amphibians, are associated with the Walla Walla subbasin terrestrial and aquatic habitats. Many populations have been impacted by habitat loss and degradation, hydro system and other development, and out of basin effects. The status of populations varies throughout the subbasin and by species. Shrub Steppe wildlife assemblages are in a state of decline due to loss of habitat. Many wildlife species are listed as threatened, endangered, sensitive, or at-risk including burrowing owls, grasshopper and sage sparrows, the Washington ground squirrel, and Ferruginous and Swainson's hawks. Big game, upland game bird and waterfowl species are monitored by state and tribal managers for establishment of seasons of harvest and bag limits.

Table 2. Production Program Description

Stock	Mgmt Intent	Initial Broodstock	Operating Broodstock	Adult Collection & Holding	Central Facility (Incubation & Rearing)	Acclimation &/or Release Sites	Status	Funding
StS(A)	Harvest Mitigation	Lyons Ferry	Lyons Ferry	Lyons Ferry	Lyons Ferry	Mainstem Walla Walla-direct; Dayton Pond (Touchet R.)	On-going	LSRCP
StS(A)	Supplemt	Walla Walla	Walla Walla	Nursery Bridge Dam/ S.F. Walla Walla	Umatilla H.		Hatch-Compl.	NWPPC
StS(A)						S.F. Walla Walla	Discussion	NWPPC
ChS	Supplemt	Carson	Walla Walla	S.F. Walla Walla	S.F. Walla Walla	S.F. Walla Walla	Discussion	NWPPC

Habitat Areas and Quality

Although passage and flow problems predominate in the lower portions of the basin, the upper watershed conditions are generally good, particularly in the upper South & North Forks of the Walla Walla and Mill Creek, and some of the upper portions of the Touchet River and its tributaries. Soils over much of the subbasin are deep windblown silt and fine sand and highly erodible, yielding sediments that limit fish production, particularly in the middle reaches of Mill Creek and the middle and lower reaches of the Touchet and Walla Walla rivers. Riparian and fish habitats have been severely degraded by water withdrawals, urban and rural development, flood control efforts, logging, farming, grazing, gravel mining, and roads in the middle and lower portions of the basin. These activities have resulted in unstable stream banks, degraded water quality including elevated stream temperatures and sedimentation rates, reduced or eliminated critical fish holding and rearing areas and diminished summer instream flows. Mudd (1975) estimated that only about 37% of the Touchet River riparian zone is currently vegetated. Along the Oregon portion of the Walla Walla River, 70% off the existing riparian zone is in poor condition (Water Resources Commission, 1988).
As a result of irrigation withdrawals and to a lesser extent an alluvial deposit in the Milton-Freewater area which acts as a giant sink, portions of the mainstem Walla Walla River are seasonably dewatered near the state border. Additional irrigation withdrawals downstream de-water other reaches of the river.

The development of the hydropower system in the Lower Mid-Columbia River Subregion has affected many species of wildlife within the subregion, including the WallaWalla subbasin. Habitat lost to the construction of the hydroelectric facilities was home to many, interdependent species. Floodplain and riparian habitats important to wildlife were inundated when reservoirs were filled. Activities associated with hydroelectric development and operation, such as fluctuating water levels, have altered land and stream areas that affect wildlife. In some cases, caused by dam operations have created barren vegetation zones, which expose wildlife to increased predation. Other activities related to hydroelectric development (e.g., road construction, the draining and filling of wetlands) have altered land and streams areas in ways that affect wildlife. Shrub Steppe and Savannah Prairie habitats have been lost due to conversion to irrigated cropland. In some cases, the construction and maintenance of power transmission corridors altered vegetation, increased access to and harassment of wildlife, and increased erosion and sedimentation in the Columbia River and its tributaries. Other impacts to wildlife and wildlife habitats in the Walla Walla River subbasin caused by hydropower construction and operation include irrigation, agricultural practices, livestock management practices, human development, forest management practices, noxious weeds, and the loss of prey base for certain wildlife species. Any of these influences can, and are, limiting factors to local wildlife populations. Changes in local populations can affect species integrity on a larger scale.

The Rainwater Wildlife Area was established in the headwaters of the South Fork Touchet River in 1998 to protect and restore critical andadromous and resident fish habitat and terrestrial wildlife habitat.

The Oregon Trust Planning Project and Oregon GAP analysis identified gaps in biodiversity, needs for terrestrial habitat restoration and prioritized list of potential habitat restoration opportunities in the Walla Walla Basin in Oregon. Less than 1% of the Basin is in a highly protected status for wildlife.

Watershed Assessment

Several watershed assessments have been completed for portions of the Walla Walla Basin (COE 1997, WRD 1988, Pacific Ground Water Group 1995, Mudd 1975, Likes 1984, Hunter and Cropp 1975, BOR 1997,etc.). The information available regarding fish habitat conditions is generalized and incomplete. Stream or reach specific limiting factor analysis is currently unavailable. A comprehensive summary watershed assessment is presently being compiled and is scheduled for completion in January 2000.

A comprehensive updated summary watershed assessment is currently under development and scheduled for completion in early 2000. The effort is being coordinated among all natural resource managers and various interest groups. The assessment will provide a consolidated update of habitat conditions, limiting factors, strongholds, and recommendations for protection and enhancement of water quality, quantity and general watershed health.

A Columbia Basin wide losses assessment was conducted to quantify habitat impacts from Hydrosystem development losses associated with the McNary hydro are equal to 23,545 habitat units. Wildlife mitigation objectives for the Walla Walla River subbasin are based on this losses assessment. These losses were amended into the Northwest Power Planning Council's Fish and Wildlife Program as accepted wildlife losses measured in Habitat Units (HUs) for selected target/indicator species linked to priority habitats. (Note: all or part of the wildlife losses for Lower Mid-Columbia subregion may be mitigated for in the Walla Walla River, though it is unlikely that it would be proposed or could occur).

Limiting Factors

Although problems associated with gravel mining, diking, logging, roads, rural development, flood control urbanization, and grazing practices exist, the most significant habitat impacts in the Walla Walla system are associated with the extensive network of irrigation diversions, farming practices, and resultant riparian degradation. Numerous passage problems for both adults and juveniles exist throughout the lower portions of the basin. Sedimentation has degraded habitat in much of the lower rivers and streams. The mainstem of the Walla Walla River is de-watered in places and has very low flows and high stream temperatures in other sections during the summer. Similar low flow or high temperature conditions exist in various portions of the lower Touchet River and Mill Creek. Additionally, the lower Mill Creek is an urban stream that has been dammed, diked, and the channel altered with weirs or concrete for flood control or water withdrawals. These problems have caused major habitat fragmentation and result in poor connectivity. Combined with out-of-subbasin problems (e.g., Columbia mainstem passage and harvest), these problems have contributed to the extirpation of spring chinook, and greatly reduced populations of summer steelhead and bull trout.

Wildlife abundance is currently limited by the results of past hydropower development (through habitat loss and degradation, and the decrease in fish abundance), past and current land management practices, the spread of non-native plant and wildlife species, and urban expansion. Water quality and quantity are also factors limiting to wildlife. Any of these influences can, and are, limiting factors to local populations. Changes in local populations can affect species integrity on a larger scale. Opportunities to restore wildlife populations and improve wildlife habitat diminish over time as land prices, human population expansion and associated habitat loss and degradation continue. Shrub/steppe habitats are particularly sensitive to additional loss as the vast majority of Columbia Plateau Shrub/steppe has been converted to agriculture. Many of the State T, E and S species are shrub/steppe or riparian dependent.

Subbasin Management

Goals, Objectives and Strategies

Fish

The indigenous fish species most actively targeted for management in the Walla Walla River Subbasin are spring chinook, summer steelhead and bull trout. The goal for these species is to restore sustainable, naturally producing populations, attain species delisting, and allow tribal and non-tribal harvest and cultural and economic practices while protecting the biological integrity and the genetic diversity of fish stocks in the watershed. Specific objectives to accomplish this goal are as follows:

1. Improve adult holding, spawning, and juvenile rearing survival.
2. Improve adult and juvenile migration survival.
3. Restore sustainable naturally reproducing populations of salmonids in the subbasin.
4. Maintain LSRCP harvest mitigation for nonendemic steelhead and rainbow trout in area streams and ponds in the Washington section of the basin. CTUIR disagrees with WDFW position to maintain non-endemic harvest augmentation program without regard for assisting the natural listed population.

The strategies for achieving these objectives are to:

1. Implement instream or riparian habitat enhancement, sediment reduction methods, and watershed protection projects with an emphasis on high-impacted private lands in order to overcome the key limiting factors of high water temperatures and sedimentation.

2. Implement fish passage improvement projects such as instream flow augmentation, screening at irrigation canals, ladders at diversion dams, and fish trap and haul operations which are intended to minimize mortality of migrating juvenile and adult fish.
3. Develop and implement a comprehensive watershed-based restoration program using hatchery production to re-introduce extirpated spring chinook and supplement the existing run of steelhead. This includes supplementing available watershed assessment information, monitoring endemic salmonid populations, and evaluation of the Walla Walla Subbasin salmon restoration strategy to guide and assess the habitat improvement actions and various artificial propagation strategies, as well as the reproductive success of re-introduced spring chinook.

Wildlife

The overall wildlife mitigation goal within Columbia River Basin is to achieve and sustain levels of habitat and species productivity in order to fully mitigate for all wildlife and wildlife habitat losses caused by the development and operation of the hydropower system. This goal applies to the Lower Mid-Columbia subregion, and more specifically, to the Walla Walla River subbasin. This goal is to be achieved by fully mitigating for losses associated with the Bonneville, The Dalles, John Day, and McNary Dams.

Strategies

The following strategies will achieve wildlife mitigation objectives within the Walla Walla River subbasin:

- Identify potential protection and enhancement projects within the Walla Walla River subbasin through the GAP Analysis and coordinate implementation of activities through the Oregon and Washington Wildlife managers.
- Monitor and evaluate wildlife habitat and wildlife species response to implemented enhancement activities within the Walla Walla River subbasin.

The priority habitat types for wildlife in this subbasin are riparian/riverine, wetlands and shrub-steppe. Islands are medium priority, agricultural lands low priority.

Past Efforts

Specific actions responding to subbasin strategies include: 1) habitat enhancement planning; 2) watershed assessment and coordination; and, 3) habitat improvements implemented under project #9604601. Considerable passage planning and improvements have been done under projects #9601100 & #9601200. Operation of juvenile screen and adult ladder passage facilities are coordinated and monitored by the Walla Walla Fish Passage Operations project.

Some habitat coordination, planning, and implementation has been funded by projects #9604600 and #9606400. Additionally, funds from the State of Washington, with a federal match, are being coordinated through the Conservation District for habitat assessment and restoration, as well as for educational efforts.

ODFW in coordination with CTUIR has operated an adult steelhead trap on the mainstem Walla Walla River in Milton-Freewater since 1992. The purpose of this trap has been to gather baseline data on the abundance of adult summer steelhead returning to the Oregon portion of the Walla Walla subbasin. This activity has provided fish managers an understanding of the current status of the population as well as information on some of their biology such as life history, return timing, size and sex ratios. Over the past two seasons fin clips have been taken for DNA analysis. The Washington Department of Fish and Wildlife has been collecting samples throughout the Washington portion of the basin and will analyze the samples to determine the genetic makeup of steelhead in the Walla Walla basin. Funding for all of the above work has been from a variety of sources including ODFW, BPA, and USFWS.

ODFW in cooperation with USFS and many volunteers has conducted intensive and extensive bull trout spawning ground surveys in the basin since 1993. These surveys have led to an understanding of spawning distribution and the relative abundance of adult spawners in the basin.

The Rainwater Wildlife Area was secured by the CTUIR using Interim Washington Wildlife Mitigation Agreement funds for wildlife and anadromous and resident fish benefits. The Habitat Evaluation Procedures (HEP), public outreach and management plan development was initiated in the fall of 1998.

Research, Monitoring and Evaluation

Only limited monitoring has occurred recently in the Walla Walla River Basin. Past and current work has been designed to provide critical information to the development of a Master Plan to restore salmon and steelhead in the basin. Currently this Master Plan is in draft form and CTUIR, ODFW and WDFW need additional data to best complete it. In 1998, monitoring consisted of some stream temperature monitoring and the development of an initial monitoring plan. This initial monitoring plan provides direction for limited evaluation within the basin to aid the planning process. Extensive monitoring and evaluation programs will be developed depending on management actions that are yet to be finalized in the Master Plan. For example, if the Master Plan calls for spring chinook restoration and steelhead supplementation then additional M & E activities will be developed to monitor the hatchery and natural production components of those programs**.** The current monitoring work (FY 1999 and 2000) has been streamlined to minimize costs and will provide information for Master Plan development. Work includes stream temperature monitoring, spawning surveys, steelhead genetic sampling, and fisheries surveys. Fisheries surveys will determine distribution, abundance and age structure of salmonids currently in the Walla Walla River Basin.

The local Conservation District in Washington has used State and other federal funds to involve schools and other groups in monitoring. Baseline monitoring includes assessment of steelhead and bull trout distribution, adult and juvenile population estimates, population genetics, determination of temperatures, stream flows, water quality and habitat conditions. Washington State University has been contracted to compile all known existing information and help identify data gaps. Evaluation needs will be identified through coordination of all these efforts and review of a coordinated, newly compiled watershed assessment.

Wildlife mitigation projects are habitat based and use the U. S. Fish and Wildlife Service Habitat Evaluation Procedure (HEP) as a means of tracking project progress. Treatment specific monitoring may also be employed to evaluate methods. Additionally, population monitoring throughout is conducted to address species response to project implementation and for setting of harvest regulations.

Remaining Work

Remaining passage projects will address improperly functioning adult and juvenile ladders and screens and removal or modification of passage barriers such as road culverts and abandoned or discontinued irrigation dams.

Continued habitat restoration, including riparian revegetation, livestock exclusion, riparian buffers, and various instream treatments will be focused on areas of the basin that provide spawning and rearing potential for salmonid fishes.

Supplementation of summer steelhead and reintroduction of extirpated spring chinook salmon will be accomplished through the completion of the hatchery on the South Fork of the Walla Walla River. This effort will elevate juvenile outmigration, adult return, and provide future opportunities for Indian and non-Indian harvest.

Instream flow enhancement opportunities for critical juvenile outmigration and adult return periods are currently being investigated by the CTUIR and COE within the basin. If implemented, additional outyear funding will be necessary. Options being investigated include headwater storage, irrigation delivery system consolidation and efficiency improvements, purchase of instream water rights (willing sellers), and Columbia River water exchange.

Monitoring and evaluation will be used to measure the effectiveness of hatchery practices, passage projects, instream flow enhancements and habitat restoration. Information gathered as a result of these efforts will be exchanged between agency managers and modified as necessary to improved conditions for salmonid fish within the basin.

The watershed assessment activities will fill many data gaps and compile known information. This will consolidate our knowledge and focus our efforts in the subsequent years. Habitat improvement activities will continue, and likely expand with both BPA, State and other federal funds. The highest priority passage improvements in the mainstem Walla Walla should be completed in the next year or so. Less significant barriers, such as road culverts, will be addressed in out years. The hatchery production Master Plan should be completed in the next year or two and spring chinook salmon should be re-introduced to the basin in 2000 or 2001.

Remaining monitoring and evaluation work will depend on the final Master Plan. Many of the factors limiting salmonid production in the Walla Walla Basin have been identified. However, few limiting factors have been well quantified or documented. Known problems include: extinct runs of chinook, declining runs of summer steelhead, poor adult and juvenile salmon passage facilities, stream and river de-watering, habitat degradation, sedimentation, channelization, loss of riparian habitat, loss of floodplain function, and effects of Columbia River dams. Management actions to eliminate or reduce in-basin factors need to be finalized through the Master Plan Process before implementation.

Genetic evaluation of natural steelhead broodstocks is occurring under the WDFW project. Genetically appropriate broodstocks will be used to carry out any proposed new hatchery production objectives. Future hatchery production may involve central production facilities and juvenile acclimation/release facilities located near natural production areas. Satellite adult trapping, holding, and spawning facilities may be needed for broodstock development as adult returns increase. Current releases of non-endemic summer steelhead in the lower rivers are funded under the Lower Snake River Compensation Program (LSRCP).

Rainwater Wildlife Area HEP assessments will be completed in FY 1999. The final management plan is scheduled for completion late in FY 99 or early in FY2000. Enhancements will be ongoing through FY 2005.

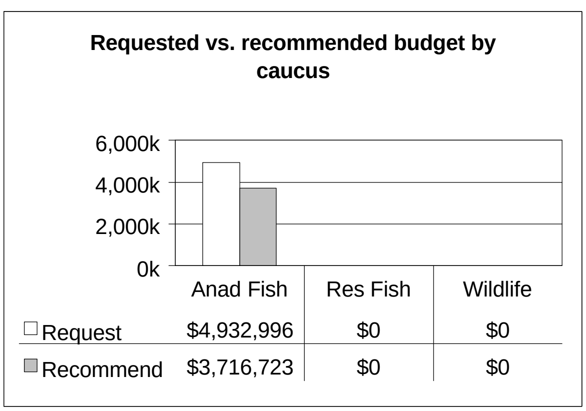
Subbasin Recommendations

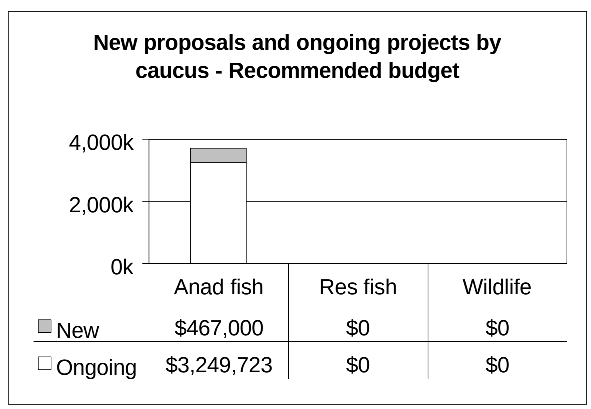
The proposed projects are necessary for completion of the watershed assessment and coordination to guide future actions, to improve fish passage and habitat conditions, to prepare for re-introduction of spring chinook, and protect listed bull trout and summer steelhead.

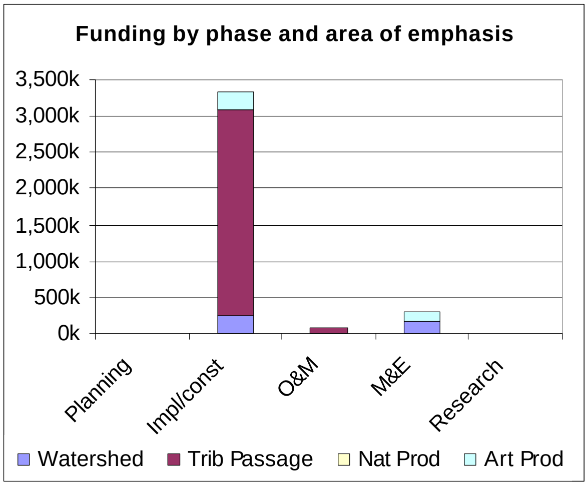
Projects and Budgets

Based on the preceding subbasin description, the CBFWA fish and wildlife managers recommend funding a total of 7 anadromous fish projects at a cost of $3,716,723.

Refer to the following figures for detail on: 1) total recommended and requested budget by caucus, 2) funding for new and ongoing work, 3) funding by project phase and emphasis, and 4) funding by time period (past, current and future). Individual projects are listed in the following table.






Funding by phase and area of emphasis
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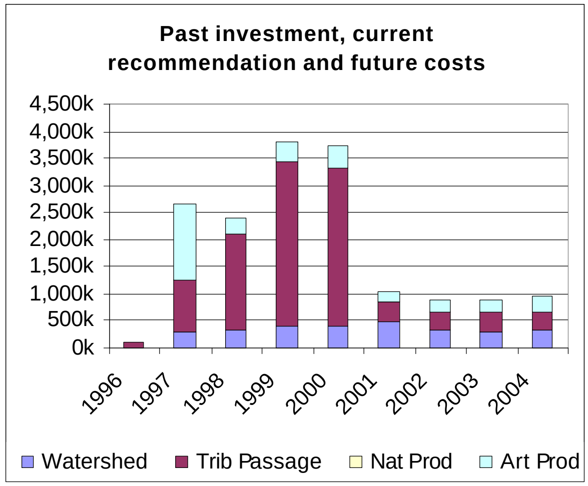
2,500k
2,000k
1,500k
1,000k
500k
0k
Planning
Impl/const
O&M
M&E
Research
Watershed
Trib Passage
Nat Prod
Art Prod


Past investment, current recommendation and future costs
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4,000k
3,500k
3,000k
2,500k
2,000k
1,500k
1,000k
500k
0k
1996
1997
1998
1999
2000
2001
2002
2003
2004
Watershed
Trib Passage
Nat Prod
Art Prod

ProjectID	Title	Sponsor	FY99 recom.	FY00 recom.	Estimated Outyears FY01	FY02	FY03	FY04
Anadromous Fish Projects								
20022	NE Oregon Hatchery Planning & Coordination - WDFW	WDFW		10	15	15	16	17
20127	Walla Walla River Basin Monitoring and Evaluation Project	CTUIR		134	203	208	213	263
20138	Design and Construct Neoh Walla Walla Hatchery	CTUIR		250	0	0	0	0
20139	Walla Walla River Fish Passage Operations	CTUIR		73	88	92	97	101
9601100	Walla Walla River Juvenile and Adult Passage Improvements	CTUIR	2,600	2,840	250	250	250	250
9604601	Walla Walla Basin Fish Habitat Enhancement	CTUIR	230	240	285	295	305	315
9901100	Assess Fish Habitat & Salmonids in the Walla Walla Watershed in Washington	WDFW	184	170	207	35	0	0
		Anadromous Fish Totals	**$3,717**	**$1,048**	**$895**	**$881**	**$946**	
	* indicates ESA project, † indicates 'Innovative work'	**SUBBASIN TOTALS**	**$3,717**	**$1,048**	**$895**	**$881**	**$946**	

All figures in thousands of dollars

Needed Future Actions

Additional monitoring of steelhead populations is needed to determine run size and production for each of the three major watersheds (Walla Walla River, Touchet River, and Mill Creek). Specific stream reach information is needed concerning habitat conditions and fish population to guide actions such as habitat improvements or hatchery enhancement, and monitor success of our actions. The information needed includes juvenile abundance, available rearing habitat (summer and winter), habitat usage (summer and winter), smolt output, outmigration patterns and survival, spawning distribution and genetic characteristics. In combination with the existing information, collection of these data would allow an accurate assessment of the population and recovery needs. The sub-basin plan and Hatchery Master Plan needs to be completed to develop a coordinated plan for using habitat restoration actions, hatchery production and harvest management, as well as inclusion of wildlife management goals and other factors. From the above information, spawning escapement goals should be refined for steelhead, bull trout and spring chinook. These efforts should occur with assistance from BPA, State, Tribal, and other federal funding sources (State match, farm programs, Growth management programs, etc.).

Additional lands will need to be secured and managed for wildlife to fully meet the goals of the Wildlife Program.

Actions by Others

Managers recommend complementary activities by USFS, State agencies, private land/water owners, etc. The States of Oregon and Washington are actively involved in salmonid recovery and watershed restoration. Large sums of money are being allocated, habitat projects are being implemented, and the public is becoming more and more involved in planning and implementation efforts. By mid-summer 1999, the State of Washington will submit their salmon recovery plan to the federal agencies. Local and regional efforts for the Walla Walla Basin are already underway by the Walla Walla Watershed group in Oregon, the Conservation District in Washington, and others with State and federal funding.

Watershed References

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Confederated Tribes of the Umatilla Indian Reservation and the Oregon Department of Fish and Wildlife. 1990. Umatilla Hatchery Master Plan. Prepared for the Northwest Power Planning Council. Portland, Oregon. 118 pp.

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Corps of Engineers (COE), 1997. Walla Walla River Watershed, Oregon and Washington Reconnaissance Report. U. S. Army Corps of Engineers, Walla Walla District. Walla Walla, Washington.

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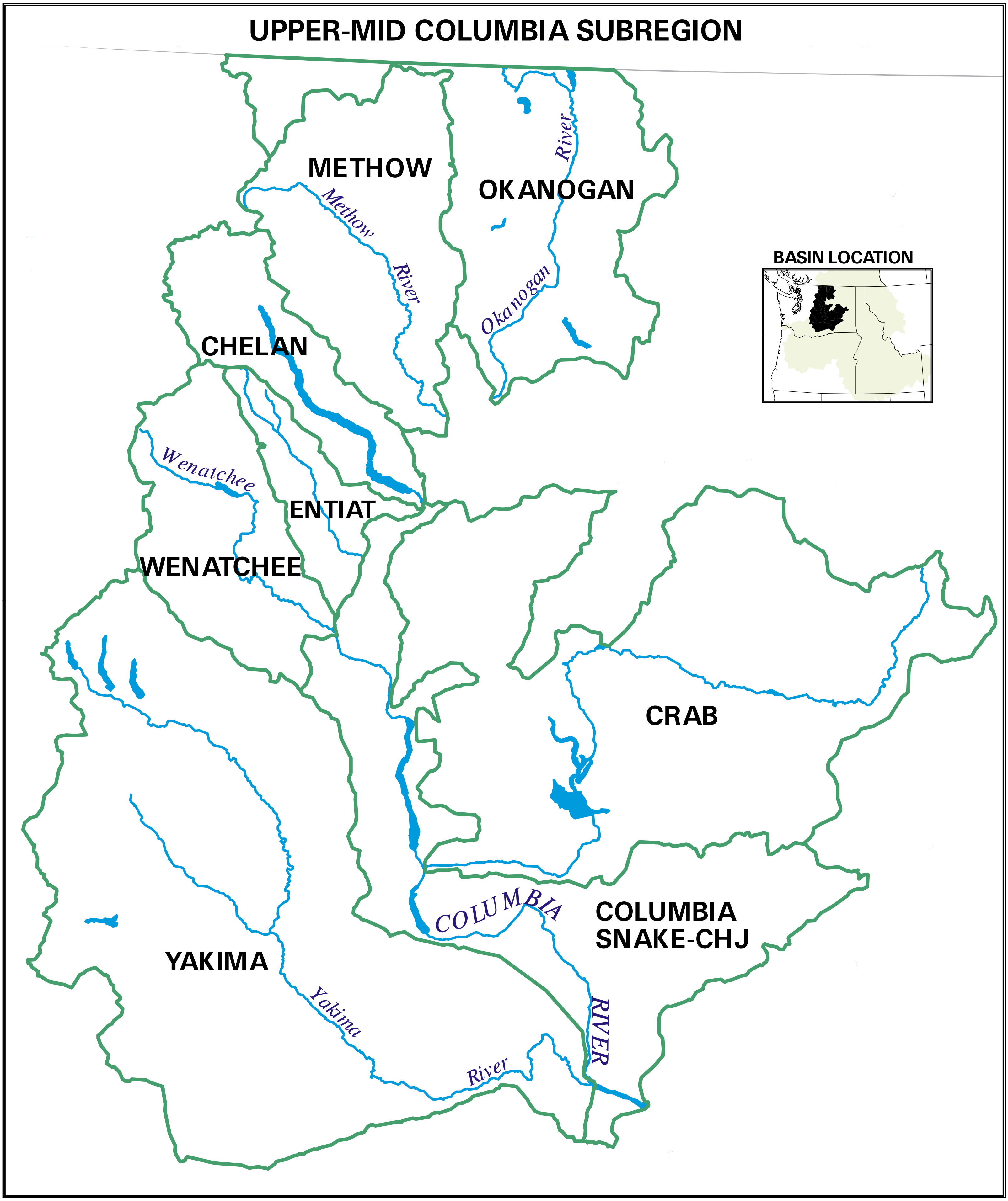
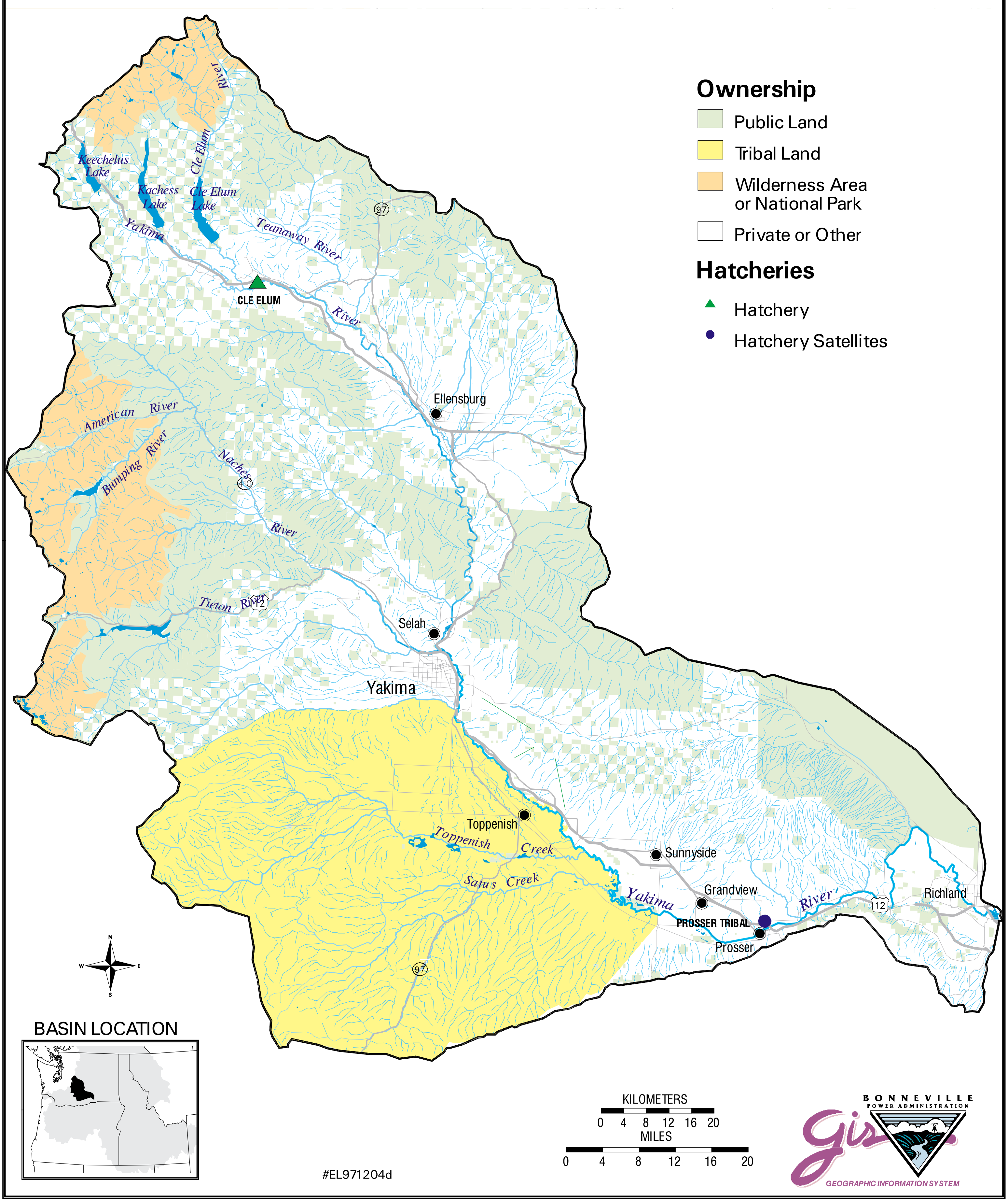

UPPER-MID COLUMBIA SUBREGION
METHOW
OKANOGAN
Methow
River
River
Okanogan
BASIN LOCATION
CHELAN
Wenatchee
ENTIAT
WENATCHEE
CRAB
COLUMBIA
COLUMBIA
SNAKE-CHJ
YAKIMA
Yakima
River
RIVER

Upper Mid-Columbia Subregion

The Upper Mid Columbia Subregion is defined as the Columbia River and its tributaries from Priest Rapids Dam to Chief Joseph Dam. This subregion covers approximately 13,900 square miles and includes the following subbasins: Upper Mid Columbia Mainstem, Wenatchee, Entiat, Lake Chelan, Okanogan/Similkameen, Methow, and Crab.

Yakima Subbasin



Yakima Subbasin

Anad fish	20	projects	$13,655
Wildlife	2		3,462
	22		$17,117

Fish and Wildlife Resources

Subbasin Description

The Yakima River Subbasin in south central Washington covers 6,155 square miles around the city of Yakima. The Yakima River originates near the crest of the Cascade Range above Keechelus Lake and flows 214 miles southeast to the Columbia River. Topography of the subbasin is characterized by a series of long ridges that extend eastward from the Cascades and encircle flat valley areas. Six major reservoirs are located in the subbasin (Keechelus, Kachess, Cle Elum, Rimrock, Bumping and Clear lakes). Six major diversion dams are on the mainstem Yakima (Easton, Roza, Wapato, Sunnyside, Prosser, and Horn Rapids) and two are on the Naches (Wapatox and Naches Cowiche).

The Yakama Indian Reservation is located in the southwest corner of the subbasin just south of the city of Yakima. Patterns of land ownership within the subbasin are complex: approximately 32 percent is private, 30 percent is tribal, 28 percent federal and 10 percent state. The predominant types of land use are irrigated agriculture, urban, timber harvesting and grazing. Although the area affected by timber harvesting and grazing is roughly five times the area affected by agriculture and urbanization, the intensity of activity makes agriculture and urbanization of primary importance to water quality.

Fish and Wildlife Status

Currently, endemic populations of spring chinook spawn in the Yakima mainstem and a number of its tributaries from Roza Dam to Keechelus Dam, and in the Naches and some of its tributaries from the Tieton confluence to Bumping Dam on the Bumping River and the upper American River. Wild/naturalized fall chinook spawn primarily below Sunnyside Dam, especially between Benton City and Horn Rapids Dam, but with smaller numbers spawning below Horn Rapids, in the Yakima mainstem near Granger and Toppenish and in Marion Drain. Even if only infrequently and in very small numbers, endemic steelhead spawn in virtually every mainstem reach above Sunnyside Dam and in almost all of the basin's tributaries. As determined by radiotagging studies conducted in 1991 and 1992 (Hockersmith et al. 1995), about 7% of Yakima steelhead spawn in the Yakima mainstem and in tributaries above Roza Dam, 13% spawn in Toppenish Creek, 32% spawn in the Naches drainage and 48% in Satus Creek. A naturalized population of coho may be establishing itself in response to YIN outplantings, but it is currently unknown where the majority of the considerable number of returns seen in recent years are spawning.

Estimates of the size of the historical runs of anadromous salmonids (spring chinook, fall chinook, coho, sockeye and steelhead) in the Yakima Basin range from ~300,000 (Kreeger and McNeil, 1993) to ~800,000 (Anonymous, 1990). Habitat destruction and alteration both inside and outside of the basin has reduced current production to one to two percent of the historical levels. Inside the basin, the biggest impacts are due to irrigation practices and intensive agriculture. Irrigation withdrawals and return flows of poor quality, unladdered dams, an unnatural, regulated hydrograph, elimination of side- and off-channel habitat, a structurally and functionally disrupted floodplain and a long history of riparian grazing have all contributed to a degradation of habitat. This degradation is more severe in the lower two thirds of the basin but is substantial virtually everywhere. In combination with problems occurring outside the basin (e.g., four Columbia River dams, harvest pressure, and ocean conditions), these irrigation- and agriculture-related problems led to the extirpation of summer chinook, coho, and sockeye, and major reductions in the remaining populations of spring and fall chinook and summer steelhead. Subject ot the condition that it is determined to be in the best interest of the resource, programs to supplement or re-introduce all stocks historically present in the basin will be implemented by the YIN and the WDFW under the Yakima/Klickitat Fisheries Project (YKFP). Although current enhancement activities emphasize supplementation, complementary habitat enhancement/supplementation programs are envisioned for the future.

One of the three remaining populations of spring chinook and both of the extant fall chinook populations are currently being supplemented, and the feasibility of reestablishing naturalized populations of coho in various portions of the basin is being evaluated by annual releases of hatchery coho smolts. The first release of 440,000 hatchery spring chinook smolts ('97 brood upper Yakima stock) under the YKFP was made this year. Approximately 730,000 hatchery-reared YKFP spring chinook smolts will be released in the upper Yakima in 2000 and, pending availability of sufficient wild fish for broodstock, 810,000 smolts will be released in 2001 and succeeding years. Releases of out-of-basin hatchery fall chinook (URB stock) and coho (early run) smolts have averaged about 1.7 million and 1.1 million, respectively, over the last five years. The first releases of Yakima stock fall chinook smolts (191,000) and the progeny of returning hatchery coho (25,000) will also be made in 1999. All Yakima supplementation or reintroduction programs involve acclimated smolt releases, and all are experimental in that they entail monitoring of rearing and release "treatments" designed to circumvent stock-specific problems. All programs are also subject to monitoring for adverse impacts on non-target stocks. A kelt-reconditioning and re-release program for steelhead will be initiated in 1999, and a complementary habitat enhancement/supplementation steelhead program is planned for the future. Summer chinook and sockeye have been extirpated, and no reintroduction work is in progress or planned for the near future. The status Pacific lamprey is virtually unknown, but sightings in the field and at smolt traps are rare, and the population is probably severely depressed. An effort to determine the status of lamprey more precisely is under way.

Table 1. Stocks, history and management goals

Stock	Genetic History / Management Intent	5-yr avg. Spawn Escape	Removal for Broodstock	5-yr avg. Harvest	5-year avg. Total Returns
ChSp	Three genetically distinct, endemic stocks remain: Upper Yakima (supplemented with local stock), Naches (currently unsupplemented); and American R. (currently unsupplemented). All eventually will be supplemented to boost productivity and harvest opportunity.	1,578	261 (1997) 408 (1998)	173	2,024
ChF	Two genetically distinct populations remain: Lower Yakima & Marion Drain (supplemented with local stock).	Unknown	140 (1998)	17 (at mouth, 1992-98)	1,300
ChSu	Extirpated. Future, re-introductions of Wenatchee stock will occur when water quality problems in lower river improve sufficiently.	0	0	0	0
StS	Four major populations remain: Satus; Toppenish; Naches; and Upper Yakima. Targeted for eventual supplementation with local broodstock and strategic habitat enhancement. Kelt reconditioning program initiated 1999. Satus, Toppenish and Naches-upperYakima populations are genetically distinct.	Unknown	0	1 (harvest banned in 1994)	841
Coho	Endeminc stock extirpated. Feasibility of re-establishing early run being tested. Developing local broodstock.	Unknown	400 (1998)	71 (at mouth, 1988-92)	1,723
Sock-eye	Extirpated. If smolt emigration problems from reservoirs can be solved, attempt to re-introduce with Wenatchee stock.	0	0	0	0
Lam-prey	Status unknown but under investigation.	Unknown	---	0	Unk.

Table 2. Production Program Description

Stock	Mgmt Intent	Initial Broodstock	Operating Broodstock	Adult Collection & Holding	Central Facility (Incubation & Rearing)	Acclimation &/or Release Sites	Status	Funding
ChS	Supplemt	Yakima			Cle Elum	Naches (multiple sites), upper Yakima (multiple sites)	Construction	NWPPC
ChF	Supplemt	Yakima			Y/K FP	Lower Yakima, Marion Drain	Construction?	NWPPC
StS(A)	Supplemt	Yakima			Y/K FP	Staus, Toppenish, Naches, upper Yakima	Construction?	NWPPC
ChSu	Supplemt	Wentachee			Y/K FP	Yakima	Discussion?	NWPPC
Coho	Supplemt	Early			Lewis R./Eagle Cr	Naches (multiple sites), upper Yakima (multiple sites)	Discussion	NWPPC
Sockeye	Supplemt	Wentachee			Y/K FP	Yakima Basin lakes	Discussion	NWPPC

Habitat Areas and Quality

Lower Yakima (below Roza Dam)

The greatest change from normative conditions has occurred in the lower Yakima River. In rough order of importance, these changes are:

- increased summer water temperatures,
- elimination of side- and off-channel habitat and the disconnection of the floodplain from the river, and
- massive depositions of sediments.

Of the three major problems listed above, increased water tempoerature is clearly most sigfnificant. This is because summertime water temperatures throughout most of this area are borderline or frankly lethal to salmonids, making the structural complexity of the channel or the condition of the substrate moot for all anadromous salmonids save fall chinook, which are capable of emigrating as subyearlings before water temperatures reach critical levels.

Channel form and floodplain function in the lower Yakima have been radically altered. This degradation occurred as a result of a century of the filling and draining of wetlands, side channels and sloughs; channelization and diking; LWD removal and elimination of riparian vegetation for agricultural purposes. These changes in river/floodplain structure and function, in combination with radically increased summer water temperatures, have dramatically reduced the amount of rearing habitat for fry and fingerlings.

Almost all of the waste water returns from the major irrigation systems in the valley re-enter the river in this area, discharging suspended solids at a rate of more than 260 tons per day (Anonymous, 1990) and severely degrading the quality of spawning substrate for fall chinook. Additional problems in this are include the following:

- Inadequate instream flows for either adults or juveniles between Prosser Dam and the Chandler powerplant outfall and especially below Sunnyside Dam. The reach below Sunnyside Dam can be virtually dewatered during the irrigation season by unforseen increases in irrigation demand that were not offset early enough by increased releases from storage reservoirs nearly 100 miles upstream.
- The main irrigation diversion dams – Wapato, Sunnyside, Prosser and Horn Rapids -- attract aggregations of piscivorous birds and fish during the smolt outmigration period.
- As is characteristic of many reaches in the basin, the upper portion of this area, especially below Sunnyside Dam, suffers from an inverted hydrograph , with peak higher flows in the summer and early fall, and minimum flows lower in the late winter and spring. This inversion is the result of stream flows being managed for irrigation. This change adversely affects the survival of outmigrating smolts from all parts of the basin and probably limits the amount of accessible overwintering habitat for spring chinook pre-smolts.

Upper Yakima (above Roza Dam)

To a lesser degree than the lower Yakima, the upper Yakima also suffers from a loss of channel complexity, floodplain connectivity and sediment loading. In addition, most of this reach is subject to moderate to extreme flow fluctuations, subjecting fry and parr to a risk of stranding in the remaining side channels, and most of its tributaries contain at least one diversion dam which either totally blocks adult access, entrains juveniles or partially or totally dewaters the reach downstream.

As in the lower river, channelization, diking and filling have eliminated most side- and off-channel habitat, especially in the historically complex reach that flows by Ellensburg. Channel complexity has been further reduced by the removal of LWD as a consequence of large log drives which occurred annually from the late 1880’a until just before the first World War and subsequent stream clearing projects. Sedimentation is also a problem here, although the problem is not nearly so severe as in the lower river. The sources of excessive sediment loading in the upper Yakima include agricultural runoff (especially in the Wilson Creek watershed) and bank sloughing, as well as upland disturbances such as logging, forest roads and grazing. Access to a large amount of historically productive habitat has been completely eliminated by the construction of unladdered storage dams at the outlets of Kecheelus Lake, Kachess Lake and especially Lake Cle Elum. Numerous, small, unscreened and/or unladdered diversion dams exist on many upper Yakima tributaries (e.g., Wilson, Manastash, Swauk and Big Creeks), either making the streams inaccessible to adults, a major entrainment hazard to juveniles, or dewatering the reach downstream in the summer and fall. Extreme fluctuations in discharge associated with release of water from Keechelus, Kachess and Cle Elum Reservoirs affect the upper Yakima and the lower Cle Elum. In these areas, flows are unnaturally low in the fall and winter, when releases are cut back to refill the reservoir, and unnaturally high in the summer, when water must be released in large quantities for lower valley users. Flow fluctuations of a smaller magnitude affect fish adversely throughout this area, which retains more side- and off-channel juvenile habitat than any other portion of the basin. Specifically, irrigation-related flow reductions in the complex portion of the river near Easton in the spring and early summer dewater the shallower side channels and sloughs, stranding the fry and fingerlings that seek out such areas for rearing. The so-called "flip-flop" in river operations also strands and displaces many parr throughout the upper Yakima. "Flip flop" refers to a marked reduction is releases from the upper Yakima reservoirs in early September in an effort to force spring chinook to spawn near the center of the channel, thus precluding redd dewatering when releases are cut back to refill the reservoirs. At the same time upper Yakima releases are cut back, releases are "flip flopped" to Rimrock Reservoir on the Tieton, which becomes responsible for meeting lower valley irrigation demand for the remainder of the season. Although this practice prevents upper Yakima redds from being dewatered, it also dries up most of the side channels from Ellensburg to Keechelus at a time when subyearling chinook, rainbow trout and steelhead are still residing in them.

Lower Naches (below the Tieton confluence) & Cowiche Creek

The lowermost three miles of the Naches River below the confluecne with Cowiche Creek has lost channel complexity and floodplain function because of filling, channelization and diking associated with road construction and flood control. From Cowiche Creek upstream to the Tieton confluence, however, the river usually flows through two or more channels and channel complexity increases substantially. Instream flows between Wapatox Dam (RM 17) and the Wapatox hydroelectric power plant (RM 9.7) can be extremely low during the late summer, causing either the displacment or stranding of fry and parr rearing in the many side channels in this area. The implementation of flip flop is believed to impact this area particularly severely, as immediately after flows reach their seasonal minimum of 100 cfs or less, releases from Rimrock Reservoir raise discharge to 2,000-2,200 cfs. Many local biologists believe that this one-two punch has impacted steelhead severely: those not stranded or eaten by predators during the low flow period of August are displaced from the lower Naches to the lower Yakima, where temperatures become lethal the next summer. Sedimentation associated with upslope disturbances (e.g., agriculture, urbanization, forestry) has degraded the quality of spawning gravel throughout this reach.

The lower seven miles of Cowiche Creek, most of which flows through a canyon, has been channelized to accommodate railroad. The substrate has been fairly heavy impacted from sediments associated with agricultural activities upstream of the canyon, road work and forestry in the upper watershed. Two unladdered diversions dams completely block the South Fork, the main tributary to Cowiche Creek, and irrigation withdrawals associated with the operation of French Creek Storage Reservoir dewater the lower portion of the North Fork. Although four unscreened diversions are operated on the South Fork and riparian grazing is occasionally problematic, the South Fork remains a potential steelhead producer.

The Tieton River, especially the portion of the North Fork now inundated by Rimrock Reservoir, was once a major producer of spring chinook, coho and steelhead. Access is now totally blocked at Rimrock Dam, and extreme seasonal flow fluctuations associated with reservoir refilling and flip flop preclude more than token production of any anadromous salmonid.

Upper Naches (above the Tieton confluence)

The channel has been severely channelized and simplified by extensive diking, rip-rapping, road construction and the removal and general lack of recruitment of LWD. Though generally confined, the stream did contain a number of side channels which provided critical rearing habitat for fry and overwintering habitat for pre-smolts. Most of these side channels have been lost to diking and road building. Spawning gravels contain excessive quantites of fines, largely because of sediment loading associated with logging in the Little Naches.

Satus/Toppenish/Ahtanum Creeks

Both riparian and upslope land use practices have impacted these basins. Road building primarily for logging purposes and upslope logging have led to sedimentation problems. In the lowland portions of these basins agricultural land use practices contribute to this problem. Channelization and simplification has occurred as a result of channel straightening (especially in the agricultural used parts of Ahtanum and Toppenish creeks), road encroachment, diking, and the loss of LWD and the recruitment of LWD. Dewatering of stream reaches is a serious problem in lower Ahtanum Creek and in a few reaches in the Toppenish Creek basin. Unscreened diversions are a problem parts of the Toppenish Creek basin. In the Satus basin what were historically low summer flows, have been exacerbated by upslope land use practices resulting in little to no flow in several stream reaches and/or excessive stream temperatures.

Quality Areas

Several key spawning and rearing areas for salmonids remain in the Yakima Basin. These will be listed with a brief description of important habitat qualities and salmonid species who benefit.

Easton-Keechelus reach- Currenly the reach is not affected by urban development (though this slowly changing). The channel consists of many lateral channels, with much LWD. The channel has a good pool/riffle ratio and is high complex. Primary salmonid species are spring chinook, coho, sockeye and steelhead (somewhat) and rainbow trout.

Yakima mainstem from the Cle Elum confluence to Easton Dam. Though not pristine, this reach still retains a good measuren of all the impacted, many key features such as lateral channels, LWD, good pool/riffle ratio, deep holding pools and riparian cover exist throughout this reach. Approximately 80% of the upper Yakima spring chinook spawn in this reach. Other salmonid species currently using this reach are steelhead, bull trout, and cutthroat trout. The potential for coho production is clearly present because native coho spawned here before they went extinct about 1980.

American River- This watershed originates in Rainier National Park and flows through an USFS wilderness area, then through mostly general USFS land before entering the Bumping River. Because of this the watershed is considered healthy from a stream ecology point of view. Of the mainstem tributaries in the Yakima basin, the American River most resembles historic conditions. Primary salmonid species are spring chinook and bull and cutthroat trout, and potentially coho.

Upper Little Naches (above Salmon Falls)- Though land use practices have degraded various aspects of this part of the watershed, stream function for salmon use is generally good in the mainstem and into the three forks. Primary salmonid species are steelhead, coho, spring chinook and bull, cutthroat and rainbow trout.

Limiting Factors

The key factors limiting production were outlined in the **Habitat Areas and Quality** section. Accordingly, it is appropriate in this section to describe the manner in which habitat information is being analyzed to refine species- and area-specific enhancement priorities, and how enhancement strategies and actions will be developed in response to these prioritized problems.

The Ecosystem Diagnosis and Treatment (EDT) model is being used by the YKFP to quantify the impact of specific limiting factors on specific populations, and to develop and refine enhancement strategies for all populations of anadromous salmonid in the basin. In the current exercise, the analysis will extend to spring chinook, fall chinook steelhead and coho, and will be completed in approximately two years. Products of the analysis include estimates of productivity, carrying capacity and life history diversity (the number of distinct self-sustaining life history types) for the entire basin or any portion of the basin. These estimates can be generated for current conditions, or for hypothetical future conditions, such as those expected after successful enhancement projects. At the core of the analysis is a reach by reach and life stage by life stage evaluation of the amount of “key habitat” available and an estimate of the impacts on productivity of 18 different “habitat attributes”. Key habitat refers to the specific type of habitat required by a specific life stage of a specific species. Habitat attributes include measures of such things as “deposited sediment”, “temperature”, “habitat complexity”, “flow (quantity and variability)”, and so on. Importantly, the model accommodates supplementation, treating it essentially as a super-productive tributary in terms of egg-to-smolt survival, and handicapping the survival and reproductive success of hatchery fish in accordance with whatever genetic hypothesis is deemed most probable. Therefore, when the initial “diagnosis” of a population is completed, it is possible to identify the specific environmental reaches and the factors acting within them that limit current production potential.

From a resource management or restoration perspective the EDT model quantifies limiting factors for a particular species, or for a number of species, in a particular subbasin. It will therefore permit the prioritization of projects in terms of what is needed most by the greatest number of targeted stocks. The model will also be used to evaluate the potential benefit of proposed enhancement strategies, by upgrading appropriate habitat attributes and/or amounts of key habitat.

Watershed Assessment

A fair number of watersged assessment projects have been completed, are in progress or are planned for implementation in 1999 or 2000. "Traditional", small-scale watershed assessments have been conducted on the forested reaches of smaller tributaries throughout the basin by the YIN, Washingtion State Department DNR , WDFW, Boise Cascade and Plum Creek timber companies, the USFWS and the USBOR. Many of these agencies or companies participate in the Timber, Fish and Wildlife (TFW) process. Watershed assessments have been completed or are in progress for all or a portioin of the following streams/watersheds: Teanaway and Cle Elum Rivers, Big Cr., Taneum Cr., Cabin Cr., Rattlesnake Cr, the Bumping, American, and Naches Rivers, Manastash Cr, Naneum Cr., Satus Cr., Toppenish Cr., and Ahtanum Cr. Data and relationships highlighted by these watershed assessments will be incorporated in the EDT analysis described previously.

Several newer efforts mandated and funded by the Yakima River Basin Water Enhancement Project (YRBWEP) legislation also should be mentioned in this context. One project, "A review and synthesis of data related to instream flow provisions in the Yakima River ecosystem", entails an analysis of all existing data on surface and subsurface flows in the basin with the aim of evaluating the impacts of the current regulated hydrograph on overall ecosystem health. Another YRBWEP initiative, "ccc" or the "reaches study", entails a study of the effects of regulated flows on a number of reaches characterized as anastomosing in form and known or suspected to be the site of a major upwelling of hyporheic flows. Such sites are known to provide optimal or near optimal habitat for virtually all life stages of salmon and steelhead. The specific goals of this study are to determine the relationship between current regulated flows and the following factors: the status of side channels and alcoves (i.e., whether they are dry, isolated or full and clearly connected to the mainstem); the discharge and distribution of upwelling areas; and the magnitude and extent of hyporheic flows and such associated phenomena as the flows and distribution of spring brooks. All of these physico-chemical ecological studies will provide valuable insights into the structure and function of the Yakima ecosystem. The YKFP intends to make the maximum possible use of the findings from these studies and will, among other things, incorporate them in the ongoing EDT analysis.

Subbasin Management

Goals, Objectives and Strategies

Currently, the most intensively managed anadromous fish species in the basin are spring chinook, fall chinook, coho and steelhead. The fundamental goal for all of these species is to increase their productivity and abundance to increase tribal and non-tribal harvest opportunity while maintaining the genetic integrity of the targeted stocks and keeping ecological and genetic impacts on non-target stocks within acceptable limits. The same goal applies to summer chinook, sockeye and Pacific lamprey, but major environmental or passage problems (summer chinook and sockeye) must be overcome, or large gaps in the knowledge of the life history and stock status must be filled (lamprey), before re-introduction and/or enhancement programs become feasible.

To accomplish this goal the managers have adopted the following objectives: 1) improve adult passage survival; 2) improve adult spawning success; 3) improve juvenile passage survival; 4) improve survival of fry and parr; 5) improve juvenile overwinter survival; and 5) restore depressed populations to productive levels.

The most comprehensive fisheries planning document for the Yakima Basin is the Yakima Subbasin Plan (Anonymous, 1990). The general strategy of the Subbasin Plan is to couple supplementation with rectification of the major environmental constraints affecting each freshwater life stage of a salmon or steelhead. The Subbasin Plan therefore assumed that the stocks in the basin were underseeded in terms of capacity, suffering instead primarily from depressed productivity attributable to a host of density-independent impacts. Accordingly, the release of hatchery-reared smolts of a genetically appropriate stock was the first element of each species plan. The plan then listed actions intended to improve survival and/or capacity for each of the major feshwater life stages of an anadromous salmonid: pre-spawner, incubating egg, fry, parr, overwintering pre-smolt and outmigrating smolt. The habitat enhancement strategies outlines in the Subbasin Plan may be summarized as follows:

1. Improve adult spawning success. In general, this was to be accomplished by increasing pre-spawning survival rates, reducing sediment loading in spawning areas, and restoring access to blocked but historically productive habitat. Recommended actions to carry out these strategies included reducing poaching by hiring additional enforcement agents, screening off the mouths of irrigation returns (a false attraction hazard for adults); subordination of power production at the Roza,Wapatox, and Prosser hydroelectric sites to minimum instream flows to facilitate adult passage; installing fishways on unladdered diversion dams and screens on irrigation ditch headworks to restore adult access or facilitate juvenile passage on a number of tributaries; buying water rights or land to eliminate diversions that dewatered other tributaries; encouraging the funding of a number of improvements to irrigation systems that would improve their efficiency and result in less water being diverted from the river; and to encourage on-farm land use practices that minimized erosion as well as improvements to irrigation delivery or return systems that would reduce the amount of suspended sediments entering the river.

2. Increase survival of fry and parr. General measures for accomplishing this objective included reducing entrainment of juveniles in irrigation systems, riparian restoration projects and predator control (primarily for fall chinook). The entrainment problem was to be addressed specifically by power subordination at Wapatox, Roza and Prosser as well as by full implementation of the Phase-2 screening project. Riparian restoration was to be achieved primarily by fencing riparian areas and eliminating grazing until a determined degree of vegetative restoration had occurred, after which the fenced areas could be grazed as special-use pastures. Predators were to be controlled by hiring individuals who would remove predators from “hot spots” by a variety of means.

3. Increase overwinter survival. The only specific recommendation in the Subbasin Plan on this issue was to retrofit portions of 18 smaller irrigation ditches so they could be used as off-channel winter refuges. Other measures, such as reducing sediment loading or subordinating power withdrawals to minimum instream flows, would increase the quantity or accessibility of quality winter habitat.

4. Increase juvenile passage survival . The Subasin Plan proposed a goal of halving the mortality rate smolts incur as they migrate through the lower Yakima from ~50% to ~25%. Two specific actions were proposed for this objective: predator control/prey protection and completion of the Phase-2 screening project. Evidence was presented that high in-basin smolt mortality was probably due to predation. A study to identify predation “hot spots” and the most serious predators was proposed. Predator control and/or prey protection programs were to be implemented in accordance with the findings of this study.

Past Accomplishments

A number of specific actions are now being undertaken that were called for by the Subbasin Plan. These actions include: improving flows below irrigation diversions which currently can become significantly dewatered (adult and juvenile passage); increasing enforcement of fishing and environmental regulations and increasing public awareness of essential habitat features (all objectives); reducing sediment loading (enhancement of spawning success, especially for fall chinook); studies of the impact of lower river predators on migrant smolts (smolt passage/production); development of side-channel “refuges” for juveniles (enhancement of rearing and overwinter survival); irrigation screening and flow improvements (juvenile and adult passage/production); a major experimental program (the YKFP) to assess the impacts of supplementation on natural production, the genetic integrity of the targeted stock and ecological impacts on non-target species (supplementation); increasing access to potentially productive but inaccessible habitat by increasing flow in critical reaches of affected tributaries (improvement of tributary habitat for all life stages); developing and applying new computer models to diagnose limiting factors, prioritize enhancement proposals and develop stock-specific enhancement plans (all objectives); and developing and implementing monitoring and evaluation measures intended to answer key questions reagarding supplementation (supplementation).

Efforts to enhance the fishery in the Yakima Basin have been proposed frequently and less frequently implemented for the past five or six decades. It was, however, not until passage of the Northwest Power Planning Act of 1980 Act that a significant number of enhancement projects were actually implemented in the basin under the Fish and Wildlife Plan. These projects and their recent accomplishments are summarized in Appendix C.

Research, Monitoring and Evaluation

Habitat

Yakima Basin Side Channels (Project No. 9705100)-

Monitoring activities are mainly concentrated on evaluating the success of vegetation plantings, fence maintenance (where located).

Reestablish Safe Access Into Tributaries of the Yakima Subbasin (Project No. 9803400)

Specific monitoring plans have not been prepared for specific projects. However, success of a project will likely be measured, for example, by the effectiveness of fish screens to safely bypass juvenile fish back to the tributary.

Satus Watershed Restoration (Project No. 9303501)

Continue the patrol and maintenance of range fences in the Satus Creek watershed. We currently patrol and assist with fence maintenance on all rangelands and stream corridors we manage under this project. The project has a full-time technician dedicated to this task monitoring range units daily. This continuing task ensures secure boundaries for recovering areas, preventing new damage caused by livestock trespass.

Characterize and quantify streamflow. We have established eleven permanent stream gaging stations to continuously measure stream discharge for Satus Creek and its two largest tributaries, Dry and Logy creeks. This information will be used to assess changes in the timing and quantity of flows, in relation to climatic conditions, and to conduct flood frequency analysis. We are using a set of staff gages and discharge measurements to characterize the flow regimes of several intermittent streams. A long-term record of streamflow is vital to identifying changes in watershed functioning.

Characterize suspended sediment transport. We are taking regular turbidity measurements at all stream gaging sites and at other selected locations throughout the watershed. This information will be used in combination with flow data to monitor changes in the relationship between flow and suspended sediment.

Climatological monitoring. We have established ten permanent climate stations which continuously monitor precipitation and temperature across the watershed. This information will be used monitor changes in precipitation-streamflow relationships. The new information is being added to the data set used in the watershed analysis, which included historical information dating back to 1910, in order to refine long term changes in the precipitation-streamflow relationship.

Channel survey. We will resurvey channel cross-sections and profiles on major perennial streams in the Satus Creek watershed to evaluate channel response to high flows and restoration treatments. This task will allow very precise monitoring of stream channel change in both the short and long-term. (Objective 6)

Characterize stream habitat conditions throughout the Satus watershed. Specific stream segments (approximately 1500') have been selected following standard Washington State ambient habitat monitoring protocols (TFW). A long-term stream segment monitoring strategy includes aerial photo interpretation, channel surveying, channel habitat unit classification, and measurements of canopy coverage, bank stability, gravel embeddedness, large woody debris frequency, temperature, and water quality. Initial monitoring of the selected stream segments has been largely completed. These stream segments will also be targeted for site specific restoration efforts, including those detailed in this methods section (e.g. re-vegetation, burning, large woody debris placements). (Objective 6)

Fisheries surveys. Quantify target fish population characteristics and habitat specific biological responses, including abundance, density, growth, and condition of life history cohorts from young-of-the-year fry to migrating smolts, including parr stages. Population characteristics and cohort fate will be compared within and among watershed tributaries. Population sampling has been conducted with electrofishing techniques within the stream habitat monitoring segments, as outlined above. Smolts have been sampled in the lower Satus Creek area, below all contributing tributaries, to obtain an estimate of overall Satus watershed steelhead production. The redds of spawning adults were surveyed between March and the first half of May, 1997, as in the past, to track overall population trends and identify important spawning reaches for purposes of future conditions analysis (e.g., fine sediment composition). Analysis of monitoring will be performed using the standard procedures established by the TFW Ambient Monitoring Program. (Objective 6) Continuation of these monitoring protocols will be needed to evaluate the success of the restoration treatments being applied.

Experimental treatment development and evaluation. Experimental watershed treatments will be performed on small subwatersheds, and monitored using appropriate combinations of measurements, including: stream gaging, precipitation gaging, channel and floodplain characteristics, vegetative response, and monitoring of survival and growth of juvenile steelhead. This small-scale intensive monitoring allows us to assess the cost effectiveness of individual treatments and applicability for adaptive management in other watersheds. (

Large woody debris placements. Several of the LWD placements are located within habitat survey segments, thus data have been collected on fish population abundance and density prior to placement; monitoring consists of intensive survey with a laser total-station combined with fish population and habitat protocols at each site to asses local effects on fish habitat, persistence or downstream/off-channel transport of large woody debris as well as cost-effectiveness and applicability to other sites.

Enhance beaver habitat by propagating riparian hardwoods. We are propagating aspen seedlings in a green house for planting in sites suitable for beaver habitat. Each site will be monitored with a combination of photo points and cover or density measurements to assess vegetative response and beaver use.

Plant scattered Ponderosa pine seedlings throughout the mainstem floodplains of Satus, Dry, and Logy Creeks to recreate historic distribution and enhance long term stream shade, bank strength, and future high quality large woody debris. Plantings will be monitored every other year (for 4 years) to assess establishment and growth rates.

Rehabilitate incised ephemeral and intermittent channels, especially in headwater meadows. Headcuts will be evaluated in three years to measure stabilization and headward movement. A subsample of sediment traps will be monitored with erosion pins above the upstream face and permanent line-intercept crossections to track vegetative establishment.

Reintegrate fire as a landscape process. We will introduce prescribed fire into the Satus Creek basin, with the goals of improving watershed functioning and restoring high quality aquatic habitat. A combination of methods will be used to assess vegetative response, soil stability, and water quantity and quality changes.

Toppenish-Simcoe Instream Flow Restoration And Assessment (Project No. 9705300)

Characterize Project area water budget. Update conceptual Management Plan with data collected and analyses performed to adapt future activities. Continue development of GIS to include land status, delivery and drainage systems and basin streamcourses. Incorporate orthophotos, district maps and other coverages into Project GIS. Use irrigation district crop reports, data compiled from current surface water adjudication and recent aerial photographs to add cropping patterns to GIS. Measure surface water diversions, return flows and temperature in Project watercourses over time and distance with sufficient resolution to account for accretion and seepage gains/losses. Incorporate and analyze all available gaging station data and collected Project data to develop a descriptive model of watercourse flow by season and location, thus producing an accurate and dynamic estimate of Project water budget. Assess consumptive use and irrigation efficiency by utilizing withdrawal, return and cropping pattern data. Develop decision support system, update and begin draft Management Plan that outlines priority lands and water for acquisition.

Survey creek channel, floodplain and alluvial aquifer. Assess channel morphology and condition by cursory survey with auto-level (in entrenched reaches) and Proper Functioning Condition method developed by the Bureau of Land Management. Use current and historic aerial photos to track channel width, sinuosity and riparian vegetation trends over time. Monitor dewatered Toppenish Creek alluvial aquifer by installing a network of piezometers and measuring groundwater levels weekly over time to gain an idea of the magnitude and direction of groundwater flow relative to Toppenish Creek over time. In addition to piezometers, we hope to install eight-inch diameter wells for macroinvertebrate samples (see Objective 3, below).

Monitor steelhead and other biota in Project watercourses. Conduct yearly spring spawner surveys and population censuses (electrofishing, snorkeling). Install, maintain and monitor a 5-foot screwtrap located downstream of all rearing reaches to index the size, age structure, number and timing of outmigrant Toppenish basin steelhead. This activity serves as the baseline from which we will judge Project success based on the working hypothesis that securing year-round favorable discharge in Project streams will increase the total number of adults returning to the system to spawn each year. Qualitatively monitor hyporheic macroinvertebrates in wells by weekly pumping and cursory identification and enumeration. It is our hypothesis that perennial flow in the dewatered reach will foster a functioning, 3-dimensional ecosystem (Ward and Stanford, 1992; Stanford and Ward, 1993) and increase the stream's ability to rear steelhead.

Implement Project Management Plan. Finalize Project Management Plan by assessing the efficacy and reality of output of objectives 1-3, above. Approach Yakama Tribal Council for approval of Plan, and help in disseminating its scope and objectives to enrolled tribal members and private landowners within the Project boundary. Identify obstacles to Plan's success to Tribal Council and ask for approval of measures to ensure that water replaced instream for aquatic and riparian ecosystems will remain instream with no further consumptive use. Actively pursue the acquisition of lands, as decided by Plan, by purchase and/or lease. Identify opportunities for instream flow by water substitution and/or system modifications (conversion to drip, etc.). Identify willing participants within project that will delay diversion timing to allow aquifer recharge, or decrease or cease late spring-summer diversions to restore instream flows.

Maintain leases, monitor steelhead and riparian ecosystem response. Finances will be required to maintain leases on a yearly basis. Enforcement by way of "policing" the stream and backing from Tribal Council will be needed to ensure that any water returned to streams is not appropriated for consumptive use at some point downstream of the point of addition. Steelhead population monitoring will be accomplished by observations at the Prosser and Roza video windows and yearly Toppenish Basin spawner surveys to determine the number of adults returning to the basin. Indices of outmigration age structure, number, and timing will be derived from monitoring a 5-foot screwtrap downstream of rearing reaches in the Project to evaluate the effects of returning flows to instream uses.

Ahtanum Creek Watershed Assessment (Project No. 9102)

Map irrigation systems. Develop map from existing Yakama Reservation and Yakima County GIS coverages, orthophotos and irrigation district maps. Add irrigation district delivery and drainage system features from other sources such as aerial photographs. Use district crop reports, data compiled for current surface water adjudication, and aerial photographs to add cropping patterns to map.

Model irrigation water use. Measure surface water withdrawals (irrigation water supply) from Ahtanum Creek and return flows (irrigation system spills and runoff) to Ahtanum Creek. Incorporate all available gaging records. Use withdrawal data and cropping information to assess consumptive use and irrigation efficiency.

Describe stream flow and water temperature regime. Measure creek flow and temperature over time and distance, with sufficient spatial resolution to detect significant seepage gains and losses. Incorporate all available gaging records. Develop a descriptive model of creek flow by location and season.

Survey channel and floodplain. Utilize the qualitative Proper [riparian] Functioning Condition assessment method developed by the Bureau of Land Management, adding channel measurements if practicable. Also use current and historical aerial photographs to map channel width and sinuosity, riparian vegetation and trends in these features over time. The most intensive of these techniques will be applied to random segments of the creek rather than the entire mainstem.

Describe fish population responses to habitat changes. Assess potential (pre-development) salmon and steelhead production. Describe response to changes in water withdrawal, return flows and riparian management under different restoration scenarios. Utilize available modeling techniques such as IFIM (IFIM has been locally calibrated with three locations on Ahtanum Creek) and the Ecosystem Diagnostic and Treatment Planning Model currently under development for the Yakima subbasin.

Little Naches River Riparian & In-channel Enhancement Project (Project No. 9705000)

Monitoring and evaluation of this project is primarily limited to monitoring the success of recent plantings.

Restore Upper Toppenish Creek Watershed (Project No. 9803300)

Headcut stability and sediment retention structures will be monitored on an annual basis throughout the duration of this project.

Headcuts will be monitored visually to determine stability of the treated sites. Success of headcut stabilization will be evaluated based on the percentage of headcuts which have been arrested three years after completion of the project.

Sediment retention structures will be visually inspected to monitor for structural failures. Additionally, the depth of sediment retained will be measured by installing erosion pins at the upstream face of each structure. Success of the structures will be evaluated on two criteria: 1) the percentage of structures intact three years after completion of the project, and 2) the average depth of sediment accumulated above each structure. It is expected that the uppermost structures will initially retain sediment at higher rates than the structures further downstream, due to the limited supply of sediment available for capture. If this trend is observed, a third criteria for success will be included: sediment retention rates for the uppermost 10% of the structures installed. The lower structures will become more effective as the upper ones reach their retention capacities.

Channel revegetation will be monitored concurrently with monitoring headcut stability and sediment retention structures for two years following project completion. Success of vegetative establishment within the exclosures will be evaluated with line-intercept cover measurements; establishment rates downstream of the exclosures will be estimated. Revegetation success will be based on the change in vegetative cover within the exclosures composed of the transplanted species two years after completion of the project.

A subsample of treatment sites of headcut stabilization, sediment retention structures, and revegetation will be monitored using photo points, and their locations established using GIS coordinates. Equipment for this monitoring will be provided on an in-kind basis.

Enhance channel/floodplain interactions
Pre-treatment channel geometry will be measured at sample locations in the vicinity of treated sites; surveys will be repeated annually for three years. Bankfull flow will be estimated using channel survey data and Manning's equation (Maidment 1993).

Stabilize sensitive eroding uplands
Erosion pins will be placed at the heads of a sample of rills in each treated area. These will be monitored annually for headward expansion of the rills.

Riparian assessment
The functional condition of the riparian areas of all the anadromous fish-bearing stream reaches and a sample of the intermittent/ephemeral streams in the upper watershed will be conducted in the first year. It is intended that these assessment will be repeated every 3-5 years to evaluate changes in stream/riparian condition.

YKFP (Project Nos. 20510, 8811525, 8812025, 9506325, 9506425, 9701325)

The YKFP, the largest fisheries enhancement program in the basin, currently has the goal of using hatchery-reared fish to increase natural production and harvest opportunity while preserving the genetic integrity of the targeted stocks and keeping adverse ecological and genetic impacts on non-target stocks within acceptable levels. "Natural production" is defined Natural Origin Recruits (NOR's) – the adult progeny of naturally spawning fish entering the Yakima Subbasin. Therefore, at its most basic level, the definitive test of the YKFP will be whether at some future date the number of NOR's is significantly greater than the number from the presupplemented era.

In 1997 the project completed a monitoring plan for spring chinook. This plan will serve as the template for developing monitoring plans for other species. The monitoring plan was primarily conceptual, defining critical issues and problems and identifying appropriate response variables. The project's monitoring efforts have taken the basics of this plan and gone on in many areas to design and implement specific monitoring measures (described briefly below). The plan recognizes two experimental tiers, the supplementation effort itself, and the large scale test of naturalized rearing treatments made possible by the physical layout of the Cle Elum hatchery and acclimation sites. Monitoring efforts aimed at the supplementation effort itself are designed to evaluate how well the spring chinook supplementation effort is performing in terms of: 1) increasing natural production, 2) increasing harvest opportunity, 3) limiting genetic impacts to target and nontarget populations, and 4) limiting ecological impacts to nontarget populations. Monitoring efforts are well developed in all these areas. In the natural production area, monitoring measures are developed for smolt-smolt (as far as John Day dam) and smolt-adult survival rates of hatchery and wild fish (using both PIT and CWT), and for total production of both (using the Chandler juvenile fish monitoring facility). In addition, supplementation dynamics models have been developed that will facilitate fine-tuning of monitoring measures. An experimental reproductive success arena is planned for evaluation of relative reproductive success of wild and hatchery fish. The major problem yet to be tackled is being able to clearly distinguish changes in production due to supplementation from changes in production due to environmental fluctuations. In the harvest area, sampling techniques are being refined to allow improved estimates of harvest of wild and hatchery fish, both inside and outside the basin. In the genetic area, spawning designs have been developed and implemented to maximize the effective size of the population, and a DNA microsatellite baseline is being built that will enable the parentage of each returning hatchery fish to be determined. A recent project modeling exercise showed that taking hatchery fish into the hatchery would not appreciably increase genetic change over that caused by wild-only broodstock collection. This means that monitoring of domestication selection will likely involve inter se matings of hatchery and wild fish and performance characterizations of their progeny. Ecological interactions is the most well developed monitoring area. Fish and bird predation indices are being developed, as well as measures aimed at competition and disease. Detectable levels of impact in terms of distribution, size, and age structure been determined for a number of nontarget taxa. In addition to these areas, facilities are being monitored as well. To mention just a few: the Roza adult trap has been monitored to evaluate its affect on fish passage; the Roza juvenile trap evaluated for possible improved fish guidance by infra sound or strobe lighting; and the Chandler facility is being intensely evaluated to determine how precise a flow-entrainment relationship exists, which is of critical importance for smolt enumeration.

Habitat Enhancement

- **Yakima Basin Side Channels (Project No. 9705100)-** An ongoing project designed to protect riparian and off-channel habitat primarily upstream to Union Gap on the Yakima River (including the lower Naches River). Habitat protection is secured through the purchase of lands, fencing projects, revegetation, land easements, improvements to juvenile access, etc.

- **Reestablish Safe Access Into Tributaries of the Yakima Subbasin (Project No. 9803400)** Several small tributaries with associated adult and/or juvenile passage issues have been identified. The project is designed to address unscreened diversions, instream flow problems below diversion points and to provide adult passage at present upstream blockages.

- **Satus Watershed Restoration (Project No. 9603501)** Satus Creek, contained entirely within the Yakama Indian Reservation, is the most productive steelhead stream in Yakima subbasin, in recent years accounting for more than 1/3 of returning adults. The Satus watershed, comprising approximately 10% of the Yakima subbasin, is largely undeveloped and has no irrigation diversions. This setting offers a unique opportunity to proceed with the landscape-scale restoration and monitoring undertaken by the Yakama Nation Satus Watershed Project. Several major complementary projects, funded by six state and federal agencies, are also underway in the Satus watershed.

The Satus Watershed Project was conceived as a long-term, large-scale watershed restoration and monitoring effort designed to develop, apply, and evaluate cost-effective methods for restoring fish habitat degraded by impaired watershed functioning. This approach was accepted by the BPA, and the project was initiated in June 1996. We are increasing the productivity of anadromous fish habitat by restoring ecological function of the Satus Creek watershed

(Brooks et al. 1991; FWP 1995). Restoration activities will also favor riparian dependent wildlife species and reestablishment of coho and spring chinook. Coordinated projects are addressing stream channel stability and complexity, riparian structure, diversity and productivity, and upland source areas

This proposal outlines specific restoration and monitoring tasks which will effect improvements in ecological function. Project staff work closely with BIA and Tribal programs to assure that management activities in the watershed will be complementary. An extensive monitoring system is in place, quantifying the value of coordinated watershed-scale restoration.

- **Toppenish-Simcoe Instream Flow Restoration And Assessment (Project No. 9705300)** The main objectives and approach of this Project are to monitor all steelhead life stages as to location and timing of habitat utilization, quantify and locate all sources of diversion and augmentation, model consumptive use, and identify land status to develop an adaptive Management Plan and decision support system to actively pursue lands available for acquisition to return irrigation water for instream use. If land acquisition is not possible, we hope to work with landowners to restrict diversion timing to periods when surface discharge is not limiting (spring runoff). We expect that providing perennial flow to all stream reaches in the Project area will have a positive affect on steelhead populations, measured by yearly spawner surveys and fisheries censuses.

By FY2000, we will have completed two seasons of field data collection, the Project GIS, and the Project Management Plan. Integrating Project products and those of other activities in the basin, we will have a decision support system in place to begin implementing the Management Plan. In doing so, we will be able to intelligently secure tracts of land and water to return to Toppenish basin streams for instream use. In addition, we hope to reduce irrigation system inefficiencies and limit summertime diversions while avoiding hardship on local landowners. Future activities will hinge on adaptive management as we develop our knowledge base. We hope to utilize this knowledge base in other YIN BPA-funded activities, both on and off the Yakama Indian Reservation.

- **Ahtanum Creek Watershed Assessment (Project No. 9102)** A watershed analysis for the upper, forested portion of the watershed is nearing completion. Water withdrawal, diking and channelization, grazing practices and residential development on the floodplain adversely affect the lower, largely agricultural portion of the watershed. Restoration of significant salmon and steelhead production in the watershed can be accomplished, but science-based strategies are needed for protecting stream flow, stream channels and floodplains.

We propose to map irrigated lands and water delivery systems, measure water discharge and temperature, compare water diversion and loss with on-farm water needs, and estimate the efficiency of irrigation water conveyance and use. At the same time we will gather historic and current data on stream channel condition, riparian function and salmonid populations.

We will use this information to determine how water use and riparian management in lower Ahtanum Creek may be limiting production of anadromous salmonids in the watershed as a whole, and to determine the most effective measures for salmon and steelhead restoration. After completing data analyses and the Assessment document in FY2000, we will recommend restoration measures that could include improved irrigation facilities, land and water management changes, and purchase or lease of land and water rights.

- **Little Naches River Riparian & In-channel Enhancement Project (Project No. 9705000)** This project is directed towards eroding stream banks below Kaner Flats to the confluence. The vast majority of the project (85%) is directed towards the placement of instream structures (i.e., wood and boulders) to increase channel complexity. In addition, some revegetation is being conducted along eroding stream banks.

- **Restore Upper Toppenish Creek Watershed (Project No. 9803300)**

  Restoration of the Toppenish watershed (comprising more than 10% of the Yakima sub-basin) is critical to restoring healthy runs of steelhead to the Yakima River. This proposal addresses degradation in the upper watershed, complementing three major restoration efforts underway in the lower, agricultural area. Proposed activities, following a FY98-99 analysis, are based on the assumption that aquatic/riparian habitat is an expression of watershed functioning. Our goal is to improve steelhead habitat by moderating flows from the upper watershed. The most efficient means is to restore the retentiveness of those areas, such as headwater meadows and floodplains, which formerly provided soil water storage. The objectives are to reduce erosion, aggrade downcut channels, and restore channel/floodplain interactions. The methods for achieving these goals include: 1) improved grazing management, 2) stabilization of headcuts and construction of sediment traps in headwater areas using native materials and geotextiles, 3) revegetation of sediment deposits and eroding uplands, and 4) removal of dikes. Monitoring of headcut stability, channel aggradation, and percent native vegetative cover in treated areas will allow us to evaluate the effectiveness of these treatments in meeting our objectives 3 years after application. We assume that meeting these objectives will gradually increase the hydrologic retentiveness of the upper watershed, thereby moderating flow regimes.

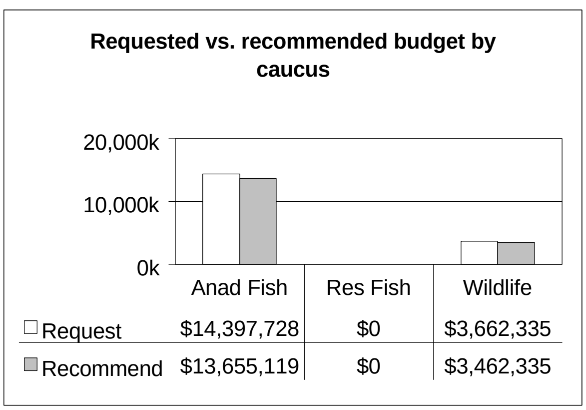
Subbasin Recommendations

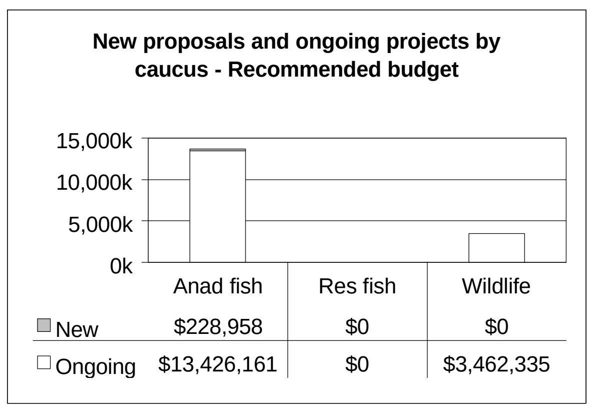
In general the proposed projects are three pronged. First, fish supplementation projects are designed to increase natural production of existing salmonid populations in the basin. Second, habitat restoration projects are designed to increase the natural productivity of the existing riverine habitat and to opened up previously blocked habitat. Habitat restoration is a vital component to maximize success of the hatchery supplementation programs. Third, policy/management issues on how water is managed for all basin user groups is being address through a variety of technical and policy groups or committees.

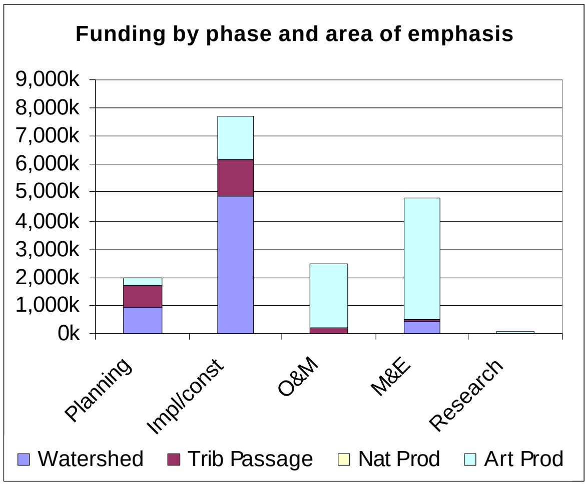
Projects and Budgets

Based on the preceding subbasin description, the CBFWA fish and wildlife managers recommend funding a total of 22 projects at a cost of $17,117,454. Of the projects recommended, 20 focus on anadromous fish, and 2 are directed at wildlife.

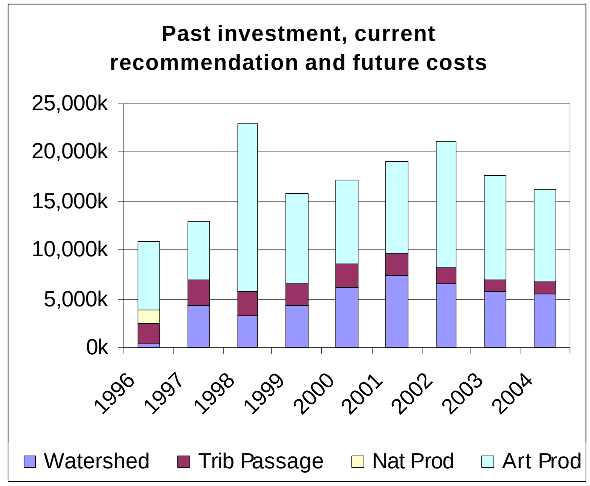
Refer to the following figures for detail on: 1) total recommended and requested budget by caucus, 2) funding for new and ongoing work, 3) funding by project phase and emphasis, and 4) funding by time period (past, current and future). Individual projects are listed in the following table.







Funding by phase and area of emphasis
9,000k
8,000k
7,000k
6,000k
5,000k
4,000k
3,000k
2,000k
1,000k
0k
Planning
Impl/const
O&M
M&E
Research
Watershed
Trib Passage
Nat Prod
Art Prod



Past investment, current recommendation and future costs
25,000k
20,000k
15,000k
10,000k
5,000k
0k
1996
1997
1998
1999
2000
2001
2002
2003
2004
Watershed
Trib Passage
Nat Prod
Art Prod

ProjectID	Title	Sponsor	FY99 recom.	FY00 recom.	Estimated Outyears FY01	FY02	FY03	FY04
Anadromous Fish Projects								
20119	Rock Creek Watershed Assessment and Restoration Project	YIN		156	289	305	182	119
20141	Recondition Wild Steelhead Kelts	CRITFC		73	70	70	18	20
8506200	Passage Improvement Evaluation	PNNL	100	100	100	100	100	0
8811525	Yakima/Klickitat Fisheries Project Design and Construction	YIN		1,565	1,600	4,570	2,000	400
8812025	Ykfp Management, Data and Habitat	YIN		750	760	770	780	790
9105700	Yakima Phase 2 [Fish] Screen Fabrication	WDFW, YSS	186	293	150	100	0	0
9107500	Yakima Phase II Screens - Construction	USBOR	1,500	1,000	1,000	500	0	0
9200900	Yakima [Fish] Screens - Phase 2 - O&M	WDFW, YSS	156	134	140	150	150	155
9405900	Yakima Basin Environmental Education	ESD 105	119	125	125	127	130	132
9503300	O&M of Yakima Phase II Fish Facilities	USBOR	220	100	105	110	115	120
9506325	Yakima/Klickitat Fisheries Project Monitoring and Evaluation	YIN		4,310	4,918	5,213	5,213	5,213
9506425	Ykfp - Wdfw Policy and Technical Involvement in the YKFP	WDFW		275	275	275	275	275
9603501	Satus Watershed Restoration	YIN	500	472	400	375	110	110
9701325	Yakima/Klickitat Fisheries Project Operations and Maintenance	YIN		2,260	2,551	2,824	3,321	3,521
9705100	Yakima Basin Side Channels	YIN	1,000	602	800	0	0	0
9705300	Toppenish-Simcoe Instream Flow Restoration and Assessment	YIN		164	200	125	125	80
9803300	Restore Upper Toppenish Creek Watershed	YIN	100	195	350	375	75	80
9803400	Reestablish Safe Access Into Tributaries of the Yakima Subbasin.	YIN		772	780	789	796	804
9901200	Coordinate/Facilitate Watershed Project Planning/Implementation	Ki-Yak	75	70	80	80	80	80
9901300	Ahtanum Creek Watershed Assessment	YIN	150	240	180	150	80	60
		Anadromous Fish Totals	**$13,655**	**$14,873**	**$17,008**	**$13,550**	**$11,959**	
Wildlife Projects								
9206200	Yakama Nation - Riparian/Wetlands Restoration	YIN	1,600	1,550	1,750	1,750	1,750	1,750
9609400	WDFW Habitat Unit Acquisition	WDFW	3,130	1,912	2,400	2,400	2,400	2,400
		Wildlife Totals	**$3,462**	**$4,150**	**$4,150**	**$4,150**	**$4,150**	
	* indicates ESA project, † indicates 'Innovative work'	**SUBBASIN TOTALS**	**$17,117**	**$19,023**	**$21,158**	**$17,700**	**$16,109**	

All figures in thousands of dollars

Needed Future Actions

Actions by Others

- **Yakima River Watershed Enhancement Project-** This is a federally funded program designed to address water needs for all water users in the basin. This is a cooperative effort between federal, state, local and private parties to devise solutions to the various water issues in the basin.
- **Yakima River Subbasin Assessment-** The BOR and BPA are cooperatively funding a study designed to monitor and evaluate the surface and subsurface water connectivity within several reaches of the Yakima mainstem river. A better understanding of this relationship will be incorporated in ways to make the river more "normative" to historic conditions.
- **Regional Fish Enhancement-** Washington State has provided monies to conduct small scale habitat restoration projects (i.e., $5,000-$10,000) in cooperation with individual landowners. One such example is the Buckskin slough project a tributary to the lower Naches River. These projects are design primarily to enhance existing salmonid habitat for both juvenile and adult lifestages.
- **USFWS-** The USFWS through their ecosystem conservation program, in a similar fashion to that of Washington State endeavors to work with individual landowners to improve or create salmonid fish habitat.
- **USFS-** The USFS has planned projects (FY1999 & 2000) to address damaged stream banks caused by dispersed recreational sites. Projects are proposed in the Little Naches (4 sites), South Fork Tieton River, Sawmill Flats campground on the Naches River and the American River. Activities will consist of instream wood structures (i.e., rootwads) to stabilize stream banks and allow for the reestablishment of natural vegetation. At less impacts sites barriers will be placed to move camp sites away from the stream bank and allow natural vegetation to be established.

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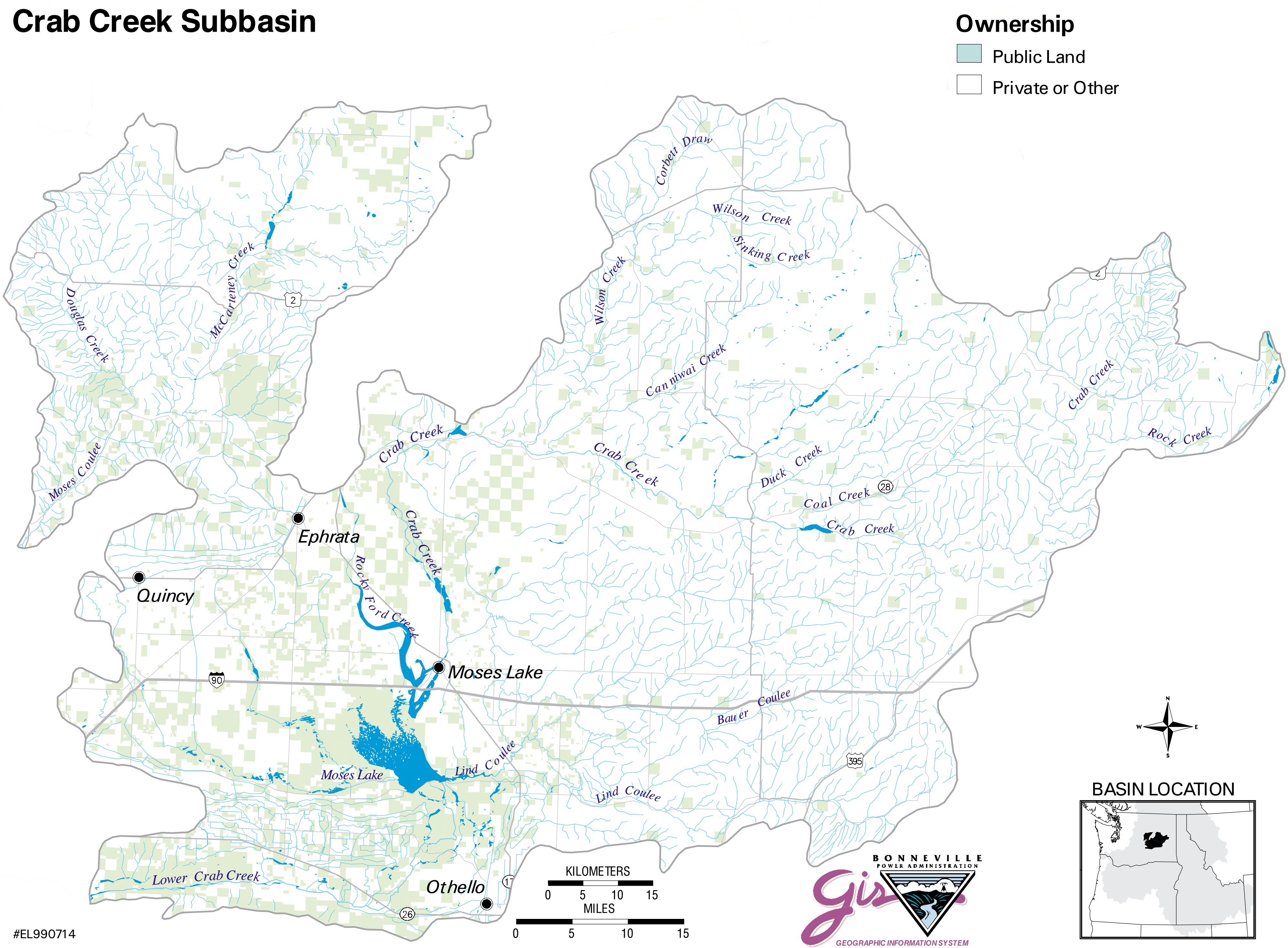
Crab Creek Subbasin



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Crab Subbasin

Res fish 1 project $234

Fish and Wildlife Resources

Subbasin Description

The Crab Creek watershed is located in central Washington State's Columbia Basin. Crab Creek begins in Lincoln County and flows southwest draining into the Columbia River near the present day town of Schwana, Grant County. Today, upstream fish passage is prohibited above O'Sullivan Dam which creates the impoundment known as Potholes Reservoir, just below Moses Lake. O'Sullivan Dam is the designated split between Upper and Lower Crab Creek. This lower section of the creek contains approximately 40 linear miles of perennial stream habitat.

Lower Crab Creek is in the shrub-steppe region of Washington State. Native upland vegetation consists of big sagebrush dominating the shrub component with various bunch grasses in the understory. Historically, riparian areas along creeks and wetlands consisted of several woody species including peach leaf willow (*Salix amygdaloides*), coyote willow (*S. exigua*), red-osier dogwood (*Cornus stolonifera*), golden currant (*Ribes aureum*), Wood's rose (*Rosa woodsii*), and black cottonwood (*Populus trichocarpa*).

Moses Lake is the third largest natural lake in Washington and represents an invaluable asset for wildlife and fisheries propagation and recreational interest. It is part of the Crab Creek drainage to the Columbia River and was connected to the Columbia Basin Reclamation Project in the 1950's. The lake currently covers 6,800 acres, inundates 120 miles of shoreline, and is 16 miles long.

Fish and Wildlife Status

Fish

Species that reside in Crab Creek include chinook (*Oncorhynchus tshawytscha)*, steelhead (*Oncorhynchus mykiss)*, resident fish species as well as waterfowl, raptors and ungulates. Important resident fish species found in Moses Lake include black crappie, bluegill, yellow perch, rainbow trout, largemouth bass, walleye, and smallmouth bass.

Prior to irrigation development at the turn of this century, Crab Creek contained resident salmonids even though channels naturally dewatered in several locations, especially above Moses Lake (Evermann and Nichols 1909). Currently, the quality of Crab Creek's fisheries is poor and the current status of distribution and abundance is at risk. In the lower 20 miles, Chinook salmon, steelhead, mountain whitefish (*Prosopium williamson*) and an array of centrarchid, cottids and cyprinids have been observed. Currently, chinook and steelhead spawning are being monitored in Red Rock Coulee. In the area of Lower Crab Creek, very little fisheries information exists.

Naturally reproducing fall Chinook salmon, resident rainbow trout and possibly anadromous steelhead trout have become established in Red Rock Coulee Creek, a tributary of Lower Crab Creek near Beverly, Washington. Although Red Rock Coulee Creek has limited spawning and rearing habitats, this small tributary provides evidence that salmonids can inhabit and naturally reproduce in the Crab Creek watershed. Aquatic biota composition upstream from this tributary is largely unknown.

In 1997, the National Marine Fisheries Service (NMFS) listed the Upper Columbia River steelhead ecological significant unit (ESU) as endangered. This ESU occupies the Columbia River Basin and its tributaries upstream from the Yakima River, Washington, to the United States border with Canada.

Moses Lake was once the premier fishery for resident fish species in central Washington. The USFWS initially stocked fish in the lake during the 1930's and 1940's, and fisheries for black crappie, bluegill, and yellow perch were quickly established (Groves 1951). Crappie began to dominate the fishery by the mid-1960's and continued as such until the early 1980's. The first indications of this species' decline in total harvest appeared during 1969-1974; however, crappie still constituted three-quarters of the harvest during 1974, with bluegill and perch making up most of the remaining game fish harvest (Duff 1976). Seventy-five percent of the angling effort during this time was for spiny-rayed species even though the Washington Department of Game had begun stocking the lake with rainbow trout during the 1960's.

Surveys during the mid to late 1970's indicated further declines in the total harvest of crappie and bluegill (Zook 1976, 1977, 1978). Washington Department of Fisheries data indicated that commercial carp harvest, at peak levels during the heyday of crappie harvest, was also falling sharply due to failing market conditions during this period. By 1983, crappie and bluegill harvest together was only one-third of the catch, and perch and trout contributed about equally to the remaining harvest (Jackson 1985). While the total angling effort had doubled since 1974, total harvest had only increased two percent, and almost half of the angling effort was now focused on trout. Walleye harvest was also documented for the first time during the creel survey in 1983. Walleye had not been stocked in Moses Lake previous to this survey, and this species likely entered the lake from the Columbia River through the irrigation system.

Largemouth and smallmouth bass had always accounted for a relatively small percentage of the harvest in Moses Lake. Relative abundance of these species actually increased until the mid 1980's, but declined thereafter. Perhaps the best evidence that bass species were also on the decline came from tournament data. The years 1987-90 averaged only seven organized club events per year and only 81 fish per event (Fletcher et al, 1987-93). Fewer events have been held during the 1990's. Smallmouth bass appear to have largely displaced the largemouth bass in Moses Lake, although there was some evidence that smallmouth bass were only holding their own and that largemouth bass had suffered the majority of the decline as concerns bass species.

Surveys through the remaining years of the 1980's continued to document declines in the crappie and bluegill populations (Chadwich, et al 1985; Walton 1988). By the end of the decade and early 1990's, even perch and the stocked rainbow trout were contributing little to the fishery (Eads, et al 1991; Korth, 1992). Carp and bullheads were noted as the lake’s dominant inhabitants. Walleye continued to increase in numbers during the early to mid 1990's and were eventually established as the dominant predatory species in Moses Lake (Korth, 1992-1998).

Wildlife

In Washington, the winter of 1997-98 was abnormally mild and provided a favorable condition for deer. Winter food for most deer is winter wheat and new growth forbs. During the winter of 1997-98 these low-growing foods were readily available to deer because of lack of snow. Winter mortality was likely less than normal.

Elk populations in Eastern Washington are strong and relatively stable due primarily to the large amount of elk winter range controlled by WDFW.

The 1997-98 midwinter waterfowl inventory was completed by WDFW and U.S. Fish and Wildlife (USFWS). During the 1980s, ducks declined in the Pacific Flyway midwinter survey, from about 7,000,000 in the 1970s. Numbers this year increased from 5,473,691 in 1996-97 to 6,607,263 in 1997-98.

Columbian Sharp-tailed grouse numbers have drastically declined in Washington over the past 100 years. Sharp-tails were plentiful in eastern Washington according to early explorers. A total number of 112 sharp-tailed grouse leks were documented between 1954 and 1994. Lek counts are used to estimate population size and stability. The number of males per lek and active leks also indicate stability of the population. Males per lek declined from 13 in 1954 to 5 in 1994. In Douglas County, 46% of active leks disappeared, 65% disappeared in Okanogan County, and 61% disappeared in Lincoln County from 1954 to 1994.

Several environmental and habitat changes appear to have led to improving sage grouse and sharp-tailed grouse populations. The breeding population of sharp-tailed grouse in Washington is currently estimated at 380. These sharp-tails reside in scattered groups in Douglas, Lincoln, and Okanogan counties. Areas supporting the most sharp-tails include West Foster Creek, East Foster Creek, Cold Springs Basin, and Dyer Hill in Douglas County; Swanson Lakes Wildlife Area in Lincoln County; and the Tunk Valley and Chesaw Units of the Scotch Creek Wildlife Area in Okanogan County.

Habitat Areas and Quality

Historically anadromous salmonids spawned and reared within the Crab Creek Drainage. Chinook and steelhead are currently spawning and rearing in Red Rock Coulee, a tributary to Crab Creek. Very little information has been collected on current fish use. A watershed assessment is necessary to evaluate the fish use and the condition of the instream and riparian habitat.

The availability of irrigation waters resulted in a conversion of much of the native shrub-steppe habitat to cropland. Stream discharge increased dramatically as a result of additional water from wasteways and groundwater recharge (Embrey and Block 1995). Impacts to Crab Creek include augmented flows, flood plain conversion to cropland resulting in channel constriction, continued removal of riparian habitat for grazing and cropping, and increased water temperatures from loss of shading and Project water inputs. Much of Lower Crab Creek has been severely channelized thus closely resembling a canal.

An extensive water quality investigation by Embrey and Block (1995) revealed that water quality is relatively good in Crab Creek. They reported that concentrations of dissolved constituents, including nutrients and trace elements were small and with few exceptions, did not exceed various standards and criteria for humans or aquatic life. Embrey and Block (1995) also reported that median trace element concentrations were less than analytical reporting limits and did not appear to threaten human or wildlife health.

Moses Lake represents an invaluable asset for wildlife and fisheries propagation and recreational interest. Moses Lake is heavily influenced by irrigation transport and return flows and has been slightly enlarged and stabilized by the construction of outlet control structures.

Three major changes in habitat have occurred in Washington's Columbia Basin in recent years that appear to have affected deer significantly. Several thousand acres of primarily dry land wheat ground was in the Conservation Reserve Program. Conversion of wheat to grass added permanent cover and some useful forage in the form of forbs, but in some areas removed a vital winter food resource (i.e., winter wheat).

Major habitat development, including several hundred acres of irrigated food plots provided high quality habitat for deer migrating from Douglas County and northeastern Lincoln County.

During the past three seasons weather patterns have been favorable resulting in improved elk forage production on all ranges. However, the summer of 1998 was a very dry period with no green up beginning before the winter set in and impacted winter forage availability. Most of the summer range is managed by the U.S. Forest Service, Washington Department of Natural Resources, Boise Cascade Corporation, Plum Creek Timber Company and Longview Fiber Corporation. Habitat suitability for elk varies across these ownerships depending on management emphasis.

Sagebrush and other native vegetation has invaded many of the Conservation Reserve Program fields improving their benefits to sage and sharp-tailed grouse. Aggressive habitat enhancements for sharp-tails continue on lands purchased by WDFW (using BPA and other funding sources). The value of these lands to the grouse is increasing noticeably as habitat rehabilitation proceeds. The research efforts on the Swanson Lakes Wildlife Area showed satisfactory breeding success. Habitat is much improved over previous ownership of the site. Overall, conditions and breeding potential of this population and adjacent populations on Bureau of Land Management lands in Lincoln County bode well for the future.

Watershed Assessment

No comprehensive watershed assessment exists for the Crab subbasin. Work has been performed in this area to address specific concerns. WDFW is addressing sport fish issues in Moses Lake using BPA funds through the Fish and Wildlife Program. Historically, Moses Lake was managed primarily for the production of crappie, bluegill, bass, perch, and rainbow trout. Along with Potholes Reservoir, the fisheries were unequaled anywhere in the State. Productivity began declining rapidly in the early 1980s and current recreational harvest is less than 15 percent of former levels.

In 1979, U. S. Fish and Wildlife Service (USFWS) biologists conducted fisheries surveys below Potholes Reservoir utilizing electrofishing, seines and concussion sampling in the creek upstream of state highway 26. They only recorded carp (*Cyprinus carpio*) and a few juvenile catfishes (*Ictalurus* spp.) (USFWS 1981). Presently, carp are ubiquitous throughout the Crab Creek system and their bottom feeding behavior and abundance undoubtedly contribute to the turbidity problem affecting the water quality. Angler activity in Crab Creek below Potholes Reservoir is low. A 1978 survey by the USFWS indicated that approximately 100 angler-days of sport fishing occurred above state highway 26 and this fishing activity was largely limited to bow fishing for carp (USFWS 1981).

Instream invertebrate sampling at McManamon road by Plotnikoff (1995) revealed very low taxa richness. In this study, zero stonefly *(Plecoptera)* and only three of each taxa from mayfly *(Ephemeroptera)* and caddis *(Trichoptera)* were found in the pool and riffle habitats sampled. Abnormally high discharge in late summer has been suggested as the primary factor in precluding development of these macroinvertebrate taxa.

Water quality data has been routinely and voluminously collected by several State and Federal agencies and others (Bush; Eads, et al 1991; Sylvester 1964; Welch 1971). In addition, the rapid shoreline development on Moses Lake and the resultant habitat losses were cause for rescinding the nationwide shorelines permit for this water.

Nutrient loads in Moses Lake and the accompanying algae and plant growth have been a problem for over four decades. Studied since the 1960's, the most extensive work to date was initiated by the Moses Lake Irrigation and Rehabilitation District (MLIRD 1987). Despite MLIRD's instigating several successful projects to reduce nutrient loading in Moses Lake, the Washington Department of Ecology continued to list water quality as severely impaired by high levels of phosphorous.

Yet the relationships of these many factors have never been synthesized, nor has this information been correlated with any extensive study of the fisheries. An extensive database on species biology remained unanalyzed with much of the data in its raw form. Current fisheries management tactics included the continued stocking of rainbow trout combined with net pen rearing and stocking crappie broodstock in an artificially isolated portion of the lake. Evaluation of these measures has been minimal.

Limiting Factors

Summer water temperatures in Lower Crab Creek near Beverly can reach 90 °F. The upper reaches sustain lower water temperatures; 73°F and 82°F have been recorded near McManamon road (Plotnikoff 1995, USFWS 1981).

Temperature, pH, and dieldrin are above Washington State limits within the project area (Washington Department of Ecology 1998). Turbidity is very high due to irrigation returns from the Columbia Basin Project. Other sources of water quality information include: Cunningham and Rothwell (1971), Jones and Wagner (1995), U.S. Geological Survey (1996), and Wagner et al. (1996).

While Moses Lake and its fisheries have little or no biological impact to the Columbia River, the converse has not been true. Moses Lake has been greatly influenced by the Columbia River and its fisheries, primarily due to direct tie-ins with the irrigation system of the Columbia Basin Reclamation Project. Seasonal fluctuations in water retention times, and thus temperatures and productivity, are influenced by water management at Potholes Reservoir because the most direct route for incoming water to Potholes is through Moses Lake. It is more than likely that walleye from FDR were and continue to be introduced to Moses Lake by this connection.

Subbasin Management

Goals, Objectives and Strategies

WDFW has committed to the goal of restoring the Moses Lake fisheries. The general strategy is to: 1) identify factors contributing to the decline of the Moses Lake fishery that will form the basis for biological objectives, 2) identify management actions that will address those objectives, 3) implement those actions, and 4) monitor and evaluate their success.

The Swanson Lakes Wildlife Area is a wildlife mitigation project which has been funded by BPA since 1993. Located in Lincoln County, this Wildlife Area encompasses over 19,000 acres. It was purchased, enhanced and is managed for the recovery of the Columbian sharp-tailed grouse. This project will partially meet BPA's mitigation obligation to compensate for wildlife losses resulting from the construction of Grand Coulee hydroelectric dam. BPA, by funding enhancement and reasonable operation and maintenance of the Swanson Lakes Wildlife Area for the life of the project, will receive credit (15,984 Habitat Units) toward their mitigation debt. All enhancement activities have been completed and the project is in the operation and maintenance mode. The objective is to maintain the positive benefits that have and are accruing from the restoration/enhancement activities.

Past Efforts

The Swanson Lakes mitigation project was approved by BPA in 1990. An Environmental Assessment was conducted for National Environmental Policy Act compliance in 1992 (DOE/EA-0791) with a Finding of No Significant Impact. In August 1992, WDFW adopted the Environmental Assessment pursuant to the State Environmental Policy Act. Acquisition of land, and wildlife habitat enhancement started in 1993 and were completed in 1997.

Research, Monitoring and Evaluation

The proposal to restore the resident fisheries of Moses Lake is off-site substitute mitigation for the loss of anadromous species in the blocked portion of the Columbia River due to hydropower development (Chief Joseph and Grand Coulee projects). Repair of this valuable fishery would mitigate some of the resource and associated recreation lost to the residents of Grant County as well as to the State of Washington. This project would provide 150-200,000 additional days of recreational angling annually within a one hour drive of the impacted area.

Remaining Work

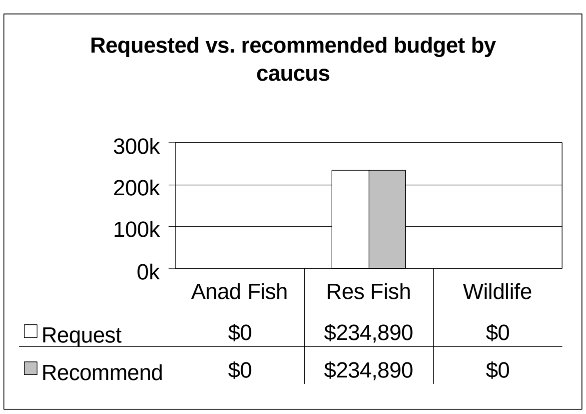
The Swanson Lakes Wildlife Area is comprised primarily of shrub-steppe habitat. The Northwest Power Planning Council has designated shrub-steppe habitat as a high priority. This mitigation project has emphasized the recovery and management of sharp-tailed grouse. Operation, maintenance, monitoring and evaluation activities must continue to ensure the continuance of the positive wildlife habitat benefits which are accruing.

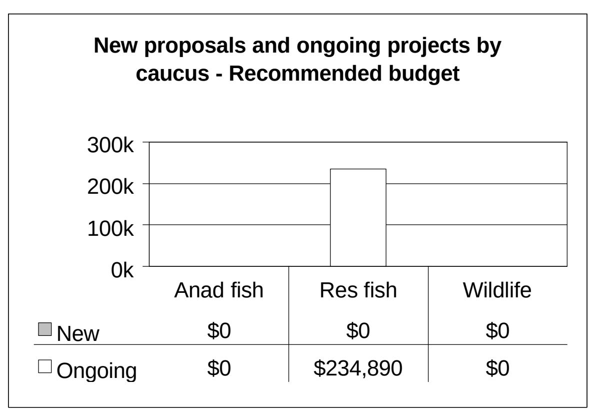
Subbasin Recommendations

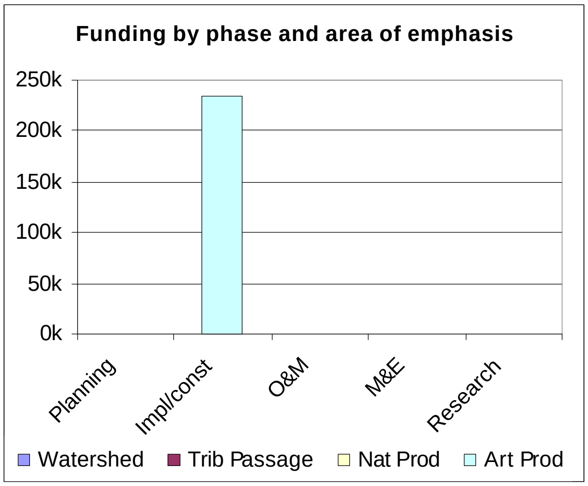
Projects and Budgets

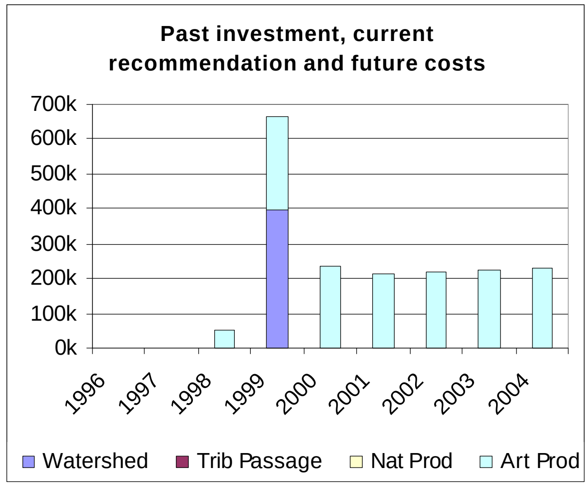
Based on the preceding subbasin description, the CBFWA fish and wildlife managers recommend funding one resident fish project at a cost of $234,890.

Refer to the following figures for detail on: 1) total recommended and requested budget by caucus, 2) funding for new and ongoing work, 3) funding by project phase and emphasis, and 4) funding by time period (past, current and future). Individual projects are listed in the following table.






Funding by phase and area of emphasis
250k
200k
150k
100k
50k
0k
Planning
Impl/const
O&M
M&E
Research
Watershed
Trib Passage
Nat Prod
Art Prod


Past investment, current recommendation and future costs
700k
600k
500k
400k
300k
200k
100k
0k
1996
1997
1998
1999
2000
2001
2002
2003
2004
Watershed
Trib Passage
Nat Prod
Art Prod

ProjectID	Title	Sponsor	FY99 recom.	FY00 recom.	Estimated Outyears FY01	FY02	FY03	FY04
Resident Fish Projects								
9502800	Restore Moses Lake Recreational Fishery	WDFW	269	235	213	218	223	228
			Resident Fish Totals	**$235**	**$213**	**$218**	**$223**	**$228**
	* indicates ESA project, † indicates 'Innovative work'		**SUBBASIN TOTALS**	**$235**	**$213**	**$218**	**$223**	**$228**

All figures in thousands of dollars

Actions by Others

The Swanson Lakes Wildlife Area is adjacent to lands owned by the Bureau of Land Management (BLM). BLM is working cooperatively with WDFW to provide positive habitat benefits. They have moderate grazing programs and are replanting areas with native shrub-steppe vegetation.

The U.S. Fish and Wildlife Service's Columbia National Wildlife Refuge has proposed the acquisition of property along lower Crab Creek. The Rasor Ranch encompasses approximately 4.5 linear miles of Lower Crab Creek and flood plain, much of which has been severely altered by agricultural practices. The objectives of this project are to: 1) remove farming and livestock operations from damaged wetland, riparian, and upland areas, 2) restore of wetland, riparian, and upland areas, 3) control noxious weed, 4) Install fencing, and 5) implement compatible wildlife oriented public use and education.

Ducks Unlimited is taking the lead on a cooperative restoration and enhancement effort to restore riparian habitat along Crab Creek and its associated wetlands. The project is currently in the conceptual stage. The proposal will be submitted under the North American Wetlands Conservation Act (NAWCA) early summer of 1999. Project areas will include the Eagle Lakes area, Washington Department of Fish and Wildlife's Windmill Ranch, Columbia National Wildlife Refuge's Marsh Unit 3, and several private land owners.

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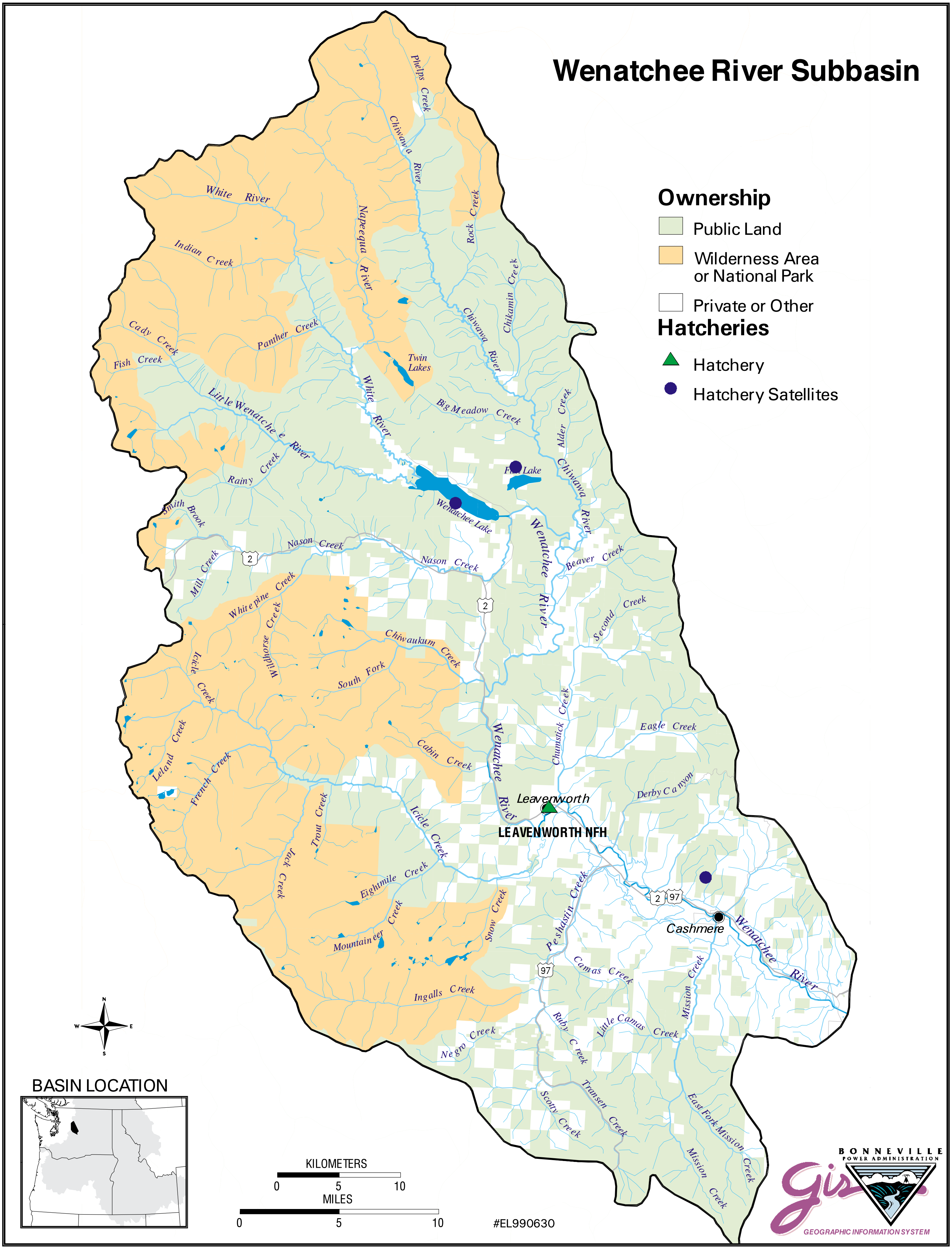

Wenatchee River Subbasin
Ownership
Public Land
Wilderness Area or National Park
Private or Other
Hatcheries
Hatchery
Hatchery Satellites
Phelps Creek
Chiwawa River
White River
Napeequa River
Rock Creek
Indian Creek
Chikamin Creek
Cady Creek
Panther Creek
Fish Creek
Twin Lakes
Little Wenatchee River
Big Meadow Creek
Alder Creek
Rainy Creek
Fish Lake
Chiwawa River
Smith Brook
Wenatchee Lake
Wenatchee River
Nason Creek
Beaver Creek
Mill Creek
Whitepine Creek
Second Creek
Wildhorse Creek
Chiwaukum Creek
Icicle Creek
South Fork
Chumstick Creek
Eagle Creek
Cabin Creek
Leland Creek
French Creek
Derby Canyon
Leavenworth
LEAVENWORTH NFH
Trout Creek
Jack Creek
Eightmile Creek
Peshastin Creek
Cashmere
Mountaineer Creek
Snow Creek
Camas Creek
Mission Creek
Ingalls Creek
Ruby Creek
Little Camas Creek
Negro Creek
Transen Creek
Scotty Creek
East Fork Mission Creek
Mission Creek
2
97
BASIN LOCATION
KILOMETERS
0 5 10
MILES
0 5 10
#EL990630
BONNEVILLE POWER ADMINISTRATION
GEOGRAPHIC INFORMATION SYSTEM

Wenatchee Subbasin

Anad fish 2 projects $260

Fish and Wildlife Resources

Subbasin Description

The Wenatchee River Subbasin in north central Washington covers approximately 1,327 square miles. The Wenatchee River flows in a southeasterly direction to the Columbia River. The watershed originates in the high mountainous regions of the Cascade Crest, with numerous tributaries draining sub-alpine regions within the Alpine Lakes and Glacier Peak wilderness areas.

Land ownership is in a checkerboard pattern in many areas of the subbasin, alternating between private and federal ownership. Approximately 77 percent is in federal ownership, with the U.S. Forest Service by far the largest owner. More than one-quarter of the land is within wilderness boundaries. Approximately 22 percent is privately owned, with about 1 percent in state ownership. Large corporate landowners manage much of the private lands for timber production.

Fish and Wildlife Status

Spring chinook -- Spring chinook spawn and rear in the Chiwawa, White, and Little Wenatchee rivers, and Peshastin, Nason, and Icicle creeks. The run is made up of naturally produced fish and hatchery fish from Leavenworth National Fish Hatchery (BOR Reimbursable).

Summer chinook -- Summer chinook spawn primarily in the lower Mainstem. The main natural production area for all summer chinook in the mid-Columbia River is the Wenatchee River system.

Summer steelhead -- Naturally spawning summer steelhead occur throughout the basin.

Sockeye -- These fish originally spawned in eight tributary-lake systems of the mid- and upper-Columbia. Currently, sockeye occur only in the Okanogan and Wenatchee river systems. Sockeye spawn in the White, Napeequa, and Little Wenatchee rivers above Lake Wenatchee. Juveniles drop downstream and rear in the Lake.

Coho -- A large naturally spawning run of coho (now extinct) was present in nearly all mid-Columbia River tributaries including the Wenatchee River. Plans are currently under way to re-establish coho in the Wenatchee.

Resident native trout -- The Wenatchee River and its tributaries support a variety of resident trout, including bull trout, cutthroat trout and rainbow trout. Under existing conditions, bull trout are mostly limited to headwater tributary streams including the Chiwawa, White, and Little Wenatchee Rivers and Nason Creek.

Stock	Genetic History / Management Intent	Spawn Escape	Hatchery Take	Harvest	Recent Total Escape
ChS	Manage for natural and hatchery production. Local broodstock.	(12,000)	(9,000)	(9,150)	9,263
ChSu	Manage for natural production	(10,000)		(3,000)	7,800
StS	Manage for natural and hatchery production with local broodstock	4,718	(7,500)	(7,500)	
Sock	Manage for natural production	(35,000)			36,000
Coho	Extirpated-Activities underway to re-establish runs				0

Habitat Areas and Quality

Mainstem **--** The mainstem is the primary spawning and rearing area left for summer chinook. Production is limited by low flows, high temperatures, and the elimination of stream side rearing area by bank alteration. These low flows and high water temperatures during summer and fall have also adversely impacted adult summer chinook survival. This section of the river is the most highly developed and is greatly impacted by stream channelization for road construction, stream bank armoring to prevent erosion on private lands, and water withdrawal for irrigation.

Lake Wenatchee and tributaries **--** This area is primarily national forest with much of that in wilderness and is therefore less impacted by development than the lower river and provides the primary rearing area for sockeye, spring chinook, and steelhead. Lake Wenatchee and the lower reaches of its feeder tributaries continue to receive development pressure in riparian areas for cabins and recreational use.

Watershed Assessment

Watershed Assessments or Analyses have been completed on several subdrainages of the Wenatchee River by the U.S. Forest Service. Known assesments include Mission Creek (1995) and Round Mountain (1995) (Kahler/Nason Creek).

Limiting Factors

Diversion of water for irrigation and stream channelization have significantly reduced fish production while inadequately screened irrigation diversions results in downstream migrant losses.

- Both adults and juveniles are entrained at the mainstem Dryden Diversion.
- Irrigation withdrawals significantly reduce habitat quality on the mainstem and render several tributaries, notably Peshastin Creek, nearly unusable for anadromous fish.
- Riparian areas in the mid and lower Wenatchee River watershed have been, and continue to be, significantly impacted from intense residential development and recreational use.
- River bank armoring on the lower river has greatly reduced rearing area for summer chinook.
- Forest Practices have impacted water quality and habitat conditions in some tributaries of the Wenatchee. In particular, portions of Peshastin Creek, Mission Creek, and Chumstick Creek have been degraded due to logging activities.
- Parallel roads in close proximity to tributary streams have substantially reduced stream channel complexity, removed riparian vegetation, and confined the stream channel system. The worst conditions due to parallel roads are found in the Peshastin, Icicle, Nason, and Chumstick Creek drainages.
- Icicle Creek is so over-appropriated that summer water temperatures approach lethal levels. The dam at the Icicle Creek Hatchery continues to be an impediment to upstream adult migration.
- Highway construction and attendant channel realignment, bank hardening, and loss of riparian vegetation have severely limited rearing habitat downstream of Lake Wenatchee.

Subbasin Management

Goals, Objectives and Strategies

The indigenous anadromous fish species most actively targeted for management in the Wenatchee River Subbasin are spring and summer chinook, sockeye, and summer steelhead. Coho are extinct, and little is currently known about Pacific lamprey status. The goal for these species is to restore sustainable, naturally producing populations to support tribal and non-tribal harvest and cultural and economic practices while protecting the biological integrity and the genetic diversity of the watershed.

To address these problems, the co-managers have adopted the following outcome-based objectives:
1. Improve adult pre-spawning survival.
2. Improve juvenile rearing survival.
3. Improve juvenile migrant survival.

4. Improve egg and alevin survival by reducing fine sediment delivery to the stream system and moderating the frequency and occurrence of peak flows to near that found naturally.
5. Re-establish exterpated runs.

Strategies which achieve the objectives include improving habitat through implementation of habitat restoration and fish passage projects; reduce fine sediment delivery from roads and ground disturbing acitivities, modify and conduct land management activities to ensure that the frequency and occurrence of peak flows is similar to that found naturally, and supplementing naturally spawning populations to enhance natural production and re-establish natural production.

Past Efforts

Mainstem passage improvements for the three mid-Columbia Projects downstream of the Wenatchee River are being implemented through the mid-Columbia Coordinating Committee. Lower Mainstem passage survival improvements are being pursued through the Snake River Recovery planning efforts. Tributary passage is being addressed through irrigation screening activities. Additional habitat protection activities are being developed and pursued through the mid-Columbia Habitat Conservation Plan currently under development.

Re-establishing coho to the Wenatchee and Methow through supplementation is implemented under project #9604000. This project implements the design and construction of rearing and acclimation facilities, O & M, and monitoring and evaluation. Supplementation is being implemented (with mid-Columbia PUD funding) through the Rock Island Dam Settlement Agreement. Supplementation activities are based upon multiple collection and release sites throughout the drainage in order to protect the genetic integrity of the run. A spring chinook hatchery program centered on Icicle Creek has been carried out through Leavenworth National Fish Hatchery (BOR Reimbursable Budget - MOA).

Research, Monitoring and Evaluation

- Further delineate fish distribution and habitat conditions in the basin.
- Complete Watershed Assessments/Analyses on priority basins where it has not been completed.
- Further determine limiting factors to stocks in the Wenatchee basin.
- Evaluate effectiveness of supplementation projects, habitat and riparian restoration, and improvements to land management activities.
- Conduct a thorough survey of road crossings (culverts) in the drainage to determine sites that block or impede fish passage.

Remaining Work

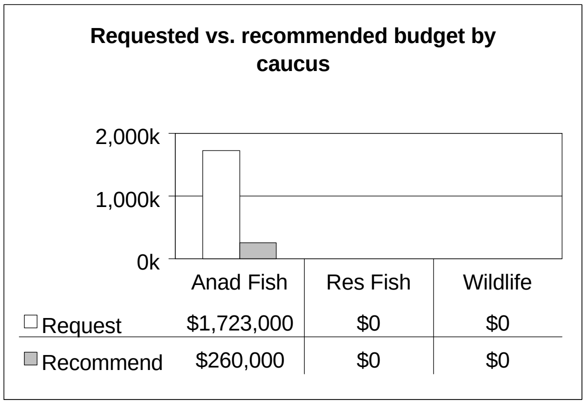
- Acquire lands critical for future stock productivity through purchase or easement.
- Restore degraded habitat and riparian areas important for production.
- Modify land practices that are limiting salmonid production.
- Reintroduce coho back to the Wenatchee basin.
- Provide adequate flows in the Wenatchee River and its tributaries. In particular, summer flows need to be improved on Peshastin Creek, lower and middle Wenatchee River, Icicle Creek, Mission Creek and Chumstick Creek.
- Relocate or remove roads in close proximity to streams. Road segments that are causing sediment delivery and channel confinement should be prioritized for work.

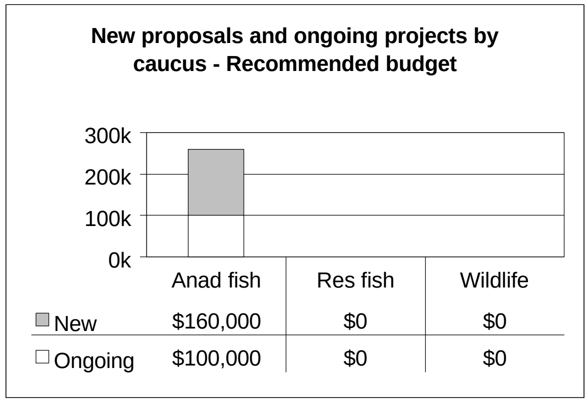
Subbasin Recommendations

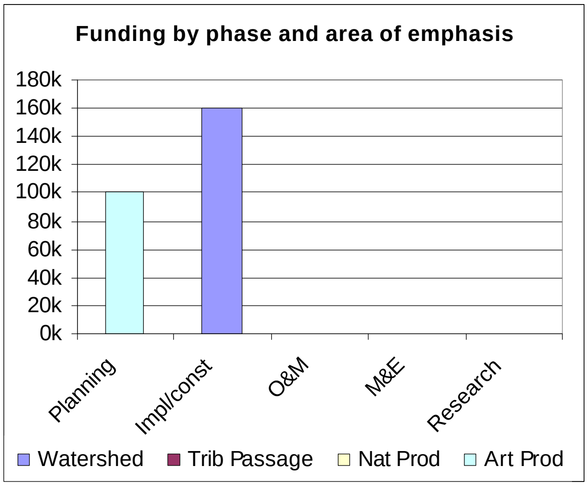
Projects and Budgets

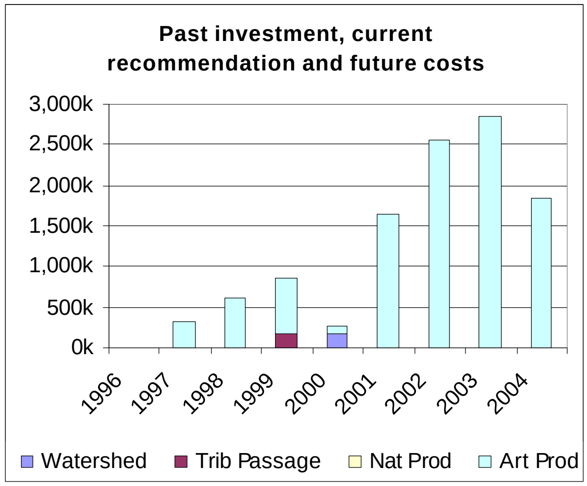
Based on the preceding subbasin description, the CBFWA fish and wildlife managers recommend funding a total of 3 anadromous fish projects at a cost of $260,000. One project supports ESA requirements for a total of $100,000.

Refer to the following figures for detail on: 1) total recommended and requested budget by caucus, 2) funding for new and ongoing work, 3) funding by project phase and emphasis, and 4) funding by time period (past, current and future). Individual projects are listed in the following table.









ProjectID		Title	Sponsor	FY99 recom.	FY00 recom.	Estimated Outyears FY01	FY02	FY03	FY04

Anadromous Fish Projects

ProjectID		Title	Sponsor	FY99 recom.	FY00 recom.	FY01	FY02	FY03	FY04
20001		Remove 23 migrational barriers and restore instream and riparian habitat on	USFWS		160	0	0	0	0
9604000	*	Evaluate the Feasibility and Risks of Coho Reintroduction in Mid-Columbia	YIN	700	100	1,650	2,550	2,850	1,850
			Anadromous Fish Totals		**$260**	**$1,650**	**$2,550**	**$2,850**	**$1,850**
		* indicates ESA project, † indicates 'Innovative work'	**SUBBASIN TOTALS**		**$260**	**$1,650**	**$2,550**	**$2,850**	**$1,850**

All figures in thousands of dollars

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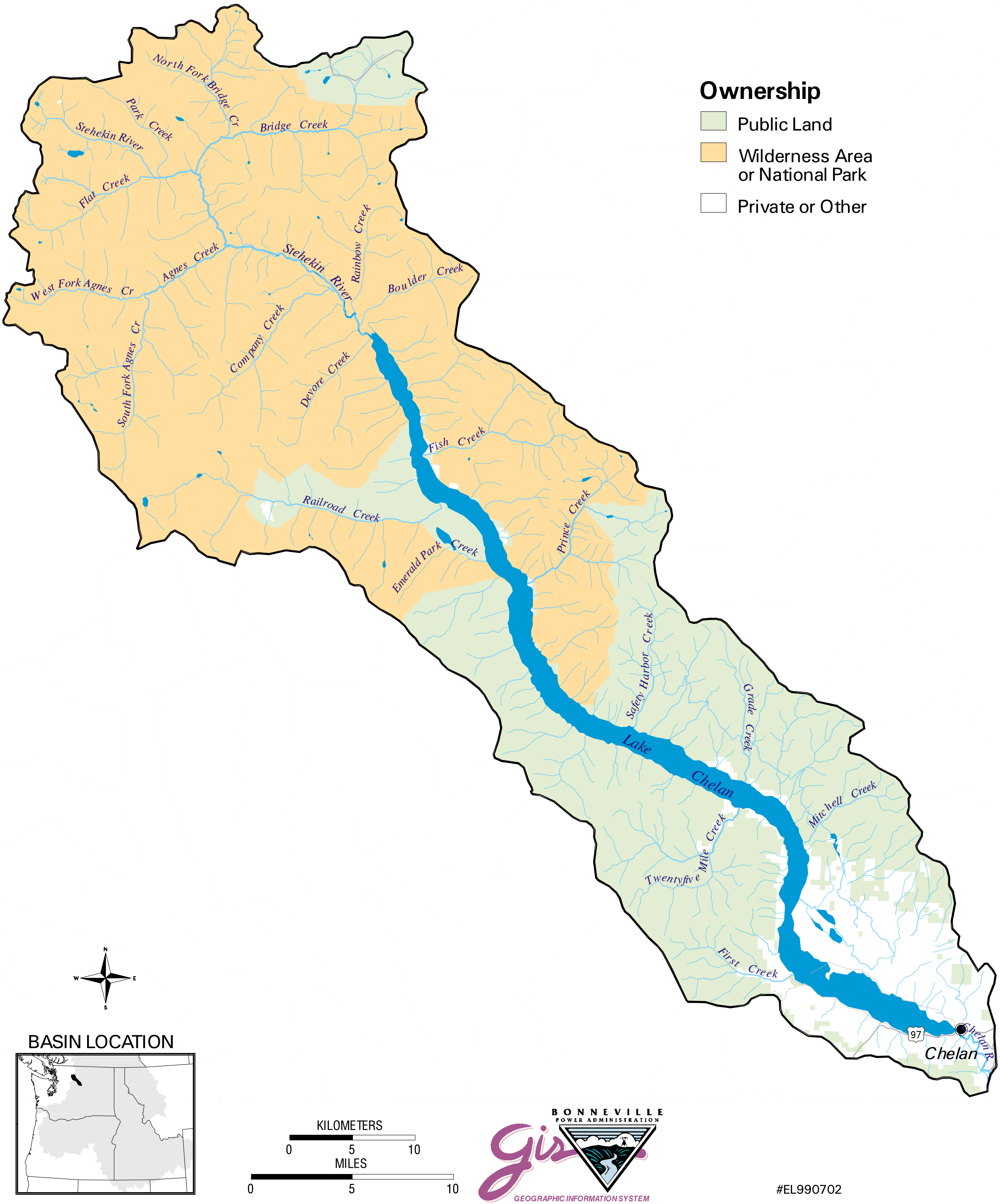
Chelan River Subbasin



Chelan Subbasin

Fish and Wildlife Resources

Subbasin Description

Lake Chelan is located in Chelan County in north central Washington. The Entiat and Chelan Mountains and Glacier Peak complex border Lake Chelan to the south. To the north it is bordered by the Sawtooth Mountain Range. From Twenty-five Mile Creek uplake, the terrain is mountainous and rugged. In many cases, the steep slopes run directly into the lake with no flat beaches or shoreline. The terrain of the lower end of the lake is much less severe, although semi-arid.

Lake Chelan is deep and narrow, extending northwesterly approximately 50 miles from the city of Chelan at its lower end to Stehekin at the head of the lake. Lake Chelan is a natural lake that developed within a broad glacial trough. The lake averages one mile in width and has depths of over 1,480 feet. The lake is bordered by more than two million acres of National Forest lands, more than half of which are designated as wilderness. Surrounding peaks reach elevations as high as 7,000 feet. The lake serves as a waterway approach to the Forest Service's Wenatchee National Forest above Twenty-five Mile Creek, and to the National Park Service's Lake Chelan National Recreation Area at Stehekin. The lower 15 miles of the lake are mostly privately owned. The next 35 are within the Wenatchee National Forest, and the upper five miles are within the Lake Chelan National Recreation Area.

The average surface area of the lake is 32,000 acres. The area of drainage at the dam is 924 square miles. The confluence of the Chelan River and Columbia River is approximately 1.5 miles southeast of the city of Chelan. The lake level and flow through the Chelan River drainage were altered through the construction of a hydroelectric project in the river channel near the City of Chelan in 1928. The average drawdown of the lake for the past 30 years has been to 1,085.5 feet. The reservoir has 676,000 acre-feet of usable storage above 1,079 feet.

The annual drawdown of the lake begins in early October. The lowest lake elevation normally occurs in April. From May through June the lake refills from spring runoff. The reservoir is maintained at or above an elevation of 1,098 feet from June 30 through September 30 each year. Since the project was originally licensed in 1926, the lake has never been drawn down to the minimum allowable elevation (1,079 feet). The lowest drawdown on record was 1,079.7 feet in 1970. That occurrence coincides with the lowest annual precipitation on record. The Chelan PUD has never failed to refill the reservoir to an elevation of 1,098 feet by June 30.

Fish and Wildlife Status

Cutthroat Trout – The natural production of cutthroat trout were depleted by a combination of over-fishing, early hatchery operations such as excessive trapping and spawn removal, reduction of available spawning gravels, and the introduction of rainbow trout in 1917.

Bull Trout – Extirpated of 1948 from severe winter floods.

Kokanee – Kokanee spawn in Lake Chelan as well as Company Creek. They were introduced in Lake Chelan in 1916. The kokanee responded will to the lake's environment and became the major sport fish in the lake.

Chinook – Introduced residualized chinook salmon to Lake Chelan in 1974.

Table 1. Populations

Species / Stock	Pop. Location	Mgmt Intent	Special Status	Number of Adults Current	Target
Peregrine falcons	Lake Chelan drainage area	N	Endangered	Unknown	unknown
Bald Eagles	Lake Chelan drainage area	N	Threatened	During one survey 12 were seen in 1984	unknown
Bull Trout	Lake Chelan	E	Extirpated	0	unknown
Kokanee	Lake Chelan, Company Cr.	R	Introduced in 1916	Unknown	600,000 of catchable size. Goal set in 1984
Chinook	Lake Chelan	S	Introduced in 1974	50,000 fish/year in mid 70's	unknown
Rainbow Trout	Tributaries to Lake Chelan	R –exotic	N/A	18,104 in 1982	unknown
Westslope Cutthroat trout	Ten-mile Cr. Trib. to Railroad Cr.	R – native	N/A	6 in September 1982	unknown
Lake Trout	Lake Chelan	R – exotic	N/A	Unknown	unknown
Smallmouth Bass	Lake Chelan	R - exotic	N/A	Unknown	unknown
Burbot	Lake Chelan	R - native	N/A	Unknown	unknown

Subbasin Management

Goals, Objectives and Strategies

Native Populations:
Objectives:
1. Maintain population productivity reduced by hydropower development and operations to healthy levels which provide opportunities for consumptive and nonconsumptive uses of native population or other species whose use is constrained to protect sensitive populations.
2. Ensure population levels of native fish which maintain adaptability and genetic diversity, and maximize probability of survival.

Quantitative objective: minimum breeding populations of 150-300 individuals and >95% probability of persistence for at least 5 generations.

Strategies:
1. Identify and estimate the status of populations and groups of native fish species with unique genetic characteristics.
2. Identify factors limiting each population, critical habitats or conditions which limit life stages, and population sizes corresponding to management objectives.
3. Select and implement measures based on distribution, status, and limiting factor assessments to improve habitat conditions, restore connectivity between isolated subpopulations, and meet biological objectives.
4. Monitor the status of native populations to evaluate the effectiveness of restoration efforts and to determine when protection and restoration goals have been achieved.

Non-native Populations:
Objectives:
1. Protect and enhance native wild stocks of anadromous and resident species as a higher priority that introduced gamefish species.
2. Reduce or eliminate detrimental effects of existing introduced gamefish species on native species where feasible.
3. Provide only those opportunities for consumptive and nonconsumptive uses of introduced gamefish populations which do not produce substantial negative effects on native species.

Quantitative objective: optimum sustained yield of bass, catfish, etc. conditional on no native species effects.

Strategies:
1. Conduct only those assessments of introduced gamefish populations needed to identify and minimize effects on native species.
2. Implement hydropower system configurations and operations that reduce numbers of effects of introduced gamefish species on native species.
3. Obtain stock assessment information appropriate to optimizing management of introduced gamefish species incidental to work focused on other problems (for instance, predation or sturgeon restoration evaluations).

Research, Monitoring and Evaluation

The first step taken by Chelan PUD in the Lake Chelan ARP was to solicit identification of issues from the participating stakeholders regarding all aspects of the Lake Chelan Hydroelectric Project that would need to be addressed during the relicensing process. Issues identified were then grouped according to similar topics. From the sub-groups of topics, study plan outlines were developed to address the pertinent issues. The detailed study plans are a further refinement of the study plan outlines.

Chelan PUD has established comprehensive programs at Lake Chelan to reduce the impact of the project operations on fish and wildlife. Surveys of deer, mountain goat, and bald eagle populations are conducted by boat along the reservoir to track their abundance and distribution, as well as the age and sex composition of the animals. Information derived from these surveys is used to manage the level of harvest and assess the condition of the wildlife habitat. Funds are provided for improving mule deer winter forage through prescribed burns and planting forage plants. Chelan PUD also assists wildlife during the winter months by maintaining upland bird feeders and mineral blocks for mule deer and mountain goats.

Remaining Work

The effect of project operations on big game species, mule deer, mountain goats, and bighorn sheet will be determined through results of wildlife surveys currently being conducted, and by consultation with the Wildlife Workgroup. The effect of project operations on small game and other species will be determined through the Riparian Zone Investigation.

The effect of the Lake Chelan Hydroelectric Project operation on riparian habitat, and the associated wildlife such as birds and small mammals, reptiles, and amphibians, is an issue that has been raised in the relicensing process. In order to assess the project's effects, a thorough survey of riparian habitat, and plant and wildlife species will be conducted. Where available, existing maps and photographs will be used to document changes that have occurred since construction of the project. Included in the survey will be assessment of riparian habitat types and structures, e.g., number of canopy layers, snags, down woody debris, and shoreline configuration.

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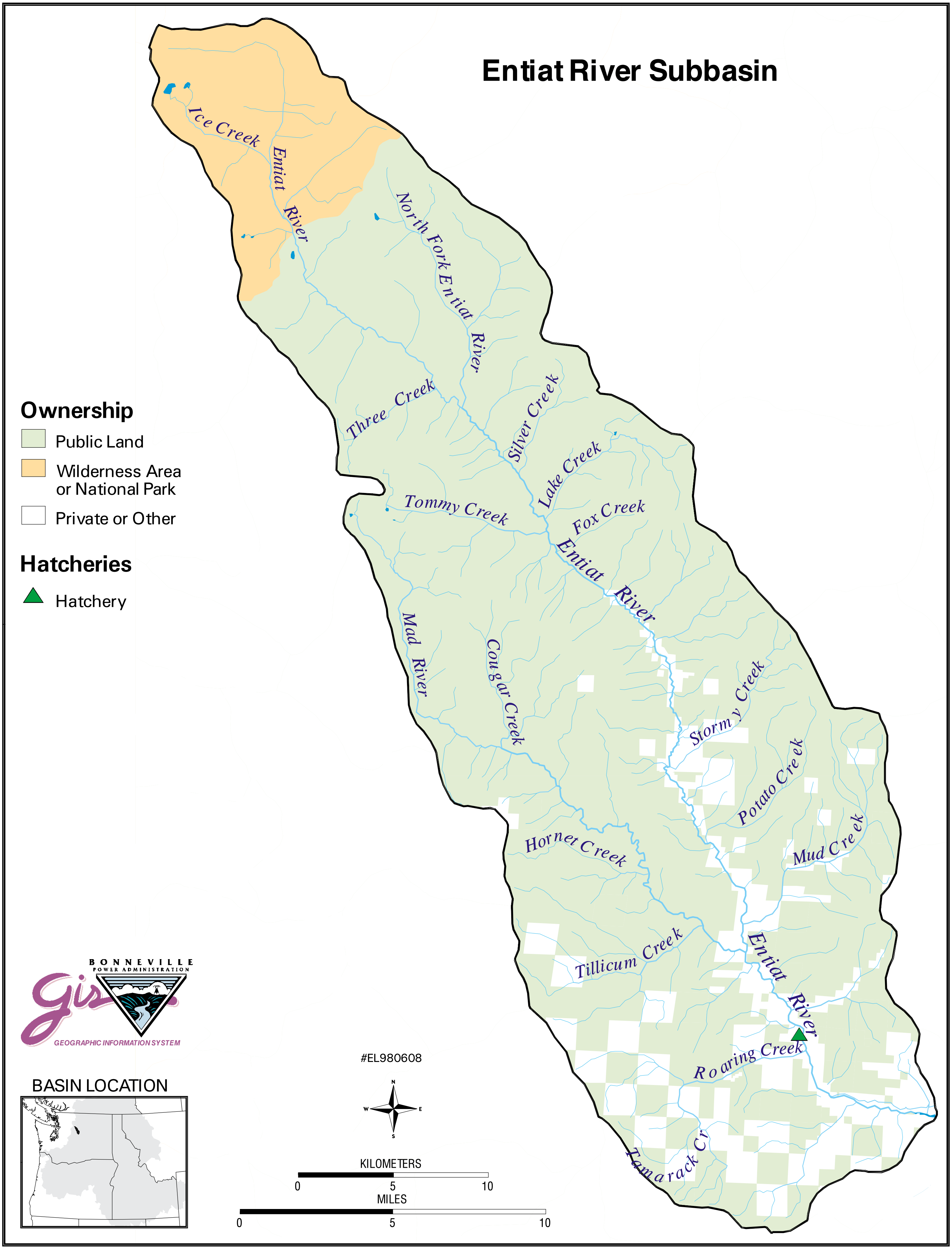

Entiat River Subbasin
Ownership
Public Land
Wilderness Area or National Park
Private or Other
Hatcheries
Hatchery
Ice Creek
Entiat River
North Fork Entiat River
Three Creek
Silver Creek
Lake Creek
Tommy Creek
Fox Creek
Mad River
Cougar Creek
Stormy Creek
Potato Creek
Mud Creek
Hornet Creek
Tillicum Creek
Roaring Creek
Tamarack Cr
BONNEVILLE POWER ADMINISTRATION
GEOGRAPHIC INFORMATION SYSTEM
#EL980608
BASIN LOCATION
N
W
E
S
KILOMETERS
0
5
10
MILES
0
5
10

Entiat Subbasin

Fish and Wildlife Resources

Subbasin Description

The Entiat River Subbasin in north central Washington, within Chelan County, covers approximately 420 square miles. The watershed originates from several high mountain peaks in the Cascades including Buckskin, Tinpan, and Pinnacle Mountains; Mt. Maude; Seven Fingered Jack; and Mt. Fernow. The Entiat Mountains form its southwestern boundary and the Chelan Mountains its northeastern boundary, with peaks to 9,249' elevation. The Entiat subbasin does not reach the crest of the Cascade Range crest and therefore does not receive as much precipitation as adjoining subbasins. The headwaters of the Entiat River come out of the Glacier Peak Wilderness Area. The Entiat River flows in a southeasterly direction for approximately 42 miles before entering the Columbia River at river mile (RM) 483.7. The Entiat River enters the Columbia River eight dams above the Pacific Ocean. Two major tributaries drain into the Entiat River, the North Fork Entiat and the Mad River.

Land ownership in the Entiat watershed is predominantly in public ownership, with much under management by the USFS, BLM and Washington Dept. of Fish and Wildlife (approximately 83%). The remainder of the lands is privately owned and primarily lies in the lower part of the watershed. There are approximately 1,300 acres of orchards in the lower valley; much of it classified as prime agricultural land. Much of this agricultural land lies adjacent to the mainstem of Entiat River.

Fish and Wildlife Status

Spring chinook. The endangered population of spring chinook spawn and rear in the Entiat River and the lower Mad River. Fry emerge in early spring and emigrate to the lower reaches of the primary tributaries, and mainstem Entiat River, where they rear until emigrating during late spring and early summer of the following year. Their numbers have substantially declined in recent times. The management intent is for hatchery supplementation. Presently eggs for fish production are collected from adults that return to the hatchery. Virtually all of the adults return to the hatchery. The goal is for 400,000 yearling plus 400,000 sub-yearling to be produced and released to ponds at the hatchery. The hatchery escapement goal is 225 females and 225 males, which total 450 adult spring chinook.

Summer chinook. A remnant natural spawning run of summer chinook exists in the Entiat River from the mouth to at least River Mile 28 (CRITFC 1995). The management intent is for natural production.

Summer steelhead. Summer steelhead spawn and rear in the Entiat River and some tributaries. The Mad River is the principal steelhead-producing tributary to the Entiat River (ECRBS 1979). The Entiat River historically had a moderate population of natural steelhead that was probably distributed throughout the watershed. The natural stock is thought to have declined dramatically from historical numbers, although the extent of decline is unknown for there is little information on the condition of steelhead in the Entiat River. The natural spawning population of summer steelhead is listed as endangered under ESA listings. The management intent is for natural production

Sockeye. A small naturally spawning population of sockeye occurs in the Entiat River. Spawning has been reported in the River near Brief (CRITFC 1995). The origin of these fish is not known, but is assumed to be from strays from the Wenatchee or Okanogon River systems.

Coho. A large naturally spawning run of coho historically occurred in the mid-Columbia River tributaries. Natural spawning runs were recorded in the Okanagon, Methow, Entiat and Wenatchee (CRITFC 1995). Coho are currently listed as extirpated from the Entiat drainage (WDF et al 1990). Reintroduction is under discussion.

Resident native trout. The Entiat River and its tributaries support bull trout, cutthroat trout and rainbow trout. The predominant areas found to have the threatened population of bull trout are the upper and middle Mad River and the upper Entiat River below the confluence with the North Fork.

Table 1. Populations

Species/Stock	Pop. location	Mgmt intent	Special status	Number of Adults Current	Number of Adults Target
ChS	Entiat R., Lower Mad R.	S	Endangered	62 returning adults (average between ‘94-’98 based on redd count surveys)	Hatchery escapement goal: 225 females and 225 males, Total: 450 adult spring chinook.
ChSu	Entiat R. from mouth to at least River Mile 28	N		91 returning adults (average between ’94 – ’98 based on redd count surveys)	
StSu	Entiat R. and some tributaries especially Mad R.	N	Endangered	8 redds found in Mad River (1998)	Natural production goal: 1,471 (1996)
Sockeye	Entiat R.	N		9 returning adults (1998)	
Bull Trout	Upper Entiat R. below the confluence with the NF, and the upper and middle Mad R.	R –native	Threatened		
Westslope Cutthroat Trout	Upper Entiat R. below the confluence with the NF, and the upper and middle Mad R.	R –native			
Rainbow Trout	Upper Entiat R. below the confluence with the NF, and the upper and middle Mad R.	R – exotic			
Mountain Whitefish		R – native			
Coho	Entiat River		Extirpated	0	

* Blanks are information unknown

Habitat Areas and Quality

The mainstem is the primary spawning and rearing area for spring and summer chinook and the small run of sockeye. The most suitable spawning habitat is concentrated between Fox Creek Campground and McKenzie Diversion Dam. About 80% of spawning takes place between RM 16 – RM 21. Past RM 21 spawning is considered sporadic up to Box Canyon. Poor spawning and rearing habitat exists in the Mad River up to Tillicum Creek, whereupon habitat is upgraded to "fair" up to Young Creek. From the mouth Entiat up to the McKenzie Diversion Dam spawning and rearing areas are poor.

At RM 15 there is a terminal moraine formed by a valley glacier during the Pleistocene. Above the moraine, the valley is U-shaped and below it is V-shaped from stream cutting. A series of water falls at RM 29.1 forms a natural barrier to spawning salmon. Stream gradient below Box Canyon RM 29 to 26 is steep and gravel is only found in small pockets. From 26 to 15 the gradient lessens and gravel is abundant. Between RM 15 and RM 2 the river gradient steepens and substrate is mostly cobble and boulder. Below RM 2 the river gradient decreases. There are limited gravel areas around RM 1 and large deposits of silt and sand exist near the mouth.

Habitat quality has been significantly reduced from historic levels as a result of fires occurring in 1970, 1976, 1988, 1990, and 1994. With the burning of considerable amounts of vegetation, coupled with high intensity rain and flooding, erosion of slopes and deposition of materials within the river resulted in heavy losses of spawning and rearing habitat. The loss of riparian area has caused decreased amounts of shade and large woody debris recruitment. There is also a reduction of ground water release to surface flows. Increased erosion has concluded in fine sediment delivery to the creeks and river.

The major constraint on the Entiat River is productivity, with instream cover and adequate flows also problems. Since the Entiat is in a semiarid farm region, irrigation diversions and improper culver installation have adverse effects on spring chinook production. Low flows due to irrigation diversions contribute to high temperatures. These conditions of high temperatures during late summer months can reduce the area available for rearing and spawning as well as adversely impacting adult migration and survival. Subbasin diversions, low flows and improper screening impact steelhead production and juvenile survival.

The tributaries to the Entiat River primarily drain from the national forest land with some private and state holdings, especially on the Roaring Creek, Mud Creek and Stormy Creek. Conditions on the tributaries vary considerably with heavier impacted areas due to roads impinging on the stream channel, logging, fires, and recreational activities. Roads in close proximity to the channel cause channel and habitat simplification, fine sediment delivery, reduction in riparian vegetation, and channel confinement.

Watershed Assessment

Watershed Assessment has been completed on the Entiat River by the U.S. Forest Service (Watershed Assessment Entiat Analysis Area, Wenatchee National Forest, 1996).

Limiting Factors

- Irrigation withdrawals reduce habitat quality and contribute to elevated temperatures in the summer months on the lower mainstem of the Entiat River.
- Riparian areas in the mid and lower Entiat River have been, and continue to be, impacted from residential development, agriculture, roads and recreational use.
- Riverbank armoring on some portions of the lower river have reduced rearing area and confined the channel.
- Forest Practices have impacted water quality and habitat conditions along portions of the mainstem of the Entiat River as well as its tributaries. Past logging activities have reduced large woody debris recruitment and shade, caused fine sediment delivery from roads and ground disturbance, and simplified habitat conditions.
- Roads parallel and in close proximity to streams in the Entiat watershed have substantially reduced stream channel complexity, removed riparian vegetation, and confined the stream channel system. In particular, roads contributing to impaired habitat and water quality conditions occur along portions of the middle mainstem of the Entiat River, lower Mad River, Lower Roaring Creek, Crum Canyon, and Mud Creek.

- Road construction and attendant channel realignment, bank hardening, and loss of riparian vegetation have severely limited rearing habitat.
- Peak flows and fine sediment delivery has been elevated from the Tyee Complex Fire of 1994 and the Dinkleman Fire of 1988.

Subbasin Management

Goals, Objectives and Strategies

The indigenous anadromous fish species most actively targeted for management in the Entiat River Subbasin are spring and summer chinook, sockeye, and summer steelhead. Coho are extinct, and little is currently known about Pacific lamprey status. The goal for these species is to restore sustainable, naturally producing populations to support tribal and non-tribal harvest and cultural and economic practices while protecting the biological integrity and the genetic diversity of the watershed.

To address these problems, the co-managers have adopted the following outcome-based objectives:

1. Improve adult pre-spawning survival.
2. Improve juvenile rearing survival.
3. Improve juvenile migrant survival.
6. Improve egg and alevin survival by reducing fine sediment delivery to the stream system and moderating the frequency and occurrence of peak flows to near that found naturally.
7. Re-establish extirpated runs.

Strategies which achieve the objectives include improving habitat through implementation of habitat restoration and fish passage projects; promote and maintain functioning stream channels; reduce fine sediment delivery from roads and ground disturbing activities, modify and conduct land management activities to ensure that the frequency and occurrence of peak flows is similar to that found naturally, and supplementing naturally spawning populations to enhance natural production and re-establish natural production.

Research, Monitoring and Evaluation

- Further delineate fish distribution and habitat conditions in the basin.
- Complete Watershed Assessments/Analyses on priority basins where it has not been completed.
- Further determine limiting factors to stocks in the Entiat basin.
- Evaluate effectiveness of supplementation projects, habitat and riparian restoration, and improvements to land management activities.
- Conduct a thorough survey of road crossings (culverts) in the drainage to determine sites that block or impede fish passage.

Remaining Work

- Acquire lands critical for future stock productivity through purchase or easement.
- Restore degraded habitat and riparian areas important for production.
- Modify land practices that are limiting salmonid production.
- Reintroduce coho to the Entiat basin.
- Provide adequate flows in the Entiat River and its tributaries. In particular, summer flows need to be improved on the lower and middle Entiat River.
- Relocate or remove roads in close proximity to streams. Road segments that are causing sediment delivery and channel confinement should be prioritized for work.

Subbasin Recommendations

Projects & Needed Future Actions

The Yakama Indian Nation will study the feasibility of re-establishing a naturally spawning coho population within the mid-Columbia tributaries (Project #9604000), while keeping adverse ecological impacts on other salmonid species of concern within acceptable limits. One objective is to determine whether it is feasible to establish a viable localized broodstock for hatchery supplementation in the mid-Columbia. By releasing coho smolts from mid-Columbia location and capture returning adults at various established traps with the intent of egg banking at an existing, yet to be determined mid-Columbia facility, would accomplish this objective. Another objective is to evaluate the long-term changes in the genetic and life history profiles of non-native sock of hatchery coho introduced to mid-Columbia River tributaries. By monitoring divergence between lower Columbia River hatchery stocks (LCRHS) and broodstock used by YIN to obtain information on traits of adaptive value within the mid-Columbia basin would meet this objective. A further objective is to develop an Environmental Impact Statement on the long-term restoration phase of the project by following the policies and guidelines as defined in the National Environmental Policy Act.

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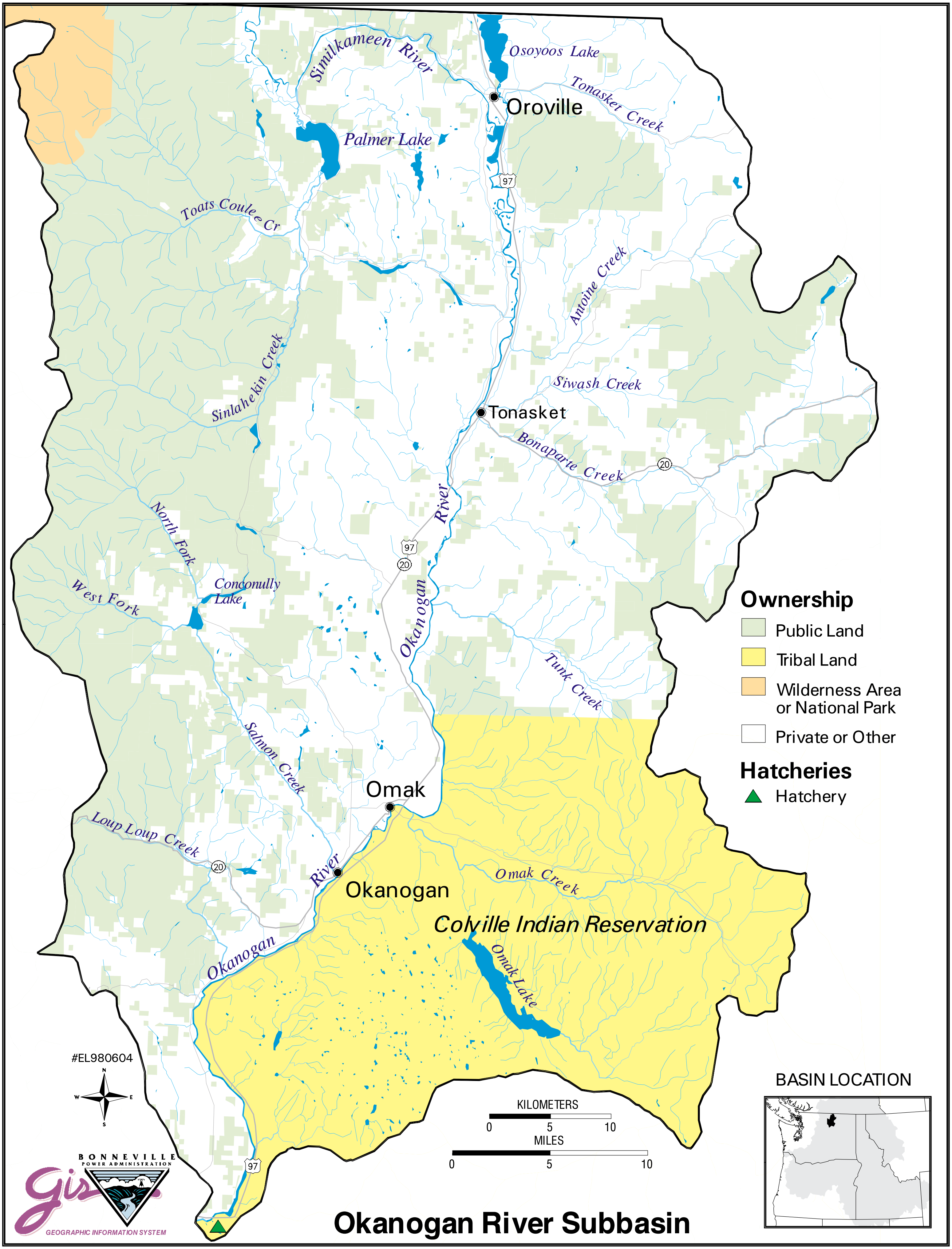


Okanogan River Subbasin

Fish and Wildlife Resources

Subbasin Description

The Okanogan Subbasin straddles Washington and British Columbia. The Okanogan River begins near Armstrong, British Columbia, and flows south through a series of lakes to the Columbia River where it enters between Wells and Chief Joseph dams. The Similkameen River, which enters the Okanogan River from the northwest approximately 75 miles above the mouth, is the main tributary and is primarily in Canada. Together, the Okanogan-Similkameen subbasin covers approximately 8,200 square miles, with 2,500 square miles in the United States. Nearly all of the subbasin experienced glaciation and is characterized by moderate slopes and broad, rounded summits.

The largest landowners in the U.S. portion of the subbasin are the Confederated Tribes of the Colville Reservation and the U.S. Forest Service. Forest, rangeland and irrigated agriculture are the dominant land uses. A diversion dam above Oliver, B.C. is the upper terminus to migratory fish. The Similkameen River is impassable at Enloe Dam, an abandoned power generation facility 8.8 miles above the confluence with the Okanogan River that blocks access to more than 95% of the anadromous fish habitat in the Similkameen River, the Okanogan’s largest tributary. Recently there has been interest in relicensing the Enloe Dam, as well as investigations of potential fish passage alternatives there.

Fish and Wildlife Status

The Okanogan River and connected tributaries currently support anadromous runs of chinook salmon, sockeye salmon, and smaller runs of steelhead. Summer steelhead are listed as endangered and spring chinook, also listed as endangered, are considered extirpated from the Okanogan River Basin. Important inland species include mountain whitefish, rainbow trout and westslope cutthroat trout. Bull trout were once found in Salmon Creek and Loup Loup Creek, both tributaries to the Okanogan River.

Spring chinook. Spring chinook have been extirpated from the subbasin. Suitable habitat for spring chinook exists above Enloe Dam and possibly in Salmon and Omak creeks.

Summer chinook. These fish are managed for natural production and utilize the middle and upper reaches of the mainstem and the Similkameen below Enloe Dam.

Sockeye. Run strength of sockeye salmon to the Okanogan is highly variable. Lake Osoyoos is the primary rearing area for sockeye salmon in the Okanogan Watershed. Sockeye salmon spawn in the mainstem Okanogan River upstream of Osoyoos Lake, in an 8 km reach (Hagen and Grette 1994).

Table 1. Summer steelhead. Steelhead natural production occurs throughout the subbasin.

Stock	Genetic History / Management Intent	Spawn Escape	Hatchery Take	Harvest	Recent Total Escape
ChS	Re-establish through supplementation	1,000			
ChSu	Manage for natural and hatchery production	2,000			
StS	Manage for natural and hatchery production			10,000	1,750
Sock	Manage for natural production	15,000			47,300

In Washington, the winter of 1997-98 was abnormally mild and provided a favorable condition for deer. Winter food for most deer is winter wheat and new growth forbs. During the winter of 1997-98 these low-growing foods were readily available to deer because of lack of snow. Winter mortality was likely less than normal.

Elk populations in Eastern Washington are strong and relatively stable due primarily to the large amount of elk winter range controlled by WDFW.

The 1997-98 midwinter waterfowl inventory was completed by WDFW and U.S. Fish and Wildlife (USFWS). During the 1980's, ducks declined in the Pacific Flyway midwinter survey, from about 7,000,000 in the 1970's. Numbers this year increased from 5,473,691 in 1996-97 to 6,607,263 in 1997-98.

Columbian Sharp-tailed Grouse numbers have drastically declined in Washington over the past 100 years. Sharp-tails were plentiful in eastern Washington according to early explorers. A total number of 112 sharp-tailed grouse leks (courtship areas) were documented between 1954 and 1994. Lek counts are used to estimate population size and stability. The number of males per lek and active leks also indicate stability of the population. Males per lek declined from 13 in 1954 to 5 in 1994. In Douglas County, 46% of active leks disappeared, 65% disappeared in Okanogan County, and 61% disappeared in Lincoln County from 1954 to 1994.

Several environmental and habitat changes appear to have led to improving sage grouse and sharp-tailed grouse populations. The breeding population of sharp-tailed grouse in Washington is currently estimated at 380. These sharp-tails reside in scattered groups in Douglas, Lincoln, and Okanogan counties. Areas supporting the most sharp-tails include West Foster Creek, East Foster Creek, Cold Springs Basin, and Dyer Hill in Douglas County; Swanson Lakes Wildlife Area in Lincoln County; and the Tunk Valley and Chesaw Units of the Scotch Creek Wildlife Area in Okanogan County.

Habitat Areas and Quality

Anadromous fish restoration efforts have recently been initiated in the basin. The restoration efforts have been focused in Salmon Creek and Omak Creek. These two tributaries have been identified in the Mid-Columbia Mainstem Conservation Plan (draft 1997) to be logistically and institutionally feasible to recover anadromous fish and where the likelihood of success is greatest.

Similkameen River. This is the largest tributary and 95% of its anadromous fish habitat is blocked by Enloe Dam.

Lake Osoyoos. This lake provides the principal rearing for sockeye and moderates winter temperatures in the Okanogan River below the lake. Water quality in Lake Osoyoos may be a significant factor limiting smolt production.

Upper Okanogan. Instream flows are also a significant problem for sockeye. Flows in the Canadian portion of the subbasin are dropped approximately by half at the end of the irrigation season, resulting in exposure and occasionally, total desiccation of the redds. Spring flows have also been inadequate to flush sockeye smolts from the system, leaving them vulnerable to predation.

Historically, records indicate sockeye salmon were once found in Lake Osoyoos, Skaha, Vaseaux, and Okanogan (Fryer 1995). Together, these lakes contained over 41% of the rearing habitat in the Columbia Basin but because of the construction of impassible dams the distribution of sockeye is limited. Although sockeye continue to return to Osoyoos Lake, a lake where spawning and rearing habitat is marginal, the levels of sockeye are not approaching what the Canadian portion of the Okanogan system used to support.

Three major changes in habitat have occurred in Washington's Columbia Basin in recent years that appear to have affected deer significantly. Several thousand acres of primarily dryland wheat ground was in the Conservation Reserve Program. Conversion of wheat to grass added permanent cover and some useful forage in the form of forbs, but in some areas removed a vital winter food resource (i.e., winter wheat).

Major habitat development, including several hundred acres of irrigated food plots provided high quality habitat for deer migrating from Douglas County and northeastern Lincoln County.

During the past three seasons weather patterns have been favorable resulting in improved elk forage production on all ranges. However, the summer of 1998 was a very dry period with no green up beginning before the winter set in and impacted winter forage availability. Most of the summer range is managed by the U.S. Forest Service, Washington Department of Natural Resources, Boise Cascade Corporation, Plum Creek Timber Company and Longview Fiber Corporation. Habitat suitability for elk varies across these ownerships depending on management emphasis.

Sagebrush and other native vegetation has invaded many of the Conservation Reserve Program fields improving their benefits to sage and sharp-tailed grouse. Aggressive habitat enhancements for sharp-tails continue on lands purchased by WDFW (using BPA and other funding sources). The value of these lands to the grouse is increasing noticeably as habitat rehabilitation proceeds.

Scotch Creek Wildlife Area is located in north-central Washington, approximately ten miles northwest of Omak and Okanogan, both are geographic populations centers of Okanogan County. The area lies approximately 40 miles south of the Canadian border and 100 miles north of Wenatchee.

The Okanogan River Basin has multiple listings for impaired and threatened surface waters as determined by the Washington Department of Ecology. The listings include temperature, dissolved oxygen, pH, DDT and instream flow.

Watershed Assessment

During 1995 a watershed assessment was completed for Omak Creek. The assessment was prepared under the authority of the Watershed Protection and Flood Prevention Act (16U.S.C 1001-1008), known as Public Law 566 (PL 566). The plan was prepared by the CCT, Natural Resources Conservation Service (NRCS) and the Bureau of Indian Affairs (BIA). The plan was formulated to achieve watershed improvement and to restore fish habitat for anadromous fish.

A watershed assessment for Salmon Creek was prepared by the U.S. Forest Service during 1997. Although the assessment focused on the upper region of the watershed (U. S. Forest Service lands), the reestablishment of flow and consequently anadromous salmonids in the lowermost 14 miles was identified as a recommended project. Currently a partnership has formed between the Colville Confederated Tribes and the Okanogan Irrigation District to investigate the feasibility of providing flows in Salmon Creek to restore anadromous fish while maintaining agricultural production within the district.

Other watershed assessments which have been conducted by the U.S. Forest Service included Toats-Coulee (1994), Bonaparte Creek (1998), Tonasket Creek (1998) and Antoine-Siwash Creeks (1999, draft).

Limiting Factors

Thermal and/or structural barriers exist on most tributaries within the subbasin. The mainstem Okanogan suffers from extreme summer temperature, fine sediment, and low flow problems due to irrigation withdrawal. Stream bank erosion from overgrazing is found throughout the subbasin. Salmon Creek, once an important spring chinook stream, is now entirely diverted into an irrigation delivery system.

Resource problems were identified in the Omak Watershed Assessment and included fish migration barriers (man-caused), lack of riparian vegetation, poor stream channel conditions, high seasonal temperatures, low levels of dissolved oxygen, and accelerated sediment yield from uplands and streambanks.

Two man-made fish passage barriers were identified as a resource problem in Omak Creek (NRCS 1995). One barrier was located near the Okanogan River confluence. The barrier was created by an 1,800 ft. section of culvert, which routed Omak Creek under a timber mill. The section of culvert created a velocity barrier to migrating fish. Currently, under the direction of new ownership, Omak Creek has been re-routed in a newly constructed channel which is located away from the mill site. The new channel has been constructed to mimic natural channel morphology based upon similarities of upstream reaches, gradient and valley form. The stream gradient of the new channel was designed to optimize fish passage. The re-routing of Omak Creek in the newly constructed channel will minimize impedance to fish passage and access approximately 5 miles of habitat upstream of the mill. Omak Creek was listed in the Habitat Conservation Plan (HCP), developed by the public utility districts of Chelan, Grant, and Douglas counties and fish management agencies, as the second biological priority for habitat restoration in the Okanogan River Watershed. The HCP identified the velocity barrier, created by the culvert, to be the single most important means to restore natural reproduction in Omak Creek.

The second fish passage barrier is located at Mission Falls. The Mission Falls reach is located within a gorge. During the early 1900's a railroad system was constructed along Omak Creek to transport commodities, particularly timber. The rail system followed along the gorge at Mission Falls. Rubble from the railroad construction (boulders, cribbing, and railroad ties fell into the stream channel and created a barrier to migrating anadromous fish. Preliminary surveys conducted by the NRCS and CCT-Fish and Wildlife personnel have identified individual boulders which have created barriers to migrating fish. Stream profiles based on engineered surveys and generated via computer programs have revealed a stream channel which anadromous fish are capable of navigating. Removal of rubble and railroad material will allow anadromous fish to access approximately 26 miles of potential spawning and rearing habitat within the mainstem of Omak Creek. In addition, lower reaches of connected tributaries, such as Stapaloop Creek, Swimptkin Creek, and Trail Creek, may also be utilized by adult spring chinook salmon and summer steelhead.

Subbasin Management

Goals, Objectives and Strategies

The indigenous anadromous fish species most actively targeted for management in the Okanogan River Subbasin are spring chinook (extirpated) and summer chinook, sockeye, and summer steelhead. The goal for these species is to restore sustainable, naturally producing populations to support tribal and non-tribal harvest and cultural and economic practices while protecting the biological integrity and the genetic diversity of the watershed.

In an attempt to meet the subbasin goal, the co-managers have adopted the following outcome-based objectives: 1) improve adult pre-spawning survival and 2) improve juvenile survival.

The broad strategy for rebuilding and protecting Okanogan spring chinook combines habitat protection, passage improvements, harvest management restrictions, and supplementation with artificial production. Specific strategies include improving habitat through the use of habitat restoration and passage improvements and supplementing naturally spawning populations to enhance natural production.

In 1991, the Washington Department of Fish and Wildlife (WDFW) purchased what is now the Scotch Creek Wildlife Area, primarily for the protection of critical Columbian sharp-tailed grouse habitat. Acquisition funding was provided through the Washington Wildlife and Recreation Coalition. The primary management objective for the Wildlife Area is the recovery of sharp-tailed grouse habitats and the remnant grouse populations, however, mule deer habitat is also a major focus. The area encompasses 15,469 acres in three separate units, Scotch Creek, Tunk Valley and Chesaw.

Past Efforts

Project #9604200 funds the Colville Confederated Tribes to carry out Okanogan Watershed Planning and to implement habitat restoration.

Protection of existing spawning and rearing habitat along with alleviation of survival problems in summer rearing/overwintering in the lower tributaries are critical objectives of the strategy. Specific recommendations of habitat protection activities are being developed and pursued through the mid-Columbia Habitat Conservation Plan currently under development. There is significant potential for increasing spawning and rearing habitat available to anadromous fish in this subbasin by addressing passage blocks such as Enloe Dam.

Supplementation is being implemented primarily through mid-Columbia PUD funding.

In Washington, over the past 60 years, the area now known as Scotch Creek Wildlife has undergone significant changes. As a working cattle ranch, much of the uplands were originally converted from native shrub-steppe grassland to grain fields of rye or wheat. Later these fields were seeded to crested and intermediate wheatgrass for livestock grazing. The native rangeland has been severely over grazed, allowing the encroachment of diffuse knapweed and Russian knapweed. Another significant vegetation change was the removal of deciduous trees (primarily water birch) along the riparian corridor to accommodate alfalfa production. This practice drastically reduced critical wintering habitat for sharp-tailed grouse.

The Scotch Creek Wildlife Area management plan was approved by BPA in 1997. Since that time restoration and enhancement efforts have included planting shrubs, weed control, and grassland seedings.

For the past 90 years, the Okanogan Irrigation District has diverted 100% of the flow from Salmon Creek leaving 3.5 miles downstream of the diversion dam dry. During May of 1998, the Colville Confederated Tribe joined in a partnership with the Okanogan Irrigation District. The partnership formed to study the feasibility of providing water downstream of the diversion dam for anadromous fish, while affording the Okanogan Irrigation District the ability to fulfill water delivery service in accordance with its water rights. Preliminary results and alternatives of the study will be completed in August 1999.

Habitat restoration projects, which address the aforementioned problems, are being implemented by the NRCS and CCT-Fish and Wildlife Department. Riparian vegetation has been planted along one mile of Omak Creek. Six in-stream structures were installed in Omak Creek to divert high energy flows away from exposed banks. Conifer tree revetments were also installed at 15 sites to dissipate energy and trap sediment. Changes in land management are also being addressed. Modification have included altering sizes of livestock grazing units to better utilize vegetation and incorporate grazing strategies (rest-rotation, riparian pasture, deferred grazing, etc.). Modifications in logging practices have included identification of roads to be removed, implementation of different timber management and consideration of effects upon the hydrologic cycles (Equivalent Clearcut Acres), and the potential sediment sources and effects of implementing other logging methods (helicopter, skyline).

Research, Monitoring and Evaluation

Project #9604200, Restore and Enhance Anadromous Fish Populations and Habitat in Salmon Creek, provides watershed planning activity for the Salmon Creek watershed.

The Natural Resources Conservation Service (NRCS) has joined in partnership with the Colville Confederated Tribes to conduct a physical stream survey of Salmon Creek. The result of this survey will outline recommendations and alternatives for improvements to the riparian corridor, fish habitat, water quality and streambank stability. Based on this survey a landowner steering committee will prioritize restoration projects on private lands. These projects may include instream structures, riparian vegetation planting, spring-box development and riparian fencing.

To address stabilizing and rebuilding the population of Okanogan River sockeye, an experimental re-introduction of sockeye salmon in Skaha Lake is proposed. This study would assess the potential risks (disease transfer, exotic species introduction, competition) and benefits (strengthening an indigenous stock, increased commercial, sport and tribal fisheries) of reintroducing sockeye salmon. The results of this study would be the basis for developing a strategy for re-introducing the species into Okanogan Lake, the farthest upriver lake. Okanogan Lake (34,997 ha) is considerably larger than Osoyoos Lake (2,332 ha) and Lake Wenatchee 995 ha), and consequently has the potential for a substantial increase in rearing capacity.

Remaining Work

The implementation of restoration projects and changes in land management practices will continue in Omak Creek. These efforts will be directed by the resource problems identified in the Omak Creek Watershed Plan/Environmental Assessment (NRCS 1995).

Some of the aforementioned restoration efforts have been implemented in the Omak Creek watershed. The implementation of the Omak Creek Watershed Plan/Environmental Assessment will continue and is to be completed in approximately 10 years.

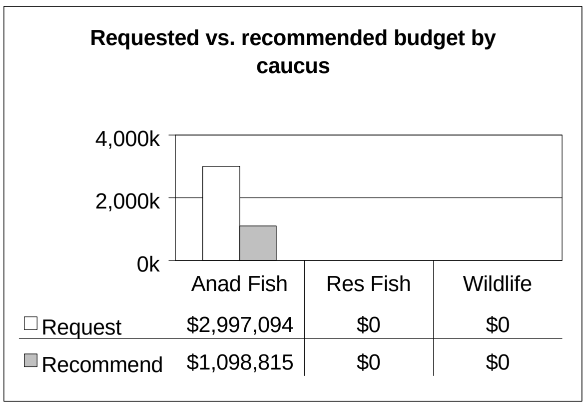
The Scotch Creek Wildlife is comprised primarily of shrub-steppe habitat. The Northwest Power Planning Council has designated shrub-steppe habitat as a high priority. This mitigation project's goal is the recover and management of sharp-tailed grouse. Restoration, enhancement, operation, maintenance, monitoring and evaluation activities must continue to ensure the continuance of the positive wildlife habitat benefits which are accruing.

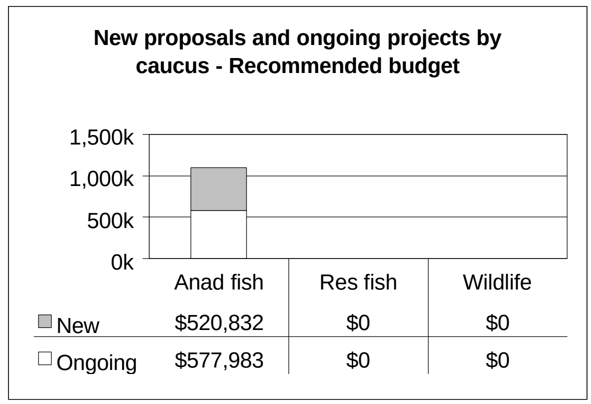
Subbasin Recommendations

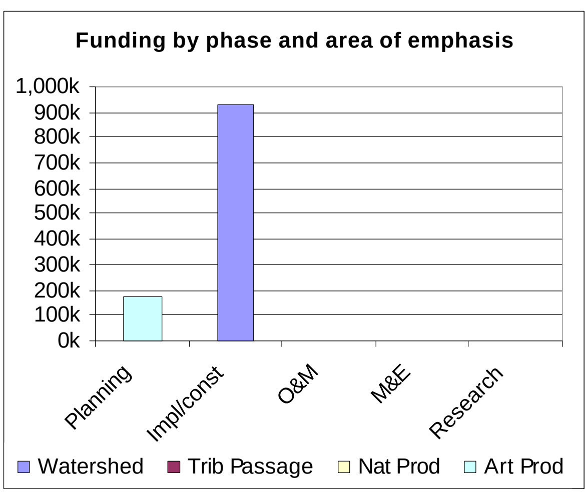
Projects and Budgets

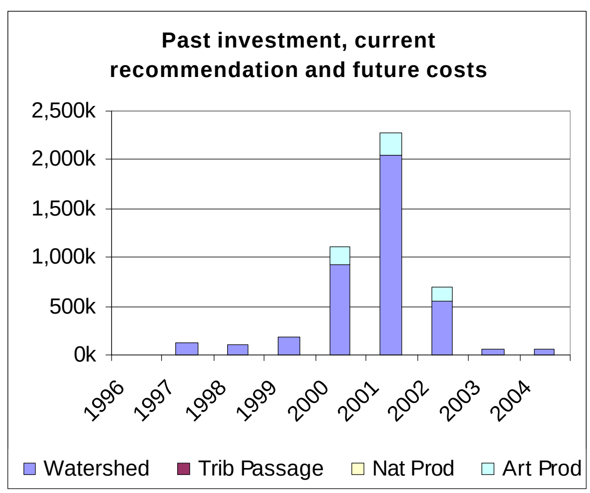
Based on the preceding subbasin description, the CBFWA fish and wildlife managers recommend funding a total of 3 anadromous fish projects at a cost of $1,098,815.

Refer to the following figures for detail on: 1) total recommended and requested budget by caucus, 2) funding for new and ongoing work, 3) funding by project phase and emphasis, and 4) funding by time period (past, current and future). Individual projects are listed in the following table.









ProjectID	Title	Sponsor	FY99 recom.	FY00 recom.	Estimated Outyears FY01	FY02	FY03	FY04

Anadromous Fish Projects

ProjectID	Title	Sponsor	FY99 recom.	FY00 recom.	FY01	FY02	FY03	FY04
20037	Improvement of Anadromous Fish Habitat and Passage in Omak Creek	CCT		350	56	56	56	56
20124	Evaluate An Experimental Re-Introduction of Sockeye Salmon Into Skaha Lake	CCT		171	223	135	0	0
9604200	Restore and Enhance Anadromous Fish Populations & Habitat in Salmon Creek	CCT	175	578	2,000	500	0	0
		Anadromous Fish Totals		**$1,099**	**$2,279**	**$691**	**$56**	**$56**
	* indicates ESA project, † indicates 'Innovative work'	**SUBBASIN TOTALS**		**$1,099**	**$2,279**	**$691**	**$56**	**$56**

All figures in thousands of dollars

Needed Future Actions

Restoration of aquatic resources should continue in the Okanogan Basin. Historically the Okanogan River embodied a fishery of major importance (Mullan et al 1992). Since the Okanogan River is a large system and approximately 2/3 of the basin lies within Canada, restoration efforts along the mainstem of the Okanogan River may be difficult. Therefore, restoration efforts have and will continue to be focused on more manageable units, such as tributaries. Restoration efforts directed toward tributaries will likely have a greater effect on improving anadromous fishery resources in the Okanogan River basin and may, cumulatively, reduce maximum water temperatures (identified water-quality impairment for the Okanogan River).

Efforts to restore sockeye salmon to historical range and levels should continue. Once, sockeye salmon were found in Okanogan Lake (British Columbia), the uppermost lake along the Okanogan River. This lake has been restricted to migratory fish since 1915. Historically, at Okanogan Falls, south of Okanogan Lake, an estimated 100,000 sockeye salmon were harvested by native people annually. Currently, a pilot study to reintroduce sockeye salmon into the historic range has been proposed. This pilot study will be the first study conducted in the Okanogan River basin to address the issues of reintroduction of sockeye salmon and begin to restore a formerly strong salmonid population.

Actions by Others

Efforts by the Colville Confederated Tribes continue to maintain, restore or enhance aquatic resources within the Okanogan Basin. The Colville Confederated Tribes, Quality Veneer and Lumber Inc. and the Washington Department of Fish and Wildlife have joined together to reroute Omak Creek to an open channel, away from lumber mill site where it was routed through 1,800 feet of culvert. Joint efforts between the Colville Confederated Tribes and the Natural Resources Conservation Service continue in the Omak Creek watershed. These efforts include instream restoration (structures, revetments, etc.), vegetation planting, livestock management and road obliteration.

The U.S. Forest Service continues to conduct watershed assessments in the sub-basins within the Okanogan Basin. These assessments are used in directing future management activities. Roads, in many of the sub-basins, have been identified as a factor reducing the quality of wildlife and fishery resources. Overstocked forest stands have been identified in certain areas. These may be managed toward historical vegetation density, resulting in a more natural hydrological flow regime.

Okanogan Conservation District is near completion of a water quality study in the Okanogan Basin. This study is funded by the Washington Department of Ecology. The preliminary results have identified specific sub-basins contributing unnaturally high levels of sediment. Future management activities and modifications to current land practices may be directed toward these subbasins.

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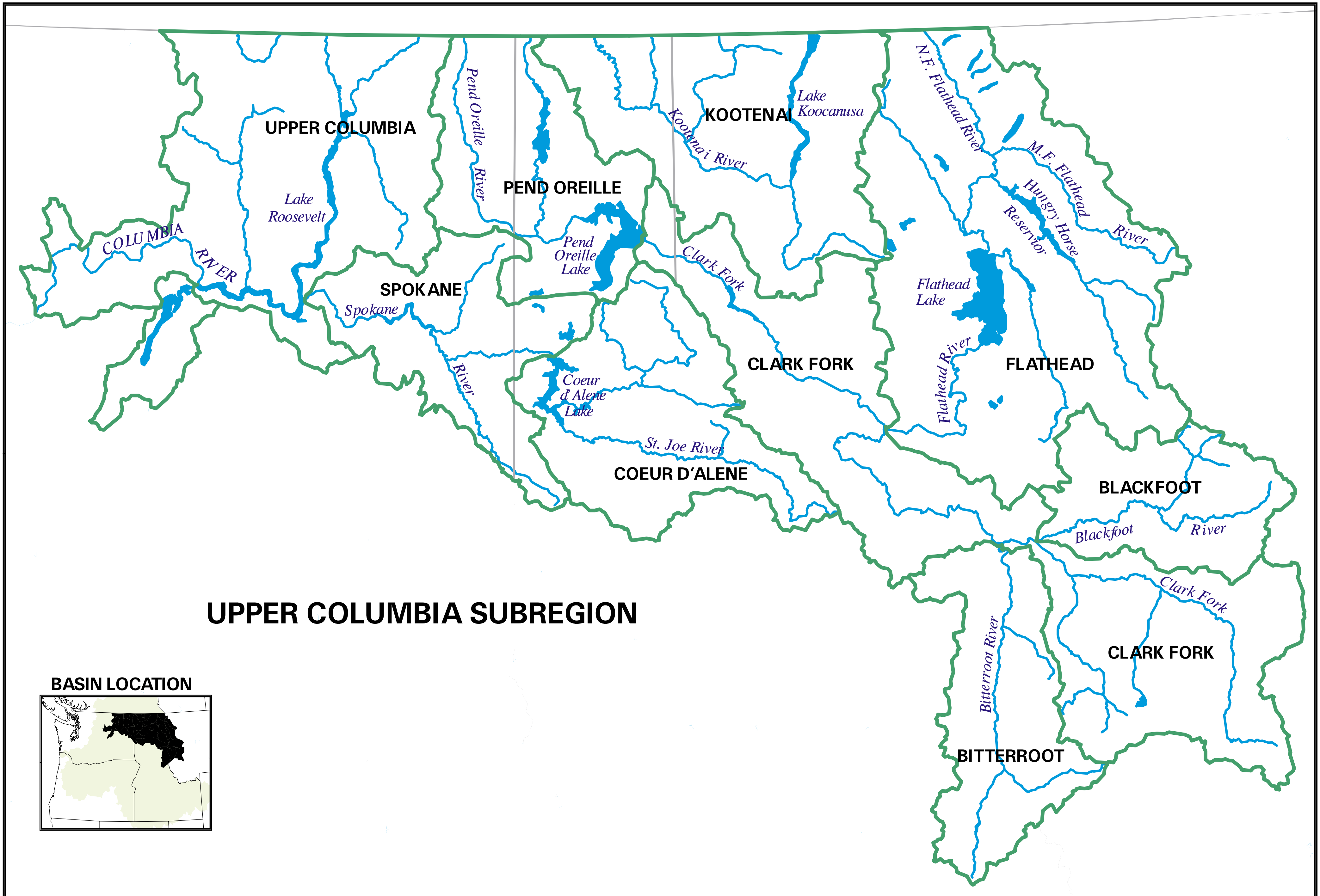
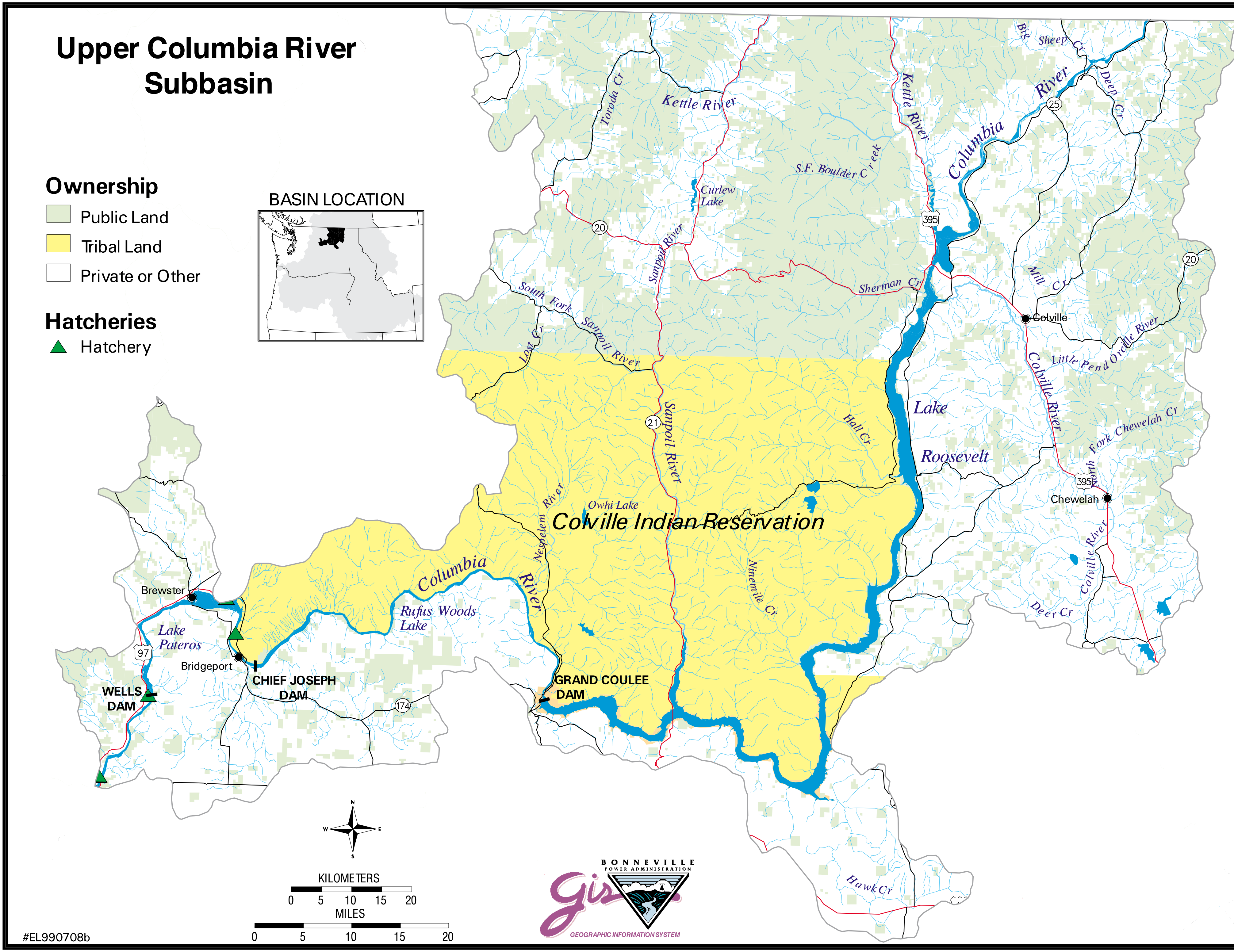


UPPER COLUMBIA SUBREGION
UPPER COLUMBIA
PEND OREILLE
KOOTENAI
FLATHEAD
SPOKANE
CLARK FORK
COEUR D'ALENE
BLACKFOOT
CLARK FORK
BITTERROOT
Lake Roosevelt
COLUMBIA RIVER
Pend Oreille River
Pend Oreille Lake
Spokane River
Coeur d'Alene Lake
St. Joe River
Kootenai River
Lake Koocanusa
Clark Fork
N.F. Flathead River
M.F. Flathead River
Hungry Horse Reservior
Flathead Lake
Flathead River
Blackfoot River
Clark Fork
Bitterroot River
BASIN LOCATION

Upper Columbia Subregion

The Upper Columbia Subregion is defined as the Columbia River and its tributaries from Chief Joseph Dam to the headwaters within the United States. This subregion covers approximately 43,300 square miles and includes the following subbasins: Upper Columbia Mainstem, Spokane, Coeur d'Alene, Kootenai, Pend Oreille, Clark Fork, Flathead, Bitterroot, and Blackfoot.

Upper Columbia River Subbasin



Upper Columbia Mainstem Subbasin

Res fish	9	projects	$3,878
Wildlife	4		1,094
	13		$4,972

Fish and Wildlife Resources

Subbasin Description

The Upper Columbia Mainstem refers to the Columbia River from Chief Joseph Dam upstream to the Canadian Border, tributaries to the mainstem, and closed basin lakes adjacent to the mainstem within Washington State. Chief Joseph Dam created Rufus Woods Lake and Grand Coulee Dam created Lake Roosevelt. Major Tributaries are the Nespelem, San Poil, Spokane, Kettle, and Colville rivers. The subbasin includes waters within the Colville Indian Reservation, Spokane Indian Reservation and the State of Washington. Specific waters are subject to cooperative fisheries management by two or three of the aforementioned management agencies.

Fish and Wildlife Status

Fish

The construction of Chief Joseph and Grand Coulee Dams blocked anadromous and resident fish migration to the Upper Columbia Mainstem. These dams were not built with fish ladders or other devices to allow fish migration upstream. As a result, the Upper Columbia Mainstem is called the “blocked area”. Prior to hydropower development, the Upper Columbia areas supported a large diverse fish population, which included eleven anadromous salmonid stocks (Scholz et al. 1985). The construction of Chief Joseph and Grand Coulee Dams caused the complete extirpation of those eleven anadromous fish stocks, reducing the native salmonid species assemblage by approximately 64 percent. The loss of salmon irrevocable altered the ecosystem and forever changed the social – economic systems of those inhabiting the blocked area. The Native American culture, religion and livelihood were dependent upon the once abundant salmon. Resident fish species were also impacted through habitat alteration (inundation), lost productivity (absence of nutrient component attributable to anadromous fish), habitat degradation relating to land-use practices (agriculture, grazing, logging and municipal development) and altered aquatic communities (exotic introductions).

The “blocked area” has little resemblance to the pre-dam state. As a result, few resident native keystone species remain abundant. Native bull trout, westslope cutthroat and redband trout are undetectable in the mainstem. Moreover, few tributaries of the mainstem contain fluvial stocks. The only known adfluvial native salmonid stocks are associated with the San Poil River, rainbow trout (either redband or residulized steelhead) and kokanee (Jerry Marco, Tribal Fisheries Biologist, personal communication). The remainder of the salmonid stock assemblage consists of native northwest species comprised of non-native stocks (coastal rainbow trout) and non-native species (brook trout, and lahontan cutthroat trout). The non-salmonid community has also changed from predominantly native sturgeon, lamprey, and burbot populations to predominantly exotic walleye, and smallmouth. Mountain lakefish populations have been substituted by lake whitefish. White sturgeon inhabit the mainstem of the Columbia River and have been greatly reduced in numbers due to development of the hydropower system.

Historical stocking data indicate non-native species/stocks were and are used to supplement depressed fisheries since the early 1930's (Thiessen, 1965 and Halfmoon, 1978). Species utilized included rainbow trout (various non-native stocks), eastern brook trout, coastal cutthroat trout and lahontan cutthroat trout, and walleye, among others. Currently the fishery programs stock 33 different water bodies within the Upper Columbia Subbasin. One hundred percent of the water bodies currently being stocked have received hatchery origin fish since 1974 and seventy-seven percent of those have received stocking since 1960. Large proportions (90%) of the water bodies stocked through these projects are closed lake systems and are not inhabited by native salmonids.

Definitive stock status of the two possible native salmonid stocks present (adfluvial rainbow trout and natural production kokanee) is currently unknown. Initial research currently being conducted to determine stock origin and status of these two salmonid populations indicates that the adfluvial rainbow trout population is depressed, while the natural production kokanee may be considered critically depressed. The non-native salmonid stocks and species’ (coastal rainbow trout, brook trout and lahontan cutthroat trout) status is considered robust. These populations exist as naturally producing and artificially augmented populations.

Wildlife

In addition to the losses to fish, about 80,000 plus acres of critical, low elevation wildlife habitat were lost above the Chief Joseph and Grand Coulee projects due to dam construction and inundation. Over 24,000 acres of this loss occurred within the Colville Indian Reservation, and 3,900 acres on the Spokane Reservations. This destroyed critical habitat for deer and other wildlife species such as sharp-tailed grouse that were relied upon for existence by native peoples.

Several target species of wildlife were used to aid in evaluating the losses from the hydropower development. These target species represent guilds of species with similar habitat requirements. These target species are also used to evaluate mitigation project lands and management effectiveness. These target species are: mule deer, sharp-tailed, blue, spruce, and ruffled grouse, mourning dove, Lewis and downy woodpecker, yellow warbler, Canadian goose, mink, bald eagle and spotted sand piper.

In Washington, the winter of 1997-98 was abnormally mild and provided a favorable condition for deer. Winter food for most deer is winter wheat and new growth forbs. During the winter of 1997-98 these low-growing foods were readily available to deer because of lack of snow. Winter mortality was likely less than normal.

Elk populations in Eastern Washington are strong and relatively stable due primarily to the large amount of elk winter range controlled by WDFW.

The 1997-98 midwinter waterfowl inventory was completed by WDFW and U.S. Fish and Wildlife (USFWS). During the 1980's, ducks declined in the Pacific Flyway midwinter survey, from about 7,000,000 in the 1970's. Numbers this year increased from 5,473,691 in 1996-97 to 6,607,263 in 1997-98.

Columbian Sharp-tailed Grouse numbers have drastically declined in Washington over the past 100 years. Sharp-tails were plentiful in eastern Washington according to early explorers. A total number of 112 sharp-tailed grouse leks were documented between 1954 and 1994. Lek counts are used to estimate population size and stability. The number of males per lek and active leks also indicate stability of the population. Males per lek declined from 13 in 1954 to 5 in 1994. In Douglas County, 46% of active leks disappeared, 65% disappeared in Okanogan County, and 61% disappeared in Lincoln County from 1954 to 1994.

Several environmental and habitat changes appear to have led to improving sage grouse and sharp-tailed grouse populations. The breeding population of sharp-tailed grouse in Washington is currently estimated at 380. These sharp-tails reside in scattered groups in Douglas, Lincoln, and Okanogan counties. Areas supporting the most sharp-tails include West Foster Creek, East Foster Creek, Cold Springs Basin, and Dyer Hill in Douglas County; Swanson Lakes Wildlife Area in Lincoln County; and the Tunk Valley and Chesaw Units of the Scotch Creek Wildlife Area in Okanogan County.

Currently, the known Washington range for the pygmy rabbit is greatly restricted. Pygmy rabbits are known to occur in only five isolated fragments of suitable habitat in Douglas County. The current Washington pygmy rabbit population is estimated to be fewer than 250 rabbits. Of the five pygmy rabbit areas known to remain, the largest may be comprised of fewer than 150 rabbits. The other four populations are significantly smaller. In 1990, the pygmy rabbit was listed as a threatened species by the Fish and Wildlife Commission. The Commission reclassified the species to endangered in 1993. It is also listed as a federal species of concern.

Habitat Areas and Quality

Grand Coulee Dam inundated 135 miles of habitat in the Columbia Mainstem between the dam and Canadian Border, 28 miles of the lower Spokane River, 12 miles of the Sanpoil River and 15 miles of the Kettle River. What had been a relatively shallow, free-flowing river was converted into a deep reservoir lake habitat. Native resident salmonids, including cutthroat trout, bull trout and mountain whitefish adapted to riverine conditions soon disappeared and at present only remnant populations are left. The same problems exist in the upper reaches of the Spokane River, where four private and one municipal dam, and in the Pend Oreille River, where a public utility district dam and one municipal dam, have blocked migration corridors and inundated most of the resident salmonid habitat. Resident fish species were also impacted through lost productivity (absence of nutrient component attributable to anadromous fish) and habitat degradation relating to land-use practices (agriculture, grazing, logging and municipal development) largely made possible by hydropower development in the region. The species/stock assemblages present in reservation waters are adapted to survive in marginal salmonid habitat and have been present for many years. Mainstem sturgeon habitat has been damaged by hydropower development.

Typically interior lacustrine habitats exhibit extensive macophyte communities, decreased hypolimnion during summer stratification and high surface water temperatures. Lacustrine habitats also include “chara bench” and high saline lakes (pH< 9.7 and alkalinity <1,980 mg/ml). (Brock et al. 1995). Riverine habitats exhibit unstable banks, poor riparian communities, high summer temperatures, substantial fines component in the substrates and intermittent flows. The potential for natural production (native or non-native species/stock) has been decreasing in many of the associated watersheds. Due to poor land use practices, elimination of the anadromous fish nutrient component and associated nutrient cycle, which has been linked to salmon production potential in many watersheds (Bilby et al. 1996, Larkin 1997 and Johnson et al. 1997).

<u>Wildlife</u>

The Grand Coulee and Chief Joseph hydroelectric projects destroyed, essentially forever, in excess of 80,000 acres of critical low elevation wildlife habitat. This was largely composed of riverine, island, riparian, shrub-steppe, mixed and conifer habitats. This was habitat, rich in bio-diversity, which supported a large number and abundance of wildlife species.

Existing conditions throughout the region very likely preclude current management entities from ever being able to fully mitigate these losses. Current and proposed wildlife projects around the subbasin provide partial mitigation leading towards the fish and wildlife program goal. These projects protect and maintain some of the few remaining portions of shrub-steppe and upland wildlife habitat that are still in fair to good condition in the region.

Enhancement activities will be necessary on some sites to return them to properly functioning habitat. These activities will be closely scrutinized prior to implementation to help insure success while maintaining cost effectiveness. Passive restoration “letting nature heal itself”, will be emphasized wherever feasible.

Three major changes in habitat have occurred in Washington's Columbia Basin in recent years that appear to have affected deer significantly. Several thousand acres of primarily dryland wheat ground was in the Conservation Reserve Program. Conversion of wheat to grass added permanent cover and some useful forage in the form of forbs, but in some areas removed a vital winter food resource (i.e., winter wheat). Major habitat development, including several hundred acres of irrigated food plots provided high quality habitat for deer migrating from Douglas County and northeastern Lincoln County.

During the past three seasons weather patterns have been favorable resulting in improved elk forage production on all ranges. However, the summer of 1998 was a very dry period with no green-up beginning before the winter set in and impacted winter forage availability. Most of the summer range is managed by the U.S. Forest Service, Washington Department of Natural Resources, Boise Cascade Corporation, Plum Creek Timber Company and Longview Fiber Corporation. Habitat suitability for elk varies across these ownerships depending on management emphasis.

Sagebrush and other native vegetation has invaded many of the Conservation Reserve Program fields improving their benefits to sage and sharp-tailed grouse. Aggressive habitat enhancements for sharp-tails continue on lands purchased by WDFW (using BPA and other funding sources). The value of these lands to the grouse is increasing noticeably as habitat rehabilitation proceeds.

Habitat loss and degradation are the primary reasons pygmy rabbit populations have declined in Washington. Moreover, as the amount of suitable habitat has decreased, the pressures of competition with other species and predation increased. Protection and enhancement of habitats are the most important factors in protecting the pygmy rabbit.

Watershed Assessment

True "watershed assessments" have yet to be conducted in the upper Columbia River Basin, however several quantitative assessments regarding constraints to fish production have and are being conducted. Fish habitat and passage evaluations were conducted in the San Poil River Basin and other tributaries of the mainstem (LeCaire, 1991). In addition, two (2) Integrated Watershed Management Plans have been developed on the Colville Reservation (Six-Mile IRMP Watershed Plan and Owhi Lake IRMP Watershed Plan), which integrate land-use activities with fish and wildlife needs.

Limiting Factors

Limiting factors to fisheries production in the Upper Columbia River Mainstem is primarily related to blockages and operation of the hydro-system and habitat conditions. Specifics related to these categories have been discussed in aforementioned and upcoming sections.

Primary limiting factor from a wildlife stand point, will be getting adequate funding in a timely manner to carry out mitigation program activities.

Subbasin Management

Goals, Objectives and Strategies

Fish

The goal of Columbia Basin resident fish managers is to achieve a healthy Columbia River ecosystem that supports viable and genetically diverse fish populations, which will provide for societal needs, such as harvest.

The Upper Columbia River managers have developed short and long term objectives for the currently "blocked area". The short-term objective is to develop sustainable resident fish populations to a level that will allow for harvest at near historical pre-dam levels. The long-term objective is to restore native anadromous salmonid based communities above Chief Joseph and Grand Coulee dams that will meet societal needs. (Vigg 1999, in press).

To accomplish these goals the managers have adopted the following objectives: 1) improve survival for all life history stages for target species; and 2) restore depressed populations to productive levels.

Short and long term strategies are proposed to accomplish these objectives. The short term strategy is a mitigation program of native resident fish restoration and native/non-native fish substitution (i.e. continuation and enhancement of the policies, goals and objectives documented in the Power Planning Council's 1995 Fish & Wildlife Program and the Columbia Basin Fish & Wildlife Authority's (1997) Multi-Year Implementation Plan). Numerous project-specific strategies to achieve project and subbasin objectives are identified in the Resident Fish Multi-Year Implementation Plan and can be grouped into several general categories including the following:

- Develop and identify specific reservoir operations management plan for Lake Roosevelt to enhance resident fisheries.
- Initiate watershed management activities necessary for habitat enhancement that will facilitate the natural production of native and non-native fish species (consistent with native species conservation).
- Conduct stock assessments, angler surveys, and population inventories (both adult and juvenile) to estimate population strength, population dynamics, and fishery quality over time (population trends).
- Utilize artificial production to enhance native and non-native fish populations consistent with native species conservation.
- Maintain harvest regulations that protect naturally producing fish populations (native and non-native) while maximizing the contribution of hatchery origin stocks.
- Monitor effects of specific strategies and actions towards meeting subbasin objectives.
- Implement specific management actions within the subbasin in a cohesive, cooperative and integrated fashion.

The long-term strategy is to develop adult and juvenile anadromous fish passage capabilities – exploring all possible engineering, technological, and societal means to circumvent the current barriers to anadromous salmon and steelhead migration at Chief Joseph and Grand Coulee Dams. Concurrently, fish species and stocks that genetically and behaviorally resemble the assemblages present before the construction of the Upper Columbia River dams will be re-introduced. Reestablishment of healthy anadromous fish populations will require artificial production facilities to establish populations while adequate habitat is filled and degraded habitat is rehabilitated.

Wildlife

The basic wildlife goal for the subbasin is to fully mitigate for all losses caused by the federal hydropower system.

The overall objectives and strategy is to acquire the management rights to enough property to provide a land base where wildlife habitat can be protected, managed and enhanced to meet the mitigation goal.

For example, the 8,240 acre Douglas County Pygmy Rabbit Project (now the Sagebrush Flat Wildlife Area) was approved as a mitigation project by BPA in 1990. Although it is not known whether pygmy rabbits were actually lost due to inundation, they ranked high on the Northwest Power Planning Council's priority list because they depend on shrub-steppe habitat. Enhancement activities to meet mitigation objectives for the Sagebrush Flat Wildlife Area were made based on the Washington State Recovery Plan for the Pygmy Rabbit. Wildlife enhancement activities have been under way since 1995 and are anticipated to be completed in 2002.

Furthermore, the Sagebrush Flat Wildlife Area has four management units. The primary management objective for the Sagebrush Flat and Dormaier Units is to protect and enhance existing pygmy rabbit habitat and convert agricultural fields to shrub-steppe vegetation. WDFW's primary wildlife management goal for this Unit is to increase the existing pygmy rabbit population and reintroduce pygmy rabbits, through artificial or natural means into unoccupied habitats.

In addition, the primary management objective on the MJM Unit is to protect and enhance existing sage grouse habitat and to increase the number of sage grouse residing on the property and adjoining areas. A second objective is to identify potential pygmy rabbit sites and manage these habitats for that species.

On the Smith Unit, the management objective is to protect and enhance existing sharp-tailed grouse habitat including an active lek site as well as increasing the number of sharp-tailed grouse using this property, the adjacent Wells Wildlife Area, and nearby privately owned land.

As demonstrated, the wildlife mitigation land base is being acquired through easements, cooperative agreements and outright purchase. It is and will be managed over the very long term using state of the art ecosystem and adaptive management concepts and techniques.

Past Efforts

Fish

The three management agencies with fisheries management responsibility within the subbasin have initiated numerous projects through the Northwest Power Planning Council's Fish and Wildlife Program to partially mitigate for the loss of anadromous fish due to the federal hydropower system utilizing resident fish (resident fish substitution). These projects have enhanced the resident fishery (both native and non-native) in the "blocked area" through habitat/passage improvements (Lake Roosevelt Rainbow Trout Habitat/Passage Improvement project, #9001800); stock assessment activities, (Habitat/Passage Improvement project,#9001800, Chief Joseph Kokanee Enhancement Project, #9501100 and Lake Roosevelt Fisheries Monitoring Program, #944300); artificial production enhancement activities (Colville Tribal Fish Hatchery, #8503800, Spokane Tribal Hatchery, #9104600, Sherman Creek Hatchery, #9104700 and Lake Roosevelt Rainbow Trout Net Pens, #9500900) and cooperative resource management (Resident Fish Stock Status Above Chief Joseph and Grand Coulee Dams, #9700400).

Currently hatchery production programs are being monitored to evaluate their contribution to existing fisheries in the subbasin. Habitat improvement projects are currently being monitored/evaluated for effectiveness, while existing habitat and fish stock/population evaluations are proceeding throughout the basin.

Colville Tribal Hatchery (#8503800)

Operations began at the hatchery in the fall of 1990 and have continued to the present time. Originally the project was only production goal oriented (1990-1994). Beginning in the operating year 1995 more fisheries-related goals and objectives were developed for the program to assess the program impact on subsistence and recreational fisheries (Truscott 1995). Objectives include both short-term (annual production objectives and administrative objectives) and long-term fishery related objectives, such as average creel size fish, catch per unit efforts, average fish condition factor in creel, increases in natural production fishery component, maintenance and development of free-ranging brood stock sources, monitoring and evaluation and development of comprehensive fishery management plans. Reports and technical papers developed during this period include, annual operating plans (Trucsott 1990-1999), and annual operating reports (Truscott 1990-1997).

The project has met or has closely met the production objective of 22,679 kg (50,000 lb.) of resident salmonid production annually. Most recently The Colville Tribal Fish hatchery distributed 17,912 kilograms and 31,752 kg during 1997 and 1998, which is 80% and 140% respectively of the annual production goal of 22,679 kg (Truscott 1997). Production was down in 1997 primarily due to soft-shell disease in the lahontan cutthroat trout, which resulted in 100% mortality of the “eyed eggs”. The increase in 1998 is associated with distribution of larger fish (fingerling and legal components).

Rearing densities at the hatchery have been within industry standards with the exception of short duration during inside rearing. Excessive fin erosion has been a continual problem with rainbow trout and is considered to be a space related problem at the hatchery even though the rearing densities are within industry standards. Feeding regimes involving auto-feeders were successful in reducing behavioral responses to over-head disturbance, but unsuccessful in reducing fin erosion in rainbow trout.

The continued development and monitoring of reservation rainbow brood stocks was limited to four streams during the 1997-98 period. Monitoring activities investigating potential brood source stock included adfluvial rainbow trout stocks in the SanPoil River Basin. Monitoring activities in 1997 recovered 13 gravid adfluvial rainbow in the four identified streams. Extreme high water flows in the spring of 1997 prevented any meaningful trapping/monitoring of the adfluvial rainbow trout population in the SanPoil River Basin. Monitoring activities on North and South Twin Lakes and Round Lake were not implemented due to extended ice-cover and personnel shortages. Continued monitoring of both adfluvial and lacustrine rainbow stocks is warranted at this time, however the apparent unpredictability of year class strength and seasonal difficulty in trapping the adfluvial stock may preclude its utility as a free-ranging broodstock source. Future monitoring activities should concentrate on developing an interior lacustrine rainbow broodstock.

Hatchery monitoring activities relative to fishery contribution included: Creel census surveys on North Twin Lake, South Twin Lake and Owhi Lake and gill net surveys on North Twin Lake, South Twin Lake and Buffalo Lake. Specific evaluation components of interest included Catch Per Unit Effort (CPUE), average fish length, weight and condition factor, as well as relative species abundance.

Creel census data from the Twin lakes and Owhi fishery indicated a resurgence of the brook trout fishery at both locations, while the rainbow fishery in Twin Lakes may have decreased slightly during the 1991-97 period. The 1997 observed values for Owhi Lake and brook trout CPUE (.76 fish/hr) were less than the program objective (1.0 fish/hr) while the average fish lengths (370 mm) were greater than the program objectives. The average condition factor was slightly less than the program objective. Program objectives for CPUE and condition factor were not observed for brook trout in the Twin Lakes fishery (recreational fishery). However, the average fish length objective was satisfied and the average fish weights were the greatest since 1993 (Truscott 1997). The observed values for rainbow trout in 1997-98 did not meet any of the program objectives; however, the CPUE was 16% greater than that observed in 1996 and was comparable to values observed during the period when the fishery was being supplemented with stocking from the Winthrop National Fish Hatchery. Creel census information for Buffalo Lake is unavailable. Therefore, gill net survey information was used to determine average fish size and condition factor. Rainbow trout observed in the Buffalo Lake gill net catches during the 1997 survey period were few (5 fish). Therefore, assessment of the program’s objective for average fish length and condition factor was a moot consideration in 1997.

It appears the operation of the Colville Tribal Hatchery is having a positive effect or at least maintaining the existing recreational and subsistence fisheries on the reservation. Some lakes and species have responded better to the hatchery program than others. Brook trout fisheries in all waters monitored, with the exception of Buffalo Lake, have shown substantial improvement since the inception of the hatchery program. The hatchery's effect upon the monitored rainbow fisheries does not appear to be as conclusive as the brook trout fisheries. Continued creel census and increased gill net survey frequencies are warranted in an effort to better determine the hatchery's current contribution to the reservation fishery, potential contribution, and to define its role in fisheries management on the Colville reservation.

Spokane Tribal Hatchery (#9104600)

The Spokane Tribal Hatchery (managed by the Spokane Tribe) rears kokanee salmon and rainbow trout for release into Lake Roosevelt, Lake Roosevelt tributaries, and Banks Lake. The hatchery was constructed in 1991 and began releasing fish in 1992. This hatchery was designed to raise 8 million fry kokanee, but due to limited water supply and limited survival of fry fish in Lake Roosevelt, the hatchery now rears 500,000 kokanee to yearling age. Currently, the kokanee reared in the Spokane Tribal Hatchery are from Lake Watcom. However, the program goal is to develop a self-sustaining egg source from Lake Roosevelt. As a result, alternative kokanee stocks are being tested (e.g.. Kootenia Lake). The hatchery also rears approximately 500,000 rainbow trout annually. The rainbow eggs are provided by the Spokane Hatchery, which is managed by the WDFW.

Sherman Creek Hatchery (#9104700)

The Sherman Creek Hatchery (managed by WDFW) serves two functions. The hatchery is an acclimation and rearing facility for kokanee and rainbow trout, and is a kokanee egg collection facility. Sherman Creek hatchery was built and began releasing fish in 1992. The Spokane Tribal Hatchery transfers 250,000 kokanee to Sherman Creek in April of each year. The kokanee acclimate to Sherman Creek water until July and then are released into Lake Roosevelt. At age three or four years old the kokanee released from Sherman Creek return to spawn. Sherman Creek Hatchery is outfitted with a fish ladder to collect the eggs of the returning spawners. The fertilized kokanee eggs are transported to the Spokane Tribal Hatchery for rearing. Sherman Creek Hatchery also acclimates rainbow trout and additional kokanee during the summer months depending on fish availability and water temperatures.

Lake Roosevelt Rainbow Trout Net Pen Project (#9500900)

The Lake Roosevelt Net Pen Project is a grass roots, community based effort to enhance rainbow trout harvest opportunity. This project began in the 1980's with local anglers looking for a method to enhance the Lake Roosevelt Fishery. In 1996, BPA provided a coordinator to assure this program continued. The project has grown to over 9 net pen sites, which in total rear 500,000 rainbow trout. The Spokane Tribal Hatchery rear the rainbow trout from eggs in November to fry in September. The hatchery then transfers the fish to the net pens in September, where they are reared to catchable size by June. The rainbow trout are released ideally in June, but in years of deep drawdown physical limitations require earlier releases. The net pen program produces the most successful fishery in the lake. Over 95% of all rainbow trout captured in the lake are from the net pens.

Chief Joseph Kokanee Enhancement Project (#9501100)

The Goal of the chief Joseph Kokanee Enhancement Project is to Protect and enhance the natural production of kokanee stocks above Chief Joseph and Grand Coulee dams to provide successful subsistence and recreational fisheries and provide a broodstock source for artificial production in Lake Roosevelt.

Field activities began during the early fall of 1995 to present. Activities include: (1) Spawning escapement monitoring and enumeration of adult kokanee present in six (6) tributaries to Lake Roosevelt and Rufus Woods Reservoir (SanPoil River, Big Sheep Creek, Deep Creek, Onion Creek, Ora-Pa-Ken Creek and Nespelem River respectively). (2) Collection of genetic material from adult tributary spawning populations in the aforementioned streams and free-ranging kokanee in Lake Roosevelt kokanee. (3) Collection of kokanee "swim-up" from redds and monitoring fry emigration from the SanPoil River to Lake Roosevelt. (4) Hydroacoustic monitoring of fish entrainment through Grand Coulee Dam.

A critical accomplishment achieved through this project has been the identification of a unique stock of kokanee that is distinctly different than any other known kokanee or sockeye population. Genetic evaluations related to this project have also collected information that will allow a characterization of the free-ranging kokanee populations in Lake Roosevelt. Rapid declines of the adult tributary spawning population have been documented through adult spawning escapement and redd surveys from 1995 through 1997. This stock has been characterized as a critically depressed and declining population. Additional important achievements related to this project include the identification of spawning locations in the SanPoil River and Barnaby Creek, seasonal adult run-timing, and potential limiting factors to tributary production such as abnormal peak late-winter / early-spring flows, bedload movement and passage barriers relating to reservoir operations. The project has documented substantial entrainment related to Grand Coulee. Important data have and continue to be collected to access entrainment characteristics related to project operations (i.e. flood control draft, power draft, power peaking, spring flow augmentation and summer flow augmentation).

Lake Roosevelt Rainbow Trout Habitat/Passage Improvement Project (#9001800)

The goal of the project is to contribute to subsistence and recreational fisheries by protecting and enhancing the production of adfluvial rainbow trout populations through improvement to fish passage and in-stream habitat in tributaries to Lake Roosevelt.

Early fisheries investigations (Scholz, 1986) indicated that the lack of high quality spawning and rearing habitat was a limiting factor to adfluvial rainbow trout production in Lake Roosevelt. Limited stream surveys also identified fish passage barriers (improper culvert installation and intermittent flows) as limiting production.

Twenty-seven streams were examined during 1990-1991 to assess fish habitat, fish population estimates and potential limiting factors to adfluvial rainbow trout production. Five (5) streams were selected for planning and implementation of passage / habitat improvements based upon presence of adfluvial rainbow trout, limiting factors, and potential for improved production.

Design and implementation of habitat and passage improvement actions on the five selected streams began in 1992 and continued through 1995. Implementation actions affected 20.9 miles of stream course. Specific actions included, reinstallation of six (6) culverts, 500 meters of channel reconstruction (meanders) installed in previously channeled stream courses and 125 in-stream structures installed in efforts to improve passage and improve habitat quality. Riparian improvements included placing 14,500 riparian plants/shrubs/trees and livestock exclusion fence along 4.5 miles of stream course. Habitat quantity was increased by 11% through passage improvement alone.

Monitoring of the effectiveness of implementation actions began in 1995 and is expected to continue through 2001. Specific accomplishments related to the monitoring phase. Specific outcomes of the program are uncertain at this time. Definitive results and evaluation will be available in post-2001. However interim accomplishments realized during the monitoring activities include trend information related to adult spawning year-class strength, adult run-timing, juvenile outmigration timing, juvenile population densities, and longevity/function of instream structures and channel reconfiguration.

Lake Roosevelt Monitoring Program (#944300)

This program has two primary goals. The first is to monitor and evaluate the performance of fish released into Lake Roosevelt by the Spokane Tribal and Sherman Creek Hatcheries. The second goal is to develop a fisheries management plan, which prescribes mitigation actions and hydro operations that will maximize ecosystem diversity, complexity, and sustainablity. In order to develop an achievable fisheries management plan, a better understanding of this unique non-native Lake Roosevelt ecosystem is required. As a result, a model is being developed to predict the effect of single actions on the ecosystem and fishery of the lake.

Resident Fish Stock Status Above Chief Joseph and Grand Coulee Dams (#9700400)

The purpose of this project is to compile all data useful to fisheries management for waters in the "blocked area," identify data gaps, and collect data to fill those gaps. This project is the glue that combines all "blocked area" activities into a cohesive fisheries mitigation package.

Wildlife

The wildlife management Tribes and agencies in the sub-basin have initiated several projects under the councils wildlife program. These projects represent a start in mitigating for the losses that occurred.

Since 1993, the Colville Tribes have acquired about 18,500 acres of land under our Hellsgate Big Game Winter Range project (#9204800). Baseline habitat assessments have been completed on all but about 1,800 acres. The results of these assessments as described by vegetative cover types are as follows:

- Shrub-steppe, a total of 6,264 acres are protected and will be enhanced to shrub-steppe obligate species with sharp-tailed grouse and mule deer the main management species for this cover type.
- Grasslands, a total of 3,108 acres are protected and will be enhanced for wildlife species using this cover type such as sharp-tailed grouse.
- Conifer forest, a total of 2,565 acres are protected and will be enhanced for wildlife species using this cover type such as downy woodpecker and blue grouse.
- Agricultural lands, a total of 2,360 acres will be converted back to native habitat types based on soil types. These areas will then be managed for the benefit of wildlife. This includes land enrolled into CRP.
- Conifer woodland/Ponderosa pine savanna, a total of 1,365 acres are protected and will be enhanced for mule deer, Lewis woodpecker, and other wildlife species using this cover type.
- Riparian, a total of 336 acres will be protected and enhanced for obligate species such as mink and beaver using this cover type.
- Rock/shrub-steppe, a total of 220 acres will be protected and enhanced for species such as bobcat using this cover type.
- Mixed forest, a total of 208 acres will be protected and enhanced for wildlife species using this cover type.
- Deciduous woodland, a total of 75 acres will be protected and enhanced for species using this cover type especially neo-tropical migrant birds.
- Shoreline areas, a total of 60 acres will be protected and enhanced for waterfowl species and wading birds using this cover type.

Management actions to protect and enhance these cover types include:

- Maintaining boundary fences to prevent livestock trespass.
- Removing trespass livestock.
- Control and/or eliminate noxious weeds.
- Maintain and enhance the desired vegetation for each cover type.
- Enhance plant community composition by planting and/or seeding.

STOI Wildlife O&M (#9800300)

The Spokane Tribe began to acquire lands for protection and enhancement of wildlife in 1996. Since then, the Tribe has acquired 1704.5 acres of land. This land has had habitat evaluations and site specific management plans have been developed. In addition, the Spokane Tribe has contributed 160 acres of land in conjunction with BPA purchased land for wildlife protection and enhancements.

The Colville Tribe's wildlife projects are monitoring both habitat and animal population responses to management activities. From the habitat stand point, this is being done using habitat evaluation procedures (HEP), permanent vegetative transects and photo plots. We are currently conducting both large and small mammal surveys for the animal populations. Lek surveys for sharp-tailed grouse are being conducted. Surveys for other bird species are planned for the near future.

The Spokane Tribe has conducted HEP on all purchased lands to determine habitat quality and quantity.

Remaining Work

Fish

Artificial production and program monitoring/evaluation efforts need to continue and should be expanded to include ecological interaction. Habitat improvement projects that effect natural production should continue with monitoring/evaluation efforts and expand to include ecological interactions. Additional actions should be implemented if current evaluations indicate sufficient positive results.

Current stock/population assessments should continue and propose actions to address identified limiting factors to the protection and enhancement of identified stocks. Subsequent implementation of identified actions should be conducted expeditiously. Additional stock assessments should be proposed and implemented to evaluate native stock status, particularly in headwater areas where data maybe lacking.

Continuation of monitoring/evaluation of current habitat conditions and system operation activities affecting reservoir environments should continue. Efforts to develop a database and functional model to facilitate the operation of the Columbia River System to maximize the benefits to anadromous and resident fish species throughout the region should also continue. Strategies/actions identified to address systems operation impacts on reservoir habitats and affected species should be implemented expeditiously.

Wildlife

A great deal more remains to be done for wildlife mitigation than what has been accomplished thus far.

The Colville Tribes feels they may be approaching about a third of the needed land base. Our project is very long-ranged based in terms of protecting, managing, and enhancing the wildlife habitat on the project. We feel that it is imperative that we press forward with efforts to achieve full mitigation as rapidly as possible. Opportunities to do meaningful mitigation within the region are dwindling at an alarming rate.

The Spokane Tribe will begin habitat improvements in spring 1999 and continue through Fall 2001. Lands acquired that were once shrub-steppe and converted to agriculture will be converted back to shrub-steppe. All lands will be monitored to determine effectiveness of enhancement practices. Species response studies will occur once enhancement activities are completed. Also, to fully mitigate for the loss of wildlife, additional acreage will need to be acquired.

The Sagebrush Flat Wildlife Area is comprised primarily of shrub-steppe habitat. The Northwest Power Planning Council has designated shrub-steppe habitat as a high priority. This mitigation project's goal is the recover and management of pygmy rabbit, sharp-tailed grouse and sage grouse. Restoration, enhancement, operation, maintenance, monitoring and evaluation activities must continue to ensure the continuance of the positive wildlife habitat benefits, which are accruing.

On the Sagebrush Flat Unit, approximately seven miles of green strips (firebreaks) will be developed between 1999 and 2002. Two miles of fence will be constructed to prevent trespass livestock grazing. 230 acres of agricultural land will be converted to shrub-steppe habitat in 1999. To control noxious weeds, vegetation will be removed from the access road primarily by herbicide application, but may also include mowing and removal by hand

On the Dormaier Unit, sagebrush thinning will occur on approximately 80 acres of abandoned agricultural land to reduce shrub canopy from 73% to less than 25% canopy cover. Herbicides and mechanical means will be employed. Grass and forbs, now largely non-existent, will be planted with conventional farming methods and/or broadcast seeding techniques to improve under story vegetation.

For the MJM and Smith Units completion of the Habitat Evaluation Procedure is scheduled for 1999. The Sagebrush Flat Mitigation Plan will be updated to include enhancement measures for these two units.

Subbasin Recommendations

The extensive degradation and elimination of fish habitat in the Upper Columbia River subbasin limits the proposed activity's ability to "fix" the problems in the subbasin. More likely, the proposed projects will be able to partially mitigate for the impacts related to the construction and operation of the Federal Hydropower development in the basin, particularly the elimination of anadromous fish populations and degradation of native habitats effecting native resident fish.

Hatchery production programs will augment resident fish populations in the blocked area to provide for subsistence and recreational fisheries. Extensive tribal fisheries were lost due to the construction and operation of the Federal Hydropower system. Hatchery programs are an effective means of partially mitigating for lost fisheries by annually providing fish for consumptive fisheries. Fish populations can be maintained at a greater level than what could be possible under natural production, particularly when irrevocably altered habitat limits productivity of a specific life history stage (spawning habitat, early rearing habitat etc.).

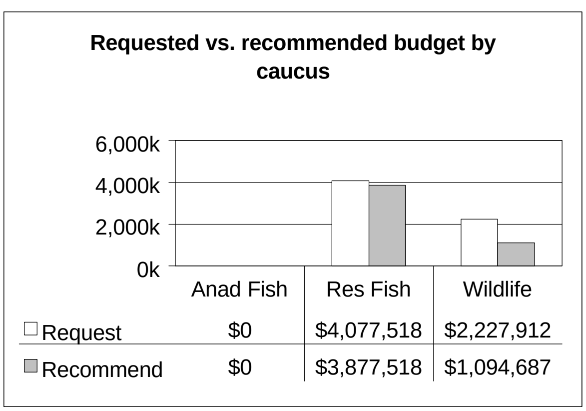
Habitat evaluation and rehabilitation measures will provide improved productivity capabilities for naturally producing resident fish species and potentially increase the carrying capacity of habitat for augmented populations of fish.

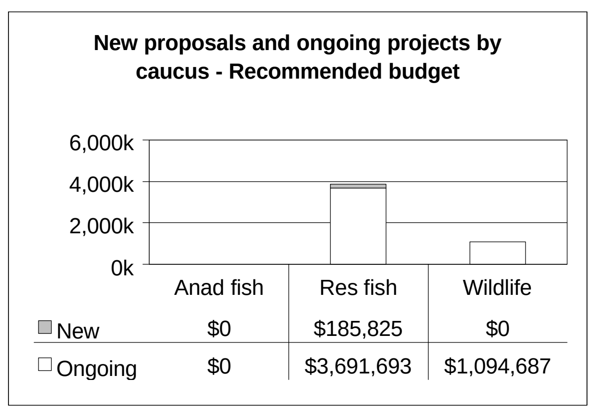
Research and stock assessment activities will provide identification of fishery "data gaps," existing stock status reports, identification of limiting factors to fishery production, and strategies necessary to reach identified objectives. These data and subsequent evaluations will be paramount in developing and implementing fishery programs that protect, mitigate, and enhance fisheries resources impacted by the Federal Hydropower system in the Columbia River Basin.

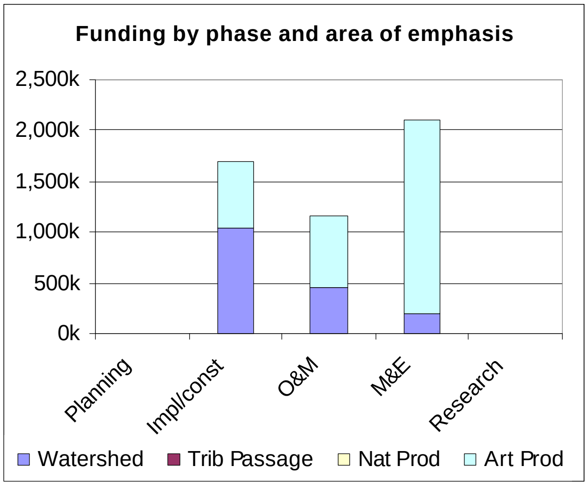
Projects and Budgets

Based on the preceding subbasin description, the CBFWA fish and wildlife managers recommend funding a total of 13 projects at a cost of $4,972,205. Of the projects recommended, 9 focus on resident fish, and 4 are directed at wildlife.

Refer to the following figures for detail on: 1) total recommended and requested budget by caucus, 2) funding for new and ongoing work, 3) funding by project phase and emphasis, and 4) funding by time period (past, current and future). Individual projects are listed in the following table.






Funding by phase and area of emphasis
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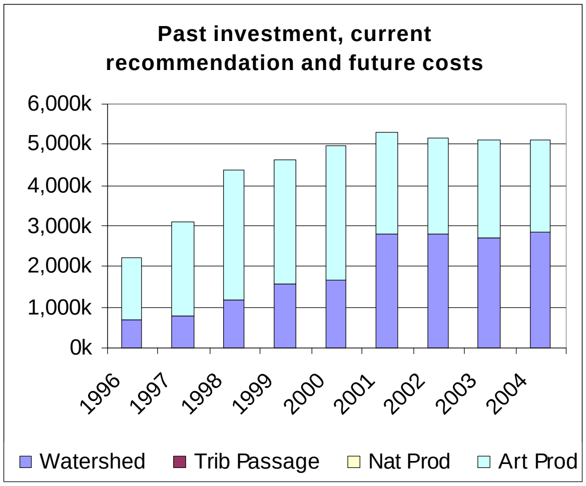
2,000k
1,500k
1,000k
500k
0k
Planning
Impl/const
O&M
M&E
Research
Watershed
Trib Passage
Nat Prod
Art Prod


Past investment, current recommendation and future costs
6,000k
5,000k
4,000k
3,000k
2,000k
1,000k
0k
1996
1997
1998
1999
2000
2001
2002
2003
2004
Watershed
Trib Passage
Nat Prod
Art Prod

ProjectID	Title	Sponsor	FY99 recom.	FY00 recom.	Estimated Outyears FY01	FY02	FY03	FY04
Resident Fish Projects								
20146	Lake Roosevelt Kokanee Net Pens	WDFW		186	35	36	37	38
8503800	Colville Tribal Fish Hatchery	CCT	360	361	365	370	375	380
9001800	Evaluate Rainbow Trout/Habitat Improvements of Tribs. to Lake Roosevelt	CCT	168	190	0	0	0	0
9104600	Spokane Tribal (Galbraith Springs) Hatchery Operation & Maintenance	STOI	453	522	505	515	520	525
9104700	Sherman Creek Hatchery O&M	WDFW	319	201	176	182	187	193
9404300	Monitor, Evaluate, and Research the Lake Roosevelt Fishery	STOI	1,400	1,500	900	750	750	600
9500900	Rainbow Trout Net Pen Rearing Project	LRDA	100	100	98	100	100	102
9501100	Chief Joseph Kokanee Enhancement Project	CCT	600	397	600	600	350	0
9700400	Resident Fish Stock Status Above Chief Joseph and Grand Coulee Dams	KNRD	405	421	438	438	456	456
		Resident Fish Totals		**$3,878**	**$3,117**	**$2,991**	**$2,775**	**$2,294**
Wildlife Projects								
9106100	Swanson Lakes Wildlife Area	WDFW	233	248	250	250	250	250
9204800	Hellsgate Big Game Winter Range Operation and Maintenance Project	CCT	250	350	350	350	500	500
9506700	Colville Tribes Performance Contract for Continuing Acquisition	CCT	100	400	1,500	1,500	1,500	2,000
9800300	O&M Funding of Wildlife Habitat on STOI Reservation for Grand Coulee Dam	STOI	97	97	90	89	88	87
		Wildlife Totals		**$1,095**	**$2,190**	**$2,189**	**$2,338**	**$2,837**
	* indicates ESA project, † indicates 'Innovative work'	**SUBBASIN TOTALS**		**$4,972**	**$5,307**	**$5,180**	**$5,113**	**$5,131**

All figures in thousands of dollars

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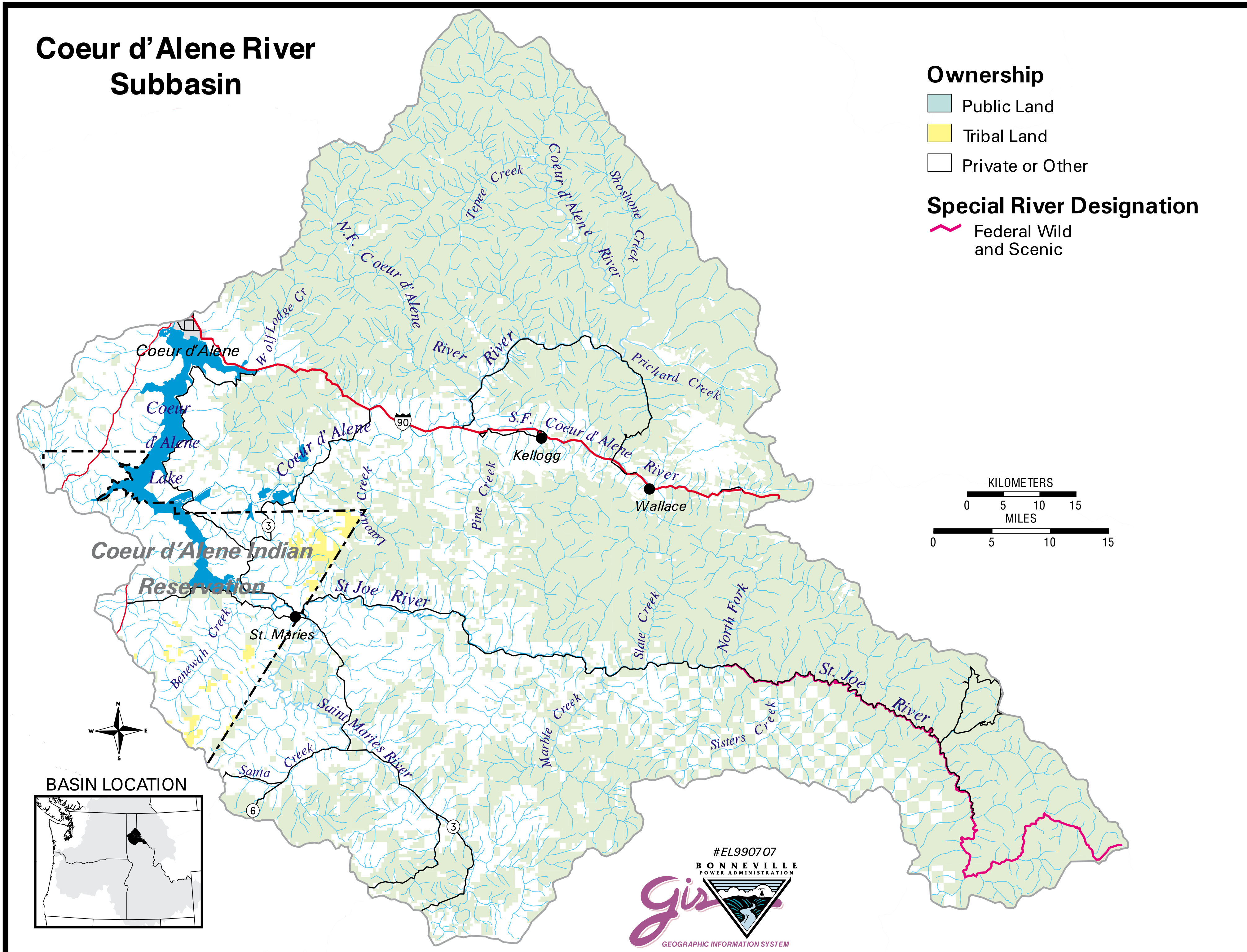


Coeur d'Alene River
Subbasin
Ownership
Public Land
Tribal Land
Private or Other
Special River Designation
Federal Wild
and Scenic
KILOMETERS
0 5 10 15
MILES
0 5 10 15
Tepee Creek
Coeur d'Alene River
Shoshone Creek
N.F. Coeur d'Alene River
River
Wolf Lodge Cr
Coeur d'Alene
Prichard Creek
S.F. Coeur d'Alene River
Kellogg
Wallace
Coeur d'Alene Lake
Coeur d'Alene
Lamont Creek
Pine Creek
Coeur d'Alene Indian Reservation
St Joe River
St. Maries
Slate Creek
North Fork
St. Joe River
Benewah Creek
Saint Maries River
Marble Creek
Sisters Creek
Santa Creek
BASIN LOCATION
#EL990707
BONNEVILLE
POWER ADMINISTRATION
GEOGRAPHIC INFORMATION SYSTEM

Coeur d'Alene Subbasin

Res fish	2	projects	$2,185
Wildlife	1		140
	3		$2,335

Fish and Wildlife Resources

Subbasin Description

The Coeur d'Alene subbasin lies in three north Idaho counties Shoshone, Kootenai and Benewah. The basin is approximately 3840 square miles and extends from the Coeur d'Alene Lake upstream to the Bitterroot Divide along the Idaho-Montana border. Elevations range from 2,120 feet at the lake to over 7,000 feet along the divide. A portion of the watershed lies within the boundaries of the Coeur d’Alene Indian Reservation.

Coeur d'Alene Lake is the principle waterbody in the subbasin. The lake is the second largest in Idaho and is located in the northern panhandle section of the state. Population centers are located on the Northern most shoreline of Coeur d'Alene Lake (Coeur d'Alene) and at the mouth of the Coeur d'Alene River (Harrison). The lake is located in two Idaho counties: Kootenai and Benewah. The city of Coeur d'Alene is the largest in Kootenai County and Harrison is the second largest in Benewah County. The largest town in Benewah County (St. Maries) lies about 12 miles upstream of Coeur d'Alene Lake on the St. Joe River.

Coeur d'Alene Lake is within the 17,300 square kilometer Spokane River drainage basin. The lake lies in a naturally dammed river valley with the outflow currently controlled by Post Falls Dam. Post Falls Dam controls the level of the St. Joe River at the town of St. Maries, and the level of the lake. At full pool (lake elevation 648.7 meters) the lake covers 129 square kilometers and at minimum pool level (lake elevation of 646.2 meters) the lake covers 122 square kilometers. The lake is 26 miles long and anywhere from 1 to 6 miles wide. The lakes mean depth is 22 meters with a maximum depth of 63.7 meters.

Many tributaries feed Coeur d'Alene Lake. The two main tributaries of the lake are the Coeur d'Alene and St. Joe Rivers that drain the Coeur d'Alene and St. Joe mountains. Recently completed geographic assessments of the Coeur d’Alene and St. Joe river basins describe geologic and geomorphic processes affecting the Coeur d’Alene Lake basin. The underlying geology of much of the basin is primarily Belt meta sediments, but the southern portion of the St. Joe basin and the St. Maries basin have been modified or influenced by intrusions of the highly granitic Idaho Batholith. These intrusions have resulted in the formation of re-metamorphosed sedimentary rock that tends to be less stable than landforms based primarily on Belt meta sediments. Lower elevations are composed primarily of glaciofluvial deposits.

The watersheds of interest have evolved and adapted to a series of geologic and climatic events, including general regional uplift, volcanism, intrusion of granite materials, and several stages of glaciation and climate change. The historic range of conditions resulted in watersheds and biotic communities that have developed and evolved with an operating range and resiliency that allows them to adjust to both frequent and rare events. Recently, dramatically increased human populations have exerted stresses on the aquatic and terrestrial ecosystems. Anthropogenic changes, such as, urbanization, construction of Post Falls Dam, conversion of forests and wetlands to pasture and agricultural lands, road construction, and introduction of exotic species have disturbed many natural processes of the Coeur d'Alene subbasin and their biotic systems.

The climate and hydrology of the watersheds of the Coeur d'Alene subbasin are similar in that they are influenced by the maritime air masses from the pacific coast, which are modified by continental air masses from Canada. Summers are mild and relatively dry, while fall, winter, and spring brings abundant moisture in the form of both rain and snow. A seasonal snowpack generally covers the landscape at elevations above 4,500 feet from late November to May. Snowpack between elevations of 3,000 and 4,500 feet falls within the “rain-on-snow zone” and may accumulate and deplete several times during a given winter due to mild storms (US Forest Service 1998). The precipitation that often accompanies these mild storms can cause significant flooding because the soils are either saturated or frozen and the rain and melting snow is added directly to the runoff.

Morphology, aspect, and vegetative cover can influence the magnitude and frequency of these peak flow events. Large openings that permit free air movement over the snow pack can accelerate the rate of snow pack depletion. Openings from fires, insects and disease, and wind have always existed in the watersheds and have enhanced this rain-on-snow phenomenon. More recently, however, clearing of land for homesteads, logging, pasture, and agriculture have substantially enhanced this phenomenon. In Lake Creek for example, where nearly 40 percent of the basin area has been cleared for agriculture, peak discharges have increased by an estimated 55% for 100-year events when compared with the pre-settlement period (CDA Tribe, 1998). Lesser amounts of forest clearing have occurred in the other Coeur d'Alene subbasin watersheds, suggesting measurable increases in peak discharges for these areas as well.

The runoff period and peak discharge from the lake generally occurs between April and June, but the highest peak flows recorded are from mid-winter rain-on-snow events. Peak flows from the St. Joe and Coeur d’Alene rivers have exceeded 50,000 cfs and 70,000 cfs, respectively. Average monthly discharges from both the St. Joe and Coeur d’Alene rivers range from September lows of between 400 cfs to 500 cfs to April-May highs of 7,000 to 8,000 cfs.

One of the more profound disturbances that the watersheds have been subjected to is from road construction. The road network in the subbasin includes five state highways, numerous county and municipal roads, and an extensive network of unimproved roads. Those areas with the highest density of roads occur on lands managed primarily for timber production. Some roads initially constructed for timber harvest are still used for land management purposes, while many are now used mainly for recreational access and still others have been abandoned and are no longer maintained. On slopes, roads intercept the downward movement of subsurface water and cause it to flow rapidly on the surface. Road location and construction has created erosion rates far beyond those under which the watersheds and streams evolved. Furthermore, this road system has been constructed in many of the most sensitive locations (floodplains, and unstable land types) within the watersheds. The density of unimproved roads exceeds 2.5-miles/mile^2 in most of the subbasin watersheds.

Fish and Wildlife Status

Twelve native fish species inhabit the Coeur d’Alene Lake basin: northern pikeminnow *Ptychocheilus oregonensis*, redside shiner *Richardsonius balteatus*, torrent sculpin *C. rhotheus*, shorthead sculpin *C. confusus*, speckled dace *Rhinichthys osculus*, longnose dace *R. cataractae*, longnose sucker *Catostomus catostomus*, largescale sucker *Catostomus macrocheilus*, bridgelip sucker *C. columbianus*, mountain whitefish *Prosopium williamsoni*, westslope cutthroat trout *Oncorhyncus clarki lewisi* and bull trout *Salvelinus confluentus*.

Introduced fish species present in the basin include: smallmouth bass *Micropterus dolomieui*, largemouth bass *M. salmoides*, crappie *Pomoxis spp.*, sunfish *Lepomis spp.*, yellow perch *Perca flavescens*, lake superior whitefish *Coregonis clupeaformis*, brown bullhead *Ameiurus nebulosus*, channel catfish *Ictalurus punctata*, tench *Tinca tinca*, northern pike *Esox lucius*, tiger musky *E. lucius x E. masquinogy*, brook trout *Salvelinus fontinalis*, rainbow trout *Oncorhynchus mykiss*, chinook salmon *O. tshawytscha*, cutthroat-rainbow trout hybrids, and kokanee *O. nerka*.

Herptofauna known or suspected to inhabit the Coeur d'Alene subbasin include the long toed salamander *Ambystroma macrodactylum*, Coeur d’Alene salamander *Plethodon idahoensis*, Idaho giant salamander *Dicamptodon aterrimus*, tiger salamander *Ambystoma tigrinum*, garter snake *Thamnophis sirtalis*, western toad *Bufo boreas*, Pacific chorus frog *Pseudacris regilla*, Columbia spotted frog *Rana pretiosa*, and tailed frog *Ascaphus truei*.

Wide spread changes in land-use patterns have caused the decline of many of the more sensitive native species. Bull trout have been listed as threatened under the Endangered Species Act by the USFWS and the status of westslope cutthroat trout is currently under review. Species of concern also include the Coeur d'Alene salamander and the Columbia spotted frog. These changes in land-use patterns are not always to the detriment of native species. Some species like the northern pikeminnow have flourished under the current conditions of the watersheds. Most of the introduced exotic species are also doing well under the current environmental conditions. Northern pike, largemouth and small mouth bass, chinook salmon, kokanee salmon, as well as, yellow perch and black crappie are all doing well. Historically, cutthroat trout were the most abundant fish species. Today, kokanee salmon are the most abundant fish species in the subbasin.

Wildlife species are abundant within the Coeur d'Alene subbasin. Ungulates consist of two deer species, elk, and moose. Carnivores are widespread and diverse throughout the basin including the lynx, gray wolf, black bear, fishers, martens, and other species. Other important guilds include various waterfowl populations, neo-tropical migratory birds, small mammals, amphibians and reptiles. Mitigation activities are directed at a group of target species intended to represent cover types that were impacted by the development and operation of the Federal Columbia River Hydropower System. Specifically, Albeni Falls Dam mitigation is centered around eight target species. They include bald eagle (breeding & wintering), black-capped chickadee, Canada goose, mallard, muskrat, redhead, white-tailed deer, and yellow warbler.

Habitat Areas and Quality

The Coeur d’Alene subbasin can be grouped into four key watersheds based on geographic features, known relatively unimpacted areas, other important habitat related to native species, and known historic conditions (Table 1). The key watershed groupings are the St. Joe River and tributaries (excluding the St. Maries River), St. Maries River and tributaries, Coeur d’Alene River and tributaries, and Coeur d’Alene Lake and tributaries. Each key watershed is further broken into sub-watersheds for which similar characteristics exist.

Table 1. Breakdown of vegetative cover per key watershed area in the Coeur d'Alene subbasin.

	COVER TYPE			WATERSHED		
	Coeur d'Alene River	St. Joe River	St. Maries River	Coeur d'Alene Lake and Tributaries	Spokane River	Coeur d'Alene Subbasin Total
Forest	834146	648633	287006	192244	68926	2030954
Agriculture	17731	8669	10615	53162	46508	136685
Rangeland	62924	46477	13281	23923	23093	169697
Water	6034	1257	35	31236	2411	40972
Wetland	4508	131	221	877	178	5915
Other	28479	87338	1188	5113	10905	133022
Watershed Totals (Acres)	953821	792505	312345	306555	152021	2517246

St. Joe River and Tributaries

The St. Joe River excluding the St. Maries River contains an estimated 590 miles of streams with over 63 tributaries. The St. Joe River and tributaries is one of the core refugia watersheds for native riverine fish and herptofauna. Land ownership is primarily in large blocks. Forty-seven percent of the lands found within the watershed are managed by the Idaho Panhandle National Forests.

St. Joe River Watersheds: Upstream from Heller Creek

This 14,272 acre portion of the St. Joe River basin includes the upper-most reaches of the St. Joe River and several tributaries. Major river tributaries include (beginning toward the headwaters) Wisdom Creek, Medicine Creek, California Creek, and Yankee Bar Creek. The high elevation and cold water temperatures inherent to this area result in natural conditions that favor the persistence of native species. In addition, the processes within this watershed area have been minimally altered by human management actions. Historic mining and naturally occurring events such as fires and floods are the most noteworthy disturbances associated with this portion of the basin. Currently, a primitive road system is still in use that represents a road density of approximately 0.61-mile of road/square mile of area. The land base consists exclusively of National Forest System lands managed by the United States Forest Service (USFS).

Native species including bull trout and westslope cutthroat trout are currently known to spawn, rear, and overwinter within this portion of the St. Joe River basin. Fish populations that exhibit adfluvial, fluvial and resident life history forms utilize this area. Collectively, this watershed area is one of the core native trout refugia watersheds and is, in fact, the most important known source of bull trout within the St. Joe River basin. More than 70% of the bull trout redds located within the entire St. Joe River basin have been found in this area and over 50% of the redds have been found in Medicine Creek alone.

St. Joe River Watersheds: Copper Creek to Bean Creek

This portion of the St. Joe River basin consists of approximately 29,900 acres of tributary watersheds in the St. Joe River basin. Major river tributaries include Bean Creek (8,041 acres), Bacon Creek (5,692 acres), Ruby Creek (5,954 acres), Timber Creek (5,511 acres), and Copper Creek (4,707 acres). The high elevation and cold water temperatures inherent to this area result in natural conditions that favor persistence of native species. In addition, the processes within this watershed area have been minimally altered by human management actions. Historic mining and naturally occurring events such as fires and floods are the most noteworthy disturbances associated with this portion of the basin. Currently, Bean Creek and Copper Creek are the only two of these tributaries that have roads. A portion of a primitive ridgetop road provides for road densities of about 0.04 and 0.61 mile of road/square mile in the Bean Creek and Copper Creek watersheds, respectively. The land base consists exclusively of National Forest System lands managed by the USFS.

Native trout spawning and rearing has been documented in each stream. Fish populations that exhibit adfluvial, fluvial, and resident life history forms likely occur.

St. Joe River downstream to Mica Creek including all tributaries

The high elevation and cold water temperatures inherent to this area result in natural conditions that favor native trout persistence. Historic activities include road construction as well as some development in the lower portions of the watersheds. Otherwise, the processes within this watershed have been minimally altered and are primarily influenced by naturally occurring events such as fires and floods. Currently, a primitive road system is still in use that represents a road density of approximately 1.57 miles of road/square mile of area. The land base consists primarily of National Forest System lands managed by the USFS.

Native trout are currently known to spawn, rear, and overwinter within most of these watersheds. Fish populations that exhibit adfluvial, fluvial and resident life history forms most likely utilize this area.

St. Joe River downstream to the mouth excluding St Maries River

These areas have been heavily impacted by wide spread land use changes. Problems associated with elevated temperature and increased sedimentation limit productivity of native fish species. This area does serve as a migratory corridor for adfluvial fish including bull trout and westslope cutthroat trout. Westslope cutthroat trout probably utilize some of the tributary habitat within these watersheds for spawning and rearing. Spawning and rearing populations of bull trout have not been found in recent surveys however, individuals are frequently sighted in these watersheds at various times of the year.

St. Maries River and Tributaries

The St. Maries River contains an estimated 150+ miles of streams with over 15 tributaries. Breaklands are a common land type in the St. Joe and Coeur d'Alene river watersheds. Breaklands are typically steep and may be more susceptible to mass erosion in some areas. Alpine glaciation in the upper reaches of the St. Joe and Coeur d'Alene rivers watersheds resulted in alluvial valleys which may be important for native trout. The St. Maries watershed tends to be more rounded with less relief than most of the rest of the basin. Streams tend to be lower gradient, meandering streams, with a high percentage of the bed and banks, comprised of finer alluvial materials and deposits from ancient Lake Clarkia. A large garnet placer mining operation in the St. Maries River watershed has resulted in significant alterations to Emerald and Carpenter Creek since the 1940's. Current mining operations in these streams have placed considerable emphasis on reclamation in recent years, with significant improvements to aquatic habitat as compared with conditions between 1950 and 1990. Garnet mining operations still significantly alter stream courses, but reclamation generally is completed within two years of disturbance. New placer mining for garnets is currently being proposed along a 3.2 mile reach of the St. Maries River between the mouths of Emerald and Carpenter creeks. Legacy effects from not only mining but logging and grazing have contributed to the conditions of today. Today only occasional sightings of bull trout occur and westslope cutthroat trout populations are severely depressed.

Coeur d'Alene River and Tributaries

The Coeur d'Alene River contains an estimated 654 stream miles with over 78 tributaries. Development of the Silver Valley mining district in the South Fork Coeur d’Alene River valley since the 1880's has brought significant and essentially permanent changes to the South Fork watershed. Silver mining is still active in the valley, but at a much reduced level due to low silver price. Early gold placer mining operations in tributaries to the North Fork of the Coeur d’Alene River (Beaver and Prichard creeks) resulted in destruction of stream channels and floodplains, and continue to negatively impact fish habitat. Early logging in the Coeur d’Alene Lake basin was largely centered on the river valley bottoms where logs could be easily skidded or transported by flume to the river and ultimately floated to downstream mills. Splash dams were used in the North and Little North Forks of the Coeur d’Alene River. Prior to the establishment of the Idaho Forest Practices Act and the National Forest Management Act, streams and riparian areas received little protection from harvesting, skidding and processing activities. The legacy of these activities still affects fish habitat in some areas of the basin and they must be addressed to protect and restore fish habitat. Bull trout spawning and rearing currently does not occur in this basin and westslope cutthroat trout are limited to upper most reaches of the system. These populations are also severely depressed.

Coeur d'Alene Lake and Tributaries

Coeur d'Alene Lake contains over 200+ miles of streams with over 27 tributaries excluding the St. Joe and Coeur d'Alene Rivers. The following streams were surveyed for native trout: Fighting Creek, Lake Creek, Plummer Creek, Benewah Creek, Cherry Creek, Hells Gulch Creek, Alder Creek, Evans Creek, PeeDee Creek, Cottonwood Creek, Squaw Creek (West Side), and all tributaries of these creeks from the mouth to headwaters. No bull trout were found in any of the streams except one sub-adult was found in Lake Creek in 1993 and one sub-adult was found in Fighting Creek in 1998. Adfluvial populations do reside in Coeur d'Alene Lake. Westslope cutthroat trout spawn and rear in most of these watersheds however, their populations are severely depressed. Water temperature, excess sedimentation, and interactions with exotic species are the main reasons for the collapse in the native fish populations.

Wildlife Habitat

Land use activities have impacted native wildlife habitat in the Columbia Basin over the last 100-200 years. Since the 1860’s, when mining and farming boomed, wetlands in Idaho have decreased 56%, from 879,000 acres to approximately 386,000 acres (Dahl 1990). Most major rivers in northern Idaho are impacted by water development for hydroelectricity and recreation. Agriculture and urbanization account for additional significant wetland losses. Most wetlands in northern Idaho that have been impacted by human influences have resulted in shifts of wetland functions (Jankovsky-Jones 1997). Currently, the primary threats to wildlife habitat within the Coeur d’Alene Subbasin are the continuing increase in recreational home development and existing land management practices including agricultural and forest management related activities. The 1992 National Resource Inventory indicates that 30% and 29% of nonfederal wetlands in the Kootenai-Pend Oreille-Spokane sub-basin are used for cropland and pastureland respectively (Soil Conservation Service 1992 in Jankovsky-Jones 1997).

In the *Conservation Strategy for Northern Idaho Wetlands* (1997), Jankovsky-Jones reported wetlands, including deepwater habitat, represent approximately 11% of the 1.4 million acres of land area in northern Idaho. Wetlands (excluding deepwater habitat) represent approximately 4% of the total land area in northern Idaho (Jankovsky-Jones 1997). In a survey area encompassing most of Boundary and Bonner counties as well as a small portion of Kootenai county, Jankovsky-Jones found that nearly 1/4 of the wetlands are in private ownership. Approximately 5,362 acres of wetland and deepwater habitat are currently protected, representing less than 3.3% of the wetland and deepwater habitat in the survey area. This equates to approximately 0.2% of the total land base in the survey area. An estimated 1,598 acres of a total 22,443 acres (7.1%) of emergent wetlands are protected or administered to maintain natural resource values. Of the estimated 9,920 acres of scrub-shrub wetlands in the survey area, approximately 441 acres (4.4%) are protected. A total of 5.8% of the forested wetland cover type is protected (471 acres of an estimated total of 8,011 acres).

Watershed Assessment

Aquatic habitat surveys were completed by the USFS for most streams in this portion of the watershed most recently in 1991 and 1992. Snorkel surveys were conducted by the USFS in Medicine Creek in 1993. In addition, bull trout redd surveys have occurred annually since 1992 in a cooperative effort between numerous agencies and organizations. (Data from these surveys are on file at the St. Joe Ranger District office). Plum Creek Timber Company (PCTC) conducted electrofishing surveys during 1994.

Aquatic habitat surveys were completed by the USFS in these watersheds most recently in 1992. Bull trout redd surveys have occurred in these streams periodically since 1992 in a cooperative effort between numerous agencies and organizations. Snorkel surveys were also conducted in Timber Creek in 1993 and in Bacon Creek in 1997. (Data from these surveys are on file at the St. Joe Ranger District office).

Aquatic habitat surveys were completed by the USFS in the watersheds most recently in 1997. In addition, bull trout redd surveys have occurred nearly annually since 1992 in a cooperative effort between numerous agencies and organizations. Electro-fishing surveys and snorkel surveys were also conducted in 1993. (Data from these surveys are on file at the St. Joe Ranger District office).

Limiting Factors

Dramatic effects on riparian/stream ecosystems have resulted from trapping, livestock grazing, dam construction, logging, mining, the introduction of exotic species, channelization, urbanization, road construction, irrigation withdrawals, etc. In many instances, habitat degradation and consequent reduction in native trout populations have resulted from the cumulative effects of small changes to the aquatic ecosystem. Over time, these cumulative effects may be the most harmful to native fisheries because of their potential to alter ecosystem processes. Thus, anthropogenic disturbance can significantly alter the productivity of ecosystems by adversely affecting species composition and diversity. Accordingly, the focus of interest is restoration of an ecosystem characterized by declines in biological diversity and ecosystem productivity.

Aquatic Resources

There are five suppressing factors affecting native aquatic species defined in this report: habitat degradation, loss of prey species, passage barriers, hybridization and competition with exotics, and harvest. Any number or combination of suppressing factors is present in the Coeur d'Alene Lake basin and they can be further divided into either legacy or ongoing impacts.

Legacy impacts are results of activities, management actions, or events that occurred in the past, but their effects are still present. In many cases legacy effects continue to pose a risk to native trout. Legacy degradation to native trout habitat has resulted from timber harvest and skidding in and along riparian areas, splash dams, stream crossing structures (passage barriers and/or potential flow blockages), roads, wildfire, mining, grazing, and removal of large organic debris. Legacy effects have diminished, and in many instances continue to diminish, habitats and require restoration efforts. Legacy impacts can influence ongoing or proposed activities.

Ongoing impacts may result from activities or management actions that are legal according to present laws and regulations. Examples include road construction and maintenance, timber harvest, mining, grazing, urbanization, recreation, etc.

Legacy impacts directly affecting native trout populations have occurred from fishery management actions such as liberal harvest limits, actual harvest and the stocking of exotic fish species.

Ongoing fishery management activities that may threaten native trout include management for exotic chinook salmon in Coeur d'Alene Lake, and maintaining fishing seasons which can result in incidental catch.

The effects of both legacy and ongoing problems from land use can be reduced through immediate actions and other actions identified by analysis and monitoring. Watershed analysis provides a comprehensive assessment of watershed and fish habitat conditions within a basin. The analysis includes assessments for roads, streams, riparian areas, erosion, and fish. The results are applied to improve land management and fishery management actions. At a minimum, until watershed analyses are completed, effects from ongoing activities can be addressed by education of land and fishery users, and increased enforcement of existing laws, followed by intensified monitoring to assure implementation of existing rules and regulations.

Habitat Degradation

Habitat degradation may generally result from two sources: natural and human-caused disturbances.

Wildfire is an example of a natural habitat disturbance that can degrade bull trout habitat. Poor construction or design of roads is an example of a management related disturbance that can degrade bull trout habitat and lead to surface or mass wasting erosion

Fire

Man-caused fire ignition may be intentional (either legally for management purposes, or illegally in cases of arson) or accidental. Recent evidence suggests that successful fire suppression since the 1930's may be currently resulting in more intense, catastrophic fires. Catastrophic fire is associated with increased sediment delivery to streams, more rapid water delivery to stream channels, increased temperatures (due to burning of stream side vegetation), lack of large woody debris (in extreme cases the existing woody debris is consumed by the fire, in other cases the fire consumes trees that would contribute to woody debris in the future) and lack of habitat complexity (due to increased sediment and reduction in woody debris). Less intense fires can actually increase the complexity and diversity of the aquatic and terrestrial habitat mosaic. If the fire is not extremely hot, woody debris recruitment may increase. Woody debris acts in the channel to provide cover, pool habitat complexity, and sediment storage in the stream.

Past management activities and successful wildfire control have caused a shift in forest species composition and stocking levels, predisposing forests to large scale mortality. Drought conditions can further dispose these forests to increased wildfire incidence and intensity, with the potential for significant negative impacts on water quality and fish habitat. Large wildfires (during 1910 and the 1930's), and numerous smaller fires, have burned in the Coeur d'Alene Lake basin in this century. Large fires have often left riparian vegetation intact along larger streams, but accounts of the 1910 fire from the St. Joe watershed documented significant burning of riparian areas along some streams. Intense fires may increase natural sediment delivery to streams, when hydrophobic soils are created. At the same time, fires can significantly increase recruitment of large woody debris to stream channels. Where post-fire salvage operations have removed woody debris from stream-side areas, or created other disturbances such as roads and fire breaks, impacts to fish may be increased (Rieman and Clayton 1997). Although stream habitat in the most severely burned drainages is recovering from past fires, legacy effects from these fires may continue to lower overall productivity for native trout in some stream reaches.

Wildfire may result in short or longer term loss of, or reductions in, bull trout use of specific streams or stream reaches. Rieman and McIntyre (1995) document a case where a catastrophic (using the definition above) fire extirpated bull trout from a small watershed and within two years bull trout returned. The large, stand replacing fires of 1910 burned through a considerable portion of the upper St. Joe watershed, including riparian areas, yet the upper St. Joe is the remaining stronghold for bull trout in the Coeur d'Alene Lake basin.

Roads

Road and railroad construction has resulted in significant changes on the Coeur d'Alene Lake basin landscape since the 19th century. Road and railroad construction has been developed for hauling goods to markets, extraction of timber and other natural resources, and for general transportation. Roads and railroads have had significant impacts on stream habitats through channelization of streams, encroachment on floodplains, destruction of riparian zones, creation of migration barriers for fish, through sediment delivery associated with construction and failures, and altered runoff patterns. Those areas with the highest density of roads occur in areas managed primarily for timber production. Land management and access roads paralleling tributary streams are common and along with the problems cited above are typically more prone to failure and sediment delivery to streams.

Roads (and old railroad beds) paralleling streams typically constrain channel meanders, reduce floodplain capacity, and reduce or eliminate riparian areas and large woody debris recruitment. Streamside roads are vulnerable to failure during high flows and are significant sources of sediment to stream channels. Stream crossings may result in channel constrictions and impede water movement through floodplains, and can increase deposition on the upstream side and erosion on the downstream side of a crossing. Over 50% of the tributaries (second order and larger) to the St. Joe, St. Maries, and Coeur d'Alene rivers have significant reaches which are significantly affected by roads in floodplains or adjacent to stream channels.

The most significant problems are usually associated with “legacy” roads and roads for which there are insufficient funds to conduct routine maintenance. Legacy roads are those roads which were constructed prior to the advent of best management practices, or which were constructed without using best management practices, and which pose a significant threat to fish and fish habitat. Legacy roads impact, or pose risks to, fish habitat from failure and sediment delivery, actual loss of stream area and length, modified hydrology, loss of woody debris recruitment, and/or obstruction of fish habitat.

Legacy effects of past construction practices are evident and old, unmaintained road and railroad beds continue to pose serious risks to fish habitat in some portions of the basin. Construction of the Milwaukee rail line and Forest Highway 50 resulted in channelization of the mainstem St. Joe and numerous stream crossings became fish migration barriers. Rail grades and more recently Interstate 90 have also resulted in channelization of the South Fork Coeur d’Alene River. Fill failures associated with old and unmaintained rail beds and timber roads are relatively common, particularly during years with flood events. Forest Highways 9 and 208 up the North Fork Coeur d’Alene River have had similar impacts and in particular isolation of much of the floodplain from main channel of the river.

Roads for timber harvest or improved fire control were built in the Coeur d’Alene Lake basin throughout most of this century and road construction continues today. Roads may cause elevated sediment delivery to streams in two ways: landsliding and road surface runoff (Edwards and Burns 1986, Weaver and Fraley 1991, Shepard et al. 1984). Roads can also reduce subsurface flow and contribute to increased rates of flow delivery to streams, affecting the way that significant storm events affect stream channels (Jones and Grant 1996, Rothacher 1970, Peck and Williamson 1987, Troendle and King 1987).

Newer timber roads constructed in the 1980’s and 90’s (following the advent of the Forest Practices Act) are generally considered to be less likely to contribute sediment to streams than older roads. There are a large number of old roads in the basin, many of which are no longer maintained and have essentially been abandoned. Some old roads have stabilized and may not pose a significant risk to stream habitat, but many are in an unstable condition, and/or have undersized and unmaintained culverts which may plug and fail, resulting in landslides and massive sediment inputs to streams. Regular inspection and maintenance of all roads in the road network can help reduce road-related landslides.

Sediment from surface erosion of roads is delivered to streams from parts of the existing road network. Proper road maintenance is critical in keeping road surface erosion to a minimum.

Timber Harvest

Timber harvesting activities in the study area have included clear cutting, partial cutting, thinning, fertilization and prescribed burning. The yarding or skidding of trees varies from ground-based operations and cable systems to aerial approaches such as helicopters. The road building aspects of timber harvesting management are discussed above.

Legacy impacts of timber harvest include streams with decreased large woody debris (from log skidding directly in streams and riparian harvest), and lack of recruitable large woody debris and increased temperatures (from harvest of riparian forests). Splash dams were used in several streams (most notably Marble Creek in the St. Joe watershed) and created significant changes to stream channels and fish habitat by creating migration barriers and scouring channels with regular releases of large flows of water and logs.

Current impacts of timber harvest on native trout have been reduced with implementation of forest practice rules requiring leave trees in riparian areas, prohibiting equipment in or near streams, and controlling erosion from roads, trails and landings. However, the current leave tree requirement may not adequately protect temperature in all cases (Sullivan et al. 1990).

Zaroban et al (1997) found that forest practice rules were implemented 97% of the time, and when applied, they were 99% effective at preventing pollutants from reaching a stream. However, half of the timber sales reviewed had sediment being delivered to streams or streams channels. The impact of this sediment delivery was not assessed. These findings illustrate the need to adequately implement all applicable rules as the misapplication of one rule, out of many, can result in sediment delivery. Recently, federal lands have adopted PACFISH and INFISH management guidelines that exceed Idaho rules and were designed to protect native fish populations.

Other impacts of timber harvesting may include decreased slope stability and hydrologic alteration. Clear-cutting on steep, unstable slopes has been associated with decreased slope stability in other northern Idaho watersheds (McClelland 1998, Cacek 1989).

Hydrologic alteration, such as increased water yields, increased summer low flows, shifting of snowmelt timing, and increased peak flows have been associated with timber harvesting (Brooks et al 1991, Grant and Jones 1996). While increased summer low flows may be of benefit to native trout, the principal concern is on increases in peak flows during egg incubation and prior to emergence from the gravel. Increased peak flows may result in increased scour and deposition on redds.

Mining

Placer mining in streams and valley bottoms can have serious negative effects on native trout. This type of mining is associated with increased sediment load, substrate disturbances, resuspension of fine sediments, channelization, bank destabilization, and removal of large woody debris. Streams that have been mined usually lack habitat complexity, large woody debris, and suitable spawning and wintering habitat (Nelson et al. 1991). Revegetation of dredge piles may be slow and sparse, creating a long-term potential for sedimentation (Levell et al. 1987, Nelson et al. 1991). Griffith (1981) found that entrainment of salmonid eggs and sac fry by suction dredges resulted in 100% mortality of uneyed eggs, 35% mortality of eyed eggs, and 42% mortality of sac fry. These particular developmental stages are considered to be more vulnerable due to sensitive soft tissues.

Placer mining has significantly impacted streams in the Beaver and Prichard drainages in the North Fork Coeur d'Alene watershed, and the Emerald and Carpenter in the St. Maries watershed. Some placer mining has occurred in upper St. Joe tributaries, including Heller and Sherlock creeks, but impacts appear to be less severe in those streams.

Tailings dams, waste dumps and diversions can provide barriers to bull trout migratory corridors and spawning sites. Toxic constituents (such as heavy metals) arising from historical activities can block migratory corridors or kill life stages of native trout. Prior to establishment of the Clean Water Act, the entire South Fork of the Coeur d'Alene River from Wallace downstream to the mainstem Coeur d'Alene River, and the mainstem downstream to Coeur d'Alene Lake, were so polluted from mining and other wastes that resident fish were unable to survive (Ellis 1932). Portions of the South Fork still do not support coldwater biota due to metals contamination, and the Bunker Hill Superfund Site centered at Kellogg is one of the largest in the nation. The lower reaches of many South Fork tributaries are also impaired by heavy metals and do not currently support fish. Clean-up projects and the cessation of much of the mining and all of the smelting operations have allowed recovery of several stream reaches to the point where at least some fish and other coldwater biota are supported. Waste dumps and tailings placed in stream channels have also contributed to channel instability and intermittency problems in some stream reaches.

Mining in upland areas for sand, gravel and aggregate are probably not a major threat to native trout.

In Idaho, all mining except underground mining and placer mining that covers less than half a surface acre is regulated by the Idaho Department of Lands. The Idaho Department of Water Resources also jointly regulates any mining that occurs within a stream's bed or banks. Recreational dredge mining has regulations establishing locations and seasons throughout the state. Recreational suction dredge operators must get a "One Stop" permit from the Idaho Department of Water Resources and comply with these regulations. If they choose to operate outside of the One Stop regulations, they are required to obtain a stream channel alteration permit. Commercial dredge mining requires special permits.

Agriculture

Agriculture activities such as livestock grazing and crop production can result in increased nutrient levels from fertilizers and wastes, increased chemicals from pesticides, increased sediment from bank and channel alteration, and riparian damage. Establishment of drainage districts along the lower St. Joe and Coeur d'Alene rivers has resulted in reduced floodplain capacity, channel alterations, and migration barriers. Grazing may result in decreased water quality, increased temperatures, lack of habitat complexity, stream widening, decreased stream depth, and bank sloughing (Amour et al, 1991; Chaney et al, 1993; Platts 1991). Increased sediment input may be a major problem where row crop production occurs.

In the Coeur d'Alene Lake basin livestock grazing is generally confined to the lower river valley bottoms, and livestock grazing is generally not considered to be a significant factor affecting native trout distribution. Livestock grazing along the St. Maries River and some of its tributaries is likely interfering with successional processes which would lead to more shade and stream bank stability.

Row crop agriculture is most common on the Palouse area, where streams drain into Coeur d'Alene Lake, and along the lower river valleys. Historically, large amounts of fine sediment were delivered to streams from row crop agriculture. Changing practices, implementation of BMPs, and changes in crops and field cover have helped to reduce fine sediment delivery.

Other

A significant legacy change in many stream systems, that does not fit well in any of the categories above, is the change in stream conditions associated with the near eradication of the beaver. There is no specific literature describing native trout use of beaver dams. However, it is clear that native trout co-evolved with beaver over much of the landscape. Beaver dams are known to have a variety of positive and negative impacts on salmonid production including reduced spawning habitat and barriers to migration (Churchill 1980, Call 1966), increased rearing and over-wintering habitat (Gard 1961, Bustard and Narver 1975), sediment trapping (Smith 1980) and increased bottom fauna (Gard 1961). Beaver ponds may positively or negatively influence stream temperatures. In stream systems where beaver ponds elevate water tables and saturate the adjacent floodplain, stored water released from the floodplain during the warm summer months may serve to cool stream temperatures. Large shallow ponds with significant exposure to the sun and a low turnover rate may warm stream temperatures. In exceptionally low flow years, beaver ponds have been observed to provide refuge areas for salmonids in otherwise intermittent reaches of stream (Corsi and Elle 1989). In general, negative impacts to salmonids from beavers have been noted in low elevation and low gradient streams in the eastern and midwestern United States. In the mountainous western United States, the primary impact of beavers on salmonids noted by researchers has been creation of migration barriers, but others (Gard 1961, Corsi 1988) have noted that beaver dams do not necessarily obstruct fish passage.

A potential impact of beaver activity on native trout in the Coeur d'Alene Lake basin may be the value of ponds as brook trout habitat. MacPhee (1966), Platts (1974), and Griffith (1971) observed that brook trout in Idaho streams were more likely to occupy low gradient habitat. Call (1966) and Huey and Wolfrum (1956) observed that brook trout growth and biomass was favored by the presence of beaver ponds in Rocky Mountain streams.

Beavers and beaver activity are relatively common in the Coeur d'Alene Lake basin, with most of the activity occurring on lower gradient stream reaches where stream energy is less likely to remove dams. Brook trout distribution in the watershed does not appear to be strongly correlated with the occurrence of beaver activity. Beaver dams are present in reaches of the upper St. Joe watershed which native trout are known to pass through on their way to spawning areas.

Passage Barriers

Restoring and maintaining connectivity between remaining populations of native trout is believed to be important for the persistence of the species (Reiman and McIntyre 1993). Migration and spawning between populations increases genetic variability and strengthens population viability (Rieman and McIntyre 1993). Barriers caused by human activities limit population interactions and may eliminate life history forms of native trout. Where isolation has occurred, the risk of local extinction due to natural events such as flood and drought increase (Horowitz 1978).

Native trout that migrate downstream of fish passage barriers are unable to contribute to the trout population upstream. In systems with dams, this loss can be quite significant. Research on Arrow rock reservoir (Boise River) found that about 20% of the bull trout in the reservoir migrated past Arrow rock dam (pers. comm. Brian Flatter, IDFG). Swanberg (1997) also found that a significant portion of bull trout in the Blackfoot River (Clark Fork River drainage, Montana) migrated downstream of Mill Town Dam. The only known dams affecting fish migration in the Coeur d'Alene Lake basin are the remnant splash dams on Marble creek in the St. Joe watershed. Post Falls Dam, located on the Spokane River downstream from Coeur d'Alene Lake, was constructed an existing natural migration barrier.

Culverts can be barriers to fish movement because the jump into the culvert is too high, the jump pool below the culvert is not adequate, water velocity through the culvert exceed the fishes swimming ability, or inadequate water depths occur through the culvert (especially for spawning adult trout during August and September). Fish size, season and flows need to be considered for native trout access to habitat. Where culverts prevent invasion of exotic fishes, they may have a positive effect on native trout populations. Barriers should be evaluated for their effect to native fishes and amphibians in the drainage before they are removed. Culvert barriers with negative effects to native trout should be removed or modified to provide for fish passage. The Idaho Forest Practices Act (enforced by IDL), the stream channel Protection Act (enforced by IDWR) and Idaho Code 36-906 (enforced by IDFG) require stream crossing on fish bearing streams to provide unrestricted fish passage. Migration barriers created by culverts are common in the Coeur d'Alene Lake basin.

Hybridization, Competition, and Predation

Bull trout hybridize with introduced brook trout. Brook trout were widely stocked in the early 1900's, and there are currently several populations in the Coeur d'Alene Lake basin. Bull-brook trout hybrids have a low egg to adult survival and are sterile in most cases. Brook trout competition and hybridization have resulted in complete displacement of bull trout in some resident populations (Dambacher et al 1992, Leary and Allendorf 1989, Leary et al. 1991).

Leary et al. (1993) believe that brook trout are always favored over bull trout because brook trout mature at a much earlier age. Although it is assumed that brook trout have the greatest advantage in out-competing bull trout in degraded streams, brook trout are thought to have displaced bull trout in some wilderness streams (S. Russell, pers.com). Temperature may affect the ability of bull trout to compete with brook trout. Dambacher et al. (1992) suggests that bull trout were out-competing brook trout in an area where influxes of cold groundwater were occurring. Adams and Bjorrn (1994) found that in streams that had brook trout and bull trout, only bull trout occurred where the coldest temperatures occurred (typically less than 10^{O}C). Brook trout and bull trout do not co-exist in the core bull trout spawning and rearing habitats in the upper St. Joe watershed. Measures to reduce brook trout in the Coeur d'Alene basin would likely have little beneficial effect except in streams where conditions are thought to be suitable for and likely colonized by bull trout. Attempts to eradicate brook trout in other areas have been largely unsuccessful and labor intensive. IDFG has a state-wide bonus brook trout limit that allows an angler to keep 10 brook trout (any size) in addition to the normal trout limit. The bonus brook trout limit applies on all waters open to fishing (including catch-and-release waters) unless specifically excluded in the regulations. However, because brook trout often mature at sizes smaller than what anglers will normally catch or keep, angling is not likely to significantly reduce brook trout populations.

Westslope cutthroat trout hybridize with rainbow trout producing inferior progeny that can significantly alter the genetic composition of the entire population. Westslope cutthroat trout are also negatively impacted by brook trout. Cutthroat trout did not evolve with brook trout in the Coeur d'Alene subbasin. Therefore, mechanisms that promote coexistence and resource partitioning have likely not developed. Griffith (1972) demonstrated that cutthroat trout fry emerge from the gravel later in the year than brook trout and, thus, age-0 cutthroat trout acquire a statistically significant length disadvantage that may continue throughout their lifetime. Such a size discrepancy may enhance resource partitioning, but in times of habitat shortage cutthroat trout may be at a disadvantage if they cannot hold territories against larger competitors. Competitive exclusion is a likely cause of decline for cutthroat trout in some subbasin watersheds. Replacement of this kind, at least in stream environments, may be an irreversible process (Moyle and Vondracek 1985). This was found to be the case in Yellowstone National Park, where the introduction of brook trout has nearly always resulted in the disappearance of the cutthroat trout (Varley and Gresswell 1988). Implications are that cutthroat trout may have a difficult time recovering given continued water quality degradation and the persistence of brook trout.

Chinook salmon feed on kokanee salmon (both introduced species) in Coeur d'Alene Lake. Kokanee are likely an important forage item for adfluvial native trout. Kokanee are relatively abundant in the lake, and it is unknown whether there is enough predation on kokanee by chinook to result in competition with native trout. Chinook salmon likely feed on westslope cutthroat trout as well.

Illegally introduced northern pike are found in bays, smaller lakes, and slow moving river reaches and may consume trout as they migrate to Coeur d'Alene Lake. Northern pike are known to consume large numbers of migratory cutthroat trout, but it is unknown how much of a threat they pose for other trout species migrating into the lake. Northern pike have been in the Coeur d'Alene system since at least the 1970's. Native northern pike-minnows (formerly northern squawfish) may also occasionally prey on juvenile trout migrants in the lower St. Joe River.

Harvest and Fishing Mortality

Current harvest regulations allow a limited harvest fishery on westslope cutthroat trout with a complete closure to fishing on bull trout. Harvest of bull trout occurs through both misidentification and deliberate catch. Spawning bull trout are particularly vulnerable to illegal harvest since the fish are easily observed during fall low flow conditions. Even in cases where an angler releases the fish, incidental mortality of 4% has been documented (Schill and Scarpella 1997). Harvest and reduced fishing mortality can be further addressed through fishing regulations, angler education, enforcement, and road closures where roads readily access native trout spawning areas. Fishing regulations that allowed the harvest of bull trout in the Coeur d'Alene Lake basin were discontinued in 1988. Fishing in the core bull trout area (the area upstream from Prospector Creek where all of the known spawning and early rearing occurs) of the upper St. Joe River system is regulated with catch and release fishing regulations, with no bait allowed. Some anglers catch and release bull trout in the migration corridor downstream from Prospector Creek.

Wildlife Mitigation Efforts

A major limiting factor in the implementation effort will continue to be the abundance of opportunities to secure management rights to priority areas within the subbasin. Looking for landowners willing to participate in the mitigation program and determining appropriate protection measures can take several months. The requirements of the mitigation program, e.g., appraisals, property surveys, environmental surveys, cultural resource surveys, and title searches are all necessary components of any protection program. Agencies and tribes often cannot secure option agreements on a parcel until many of the pre-acquisition requirements are met. For properties that are listed on the open market, landowners often will not wait for an organization to complete its tasks before deciding to sell to another willing buyer. In addition, once a willing landowner has been identified, funding limitations within the region can prove detrimental to the success of the project. These two factors will continue to limit the success of wildlife mitigation efforts throughout the basin.

Subbasin Management

Goals, Objectives and Strategies

Aquatic Resources

The following generalized goals and objectives have been identified for the Coeur d' Alene subbasin.

1. Rehabilitate and maintain continuous, healthy riparian corridors that support the full range of ecological and hydrological processes.
2. Re-establish and protect self-sustaining populations of native cutthroat and bull trout that were historically prominent in the Lake Coeur d' Alene system.
3. Manage the riparian/aquatic interface for both wildlife and limited domestic use, while protecting water quality, public health, and the fisheries resource.
4. Develop agreements with private landholders to implement site specific restoration projects and encourage commitments to cost-sharing opportunities.
5. Provide alternative harvest opportunities to give restoration efforts a chance to take hold and provide protection to weak native fish populations.

Wildlife Resources

The Bonneville Power Administration has committed itself to protecting and enhancing native fish and wildlife habitat within the Coeur d'Alene Subbasin as a means of partially mitigating the impacts of the Columbia River Hydroelectric System. Section 11.1 of the Columbia River Basin Fish and Wildlife Program states that the goal of the program's wildlife strategy is to achieve and sustain levels of habitat and species productivity as a means of fully mitigating wildlife losses caused by the construction and operation of the federal and non-federal hydroelectric system. Wildlife mitigation efforts in the Coeur d'Alene Subbasin are one component of an ongoing effort directed at mitigating the losses attributable to Albeni Falls Dam. The primary focus of the project is on protecting and replacing in-kind riparian and wetland habitat types that were impacted by the Albeni Falls Hydroelectric Project.

Continued implementation, operation, and maintenance of wildlife mitigation efforts will help in the protection and enhancement of key wildlife habitats throughout the Coeur d'Alene Subbasin. In addition, mitigation efforts will target in-kind habitat types similar to those directly impacted by the construction and operation of Albeni Falls Dam as the priority for future mitigation. This effort will progress in a manner consistent with Table 11-2 of Section 11.2E of the Columbia River Basin Fish and Wildlife Program, which identifies riparian and wetland habitats as the highest priority for mitigation efforts in the Upper Columbia Subbasin.

In addition, a recent agreement between the Coeur d'Alene Tribe, Kalispel Tribe, Kootenai Tribe, Idaho Department of Fish and Game, U.S. Fish and Wildlife Service, U.S. Army Corps of Engineers, and the Natural Resources Conservation Service has produced a cooperative working relationship that will guide future wildlife mitigation efforts. All future mitigation projects to be credited to Albeni Falls Dam will be reviewed, ranked, and prioritized at the local level by the work group (an Interagency team of biologists) to ensure consistency with local goals and objectives for mitigation prior to submittal to the regional level for review by the CBFWA, ISRP, and the NWPPC. The work group is committed to a cooperative and unified effort towards the goal of achieving a level of self-sustaining habitat productivity equal to that which was lost through the construction and operation of the Albeni Falls Hydroelectric facility.

Wildlife goals, objectives and strategies for the Coeur d'Alene Subbasin are as follows:
1. Identify all of the impacts that the Columbia River Hydropower System has had on the region.
2. Identify and prioritize opportunities for wildlife habitat protection in the subbasin with in-kind habitat types being of highest priority whenever possible.
3. Implement protection, mitigation, and enhancement measures in perpetuity to help offset impacts associated with the construction and operation of the Columbia River Hydropower System.

Past Efforts

The project to Implement Fisheries Enhancement opportunities: Coeur d'Alene Reservation (9004400) helps protect fish and wildlife habitat in the subbasin by land acquisition and development of management plans. The Lake Creek Land Acquisition and Enhancement project (9004401) protects valuable habitat by acquiring privately held lands.

Research, Monitoring and Evaluation

Aquatic Resources

Major land managers within the area include Idaho Panhandle National Forest, Bureau of Land Management, State of Idaho, Plum Creek Timber Company, Louisiana Pacific Company, Crown Pacific International Corporation, and Potlatch Corporation and the Coeur d'Alene Tribe. The Idaho Panhandle National Forest manages the most land within the watershed. The Idaho Department of Fish and Game and the Coeur d'Alene Tribe are fish population managers within the basin.

Since the listing of bull trout as threatened by the USFWS each of the major land managers in the subbasin have had to modify what they have been doing to accommodate requirements associated with the listed species. This includes implementation of a conservation strategy sufficient to recover the species such that a harvestable surplus is available to a fishery.

Westslope cutthroat trout are also a species of interest. The Coeur d'Alene Tribe has been working for over 10 years in the basin restoring key tributary habitat such that a harvestable surplus can be maintained in perpetuity. Other land management agencies have been working as well to restore degraded habitat associated with westslope cutthroat trout in the subbasin.

Wildlife Mitigation Efforts

Habitat Evaluation Procedure (HEP) and other vegetative sampling techniques will be used to monitor the effectiveness of enhancements and other mitigation efforts in the basin. Species evaluations will also be compiled using standardized survey techniques. This information will be used to help adaptively manage the projects for increased benefit to species and habitats while reducing project costs. Site-specific wildlife management plans with detailed monitoring and evaluation measures and timetables will be completed for each mitigation project. Currently, the Regional Wildlife Caucus is developing standardized methods for monitoring and evaluation activities. Monitoring and evaluation activities for all wildlife mitigation projects in the Coeur d'Alene Subbasin will be consistent with those developed by the regional managers.

Remaining Work

Aquatic Resources

Remaining work includes the completion of land acquisition efforts, implementation of short and long-term habitat restoration projects, maintenance activities, and drafting of a project management plan to guide future enhancement, and O&M efforts.

Wildlife Mitigation Efforts

Currently only about 6% of the construction and inundation losses attributable to the Albeni Falls dam have been mitigated. It is the goal of the Albeni Falls Interagency Workgroup (AFIWG), to continue its efforts to assist in fully mitigating the losses associated with Albeni Falls Dam. Complete HEP evaluations and management plans for new lands acquired under this project and implement enhancement, operations, and maintenance activities for lands with existing HEPs and management plans in place.

Subbasin Recommendations

Aquatic Resources

The proposed efforts are intended to first, stabilize the populations of native fish species then, secondly, increase productivity such that a harvestable surplus is available to the surrounding communities. The land management agencies are currently implementing habitat restoration projects in areas with highly degraded habitat. Attempts are also being made to remove factors limiting the production of native fish so naturally sustaining populations of native fishes can return to areas where habitat currently limits distribution.

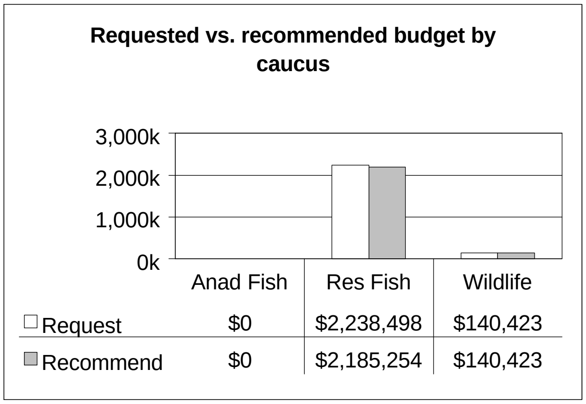
Wildlife Mitigation Efforts

Complete current acquisition efforts and continue to identify and pursue new wildlife habitat projects that will partially mitigate for Albeni Falls Dam losses. It is important to note that these future actions and needs are based upon a watershed effort to replace in-kind habitats while targeting important fisheries habitat issues. Where human encroachment and habitat development are out-pacing mitigation implementation and precluding opportunities to protect and enhance wildlife habitat on- site, it becomes necessary to broaden the areas in which prospective mitigation implementation takes place.

Projects and Budgets

Based on the preceding subbasin description, the CBFWA fish and wildlife managers recommend funding a total of 3 projects at a cost of $2,325,677. Of the projects recommended, two focus on resident fish and one is directed at wildlife. Our project supports ESA requirements for a total of $1,500,000.

Refer to the following figures for detail on: 1) total recommended and requested budget by caucus, 2) funding for new and ongoing work, 3) funding by project phase and emphasis, and 4) funding by time period (past, current and future). Individual projects are listed in the following table.


Requested vs. recommended budget by caucus
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2,000k
1,000k
0k
Anad Fish
Res Fish
Wildlife
Request
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$2,238,498
$140,423
Recommend
$0
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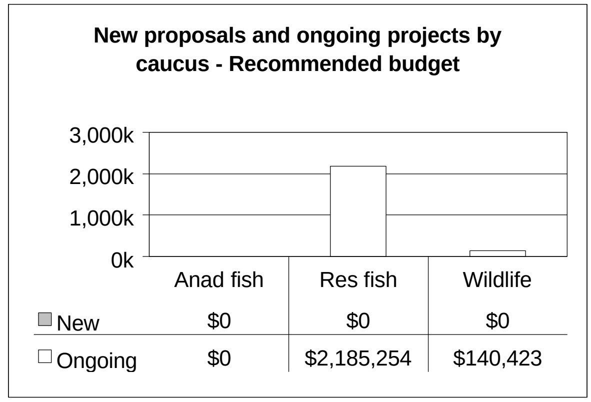
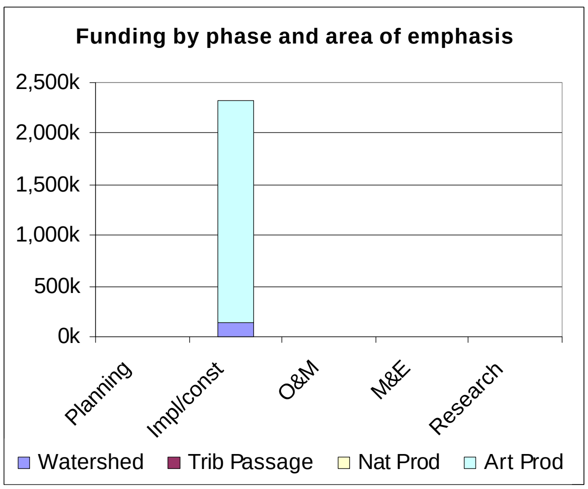
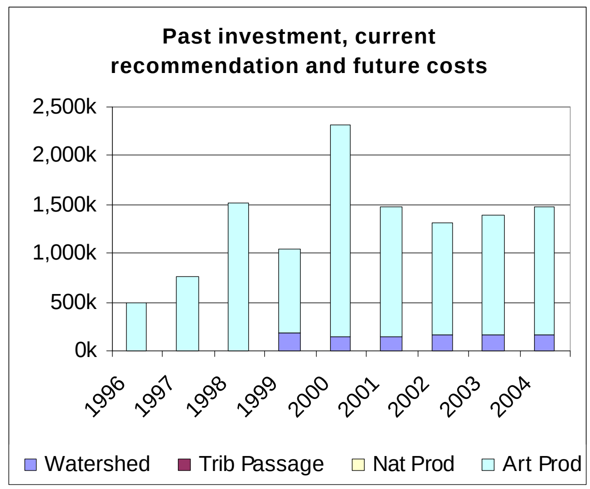
$140,423


New proposals and ongoing projects by caucus - Recommended budget
3,000k
2,000k
1,000k
0k
Anad fish
Res fish
Wildlife
New
$0
$0
$0
Ongoing
$0
$2,185,254
$140,423


Funding by phase and area of emphasis
2,500k
2,000k
1,500k
1,000k
500k
0k
Planning
Impl/const
O&M
M&E
Research
Watershed
Trib Passage
Nat Prod
Art Prod


Past investment, current recommendation and future costs
2,500k
2,000k
1,500k
1,000k
500k
0k
1996
1997
1998
1999
2000
2001
2002
2003
2004
Watershed
Trib Passage
Nat Prod
Art Prod

ProjectID		Title	Sponsor	FY99 recom.	FY00 recom.	Estimated Outyears FY01	FY02	FY03	FY04
Resident Fish Projects									
9004400		Implement Fisheries Enhancement Opportunities: Coeur D'alene Reservation	CDA Tribe	859	685	720	755	793	833
9004402	*	Coeur D' Alene Tribe Trout Production Facility	CDA Tribe		1,500	601	394	439	471
			Resident Fish Totals		**$2,185**	**$1,321**	**$1,149**	**$1,232**	**$1,304**
Wildlife Projects									
9004401		Lake Creek Land Acquisition and Enhancement	CDA Tribe	186	140	150	158	165	174
			Wildlife Totals		**$140**	**$150**	**$158**	**$165**	**$174**
		* indicates ESA project, † indicates 'Innovative work'	**SUBBASIN TOTALS**		**$2,326**	**$1,471**	**$1,307**	**$1,398**	**$1,478**

All figures in thousands of dollars

Needed Future Actions

Aquatic Resources

The protection and enhancement of native aquatic resources through habitat restoration, land acquisition and easements must continue if aquatic resource goals are to be met. The expansion of efforts from the target tributaries to all tributaries of the subbasin will be necessary for effective conservation of the native species of interest. It should be noted that over 100 years of habitat degrading activities have occurred throughout the basin and it will take nearly as long to recover. Measurable responses from basin-wide habitat reclamation projects will take decades to be realized thus, projects have to be designed to take this into account. Multi-year implementation plans spanning multiple decades need to be in place to ensure that effective long-term solutions to problems can be prescribed and subsequently carried out.

Wildlife Mitigation Efforts

The protection and conservation of fish and wildlife habitat through continuing land acquisition and easement efforts must continue if wildlife mitigation goals and objectives for the basin are to be met. The expansion of mitigation efforts through ongoing acquisition efforts is a high priority. However, the effectiveness of this effort is limited by the availability of acquisition dollars and the amount of time it takes to fulfill the project submittal processes. Many protection opportunities are lost because of the long turn around time in securing funds from BPA. Having protection dollars more readily available would help substantially in the effort to protect high priority wetland and riparian habitats. In addition, it will be necessary to use both passive and active treatment techniques on mitigation lands during the implementation of long-term management strategies on project lands. A long-term monitoring and evaluation effort will be implemented to provide a means of assessing the effectiveness of mitigation efforts in the basin.

Actions by Others

Aquatic Resources

Land management agencies as well as private landowners need to coordinate efforts to best use limited resources. Fish and Wildlife resource managers need to work together such that rules and regulations that best promotes the enhancement of native species are put in place and enforced.

Wildlife Mitigation Efforts

The coordination of all wildlife mitigation activities through the Albeni Falls Inter-Agency Work Group will continue. In addition an effort must continue to be made by the work group to involve the public in mitigation efforts and to seek partnership opportunities whenever possible.

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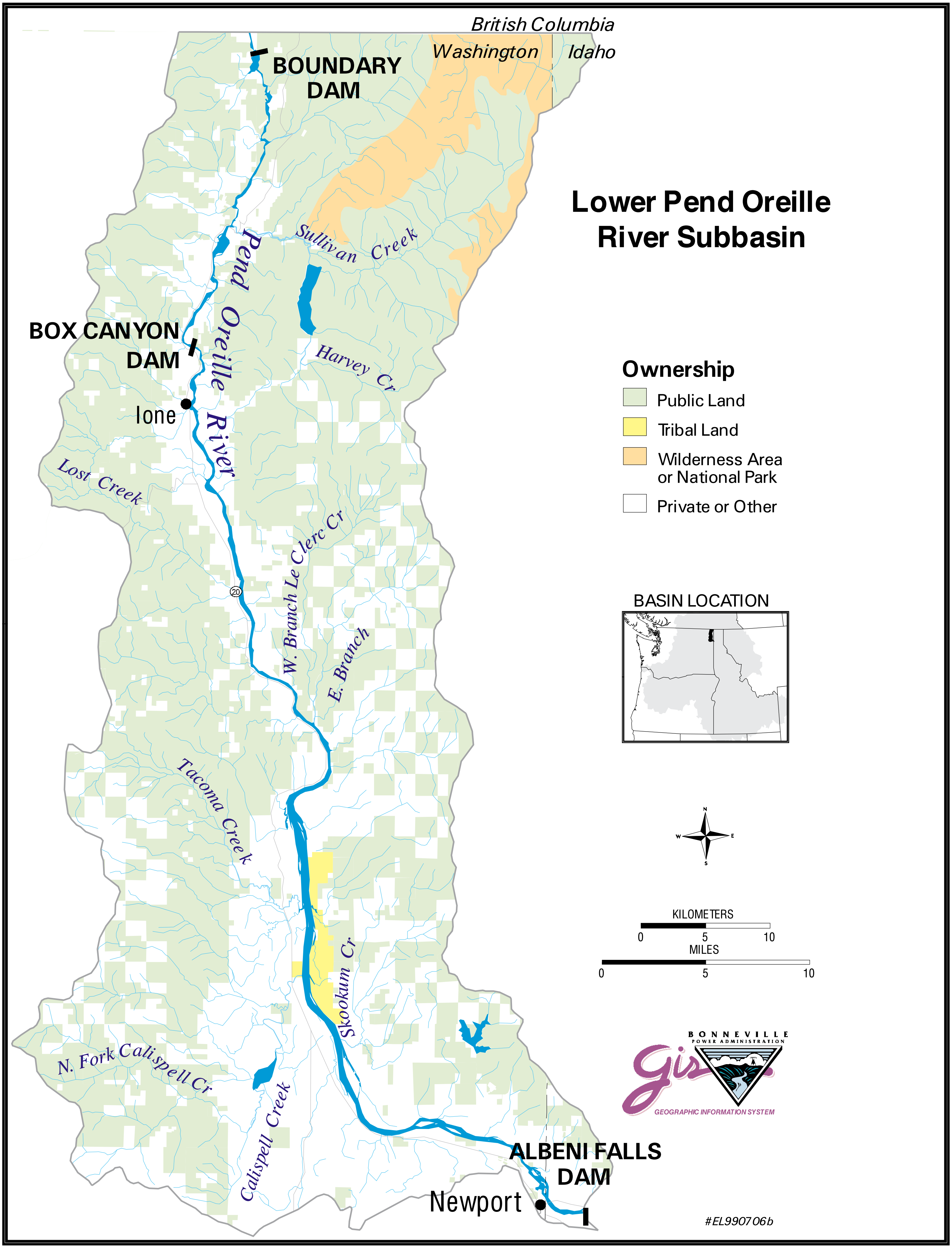

British Columbia
Washington
Idaho
BOUNDARY DAM
Lower Pend Oreille River Subbasin
Sullivan Creek
Pend Oreille River
BOX CANYON DAM
Harvey Cr
Ione
Ownership
Public Land
Tribal Land
Wilderness Area or National Park
Private or Other
Lost Creek
W. Branch Le Clerc Cr
20
BASIN LOCATION
E. Branch
Tacoma Creek
KILOMETERS
0 5 10
MILES
0 5 10
Skookum Cr
BONNEVILLE POWER ADMINISTRATION
GEOGRAPHIC INFORMATION SYSTEM
N. Fork Calispell Cr
Calispell Creek
ALBENI FALLS DAM
Newport
#EL990706b

Lower Pend Oreille Subbasin

Res fish	1	project	$297
Wildlife	1		153
	2		$450

Fish and Wildlife Resources

Subbasin Description

The Lower Pend Oreille Subbasin is located in the Upper Columbia Subregion and consists the Pend Oreille River which flows 74 miles through the Selkirk Mountains from Albeni Falls Dam to the Canadian Border. Three hydroelectric dams occupy this stretch of River; Albeni Falls Dam, Box Canyon Dam, and Boundary Dam. The Lower Pend Oreille Watershed encompasses 1,019 square miles.

Fish and Wildlife Status

The Lower Pend Oreille subbasin contains both native and non-native fish species. Endangered bull trout exist in the subbasin at very low densities (<1 fish/100 M^2 in tributaries). Existing bull trout populations are largely resident, however, adfluvial populations may be present in Boundary Reservoir. Westslope cutthroat are found to exist in the subbasin largely as non-migratory tributary residents at densities <7 fish/100 M^2. Largemouth bass, brown trout, brook trout, and many other non-native species also exist at different levels throughout the subbasin.

Wildlife species are fairly abundant within the Pend Oreille subbasin. Ungulates consist of two deer species, elk, moose and woodland caribou. Carnivores are widespread and diverse including several endangered or threatened species such as the lynx, gray wolf, and grizzly bear. Other important guilds include large waterfowl populations, neo-tropical migratory birds, small mammals, amphibians and reptiles. Target species focus for mitigating the Columbia Basin Hydropower system in this subbasin is associated with habitat cover types impacted by the construction and operation of the hydropower system. Specifically, Albeni Falls Dam mitigation is centered around eight target species. They include Bald Eagle (breeding & wintering), Black-capped Chickadee, Canada Goose, Mallard, Muskrat, Redhead, white-tailed deer, and Yellow Warbler.

Habitat Areas and Quality

See Subbasin management section for fisheries.

Wildlife habitat within the subbasin consists mainly of two major types: riparian and floodplain bottoms and inland moist forest uplands. The upland habitats are diverse ranging from open and drier ponderosa/larch areas to moist cedar/hemlock dominated stands. The lowland habitats are equally diverse containing wetland and riparian habitats associated with the floodplain and banks of Lake Pend Oreille, the Pend Oreille and Clark Fork Rivers. Remnant gallery cottonwood forests are present along these areas but remain as decadent, fragmented and limited in distribution. Within the Cusick valley floodplain less than 1/3 of the floodplain (most of which is part of the Kalispel Indian Reservation or other lands managed by the Tribe) is undeveloped and under management strategies for habitat benefits to fish and wildlife. Generally the habitats within the subbasin are moderately to severely altered and habitat quality is low. Although there are several species listed as endangered or threatened under the Endangered Species Act within the subbasin, habitat quality issues remain high on the priority list to benefit those species and other associated resources.

Since the 1860's, when mining and farming boomed, wetlands in Idaho have decreased 56%, from 879,000 acres to approximately 386,000 acres (Dahl 1990). Most major rivers in northern Idaho are impacted by water development for hydroelectricity and recreation. Agriculture and urbanization account for additional significant wetland losses. Most wetlands in northern Idaho that have been impacted by human influences have resulted in shifts of wetland functions (Jankovsky-Jones 1997). Currently, the primary threat to wetland and riparian systems surrounding Lake Pend Oreille is the continuing increase in recreational home development. The 1992 National Resource Inventory indicates that nearly 60% of nonfederal wetlands in the Kootenai-Pend Oreille-Spokane sub-basins are used for cropland and pastureland (Soil Conservation Service 1992 in Jankovsky-Jones 1997).

The public recognized that the obvious cost of the Columbia Basin hydropower system was not only the impact on wild salmon and steelhead runs, but also the cumulative impacts to wildlife. The Pacific Northwest Electric Power Planning and Conservation Act of 1980 (Public Law 96-501) directed that measures be implemented to protect, mitigate, and enhance fish and wildlife to the extent affected by the development and operation of hydroelectric projects in the Columbia River system. The Northwest Power Planning Council (Council) implemented the Columbia River Basin Fish and Wildlife Program (Program) to address fish and wildlife impacts and to ensure that wildlife receive equitable treatment in matters concerning the hydropower system.

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Limiting Factors

The two major limiting factors to native fish populations are the absence of nutrient input from anadromous fish and the impoundment of the fluvial system by hydroelectric facilities.

Currently, limiting factors to continued wildlife mitigation strategies remain the availability of in-kind habitat and funding to pursue high ranking actions.

Subbasin Management

Goals, Objectives and Strategies

The goal for these species is to restore sustainable, naturally producing populations to support tribal and non-tribal harvest and cultural and economic practices while protecting the biological integrity and the genetic diversity of the watershed.

To accomplish this goal the managers have established objectives to: 1) improve survival of all life history phases of these fish populations; and 2) restore depressed populations to productive levels.

The Lower Pend Oreille Subbasin is located in the Upper Columbia Subregion and consists of the Pend Oreille River watershed from Albeni Falls Dam (upstream) to the Canadian border (downstream). Throughout the subbasin, native resident fish will be the priority for management if habitat conditions can be adequately maintained to sustain genetic diversity and species persistence. In areas where such habitat conditions do not exist, alternative management strategies will be implemented to maximize available habitats and harvest opportunities. The subbasin is broken into four management types, each with their own physical habitat conditions and corresponding management approach.

1. Box Canyon Reach of the Pend Oreille River: Hydroelectric development has changed this reach from free flowing, coldwater fluvial habitat to a shallow, slow flowing, unstratified warmwater lacustrine environment. Due to these altered habitat conditions management actions focus on largemouth bass, brown trout, mountain whitefish, non-game species, and other non-native species tolerant to altered habitat conditions.

2. Pend Oreille River tributaries: Habitat conditions in tributaries of the Pend Oreille River are conducive to restoring and enhancing healthy native assemblages. Tributary management focuses on bull trout, westslope cutthroat, sculpin, suckers, and mountain whitefish.
3. Pend Oreille River below Box Canyon Dam: Management strategies are currently being developed based on information being collected. This stretch of river has significantly different habitat characteristics from the Box Canyon Reach and an unknown species assemblage.
4. Lakes throughout the Lower Pend Oreille Watershed: Lakes management will be considered on a case by case basis based on habitat characteristics, native species impacts, species assemblages, and harvest objectives. Species currently being managed for in lakes include, but are not limited to, burbot, westslope cutthroat, rainbow trout, brook trout, kokanee, Pygmy whitefish and brown trout.

Wildlife goals, objectives and strategies are simple, identify in-kind habitat as impacted by the hydropower system, prioritize those efforts, and implement protection, mitigation, and enhancement measures to offset impacts associated with the construction and operation of the Columbia River Hydropower System.

Past Efforts

Fisheries work in the subbasin is relatively new. The Kalispel Resident Fish Project began in 1995. Since the beginning of the project, assessments of seven tributaries have been completed in the Box Canyon Reservoir. Results of the assessments guided the Kalispel Natural Resource Department and Washington Department of Fish and Wildlife to implement habitat enhancement measures based on assessment results. Each type of enhancement measure is currently being monitored to determine the most effective restoration strategies. Results of this monitoring effort will guide future restoration efforts in an effort to achieve Biological objectives.

A largemouth bass hatchery has been constructed and is set to produce 150,000 juvenile bass in 1999.

Wildlife efforts began in 1988 with the completion of the loss assessment for Albeni Falls Dam. Shortly thereafter, the Kalispel Tribe submitted an acquisition and enhancement project through the regional process for 440-acres adjacent to the Reservation. In 1992, the land was purchased and in 1993, the Tribe began to manage the land for its benefits to wildlife associated with the habitat cover types and its value to Albeni Falls Dam mitigation efforts. In 1997 the Tribe added an additional 160-acres to the project and is currently seeking management agreements on 90-acres of adjacent public lands to fully manage this important corridor. Since 1991, a total of 2,708 baseline Habitat Units (HUs) have been credited to BPA for Albeni Falls wildlife mitigation, and an additional 400 HUs are anticipated to be credited during FY1999. The Coeur d'Alene Tribe is expected to credit BPA with baseline HUs for the Lake Creek Acquisition (project no. 9004401) when the HEP is completed. Total enhanced HUs credited to BPA thus far total 167 for the Flying Goose Ranch.

The members of the Albeni Falls Interagency Workgroup is also involved with FERC hydropower licensing efforts and will use those resources to enhance existing federal mitigation efforts.

Research, Monitoring and Evaluation

Current monitoring of habitat enhancement measures to determine effectiveness. Monitoring adfluvial movements of salmonids in BCR and principle tributaries to determine population status.

Currently Habitat Evaluation Procedure (HEP) and other vegetative sampling techniques are being used to monitor the effectiveness of enhancements within the project. Species evaluations are also being compiled using standardized survey techniques. This information is being used to help adaptively manage the projects for increased benefit to species and habitats while reducing project costs. The Work Group plans to protect additional acreage in FY 2000 and will implement minimal monitoring and evaluation activities on those properties until the management plans are complete and approved by the CBFWA Wildlife Caucus. At that time, site-specific wildlife management plans with detailed monitoring and evaluation measures and timetables will be followed. Currently, the Caucus is developing standardized methods for monitoring and evaluation activities. Monitoring and evaluation activities for all Albeni Falls wildlife mitigation projects will be consistent with those developed by the Caucus.

Remaining Work

Much work remains to be done. Implementation of habitat assessment monitoring recommendations has not begun. Population assessments of the Pend Oreille River below Box Canyon Dam have never been done, therefore population status of all species below the BCD are unknown. Lake management strategies need to be addressed for effectiveness. Migratory populations need to be identified and quantified. Biological objectives need to be developed and plans made to achieve them in the basin below BCD. Implementation of efforts aimed at achieving Biological objectives for the Box Canyon Reservoir need to be implemented.

Currently only about 6% of the construction and inundation losses attributable to Albeni Falls dam have been mitigated. It is the goal of the Albeni Falls Interagency Workgroup (AFIWG), to continue its efforts to assist in fully mitigating the losses associated with Albeni Falls Dam. The AFIWG is also committed to working through the FERC process to merge these two efforts for increased benefit wildlife and wildlife habitat within this subbasin.

Subbasin Recommendations

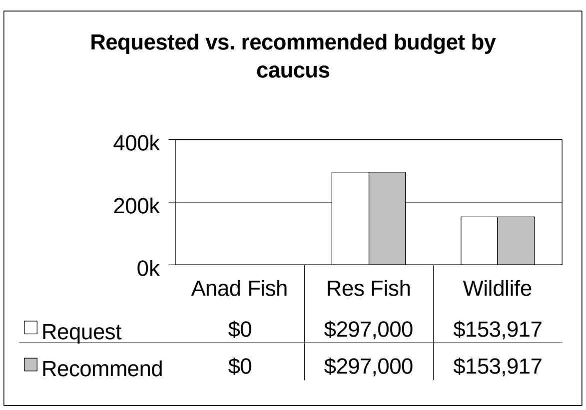
Complete the third and final year of monitoring habitat enhancement measures. Operate and maintain largemouth bass production facility. Assess population status of the Pend Oreille River below Box Canyon Dam. Assess lake management of selected lakes for effectiveness. Monitor migratory salmonid populations in Box Canyon Reservoir and tributaries.

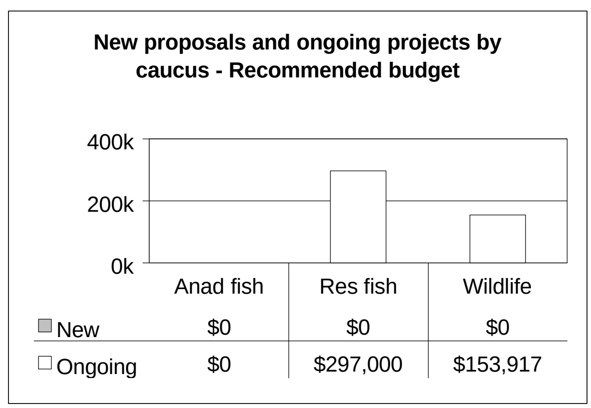
Complete current acquisition efforts and continue to identify and pursue new wildlife habitat projects that will partially mitigate for Albeni Falls Dam losses. It is important to note that these future actions and needs are based upon a watershed effort to replace in-kind habitats while targeting important fisheries habitat issues.

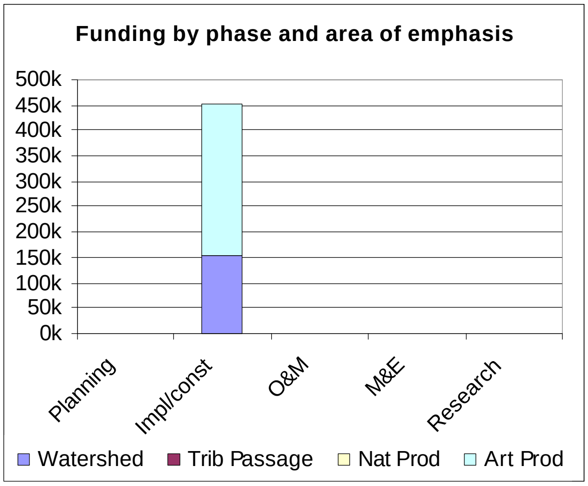
Projects and Budgets

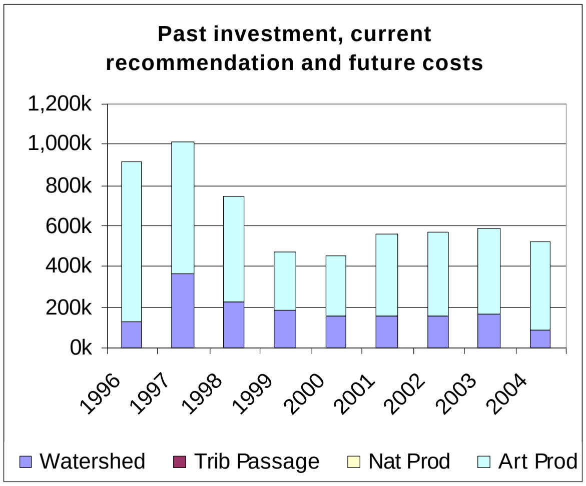
Based on the preceding subbasin description, the CBFWA fish and wildlife managers recommend funding a total of 2 projects at a cost of $450,917. Of the projects recommended, 1 focuses on resident fish, and 1 is directed at wildlife.

Refer to the following figures for detail on: 1) total recommended and requested budget by caucus, 2) funding for new and ongoing work, 3) funding by project phase and emphasis, and 4) funding by time period (past, current and future). Individual projects are listed in the following table.






Funding by phase and area of emphasis
500k
450k
400k
350k
300k
250k
200k
150k
100k
50k
0k
Planning
Impl/const
O&M
M&E
Research
Watershed
Trib Passage
Nat Prod
Art Prod


Past investment, current recommendation and future costs
1,200k
1,000k
800k
600k
400k
200k
0k
1996
1997
1998
1999
2000
2001
2002
2003
2004
Watershed
Trib Passage
Nat Prod
Art Prod

ProjectID	Title	Sponsor	FY99 recom.	FY00 recom.	Estimated Outyears FY01	FY02	FY03	FY04
Resident Fish Projects								
9500100	Kalispel Tribe Resident Fish	KNRD	286	297	400	410	420	430
			Resident Fish Totals	**$297**	**$400**	**$410**	**$420**	**$430**
Wildlife Projects								
9106000	Pend Oreille Wetlands Wildlife Mitigation Project - Kalispel	KNRD	116	154	156	162	168	87
			Wildlife Totals	**$154**	**$156**	**$162**	**$168**	**$87**
	* indicates ESA project, † indicates 'Innovative work'		**SUBBASIN TOTALS**	**$451**	**$556**	**$572**	**$588**	**$517**

All figures in thousands of dollars

Needed Future Actions

Gaps are currently being investigated by project 9700400. Needed actions will be listed as information is collected.

Actions by Others

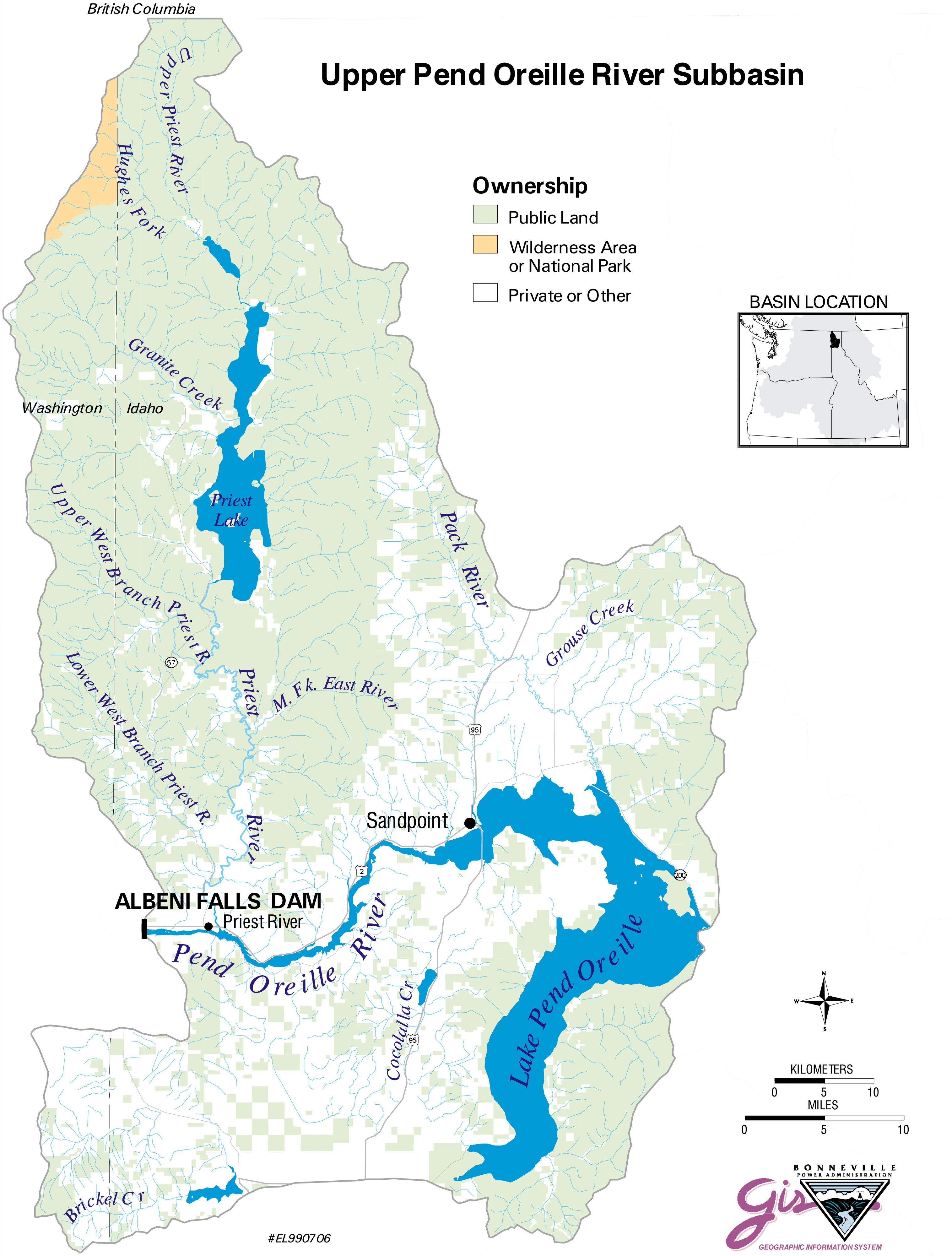
Actions in the basin are largely cooperative with USFS, Pend Oreille PUD (Box Canyon Dam), Seattle City Light (Boundary Dam), Washington Department of Fish and Wildlife, U.S. Fish and Wildlife Service, sportsmen's organizations, and conservation organizations.

Watershed References

Panhandle Bull Trout Technical Advisory Team. 1998. Lake Pend Oreille key watershed: bull trout problem assessment (June 1998 draft). Lake Pend Oreille Watershed Advisory Group and Idaho Division of Environmental Quality, Boise, Idaho.

USDA Forest Service. 1993. Trestle Creek watershed improvement environmental assessment. Idaho Panhandle National Forest, Sandpoint RD, Sandpoint, Idaho.

Upper Pend Oreille River Subbasin



Upper Pend Oreille Subbasin

Res fish	1	projects	$379
Wildlife	1		2,195
	2		$2,574

Fish and Wildlife Resources

Subbasin Description

The Pend Oreille subbasin is managed in two distinct units: the Upper Pend Oreille (above Albeni Falls) and the Lower Pend Oreille (Albeni Falls to the Canadian border).

The Upper Pend Oreille Subbasin starts at Albeni Falls Dam , a U. S. Army Corps of Engineers Project, and includes the drainage upstream of Lake Pend Oreille. Key features in this watershed include Lake Pend Oreille, which is the largest lake in the state of Idaho. It is 93,000 acres and at one time provided the largest fishery for resident fish in the state. It is also one of the deepest lakes in the country; 1100 feet deep. The subbasin also includes the Pend Oreille River which flows from Lake Pend Oreille to Albeni Falls Dam. This 28 miles of river has been severely impacted by water level fluctuations from the dam. The major inflow to Lake Pend Oreille is the Clark Fork River. This river was blocked by the construction of Cabinet Gorge Dam, and it is a complete barrier to fish passage. Prior to the dam's construction, bull trout, cutthroat trout, and kokanee heavily utilized the Clark Fork River for spawning.

Fish and Wildlife Status

Prior to the construction of Albeni Falls Dam and Cabinet Gorge Dam, Lake Pend Oreille provided in excess of 1 million fish annually to the fishermen's creel making it the largest resident fishery in the state of Idaho. Kokanee harvest was as high as 1.3 million fish annually, bull trout harvest peaked at 5,000 fish annually, and cutthroat trout harvest reached 8,000 fish annually. Currently, kokanee harvest has declined more than 90% to less than 100,000 fish per year. Bull trout are a federally threatened species and all harvest has been eliminated. Cutthroat trout have been petitioned for listing and their harvest is less than 10% of historic levels. Construction and operation of dams on the lake's inflow and outflow have been cited as primary reasons for fish declines.

The Pend Oreille River between Sandpoint and Albeni Falls Dam has been strongly affected by dam operations. The dam keeps the river high during summer and it becomes too warm for cold water fish such as trout. Winter-time draw downs return the river to its confined channel where it losses nearly all of its warm water fish habitat. Sport fish abundance in the river is very low, and the sport fishery is almost non-existent.

Wildlife species are fairly abundant within the Pend Oreille subbasin. Ungulates consist of two deer species, elk, moose and woodland caribou. Carnivores are widespread and diverse including several endangered or threatened species such as the lynx, gray wolf, and grizzly bear. Other important guilds include large waterfowl populations, neo-tropical migratory birds, small mammals, amphibians and reptiles. Target species focus for mitigating the Columbia Basin Hydropower system in this subbasin is associated with habitat cover types impacted by the construction and operation of the hydropower system. Specifically, Albeni Falls Dam mitigation is centered around eight target species. They include Bald Eagle (breeding & wintering), Black-capped Chickadee, Canada Goose, Mallard, Muskrat, Redhead, white-tailed deer, and Yellow Warbler.

Habitat Areas and Quality

Water quality in the subbasin is excellent and does not limit resident fish populations, with one notable exception-high dissolved gasses (130% of saturation) have been produced by Cabinet Gorge Dam. Nutrient status of the open water areas of Lake Pend Oreille remains largely unchanged since the early 1900's. The largest aquatic habitat changes are due to water level fluctuations for power production and flood control. Shoreline spawning kokanee are particularly susceptible to lake level changes. Prior to 1966, drawdowns after spawning have exposed kokanee eggs causing high mortality. Currently the Corps stabilizes the lake elevation once kokanee spawn. However, drawdowns immediately prior to spawning have left the wave-washed gravel high and dry and unusable for fish. This has severely limited the amount of shoreline spawning habitat for kokanee. Since kokanee are the base of the food chain for other predatory fish, low kokanee abundance has caused reductions in Kamloops rainbow trout, and limited the food supply for bull trout and lake trout.

Wildlife habitat within the subbasin consists mainly of two major types: riparian and floodplain bottoms and inland moist forest uplands. The upland habitats are diverse ranging from open and drier ponderosa/larch areas to moist cedar/hemlock dominated stands. The lowland habitats are equally diverse containing wetland and riparian habitats associated with the floodplain and banks of Lake Pend Oreille, the Pend Oreille and Clark Fork rivers. Remnant gallery cottonwood forests are present along these areas but remain as decadent, fragmented and limited in distribution. Within the Cusick Valley floodplain less than 1/3 of the floodplain (most of which is part of the Kalispel Indian Reservation or other lands managed by the Tribe) is undeveloped and under management strategies for habitat benefits to fish and wildlife. Generally the habitats within the subbasin are moderately to severely altered and habitat quality is low. Although there are several species listed as endangered or threatened under the Endangered Species Act within the subbasin, habitat quality issues remain high on the priority list to benefit those species and other associated resources.

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Completion of the Albeni Falls hydroelectric facility in 1955 permanently affected Lake Pend Oreille water level fluctuations. Construction of the dam also flooded shallow water areas known to produce high concentrations of waterfowl food plants, both emergent and submerged (USFWS 1960 in Martin *et al.* 1988). The Idaho Department of Fish and Game (IDFG) formed the Work Group in 1986 and calculated the wildlife impacts caused by Albeni Falls Dam. Today, the Work Group includes the IDFG; the U.S. Fish and Wildlife Service; the Kalispel Tribe of Indians; the Coeur d'Alene Tribe; the Kootenai Tribe of Idaho; the U.S. Forest Service; the U.S. Army Corps of Engineers; and the Natural Resources Conservation Service. Using the standardized HEP process (USFWS 1980), the Work Group estimated a net loss of 28,587 HUs for a variety of target species (Martin *et al.* 1988). Construction of the dam resulted in the loss of 6,617 acres of wetland habitat and the inundation of 8,900 acres of deep-water marsh. The Project is designed to mitigate those losses, in addition to protecting and enhancing critical wildlife habitat for a wide variety of species depending on wetland and riparian habitats. Today, the Work Group's priority for mitigation implementation is habitat protection and enhancement in the Clark Fork and Pack River deltas and pre-dam areas adjacent to Lake Pend Oreille directly impacted by construction of the dam (elevations below 2,070')

Limiting Factors

The Upper Pend Oreille Drainage has undergone several adverse physical changes in the last century that were largely due to the federal hydropower system. In 1952, the US Army Corps of Engineers built, and now operates, the Albeni Falls Dam. During the same year, Washington Water Power built the Cabinet Gorge Dam which is a federally licensed project. Operation of Albeni Falls Dam changed the natural cycle of lake elevations on Lake Pend Oreille. These changes caused significant losses of shoreline spawning areas, shoreline erosion, reductions in aquatic plant production, and elimination of much of the fish habitat in the Pend Oreille River between Albeni Falls Dam and Sandpoint, Idaho. Cabinet Gorge Dam has caused additional impacts to this drainage. It is a fish barrier blocking much of the drainage from spawning fish. It has also been found to produce dissolved gasses well in excess of the

State's standard which affects the north end of Lake Pend Oreille and the Clark Fork and Pend Oreille rivers. These changes have impacted many species including bull trout, cutthroat trout, kokanee, Kamloops rainbow trout, and several species of warm water fish. These impacts have affected the viability of native populations as well as sharply reduced economically important sport fisheries.

Currently, limiting factors to continued wildlife mitigation strategies remain the availability of in-kind habitat and funding to pursue high ranking actions.

Subbasin Management

Goals, Objectives and Strategies

The goal for the Upper Pend Oreille Subbasin is to mitigate for resident fish losses caused by the construction and operation of Albeni Falls and Cabinet Gorge Dams. This is to be accomplished by improving the ecosystem, changing dam operation to minimize impacts, recovering native fish communities, and improving the currently established sport fisheries. It is unlikely that full mitigation for the effects of the dams can be done on-site. Mitigation may, therefore, be provided by improving fish populations in other parts of the subbasin.

To accomplish this goal the managers have adopted the following objectives: 1) improve survival for all life history stages for target species; and 2) restore depressed populations to productive levels.

To achieve these objectives in the Pend Oreille River Subbasin, fish managers and researchers have defined several broad strategies. The strategic intent is to focus research on addressing critical uncertainties of habitat changes caused by dam operation, to then develop and implement recovery plans, protect and enhance aquatic habitat within this drainage, and to improve and monitor the existing sport fisheries.

Specific actions for these strategies include: 1) determine the effects of water elevation changes caused by Albeni Falls Dam on the shoreline spawning habitat and warm water fish habitat in the Pend Oreille river and Lake Pend Oreille; 2) implement beneficial changes to the rule curves of Albeni Falls Dam: 3) identify historic and current stocks, population levels, life history and habitat conditions; 4) determine the effects of gas supersaturation problems in the lake and rivers and implement solutions; 5) improve tributary streams to enhance spawning and recruitment of native fish; 6) propagate important sport fish and native species in hatcheries and net pens; 7) research and monitor natural reproduction, recruitment, and harvest of fish stocks; 8) coordinate habitat improvements on public and private land; and 9) enhance fish habitat off-site.

The management of lakes throughout the Lower Pend Oreille Watershed will be considered on a case by case basis based on habitat characteristics, native species impacts, species assemblages, and harvest objectives. Species currently being managed for in lakes include, but are not limited to, burbot, westslope cutthroat, rainbow trout, brook trout, kokanee, Pygmy whitefish and brown trout.

Wildlife goals, objectives and strategies are simple, identify in-kind habitat as impacted by the hydropower system, prioritize those efforts, and implement protection, mitigation, and enhancement measures to offset impacts associated with the construction and operation of the Columbia River Hydropower System.

Past Efforts

The Lake Pend Oreille Fishery Recovery Project began in the fall of 1996. Under this project, research is being conducted to determine the best method to restore fish populations in the lake and river. This project is experimentally changing the lake levels, and studying predators and the food web.

Wildlife efforts began in 1988 with the completion of the loss assessment for Albeni Falls Dam. Shortly thereafter, the Kalispel Tribe submitted an acquisition and enhancement project through the regional process for 440-acres adjacent to the Reservation. In 1992, the land was purchased and in 1993, the Tribe began to manage the land for its benefits to wildlife associated with the habitat cover types and its value to Albeni Falls Dam mitigation efforts. In 1997 the Tribe added an additional 160-acres to the project and is currently seeking management agreements on 90-acres of adjacent public lands to fully manage this important corridor. Since 1991, a total of 2,708 baseline Habitat Units (HUs) have been credited to BPA for Albeni Falls wildlife mitigation, and an additional 400 HUs are anticipated to be credited during FY1999. The Coeur d'Alene Tribe is expected to credit BPA with baseline HUs for the Lake Creek Acquisition (project no. 9004401) when the HEP is completed. Total enhanced HUs credited to BPA thus far total 167 for the Flying Goose Ranch.

The members of the Albeni Falls Interagency Workgroup is also involved with FERC hydropower licensing efforts and will use those resources to enhance existing federal mitigation efforts.

Research, Monitoring and Evaluation

Every year since 1977 the kokanee population on Lake Pend Oreille is monitored. Studies will begin this year to monitor the populations of warm water fish in the Pend Oreille River. Populations of shrimp, predators, and zooplankton have also been intensively studied between 1996 and 1998. All of these investigations will be related to habitat conditions in an effort to recover the lake and river.

Remaining Work

Research should continue so that an effective means to recover the lake and river can be determined. Impacts of the hydropower system on this subbasin (estimated to be in the hundreds of tons of lost fish production annually) need to be quantified. A plan for on and off site mitigation of these losses then needs to be developed.

Currently only about 6% of the construction and inundation losses attributable to Albeni Falls dam have been mitigated. It is the goal of the Albeni Falls Interagency Workgroup (AFIWG), to continue its efforts to assist in fully mitigating the losses associated with Albeni Falls Dam. The AFIWG is also committed to working through the FERC process to merge these two efforts for increased benefit wildlife and wildlife habitat within this subbasin.

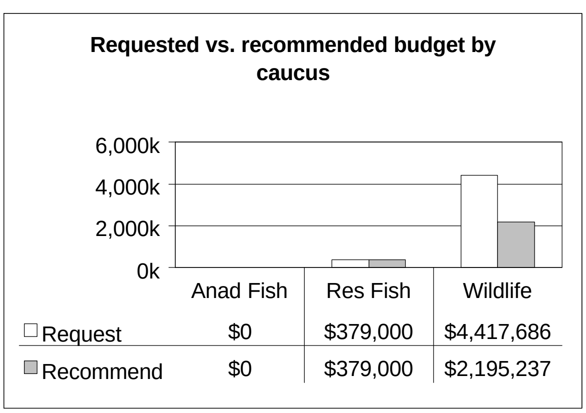
Subbasin Recommendations

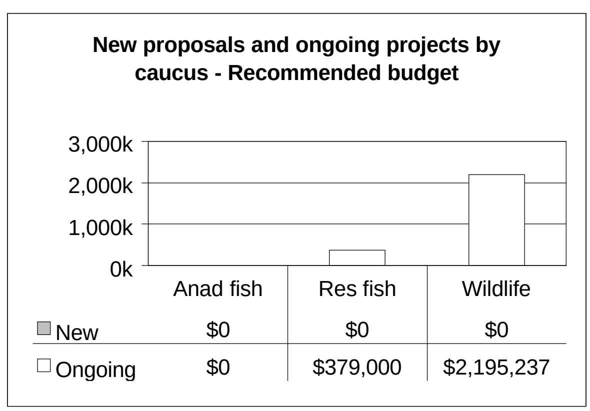
Recommendations from the Lake Pend Oreille Fishery Recovery Project will tell us how much of the fishery could be recovered by changing the rule curves for Albeni Falls Dam. It may also show whether any additional changes in habitat could be made to improve fisheries.

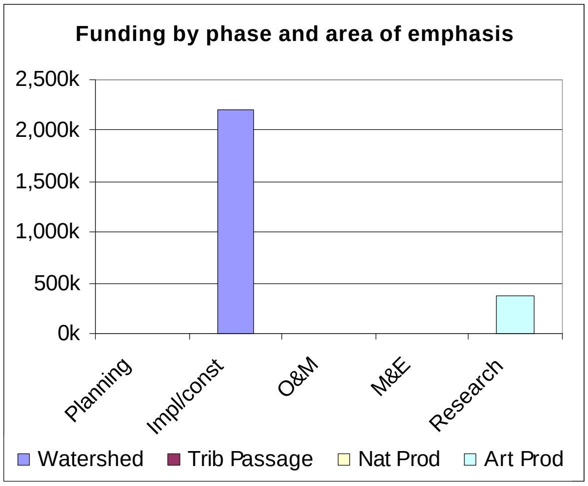
Projects and Budgets

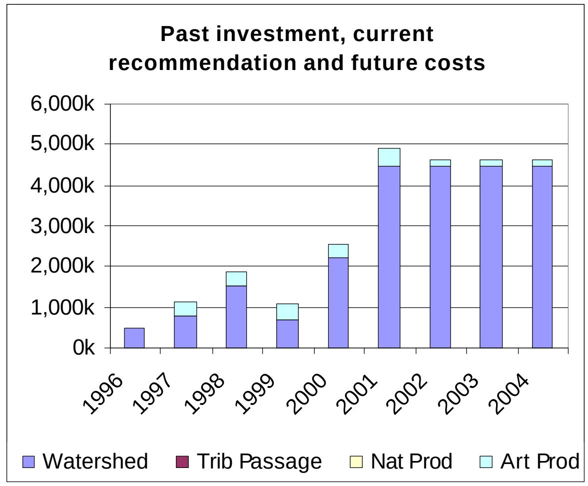
Based on the preceding subbasin description, the CBFWA fish and wildlife managers recommend funding a total of 2 projects at a cost of $2,574,237. Of the projects recommended, 1 focuses on resident fish, and 1 is directed at wildlife. The managers consider one of these projects, for $2,195,237, to be innovative in technique and application.

Refer to the following figures for detail on: 1) total recommended and requested budget by caucus, 2) funding for new and ongoing work, 3) funding by project phase and emphasis, and 4) funding by time period (past, current and future). Individual projects are listed in the following table.






Funding by phase and area of emphasis
2,500k
2,000k
1,500k
1,000k
500k
0k
Planning
Impl/const
O&M
M&E
Research
Watershed
Trib Passage
Nat Prod
Art Prod


Past investment, current recommendation and future costs
6,000k
5,000k
4,000k
3,000k
2,000k
1,000k
0k
1996
1997
1998
1999
2000
2001
2002
2003
2004
Watershed
Trib Passage
Nat Prod
Art Prod

ProjectID	Title	Sponsor	FY99 recom.	FY00 recom.	Estimated Outyears FY01	FY02	FY03	FY04
Resident Fish Projects								
9404700	Lake Pend Oreille Fishery Recovery Project	IDFG	361	379	398	120	120	120
		Resident Fish Totals		**$379**	**$398**	**$120**	**$120**	**$120**
Wildlife Projects								
9206100	† Albeni Falls Wildlife Mitigation	Albeni Falls Interagency Work Group	700	2,195	4,500	4,500	4,500	4,500
		Wildlife Totals		**$2,195**	**$4,500**	**$4,500**	**$4,500**	**$4,500**
	* indicates ESA project, † indicates 'Innovative work'	**SUBBASIN TOTALS**		**$2,574**	**$4,898**	**$4,620**	**$4,620**	**$4,620**

All figures in thousands of dollars

Needed Future Actions

Outyear budget projections for the upper subbasin include relatively stable funding for the Lake Pend Oreille Fishery Recovery Project at approximately $380,000 annually.

Actions by Others

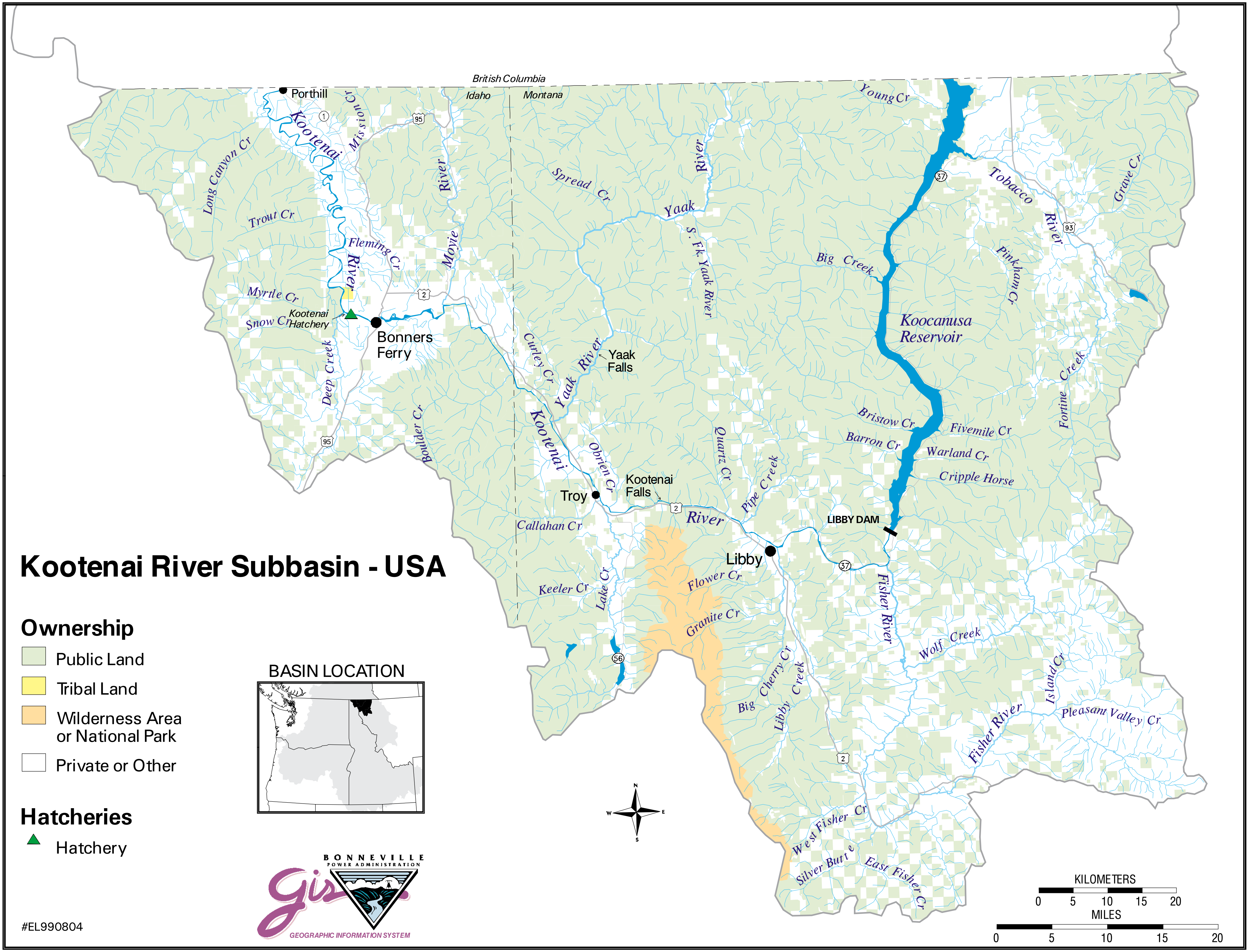
Recommendations will be developed once studies are completed in FY2001.

Watershed References

Panhandle Bull Trout Technical Advisory Team. 1998. Lake Pend Oreille key watershed: bull trout problem assessment (June 1998 draft). Lake Pend Oreille Watershed Advisory Group and Idaho Division of Environmental Quality, Boise, Idaho.

USDA Forest Service. 1993. Trestle Creek watershed improvement environmental assessment. Idaho Panhandle National Forest, Sandpoint RD, Sandpoint, Idaho.

Kootenai River Subbasin - USA



Kootenai Subbasin

Res fish 8 projects $3,171

Fish and Wildlife Resources

Subbasin Description

The Kootenai River originates in Canada, flows south into Montana, through Libby Dam, then west to Idaho and north to Kootenay Lake, British Columbia. Kootenay Lake (a natural lake) is impounded by Corra Linn Dam and Grohman Narrows at the lakes outlet. The river flows through several Canadian dams before joining the Columbia River in Canada, upstream of Grand Coulee Dam (Lake Roosevelt). The Kootenai River drainage has undergone many adverse physical and biological changes in the last century, the most recent of which was the construction and operation of Libby Dam. Operation of Libby Dam and the impoundment Libby Reservoir (Lake Koocanusa) changed the hydrograph, water temperatures and nutrient cycling of the river. Many native fish and wildlife species were affected by the dam, including white sturgeon, bull trout, interior redband and rainbow trout, westslope cutthroat, burbot, mountain whitefish, spoonhead and torrent sculpins and kokanee. Many of these species have been cited as important resident fish in the 1995 Fish and Wildlife Program.

Wildlife species are fairly abundant within the Kootenai subbasin. Large herbivores consist of two deer species, elk, moose, mountain goat, bighorn sheep and woodland caribou. Carnivores are widespread and diverse including several endangered or threatened species such as the lynx, gray wolf, and grizzly bear. Other important animal guilds include waterfowl, neo-tropical migratory birds, small mammals, amphibians and reptiles. Target species focus for mitigating the Columbia Basin Hydropower system in the Upper Columbia Basin are associated with habitat cover types impacted by the construction and operation of the hydropower system. Specifically, Albeni Falls mitigation is centered around eight target species. They include Bald Eagle (breeding & wintering), Black-capped Chickadee, Canada Goose, Mallard, Muskrat, Redhead, white-tailed deer, and Yellow Warbler. Target species not currently listed for the Upper Columbia Basin, but mitigated for Libby Dam, were bighorn sheep.

Fish and Wildlife Status

White sturgeon populations are listed as endangered under the ESA in the Kootenai River with very little juvenile recruitment since 1974. Less than 2000 individuals remain. Conservation stocking of family groups from each year-class has been initiated to avoid extinction while researchers attempt to reestablish natural reproduction and recruitment. River flow, water temperature and Kootenay Lake operations apparently influence reproductive success by influencing adult movements, spawning timing and potentially juvenile survival. The critical period in juvenile recruitment occurs between the mature egg stage and yearling age. Yearling released from the Kootenai Tribe of Idaho’s (KTOI) white sturgeon facility have survived. Adults have spawned each year during flow augmentation experiments as evidenced by fertilized eggs captured by the Idaho Department of Fish and Game (IDFG). Unfortunately, few naturally produced hatchlings have been found to date.

Bull trout are listed as threatened under the Endangered Species Act. The population in the Canadian headwaters of Libby Reservoir is believed to be the strongest metapopulation in existence. Libby Dam isolated bull trout populations above and below the dam. Populations in the reservoir have stabilized at low numbers. However, the bull trout population below Libby Dam has too few subpopulations to be considered a stable metapopulation. The population below Libby Dam is now mainly supported by three tributaries upstream of Kootenai Falls. Below the falls, only O’Brien Creek in Montana produce significant numbers of juvenile bull trout while in Idaho juvenile bull trout are occasionally found in Boundary , Mission, and Snow creeks. Recovery actions in the United States are coordinated with the British Columbia Ministry of Environment (B.C. Environment).

Burbot in the Kootenai River in Idaho is a candidate species for ESA listing while in Montana they are still common. Burbot are listed as a species of special concern. At one time the burbot fishery is thought to have produced well over 1,000 fish each winter and provided a valuable social and sport fishery. The burbot fishery in Idaho collapsed soon after closing of Libby Dam. Genetic analysis has indicated burbot in Idaho and B.C. are of the same genetic stock but differ from fish in Montana. Ongoing research has demonstrated a link between spawning migration of burbot in Idaho and B.C. and high flows from Libby Dam for power production and flood water evacuation. Evidence of recruitment in Idaho has not been found while unspawned females have been caught, post spawn, that were reabsorbing eggs.

Native kokanee salmon (*Oncorhynchus nerka*) runs in the lower Kootenai River tributaries in Idaho have experienced a profound population decline during the past several decades. Kokanee that historically spawned in lower Kootenai river tributaries in Idaho inhabited the South Arm of Kootenay Lake in British Columbia. Native kokanee are considered an important prey item for white sturgeon and also provided an important fishery in the tributaries of the lower Kootenai River. Kokanee runs into North Idaho tributaries of the Kootenai River numbering thousands of fish as recently as the early 1980s have now become “functionally extinct”. In 1998, visual observations and redd counts in six tributaries found only eight spawners returning to Boundary Creek, and no spawners or redds observed in the other tributaries.

Westslope cutthroat trout and interior redband trout have been petitioned for listing. These species, and spoonhead and torrent sculpins are designated Species of Special Concern in Montana. Westslope cutthroat trout populations have declined based on 24 years of population estimates. In 1973, 44 percent of trout captured were westslope cuttthroat with angler catch rates recorded at 0.5 fish/hour, ranking the Kootenai River among other blue ribbon trout streams in Montana. Estimates in 1994 document significant population reductions with less than five percent of the trout captured being westslope cutthroat trout. Native interior redband exist in only a few isolated Kootenai River tributaries. Callahan Creek in Montana is the only stream believed to provide spawning habitat for Kootenai River redband, although adult redband have been observed in the mouth of the Yaak River. The redband rainbow trout provides the most important fishery in the Kootenai River in Idaho. Although anglers were estimated to have caught over 1,000 trout in 1994, the total population numbers are thought to be down from pre Libby Dam years. One possible cause could be the reduced productivity in the river because Lake Koocanusa acts as a nutrient sink. Research studies have shown recruitment of rainbow trout in the Idaho reach has come from two sources. Trout below Bonners Ferry rear in the Deep Creek drainage and mature in Kootenay Lake, B.C., while fish above Bonners Ferry are thought to recruit from a few tributaries in Idaho and Montana. Electro-fishing surveys have shown a shift in the fish community from a pre-Libby Dam, one comprised primarily of whitefish and trout to a post-dam community consisting primarily of suckers, peamouth chub and northern pikeminnow.

The diversity of habitat types in the Kootenai River drainage supports a wide range of game and non game species. Of particular concern is the woodland caribou (the only population in the lower 48 states), timber wolf, and grizzly bear in Idaho, all Endangered Species, and tundra and occasional trumpeter swans. Mule and white – tail deer, moose, black bear, and elk are also found. There is some habitat for nesting and rearing of water fowl and aquatic mammals. However, the loss of, productivity, riparian, and riverine habitat no doubt has impacted fish eating birds and mammals e.g. eagles, osprey, herons, mink, and otter.

Habitat Areas and Quality

Completion of Libby Dam in 1972 on the second largest Columbia River tributary created the 109-mile Libby Reservoir. Between 1974 and 1996, reservoir drawdowns averaged 112.44 feet, ranging as deep as 152 feet. Drawdown effects all biological trophic levels and influences the probability of subsequent refill during spring runoff. Refill failures are especially harmful to biological production during the productive warm months. Annual drawdowns impede revegetation of the reservoir varial zone, resulting in a littoral zone of nondescript cobble/mud/sand bottom with limited habitat structure.

Filling Libby Reservoir inundated and eliminated 109 miles of the mainstem Kootenai River and 40 miles of critical, low-gradient tributary habitat when Libby Reservoir filled. Replacement of this inundated stream habitat is not possible. However, mitigation efforts are underway to protect, reopen or reconstruct the remaining tributary habitat to offset the loss. Fortunately, in the highlands in the Kootenai Basin, habitat quality is high. The headwaters are relatively undeveloped and retain are high percentage of the original wild attributes and native species complexes. Protection of the remaining pristine areas and reconnection of fragmented habitats are high priorities in the subbasin, while impacted areas are repaired.

Libby Dam converted a large segment of the Kootenai River from a lotic to lentic environment. Changes in the aquatic community reflect this manipulation. Westslope cutthroat and rainbow trout captured during annual gillnetting on Libby Reservoir have declined significantly from early post-impoundment levels of 10% and 14% to current levels 0.2% and 0.3% of the total catch. Conversely, non-game species such as northern pikeminnow and peamouth chub (not abundant prior to impoundment) have increased significantly in gill net catches to comprise up to 87 percent of the total catch.

Similar impacts have been observed in the tailwater below Libby Dam. Barriers have been deposited in critical spawning tributaries to the Kootenai River through the annual deposition of bedload materials (sand, gravel, and boulders) at their confluence with the river. Prior to impoundment, the Kootenai River contained sufficient hydraulic energy to annually remove these deltas. Since the dam was installed, peak flows have been limited to maximum turbine capacity (roughly 27 kcfs) and hydraulic energy is insufficient to remove deltaic deposits. During periods of low stream flow, the enlarged deltas, and excessive deposition of bedload substrate in the low gradient reaches of tributaries, may impede or block fall spawning migrations. Reversing the Kootenai River hydrograph for power and flood control and altering the annual temperature regime have caused impacts typical of dam tailwaters. Native burbot in Montana are now estimated at 10% of pre-impoundment levels based on current hoopnet catches of 0.002-0.168-fish/hoopnet hour.

Power operations cause rapid fluctuations in dam discharges (as great as 400% change in daily discharge), which are inconsistent with the normative river concept. Flow fluctuations widen the riverine varial zone, which becomes biologically unproductive. This effect can be mitigated by using computer models to develop watershed-based dam operations to recover all native species. Daily and weekly differences in discharge from Libby Dam have had an enormous impact on the stability of the river banks. Water logged banks are heavy and unstable, when the flow drops in magnitude banks calve off causing serious erosional impacts including an unstable riparian zone. These impacts are common during winter but go unnoticed until spring.

Wildlife habitat within the subbasin consists mainly of two major types: riparian and floodplain bottoms and inland moist forest uplands. The upland habitats range from open and drier ponderosa/larch areas to moist cedar/hemlock dominated stands. The lowland habitats are equally diverse containing wetland and riparian habitats associated with the wide floodplain of the Kootenai River. Remnant gallery cottonwood forests are present, but remain as decadent, fragmented and limited in distribution. Generally the habitats within the upper subbasin are cultivated and are moderately to severely altered and habitat quality is low. Although there are several species listed as endangered or threatened under the Endangered Species Act within the subbasin, habitat quality issues remain high on the priority list to benefit those species and other associated resources.

Since the 1860s, when mining and farming boomed, wetlands in Idaho have decreased 56%, from 879,000 acres to approximately 386,000 acres (Dahl 1990). Most major rivers in northern Idaho are impacted by water development for hydroelectricity and recreation. Agriculture, drainage districts/dikes and urbanization account for additional significant wetland losses. The 1992 National Resource Inventory indicates that nearly 60% of nonfederal wetlands in the Kootenai-Pend Oreille-Spokane sub-basins are used for cropland and pastureland (Soil Conservation Service 1992 in Jankovsky-Jones 1997).

Completion of the Libby Dam permanently affected the Kootenai River aquatic, amphibian and terrestrial animal ecosystems. The combined construction of the dam and dikes reduced flooded shallow water areas known to produce high concentrations of hydrophilic plants, both emergent and submerged. Today, the Kootenai Tribe of Idaho and the Idaho Department of Fish and Game are forming partnerships with local communities and state and federal agencies to design projects which mitigate hydropower losses in the Kootenai Subbasin, in addition to protecting and enhancing critical wildlife habitat for a wide variety of species dependent on wetland and riparian habitats.

Watershed Assessment

Watershed assessments in the Kootenai drainage were compiled in the Libby Dam Fisheries Mitigation and Implementation Plan for Losses Attributed to the Construction and Operation of Libby Dam (1998) and previous project reports and project review forms. The Mitigation Plan quantifies fish losses and mitigation actions above and below Libby Dam as called for by the Northwest Power Planning Council's (NWPPC) Columbia Basin Fish and Wildlife Program (FWP). Research and monitoring of the endangered Kootenai River white sturgeon is collaborative effort with IDFG, KTOI and B. C. Environment; actions are coordinated on an annual basis. White Sturgeon Recovery efforts are consistent with the internationally developed White Sturgeon Recovery Plan. Bull trout assessments and recovery actions are coordinated with the Montana Bull Trout Scientific Team, The U.S. Fish and Wildlife Service (USFWS) and B.C. Environment.

In reference to the watershed technical groups review, the committee did not review the Libby Mitigation Umbrella project which provided the overall, watershed framework for several Kootenai Basin projects. These projects are being combined as per recommendations by the Independent Scientific Review Panel (ISRP), and for greater efficiency (process reduction). The watershed group also did not review one of the main projects containing nearly all of on-the-ground actions for the Umbrella. Their comments pertaining to excessive monitoring, and lack of on-the-ground progress, reflect these omissions.

Watershed assessments for wildlife were compiled in the Wildlife and Wildlife Habitat Mitigation Plan for Libby Dam dated 1984. Target species and associated habitat losses attributed to hydropower include white-tailed deer, mule deer, bighorn sheep, sharp-tailed grouse and waterfowl target species. To date, the State of Montana has performed wildlife mitigation projects for inundation losses. Currently, there is a need to produce a watershed assessment on operational losses in the Idaho/Montana Kootenai Subbasin.

Limiting Factors

Loss of 149 miles of high quality stream habitat resulted when Libby Reservoir filled. Extremely deep reservoir drawdowns expose vast expanses of reservoir bottom to drying, thus killing the primary spring food supply, aquatic insects. Reduced reservoir pool volume impacts all aquatic trophic levels due to the diminished size of the aquatic environment. During summer, reservoir drawdown reduces the availability terrestrial insects for fish prey because less insects are trapped on the diminished surface area. Impoundment by Libby Dam and the removal of riparian vegetation altered the annual temperature cycle in the river. Hydropower related discharge fluctuations in the Kootenai River have resulted in a wider zone of water fluctuation, or *varial zone,* which has become biologically unproductive. Reduction in natural spring freshets due to flood control have eliminated much of the hydraulic energy needed to maintain the river channel and periodically re-sort river gravels. Lack of flushing flows have resulted in sediment buildup in the river cobbles which are important for insect production, fish food availability and security cover.

The operation of Libby Dam has drastically altered the hydrograph, thermograph, and the downstream nutrient loading rates in the Kootenai River. Increased fine sediments in spawning gravels from roads and land management have reduced egg to fry survival in native trout. Caving of river banks has increased silt loads which in turn further reduces productivity by reducing transparency and covering invertebrates.

Loss of riparian vegetation and large woody debris due to land management activities has resulted in a net loss of security cover, bank stability and pool formation. Fish migrations were blocked due to man caused barriers (Libby Dam, delta formation, road culverts, dewatered stream reaches, irrigation diversions etc.). Illegal and unintentional introductions of non-native fish species have set up negative inter-species competition with native fish. Conversely, impoundment greatly benefited the native pikeminnow and peamouth chub, which now compete with species of special concern for food and space, and predation.

Temperature changes may have had an adverse impact on the winter spawning burbot, winter temperatures are now 3 – 4^{o}C warmer than they were pre Libby Dam. High winter flows have also affected burbot spawning migration by reducing synchrony and stamina. Loss of productivity and rearing habitat has effected growth and survival of rainbow , cutthroat, and bull trout and whitefish.

Limiting factors to continued wildlife mitigation strategies remain the availability of in-kind habitat and funding to pursue high-ranking actions. Furthermore, there is insufficient data on habitat losses attributed to the Libby Dam hydropower facility, particularly operational losses, which need to be clarified to develop future project proposals.

Subbasin Management

Goals, Objectives and Strategies

The subbasin goal for the Kootenai drainage is to mitigate for resident fish losses caused by the construction and operation of Libby Dam by improving the ecosystem and recovering the fish community to self-sustained levels.

The management objectives for the Kootenai subbasin are: 1) improve adult spawning success; 2) improve survival for all life history phases; and 3) re-establish exptirpated fish populations.

To achieve these management objectives for the fish species of interest in the Kootenai River Subbasin, fish managers and researchers have defined several strategies. From a population perspective, the strategic intent is to maintain and enhance production, adjust flows to create suitable spawning conditions, maintain genetic diversity and adaptiveness, and re-establish populations where appropriate. From a management perspective, the strategic intent focuses on learning more about the condition of existing fish populations and the habitat by hypothesis testing where needed, developing and implementing recovery plans, protecting and enhancing the habitat, creating harvest opportunities, and managing angling demand consistent with healthy fish populations.

Throughout the Kootenai Subbasin, native wildlife species and associated habitats will be the priority for management if habitat conditions can be adequately maintained to sustain genetic diversity and species persistence. In areas where such habitat conditions do not exist, alternative management strategies will be implemented to maximize available habitats and harvest opportunities.

The primary wildlife objective is to identify in-kind wildlife habitat as impacted by the hydropower system, prioritize those efforts, and implement protection, mitigation, and enhancement measures to offset impacts associated with the construction and operation of the Columbia River Hydropower System.

Past Efforts/Accomplishments

Initially, subbasin managers identified the historic and current status of fish stocks, population levels, and habitat conditions. In some portions of the Kootenai subbasin, baseline work remains to be completed. The overall mitigation strategy involves “operational mitigation” requiring changes in hydropower and flood control operations and “non-operational mitigation” including actions that do not require changes in operations.

From 1982 through 1985, Montana Fish Wildlife & Parks compiled biological data needed to construct the quantitative reservoir model LRMOD. With aid from Montana State University (MSU), the U.S. Geological Survey (USGS), U.S. Army Corps of Engineers (ACOE), B.C. Hydro and scientific reviews, Montana completed the model and developed Biological Rule Curves (BRCs) for Libby Dam, first published in 1989. The BRCs were integrated with power and flood control during the Columbia Basin System Operation Review and by 1995, the Integrated Rule Curves (IRC), were completed and adopted by the Northwest Power Planning Council (NWPPC). The IRCs were subsequently superseded by operations dictated by the National Marine Fisheries Service (NMFS) and have not been fully implemented to date. An in-stream flow incremental methodology (IFIM) project on the Kootenai River below Libby Dam developed a river model. The final report is scheduled for completion in 1999. This effort extends the utility of LRMOD by refining biological relationships in the river as a result of Libby Dam operation.

Montana completed a basin-wide in-stream flow investigation of 56 important spawning and rearing streams in 1988. The two volume report located impacted areas, fish barriers and provided population estimates in Montana tributaries. This information was used to prioritize stream habitat projects. The Libby Mitigation Plan expanded on this information with a watershed framework to implement conservation aquaculture, imprint planting, native species reintroductions, and population enhancement where appropriate. On-the-ground mitigation began in 1997. Ongoing and completed projects are listed below.

The Idaho Department of Fish and Game entered the Kootenai River fisheries investigations in 1978. Post impoundment studies focused on white sturgeon, burbot, and trout population dynamics and distribution. A creel survey was implemented to document angler recreational fishing, harvest, and catch rates. The white sturgeon and burbot populations were found to be recruitment limited while rainbow and cutthroat trout abundance were found to be in lower abundance in Idaho compared to Montana. In 1989 IDFG reentered the Kootenai River with white sturgeon study #8806400, funded by BPA, directing recovery efforts at restoring the spring hydrograph to stimulate sturgeon spawning and improve rearing conditions. In 1993 burbot and trout studies were initiated and focused on spawning and recruitment and the sport fishery. Several graduate studies were also carried out. Nutrient spiraling was investigated and it was reconfirmed that the river was nitrogen and phosphorous limited. Additional studies were contracted to the USGS to document substrate composition and current profiles in the white sturgeon spawning reach. Hypothesis testing has been conducted for burbot from 1995 through 1998. However, minimal cooperation from the USACE has resulted in only one year of clear evidence linking flows to failed burbot migrations. To aid in recovery of burbot an international multi agency Recovery Committee was formed to formulate a recovery strategy.

The Kootenai River white sturgeon study and conservation aquaculture program (8806400), began in 1991 in response to questions concerning water quality, white sturgeon gamete viability and the feasibility of aquaculture as a component to population recovery. In 1991, 1992, 1993, 1995, and 1998, progeny from wild broodstock were successfully produced and reared in the Kootenai Tribal Hatchery. Two experimental releases of juvenile white sturgeon occurred in 1992 and 1994, providing the first habitat use, movement, survival, and growth information for juvenile white sturgeon in the Kootenai River. In 1997, 2,283 white sturgeon juveniles representing 4 family groups were released into the Kootenai River. Subsequent monitoring results indicate that survival of these fish is high and growth is considered normal. Since 1996, the Kootenai Tribe has also directed study efforts to obtain baseline information on the biological status of the Kootenai River ecosystem to ultimately identify management options for enhancement. Actions have included river modeling, water quality monitoring, as well as assessing macroinvertebrate and fish populations in the Kootenai River and it's tributaries in North Idaho.

All wildlife inundation mitigation efforts associated with Libby Dam for the Idaho/Montana Kootenai Subbasin have been situated in Montana. Initial mitigation projects funded included enhancement and maintenance of 8,745 acres of white-tail deer winter range, 10,586 acres of mule deer winter range, 3,190 acres of bighorn sheep spring/ winter range, 2,462 acres of sharp-tailed grouse habitat and 3,418 acres of prime waterfowl habitat. Current estimates of completed projects or negotiate alterations to projects are not available at this time.

In 1988, the Idaho Department of Fish and Game (IDFG), in coordination with the Albeni Falls Interagency Work Group, identified Boundary Creek as a potential site to mitigate wetland losses associated with construction of Albeni Falls Dam.

In 1998, the IDFG identified a 1,400-acre parcel adjacent to the Kootenai River and Boundary Creek that contained significantly altered historic riparian and wetland habitats in addition to important grizzly bear spring habitat. The Natural Resources Conservation Service protected an estimated 1,200 acres using funds from the Wetlands Reserve Program to purchase a permanent conservation easement. Today, using Albeni Falls wildlife mitigation funds and its own funds, the IDFG is negotiating the purchase of the entire property.

Research, Monitoring and Evaluation

A tiered flow approach for white sturgeon recovery was added to the model LRMOD in 1997 and refined in 1998. The flow and water temperature control specified in the white sturgeon recovery plan was designed to encourage natural reproduction. A cooperative effort is underway to assess the effectiveness of experimental flow augmentation and temperature control. To avoid extinction, the KTOI began conserving white sturgeon year-classes using hatchery technology in 1992, based on a strict breeding protocol. In 1998, KTOI sponsored the development of a dynamic river model (AEA work group) used by the white sturgeon recovery team to improve survival of juvenile sturgeon. The AEA process will also be implemented to discover ways and methods to improve productivity and survival and growth of salmonids. Idaho Fish and Game documented white sturgeon reproductive success each year and compiled detailed information on the biology of burbot and rainbow trout. Cooperative genetic research between the University of Idaho and IDFG has shown the Kootenai River white sturgeon to be genetically different that sturgeon in the Columbia River. Population estimates of white sturgeon by IDFG (in cooperation with KTOI and B.C. MELP) indicate fewer than 2,000 white sturgeon in the lower Kootenai River. Cooperative work continues between IDFG and KTOI. Each spring IDFG captures adult white sturgeon for monitoring and evaluation and also provides wild sturgeon broodstock to the KTOI for their Conservation Culture Program, when possible. The IDFG has developed a logistic regression model to predict spawning migration and eventual spawning of Kootenai River white sturgeon. The model was based on the monitoring and study of over 50 male and female white sturgeon since 1991. The model incorporates river temperature and river stage as a predictor of female sturgeon migration. This model can become a useful tool to guide the Kootenai River White Sturgeon Recovery Team in the decision making process, it will also be useful in predicting the outcome of various flow and temperature scenarios. Examination of habitat features of white sturgeon spawning has indicated Kootenai River white sturgeon are spawning in habitat thought to be unusual for white sturgeon, it is not known if this phenomenon is due to environmental changes since Libby Dam or they are natural.

A graduate study is actively examining the concentrations of toxic substances in white sturgeon eggs and the possible source of uptake. Additional genetic research using mitochondrial DNA has shown burbot in Idaho and B.C. are distinct from fish in Montana (this was a cooperative effort). Hypothesis testing of the effects of flows on burbot migration and spawning has documented the adverse impact of high flows on burbot migration to spawning tributaries. Further studies need to develop a flow strategy that is burbot migration friendly as well as development of a recovery strategy and implementation of a recovery plan. Trout research has keyed in on the sources of rainbow and bull trout recruitment in the upper and lower river and is investigating the prospects of some management options to improve catch rates and size structure of rainbow and cutthroat trout. Growth rates and relative weights of trout and whitefish in the Kootenai River were found to be lower than other populations in Idaho adding further to the concept of improving secondary productivity.

In 1998, Montana initiated an In-stream Flow Incremental Methodology (IFIM) project on the Kootenai River to refine the river component of LRMOD. The final report will be completed this year. The IFIM research calibrated simulations of hydraulic conditions (stage/discharge and velocities) and fish habitat from Libby Dam to Kootenay Lake, British Columbia, Canada at various discharges from Libby Dam. An optimization program of future LRMOD remaing work is scheduled for development to allow managers to assess tradeoffs between the requirements of reservoir and riverine biota, when conflicts occur between reservoir operation and river flow limits as per the FWP. Montana monitors the effects of dam operation in Libby Reservoir and the Kootenai River and its tributaries. Research and monitoring in the Canadian portion is performed cooperatively with B.C. Environment.

Research and monitoring efforts by the Kootenai Tribe include: sampling hatchery reared white sturgeon juveniles released into the Kootenai River to evaluate survival, condition, growth, and habitat use; kokanee spawner and redd counts in tributaries in North Idaho; monitoring of hatching success of kokanee reintroductions using in-stream incubation techniques; water quality monitoring in the Kootenai River and tributaries to be used in a watershed assessment of the Kootenai River in Idaho; experiments to determine timing of embryo development to be used to stage naturally produced eggs (cooperative research with USGS National Biological Service and IDFG); experiment to determine white sturgeon hatch and larval survival rates in the Kootenai River using protective egg capsules; and assessment of fish and macroinvertebrate community conditions at established biological monitoring stations in the watershed.

Remaining Work

- Implement the Libby Mitigation Plan including non-operational mitigation habitat restoration, passage improvements, hatchery activities and offsite mitigation.
- Implement Integrated Rule Curves for Libby Reservoir operation and normative river flows based in the IFIM results.
- Implement the white sturgeon recovery plan.
- Implement tiered flow approach for white sturgeon recovery.
- Conserve all white sturgeon year-classes until natural reproduction and juvenile recruitment is sufficient to sustain the population.
- Develop cryopreservation techniques for preservation of white sturgeon gametes.
- Determine the effects of changing Kootenay Lake elevations on focal spawning location of white sturgeon.
- Improve secondary productivity of Kootenai River.
- Determine source of recruitment for trout above Bonners Ferry.
- Implement AEA model to restore ecosystem health.
- Restore Kootenai River fish community trophic structure.
- Improve survival and growth of salmonids.
- Identify primary factors limiting rainbow and bull trout stocks.
- Develop a Recovery Strategy for burbot.
- Develop and implement a Recovery Agreement for burbot.
- Reintroduce native kokanee stocks in the tributaries to the lower Kootenai River in Idaho.
- Assess habitat and implement habitat improvement measures in the tributaries to the lower Kootenai River in Idaho.

- Quantify losses of fish and wildlife in the Idaho portion of the Kootenai River due to the operation of Libby Dam and implement protection, mitigation, and enhancement measures to offset impacts.

Subbasin Recommendations

Implement Integrated Rule Curves (IRCs) at each storage project where currently available. Create IRCs for projects that do not presently have integrated operational rules by modeling watershed hydrology. The necessary hydrographic information exists for all projects to develop preliminary IRCs. Preliminary IRCs can be developed rapidly given the available data and a competent team of computer programmers. Research has demonstrated a striking similarity among the biological functions at storage projects and river reaches, allowing extrapolation from detailed studies to other sites where biological sampling is incomplete. The next step would incorporate site-specific modifications to the preliminary IRCs which were constructed based on hydrology alone. Modified IRCs can be adjusted over time as additional biological information becomes available. After IRCs are developed, a system model with sufficient time resolution (e.g. weekly, rather than monthly models) can incorporate the operating rules at the various projects. Given that runoff events occur at subtly different times, and volumes, the combined discharges from the subbasins can be shaped to achieve desired flood control requirements and the needs of resident fish, while simultaneously providing a protracted flow event to help meet the goals of salmon managers.

Implement the "tiered flow" approach for Kootenai River white sturgeon below Libby Dam. The endangered white sturgeon exist only in the Kootenai River below Kootenai Falls and Kootenay Lake in British Columbia. Flows and temperatures below Libby Dam are crucial to this species recovery. Tiered flows were based on inflow forecasts prior to and during runoff. Larger discharges are scheduled in high water years than in low water years. Because the volume of the release is based on the April and May inflow forecasts, dam operators can schedule the operation in advance. Additional water can be safely retained prior to spring runoff in less than average water years. The actual shape of the runoff volume can also be modified during the release to achieve the optimal mix of flow and water temperature. Additional modeling for winter water management must include a low flow corridor for burbot spawning migration. This species is nearing demographic extinction and must be included in the hydropower and flood water management scheme.

Implement the Army Corps of Engineers variable flow flood control strategy (VARQ). VARQ differs from current operations that attempt to store the entire spring freshet and release minimum flows during the runoff period. Instead, VARQ plans to release a naturalized spring freshet within flood constraints during the runoff event. The operation requires less reservoir drafting prior to runoff, so that reservoir elevations may remain higher than the IRC targets in less than average water years. This allows operators to "save" additional water for later release, thus further augmenting spring flows during dry years without compromising reservoir refill probability. When releases are properly shaped, the result is an operation that is mutually beneficial to fish in the headwaters and lower Columbia River.

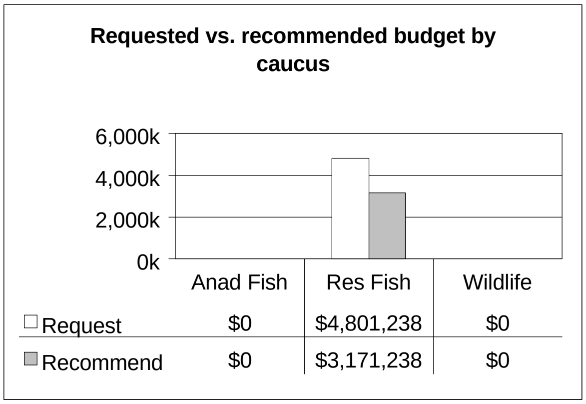
Pursuant to the Libby Fisheries Mitigation Plan, protect, reconstruct and/or reopen tributary habitat to enhance natural reproduction of native species. Reestablish spawning runs where wild stocks have been extirpated. Create angling opportunities in closed-basin lakes in the Kootenai subbasin.

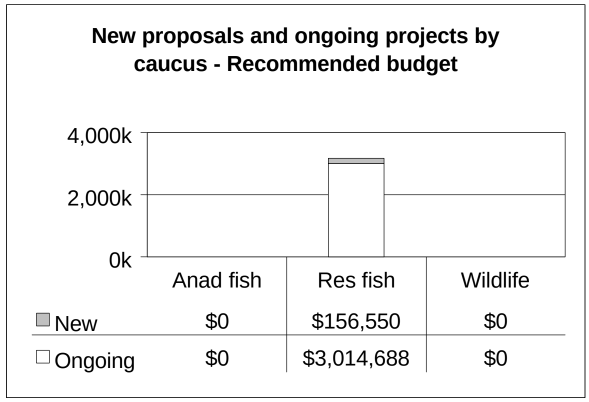
Throughout the Kootenai Subbasin, native wildlife species and their associated habitats will be identified for management as impacted by the hydropower system. Habitat conditions will be identified by the potential to adequately maintain and sustain genetic diversity and species persistence. In areas where such habitat conditions do not exist, alternative management strategies and designs will be implemented to maximize available wildlife populations and wildlife habitat opportunities and enhancement measures to offset impacts associated with the construction and operation of the Columbia River Hydropower System.

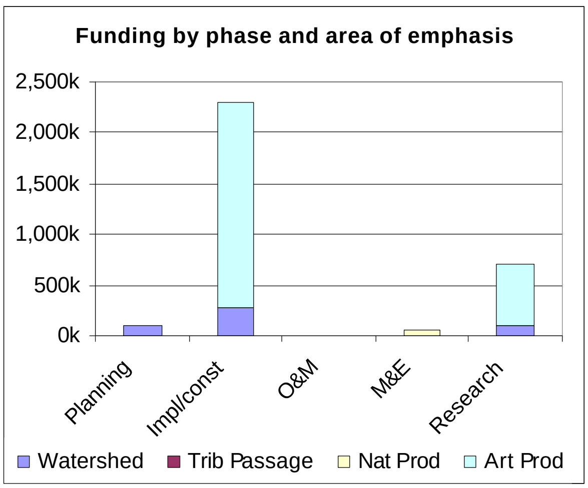
Projects and Budgets

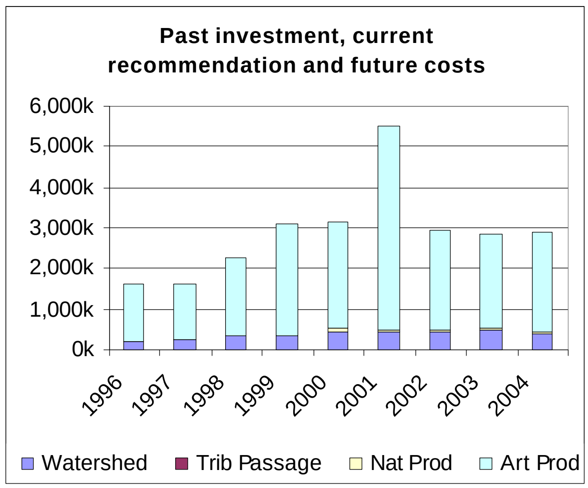
Based on the preceding subbasin description, the CBFWA fish and wildlife managers recommend funding a total of 8 resident fish projects at a cost of $3,171,238. Five projects support ESA requirements for a total of $2,423,348.

Refer to the following figures for detail on: 1) total recommended and requested budget by caucus, 2) funding for new and ongoing work, 3) funding by project phase and emphasis, and 4) funding by time period (past, current and future). Individual projects are listed in the following table.









ProjectID		Title	Sponsor	FY99 recom.	FY00 recom.	Estimated Outyears FY01	FY02	FY03	FY04

Resident Fish Projects

ProjectID		Title	Sponsor	FY99 recom.	FY00 recom.	FY01	FY02	FY03	FY04
20008	*	Monitor and Protect Wigwam River Bull Trout for Koocanusa Reservoir	British Columbia Ministry of Environment, Lands and Parks		60	60	60	60	60
20049	*	Evaluate Sediment Transport in Spawning Habitat, Kootenai R., Idaho	USGS		97	19	0	0	0
8346700	*	Mitigation for the Construction and Operation of Libby Dam	MFWP	500	500	500	505	510	515
8806400	*	Kootenai River White Sturgeon Studies and Conservation Aquaculture	KTOI	1,281	1,150	3,542	1,000	1,100	1,200
8806500	*	Kootenai River Fisheries Recovery Investigations	IDFG	604	617	647	680	714	749
9401001		Mitigation for Excessive Drawdowns At Libby Reservoir	MFWP and CSKT	374	378	300	250	0	0
9404900		Improve the Kootenai River Ecosystem	KTOI	246	270	325	350	375	400
9608720		Focus Watershed Coordination-Kootenai River Watershed	MFWP and CSKT	100	100	100	100	100	0
			Resident Fish Totals	**$3,171**	**$5,294**	**$2,945**	**$2,859**	**$2,924**	
		* indicates ESA project, † indicates 'Innovative work'	**SUBBASIN TOTALS**	**$3,171**	**$5,294**	**$2,945**	**$2,859**	**$2,924**	

All figures in thousands of dollars

Needed Future Actions

Implement VARQ flood control to provide flexibility above the IRCs in less than average water years to improve conditions for anadromous species while protecting the needs of resident fish species.

The Integrated Rule Curve (measures 10.3B.6 and 10.3B.7, NWPPC 1995) have not been implemented, so the original drawdown limits of 90 to 110 feet below full pool for power purposes remain in effect. Changes in dam operation for recovery actions in the lower Columbia affect resident fish in the headwaters (ISAB 1997), and must be balanced to benefit all native fish species.

Recognition of Kootenai River burbot and implementation of water management strategies to provide a friendly migration corridor for spawning burbot.

Implement AEA modeling and restore nutrients to Kootenai River.

The IRCs can be applied to other projects given the necessary data. A simplified version of the models was used during the Columbia Basin System Operation Review process on Dworshak, Grand Coulee and Pend Oreille. This screening model produces qualitative results that can be used to direct field sampling efforts, which in time will provide the data for quantitative subroutines to construct a full-scale quantitative evaluation model. Preliminary IRCs for the other projects can be developed rapidly, using basin hydrology and the physical properties of the dams.

One critical need of the overall FWP is the development or licensing of an icthyotoxin that functions in running water. Removal of non-native fish is necessary in certain areas to restore native species, avoid predation and competition, and stop genetic introgression.

Quantify losses of fish and wildlife in the Idaho portion of the Kootenai River due to the operation of Libby Dam and implement protection, mitigation, and enhancement measures to offset impacts.

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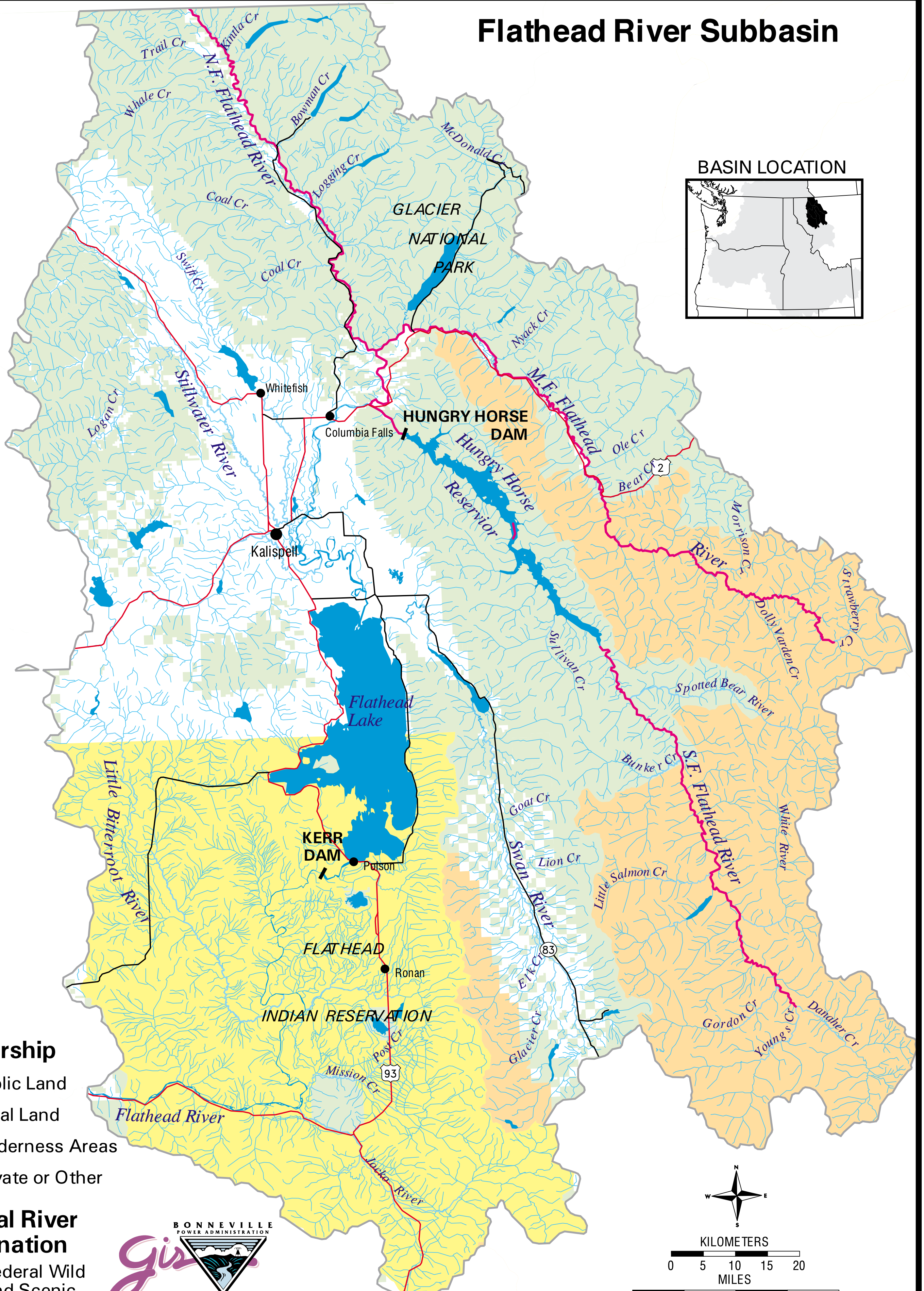
Flathead River Subbasin



Ownership

- Public Land
- Tribal Land
- Wilderness Areas
- Private or Other

Special River Designation

- Federal Wild and Scenic

BONNEVILLE POWER ADMINISTRATION

GIS GEOGRAPHIC INFORMATION SYSTEM

#EL990708

Flathead Subbasin

Res fish 6 projects $1,492

Fish and Wildlife Resources

Subbasin Description

The Flathead Drainage has three main river forks. The Middle and North Forks border Glacier National Park on the south and west sides, respectively. The North Fork originates in British Columbia, Canada. The South Fork begins in the Bob Marshall Wilderness and flows through a national wild and scenic area before entering Hungry Horse Reservoir, impounded by Hungry Horse Dam. Reservoir tributaries originate in the Great Bear Wilderness, the Jewel Basin Hiking Area and National Forest. Fish populations above Hungry Horse Dam include some of the strongest, self-sustaining stocks of native bull trout and westslope cutthroat in existence. Below Hungry Horse Dam, the South Fork flows for roughly 8 km (5 mi.) before joining the combined flows from the other two forks, forming the main stem Flathead River. The main stem flows south 64 km (approx. 40 mi.) into Flathead Lake. The lake discharge flows through the Flathead Reservation of the Confederated Salish and Kootenai Tribes (CSKT). Overall, the Flathead Watershed has experienced a severe decline in the range and number of bull trout and westslope cutthroat trout. Construction of Hungry Horse Dam in 1952 inundated and destroyed 77 miles of critical, low-gradient spawning and rearing habitat. Additional habitat was blocked by poorly installed road crossings. The impassable barrier created by the dam eliminated 40 percent of the original habitat available to migratory fish in the Flathead subbasin. Hydropower operations cause large seasonal fluctuations in reservoir elevations and unnatural flow and temperature fluctuations in the rivers downstream, resulting in reduced biological production. Wildlife populations were adversely impacted by construction of the dam through inundation of habitat, riparian habitat and adjacent forested habitats on the lower slopes the surrounding montane habitats. In addition, wildlife habitat in riparian zones, throughout the Flathead River below the dam, are impacted by flow modifications caused by operations.

Fish and Wildlife Status

Bull trout were listed in 1998 as threatened under the Endangered Species Act. The population in Hungry Horse Reservoir and its headwaters is one of the second strongest metapopulations in existence. Hungry Horse Dam isolated bull trout populations above and below the dam. Populations in the reservoir have stabilized at sustainable numbers and Montana Fish, Wildlife & Parks (MFWP) established a comprehensive monitoring program to alert managers to any change in population status. The bull trout population in the Flathead system below Hungry Horse Dam is also carefully monitored by MFWP and CSKT. Results have documented an alarming reduction in bull trout spawning redds since the early 1990s. The population declined to the lowest point in the 20-year record during 1992-1996. During 1997 and 1998, redd counts rebounded somewhat, but remain at 50 percent of the long-term average.

Westslope cutthroat trout have been petitioned for ESA listing. This species was designated a Species of Special Concern in Montana. Westslope cutthroat trout populations above Hungry Horse Dam form one of the strongest, most secure meta-populations of westslope cutthroat trout in existence. Below the dam cutthroat numbers have declined due to loss of habitat and negative interactions with non-native fish species (e.g. hybridization with rainbow trout and predation by lake trout). MFWP, through Hungry Horse Mitigation has reopened 16 percent more spawning and rearing habitat upstream of Hungry Horse Dam by replacing road culverts. Similar projects are ongoing downstream by MFWP and CSKT. Inundation impacts due to construction of the dam resulted in the total loss of riparian habitat and adjacent forested habitat. Impacted species included threatened species, such as grizzly bears and bald eagles, big game, such as deer, elk, moose, and a wide variety of nongame species of birds, mammals, amphibians and reptiles. In addition, ongoing operational impacts due to flow modifications continue on the Flathead River downstream from Hungry Horse Dam as far as the confluence of the Flathead and Clark Fork rivers.

Hungry Horse Dam operation reversed the Flathead River hydrograph for power and flood control and altered the annual temperature regime, causing impacts typical of dam tailwaters. As part of Hungry Horse mitigation, a selective withdrawal, temperature control structure was installed on Hungry Horse Dam. The device restored naturalized water temperatures to 44 river miles of the mainstem Flathead River. Model estimates predict a two to three fold increase in growth potential for fish that remain in the affected reach due to temperature control. Sampling is ongoing to document the influence on target species and their prey.

Habitat Areas and Quality

Completion of Hungry Horse Dam in 1952 on the South Fork of the Flathead River inundated 77 mi. of high quality spawning and rearing streams. Complete replacement of this inundated stream habitat is not possible. However, mitigation efforts are underway to protect, reopen, or reconstruct the remaining tributary habitat to offset the loss. Fortunately, in the headwaters of the Flathead Basin, habitat quality is high. The headwaters are largely undeveloped in the Bob Marshall and Great Bear Wilderness, Jewel Basin, and the national forest lands, and retain a high percentage of the original wild attributes and native species complexes. Protection of the remaining pristine areas, and reconnection of fragmented habitats in the subbasin are high priorities, while impacted areas are repaired.

Reservoir drawdowns have ranged as deep as 188 feet, exposing over 70 percent of the reservoir area to desiccation and erosion.. Drawdown affects all biological trophic levels and influences the probability of subsequent refill during spring runoff. Refill failures are especially harmful to biological production during the productive warm months. Annual drawdowns impede revegetation of the reservoir varial zone, resulting in a littoral zone of nondescript cobble/mud/sand bottom with limited habitat structure.

Power operations cause rapid fluctuations in dam discharges (as great as 400% change in daily discharge), which are inconsistent with the normative river concept. Flow fluctuations widen the riverine varial zone, which becomes biologically unproductive. This effect can be mitigated using computer models by developing watershed-based dam operations to recover all native species.

Watershed Assessment

Watershed assessments in the Flathead drainage were compiled in the Hungry Horse Dam Fisheries Mitigation (1991) and Implementation Plan (1993) for Losses Attributed to the Construction and Operation of Hungry Horse Dam. The Flathead Focus Watershed Project (CSKT) compiled the most comprehensive literature review of the subbasin, including all watershed assessments to date. The Mitigation Plans quantify fish losses and mitigation actions above and below Hungry Horse Dam, as called for by the Northwest Power Planning Council's (NWPPC) Columbia Basin Fish and Wildlife Program (FWP). Research and monitoring of the threatened bull trout and petitioned westslope cutthroat trout is a collaborative effort between MFWP and CSKT. Bull trout assessments and recovery actions are also coordinated with the Montana Bull Trout Scientific Team, The U.S. Fish and Wildlife Service (USFWS) and B.C. Environment.

Limiting Factors

Loss of 77 miles of high quality stream habitat resulted when Hungry Horse Reservoir filled. Extremely deep reservoir drawdowns expose vast expanses of reservoir bottom to drying, thus killing the primary spring food supply, aquatic insects. Reduced reservoir pool volume impacts all aquatic trophic levels due to the diminished size of the aquatic environment. During summer, reservoir drawdown reduces the availability of terrestrial insects for fish prey because fewer insects are trapped on the diminished surface area. Impoundment by Hungry Horse Dam and the removal of riparian vegetation altered the annual temperature cycle in the river. Hydropower related discharge fluctuations in the Flathead River have resulted in a wider zone of water fluctuation, or *varial zone*, which has become biologically unproductive. Reduction in natural spring freshets due to flood control have reduced the hydraulic energy needed to maintain the river channel and periodically re-sort river gravels. Collapsing river banks caused by intermittent flow fluctuation and lack of flushing flows have resulted in sediment buildup in the river cobbles which are detrimental to insect production, fish food availability, and security cover. Increased fine sediments in spawning gravels from roads and land management have reduced egg to fry survival of native trout. Loss of riparian vegetation and large woody debris due to land management activities has resulted in a net loss of security cover, bank stability and pool formation. Fish migrations were blocked due to man caused barriers (road culverts, dewatered stream reaches, irrigation diversions etc.). Illegal and unintentional introductions of non-native fish species have set up negative inter-species competition with native fish. Conversely, impoundment greatly benefited the native northern pikeminnow and peamouth chub, which now compete with or prey upon species of special concern for food and space. Forest management, agriculture, urbanization, and other land use activities have caused many streams in the drainage to become remarkably unstable. The result is increasing watershed fragmentation. Watershed management and fisheries management goals are to rectify this situation.

Subbasin Management

Goals, Objectives and Strategies

The goal is to mitigate for resident fish and wildlife losses caused by the construction and operation of Hungry Horse Dam and the federal hydropower system and improve sport fishing consumptive and non-consumptive wildlife opportunities as compensation. The goals are consistent with those outlined in the Hungry Horse Fisheries Mitigation and Implementation Plans, the Multi-Year Implementation Plan as well as in both the Upper Flathead System Fisheries Management Plan and the Fisheries Management Plan for the Flathead Indian Reservation.

Our objectives are to 1) improve juvenile survival, 2) improve adult survival and 3) re-establish extirpated runs of fish.

To achieve our objectives fish managers and researchers have defined several broad strategies. From a population perspective, the strategic intent is to maintain and enhance natural reproduction, adjust flows to create suitable rearing conditions, and maintain genetic diversity and adaptiveness. Wild spawning runs will be used to re-establish populations where appropriate using supplementation with imprinted fish and remote site incubators to seed existing and restored habitats. Experimental hatchery techniques will be used to hatch and rear native species at low densities (taking all steps necessary to maintain genetic integrity). Our plan is to foster and maintain wild, self sustaining populations of fishes (particularly native westslope cutthroat and bull trout) in applicable drainages and to increase opportunities for harvest and use of these species within the Flathead watershed.

Subbasin strategies consider the basin as a whole, treating the causes of degradation, not the symptoms. Habitat improvements on private lands will be coordinated through the Flathead Focus Watershed Program. Mitigation for operational impacts upon riparian habitats on the Flathead River below the dam also needs to be addressed. “Grass roots” public involvement and interagency cooperation will be used to attain locally led watershed recovery plans. These methods provide the greatest chance of success for the recovery of fisheries resources.

Subbasin strategies from a management perspective include maintaining minimum instream flows throughout the watershed and implementing Integrated Rule Curves and discharge ramping rates at Hungry Horse Dam to restore normative river conditions. Managers develop and implement recovery plans, protect and enhance habitat, create harvest opportunities, and manage harvest to promote healthy fish populations. From a watershed perspective this approach is necessary to reverse the downward trends in native species and protect healthy populations within the Flathead River Watershed.

Past Accomplishments

Initially, subbasin managers identified the historic and current status of fish stocks, population levels, and habitat conditions. Fisheries mitigation activities associated with the construction and operation of Hungry Horse Dam began in 1992. The overall mitigation strategy involves “operational mitigation” requiring changes in hydropower and flood control operations and “non-operational mitigation” including actions that do not require changes in operations.

In the early 1980’s, MFWP addressed inundation impact s upon terrestrial wildlife habitat and individual wildlife species and sought mitigation for those impacts. A settlement of these claims between MFWP and BPA resulted, and several specific mitigation projects are in various stages of completion. While fisheries mitigation efforts are dealing with impacts downstream from Flathead Lake are attributable to Hungry Horse operations, the precise nature of these impacts have yet to be resolved.

From 1982 through 1985, MFWP and CSKT compiled biological data needed to construct the quantitative reservoir model HRMOD. With aid from Montana State University (MSU), the U.S. Geological Survey (USGS), U.S. Bureau of Reclamation (BOR), Army Corps of Engineers (ACOE) and scientific reviews, Montana completed the model and developed Biological Rule Curves (BRCs) for Hungry Horse Dam (first published in 1989). The BRCs were integrated with power and flood control during the Columbia Basin System Operation Review and by 1995, the

Integrated Rule Curves were completed and adopted by the Northwest Power Planning Council (NWPPC). The IRCs were subsequently superseded by operations dictated by the National Marine Fisheries Service (NMFS) and have not been fully implemented to date.

Habitat restoration efforts outlined in the Mitigation Plan have been completed or are ongoing within the Flathead watershed. Monitoring and evaluation of restoration techniques and fish population responses continues. Cooperative programs and projects have been established with a variety of other entities for ongoing agency management and regulatory activities.

MFWP modeled the potential of retrofitting Hungry Horse Dam with a temperature control structure to modify downstream temperatures. This selective withrawal structure was funded through a congressional appropriation and became functional in 1996. Temperatures have been returned to naturalized conditions in 44 river miles of the main stem Flathead River.

Kokanee reintroduction was unsuccessfully attempted in Flathead Lake in 1992 through 1997. That program at the USFWS Creston National Fish Hatchery has now shifted to using standard and experimental hatchery techniques to hatch and rear native species at low densities for restoration stocking and to create fishing opportunities in closed-basin lakes using native, and where appropriate, non-native trout. Public education and new angling opportunities are being used to redirect angling pressure and harvest away from sensitive recovery areas.

In the first 24 months, the CSKT Focus Watershed Program began coordinating and assisting in several local projects including Dayton Creek, east and south forks of Valley Creek, Marsh Creek, Post Creek, Mission Creek, DuCharme Creek, the Little Bitterroot River and Jocko River. The watershed coordinator has worked closely with the Flathead Basin Commission, Bull Trout Restoration Team, Lake, Lincoln, Sanders, and Flathead County Conservation Districts, NRCS personnel, Tribal personnel, Montana Watercourse, Montana Watershed Inc., and several locally lead community interest groups.

Research, Monitoring and Evaluation

The state of Montana convened a scientific team in 1994 who documented the current status of bull trout and recommended restoration actions. Subsequent ESA listing in 1998 has increased the recovery planning efforts. MFWP and CSKT are restoring and reopening spawning and rearing habitat for bull trout and westslope cutthroat trout throughout the subbasin through the Hungry Horse Mitigation Program. Basin-wide redd counts and juvenile population estimates are performed annually. Treatment areas are monitored using site-specific measures, photo points and migrant trapping. Monitoring in the United States is coordinated with the British Columbia Ministry of Environment (B.C. Environment).

In 1999, Montana initiated a modified Instream Flow Incremental Methodology (IFIM) project on the Flathead River to refine the river component of HRMOD. The project has been approved for two years of funding and the final year, FY2000, is pending NWPPC approval. The IFIM research will calibrate simulations of hydraulic conditions (stage/discharge and velocities etc.) and fish habitat from Hungry Horse Dam to Flathead Lake at various discharges from Hungry Horse Dam. An optimization program is scheduled for development to allow managers to assess tradeoffs between the requirements of reservoir and riverine biota, when conflicts occur between reservoir operation and river flow limits as per the FWP. MFWP and CSKT monitor the effects of dam operation in Hungry Horse Reservoir and the Flathead River and its tributaries.

An experimental 5-year effort was planned by USFWS, beginning in FY2000, to remove non-native lake trout and other introduced species from 7,000 acre Lake McDonald in the Middle Fork Flathead drainage in Glacier National Park. This project will assess the feasibility of using lake trout removal as another tool to recover native bull and cutthroat trout populations.

Remaining Work

Work that still needs to be implemented includes:

- the Hungry Horse Mitigation and Implementation Plans including non-operational mitigation, habitat restoration, passage improvements, hatchery activities and offsite mitigation.

- Integrated Rule Curves for Hungry Horse Reservoir operation and normative river flows based on the IFIM results.
- bull trout and westslope cutthroat trout restoration measures.
- a gradual ramp-down approach to Flathead River flows after the spring runoff and maintain stabile discharges during the biologically productive summer months to benefit native species.
- downstream operational impacts of Hungry Horse Dam upon riparian habitat on the Flathead Indian Reservation need to be addressed.

Subbasin Recommendations

Implement Integrated Rule Curves (IRCs) at each storage project where currently available. Create IRCs for projects that do not presently have integrated operational rules by modeling watershed hydrology. The necessary hydrographic information exists for all projects to develop preliminary IRCs. Preliminary IRCs can be developed rapidly given the available data and a competent team of computer programmers. Research has demonstrated a striking similarity among the biological functions at storage projects and river reaches, allowing extrapolation from detailed studies to other sites where biological sampling is incomplete. The next step would incorporate site-specific modifications to the preliminary IRCs which were constructed based on hydrology alone. Modified IRCs can be adjusted over time as additional biological information becomes available. After IRCs are developed, a system model with sufficient time resolution (e.g. weekly, rather than monthly models) can incorporate the operating rules at the various projects. Given that runoff events occur at different times and volumes, the combined discharges from the subbasins can be shaped to achieve desired flood control requirements and the needs of resident fish, while simultaneously providing a protracted flow event to help meet the goals of salmon managers.

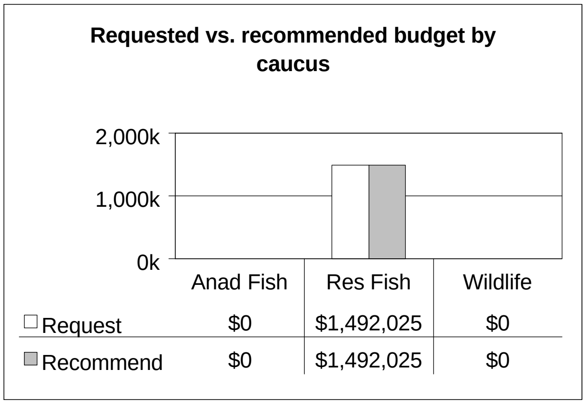
Implement the Army Corps of Engineers variable flow flood control strategy (VARQ). VARQ differs from current operations that attempt to store the entire spring freshet and release minimum flows during the runoff period. Instead, VARQ plans to release a naturalized spring freshet within flood constraints during the runoff event. The operation requires less reservoir drafting prior to runoff, so that reservoir elevations may remain higher than the IRC targets in less than average water years. This allows operators to “save” additional water for later release, thus further augmenting spring flows during dry years without compromising reservoir refill probability. When releases are properly shaped, the result is an operation that is mutually beneficial to fish in the headwaters and lower Columbia River.

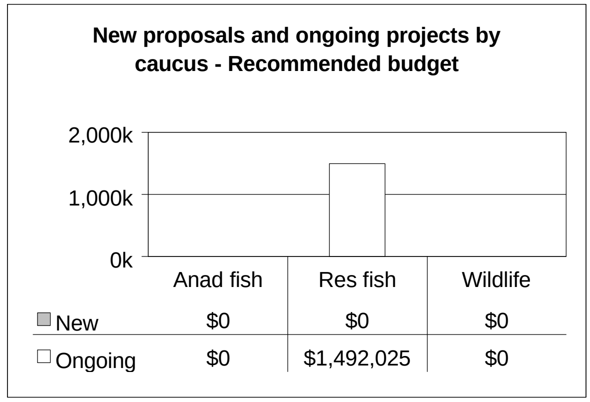
Pursuant to the Hungry Horse Mitigation and Implementation Plans, protect, reconstruct and/or reopen tributary habitat to enhance natural reproduction of native species. Reestablish spawning runs where wild stocks have been extirpated. Create angling opportunities in closed-basin lakes in the Flathead subbasin. Evaluate and, where practical, reduce impacts of non-native species on native stocks. Commence the process to address impacts of Hungry Horse operations on riparian habitat on the Flathead River on the Flathead Indian Reservation.

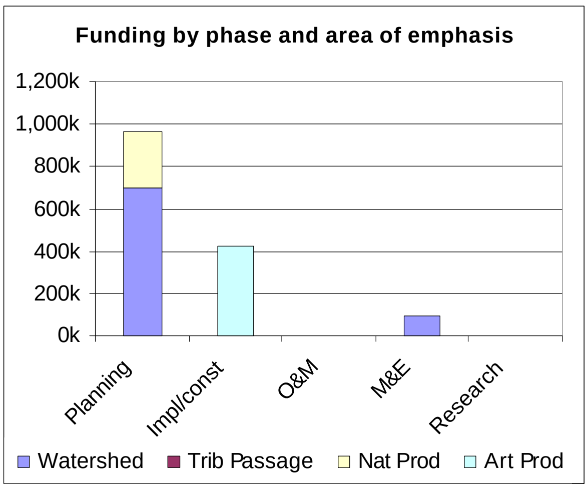
Projects and Budgets

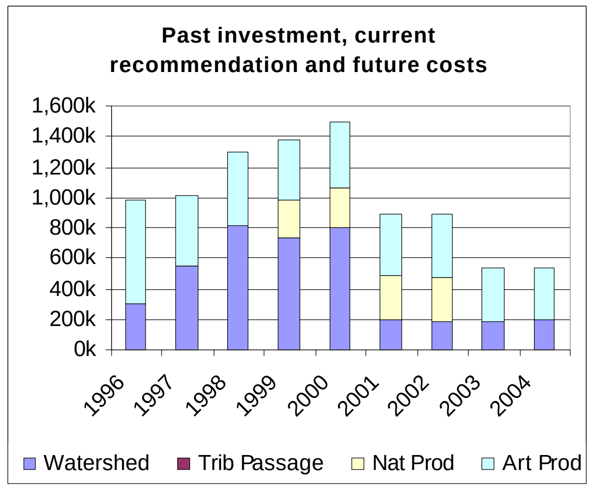
Based on the preceding subbasin description, the CBFWA fish and wildlife managers recommend funding a total of 6 projects at a cost of $1,492,025. Of the projects recommended, 0 focus on anadromous fish, 6 focus on resident fish, and 0 are directed at wildlife. 1 project supports ESA requirements for a total of $428,950.

Refer to the following figures for detail on: 1) total recommended and requested budget by caucus, 2) funding for new and ongoing work, 3) funding by project phase and emphasis, and 4) funding by time period (past, current and future). Individual projects are listed in the following table.


Requested vs. recommended budget by caucus
2,000k
1,000k
0k
Anad Fish
Res Fish
Wildlife
Request $0 $1,492,025 $0
Recommend $0 $1,492,025 $0


New proposals and ongoing projects by caucus - Recommended budget
2,000k
1,000k
0k
Anad fish
Res fish
Wildlife
New $0 $0 $0
Ongoing $0 $1,492,025 $0


Funding by phase and area of emphasis
1,200k
1,000k
800k
600k
400k
200k
0k
Planning
Impl/const
O&M
M&E
Research
Watershed
Trib Passage
Nat Prod
Art Prod


Past investment, current recommendation and future costs
1,600k
1,400k
1,200k
1,000k
800k
600k
400k
200k
0k
1996
1997
1998
1999
2000
2001
2002
2003
2004
Watershed
Trib Passage
Nat Prod
Art Prod

ProjectID		Title	Sponsor	FY99 recom.	FY00 recom.	Estimated Outyears FY01	FY02	FY03	FY04

Resident Fish Projects

ProjectID		Title	Sponsor	FY99 recom.	FY00 recom.	FY01	FY02	FY03	FY04
9101901		Flathead Lake Monitoring and Habitat Enhancement	CSKT	65	95	95	73	75	78
9101903		Hungry Horse Mitigation - Watershed Restoration & Monitoring (MFWP Umbrell	MFWP	474	498	0	0	0	0
9101904	*	Hungry Horse Mitigation - Nonnative Fish Removal / Hatchery Production	USFWS	389	429	405	420	350	350
9401002		Flathead River Native Species Project (MFWP Sub-proposal)	MFWP	248	267	285	285	0	0
9502500		Flathead River Instream Flow Project (Mfwp Umbrella Subproposal)	MFWP	100	100	0	0	0	0
9608701		Focus Watershed Coordination-Flathead River Watershed	CSKT	100	103	106	109	113	116
			Resident Fish Totals	**$1,492**	**$891**	**$888**	**$538**	**$544**	
		* indicates ESA project, † indicates 'Innovative work'	**SUBBASIN TOTALS**	**$1,492**	**$891**	**$888**	**$538**	**$544**	

All figures in thousands of dollars

Needed Future Actions

Implement VARQ flood control to provide flexibility above the IRCs in less than average water years to improve conditions for anadromous species while protecting the needs of resident fish species.

The Integrated Rule Curve have not been implemented, so the original drawdown limits of 85 feet below full pool for power purposes remain in effect. Changes in dam operation for recovery actions in the lower Columbia affect resident fish in the headwaters (ISAB 1997), and must be balanced to benefit all native fish species.
The IRCs can be applied to other projects given the necessary data. A simplified version of the models was used during the Columbia Basin System Operation Review process on Dworshak, Grand Coulee and Pend Oreille. This screening model produces qualitative results that can be used to direct field sampling efforts, which in time will provide the data for quantitative subroutines to construct a full-scale quantitative evaluation model. Preliminary IRCs for the other projects can be developed rapidly, using basin hydrology and the physical properties of the dams. One critical need of the overall FWP is the development or licensing of an icthyotoxin that functions in running water. Removal of non-native fish is necessary in certain areas to restore native species, avoid predation and competition, and stop genetic introgression.

Actions by Others

ACOE: Implement VARQ flood control to provide flexibility to operate above the IRCs in less than average water years so that spring flows can be augmented for salmon without compromising reservoir refill at Hungry Horse and operational constraints in Flathead Lake and Kerr Dam.

NMFS: Use a basin-wide, multi-species approach to protect and restore native resident and anadromous fish species in the Columbia River.

Policy Decision Makers: Follow ISAB recommendations to restore normative flow conditions throughout the Columbia. Make it a high priority for technical modelers at BPA’s Dittmer Control Center, ACOE flood control centers, NWPPC system analysts and BOR reservoir operations analysts to develop a weekly time-step model of the Columbia system that is capable of modeling the intent of the IRCs.

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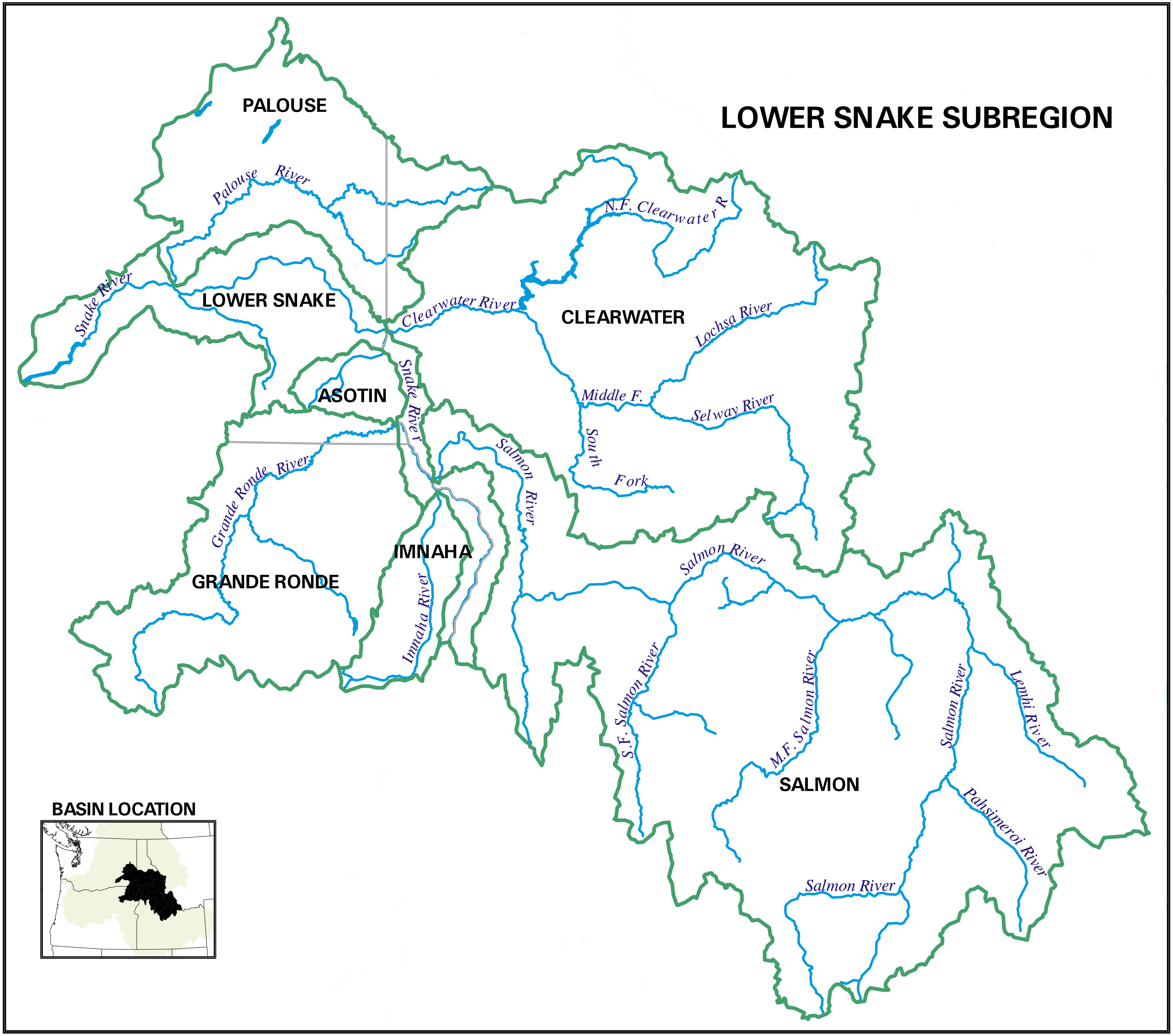
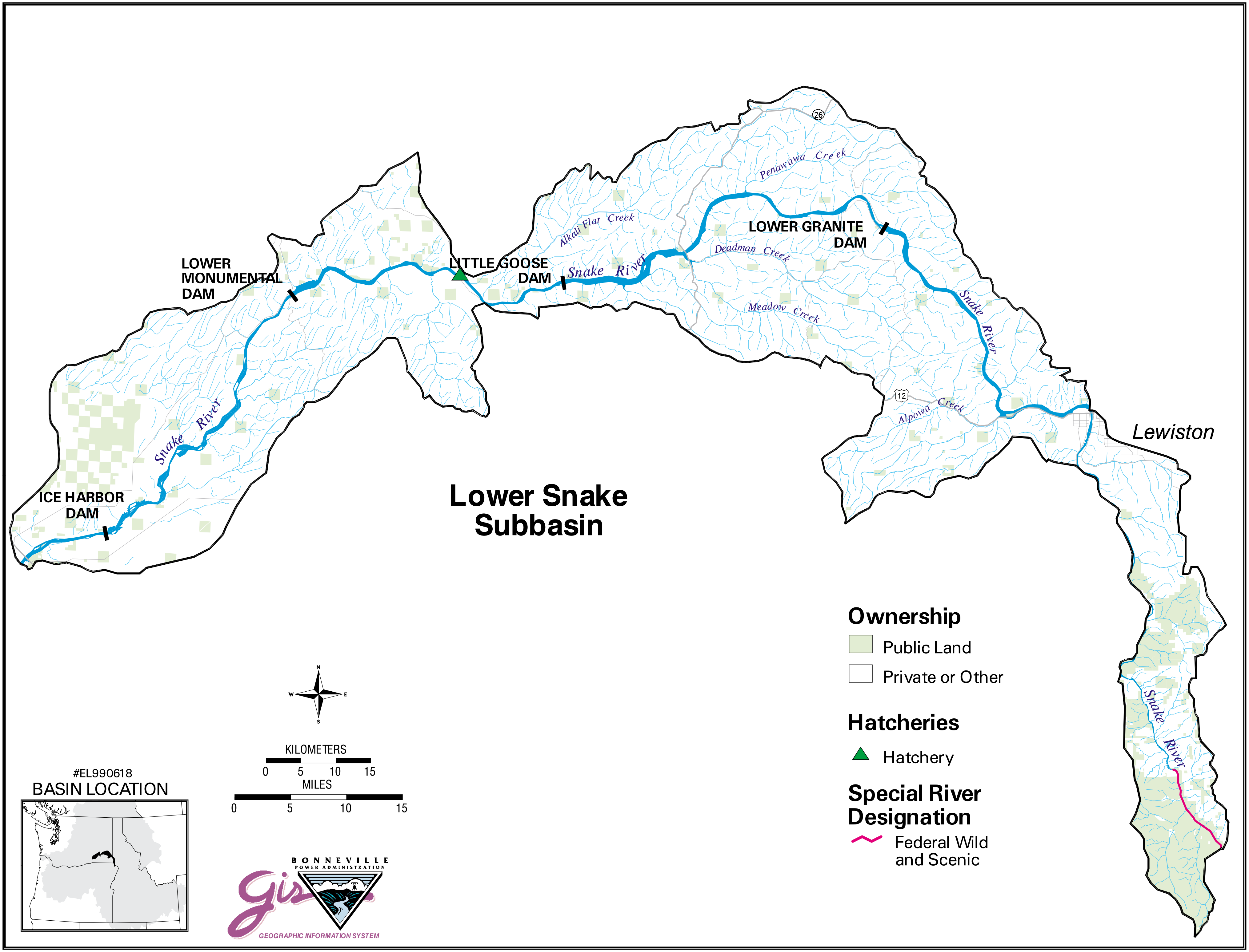


LOWER SNAKE SUBREGION
PALOUSE
Palouse River
LOWER SNAKE
Snake River
ASOTIN
CLEARWATER
Clearwater River
N.F. Clearwater R
Lochsa River
Middle F.
Selway River
South Fork
Snake River
Salmon River
IMNAHA
Imnaha River
GRANDE RONDE
Grande Ronde River
Salmon River
S.F. Salmon River
M.F. Salmon River
Salmon River
Lemhi River
Pahsimeroi River
Salmon River
SALMON
BASIN LOCATION

Lower Snake Subregion

The Lower Snake Subregion is defined as the Snake River and its tributaries from the mouth of the Snake to Hells Canyon Dam. This subregion covers approximately 35,200 square miles and includes the following subbasins: Lower Snake Mainstem, Tucannon, Asotin, Clearwater, Grande Ronde, Salmon, and Imnaha.


Lower Snake
Subbasin
Lewiston
LOWER GRANITE DAM
LITTLE GOOSE DAM
LOWER MONUMENTAL DAM
ICE HARBOR DAM
Snake River
Alkali Flat Creek
Penawawa Creek
Deadman Creek
Meadow Creek
Alpowa Creek
26
12
Ownership
Public Land
Private or Other
Hatcheries
Hatchery
Special River Designation
Federal Wild and Scenic
N
S
E
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KILOMETERS
0 5 10 15
MILES
0 5 10 15
#EL990618
BASIN LOCATION
BONNEVILLE POWER ADMINISTRATION
GIS
GEOGRAPHIC INFORMATION SYSTEM

Lower Snake Mainstem Subbasin

Anad fish 1 project $654

Fish and Wildlife Resources

Subbasin Description

The Lower Snake River mainstem subbasin extends from Hells Canyon Dam in Idaho to the confluence of the Snake and Columbia rivers in eastern Washington, a distance of about 250 river miles. The mainstem is accessible to anadromous salmonids and lamprey only as far upriver as Hells Canyon Dam. There are four federal dams on the lower Snake River, which have a major impact on the subbasin: Ice Harbor, Lower Monumental, Little Goose and Lower Granite. Upstream dam and reservoir operations profoundly affect the periodicity and magnitude of flows through this subbasin.

Major land uses in the subbasin are wilderness and agriculture, with some logging in the tributaries. About 17 percent of the land in the Washington portion of the subbasin is managed by the U.S. Forest Service (USFS); 38 percent is range land and 40 percent is cropland. The upper subbasin has USFS, private, and Bureau of Land Management Lands (BLM). The upper-most portion contains most of the Hells Canyon National Recreation Area, part of which is designated as wilderness. This also includes a part of the Snake that is designated as a Wild and Scenic River.

Fish and Wildlife Status

Anadromous Fish

Sockeye salmon **-** The primary destination for spawning is the Redfish Lake system in the Upper Salmon River basin. This endangered species must migrate through the Lower Snake River Mainstem Subbasin –downstream as juveniles (smolts) and upstream as returning adults. Favorable migratory conditions through this subbasin is, therefore, critical to the survival of this species.

Fall Chinook **-** Fall chinook spawn naturally in the free-flowing section of the Snake River below Hells Canyon Dam. NMFS listed this population as threatened in 1992. Additional spawning occurs in the lower reaches of large tributaries such as the Grande Ronde, Imnaha, Salmon, Clearwater and Tucannon Rivers. Spawning has been observed below some of the lower Snake River mainstem dams. Hatchery production of fall chinook in the mainstem Snake River takes place at Lyons Ferry Hatchery (0.5 to 2.0 million), built under the LSRCP and operated by WDFW. Adult trapping currently occurs at Lyons Ferry Hatchery and Lower Granite Dam. Releases are made directly from the hatchery and three acclimation sites above Lower Granite Dam. NMFS has not included these fish in the listing of Snake River fall chinook, although they have recommended the use of Lyons Ferry stock to supplement natural production above Lower Granite Dam since 1996. The planned Nez Perce Hatchery will include a fall chinook component. Currently, this hatchery is being designed as a central incubation, rearing, and release facility. Broodstock will be acquired from trapping at Lower Granite Dam, within the Clearwater and other areas.

Spring Chinook **-** Limited natural production of spring chinook occurs in small tributaries of Sheep, Granite, and Captain John creeks. Hatchery production of spring chinook for the mainstem Snake River occurs at Rapid River Hatchery. In 1994, spring chinook were also released below Hells Canyon Dam from Lookingglass Hatchery. An adult trap has also been constructed below Hells Canyon Dam to acquire broodstock. Direct stream releases occur at the adult trap. Since these fish are part of the Rapid River stock, the National Marine Fisheries Service (NMFS) does not consider them as listed Snake River spring chinook even though these fish represent the only major stock currently being reared that originated from the Snake River system.

Summer Steelhead **-** Some natural production of steelhead occurs in the mainstem and minor tributaries such as Alpowa, Captain John, Sheep and Granite creeks. Hatchery production of steelhead for the mainstem is at Lyons Ferry and Oxbow hatcheries. Oxbow Hatchery is an Idaho Power Company facility (Hells Canyon mitigation) that uses Niagara Springs hatchery in the mid-Snake as a rearing facility. Oxbow stock is part of the ESU, but Lyons Ferry stock is not.

Lamprey**-** Lamprey exists within the subbasin and numbers have declined due to hydropower.

Table 1. Stock status of anadromous fish.

Stock	ESA status Genetic history / management intent	Spawn escape	Hatchery Take	Harvest	Recent total escape
Sockeye Salmon	Endangered. Captive brood, manage habitat, manage harvest, and improve migration conditions through the Lower Snake River mainstem.				
Fall chinook salmon	Threatened. Supplement with Lyons Ferry and local brood.				(18300)
Summer steelhead	Threatened. Incidental natural spawning. Continue release of Lyons Ferry and Oxbow stock for harvest.			(13000-14000) partial	
Coho salmon	Extirpated. Re-introduction under discussion.				0
Lamprey	Species of concern				

<u>Resident Fish</u>

Bull trout in the Lower Snake Mainstem Subbasin are listed as threatened. Bull trout use in the mainstem appears to be limited to adult rearing and migration. Adults originating from the Tucannon, Grande Ronde, Imnaha, and Salmon subbasins are known to use the Lower Snake mainstem subbasin as a migratory corridor. They are seldom observed at the mainstem dam fish facilities, but are commonly observed in the steelhead sport fishery at the mouths of the Grande Ronde and Salmon rivers.

White sturgeon is a species of concern. Construction of the four Lower Snake River Dams and the formation of their respective reservoirs have dramatically altered the life history, productivity and habitat of white sturgeon and the prey bases on which they rely. The State of Idaho has not allowed a harvest on white sturgeon in this area since 1970. Due to low abundance, subsistence harvest for white sturgeon has been severely limited. The free-flowing section of the Lower Snake mainstem below Hells Canyon Dam supports a substantial catch and release recreational fishery.

<u>Wildlife</u>

A variety of wildlife species, including large and small mammals, waterfowl, passerines, raptors, reptiles, and amphibians, are associated with Lower Snake Mainstem riverine, riparian, wetland, and nearby upland habitats. Although the status of wildlife populations varies throughout the basin and by species, many wildlife species within the basin are listed as listed as Federal and/or State Threatened, Endangered, Sensitive, or At-Risk (Puchy and Marshall 1993). For example, the bald eagle (listed as Federally Threatened) is known to frequent the Lower Snake Mainstem Subbasin. Certain populations of wildlife species are being managed by federal and state wildlife managers throughout the subbasin, including big game, fur bearers, upland birds, and waterfowl species. The open water areas of the mainstem is used by many different species of waterfowl. Bighorn sheep occur in rocky cliff areas along the mainstem.

Habitat Areas and Quality

<u>Lower Mainstem (from the mouth to Lewiston)</u> **-** Inundation of habitat by dam construction has greatly limited fall chinook production in the mainstem Snake River. In addition, a few large irrigation pumps can kill juvenile salmonids when they are not adequately maintained. Dams and reservoirs pose artificial obstacles and altered habitats that directly and indirectly affect the capacity of native anadromous and resident fishes to flourish. Adverse habitat changes affecting native fishes include reduced water velocities, altered hydrographs, increased temperatures, and increased total dissolved gases. Habitat changes have been beneficial to some introduced fishes, causing additional negative impacts to native fishes through competition and predation.

<u>Upper Mainstem (Lewiston to Hells Canyon Dam)</u> **-** Much of this reach is in a National Recreation Area or wild and scenic designation. An existing Federal Energy Regulatory Commission (FERC) settlement between the Idaho Power Company (IPC) and fishery agencies states that petitioners may seek additional relief from IPC to provide flows for

downstream migration should the fishery agencies require IPC to release fall chinook (FERC Settlement Agreement, 1980). FERC mandates flows during the fall chinook spawning period. This part of the agreement has never been implemented. IPC has a contract for rearing and release of fall chinook from Lyons Ferry Hatchery into Hells Canyon that has not been implemented. The free-flowing riverine habitat in this section supports sturgeon spawning and contains higher densities of mature white sturgeon than the Lower Mainstem.

Minor tributaries **-** Agriculture, grazing and clearing have destroyed much of the riparian areas and increased sentiment levels. This has resulted in low flows, high water temperatures, sedimentation and pollution, limiting the spawning and rearing habitat for Spring Chinook, Steelhead and other fishes.

Wildlife are associated with riverine and adjacent riparian forest, wetland, mixed coniferous and deciduous forest, cliff, and agricultural habitats in the Lower Snake Mainstem Subbasin. Habitat quality is variable depending on the degree to which habitats have been converted into other land uses and impacted by human activities and invasion of noxious weeds. Habitat has generally been degraded due to hydropower development (i.e., by the Lower Snake River dams), past and present land management activities, the spread of non-native plant species, and human development. Agricultural lands provide limited habitat value for wildlife. Bottomlands and riverine habitats within the subbasin have also been dramatically altered by dredging, dikes, and flood control activities at the four hydroelectric facilities. Hydropower development has altered riverine and riparian habitats through flow regulation, channel modification, diking, and dredging. Other activities related to hydroelectric development (e.g., road construction) have altered land and stream areas in ways that affect wildlife. In some cases, the construction and maintenance of power transmission corridors altered vegetation, increased access to and harassment of wildlife, and increased erosion and sedimentation in the subbasin. Forest management practices on both public and private lands has also affected wildlife habitat quantity and quality.

Watershed Assessment

Because this is a mainstem stream segment, and not a watershed unit, classic watershed assessments have limited applicability. Habitat quality of this mainstem segment is, however, highly influenced by the status and management of upstream watersheds and their water resources.

The Natural Heritage Program maintains a database on habitats and species occurrences throughout the State of Oregon. The Oregon Trust Agreement Planning Project (BPA 1993) and Oregon GAP Analysis Project (ODFW 1997) identified gaps in bio-diversity and needs for terrestrial habitat restoration in the Lower Snake River Subbasin. The GAP Analysis Project concluded that of the current land base within the Snake River Hydrologic Basin in Oregon, 37 percent is in a low protected status for wildlife, 57 percent is in a moderate protected status for wildlife, and 6 percent is in a high protected status for wildlife.

A Columbia Basin wide losses assessment was conducted to quantify habitat impacts from hydrosystem development. Wildlife mitigation objectives for the Lower Snake Mainstem Subbasin are based on this losses assessment (see Tables 2 and 3 below). These losses were amended into the Northwest Power Planning Council's Fish and Wildlife Program as accepted wildlife losses caused by the construction of the hydrosystem. Losses were measured in Habitat Units (HUs) for selected target/indicator species linked to priority habitats. (Note: all or part of the wildlife losses for Lower Snake Subregion may be mitigated for in the Lower Snake Mainstem Subbasin, though it is unlikely that it would be proposed or could occur).

Limiting Factors

The primary limiting factors for both anadromous and resident fish are loss of spawning and rearing habitat related to reservoir development from dam construction, passage losses of both juveniles and adults at mainstem dams and reservoirs, and a perturbed hydrograph below Hells Canyon Dam. Limiting factors in the minor tributaries include low flows, high water temperatures, sedimentation and pollution, and limiting the spawning and rearing habitat for spring chinook, steelhead and other fishes. Reduced anadromous-based forage, for example salmon and lamprey, has been identified as a likely limiting factor for white sturgeon.

Wildlife abundance is currently limited by the results of past hydropower development (e.g., habitat loss and degradation, the decrease in fish abundance), past and current land management practices (e.g., irrigation, logging, livestock and agricultural practices, road construction), the spread of non-native plant and wildlife species, and urban expansion. Increasing development within the John Day River Subbasin continues to eliminate remaining wildlife habitats. Loss of wintering range for deer and elk due to conversion of historic ranges to agricultural use limits big game populations. Conversion of shrub steppe habitat to other uses and competition with native plant assemblages by noxious weeds limit populations of wildlife dependent on that habitat type. Land prices continue to rise, making it more economically difficult to preserve remaining undeveloped lands for wildlife. Water use practices (e.g., irrigation) can negatively affect quality and quantity; and are factors limiting to wildlife. Continued declines in salmon and other fish species results in a loss of overall biomass being contributed to the subbasin. This reduction has negative effects on wildlife abundance. Any of these influences can be, and are, limiting factors to local populations. Changes in local populations can affect species integrity on a larger scale. Opportunities to restore wildlife populations and improve wildlife habitat diminish over time as habitat loss and degradation continues.

Floodplain and riparian habitats important to wildlife were inundated when the four Lower Snake Reservoirs were filled. The habitats that were lost harbored many different, interdependent wildlife species. The fitness of the area as a functioning natural ecosystem, and its capacity to express its full natural species diversity, is limited by this alteration. Species associated with riparian and riverine habitats, including breeding and wintering bald eagles, river otters, black-capped chickadees, peregrine falcons, and ruffed grouse, have been identified as high wildlife mitigation priorities.

Subbasin Management

Goals, Objectives and Strategies

Anadromous Fish

The indigenous fish species most actively targeted for management in the Lower Snake River Mainstem Subbasin are fall chinook, spring and summer chinook, summer steelhead, white sturgeon and bull trout. Coho were extinct in 1986, and re-introduction efforts have been initiated. Pacific lamprey is another species of interest, but little is known about existing populations. The goal for these species is to restore sustainable, naturally producing populations to support tribal and non-tribal harvest and cultural and economic practices while protecting the biological integrity and the genetic diversity of the watershed.

The objectives for anadromous fish within this subbasin are: 1) improve survival for juveniles; 2) improve pre-spawning survival for adults; 3) improve adult spawning success; and 4) re-establish naturally producing populations to productive levels.

Strategies to achieve the objectives include: 1) continuing fall chinook supplementation using Lyons Ferry stock; 2) developing adult capture and continuing operations of juvenile acclimation/release facilities at Pittsburg Landing and Captain John’s on the Snake River and Big Canyon Creek on the Clearwater River; 3) continuing the summer steelhead program at Lyons Ferry Hatchery using Lyons Ferry stock and the Oxbow program; 4) discontinue all catchable trout programs in areas where they may jeopardize anadromous restoration activities; 5) develop a program to restore lamprey populations; 6) monitor and evaluate all artificial production actions; 7) use adaptive management to determine whether program changes (i.e., release number, size, time, location, and/or life history) are needed in order to meet restoration objectives; and, 8) apply PATH analyses to achieve the most effective and expeditious recovery and restoration.

Resident Fish

The primary native resident fish species targeted for active management in the Lower Snake Subbasin are white sturgeon and bull trout. Five regional goals were listed in the Resident Fish Multi-year Implementation Plan (RFMYIP) appendix to the June 4, 1997, Resident Fish Annual Implementation Work Plan (CBFWA 1997). The intent of these goals are two-fold: 1) to conserve, protect and enhance production and distribution of these species throughout their historical range; and, 2) to provide sustainable fisheries, including harvest opportunities.

To achieve these goals the managers have adopted objectives to: 1) improve survival for all life history phases for resident fish; and 2) re-establish depressed populations of fish to productive levels.

Within the Lower Snake Mainstem Subbasin, fisheries managers intend to achieve these objectives by adopting strategies that address characteristics of fish populations and fisheries, distribution range, and fisheries characteristics. These strategies include: 1) maintaining and restoring population productivity reduced by hydropower development and operations to healthy levels which provide for consumptive and non-consumptive uses of native population; and,

2) ensuring sustained population levels of native fish above the minimum viable population sizes which maintain adaptability and genetic diversity.

Specific and directed strategies for white sturgeon in the Lower Snake Mainstem Subbasin have been identified by the fisheries managers, and are also detailed in the RFMYIP. These strategies include the following: 1) configure and operate the hydropower system consistent with the salmonid recovery plan to maximize spawning and rearing success of white sturgeon; 2) supplement with artificial production where risks to naturally spawning populations are negligible if abundance of naturally produced white sturgeon cannot be restored to pre-hydrosystem levels; 3) monitor population status of white sturgeon to evaluate effectiveness of restoration efforts and conduct research as needed to ensure success of restoration efforts; and, 4) manage harvest of white sturgeon at the population level based on estimated abundance and exploitation rates which provide optimum sustainable yields.

Specific objectives relevant to native resident fish species other than white sturgeon in the subbasin are:

1. Ensure that native population levels are above minimum viable population sizes which maintain adaptability and genetic diversity, maximize probability of survival, and do not constrain consumptive and nonconsumptive uses of other species to protect sensitive populations.
   Quantitative objective: minimum breeding populations of 150-300 individuals and >95% probability of persistence for at least five generations

2. Restore populations to near historic levels with sustainable harvest opportunities.
   Quantitative objective: sustainable harvest rate of .five fish/hr.

Strategies to achieve the stated objectives for native resident fish other than white sturgeon within the subbasin include:

1. Obtain stock assessment information of native fish populations incidental to work focused on other problems (for instance, predation, fall chinook rearing, or sturgeon restoration evaluations).
2. Restore anadromous fish habitat and abundance to near historic levels to provide nutrients, food resources, and habitat conditions suitable for sensitive resident species.
3. Evaluate bull trout use of mainstem corridor and effects of dams on bull trout movements (not in RFMYIP).

Wildlife

The overall wildlife mitigation goal for the Columbia River Basin is to achieve and sustain levels of habitat and species productivity in order to fully mitigate for all wildlife and wildlife habitat losses caused by the development and operation of the hydropower system (NWPPC 1995). This goal applies to the Lower Snake Subregion, including the Lower Snake Mainstem Subbasin. Within the Lower Snake Subregion, the wildlife mitigation goal is to be achieved by fully mitigating for losses associated with Ice Harbor, Lower Monumental, Little Goose, and Lower Granite Dams.

The wildlife mitigation objective is to maintain and restore populations of wildlife native to the Lower Snake Mainstem Subbasin, including those target species selected to represent the cover types within the subbasin, and those habitat types considered priorities within the subbasin (i.e., riverine/riparian, wetlands, native greasslands and shrubs, coniferous forest, old growth forest forest, lowland forest). The wildlife mitigation objective is based on the Northwest Power Planning Council's accepted wildlife losses measured in Habitat Units (HUs) for selected target/indicator species linked to priority habitats. Priority wildlife habitats are riparian/riverine and wetlands.

The following strategies will achieve wildlife mitigation objectives within the Lower Snake Mainstem Subbasin:

- Identify potential protection and enhancement projects within the Lower Snake Mainstem Subbasin through the GAP Analysis and coordinate implementation of activities through Oregon and Washington wildlife managers.
- Implement land acquisition and easements of priority habitats.
- Implement enhancement and restoration activities (e.g., control of non-native plant species, management of livestock grazing practices for native plant communities).
- Monitor and evaluate wildlife habitat and wildlife species response to implemented enhancement activities within the Lower Snake Mainstem Subbasin.

Past Efforts

Specific actions to carry out these strategies are listed in Appendix C. A general description of past efforts by project follows.

Specific actions which implement these strategies include: monitoring and evaluating wild juvenile Snake River spring/summer chinook outmigration (Project No. 9102800); and monitoring and evaluating the spawning distribution of fall chinook (Project No. 9801003) and the rearing and migration of yearling fall chinook upstream of Lower Granite Dam (Project No. 9801004). Project No. 9801005 funds the development and operations of fall chinook acclimation facilities at Pittsburg Landing, Captain John Rapids, and Big Canyon.

Considerable research and monitoring is being (and has been) done, including studies of fall chinook life history (Project Nos. 9102800 and 9102900), one summer/fall chinook restoration project (Project No. 9403400), juvenile fall chinook survival studies (Project No. 9801003), and several monitoring studies (Project Nos. 8000200, 8611900, 9204600, and 9401004).

In 1996, a biological risk assessment of white sturgeon in the Lower Snake River between Hells Canyon and Lower Granite Dams was conducted by the Nez Perce Tribe (Project No. 700900). This assessment identified: 1) regional sturgeon management objectives; and, 2) potential mitigation actions needed to restore and protect the population. The risks and uncertainties associated with implementation of potential mitigative actions could not be fully assessed, however, because critical data concerning the status of the population and their habitat requirements are unknown. The tribe is currently collecting the missing data. Based on results of the data collection, an adaptive management plan will be formulated that will: 1) reassess potential mitigative actions; 2) recommend the implementation of needed mitigative action(s); and, 3) present a monitoring and evaluation plan.

The expected outcome of identifying and implementing appropriate mitigative actions to rebuild the white sturgeon population in the Lower Snake Subbasin would be the re-establishment of a sustainable white sturgeon harvest while ensuring a sustained population level above the minimum viable population size necessary to maintain adaptability and genetic diversity.

There is a BPA funded project for studying bull trout in the Grande Ronde basin that includes the use of the mainstem Snake River.

The Oregon Wildlife Coalition is implementing a programmatic mitigation project that may result in the implementation of mitigation projects within the subbasin. This goals of this project, *Securing Wildlife Mitigation Sites in Oregon (Project No. 9705900)*, are to:

- Fund project coordination activities to identify, plan, propose, and implement wildlife mitigation projects within the Lower Snake Subregion, including the Lower Snake Mainstem Subbasin.
- Prioritize potential mitigation projects within Lower Snake Subregion, including the Lower Snake Mainstem Subbasin.
- Acquire or ease lands with priority habitats within Lower Snake Subregion, including the Lower Snake Mainstem Subbasin.
- Enhance acquired or eased lands through alteration of land management practices, active restoration of habitats, control of noxious weeds, control of public access, etc. to provide benefits to target/indicator wildlife species and priority habitats within the Lower Snake Subregion, including the Lower Snake Mainstem Subbasin.
- Develop and implement a Monitoring and Evaluation Plan with both HEP-based and non HEP-based monitoring criteria within the Lower Snake Subregion, including the Lower Snake Mainstem Subbasin.

Research, Monitoring and Evaluation

Research, monitoring and evaluation activities include: monitoring and evaluating wild juvenile Snake River spring/summer chinook outmigration (Project No. 9102800); monitoring and evaluating the spawning distribution of fall chinook (Project No. 9801003) ,and; monitoring and evaluating rearing and migration of yearling fall chinook upstream of Lower Granite Dam (Project No. 9801004).

Considerable research and monitoring is being (and has been) done, including studies of fall chinook life history (Project Nos. 9102800 and 9102900), one summer/fall chinook restoration project (Project No. 9403400), juvenile fall chinook survival studies (Project No. 9801003), steelhead monitoring and evaluation Project No. (Project No. ?), Lyons Ferry Hatchery monitoring and evaluation (Project No. ?), bull trout assessments (Project No. 9405400), and several additional monitoring studies (Project Nos. 8000200, 8611900, 9204600, and9401004)

Wildlife surveys and inventories (e.g., big-game aerial surveys) are conducted regularly within the Lower Snake Mainstem Subbasin regularly by state, federal, and tribal wildlife managers. Wildlife mitigation projects are habitat based and use the USFWS's Habitat Evaluation Procedure (HEP) as a means of tracking project progress. Treatment specific monitoring may also be employed to evaluate methods. Additionally, population monitoring throughout is conducted to address species response to project implementation and for setting of harvest regulations.

Remaining Work

A summary of planned outyear activities for ongoing FY 2000 projects follows:

Project No. 9102800 Monitoring Smolt Migrations of Wild Snake River Sp/Sum Chinook
Continue collecting time series information to examine migrational characteristics of wild ESA-listed Snake River spring/summer chinook salmon stocks. Continue marking wild spring/summer chinook salmon parr with PIT-tags annually; intercept and decode tagged smolts as they pass traps in tributary streams and Snake and Columbia River dams annually. Continue monitoring environmental conditions within natal streams and determine how they effect wild parr and smolt movements and migrations. Continue providing real-time wild smolt timing data annually for making operational decisions to maximize survival of wild smolts as they migrate through the hydropower system.

Project No. 9102900 Life History And Survival Of Fall Chinook Salmon In Columbia River Basinnook Salmon
Continue facilitating implementation of federal and tribal fall chinook salmon recovery plans by monitoring and evaluating post-release attributes and survival of natural and hatchery juvenile fall chinook in the Snake River and Hanford Reach of the Columbia River.

Project No. 9202409 Enhance Conser. Enforcement for Fish & Wildlife,Watersheds of the Nez Perce
Increased law enforcement (LE) protection of fish, wildlife, their critical habitats and other essential natural resources within watersheds managed by the Tribe, including LE program coordination with all other resource enhancement projects of the NPT.

Project No. 9403400 Assessing Summer And Fall Chinook Restoration In The Snake River Basin.
Continue assessing current fall chinook spawning escapement and locations, juvenile emergence, growth rates, emigration timing, survival to dams, and smolt-to-adult survival for evaluating supplementation as a tool for recovery of Snake River fall chinook salmon.

Project No. 9700900 Evaluate Rebuilding the White Sturgeon Population in the Lower Snake Basin
Continue evaluating the need for and identifying potential measures to protect and restore white sturgeon between Hells Canyon and Lower Granite dams to obtain a sustainable annual harvest of white sturgeon.

Project No. 9801003 Spawning distribution of Snake River fall chinook salmon
Continue monitoring the spawning distribution of fall chinook salmon to determine if supplemented yearling hatchery fish spawn where intended, and to document redd distribution and collect information on the spawning distribution of subyearling releases and natural fish.

Project No. 9801004 M&E of Yearling Snake R. Fall Chinook Released Upstream of Lower Granite
Continue monitoring and evaluating fish health, movement patterns, migration timing, travel times, juvenile emigration survival and adult returns through supplementation of Lyons Ferry Hatchery fall chinook salmon in the Snake and Clearwater rivers.

Project No. 9801005 Pittsburg Landing, Capt. John Rapids, Big Canyon Acclimation Facilities
This project will continue supplementing natural production of Snake River fall chinook above Lower Granite Dam through acclimation and final rearing of Lyons Ferry yearling and subyearling at two sites on the Snake River and one site on the Clearwater River.

Securing Wildlife Mitigation Sites - Oregon (Project No. 9705900): The Oregon Wildlife Coalition will continue to implement this programmatic mitigation project to identify and eventually implement other potential wildlife protection and enhancement projects within the Columbia River Basin, including the John day Subbasin until remaining wildlife Habitat Unit (HU) losses are mitigated for. Implementation of projects within the subbasin would help offset the wildlife HU losses still remaining at the Bonneville, The Dalles, John Day, and McNary Dams. For example, only about 10 percent of the Oregon's HU losses at John Day Dam have been mitigated for to date.

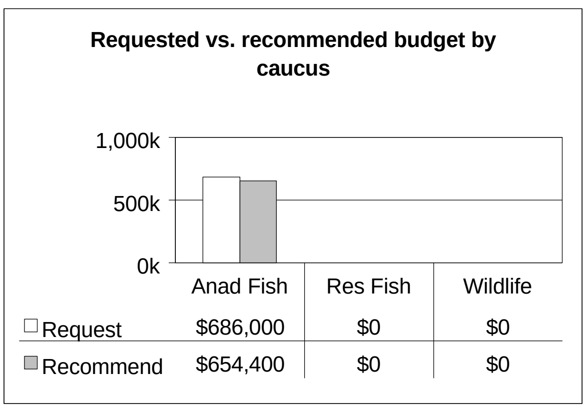
Other remaining wildlife related work tasks within the John Day Subbasin include assessment and mitigation of hydropower system operational and secondary losses, development and implementation of a regional Monitoring and Evaluation Plan, and development of both HEP-based and non HEP-based monitoring success criteria.

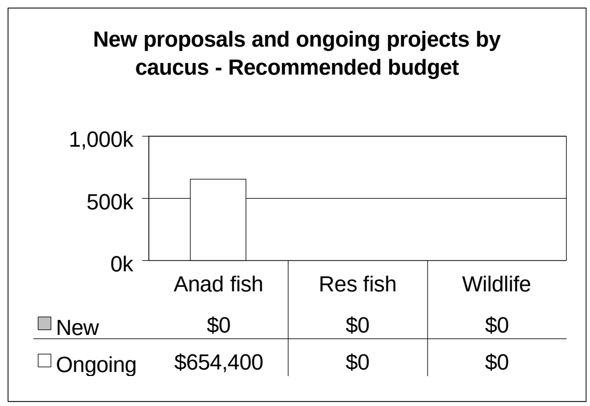
Subbasin Recommendations

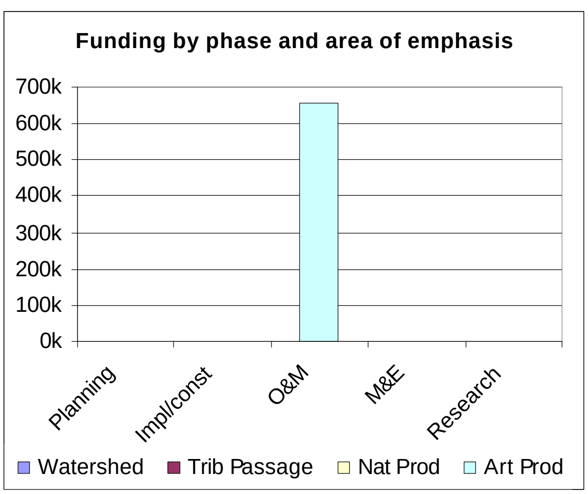
Projects and Budgets

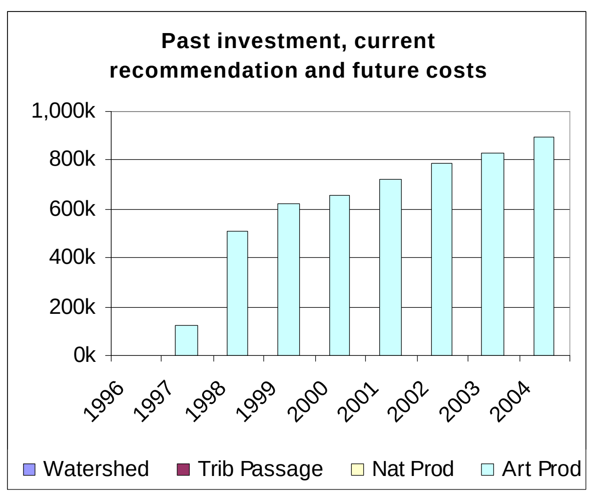
Based on the preceding subbasin description, the CBFWA fish and wildlife managers recommend funding one anadromous fish project at a cost of $654,400.

Refer to the following figures for detail on: 1) total recommended and requested budget by caucus, 2) funding for new and ongoing work, 3) funding by project phase and emphasis, and 4) funding by time period (past, current and future). Individual projects are listed in the following table.









ProjectID	Title	Sponsor	FY99 recom.	FY00 recom.	Estimated Outyears FY01	FY02	FY03	FY04
Anadromous Fish Projects								
9801005	Pittsburg Landing,Capt. John Rapids, Big Canyon Acclimation Facilities	NPT	624	654	720	790	830	890
		Anadromous Fish Totals		**$654**	**$720**	**$790**	**$830**	**$890**
	* indicates ESA project, † indicates 'Innovative work'	**SUBBASIN TOTALS**		**$654**	**$720**	**$790**	**$830**	**$890**

All figures in thousands of dollars

Needed Future Actions

There is a future need to reevaluate and monitor the anadromous fish, resident fish and wildlife resources within this subbasin to follow-up on the NMFS-ACOE late 1999/early 2000 decision on mainstem configuration and operations. Of particular interest will be to analyze how implementation of the selected decision "path" will promote functional natural ecosystem processes necessary to support native species diversity and productivity (anadromous fish, resident fish, wildlife). Costs will depend on the decision path chosen.

Opportunities to provide benefits to wildlife and wildlife habitat will be pursued through the Oregon Wildlife Coalition's programmatic project. Continued implementation of this project may identify potential wildlife protection and enhancement projects within the Lower Snake Subregion, including the Lower Snake Mainstem Subbasin. Implementation of wildlife mitigation projects within the subregion will benefit wildlife and help BPA meet their wildlife mitigation obligations at the Lower Snake hydroelectric facilities. Other negative impacts to fish and wildlife caused by the hydropower system that fish and wildlife managers are currently not aware of may need to be addressed in the future as they become apparent. For example, impacts to TES species may require mitigative action.

Actions by Others

Actions by the Columbia Basin federal water managers (ACOE, BPA, USBR) will be critical in implementing a desired path to conserve, restore, and recover fish and wildlife resources. ACOE needs to implement the Lower Snake River alternative path that provides the greatest assurance of recovery and restoration of ESA listed anadromous stocks. At the time of this writing, the PATH group has identified the natural river option as the alternative that would best provide this assurance. Land managers (USFS, USBLM, states, and tribes) will need to carry out necessary actions to restore and maintain quality watersheds. This will maximize benefits from mainstem efforts, and will assure that actions within the larger Snake/Columbia watershed are complementary.

There are numerous planning and policy development processes presently occurring as part of the effort to address fish and wildlife needs within the Columbia River Basin. These processes, as well as the number of oversight agencies, have expanded over the recent years, subsequently affecting the amount of restoration work being performed on the ground. Additional staff and funding are needed to meet the obligations to the changing process and the resources.

There are opportunities for private and public landowners, as well as non-profit organizations (e.g., watershed councils, The Nature Conservancy) to work together to benefit wildlife and wildlife habitat within the subbasin through the protection and enhancement of lands for wildlife.

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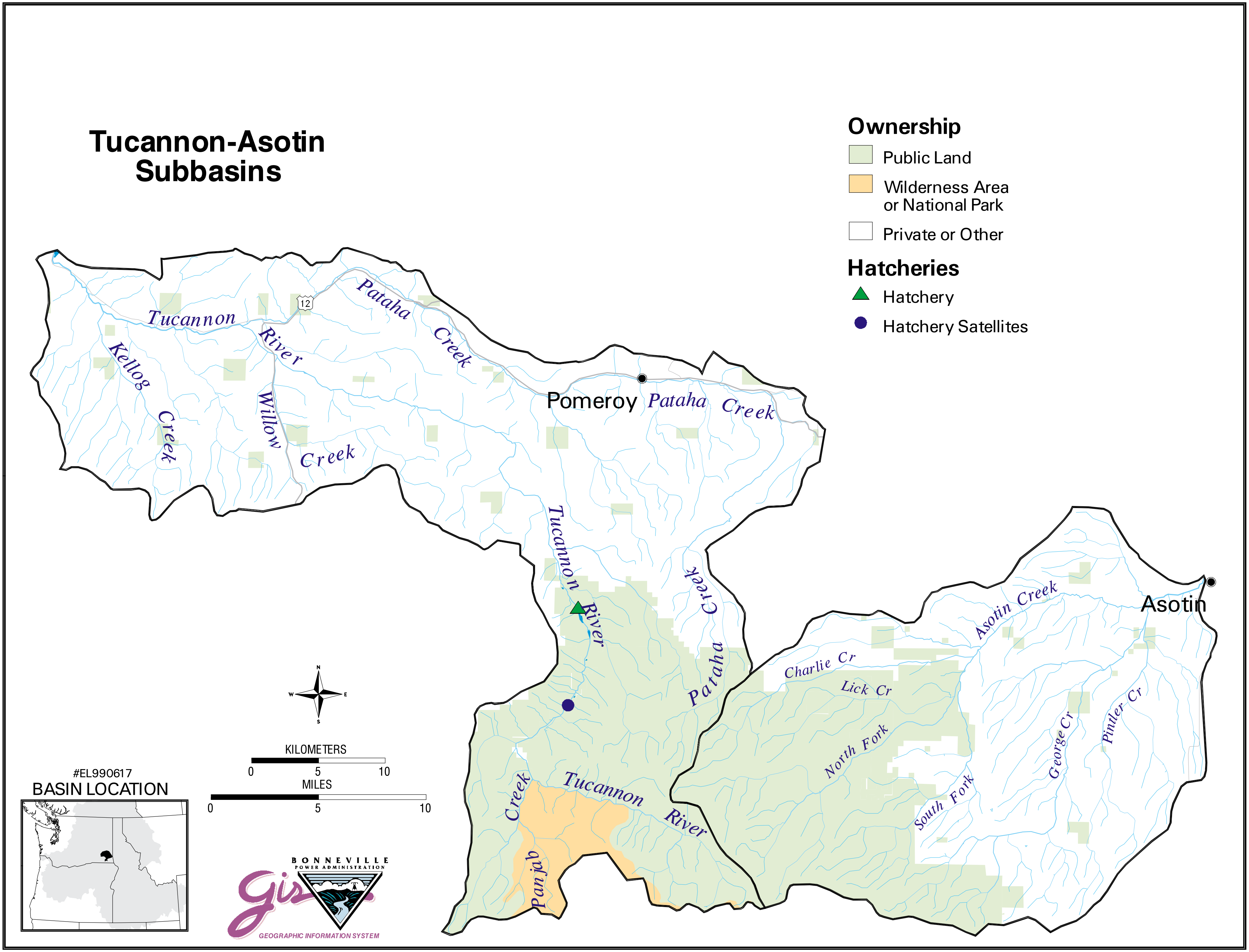


Tucannon-Asotin Subbasins
Ownership
Public Land
Wilderness Area or National Park
Private or Other
Hatcheries
Hatchery
Hatchery Satellites
Tucannon River
Kellog Creek
Willow Creek
Pataha Creek
Pomeroy
Asotin
Asotin Creek
Charlie Cr
Lick Cr
North Fork
South Fork
George Cr
Pintler Cr
Panjab Creek
12
KILOMETERS
0 5 10
MILES
0 5 10
#EL990617
BASIN LOCATION
BONNEVILLE POWER ADMINISTRATION
GEOGRAPHIC INFORMATION SYSTEM

Tucannon Subbasin

Anad fish 4 projects $682

Fish and Wildlife Resources

Subbasin Description

The Tucannon River Subbasin in southeast Washington covers approximately 500 square miles. Pataha Creek, the largest tributary, contains 185 square miles of the total. The Tucannon River originates at about 6,400 feet on Oregon Butte in the Blue Mountains, and flows about 50 miles to its confluence with the Snake River (RM 62.2). The river has peak flows highest flows in April/May and the lowest in August/September.

The subbasin contains cropland, both dry and irrigated, rangeland and forests. The Umatilla National Forest and the Tucannon-Wenaha Wilderness covers the southern portion of the subbasin, as does the nearly 12,000 acre Wooten Wildlife Area. Some water is diverted for irrigation in the lower river valley, but the diversions have not been considered to pose significant problems for salmon. Elevated temperatures and sedimentation pose the biggest limitations for salmon production in the Tucannon River.

Pataha Creek is quite different than the Tucannon River. Pataha Creek is deeply incised with steep soil banks and mud substrate in most parts of the lower basin. The upper stream channel has gravel substrate partially covered with fine silt. Stream flows are low much of the year, and lower Pataha Creek often goes dry in some areas.
Land use practices are similar to those in the rest of the Tucannon subbasin.

Fish and Wildlife Status

The Tucannon subbasin contains listed populations of spring chinook, fall chinook, summer steelhead, and bull trout. Pataha Creek likely contains a small population of steelhead and has naturally reproducing brook trout in the upper part of the creek. Salmon and bull trout do not use Pataha Creek.

<u>Spring chinook:</u> This stream contains a genetically distinct stock of spring chinook salmon. Historically it had a large run of spring chinook, with a run of over 5,000 fish as recently as 1953. The population was relatively stable at 400-800 fish in the early 1980s to early 1990s, but it declined dramatically in 1994 and 1995 to as low as 54 fish. The population has only partially rebounded from the record low in 1995. Returns in 1999 are expected to be less than 100 fish. The effects of habitat degradation presently confine spring chinook spawning and rearing to the river above RM 32. The subbasin is presently under-seeded primarily because of mortalities outside the subbasin and some loss of rearing habitat within the Tucannon River. Endemic spring chinook are captured at the Tucannon Hatchery and transported to Lyons Ferry Hatchery for spawning and rearing as part of the Lower Snake River Compensation Program (LSRCP). The juvenile fish are then acclimated at the Tucannon Satellite Facility and released as smolts in the upper Tucannon River. The goal of this program is for hatchery supplementation of the endemic population.

<u>Fall chinook:</u> Natural spawning is primarily confined to below the mouth of Pataha Creek. Some fish pass upstream of Starbuck Dam and spawn, but most fish remain below the dam. Scouring by high flows and sedimentation of spawning gravel may limit spawning success. Approximately, 20 to 60 redds have been observed in recent years. Hatchery fall chinook are not stocked into this stream, but some of the spawning adults are strays from other hatchery programs.

<u>Summer steelhead:</u> Most spawning and rearing takes place in the middle and upper mainstem and in Cummings Creek, with significant spawning and rearing as far downstream as Marengo. The LSRCP releases Lyons Ferry stock steelhead smolts into the lower Tucannon River (at or below Marengo). A substantial steelhead fishery occurs in the lower river and near its confluence with the Snake River.

<u>Bull trout:</u> Bull trout are known to use nearly all of the mainstem Tucannon River. They spawn and rear in the upper portions of the river and adults and subadults migrate to the Snake River in the winter months. They return to the upper river each spring to spawn.

Stock	Genetic History / Management Intent	Spawn Escape	Hatchery Take	Harvest	Recent Total Escape
ChS	Threatened. Manage for natural and artificial production from Lyons Ferry.	0-700	<100	0	50-800
ChF	Threatened. Manage for natural production.	60-180	0	0	60-180
StS	Threatened. Rebuild natural run using local broodstock. Continue harvest mitigation with fish from Lyons Ferry Hatchery.	350-1000	0	600-900	
TrB.	Threatened. Manage for conservation and Restoration.	60-90?	0	0	60-90?

<u>Wildlife</u>

The Tucannon subbasin contains many species of big game animals such as elk, mule deer and whitetail deer, bighorn sheep, bear, and cougar. Upland game birds include native grouse, introduced turkeys, pheasants, chukars, gray partridge and quail. The ferruginous hawk, a State sensitive species, nests within the northern part of the basin. Bald eagles and other threatened or endangered or sensitive species visit the area.

Habitat Areas and Quality

Habitat has been degraded as a result of farming, grazing, logging, roads development, concentrated recreation, and other development, as well as catastrophic floods which have occurred with greater frequency in recent years. Agricultural and livestock management practices, coupled with the local soil types and climate, have contributed to increased sedimentation and a general reduction of riparian vegetation and instream cover. Loss of riparian vegetation has likely contributed to the elevated stream temperatures observed in the lower half of the drainage. Channelization of the stream has likely impacted production as well by reducing pool-riffle ratios and riparian vegetation.

Production constraints occur primarily in the lower 20 miles of river which is too warm in the summer to provide suitable rearing area for juvenile chinook. Steelhead rearing also decreases below Marengo. Elevated stream temperatures can be largely attributed to loss of riparian vegetation from overgrazing and recent flood damage. The upper Tucannon River, on State and US Forest Service land, has good to excellent spawning and rearing habitat available for spring chinook, steelhead, and bull trout.

Wildlife habitat has been degraded by a high density of roads in the upper Tucannon subbasin, the spread of noxious weeds, and fire suppression in the timberlands. Degraded riparian vegetation zones also have reduced wildlife habitat throughout the subbasin.

Watershed Assessment

A draft Tucannon River watershed assessment was cooperatively completed in 1997 by the Conservation District, landowners, and State and federal agencies. This plan was developed after the then Soil Conservation Service had conducted an assessment of sediment transport, water quality, fish and fish habitat conditions, and the effects of sediment on redds in the lower river in the early 1980s. Additionally, a subbasin plan was completed by the co-managers in 1989, and a detailed bull trout study, funded by BPA, was completed in 1993 (Martin et al. 1992, Underwood et al. 1995). The LSRCP has funded intensive steelhead and spring chinook monitoring and evaluation studies for the past 15 years. Annual reports are written for the these studies and summaries were recently compiled in the LSRCP program review (USFWS 1998).

Limiting Factors

Over the past 100 years farming, livestock management, recreational activities, catastrophic flood events and flood repairs have contributed to habitat degradation. Aquatic resource problems include high stream temperatures, irrigation diversion, sedimentation, channel straightening, loss of instream pools and cover and loss of riparian vegetation.

Production of salmonids is limited by high temperatures, sedimentation, loss of riparian vegetation, lack of pools and cover and mortality factors outside the Tucannon River basin such as migration corridor mortalities and poor ocean conditions.

Subbasin Management

Goals, Objectives and Strategies

The indigenous fish species most actively targeted for management in the Tucannon River Subbasin are fall chinook, spring chinook, summer steelhead and bull trout. The goal for these species is to restore sustainable, naturally producing populations to support tribal and non-tribal harvest and cultural and economic practices while protecting the biological integrity and the genetic diversity of the watershed.

To address these problems, and to attempt to achieve the goals, the co-managers have adopted the following outcome-based objectives:

1. Improve adult pre-spawning survival.
2. Increase adult returns for harvest.
3. Improve juvenile survival.

The broad general strategies used to achieve these objectives include improving habitat through the use of riparian enhancement, reduction of erosion and sediment delivery to the stream, habitat improvements to increase pools and cover, and increasing adult returns to supplement natural production and provide fish for harvest. Hatchery production will be used for a standard hatchery program and a captive brood program for spring chinook to prevent extinction and increase the population as quickly as possible. The hatchery steelhead mitigation program will be modified to phase in use of endemic steelhead to minimize adverse impacts of the mitigation program on listed fish and increase the population of listed fish.

Past Efforts

Specific actions critical to carrying out these strategies are funded under projects # 9401806 and 9401807. These two projects now incorporate the planning and coordination activities that were funded under project #9202602. These projects fund Model Watershed Coordinators for Pataha and the Tucannon watersheds to develop model watershed plans and coordinate habitat improvement work on private lands. These projects also fund Washington conservation districts to work with landowners, tribes and agencies to implement the model watershed plans and improve fish habitat. Draft model watershed plans have been completed for both the Tucannon River and Pataha Creek as part of the Model watershed projects.

Hatchery supplementation or harvest mitigation activities are being accomplished by releases of fish from Lyons Ferry Hatchery as part of the Lower Snake River Compensation Plan. In the early 1980s, a fish enhancement study and an instream habitat improvement study were conducted under the LSRCP.

In the early 1990s, BPA funded a study of the interactions between bull trout, spring chinook and steelhead (#90-53). This study provided detailed information on bull trout in the Tucannon River and other streams in southeast Washington.

Research, Monitoring and Evaluation

The model watershed programs are conducting monitoring and evaluation to provide baseline information, to document enhancement activities, and to determine the effectiveness of the projects in addressing limiting factors. Data collected includes water temperatures, suspended sediment levels, other water quality and macroinvertebrate information, pre and post assessment of instream project habitat conditions, and compilation of the available literature for the area. The WDFW, under the LSRCP, is continuing to monitor the spring chinook, fall chinook and steelhead populations in the Tucannon River. This monitoring includes trapping and enumeration of adults, spawning surveys, juvenile population estimates, smolt production estimates, genetic studies, survival rates, and comparisons between hatchery and wild fish. These data can be used as baseline and evaluation data for habitat improvement efforts of the model watershed program. The past bull trout studies provided detailed information about bull trout life history and habitat use in the Tucannon River and the interactions between bull trout, spring chinook and steelhead.

Remaining Work

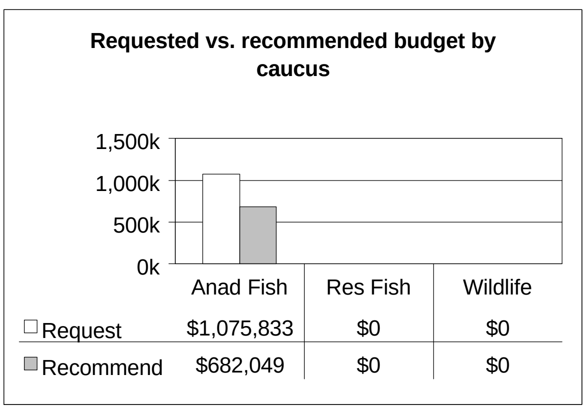
Much more watershed restoration work remains to be done. Continued effort needs to occur in the restoring and enhancing riparian buffers and reducing sediment in these streams. Some additional instream work is needed for creation of pools and cover, or to improve passage conditions. The spring chinook population is at high risk of extirpation. A captive broodstock program, in combination with the standard smolt production program, is needed immediately to rapidly increase this population and prevent extinction.

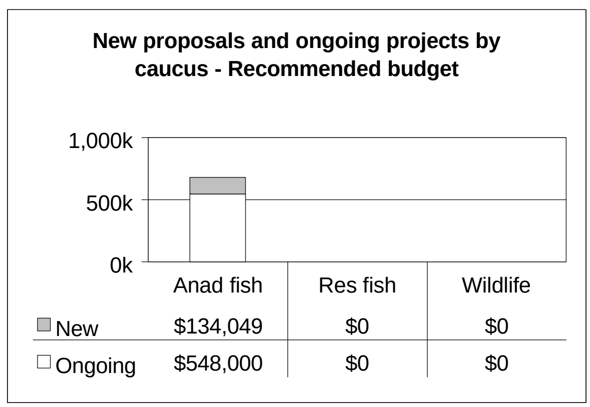
Subbasin Recommendations

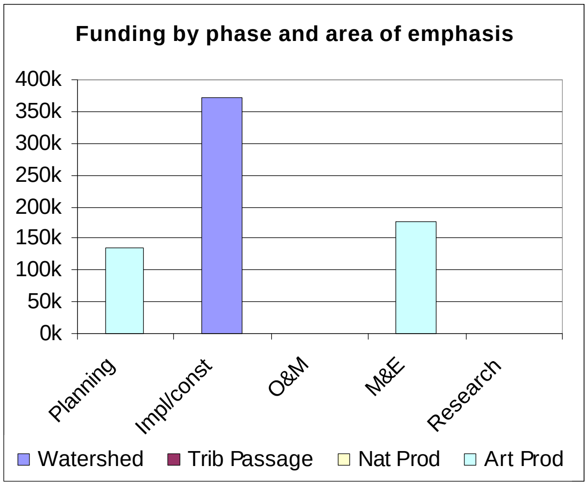
Projects and Budgets

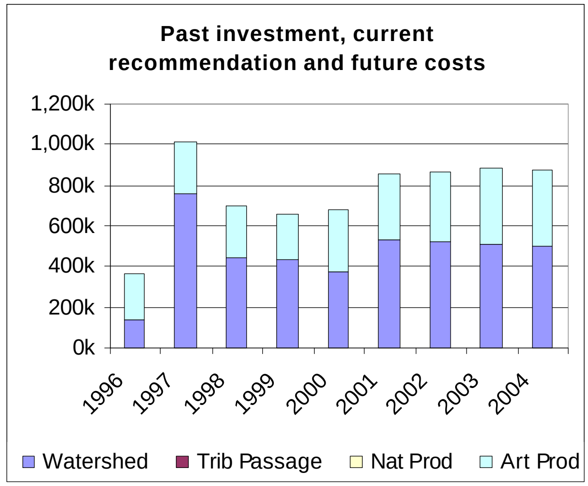
Based on the preceding subbasin description, the CBFWA fish and wildlife managers recommend funding a total of 4 anadromous fish projects at a cost of $682,049. The managers consider 1 of these projects, for $134,049, to be innovative in their technique and application. Another 2 projects support ESA requirements for a total of $309,049.

Refer to the following figures for detail on: 1) total recommended and requested budget by caucus, 2) funding for new and ongoing work, 3) funding by project phase and emphasis, and 4) funding by time period (past, current and future). Individual projects are listed in the following table.






Funding by phase and area of emphasis
400k
350k
300k
250k
200k
150k
100k
50k
0k
Planning
Impl/const
O&M
M&E
Research
Watershed
Trib Passage
Nat Prod
Art Prod


Past investment, current recommendation and future costs
1,200k
1,000k
800k
600k
400k
200k
0k
1996
1997
1998
1999
2000
2001
2002
2003
2004
Watershed
Trib Passage
Nat Prod
Art Prod

ProjectID		Title	Sponsor	FY99 recom.	FY00 recom.	Estimated Outyears FY01	FY02	FY03	FY04

Anadromous Fish Projects

ProjectID		Title	Sponsor	FY99 recom.	FY00 recom.	FY01	FY02	FY03	FY04
20020	*†	Tucannon River Spring Chinook Captive Broodstock Program	WDFW		134	75	95	121	125
8909600	*	Monitor and evaluate genetic characteristics of supplemented salmon & stlhd	NMFS	225	175	250	250	250	250
9401806		Implement Tucannon River Watershed Plan to Restore Salmonid Habitat	Columbia Conservation District	253	253	330	330	330	330
9401807		Continue With Implementation of Pataha Creek Model Watershed Projects	PCD	180	120	200	190	180	170
			Anadromous Fish Totals	**$682**	**$855**	**$865**	**$881**	**$875**	
		* indicates ESA project, † indicates 'Innovative work'	**SUBBASIN TOTALS**	**$682**	**$855**	**$865**	**$881**	**$875**	

All figures in thousands of dollars

Needed Future Actions

Continue with habitat improvement implementation and monitoring. Periodically, reevaluate the objectives and evaluate the effects of the program. Riparian vegetation planting methods need to be improved, and projects should increase riparian buffer development or protection.

An assessment of the fall chinook habitat and natural production in the lower river is needed to manage this population, and evaluate the Pataha and Tucannon watershed programs regarding their effectiveness in reducing sediment delivery to the lower Tucannon (#20024).

Continue with habitat improvement implementation and monitoring. Periodically, reevaluate the objectives and evaluate the effects of the program. Riparian vegetation planting methods need to be improved, and projects should increase riparian buffer development or protection.

An assessment of the fall chinook habitat and natural production in the lower river is needed to manage this population, and evaluate the Pataha and Tucannon watershed programs regarding their effectiveness in reducting sediment delivery to the lower Tucannon (#20024). Project #20024 was proposed but not funded due to budget constraints and priorities, and should be considered in the future.

A local, native steelhead broodstock should be developed for use in the Tucannon River. The spring chinook captive broodstock must be continued for about five brood years. Establishment of spawning escapement goals that are agreed to by all co-managers are needed for proper fish management in this basin.

Actions by Others

Continued efforts in the basin are needed by the USFS, private landowners and others to protect and increase the size and complexity of riparian vegetation buffers and to reduce sediment delivery to the streams. Also, a management change is needed on private lands that allows the river to be less constrained by levees and dikes or bank protection efforts.

Watershed References

Hecht et al. 1982. Sediment Transport, Water Quality and Changing Bed Conditions, Tucannon River, Washington. This plan identified and discussed the efforts of land use and other watershed influences on the water quality and fish habitat of the river.

Martin, S. and three others. 1992. Investigations of bull trout, steelhead trout, and spring chinook salmon in southeast Washington streams. Washington Depart. Of Wildlife for BPA. Project 90-53.

McIntosh, Bruce A. 1992. Stream Survey Summary for Asotin Creek and the Tucannon River. - raw data for publication of McIntosh et al. (1993). USFS PNW Research Station, Corvallis, Oregon.

Reckondorf & VanLiew, 1989. Determine the affect of sedimentation on artificial redds at four sites in the Tucannon Watershed. Study completed. Soil Conservation Service.

Southeast Washington Cooperative River Basin Study (USDA 1984), The objective of this study was to provide a basin-wide evaluation of existing land management and stream habitat conditions related to erosion and sediment problems.

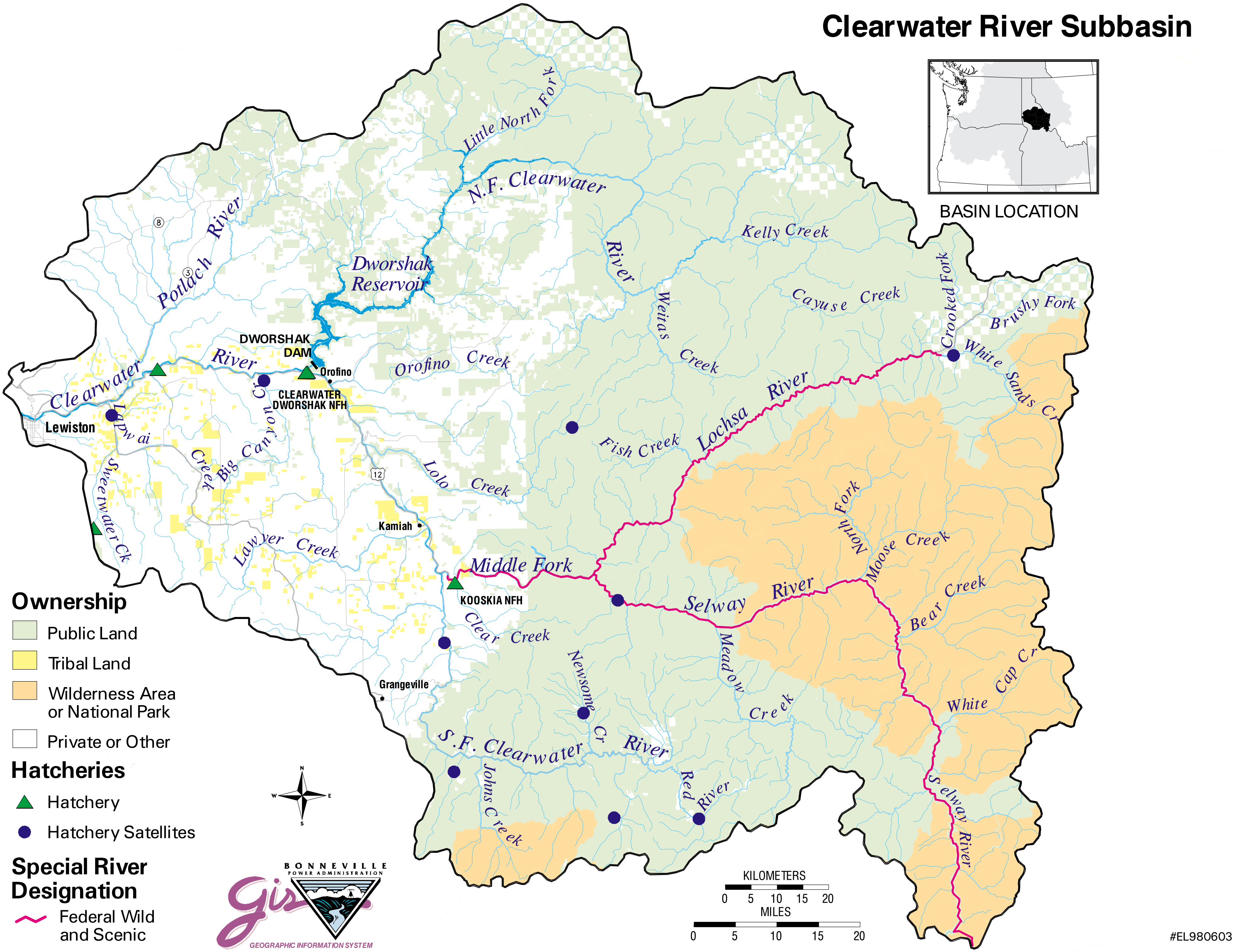
Tucannon River Model Watershed Plan - Draft. 1997. Columbia Conservation District.

Tucannon River Watershed Plan (USDA 1991) This plan was prepared under authority of PL-566 and recommends certain conservation practices that would lower water temperature and reduce the amount of sediment delivered to the stream.

Underwood, K. and three others. 1995. Investigations of bull trout, steelhead trout, and spring chinook salmon in southeast Washington streams. Washington Depart. Of Wildlife for BPA. Project 90-53.

USFWS. 1998. Lower Snake River Compensation Plan Status Review Symposium. USFWS, Boise, ID.

Clearwater River Subbasin



Clearwater Subbasin

Anad fish	20	projects	$18,541
Res fish	4		1,414
	24		$19,955

Fish and Wildlife Resources

Subbasin Description

The Clearwater River subbasin is located in north-central Idaho and covers 9,645 square miles. The Clearwater River originates at about 9,000 feet elevation in the Bitterroot Mountains and flows into the Snake River. About one-third of the Snake River stream flow comes from the Clearwater, which has several major tributaries. Dams have limited salmon production in the subbasin. Dworshak Dam blocks anadromous fish migration into all but about two square miles of the North Fork of the Clearwater River.

About 85 percent of the Clearwater subbasin is conifer forest, and the remainder is rolling high prairie. The subbasin includes the 1,250 square-mile Nez Perce Indian Reservation, of which 133 square miles are tribal or trust lands administered by the Bureau of Indian Affairs. The federal government owns 61 percent of the land in the subbasin and private landowners account for 32 percent. The U.S. Forest Service manages most of the federal land. Forestry, agriculture, and grazing are the major land uses in the subbasin.

Fish and Wildlife Status

Anadromous Fish

Wild spawning runs of spring and summer chinook were extirpated and fall chinook severely reduced by the Lewiston Dam, removed in 1973. Fall chinook, in the lower Clearwater mainstem, are listed as threatened under ESA. Spring chinook have been re-introduced and spawn naturally in the mainstem South Fork Clearwater, Selway and Lochsa rivers and their tributaries. A population of summer chinook salmon may exist in the Clearwater as a result of previous hatchery releases. Wild spawning runs of coho were extirpated in the 1970s, and listed under the Endangered Species Act as extinct in 1986. Runs of Group A and Group B summer steelhead are found in the Clearwater; Group A spawning in tributaries to the lower Clearwater, and Group B elsewhere. A major problem reducing anadromous production is poor survival and habitat under seeding due to eight dams below the Clearwater on the Snake and Columbia rivers. Spring chinook and Group B steelhead are produced for harvest at Dworshak (USFWS), Kooskia (USFWS), and Clearwater Anadromous (IDFG) hatcheries. Spring chinook salmon from Rapid River, Carson, Leavenworth, Little White Salmon, and Cowlitz hatcheries have been historically used as broodstock in the Clearwater River basin. Rapid River stock has been the only out of basin transfer since the mid-1980s.

Pacific Lamprey **-** Historically present. Abundance and life history attributes in the Clearwater River subbasin is currently unknown. Based on adult lamprey observations at Lower Granite Dam the current status is thought to be extremely depressed.

Coho Salmon – Historically present. Snake River coho salmon were functionally extirpated, and in 1986 were declared extinct. Restoration programs in the Snake river sub-basin were initiated in 1994.

Table 1. Stocks and management goals

Stock	Status / Management Intent
ChS	Extirpated and re-introduced. Conservation, restoration, and recovery of stocks. Provide sport and Tribal harvest
ChSu	Extirpated. Previous hatchery releases may spawn in subbasin. Determine historic importance and implement appropriate actions.
ChF	ESA-Threatened. Supplement natural spawning with Lyons Ferry and local returns. Provide sport and Tribal harvest.
StS (A)	ESA-Threatened. Natural spawning only. Conservation, restoration, and recovery of stocks. Provide sport and Tribal harvest.
StS (B)	ESA-Threatened. Lochsa and Selway drainages managed for wild stock only. Conservation, restoration, and recovery of stocks. Provide sport and Tribal harvest.
Coho	Extirpated. Re-introduction of Early stocks implemented in 1995.
Bull trout	ESA-Threatened. Strength of populations vary per watershed. Address land use practices. Restore anadromous fish populations to reclaim stream habitat fertility.

Other Species of Concern: Westslope cutthroat trout; native redband trout.

Table 2. Production Program Description

Stock	Mgmt Intent	Initial Broodstock	Operating Broodstock	Adult Collection & Holding	Central Facility (Incubation & Rearing)	Acclimation and/or Release Sites	Status	Funding
ChS	Harvest Mitigation	Rapid River/ Leavenworth	Dworshak	Dworshak & Kooskia	Dworshak NFH/Kooskia NFH	Kooskia, mainstem-direct?	On-going	LSRCP
ChS	Supplemt	Dworshak	Powell/Red R/ Crooked R	Powell/Red R/ Crooked R	Clearwater H.	Powell/Red R/Crooked R	On-going	LSRCP
ChS	Supplemt	Rapid River	Local	Yoosa, Newsome & Mill Cr.	Allotmt 1705 (NPTH)	Yoosa, Newsome & Mill Cr.-Ponds; Meadow, Boulder & Warm Spr.-Direct	Step 3 (5/3/99)	NWPPC
ChF	Supplemt	Ice Harbor	Lyons Ferry	Lyons Ferry	Lyons Ferry	Big Canyon	On-going	LSRCP
ChF	Supplemt	Lyons Ferry	Local	N. Lapwai & Lukes Gulch?	Sweetwater Spr. & Allotmt1705 (NPTH)	Cedar Flats, Boyd, Meadow, N.Lapwai & Lukes Gulch	Step 3 (5/3/99)	NWPPC
StS(B)	Harvest Mitigation	Dworshak	Dworshak	Dworshak	Clearwater H.	Powell/Red R/Crooked R/Kooskia/mainstem-direct	On-going	LSRCP
Coho	Supplemt	Early		Cascade/Herman Cr?	Cascade/Herman Cr?	Sweetwater Spr./Kooskia/mainstem-direct?	On-going	NWPPC

Resident Fish

The largest resident fish fishery in the subbasin is within Dworshak Reservoir. The reservoir contains kokanee, smallmouth bass, stocked rainbow trout, cutthroat trout, bull trout, and about 16 other species of sport and non-game fish. Distributions of westslope and other native trout in the basin have been declining. Declines are assocaited with a number of factors throughout the basin, including land use and stocking practices. Kokanee provide most of the sport fish harvest in the reservoir. When their population is high, they can sustain a harvest of over 200,000 kokanee/year and a fishing effort of over 140,000 angler hours/year. Acute fluctuations of the kokanee population occur in response to reservoir operations. Kokanee abundance has varied for 3.5 million fish in 1994 to 65,000 fish in 1997. Kokanee survival rates have been found to negatively correlate with the amount of water released from Dworshak Dam. High discharges from the dam in late winter and spring were found to be particularly hard on the kokanee population since they entrain high numbers of fish. Monitoring in 1996 showed that 1.3 million kokanee were lost through the dam during one flood event which impacted the sportfishery for the next three years.

Wildlife

Wildlife populations in the subbasin fluctuate in response to natural environmental conditions and natural and humans caused habitat changes as well as direct wildlife population management (e.g., hunting, trapping, etc.). Wildlife species present in the subbasin include actively managed larger mammals (i.e., big game species), game birds and waterfowl. Also, a much larger number of non-game mammals, birds, amphibians and reptiles occur in the subbasin. Grey wolves inhabit a portion of the subbasin.

Habitat Areas and Quality

Anadromous Fish

Selway **-** Chinook spawning and rearing is limited by steep gradients. Natural chinook salmon spawning occurs in upper Selway tributaries. Designated Wild River, mostly within wilderness boundary. Excellent steelhead habitat.

Lochsa **-** Holding, spawning and rearing success is limited in some tributaries by sedimentation, loss of pools, and high water temperatures due to logging, road building, and mining activity. Supports good to excellent steelhead habitat in many of the tributaries. Fish Creek is the Sistine Chapel of wild Group B steelhead production.

South Fork Clearwater **-** Holding, spawning and rearing success reduced in many tributaries by sedimentation, loss of pools, and high water temperatures due to logging, road building, and mining activity.

Lower Mainstem **-** Habitat generally good, with some water temperature problems. Operations of Dworshak Dam on the North Fork Clearwater River produces unnaturally high summer flows and low water temperatures. This can impact rearing and migration timing of naturally produced chinook salmon.

Mainstem tributaries **-** Spawning and survival limited by high water temperatures, low flows, sedimentation from agriculture, road building, residential development.

North Fork **-** Anadromous fish blocked by Dworshak Dam. Dworshak National Fish Hatchery was built below the dam as mitigation for lost steelhead production.

Resident fish

South Fork Clearwater **-** Spawning and rearing success reduced in many tributaries by sedimentation, loss of pools, and high water temperatures due to logging, road building, and mining activity. Hybridization of native westslope cutthroat trout with introduced rainbow trout can cause genetic introgression. Hybridization among bull trout and introduced brook trout may occur locally.

Lower Mainstem **-** Habitat probably utilized seasonally by bull trout seeking forage. Year-round use is limited by high water temperatures. Flow fluctuations from Dworshak Reservoir can impact benthic forage for trout. Water temperatures during late summer can be too warm for a good trout fishery. Periodic cold water releases from Dworshak Reservoir limit suitability for smallmouth bass.

Mainstem tributaries - Spawning and survival limited by high water temperatures, low flows, sedimentation from agriculture, road building, residential development.

North Fork - Dworshak Reservoir inudated spawning and early rearing habitat for native westslope cutthroat trout and bull trout. Habitat productivuty has been reduced due to the absence of anadromous fish stocks, but spawning kokanee from Dworshak Reservoir can serve as a partial surrogate if entrainment through Dworshak Dam can be controlled. Hybridization of native westslope cutthroat trout with introduced rainbow trout can cause genetic introgression. Hybridization among bull trout and introduced brook trout may occur locally. Dworshak Reservoir offers rearing habitat for bull trout and westslope cutthoat trout. Providing suitable conditions for keeping kokanee in Dworshak Reservoir is important because kokanee are utilized as direct forage by bull trout. Habitat conditions for native trout varies in the upper watersheds, depending on land use activities. Spawning and rearing habitat can be locally degraded in tributaries by sedimentation, loss of pools, and high water temperatures due to logging, road building, and mining activity.

Wildlife

Wildlife populations in the subbasin use a mixture of public and private ownership lands as habitat. The quality of both types is variable. A very small percentage of land (i.e., land which is managed primarily for wildlife habitat) is in good condition. The Interior Columbia Basin Ecosystem Management Project (ICBEMP) (1996) found that most land in the subbasin had a LOW ecological integrity rating. Wildlife mitigation projects in the subbasin have or will provide areas with HIGH ecological integrity.

Development of the hydrosystem has affected many species of wildlife by altering their habitats. Wildlife are associated with riverine and adjacent riparian forests, scrub-shrub and herbaceous wetlands, islands, mixed coniferous and deciduous forest, and agricultural habitats in the Clearwater subbasin. Bottomland and riverine habitats along the Clearwater were lost due to the construction and inundation of Dworshak and other dams and reservoirs. Those areas were home to many interdependent wildlife species that were displaced when those habitats were inundated. Activities associated with hydroelectric development and operation, such as fluctuating water levels, have altered land stream areas that affect wildlife. In some cases, dam operations have created barren vegetation zones, which expose wildlife to increased predation. Other, secondary impacts to wildlife and wildlife habitats along the river system caused by hydropower construction and operation include irrigation, agricultural practices, livestock management practices, forest management practices, human development, noxious weeds, and the loss of prey base for certain wildlife species. Any of these influences can be, and are, limiting factors to local wildlife populations.

Watershed Assessment

Watershed projects funded by Bonneville Power Administration in the Clearwater Subbasin are supported in documents relating to anadromous fish recovery. The Clearwater has diverse ownership ranging from Forest Service lands to state, tribal, and private holdings. This diverse ownership leads to multiple documents that discuss key limiting factors that have contributed to the decline in anadromous fish numbers within the subbasin and decreased habitat within tributary watersheds. Two documents used continuously for watershed restoration project identification, prioritization, and planning within the Clearwater Subbasin are; Clearwater Subbasin Ecosystem Analysis at the Watershed Scale written by the Clearwater National Forest, and The Spirit of the Salmon Anadromous Fish Plan written by the Nez Perce, Warm Springs, Umatilla, and Yakama Tribes. These documents provide support and justification for restoration activities throughout the subbasin. Watershed restoration activities were implemented in the mid-1980s and are scheduled to continue into the future. Restoration projects to date have successfully worked toward restoring habitat for anadromous fish to include road obliteration, stream reconstruction, riparian planting, fish passage improvements, cattle exclusions, etc. There are projects within the subbasin that are multi-agency cost-share agreements allowing for more work to be done. Along with the subbasin documents, there are many additional documents that give specific information concerning particular watersheds. These documents include biological assessments, problem assessments specific to ESA listed species, ecosystem analysis at the watershed scale, etc. These documents give us even more specific information about limiting factors, species distribution, and restoration needs.

The Nature Conservancy has developed Eco-regional Planning as a conservation planning tool. The Interior Columbia Basin Ecosystem Management Project (USFS 1996) identified conservation and management needs. The following documents refer to the need to protect wildlife habitats in the Clearwater subbasin: Bonneville Power Administration Wildlife Mitigation Program Final Environmental Impact Statement (BPA 1997); USFWS Pacific Bald Eagle Recovery Plan (1986); Rivers of Life: Critical Watersheds for Protecting Freshwater Biodiversity (Master et. al. 1998); Bureau of Land Management Resource Management Plans; IDFG 5-Year Mule Deer Plan (Scott et al. 1991); IDFG 5-Year Nongame Plan (Groves and Melquist 1991); IDFG 5-Year Upland Game Plan (Smith et. al. 1990); IDFG 5-Year Waterfowl Plan (Connelly and Wackenhut 1990); A Vision for the Future: IDFG Policy Plan 1990-2005 (IDFG 1991).

Limiting Factors

Anadromous Fish

A previously existing dam near the mouth of the Clearwater River at Lewiston lead to the extirpation of chinook salmon from the drainage. Out-of-subbasin mortality in the form of Columbia and Snake river mainstem dams, in addition to tributary habitat degradation, has led to the extirpation of coho salmon, reduced populations of chinook and summer steelhead, and diminished the opportunity to re-establish anadromous populations. This has resulted in under-seeded habitat, loss of production potential and lost harvest opportunity.

- Adult escapement is currently insufficient to fully seed the habitat potential. The primary limiting factor is poor smolt to adult survival (out-of-basin issue).
- Throughout the subbasin, land management activities (timber management, grazing, development, etc.) have impacted stream hydrologic processes; negatively affecting habitat carrying capacity and fish survival. Parameters affecting fish production include: sedimentation which decreases the number and size of pools and affects stream bed characteristics (embeddedness and stability), habitat amount and complexity, increased water temperatures, and others.

Resident Fish

Winter and early spring spills at Dworshak Dam limit kokanee populations in Dworshak Reservoir. This, in turn, limits available forage for bull trout. Hybridization among native and introduced trouts may limit populations, and, as in other historic ranges of Western trouts, can potentially cause local extirpation. As is the case for anadromous fish, land management activities (timber management, grazing, development, etc.) have impacted stream hydrologic processes; negatively affecting habitat carrying capacity and fish survival. Parameters affecting fish production include: sedimentation which decreases the number and size of pools and affects stream bed characteristics (embeddedness and stability), habitat amount and complexity, reduced benthic production and increased water temperatures.

Wildlife

Water regimes influence the potential for site restoration. For example, groundwater pumping has lowered water tables, thus limiting the restoration potential for a permanent emergent herbaceous wetland. Large-scale habitat conversion -- from sagebrush steppe or native grasslands to irrigated agriculture -- continues to limit the functioning of natural systems. Secondary losses due to the federal hydro system have impacted wildlife such as bald eagles, bears, and other fish- and carrion-eaters. The alteration of natural fire regimes because of widespread cheat grass invasions has limited the potential for restoring natural shrub-steppe. Other noxious weed invasions limit restoration potential.

Subbasin Management

Goals, Objectives and Strategies

Anadromous Fish

The co-managers recognize the importance and value of all anadromous fish stocks in the subbasin in management plans. The goal for these species is to restore sustainable, naturally reproducing populations to support tribal and non-tribal harvest and cultural and economic practices while protecting the biological integrity and the genetic diversity of the watershed. The NWPPC Fish and Wildlife Program anadromous projects in the subbasin have mainly focused on fall and spring chinook salmon and summer steelhead. Projects addressing coho salmon and lamprey have recently been initiated or proposed.

Goals

1. Prevent extirpation of salmon and steelhead and promote re-establishment of extirpated populations. Implement no-net decline management (at or above replacement).
2. Restore and maintain normative ecosystem processes (natural production, species composition, productivity).
3. Maintain anadromous population characteristics and genetic diversity.
4. Restore and maintain tribal and sport harvest opportunities and economic and cultural practices.

Objectives

1. Increase smolt to adult survival (SARs) to above 2% to promote naturally reproducing salmon populations.
2. Pursue habitat restoration to enhance and provide optimum habitat requirements for anadromous fish including protection of riparian corridors.
3. Define metapopulation structure of anadromous salmonids in the Snake River basin
4. Monitor and evaluate status of anadromous salmonids (abundance, life history traits, genetics) and supporting habitat (quantity and quality).
5. Define and manage for minimum adult spawner escapement goals.
6. Maximize egg to smolt survival for natural production.
7. Utilize artificial propagation to preserve and enhance populations.

Strategies

Objective 1. Activities that improve smolt to adult survival would occur out of the subbasin, primarily in the mainstem migration corridor. Immediate subbasin strategy is to improve habitat quality so smolt condition and survival potential are improved. Immediate mainstem strategy is to provide spill, water temperature, and other water quality regulation, predator control, harvest regulation, use smolt transportation in accordance with Independent Science Group recommendations, improve and protect estuary habitat, Caspian tern management, and predator control. The long-term objective is to return normative ecosystem processes.

Objective 2. Through watershed assessments identify and address habitat factors that limit anadromous fish resources. Conduct habitat restoration work consistent with identified limiting factors and the best available methods, e.g. sediment reduction, water temperature reductions, improved habitat complexity, etc.

Objective 3. Identify salmon and steelhead subpopulation structure and source and sink patches in the Snake River basin. Utilize DNA analysis to identify salmon and steelhead subpopulation structure and quantify gene flow between the various subpopulations in the Snake River basin. Analysis would include but not be limited to analysis of mitochondrial DNA, nuclear genes, and microsatellite DNA. Identify potential source and sink patches within each subpopulation.

Objective 4. Conduct annual monitoring and evaluation of juvenile and adult abundance, survival, and genetic profiles of anadromous fish. Document and describe fish life history characteristics. Conduct habitat monitoring identified in watershed assessments to quantify whether habitat restoration meets specified goals.

Objective 5. Establish a minimum number of returning adults to each stream to minimize high demographic risk of extirpation.

Objective 6. Maximize natural production (egg to smolt survival) within the subbasin. Improve habitat quality (spawning, rearing and holding) for anadromous fish by minimizing irrigation structure impacts, optimizing stream flows, achieving water temperature reduction, decreasing sediment inputs, and increasing stream productivity.

Objective 7. Increase production through early life history survival advantage in the hatchery environment and increased adult returns. Address improvements in smolt survival through advancements in fish health and smolt quality, through improved hatchery practices, and development of conservation hatchery programs. Increase adult returns above replacement and natural production of salmon and steelhead thus reducing demographic risk of population extirpation, or reduce the population decline until major limiting factors are addressed. Provide harvest augmentation, preserve genetic diversity, and mimic life history characteristics of natural fish. Investigate the utility of supplementation strategies for maintaining or enhancing natural production. Implement captive propagation programs on spawning aggregates at extreme risk of extirpation. Investigate new techniques as they apply to captive propagation.

Resident Fish

The primary native resident fish species targeted for active management in the Clearwater Subbasin include bull trout, westslope cutthroat trout, mountain whitefish, and redside shiner. Target non-native fish include kokanee, rainbow trout and smallmouth bass. These target species directly support fisheries, except the redside shiner, which is an important forage species. Restoration of the redside shiner population in Dworshak Reservoir would benefit trout and smallmouth bass fisheries. Five regional goals were captured in the Resident Fish Multi-year Implementation Plan (RFMYIP) appendix to the June 4, 1997, Resident Fish Annual Implementation Work Plan (CBFWA 1997).

1. Mitigate and compensate for resident and anadromous fish losses due to construction and operation of hydropower projects.
2. Ensure the continued persistence, health, and diversity of existing resident fish species.
3. Restore native resident fish species.
4. Maintain and restore healthy ecosystems and watersheds.
5. Administer and increase opportunities for consumptive and non-consumptive resident fisheries.

The intent of these goals is two-fold: 1) to conserve, protect and enhance production and distribution of these species throughout their historical range; and, 2) to provide sustainable fisheries, including harvest opportunities.

Within the Clearwater Subbasin, fisheries managers intend to achieve these goals by effecting a series of management objectives that address population characteristics, distribution range, and fisheries characteristics. These objectives, also described in the RFMYIP, include: 1) maintaining and restoring population productivity reduced by hydropower development and operations to healthy levels which provide for consumptive and nonconsumptive uses of native population; and 2) ensuring sustained population levels of native fish above the minimum viable population sizes which maintain adaptability and genetic diversity.

Strategies to achieve the stated objectives include the following: 1) re-establishing flow regimes that mimic the natural hydrograph, stock assessments, restoring anadromous fish populations to support ecosystem components necessary for healthy native resident populations (nutrients, food resources, habitat); 2) minimize the genetic introgression of the wild cutthroat population by stocking trout compatible with this objective; 3) control or eliminate kokanee entrainment through Dworshak Dam; 4) managing Dworshak Reservoir pool levels for fish and fish food production; 5) fishery regulation and habitat enforcement; and, 6) developing additional pond fisheries compatible with native fish management.

Wildlife

The goal of the Wildlife Section of the NWPPC FWP is to achieve and sustain levels of habitat and species productivity as a means of fully mitigating wildlife losses caused by construction and operation of the federal and non-federal hydroelectric system. @ (Sec. 11.1, 1995 Amendments).

Past Efforts

Specific actions to carry out these strategies are listed in Appendix C. A general description of past efforts by project follows.

Anadromous Fish

Hatchery production in the Clearwater River subbasin is accomplished through facilities funded under the LSRCP program (IDFG-Clearwater Anadromous Fish Hatchery, Dworshak National Fish Hatchery spring chinook salmon program, Lyons Ferry fall chinook salmon), the Mitchell Act (Kooskia National Fish Hatchery), USACE (Dworshak National Fish Hatchery steelhead program), and BPA (Sweetwater Springs, proposed Nez Perce Tribal hatchery). These hatcheries have produced chinook salmon and Group B steelhead trout for release in the subbasin. The Nez Perce Tribal hatchery (Project #8335000) has been planned to produce chinook salmon to restore and enhance populations in the Clearwater subbasin.

Riparian habitat restoration efforts have occurred on lower Red River (Project #9303501) to restore hydraulic equilibrium to a meadow complex. The Clearwater River subbasin has been designated as a NWPPC "focus" watershed, and includes habitat enhancement planning, administration, and some project implementation funded under several projects (Project #9608600, Project #9706000). Habitat enhancement and restoration activities have been funded for the Lolo Creek, Squaw Creek, Papoose Creek, lower Eldorado Falls, and McComas Meadows watersheds (Project #9607702, Project #9607703, Project #9607704, Project #9607705). Recently, new habitat restoration work was initiated for Little Canyon Creek, Nichols Canyon, Big Canyon Creek, and Lapwai Creek watersheds (Project #9901400, Project #9901500, Project 9901600, Project #9901700).

Artificial production monitoring and evaluation, associated with the planned Nez Perce Tribal hatchery, has been conducted (Project #8335000, Project #8335003, Project 9403400). The Supplementation Studies Projects (Project #8909800, Project #8909801, Project #8909802, Project #8909803, and Project #9005500) are designed to evaluate the usefulness of supplementation as a recovery/restoration measure for depressed stocks of spring and summer chinook salmon and summer steelhead in the Salmon and Clearwater subbasin. Hatchery releases (treatments) and broodstock development have occurred since 1992. These projects monitor adult escapement, juvenile production and productivity throughout the Salmon River and Clearwater River subbasin. The Idaho Natural Production Monitoring and Evaluation Project (Project #9107300) compliments monitoring conducted by the Supplementation Studies projects and conducts data analysis on a subbasin and basin wide scale. This project maintains the largest database on juvenile salmonids in the state of Idaho, conducts steelhead escapement surveys, and has developed techniques to estimate smolt to adult return rate by mainstem migration route. Spawning distribution of fall chinook salmon has been monitored (Project #9801003).

Past work has included conducting long-term monitoring on anadromous populations within the Clearwater since the early 1980s (#9107300). Stream inventories and habitat surveys have been conducted in the lower Clearwater area (Project #8200100, Project #8801500). In-stream habitat improvements have occurred in Lolo Creek, Crooked Fork Creek, and Eldorado Creek (Project #8400600), Red River (Project #8350100) and Crooked River (Project #8350200, Project #8400500).

Resident Fish

The restoration of Talmaks Reservoir and Mud Springs Reservoir on the Nez Perce Indian Reservation has increased resident fishing opportunities in part to mitigate for loss fishing opportunities resulting from the construction of Dworshak Dam (Project #9501300). Additional pond/reservoir sites are being investigated under this program in order to provide additional harvest opportunities. Kokanee abundance and entrainment loss has been monitored in Dworshak Reservoir since 1990, and strobe light testing was initiated in 1997 to prevent entrainment losses (Project #8709900). Broad biologically-based criteria for Dworshak Reservoir operations have been examined since 1993 (Project #8740700). Knowledge gained has been applied to in-season water management in various regional fora. The result has been later summer evacuation of Dworshak Reservoir, for a more stable and productive ecosystem, as well as moderated conditions in the Lower Clearwater River more conducive to rearing of naturally produced salmon.

Wildlife

In the mid-1990s, IDFG and the Nez Perce Tribe settled with BPA for construction and inundation losses associated with Dworshak dam and reservoir. The 60,000-acre Peter T. Johnson Wildlife Mitigation Area was purchased and a O&M trust fund established. Buck Creek, which has an old-growth cedar forest, was purchased as partial mitigation for the construction of (BeuclerWildlife614.doc) Dworshak. Elk habitat (canopy removal and shrub enhancements) also was enhanced near Dworshak Reservoir.

Research, Monitoring and Evaluation

Anadromous Fish

The current BPA-funded projects are addressing all seven previously stated objectives. A review of ongoing research, monitoring, and evaluation follows.

Increased smolt-to-adult return rates (SAR) are being addressed for spring and summer chinook, summer steelhead, and fall chinook salmon in the Snake River basin by monitoring SARs annually and by model development to estimate SAR by migration route. This information is being used to influence mainstem management actions (IDFG Natural Production Monitoring and Evaluation Project). PIT-tagged fish for this work are provided by the following projects: Idaho Supplementation Studies, Salmon Supplementation Studies in Idaho rivers, and Steelhead Supplementation Studies in Idaho rivers (IDFG, NPT, SBT, USFWS).

Fish production and habitat information is being compiled and analyzed on a watershed scale within the Clearwater River subbasin to identify watersheds not meeting average Snake River Basin spring/summer chinook salmon smolts per female criteria (Idaho Natural Production Monitoring and Evaluation Program, IDFG). Restoration projects are currently ongoing in the following drainages: Little Canyon Cr., Nichols Canyon Cr., Red River, Lolo Cr., Papoose Cr., Squaw Cr., McComis Meadow, Meadow Cr., Big Canyon Cr., and Lapwai Cr. watersheds (NPT, ISCC). In addition focus watershed programs are currently operating in Little Canyon Cr., Nichols Canyon Cr., and McComis Meadows.

Adult escapement, juvenile production, and genetic composition of chinook salmon and steelhead in the Clearwater River basin are being monitored annually by the following projects: Idaho Supplementation Studies (IDFG), Salmon Supplementation Studies in Idaho Rivers (IDFG, NPT, SBT, USFWS), Steelhead Supplementation Studies in Idaho Rivers (IDFG), Assessing summer and fall chinook restoration in the Snake River basin (NPT), Spawning distribution of Snake River fall chinook salmon (USFWS), and Nez Perce Tribal Hatchery monitoring and evaluation component.

Idaho Supplementation Studies, Salmon Supplementation Studies in Idaho Rivers, and Steelhead Supplementation Studies in Idaho Rivers projects (IDFG, NPT, SBT, USFWS) are evaluating the usefulness of supplementation as a recovery/restoration measure for depressed stocks of spring and summer chinook and summer steelhead. The Nez Perce Tribal Hatchery project is in the final stage of development with construction scheduled to begin in the near future.

Resident Fish

Investigations of impacts to resident fisheries from Dworshak Dam operations continue. Research is continuing to develop methods to minimize the entrainment losses at Dworshak Dam.

Wildlife

We have measured baseline conditions of wildlife and vegetation and developed management plans with desired future conditions for most of the projects referenced above. Progress towards desired future conditions will be monitored programmatically by measuring standardized target species habitat variables from HEP models (USFWS 1980) and compared to baseline measured at the time of acquisition. Some wildlife populations (i.e., big game, waterfowl, upland birds, bald eagles, neotropical migrants and others), native plant communities, noxious weed infestations, livestock trespass, and public use are routinely monitored by agencies and tribes throughout the subbasin. Plant and animal species of special concern will be monitored periodically by the Idaho Conservation Data Center staff.

Remaining Work

The remaining work necessary to accomplish subbasin anadromous fish Objectives 1-7 will include, but will not be limited to, the following:

- Conduct genetic analyses on chinook salmon and summer steelhead to support management actions in the subbasin.
- Continue existing monitoring and evaluation supplementation projects.

Further assessment of Dworshak Dam and alterations within the Clearwater Basin due to loss of anadromous fish on native trout and other resident fish species is needed.

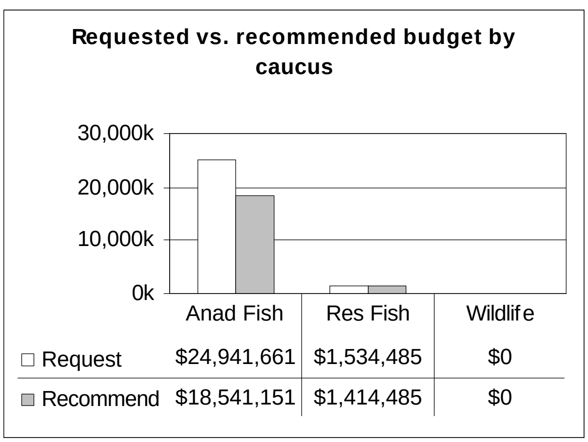
Eventually, operational losses to wildlife for Dworshak Dam will need to be addressed. Operational losses to wildlife are being addressed at the CBFWA Wildlife Caucus level at this time, therefore project proposals from anywhere in the Columbia Basin are not being submitted.

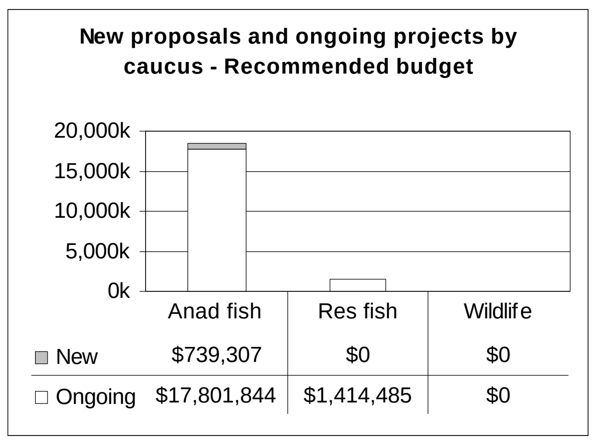
Subbasin Recommendations

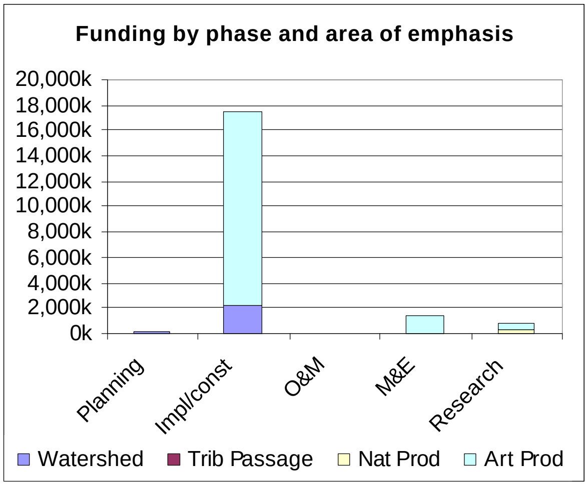
Projects and Budgets

Based on the preceding subbasin description, the CBFWA fish and wildlife managers recommend funding a total of 24 projects at a cost of $19,955,636. Of the projects recommended, 20 focus on anadromous fish, and 4 focus on resident fish. The managers consider one of these projects, for $199,485, to be innovative in technique and application. Another project supports ESA requirements for a total of $316,822.

Refer to the following figures for detail on: 1) total recommended and requested budget by caucus, 2) funding for new and ongoing work, 3) funding by project phase and emphasis, and 4) funding by time period (past, current and future). Individual projects are listed in the following table.



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Planning
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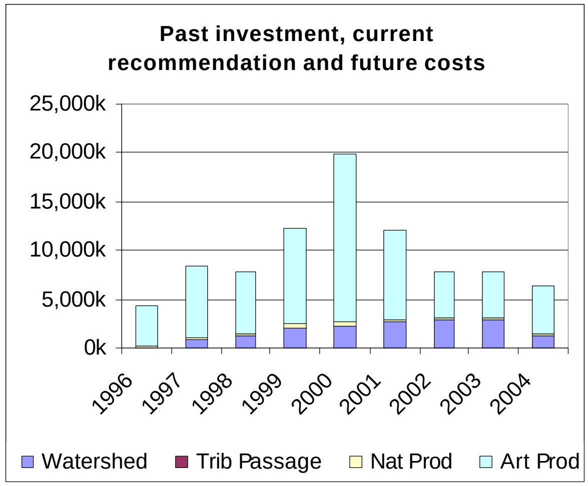
O&M
M&E
Research
Watershed
Trib Passage
Nat Prod
Art Prod


Past investment, current recommendation and future costs
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20,000k
15,000k
10,000k
5,000k
0k
1996
1997
1998
1999
2000
2001
2002
2003
2004
Watershed
Trib Passage
Nat Prod
Art Prod

ProjectID		Title	Sponsor	FY99 recom.	FY00 recom.	Estimated Outyears FY01	FY02	FY03	FY04
Anadromous Fish Projects									
20019		Evaluate Status of Pacific Lamprey in Clearwater River Drainage, Idaho	IDFG	72	73	124	130	126	96
20080		Evaluate a Modified Feeding Strategy to Reduce Residualism and Promote Smol	IFRO-USFWS		147	168	168	138	138
20084		Protect and Restore the North Lochsa Face Analysis Area Watersheds	NPT		155	249	286	329	65
20086		Rehabilitate Newsome Creek - S.F. Clearwater River	NPT		302	401	441	485	534
20087		Protect and Restore Mill Creek Watershed	NPT		63	50	50	40	35
8335000		Nez Perce Tribal Hatchery	NPT	7,918	14,590	6,500	2,200	2,200	2,200
8335003		Nez Perce Tribal Hatchery Monitoring and Evaluation	NPT		993	960	1,010	1,060	1,110
9202409		Enhance Conser. Enforcement for Fish & Wildlife,Watersheds of the Nez Perce	NPT	425		425	400	400	400
9303501		Enhance Fish, Riparian, and Wildlife Habitat Within the Red River Watershed	ISWCD	500	450	570	560	550	55
9403400	*	Assessing Summer and Fall Chinook Restoration in the Snake River Basin	NPT	305	317	323	225	235	245
9607708		Protect and Restore the Lolo Creek Watershed	NPT	361	204	150	150	100	100
9607709		Protect and Restore the Squaw to Papoose Creeks Watersheds	NPT	242	304	400	440	484	66
9607711		Restore Mccomas Meadow/ Meadow Creek Watershed	NPT		167	120	120	100	100
9608600		Clearwater Subbasin Focus Watershed Program - ISCC	ISCC	85	89	95	100	100	100
9706000		Clearwater Subbasin Focus Watershed Program - NPT	NPT	93	99	103	118	123	130
9901400		Restore Anadromous Fish Habitat in the Little Canyon Creek Subwatershed	ISCC	197	197	200	200	200	0
9901500		Restore Anadromous Fish Habitat in the Nichols Canyon Subwatershed	ISCC	182	186	200	200	200	0
9901600		Protect & Restore Big Canyon Creek Watershed	NPT	162	61	100	100	50	50
9901700		Protect & Restore Lapwai Creek	NPT	150	61	100	100	100	50
9901800		Characterize and quantify residual steelhead in the Clearwater River, Idaho	USFWS-IFRO	133	84	86	25	0	0
			Anadromous Fish Totals		**$18,541**	**$11,324**	**$7,023**	**$7,020**	**$5,474**
Resident Fish Projects									
8709900		Dworshak Dam Impacts Assessment and Fisheries Investigation	IDFG	120	285	299	314	330	346
8740700	†	Dworshak Impacts/M&E and Biological/Integrated Rule Curves	NPT	200	199	206	212	219	225
9501300		Nez Perce Tribe Resident Fish Substitution Program	NPT	749	750	300	300	300	300
9501600		Genetic Inventory Of Westslope Cutthroat Trout In The N F Clearwater Basin	NPT	190	180	0	0	0	0
			Resident Fish Totals		**$1,414**	**$805**	**$826**	**$849**	**$871**
			SUBBASIN TOTALS		**$19,956**	**$12,129**	**$7,849**	**$7,869**	**$6,345**

* indicates ESA project, † indicates 'Innovative work'
All figures in thousands of dollars

Needed Future Actions

Secondary losses to wildlife may be addressed in the future.

Actions by Others

- USCOE needs to implement the Lower Snake River alternative path that provides the greatest assurance of recovery and restoration of ESA listed anadromous stocks. At the time of this writing, the PATH group has identified the natural river option as the alternative that would best provide this assurance.
- USFS/BLM improved management of riparian land use.
- Encourage private landowners to engage in cooperative habitat restoration activities.
- USACE needs to fund genetic monitoring of the native trout populations in the North Fork Clearwater River, consistent with the NWPPC Fish and Wildlife Program.
- Wildlife populations would benefit if land throughout the subbasin is managed for increased Ecological Integrity Ratings.

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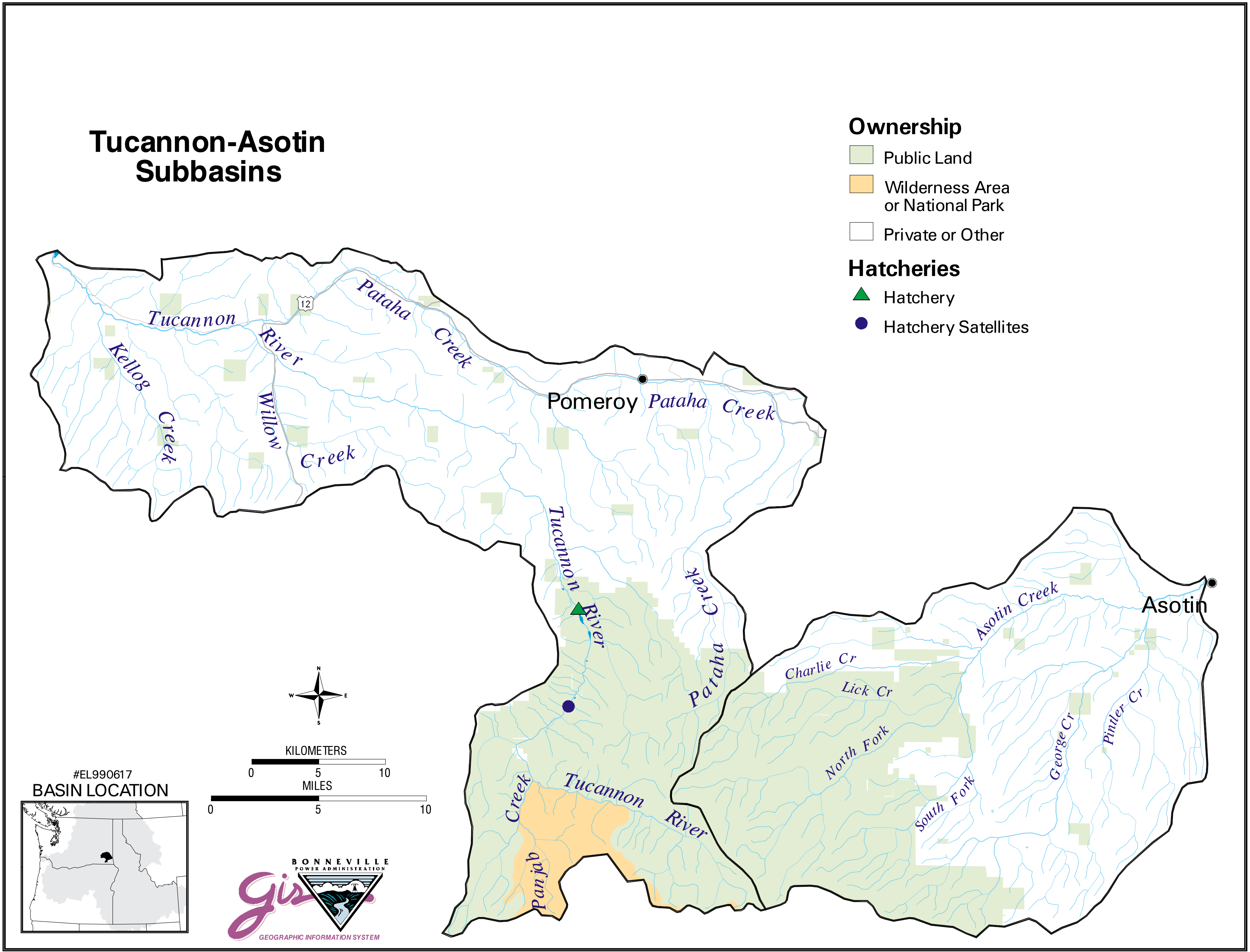
Tucannon-Asotin
Subbasins
Ownership
Public Land
Wilderness Area
or National Park
Private or Other
Hatcheries
Hatchery
Hatchery Satellites
Tucannon River
Kellog Creek
Willow Creek
Pataha Creek
12
Pomeroy
Tucannon River
Pataha Creek
Panjab Creek
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Charlie Cr
Lick Cr
North Fork
South Fork
Asotin Creek
George Cr
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KILOMETERS
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BASIN LOCATION
BONNEVILLE
POWER ADMINISTRATION
GEOGRAPHIC INFORMATION SYSTEM

Asotin Subbasin

Anad fish 1 project $235

Fish and Wildlife Resources

Subbasin Description

Asotin Creek a tributary to the Snake River (Rm 145) drains approximately 325 square miles of Asotin and Garfield Counties. The headwaters of Asotin Creek originate in the Blue Mountains (6,200 ft) and flow east into the Snake River (800 ft) at Asotin, Washington.

The subbasin contains dryland and irrigated cropland, rangeland and forests. The Umatilla National Forest, Washington Department of Fish and Wildlife (WDFW) and Department of Natural Resourse lands cover most of the headwaters. The watershed is largely rural, comprised of farming (30%), ranching (30%), and timber enterprises (40%). Approximately 15% of the watershed is publicly owned. Asotin, a small town, is located at the mouth of the creek and concentrated rural development extends upstream about three miles.

Bonneville Power Administration (Bonneville) funds are utilized to improve on “grass roots” public and agency cooperation and collaboration for habitat restoration on private and public property. This program continues to coordinate, assess, implement, and monitor fish and their habitats through cost-share programs in the Asotin Creek watershed which are consistent with the Independeptent Scientific Review Panel’s recommendation to the North West Power Planning Council to support habitat restoration projects and the “Model Watershed” programs.

Fish and Wildlife Status

Asotin Creek remains an important Snake River tributary for anadromous salmonid production in Washington and has been given the distinction of a reserve for wild steelhead under current WDFW management policy (Glen Mendel, personal conversation). Charley Creek, an upper tributary, has some of the highest densities of juvenile steelhead in southeastern Washington according to recent WDFW fisheries surveys (Glen Mendel).

ESA listed stocks of summer steelhead, spring chinook salmon, and bull trout along with resident rainbow trout utilize the Asotin Creek watershed. Historical records indicate that Asotin Creek once harbored strong runs (> 800 adults) of summer steelhead and moderate runs (> 100 adults) of spring chinook salmon. However, recent surveys indicate few adult chinook salmon spawn in Asotin Creek and spawner escapement for steelhead has declined to about 200 (ACMWP, 1995). A 1993 Forest Service survey documented the presence of bull trout in the middle branch of the North Fork of Asotin Creek and the lower 1.5 miles of the South Fork of the North Fork of Asotin Creek, and in Charley Creek. The WDFW’s Salmon and Steelhead Stock Inventory (SASSI 1992) found them only in the North and South Forks of Asotin Creek.

Stock	Genetic History/Management Intent	Spawner Escape
Spring Chinook	Threatened. (Extirpated?) Manage for natural production and hatchery re-introduction	
Summer Steelhead	Threatened. Manage for natural productions	200 ?
Bull Trout	Threatened. Manage for conservation and Restoration	

The Asotin Creek watershed supports many species of big game animals such as elk, mule deer, whitetail deer, bighorn sheep, bear, cougar, and bobcats. Upland game birds include native grouse, introduced turkeys, pheasants, chukars, gray partridge, and quail. Golden eagles, bald eagles, and other predatory birds either nest in or visit the area.

Habitat Areas and Quality

The decline in numbers of anadromous salmonids can be attributed to downstream impacts (ocean conditions, harvests, predators, and dams), and degraded habitat quality and quantity in Asotin Creek. Recent catastrophic floods and public/private management practices, coupled with the local soil types and climate, have contributed to increased sedimentation and a general reduction of riparian vegetation. Timber harvests, roads, channelization, grazing, upland practices and floods have reduced pool quality and quantity, rearing habitat, and riparian vegetation. High summer stream temperatures, lack of quantity and quality resting and rearing pools containing large woody debris (LWD), and sediment deposition in the stream were problems identified during the watershed analysis and are addressed in the *Asotin Creek Model Watershed Plan (Plan).*

Watershed Assessment

The *Plan* was printed in 1995. It was the first Bonneville funded Model Watershed Plan completed which deals specifically with watershed restoration and protection focused on fish habitat restoration. The Lower Snake River Compensation Plan (LSRCP) has funded extensive steelhead and spring chinook monitoring and evaluation studies for the past 15 years and annual reports are written for these studies.

Limiting Factors

Anadromous salmonid production is impacted by high summer stream temperatures, turbidity, sedimentation, loss of riparian vegetation, and lack of suitable resting and rearing pool habitat as recognized by the *Plan.* Over the past 100 years timber harvest, roads, farming, livestock management, recreational activities, flood plain encroachment and catastrophic flood events have contributed to habitat degradation. The construction and operation of Columbia and Snake river dams are a major limiting factor to salmon and steelhead populations in the lower Snake River subregion.

Subbasin Management

Goals, Objectives and Strategies

The indigenous anadromous fish species most actively targeted for management in the Asotin Creek watershed are spring chinook salmon and summer steelhead. The goals for these species are to restore sustainable, naturally producing populations to support tribal and non-tribal harvest and cultural and economic practices while protecting the biological integrity and genetic diversity of these species in the watershed.

1. Reduce pre-spawner adult mortality
   a. riparian planting projects for long-term LWD recruitment for shade
   b. jump-start LWD component by incorporating into restoration projects
   c. increase pools and decrease width to depth ratio by instream structures, and long-term natural floodplain and channel restoration

2. Increase incubation success
   a. continue upland cost-share for sediment reduction projects
   b. in-stream structures designed to scour and sort spawning gravels
   c. riparian plantings for streambank stabilization and LWD recruitment
   d. riparian management plans for alternative water and fencing projects

3. Increase juvenile salmonid survival
   a. in-stream habitat restoration according to sound fluvial geomorphic principals
   b. increase pools w/LWD to improve over-winter survival of juveniles
   c. decrease width and increase stream depth
   d. identify cool water refugia and protect and restore in-stream and riparian habitat
   e. construct off-channel rearing areas from springs and add LWD component to design for habitat complexity
   f. riparian plantings for shade, cover and LWD recruitment
   g. riparian management plans with fencing and off-site watering

4. Manage Asotin Creek as a reserve for wild steelhead

5. Begin planning for spring chinook reintroduction with an appropriate stock

The broad general strategies used to achieve the habitat objectives include protecting and restoring prioritized habitat through the use of in-stream, riparian and upland Best Management Practices. Hatchery steelhead will not be released into Asotin Creek.

Past Efforts

Specific actions critical to carrying out these strategies were funded under *"Enhance Habitat for Spring Chinook, Summer Steelhead and Bull Trout," and "Continued Implementation of Asotin Creek Model Watershed Projects"* both #9401805. This project now incorporates the activities that were funded under *"Implement Eastern Washington Model Watershed Projects"* #9202602, which funded Model Watershed Coordinators through the Washington State Conservation Commission to develop and implement a model watershed plan for Asotin Creek (the *Plan* was completed in 1995). This project funds a technical lead through the Asotin County Conservation District, who works with local landowner and agency representatives to implement prioritized projects on private and public property within the Asotin Creek watershed. In the early 1980's a fish enhancement study and instream habitat improvement study were conducted under the LSCRP.

Research, Monitoring and Evaluation

The Asotin County Conservation District has contracted with Northwest Management, Washington State University, Washington Department of Fish and Wildlife, and the Natural Resource Conservation Service to monitor pre- and post-habitat restoration projects, chemical and physical attributes as well as temperature, riparian habitat, and upland sediment reduction practices. Baseline information is being documented for restoration activities, and to determine effectiveness of projects addressing limiting factors. The WDFW under the LSRCP is continuing to monitor the spring chinook and steelhead populations in Asotin Creek. This monitoring includes spawning surveys and juvenile population estimates.

Remaining Work

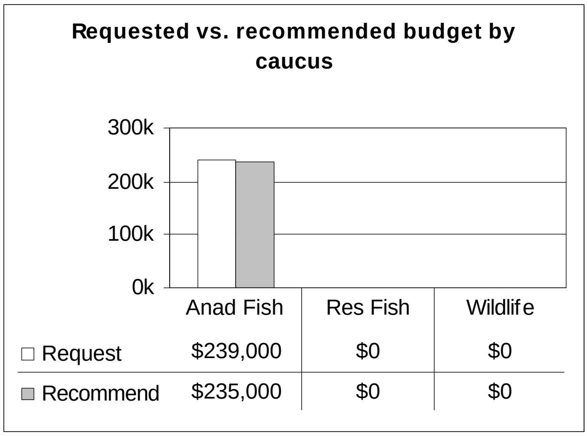
Watershed restoration work remains to be done in the riparian and upland areas alike. Continued effort needs to occur in restoring and protecting riparian buffers and reducing sediment delivery and sedimentation in Asotin Creek. Some additional in-stream work is needed to restore pool to riffle ratios for adults and juveniles. Monitoring & Evaluation remains to be completed as identified by the Asotin Creek Technical Advisory Committee.

Subbasin Recommendations

Projects and Budgets

Based on the preceding subbasin description, the CBFWA fish and wildlife managers recommend funding one anadromous fish project at a cost of $235,000.

Refer to the following figures for detail on: 1) total recommended and requested budget by caucus, 2) funding for new and ongoing work, 3) funding by project phase and emphasis, and 4) funding by time period (past, current and future). Individual projects are listed in the following table.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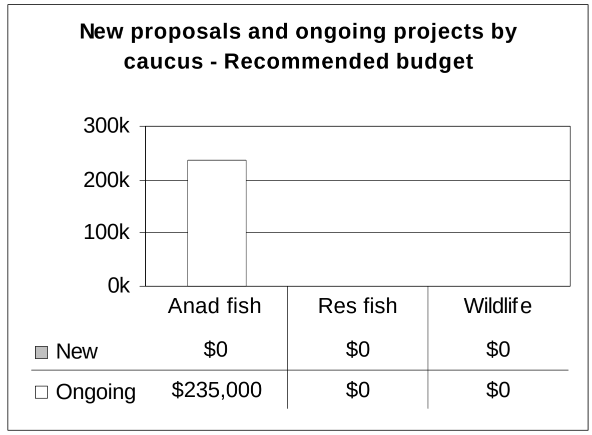
New proposals and ongoing projects by caucus - Recommended budget
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Anad fish
Res fish
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Ongoing
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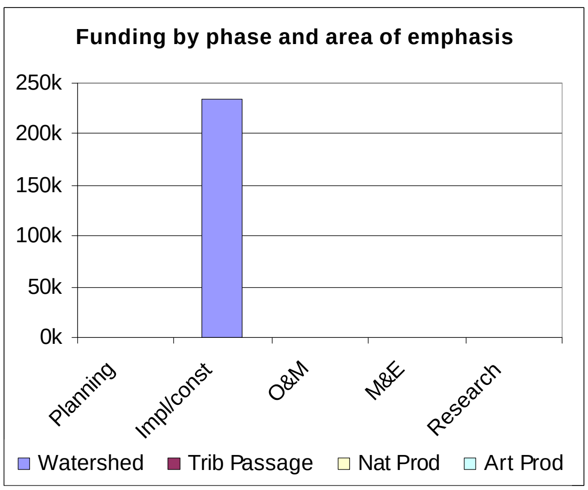
Funding by phase and area of emphasis
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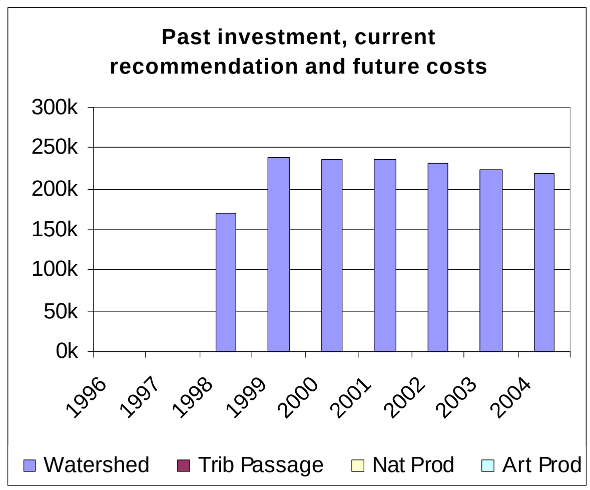
M&E
Research
Watershed
Trib Passage
Nat Prod
Art Prod


Past investment, current recommendation and future costs
300k
250k
200k
150k
100k
50k
0k
1996
1997
1998
1999
2000
2001
2002
2003
2004
Watershed
Trib Passage
Nat Prod
Art Prod

ProjectID	Title	Sponsor	FY99 recom.	FY00 recom.	Estimated Outyears FY01	FY02	FY03	FY04

Anadromous Fish Projects

ProjectID	Title	Sponsor	FY99 recom.	FY00 recom.	FY01	FY02	FY03	FY04
9401805	Continued Implementation of Asotin Creek Watershed Projects	Asotin County Conservation District	239	235	235	230	225	220
		Anadromous Fish Totals		**$235**	**$235**	**$230**	**$225**	**$220**
	* indicates ESA project, † indicates 'Innovative work'	**SUBBASIN TOTALS**		**$235**	**$235**	**$230**	**$225**	**$220**

All figures in thousands of dollars

Needed Future Actions

Continue with habitat improvement implementation and monitoring. Periodically, re-evaluate effects of program. Riparian vegetation planting methods need to be improved and increased riparian buffer development or protection need to be increased. Steelhead and bull trout distribution, abundance, and habitat use in George Creek, a major tributary of Asotin Creek need to be determined. A project to enumerate adult steelhead returns and smolt production in Asotin Creek needs to be initiated.

Action by Others

USDA – 68 landowner contracts - 16,967.7 acres of CRP in Asotin Creek watershed
Conservation Reserve Program – (113 total county contracts for 27,994 acres)
$875,040 annually paid out to watershed CRP contracts for 10 years

USDA – 3 landowner contracts – 787.7 acres of EQIP in Asotin Creek watershed
Environmental Quality Incentive Program (9 county contracts for 2,343.40 ac)
$19,497.03 annually paid out to watershed EQIP contracts for 3 years
Best Management Practices no-till, pasture/hayland planting, nutrient pest management, sediment basin and grass waterways and summer fallow reduction

USDA – 1 landowner contract – WHIP in Asotin Creek watershed
Wildlife Habitat Incentives Program $6,910.00 funded for off-channel rearing areas and wire and rock fences to reduce vehicle damage to WDFW ground

Forest Service – Pomeroy Ranger District –
$59,750.00 for FY 1998 Road obliterations, cut slope plantings using native trees and grass, fencing projects, prescribed fire and habitat restoration projects

Washington State Conservation Commission – *Water Quality Allocation Grant* –
1996 – Lick Creek Water Gap Fencing Project w/Forest Service $1,501.64
1997 – Hood Alternative Water Development $13,816.01

Washington State Conservation Commission – *Competitive Grant* – In-Stream Projects
1996 – Schlee Alternative Water Development repairs $894.62
1996 – Headgate Park In-Stream Habitat and Monitoring Project $21,351.76
1996 – North Fork Asotin Creek In-Stream Habitat Project $16,631.25

Washington State Conservation Commission – *Competitive Grant* – Upland Cost-Share
1996 – 1998 – Upland Best Management Practices to reduce erosion
$78,733.53 Cost-Share paid by Grant $26,244.52 paid by Landowners
$104,978.05 on the ground projects

Washington State Conservation Commission – *Upland Implementation Grant*
1997 –1998 – Upland Best Management Practices to reduce erosion
$15,552.09 Cost-Share paid by Grant $30,077.83 paid by Landowners *
*Direct seeding and other costs greater than 50% cost-share

Washington State Conservation Commission – Water Quality Monitoring Grant
1997 - 1998 - Grant with WSU to monitor water quality in Asotin Creek
$37,000.00 for salaries, benefits and contract with WSU

Washington Department of Fish and Wildlife – LSRCP
1980 – Present – Annual monitoring of spring chinook and steelhead populations

HB 2496 Habitat Restoration Block Grant – Upland Cost-Share
1998 – Upland Best Management Practices to reduce erosion
$943.41 Cost-Share paid by Grant $943.41 paid by Landowners

HB 2496 Habitat Restoration Block Grant – In-Stream Habitat Restoration Projects
1998 - $25,386.09 100% Cost-Share on prioritized habitat restoration projects

Governor's Salmon Recovery Funding Riparian and Upland Best Management Practices
1999 - $236,705 for two riparian fencing projects and long-term lease agreements and 9 direct seeding contracts for 5 consecutive years on 1,579 acres of cropland to reduce erosion by 90%

Continued efforts in the basin are needed by the USFS, WDFW, private landowners and others to protect and increase the size and complexity of riparian vegetation buffers and to reduce sediment delivery to Asotin Creek. Also, a management change is needed that allows the creek to be less constrained by levees and dikes or bank protection efforts.

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Snake River Recover Plan. 1995 (proposed). NMFS

Viola, Arthur E., Schuck, Mark L., Nostrant, Suzanne A. 1991. An Evaluation of Instream Habitat Alterations in Southeast Washington, 1983-1989. WDFW Management Division F.M. 91-11. WDFW, Dayton, Washington.

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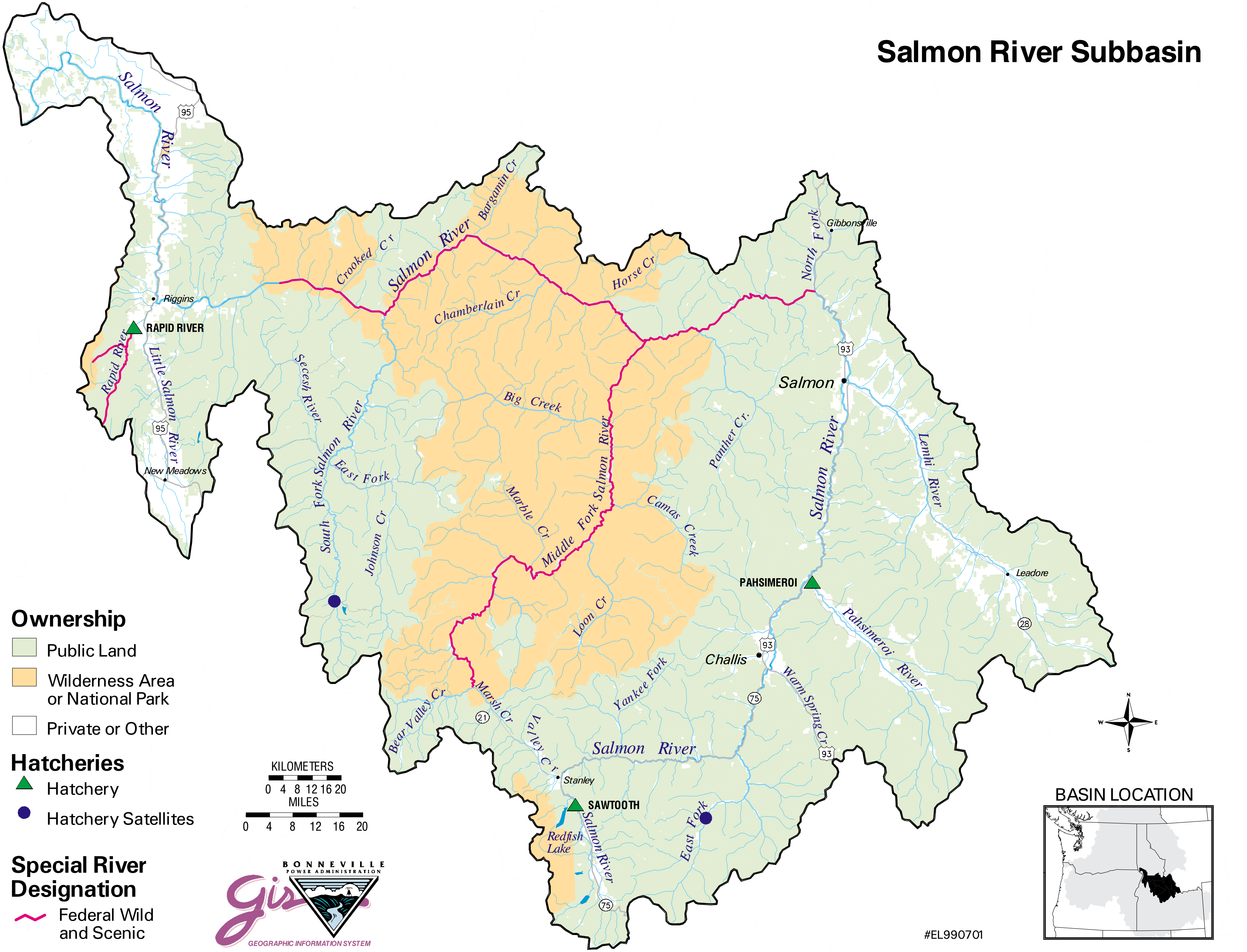
Salmon River Subbasin



Ownership
- Public Land
- Wilderness Area or National Park
- Private or Other

Hatcheries
- Hatchery
- Hatchery Satellites

Special River Designation
- Federal Wild and Scenic

Salmon Subbasin

Anad fish 27 projects $12,735

Fish and Wildlife Resources

Subbasin Description

The Salmon River Subbasin spans central Idaho, covering more than 14,000 square miles. It is the second largest subbasin in the Columbia River drainage. The largest is the Snake. The Salmon River flows 410 miles from its headwaters to the Snake. Most of the precipitation in the basin falls as snow, with peak streamflows during April and June from snowmelt. There are no major barriers to anadromous fish within the subbasin.

The U.S. Forest Service is the largest landholder in the subbasin, with almost 80 percent of the area within six national forests. The largest tract of wilderness in the lower 48 states is within the subbasin. Only 8 percent of the area is privately owned, but the private owners control essential water rights. Major land uses in the subbasin are forestry, recreation, wilderness, agriculture and grazing.

Fish and Wildlife Status

Anadromous Fish

Spring chinook – Naturally spawning populations occur in upper mainstem Salmon (upper Valley Creek, upper Yankee Fork, Herd Creek, upper East Fork, Alturas Lake Creek and Lemhi); Middle Fork (upper Big Creek, Marsh Creek, Bear Valley, and other headwater areas) and mainstem tributaries (e.g., Chamberlain and North Fork Salmon River). The entire Middle Fork drainage is a refuge for wild spring and summer chinook production. All naturally produced spring and summer chinook salmon in the subbasin are listed as threatened under the ESA. Adult escapement has been declining and currently at extremely low levels with most spawning aggregates being at high demographic risk of extirpation. Hatchery production occurs at Rapid River Fish Hatchery (3 million smolts capacity), built as Idaho Power Company mitigation for Hells Canyon Dam complex, and the Sawtooth Fish Hatchery (2.3 million smolts capacity), built under LSRCP and operated by IDFG. Rapid River Fish Hatchery production originated from Hells Canyon Dam collections of blocked upper Snake River fish and are not listed under the ESA. Rapid River returning hatchery adults periodically have exceeded hatchery production goals and capabilities and have allowed for increased Clearwater Basin production and limited sport and tribal harvest opportunity. The East Fork Salmon River (upper Salmon) supports an adult trap but, due to low escapement, it has not been activated since 1993.

Summer chinook – Naturally spawning populations occur in the upper Salmon (lower Valley Creek, lower East Fork Salmon River, and mainstem); Middle Fork (lower Big Creek, Loon Creek); and South Fork (mainstem, Johnson Creek, Secesh River, and Lake Creek) and are listed as threatened under the ESA. Hatchery production occurs at McCall Fish Hatchery (1 million smolt capacity), built under LSRCP and operated by IDFG and Pahsimeroi Fish Hatchery (1 million smolt capacity) built as Idaho Power Company mitigation for Hells Canyon Dam complex and operated by IDFG. Juvenile fish are released at Pahsimeroi Fish Hatchery and above an adult trap on the upper South Fork Salmon River. Broodstock is collected at Pahsimeroi Fish Hatchery and the South Fork Salmon River adult trap.

Summer steelhead - Group A run natural spawning occurs mostly in Salmon River tributaries below the North Fork with the exception of the Middle and South Forks of the Salmon River, which support Group B natural spawning. All naturally spawning steelhead in the subbasin are listed as threatened under the ESA. The Middle Fork and South Fork are sanctuaries for wild Group B steelhead. Hatchery production of both Group A and B run steelhead is done outside the subbasin at Hagerman National Fish Hatchery (2.4 million smolt capacity, Group A) operated by the USFWS under the LSRCP and Magic Valley Fish Hatchery, a LSRCP facility (2 million smolt capacity, Group A) operated by IDFG. Niagara Springs Fish Hatchery (1.6 million smolt capacity) was built as Idaho Power Company mitigation for Hells Canyon Dam complex. It is operated by IDFG. Releases of smolts occur at the in-subbasin hatcheries and satellite facilities and near developed areas for sport harvest. Over one million eyed eggs are also placed in streamside incubators for volitional release of fry to tributary streams. Broodstock is collected at in-subbasin traps.

Sockeye - Sockeye historically spawned and reared in the upper Salmon River lakes including Alturas, Petit, Yellow Belly, Redfish and Stanley. The Sunbeam Dam, irrigation diversions, intentional and unintentional migration barriers, harvest and eradication efforts eliminated adult sockeye from all the lakes but Redfish and Alturas lakes where remnant runs still exist. In 1992, residual sockeye salmon were identified in Redfish Lake and listed as endangered under the ESA. Added to the ESU in that same year, residual sockeye salmon are genetically similar to anadromous sockeye and can produce ocean-going outmigrants. Redfish Lake sockeye are raised in captivity at IDFG's Eagle and Sawtooth fish hatcheries and at facilities operated by NMFS in Washington. Eyed-eggs, juveniles and adults are released to Redfish, Alturas and Pettit lakes.

Pacific Lamprey - Historically present. Abundance and life history attributes in the Salmon River Subbasin are currently unknown. Based on adult lamprey observations at Lower Granite Dam the current status is thought to be extremely depressed.

Coho Salmon – Historically present. Snake River coho salmon were functionally extirpated and in 1986 were declared extinct. Restoration programs in the Snake River subbasin were initiated in 1994.

Table 1. Stocks and management goals

Stock	Status / Management Intent
ChS	ESA-threatened. /Conservation, restoration, and recovery of stocks. Provide sport and tribal harvest
ChSu	ESA-threatened. /Conservation, restoration, and recovery of stocks. Provide sport and tribal harvest
StS (A)	ESA-threatened. /Conservation, restoration, and recovery of stocks. Provide sport and tribal harvest
StS (B)	ESA-threatened. /Conservation, restoration, and recovery of stocks. Provide sport and tribal harvest
Coho	Extirpated. Re-introduction under discussion.
Sockeye	Endangered. Rebuild with Redfish Lake stock. Re-introduce in other Sawtooth lakes. Provide sport and tribal harvest.
Lamprey	Unknown status. / Conservation, restoration, recovery.

Resident Fish

Bull trout is currently listed as under ESAas threatened in the Salmon subbasin. Land use practices (e.g., grazing, mining, timber harvest activities and others) negatively impact this species that is very sensitive to environmental degradation. Bull trout have historically supported important recreational and subsistence fisheries. Other species of concern include native westslope cutthroat and redband (rainbow) trout.

Wildlife

Wildlife populations in the subbasin fluctuate in response to natural environmental conditions and natural and human caused habitat changes as well as direct wildlife population management (i.e., hunting, trapping, etc.). Wildlife species present in the subbasin include actively managed larger mammals (i.e., big game species), native (e.g., sage grouse) and non-native (e.g., chukar) game birds and waterfowl. A much larger number of non-game mammals, birds, amphibians and reptiles also occur. Grey wolves inhabit a portion of the subbasin.

Table 2. Production Program Description

Stock	Mgmt Intent	Initial Broodstock	Operating Broodstock	Adult Collection & Holding	Central Facility (Incubation & Rearing)	Acclimation &/or Release Sites	Status	Funding
ChS	Harvest Mitigation	Snake	Rapid River	Rapid River	Rapid River	Rapid River	On-going	FERC
	Supplemt	Johnson Cr.	Johnson Cr.	Johnson Cr.	???	Johnson Cr./S.Fk. Salmon	Planned	NWPPC
ChS	Supplemt	Salmon?	Sawtooth/East Fork	Hatchery, East Fork Salmon Weir	Sawtooth H.	Hatchery, East Fork Salmon Weir	On-going	LSRCP
ChSu	Supplemt	South Fk Salmon	South Fk Salmon	South Fk Salmon Weir	McCall H. (Payette R.)	South Fork Salmon Weir	On-going	LSRCP
StS(A)	Harvest Mitigation	Salmon	Upper Salmon (Oxbow, make-up)	Pashimeroi, Sawtooth, Oxbow	Hagerman NFH & Magic Valley	Direct @ Sawtooth & Pashimeroi & numerous sites on mainstem above N. Fork; Little Salmon @ Stinky Spr. (upper) and Hammer Cr. , Pine Bar (lower)	On-going	LSRCP
StS(A)	Supplemt	Salmon	Upper Salmon (Oxbow, make-up)	Pashimeroi, Sawtooth, Oxbow	Side-stream (egg-box) incubators		On-going	NWPPC
StS(A)	Harvest Mitigation	Salmon	Upper Salmon (Oxbow, make-up)	Pashimeroi, Sawtooth, Oxbow	Niagara	Direct @ Sawtooth & Pashimeroi & numerous sites on mainstem above N. Fork; Little Salmon @ Stinky Spr. (upper) and Hammer Cr. , Pine Bar (lower)	On-going	FERC
StS(B)	Harvest Mitigation	Upper Salmon	Upper Salmon (Dworshak, make-up)	East Fork, Squaw Cr Pond (formerly @ Slate Cr.), Dworshak	Hagerman NFH & Magic Valley	Upper Little Salmon (Stinky Spr.), Squaw Cr. Pond	On-going	LSRCP
StS(B)	Harvest Mitigation	Upper Salmon	Upper Salmon (Dworshak, make-up)	East Fork, Squaw Cr Pond (formerly @ Slate Cr.), Dworshak	Niagara	Upper Little Salmon (Stinky Spr.), Squaw Cr. Pond	On-going	FERC
Sockeye	Captive B	Redfish Lake/Kokanee	Redfish Lake	Collect @ Redfish Lake; hold @ Eagle	Eagle	Redfish Lake, Alturas Lake	On-going	NWPPC

Habitat Areas and Quality

The Salmon River Basin has a high proportion of federally-designated wilderness (about 3,700 miles for spring and summer chinook salmon alone) containing near pristine anadromous fish habitat. None the less, some historically important anadromous fish production areas have experienced negative habitat impacts due to land use (e.g., grazing, mining, timber harvest activities and others).

Bull trout require clean cold water and are very sensitive to environmental change. Habitat quality for this species has been degraded locally through such factors as decreased shade, decreased habitat complexity, increased turbidity and sedimentation, decreased benthic production, decreased nutrient base and increased water temperatures. These adverse changes are a result of several activities, including road building, logging, stream channelization, irrigation water depletion and the lack of returning adult salmon. These same factors negatively impact native westslope cutthroat trout and redband trout.

Wildlife populations in the subbasin use a mixture of public and private ownership lands as habitat. The quality of both types is variable. About one-half of the subbasin is protected as wilderness, which provides excellent wildlife habitat. The Interior Columbia Basin Ecosystem Management Project (ICBEMP) (1996) found that most land in the subbasin had a HIGH ecological integrity rating. Wildlife mitigation projects in the subbasin have or will provide areas with HIGH ecological integrity.

Watershed Assessment

Watershed projects funded by BPA in the Salmon Basin fall under the guidance found in documents relating to specific actions for anadromous fish recovery and more general terms in watershed subbasin assessments.

The Model Watershed Plan is a comprehensive document produced in 1996, which outlines specific objectives in the Lemhi, Pahsimeroi and East Fork Salmon rivers. These objectives relate specifically to salmon recovery, but also are meaningful to other ESA highlighted species including steelhead, bull trout and cutthroat trout. This document relates directly to BPA projects 9202603, 9401700, 9306200 and 9401500. Related to these projects is the Herd Creek Watershed Assessment produced by the BLM and Forest Service. This document provides specific actions which compliment the above mentioned projects within the Herd Creek drainage.

The Upper Salmon River Subbasin Assessment was completed in 1998 and includes the Stanley Basin, Yankee Fork Salmon River, East Fork Salmon River, main Salmon River to Morgan Creek and all major tributaries. This document was produced by an inter-agency task force, which included the BLM, Forest Service, Idaho Department of Fish and Game, other agencies, private land owners and residents and directly supports activities found in BPA projects 9202603, 9401700, 9306200, 94010500 and 8909800.

The Nature Conservancy has developed Eco-regional Planning as a conservation planning tool. The Interior Columbia Basin Ecosystem Management Project (USFS 1996) identified conservation and management needs. The following documents refer to the need to protect wildlife habitats in the Salmon River subbasin: Bonneville Power Administration Wildlife Mitigation Program Final Environmental Impact Statement (BPA 1997); USFWS Pacific Bald Eagle Recovery Plan (1986); Rivers of Life: Critical Watersheds for Protecting Freshwater Biodiversity (Master et. al. 1998); Bureau of Land Management Resource Management Plans; IDFG 5-Year Mule Deer Plan (Scott et al. 1991); IDFG 5-Year Nongame Plan (Groves and Melquist 1991); IDFG 5-Year Upland Game Plan (Smith et. al. 1990); IDFG 5-Year Waterfowl Plan (Connelly and Wackenhut 1990); A Vision for the Future: IDFG Policy Plan 1990-2005 (IDFG 1991).

Limiting Factors

Anadromous Fish

1. Adult escapement is currently insufficient to fully seed the habitat potential. The primary limiting factor is poor smolt-to-adult survival (out-of-basin issue).
2. Irrigation diversions have reduced the carrying capacity of some streams by reducing the rearing and spawning area through disconnecting tributary streams from mainstem corridors. De-watered habitat and increased water

temperatures, particularly in the upper Salmon (Lemhi, Pahsimeroi, and East Fork Salmon rivers) and in the Little Salmon River have also diminished carrying capacity.

3. Road construction, logging and mining have contributed to heavy sedimentation and degraded habitat conditions and water quality in the South Fork Salmon River and other Salmon River tributary streams.
4. Overgrazing, channelization and development have reduced riparian vegetation over much of the headwater rearing areas contributing to increased water temperatures and sedimentation and loss of suitable spawning and rearing habitat.

Between freshwater habitat impacts and mainstem passage problems in the Snake and Columbia rivers, anadromous fish stocks have been significantly diminished. All of this has contributed to under-seeded habitat, reductions in production and loss of harvest opportunities.

Resident Fish

Resident fish are limited by many of the same habitat disturbances as those described for anadromous fish. The loss of the anadromous fish nutrient base limits the overall productivity of the Salmon subbasin for native resident fishes. Hybridization among native bull trout and introduced brook trout and among native westslope cutthroat trout and non-native rainbow trout may also impact populations locally. As is the case with other native Western trouts, hybridization with non-native trout may cause local extirpation, potentially influencing entire subbasins.

Wildlife

Water regimes influence the potential for site restoration. For example, groundwater pumping has lowered water tables thus limiting the restoration potential for a permanent emergent herbaceous wetland. Large-scale habitat conversion , from sagebrush steppe or native grasslands to irrigated agriculture, continues to limit the functioning of natural systems. Secondary losses due to the federal hydrosystem have impacted wildlife such as bald eagles, bears, and other fish and carrion eaters. The alteration of natural fire regimes because of widespread cheat grass invasions has limited the potential for restoring natural shrub-steppe. Other noxious weed invasions limit restoration potential.

Subbasin Management

Goals, Objectives and Strategies

Anadromous Fish

The co-managers recognize the importance and value of all anadromous fish stocks in the subbasin in management plans. The goal for these fish is to restore sustainable naturally producing populations to support tribal and non-tribal harvest and cultural and economic practices while protecting the biological integrity and the genetic diversity of the watershed. The NWPPC Fish and Wildlife Program anadromous fish projects in the subbasin have mainly focused on spring/summer chinook salmon, steelhead and sockeye salmon. Fall chinook salmon are also targeted for management.

To accomplish this goal the managers have adopted the following objectives: 1) improve smolt to adult survival to above 2%; 2) improve egg to smolt survival; 3) improve juvenile rearing survival and 4) restore depressed populations to productive levels.

The managers have adopted the following strategies to accomplish these objectives.

1. Through watershed assessments identify and address habitat factors that limit anadromous fish resources. Conduct habitat restoration work consistent with identified limiting factors and the best available methods, e.g. sediment reduction, water temperature reductions, improved habitat complexity, etc.

2. Identify salmon and steelhead subpopulation structure and source and sink patches in the Snake River basin. Utilize DNA analysis to identify salmon and steelhead subpopulation structure and quantify gene flow between the various subpopulations in the Snake River basin. Analysis would include but not be limited to analysis of mitochondrial DNA, nuclear genes and microsatellite DNA. Identify potential source and sink patches within each subpopulation.

3. Conduct annual monitoring and evaluation of juvenile and adult abundance, survival and genetic profiles of anadromous fish. Document and describe fish life history characteristics. Conduct habitat monitoring identified in watershed assessments to quantify whether habitat restoration meets specified goals.

4. Establish a minimum number of returning adults to each stream to minimize high demographic risk of extirpation.

5. Maximize natural production (egg to smolt survival) within the subbasin. Improve habitat quality (spawning, rearing and holding) for anadromous fish by minimizing irrigation structure impacts, optimizing stream flows, achieving water temperature reduction, decreasing sediment inputs and increasing stream and lake productivity.

6. Increase production through early life history survival advantage in the hatchery environment and increased adult returns. Address improvements in smolt survival through advancements in fish health and smolt quality, through improved hatchery practices and development of conservation hatchery programs. Increase adult returns above replacement and natural production of salmon and steelhead thus reducing demographic risk of population extirpation or reduce the population decline until major limiting factors are addressed. Provide harvest augmentation, preserve genetic diversity and mimic life history characteristics of natural fish. Investigate the utility of supplementation strategies for maintaining or enhancing natural production. Implement captive propagation programs on spawning aggregates at extreme risk of extirpation. Investigate new techniques as they apply to artificial propagation.

Resident Fish

The primary native resident fish species targeted for active management in the Salmon Subbasin are bull trout, westslope cutthroat trout, redband, and mountain whitefish. Five regional goals were captured in the Resident Fish Multi-year Implementation Plan (RFMYIP) appendix to the June 4, 1997, Resident Fish Annual Implementation Work Plan (CBFWA 1997). These goals include: (1) mitigating and compensating for resident and anadromous fish losses caused by construction and operation of the hydropower system, (2) ensuring continued persistence , health and diversity of resident species by reducing or removing impacts caused by habitat degradation, competition or hybridization with non-native species and overharvest, (3) restoring native resident fish species to near historic levels throughout their ranges where habitats can be feasibly restored, (4) maintaining and restoring healthy ecosystems which preserve functional links among biota and (5) administering and increasing opportunities for consumptive and non-consumptive resident fisheries that are compatible with the continued persistence of native resident fish. The intent of these goals are two-fold: 1) to conserve, protect and enhance production and distribution of these species throughout their historical range and 2) to provide sustainable fisheries, including harvest opportunities.

To achieve these goals the managers have adopted the following objectives: 1) improve survival for all life history phases and 2) restore depressed populations to productive levels.
Specific and directed strategies to achieve these objectives for the Salmon Subbasin have been identified by the fisheries managers and are also detailed in the RFMYIP. These strategies include the following: 1) status and inventory studies for native species, 2) improving and maintaining stream flows to mimic the natural hydrograph, 3) providing enforcement to protect weak stocks from illegal harvest, harassment and illegal habitat disturbances, 4) restoring anadromous fish habitat and abundance to near historic levels to provide nutrients, food resources and habitat conditions suitable to support sensitive resident species and 5) monitoring the status of native fish populations to evaluate the effectiveness of restoration efforts and to determine when protection and restoration objectives have been achieved.

Wildlife

The goal of the Wildlife Section of the NWPPC FWP is to achieve and sustain levels of habitat and species productivity as a means of fully mitigating wildlife losses caused by construction and operation of the federal and non-federal hydroelectric system (Sec. 11.1, 1995 Amendments). Because no hydro facilities in the Salmon Subbasin are addressed in Section 11 of the FWP, no wildlife mitigation projects are proposed for the subbasin at this time.

Past Efforts

Anadromous Fish

Specific actions to carry out these strategies are listed in Appendix C. A general description of past efforts by project follows. Most projects described below provided benefits to anadromous fish. However, benefits to wildlife populations also were an outcome of many of the watershed/habitat restoration projects.

An ongoing project is in the process of restoring a healthy riparian corridor along 12 miles of the Salmon River near Challis, Idaho and restoring the natural floodplain (Project #9901900). The Idaho Model Watershed Administration and Coordination project (Project #9202603) and the Idaho Model Watershed Habitat project (Project #9401700) have implemented habitat restoration programs in the Lemhi River, Pahsimeroi River and East Fork Salmon River drainages. The Salmon River Habitat Enhancement and Monitoring and Evaluation Project (Project #9405000) has successfully implemented habitat restoration programs on Bear Valley Creek, the Yankee Fork Salmon River and East Fork Salmon River.

The Idaho Fish Screen Improvement Project (Project #9401500) has constructed and maintained screens, consolidated diversions, replaced diversions with pumps, constructed fish ladders and conducted pump and diversion surveys on many streams within the Salmon River subbasin. The Upper Salmon River Irrigation Diversion Consolidation and Water Conservation Project (Project #9600700) has eliminated three diversions in the Salmon River subbasin. One action was to replace Lemhi River water during times of critical fish passage needs. The Salmon River Anadromous Fish Passage Enhancement Project (Project #9306200) has stabilized stream banks on the East Fork Salmon River, improved diversions on the Lemhi River, eliminated canals from the Salmon River and fenced several miles of critical riparian habitat.

The Johnson Creek Artificial Propagation Enhancement Project (Project #9604300) is in the early stages of establishing a program designed to increase adult returns of a weak but recoverable stock of summer chinook salmon in Johnson Creek on the South Fork Salmon River. The Salmon River Production Program (Project #9705700) has incubated eggs and released steelhead and chinook fry in the Yankee Fork Salmon River, the Lemhi River and East Fork Salmon River. The IDFG and NMFS Chinook Salmon Captive Rearing Initiative (Project #9700100 and Project #9606700) has successfully developed fish husbandry techniques for captive-reared stocks. Conservation strategies using captive-reared fish have been implemented on three streams and evaluated. The Preserve Listed Salmonid Stocks Gamete Project (Project #9703800) has collected and cryo-preserved milt from over two hundred male chinook salmon. The Monitor Listed Stock Adult Chinook Salmon Escapement Project (Project #9703000) has successfully evaluated chinook salmon escapement on the Secesh River system since 1997.

The Supplementation Studies Projects (Project #8909800, Project #8909801, Project #8909802, Project #8909803, and Project #9005500) are designed to evaluate the usefulness of supplementation as a recovery/restoration measure for depressed stocks of spring and summer chinook salmon and summer steelhead in the Salmon and Clearwater subbasin. Hatchery releases (treatments) and broodstock development have occurred since 1992. These projects monitor adult escapement, juvenile production and productivity throughout the Salmon River and Clearwater River subbasin. The Idaho Natural Production Monitoring and Evaluation Project (Project #9107300) compliments monitoring conducted by the Supplementation Studies projects and conducts data analysis on a subbasin and basin wide scale. This project maintains the largest database on juvenile salmonids in the state of Idaho, conducts steelhead escapement surveys and has developed techniques to estimate smolt-to-adult return rate by mainstem migration route. The Spatial Persistence and Dynamics of Snake River Wild Chinook Salmon project (Project #9902000) suggested, based on emerging conservation theory, the re-colonization and persistence of wildly ranging species may be strongly influenced by the spatial geometry of remain habitats.

The IDFG and NMFS Sockeye salmon captive broodstock programs (Project #9107200 and Project #9204000) have successfully developed captive rearing protocols and produced eyed-eggs, juveniles and adult sockeye salmon for supplementation to native waters. The IDFG component of the program has monitored the success of supplementation strategies in Redfish Lake since 1993. The Snake River Sockeye Salmon Habitat and Limnological Research Project (Project #9107100) has provided concurrent rearing habitat research since the inception of the captive broodstock effort in Idaho. This project has also monitored the success of supplementation in Pettit Lake since 1996 and Alturas Lake since 1998.

Resident Fish

There has been no directed resident fish work in the Salmon Subbasin funded under the authority of the NWPPC Fish and Wildlife Program. Much of the habitat work performed under the anadromous fish arena also benefits resident fish.

Research, Monitoring and Evaluation

Anadromous Fish

The current BPA-funded projects are addressing all seven previously stated objectives. A review of on-going research, monitoring, and evaluation follows.

Increased smolt-to-adult return rates (SAR) are being addressed for spring and summer chinook, summer steelhead, and fall chinook salmon in the Snake River basin by monitoring SARs annually and by model development to estimate SAR by migration route. This information is being used to influence mainstem management actions (IDFG Natural Production Monitoring and Evaluation Project). PIT-tagged fish for this work are provided by the following projects: Idaho Supplementation Studies, Salmon Supplementation Studies in Idaho rivers and Steelhead Supplementation Studies in Idaho rivers (IDFG, NPT, SBT, USFWS).

Fish production and habitat information is being compiled and analyzed on a watershed scale within the Salmon River subbasin to identify watersheds not meeting average Snake River Basin spring/summer chinook salmon smolts per female criteria (Idaho Natural Production Monitoring and Evaluation Program). Restoration projects are currently ongoing in watersheds with known habitat degradation and irrigation diversion problems (Idaho Model Watershed Administration/Implementation Support, Idaho Model Watershed Habitat Projects, Salmon River Anadromous Fish Passage Enhancement, Salmon River Habitat Enhancement Monitoring and Evaluation, Restoring the Salmon River in Challis, Idaho to a Healthy Condition, Idaho Fish Screen Improvement Project and Upper Salmon River Irrigation Diversion Consolidations and Water Conservation). Specific remedial actions include riparian enhancement, road obliteration, fencing enclosure, the establishment of optimum stream flow and water temperature conditions and water conservation efforts.

Adult escapement, juvenile production and genetic composition of spring/summer chinook salmon, summer steelhead, and sockeye salmon in the Salmon River basin are being monitored annually by the following projects: Idaho Supplementation Studies (IDFG), Salmon Supplementation Studies in Idaho Rivers (IDFG, NPT, SBT, USFWS), Steelhead Supplementation Studies in Idaho Rivers (IDFG), Chinook Salmon Captive Rearing Initiative Program (IDFG, NMFS); Listed Stock Gamete Preservation Program (NPT); Sockeye Captive Broodstock Program (IDFG, NMFS).

Idaho Supplementation Studies, Salmon Supplementation Studies in Idaho Rivers and Steelhead Supplementation Studies in Idaho Rivers projects (IDFG, NPT, SBT, USFWS) are evaluating the usefulness of supplementation as a recovery/restoration measure for depressed stocks of spring and summer chinook and summer steelhead. The Johnson Creek Artificial Propagation Enhancement project is in the early stages of establishing a program to increase adult returns of summer chinook salmon to Johnson Creek in the South Fork Salmon River drainage. The Salmon River Production Program project uses streamside incubation techniques to hatch eggs and return chinook salmon and steelhead fry to three streams in the Salmon River subbasin. The IDFG Chinook Salmon Captive Rearing Initiative project uses captive propagation techniques to examine the efficacy of captive rearing as a tool to preserve stocks at risk of extirpation. The IDFG and Shoshone-Bannock Tribes' Sockeye Salmon programs evaluate and enhance lake rearing conditions, develop safety net captive brood stocks, and supplement broodstock progeny to native waters. The Nez Perce Tribe's Gamete Cryopreservation Program preserves milt from several listed spring/summer chinook salmon stocks.

Resident Fish

There has been no directed resident fish research, monitoring and evaluation in the Salmon Subbasin funded under the NWPPC Fish and Wildlife Program. Anadromous fish projects may obtain incidental information on resident fish.

Wildlife

Some wildlife populations (e.g. big game, waterfowl, upland birds, bald eagles, neotropical migrants and others), native plant communities, noxious weed infestations, livestock trespass and public use are routinely monitored by agencies and tribes throughout the subbasin. Plant and animal species of special concern will be monitored periodically by the Idaho Conservation Data Center staff.

Remaining Work

Anadromous Fish

The remaining work necessary to accomplish subbasin objectives will include, but will not be limited to, the following:

- Conduct genetic analyses on chinook salmon, summer steelhead and sockeye salmon to support management actions in the subbasin.
- Identify stocks at risk of extinction and, if necessary, implement conservation measures.
- Evaluate the need to improve and expand captive propagation facilities for current and potential future stocks at risk of extinction.
- Continue existing monitoring and evaluation supplementation projects.

Resident Fish

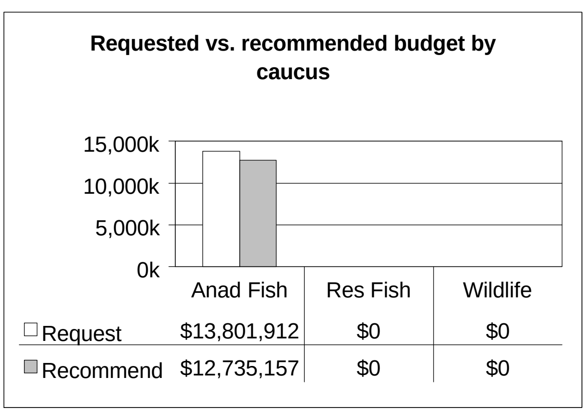
Remaining work to be accomplished by ongoing projects does not apply to resident fish activities, because there is currently no directed resident fish work in the Salmon Subbasin funded under the NWPPC Fish and Wildlife Program.

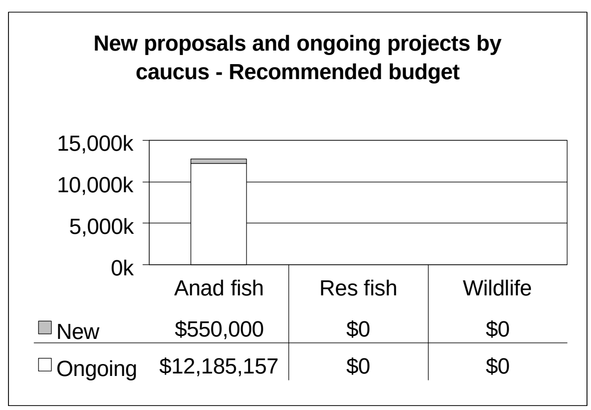
Subbasin Recommendations

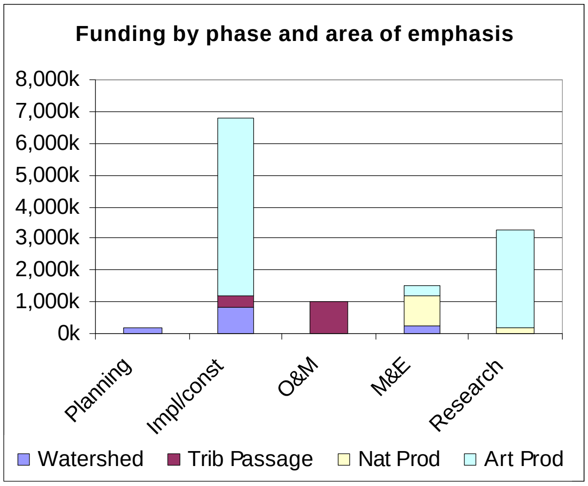
Projects and Budgets

Based on the preceding subbasin description, the CBFWA fish and wildlife managers recommend funding a total of 27 anadromous fish projects at a cost of $12,735,157. The managers consider 6 of these projects, for $3,104,115, to be innovative in their technique and application. Another 11 projects support ESA requirements for a total of $4,726,139.

Refer to the following figures for details on: 1) total recommended and requested budget by caucus, 2) funding for new and ongoing work, 3) funding by project phase and emphasis and 4) funding by time period (past, current and future). Individual projects are listed in the following table.



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5,000k
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3,000k
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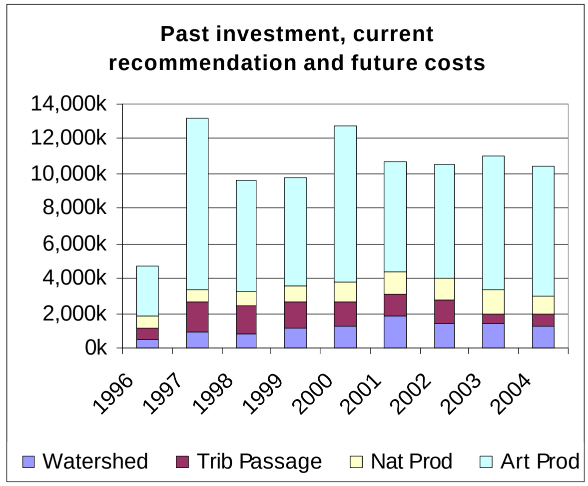
Planning
Impl/const
O&M
M&E
Research
Watershed
Trib Passage
Nat Prod
Art Prod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2,000k
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1997
1998
1999
2000
2001
2002
2003
2004
Watershed
Trib Passage
Nat Prod
Art Prod

ProjectID	Title	Sponsor	FY99 recom.	FY00 recom.	Estimated Outyears FY01	FY02	FY03	FY04

Anadromous Fish Projects

ProjectID	Title	Sponsor	FY99 recom.	FY00 recom.	FY01	FY02	FY03	FY04
20017	Restore Habitat Within Dredge Tailings on the Yankee Fork Salmon River	SBT, IDFG, USFS		65	900	500	500	500
20032	Protect Bear Valley Wild Salmon, Steelhead, Bull Trout Spawning Habitat	SBT & IDFG		310	0	0	0	0
20079	Assessing Adult Steelhead Escapement & Genetics in the South Fork Salmon	NPT		175	260	268	276	0
8909800	* Idaho Supplementation Studies	IDFG	906	974	975	975	985	990
8909801	* Evaluate Salmon Supplementation in Idaho Rivers (ISS)	USFWS-IFRO	147	130	140	140	140	140
8909802	* Evaluate Salmon Supplementation Studies in Idaho Rivers	NPT	339	377	390	400	410	420
8909803	* Evaluate Salmon Supplementation Studies in Idaho Rivers	SBT	226	228	230	235	240	245
9005500	Steelhead Supplementation Studies in Idaho Rivers	IDFG	258	408	273	281	289	297
9102800	* Monitoring Smolt Migrations of Wild Snake River Sp/Sum Chinook	NMFS	275	325	325	350	350	350
9107100	* Snake River Sockeye Salmon Habitat and Limnological Research	SBT	405	427	451	460	467	467
9107200	*†Redfish Lake Sockeye Salmon Captive Broodstock Program	IDFG	680	680	680	680	680	680
9107300	*†Idaho Natural Production Monitoring and Evaluation	IDFG	732	768	838	872	907	943
9202603	Idaho Model Watershed Administration/Implementation Support	SCC	175	185	200	200	200	200
9204000	*†Redfish Lake Sockeye Salmon Captive Broodstock Rearing and Research	NMFS	500	475	525	550	575	600
9306200	Salmon River Anadromous Fish Passage Enhancement	LSWCD, CSWCD	100	100	100	100	100	100
9401500	Idaho Fish Screen Improvement - O&M	IDFG	1,000	1,000	1,000	1,000	500	500
9401700	Idaho Model Watershed Habitat Projects	LSWCD, CSWCD	400	400	400	400	400	400
9405000	Salmon River Habitat Enhancement M&E	SBT	257	245	240	240	225	210
9600700	Irrigation Diversion Consolidations & Water Conservation; Upper Salmon R	LSWCD	446	293	250	250	0	0
9604300	Johnson Creek Artificial Propagation Enhancement Project	NPT	1,300	2,800	725	735	745	755
9606700	† Manchester Spring Chinook Broodstock Project	NMFS	450	450	525	550	575	600
9700100	† Captive Rearing Initiative for Salmon River Chinook Salmon	IDFG	145	546	450	470	1,500	1,200
9703000	* Monitor Listed Stock Adult Chinook Salmon Escapement	NPT	160	156	160	157	157	157
9703800	*†Preserve Listed Salmonid Stocks Gametes	NPT	161	185	180	182	184	186
9705700	Salmon River Production Program	SBT	220	931	350	385	424	465
9901900	Restore the Salmon River, in the Challis, ID area, to a Healthy Condition	Custer Co	100	50	50	25	25	0
9902000	Analyze the Persistence and Spatial Dynamics of Snake River Chinook Salmon	RMRS	50	50	106	108	110	0
		Anadromous Fish Totals		**$12,735**	**$10,723**	**$10,513**	**$10,964**	**$10,405**
		SUBBASIN TOTALS		**$12,735**	**$10,723**	**$10,513**	**$10,964**	**$10,405**

* indicates ESA project, † indicates 'Innovative work'
All figures in thousands of dollars

Needed Future Actions

Anadromous Fish

Steelhead/redband trout interactions.
GIS mapping of subbasin, incorporating species utilization, habitat quality, presence/absence and fish density information, among others.

Determine critical rearing areas for chinook salmon and steelhead fall emigrants.
Investigate the feasibility and reintroduce sockeye in Warm Lake if deemed feasible (SBT and NPT).

Resident Fish

Much work is needed to be done for resident fish in the Salmon Subbasin as no directed resident fish work has been funded to date under the authority of the NWPPC Fish and Wildlife Program. There is work to be done on virtually all strategies identified by the fishery managers to accomplish the specific resident fish objectives described above.

Actions by Others

USCOE needs to implement the Lower Snake River alternative path that provides the greatest assurance of recovery and restoration of ESA listed anadromous stocks. At the time of this writing, the PATH group has identified the natural river option as the alternative that would best provide this assurance.

USFS/BLM improved management of riparian land use.

Encourage private landowners to engage in cooperative habitat restoration activities.

Wildlife populations would benefit if land throughout the subbasin were managed for increased Ecological Integrity Ratings.

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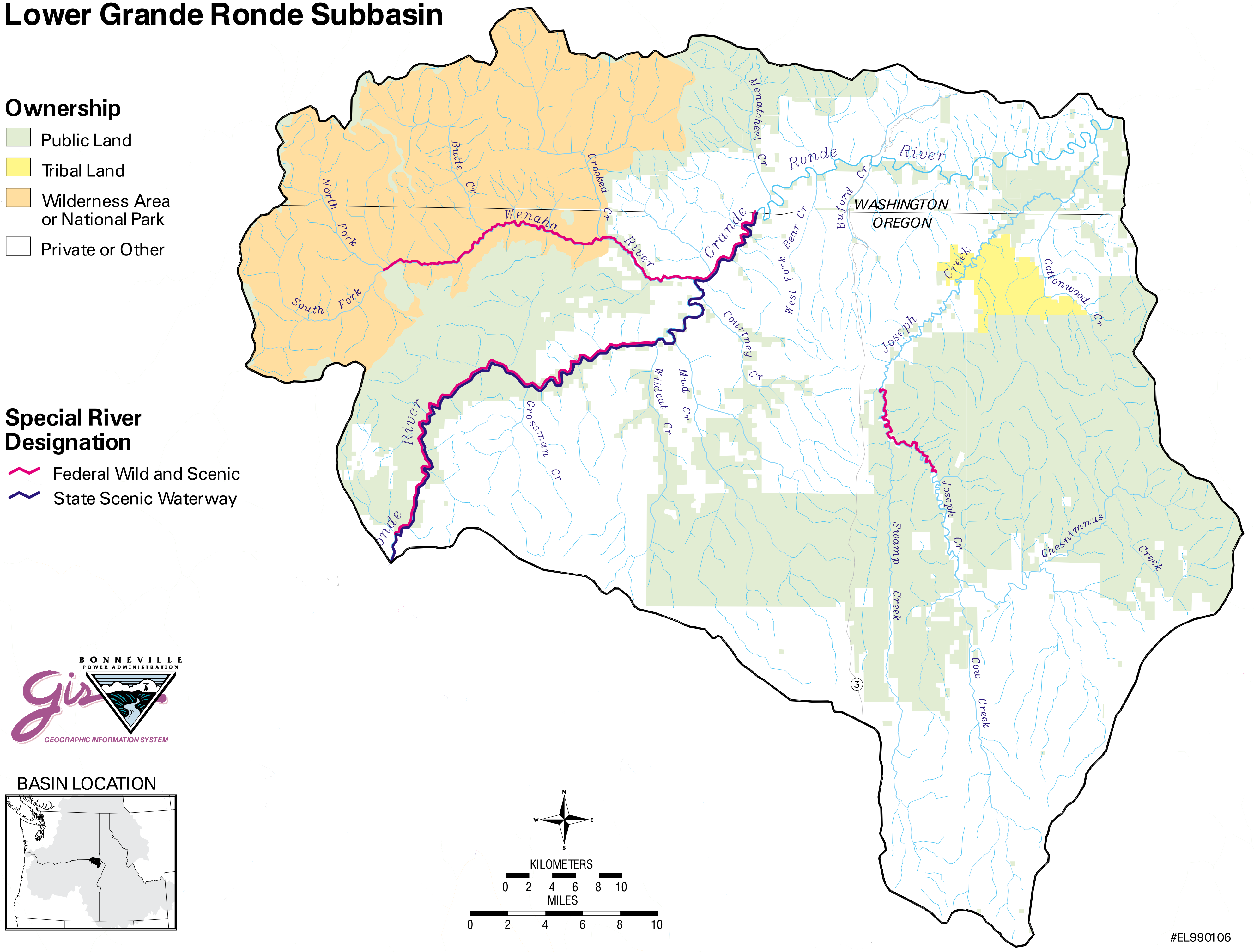
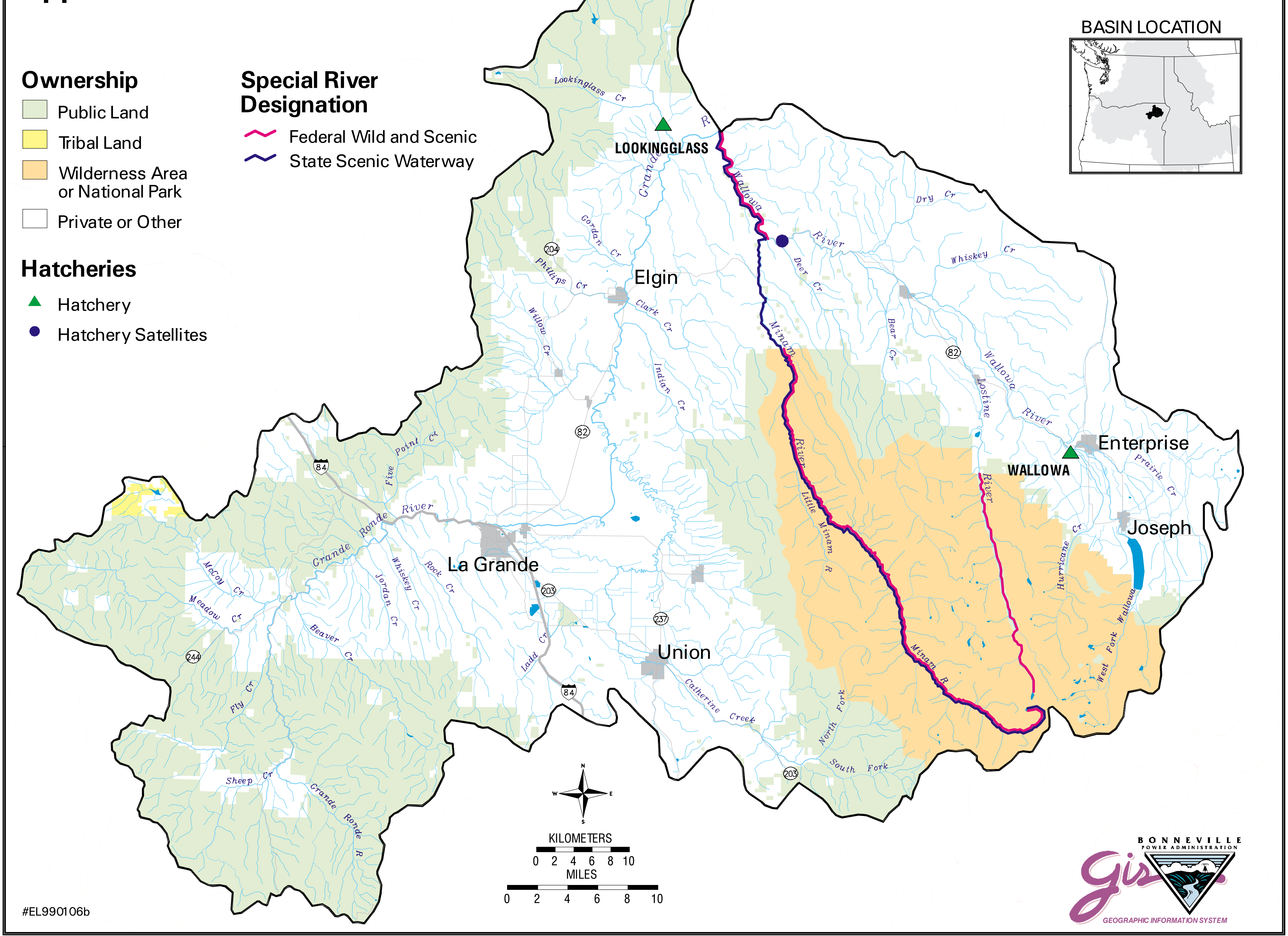
Lower Grande Ronde Subbasin



Upper Grande Ronde Subbasin



Grande Ronde Subbasin

Anad fish	12	projects	$5,167
Wildlife	3		422
	15		$5,589

Fish and Wildlife Resources

Subbasin Description

The Grande Ronde River Subbasin drains an area 4,070 square miles in northeast Oregon (Figure 1). Headwaters of the Grande Ronde River originate in the Blue and Wallowa mountains in National Forest lands and flows through forested plateaus and then into the valley floor. The river flows 212 miles from the headwaters in the Blue Mountains to its confluence with the Snake River at RM 168.7. The Wenaha, Minam and Lostine Rivers, and Catherine Creek are major tributaries in the subbasin. However, numerous other tributaries are important to salmonid production. The headwaters of the Wallowa, Lostine and Minam Rivers and Catherine Creek originate in the Eagle Cap Wilderness Area in the Wallowa-Whitman National Forest. The Grande Ronde River valley located between the Blue and Wallowa Mountains, covers approximately 360 square miles. The Wallowa River valley is adjacent to the north slope of the Wallowa Mountains and covers approximately 250 square miles. The valley land is privately owned and is used extensively for agricultural production. Gradient of the river is steep in the headwaters and becomes moderate through the valleys. Stream flow patterns in the Grande Ronde Subbasin originate primarily as snowmelt, and are similar to most northeast Oregon streams. Maximum flows typically occur in the spring and minimum flows occur in August or September. Average annual discharge at Troy (RM 45) is 3,107 cfs.

The U. S. Forest Service (USFS) manages about 45 percent of the land in the subbasin. Both the Wallowa-Whitman and Umatilla National Forests cover parts of the subbasin. Most USFS land is managed for timber, grazing, and recreation. Agriculture is the most important economic enterprise in the subbasin, with thousands of acres of privately owned irrigated cropland. Historically, the timber industry was a very important economic enterprise in the subbasin. La Grande, Oregon, is the largest town within the subbasin.

Fish and Wildlife Status

Anadromous Fish

Spring Chinook **-** Natural spawning occurs in the Wenaha, Wallowa, Minam, Lostine, and upper Grande Ronde Rivers and in Bear, Hurricane, Prairie, Sheep, Lookingglass (currently restricted to below the hatchery), Indian and Catherine Creeks. These populations are listed under the ESA as threatened. Escapement in the last five years has been so low that a captive brood program was initiated for the Catherine Creek, Lostine and upper Grande Ronde Rivers. The management intent for hatchery programs is for supplementation of natural production where biologically justified, using locally adapted brood stock.

Fall Chinook **-** A remnant population spawns in the lower Grande Ronde. This population is listed under the ESA as threatened. One pair spawned in lower Joseph Creek in 1998. The management intent is currently for natural production, although a hatchery supplementation program is being considered in the master planning process.

Summer Steelhead **-** Naturally spawning Group A run steelhead are found throughout the subbasin. Grande Ronde steelhead were listed as threatened under the ESA. Available spawning ground survey data indicate that escapement to the subbasin has decreased substantially in the last 20 years. Up to 90 percent of steelhead observed in ODFW creel census were of hatchery origin. The management intent for hatchery programs is for supplementation of natural production where biologically justified, using locally adapted brood stock.

Coho – Historically, naturally spawning coho were recorded in the Wenaha, Wallowa, Minam, and Lostine Rivers and in Catherine, Prairie, and Spring Creeks. The coho were declared extinct in the Snake Basin in 1986. Reintroduction is being considered in the master planning process.

Sockeye **-** Formerly, sockeye spawned in the tributaries of Wallowa Lake. They were extirpated in 1905 because of poor hatchery practices. Rebuilding of the irrigation dam to its present height in 1916 precluded possible adult returns from ascending to the lake. Reintroduction is being considered in the master planning process.

Table 1. Naturally Spawning Salmon Populations in the Grande Ronde Subbasin.

Stock	Population	Mgmt Intent
ChS	Wenaha	N
ChS	Lookingglass Cr. (above hatchery)	N
ChS	Minam R.	N
ChS	Indian Cr.	S
ChS	Bear, Hurricane, Wallowa,	S
ChS	Lostine R.	S
ChS	Catherine Cr.	S
ChS	Upper Grande Ronde R.	S
ChF	Lower Mainstem	S
StS(A)	Joseph Cr.	N
StS(A)	Widespread	S

N - Natural spawning without hatchery supplementation
S - On-going supplementation of naturally spawning populations

Resident Fish

Bull trout - Found in upper reaches of the Wenaha, Minam, Lostine, parts of the upper Grande Ronde Rivers, and Bear, Deer, Hurricane, Indian, and Catherine creeks in the summer, and throughout the subbasin during the winter. Bull trout populations have diminished in size, although no historic information is available to document a decreased distribution in the Grande Ronde River subbasin, with the exception of the extirpation of bull trout from Wallowa Lake in the 1950s. It was estimated, however, that greater than 75 percent of populations in the Grande Ronde Subbasin have moderate to high risk of extinction or are probably extinct (Buchanan et al. 1999). Bull trout were listed as “threatened” under the Federal ESA in 1998. Bull trout populations have been impacted negatively by over harvest, habitat degradation, and interactions with introduced brook trout (Buchanan et al. 1997).

Redband trout - Widely dispersed and, in some places, locally abundant.

Wildlife

A variety of wildlife species, including upland game birds, waterfowl, fur bearers, big game, raptors, neo-tropical migrant song birds, reptiles and amphibians, are associated with the Grande Ronde Subbasin terrestrial and aquatic habitats. Many populations have been impacted by habitat loss and degradation, human development, and hydrosystem and other out-of-basin effects. The status of wildlife populations varies throughout the subbasin and by species. Shrub Steppe wildlife assemblages are in a state of decline due to loss of habitat. Many wildlife species are listed as Federal or State Threatened, Endangered, Sensitive (TES), or Species of Special Concern, including bald eagles, peregrine falcons, Canadian lynx, Pacific fisher and American marten. Big game, upland game bird, and waterfowl species are monitored by federal, state, and tribal managers to set harvest seasons and bag limits. Many raptors (e.g., golden eagle, American kestrel, prairie falcon) occur in the subbasin. Beaver, otter, mink, and muskrat occur along the Grande Ronde and its tributaries. Bighorn sheep have been reintroduced in the subbasin.

Table 2. Production Program Description

Stock	Mgmt Intent	Initial Broodstock	Operating Broodstock	Adult Collection & Holding	Central Facility (Incubation & Rearing)	Acclimation &/or Release Sites	Status	Funding
ChS	Harvest Mitigation	Rapid River	Lookingglass	Lookingglass	Lookingglass Hatchery	Hatchery, Lookingglass Cr.	On-going	LSRCP
ChS	Supplemt	Catherine Cr.	Catherine Cr.	Catherine Cr./ Lookingglass H.	Lookingglass H	Catherine Cr. Facility	On-going	LSRCP
ChS	Captive Brood	Catherine Cr.	Catherine Cr.	Catherine Cr./ Lookingglass H.	Lookingglass H./Manchester Marine/Bonneville (fw)	Catherine Cr. Facility	On-going	NWPPC
ChS	Captive B/ Supplemt	Lostine & Bear Cr.	Lostine Cr.	Lostine Cr./ Lookingglass H.	Lookingglass H./Manchester Marine/Bonneville (fw)	Lostine Cr. Facility	On-going	NWPPC
ChS	Captive B/ Supplemt	Upper Grande Ronde	Upper Grande Ronde	Upper Grande Ronde/ Lookingglass	Lookingglass H./Manchester Marine/Bonneville (fw)	Upper Grande Ronde facility	On-going	NWPPC
StS(A)	Harvest Mitigation	Snake (Lookingglass & Pashimeroi)	Wallowa	Big Canyon & Wallowa H	Wallowa H./Irrigon H.	Wallowa, Big Canyon - direct Catherine Cr. & Upper Grande Ronde - direct	On-going	LSRCP
StS(A)	Harvest Mitigation	Snake (Lookingglass & Pashimeroi)	Cottonwood	Cottonwood	Lyons Ferry	Cottonwood	On-going	LSRCP
Coho	Supplemt	Early			Discussion	Multiple	Discussion	NWPPC
Sockeye		Wenatchee			Discussion	Wallowa Lake	Discussion	NWPPC

Habitat Areas and Quality

Joseph Creek and tributaries: logging, grazing and development have damaged riparian areas in the lower parts of the watershed; logging, grazing and road building have damaged riparian and upland areas in the upper parts of the watershed. These activities have resulted in substantial sedimentation and high water temperatures. A portion of the mid-reach of Joseph Creek on the Wallowa-Whitman National Forest is protected as federal Wild and Scenic River.

Lower Mainstem (downstream from the confluence with the Wallowa): High sedimentation and summer temps, and low summer flows reduce spawning and rearing success. The lower Grande Ronde, from the Oregon State line to its confluence with the Wallowa, is designated as a federal Wild and Scenic River.

Wallowa: Irrigation withdrawals and channelization have reduced available habitat. Agricultural return flows, agricultural pollutants and feed lot runoff degrade water quality. Logging, grazing and development have damaged riparian areas in the Wallowa Valley; logging, grazing and road building have damaged riparian and upland areas in the upper parts of the watershed. This results in sedimentation and elevated water temperatures. Whiskey, Lower Hurricane, and Prairie Creeks are severely degraded, and habitat needs stabilization and improvement. Some of the upper Bear and Hurricane Creek watersheds remain undisturbed. The Wallowa is designated as a federal Wild and Scenic River from Minam to its confluence with the Grande Ronde.

Wenaha: Logging, grazing and development have damaged some riparian areas in the lower parts of the watershed, but most of the watershed drains wilderness areas. The Wenaha is protected as a federal Wild and Scenic River.

Minam: Logging, splash damming, grazing, and development have damaged riparian areas. The Minam is protected as a federal and state Wild and Scenic River and lies primarily within the Eagle Cap Wilderness Area.

Lostine: Logging, grazing, channelization, water withdrawal, migration blockages from dewatering, and development have damaged riparian areas and in-stream habitat in the lower parts of the watershed, while the upper watershed drains wilderness areas above anadromous fish access. The Lostine is designated as a federal Wild and Scenic River within the forest boundary.

Lookingglass: Logging, grazing and road development have damaged riparian areas in the lower parts of the watershed. Upper Lookingglass Creek is in relatively good condition for a non-wilderness area.

Catherine: Logging, grazing, water withdrawals, channelization and development have damaged riparian areas in the lower parts of the watershed; logging, grazing and road building have damaged riparian and upland areas in the upper parts of the watershed. This results in severe sedimentation, extreme high water temperatures, and extreme low flow conditions below the town of Union.

Upper Grande Ronde (upstream from the confluence with the Wallowa) & tributaries: Logging, grazing, water withdrawals, channelization, and development have damaged riparian areas in the lower parts of the watershed. Past mining has negatively effected several upper Grande Ronde tributaries. The construction of the State Ditch replaced 29 miles of meandering river with 10 miles of straight ditch (Thompson and Haas 1960). Habitat in Meadow, McCoy and McIntyre Creeks is severely degraded and needs stabilization and improvement. Habitat quality in Jordan and Bear Creeks, and lower portions of Spring Creek are poor and habitat needs improvement. The mainstem Grande Ronde River (Hilgard to Elgin) has been degraded (splash dams and severe channelization). Some areas (East Fork Grande Ronde, Lookout, East Fork Sheep, Chicken, and upper Limber Jim creeks) are still relatively undisturbed above Vey Meadows and should be protected.

The Natural Heritage Program maintains a database on habitats and species occurrences throughout the State of Oregon. The Oregon Trust Agreement Planning Project (BPA 1993) and Oregon GAP Analysis Project (ODFW 1997) identified gaps in bio-diversity and needs for terrestrial habitat restoration, and resulted in a prioritized list of potential habitat restoration opportunities within the Grande Ronde Subbasin. The GAP Analysis Project found that of the current land base within the Grande Ronde Subbasin, 52 percent is in a low protected status for wildlife, 33 percent is in a moderate protected status for wildlife, and 15 percent is in a high protected status for wildlife. These include wilderness areas, wildlife management areas and wild & scenic designated river reaches (see Map). The

4,400 acre ODFW Wenaha Wildlife Management Area in the Wenaha River watershed is managed for Rocky Mountain elk, bighorn sheep, and deer. The ODFW Ladd Marsh Wildlife Management Area in the Catherine Creek watershed is managed for waterfowl and other wetland species.

Table 3. Key habitat areas

Watershed	Spawning Populations (Mgmt Intent)
Lower Mainstem	ChF (N) StS (N)
Joseph Cr.	
Wenaha R.	ChS (N), StS (N), BT
Minam R.	ChS (N?), StS (N?), BT
Lostine R.	ChS (S), StS (S), BT
Lookingglass Cr. (above hatchery)	ChS (N), StS (S)
Catherine Cr.	ChS (S), StS (S), BT
Upper Grande Ronde	ChS (S), StS (S), BT
Indian Cr.	ChS (S?), StS (S), BT
Bear, Hurricane Cr.	ChS (S?), StS (S), BT
Wallowa R. & L.	StS (S)

Watershed Assessment

Numerous projects and reports have been initiated to characterize the state of Grande Ronde Subbasin natural resource features, including fish and wildlife habitat. The USFS has completed Watershed Analyses for the Upper Grande Ronde/Meadow Creek (USFS 1995a), Beaver Creek (USFS 1998), and Spring Creek/Five Points (USFS 1995b) drainages. These analyses include descriptions of the watersheds' past and current conditions, identifies land ownership, topography, existing trail systems, transmission corridors, soil types, designated wetlands, vegetation communities, fish communities, stream channel condition, and stream cover types and condition. A watershed analysis of Catherine Creek is scheduled for completion in 1999.

Other projects documented watershed conditions in the Grande Ronde Subbasin, but mostly with a narrower focus (e.g. riparian conditions or salmon spawning and rearing habitat).

These and other documents listed in the References section were used to develop habitat plans for several areas to sequence and prioritize needed habitat repairs: Bear Creek Action Plan; Upper Grande Ronde Habitat Protection, Restoration and Monitoring Plan; Wallowa County/Nez Perce Tribe Habitat Recovery Plan; and, Grande Ronde Model Watershed Program Operation/Action Plan. The Model Watershed Council is functioning as the clearinghouse and coordination point for most of the habitat restoration in the Grande Ronde Subbasin.

Limiting Factors

Fish

The development and operation of the hydropower system in the Snake and Columbia Basins has resulted in substantial reductions in anadromous and resident fish populations due to both upstream and downstream migration effects, and the loss of habitat and food resources.

In-basin resource problems include interrelated water quantity and quality problems (e.g. low flows, sedimentation, high temperatures, and pollutants) in many areas outside of wilderness areas. These problems resulted in poor incubation and survival during juvenile rearing and migration. Riparian degradation and channelization has reduced habitat available for adult holding and juvenile rearing in most reaches outside of wilderness areas. Severe water quantity, quality, and sediment problems reduce the success of spawning. These problems have caused major habitat fragmentation and resulting poor connectivity. Combined with out-of-subbasin problems (e.g. Columbia and Snake mainstem passage), these problems have lead to the extirpation of sockeye and coho, and reduced populations of spring and fall Chinook, summer steelhead, bull trout, and other resident fish. This has caused greatly reduced natural production and harvest opportunities.

Wildlife

Degradation of riparian areas and subsequent loss of riparian vegetation cover has reduced riparian ecosystem function, water quality, and habitat for many aquatic and terrestrial species. Expansion of agricultural and urban areas on non-federal lands has reduced the extent of some rangeland potential vegetation groups, most notably dry grasslands, dry shrub lands, and riparian areas. Changes in some of the remaining habitat due to fragmentation, exotic species, disruption of natural fire cycles, overuse by livestock, and loss of native species diversity have contributed to a number of species declines. Increasing density of woody species (e.g., sage brush, juniper, ponderosa pine, lodgepole pine, and Douglas-fir), especially on dry grasslands and cool shrub lands, has reduced herbaceous understory and biodiversity. Cheatgrass has taken over many dry shrub lands, increasing soil erosion and fire frequency and reducing biodiversity and wildlife habitat. Increased fragmentation and loss of connectivity between blocks of habitat, especially in Shrub Steppe and riparian areas, have isolated populations and reduced the ability of plant and animal populations to move across the landscape, resulting in long-term loss of genetic interchange.

Subbasin Management

Goals, Objectives and Strategies

Fish

The goal for anadromous species is to restore sustainable, naturally producing populations to support tribal and non-tribal harvest, cultural, and economic practices while protecting the biological integrity and the genetic diversity of species in the watershed.

To address the problems discussed above and to achieve this goal, the co-managers have adopted the following outcome-based objectives: 1) improve adult and juvenile migration success in the Columbia and Snake River mainstem; 2) improve adult holding and spawning success, and juvenile incubation, and rearing survival within the subbasin.

Strategies to achieve the first objective, to improve mainstem migration success, are discussed the Mainstem Subbasin Summary.

Strategies to achieve objective 2 focus on two general approaches: those improving habitat quality and reducing mortality; and, those involving the use of hatcheries to release additional genetically-appropriate salmon to compensate for reduced survival. Both strategic approaches are integrated in a comprehensive watershed-based restoration program incorporating habitat restoration, hatchery production, research, monitoring and evaluation.

Habitat restoration focuses on intervention to reduce sources of mortality in the short-term and the enhancement and protection of riparian functions to maintain instream improvements. Habitat restoration is directed at:

- Improving water quality (temperature, sediment and pollutants) with riparian protection and enhancement actions, runoff controls, and road elimination or improvements;
- Improving water quantity (instream volume and timing) with improved irrigation practices and purchase of instream water rights; and,
- Improving instream structure (pools and passage) with placement of structures and large woody material, removal of channelization, passage improvements at water withdrawals.

Hatchery use focuses on production and release of salmon from local brood stock to compensate for reduced survival.

- Captive brood stock techniques are used to prevent extinction and maintain genetic diversity of natural populations during periods of extremely low escapement.
- Supplementation is used to release juveniles of local brood stock to increase numbers of adults returning to spawning areas.
- Conventional hatchery techniques are used to bolster returns of populations at low to moderate escapements.

Research, monitoring and evaluation are important aspects of these strategies. Research focuses on addressing critical questions associated with selecting future management actions. Monitoring and evaluation will address the performance of these actions in meeting the goals of restoring natural populations and providing for harvest opportunities. Program changes will be made through an adaptive management framework of identifying expectations and monitoring results.

Resident Fish

No resident fish specific projects have been done in the Grande Ronde Subbasin under the NWPPC Program, nor have the managers set resident fish objectives to guide NWPPC Program implementation. However, strategies addressing anadromous fish objectives, especially those focussing on habitat issues, also benefit resident fish species.

Wildlife

The wildlife mitigation objective under the NWPPC Program is to restore and maintain wildlife populations native to the Grande Ronde Subbasin. The general strategic approach is to protect and enhance habitat. The managers use the following strategies to achieve the wildlife objective:

- Identify potential projects within the Grande Ronde Subbasin through the GAP Analysis and coordinate implementation of activities among Oregon and Washington wildlife managers;
- Implement land acquisition and easements of priority habitats, particularly riparian/riverine, wetlands and native grass/shrublands;
- Implement enhancement and restoration activities (e.g., control of non-native plant species and manage livestock grazing to benefit native plant communities); and,
- Monitor and evaluate habitat and species response to enhancement activities.

Past Efforts

BPA has funded specific actions (projects) under the NWPPC Program to carry out the strategies identified above (see previous section on Goals, Objectives and Strategies). The Grande Ronde subbasin has had a model watershed program since 1992 with an active, community-based watershed council and staff. Administration, coordination and planning support for habitat enhancement work are funded under the *Grande Ronde Model Watershed Program* (Project No. 9202601), the *Grande Ronde Model Watershed Program Habitat Project Implementation* (Project No. 9402700), and the *Wallowa Basin Project Planner* (Project No. 9403900) and has resulted in a number of publications (see References). Wildlife mitigation planning (GAP analysis) has been done under Project Nos.

Under the auspices of these projects, other contracts for habitat enhancement have been carried out, including: the *Protection and Enhancement of Anadromous Fish Habitat in the Grande Ronde Basin Streams* (Project No. 8402500*); CTUIR Grande Ronde Basin Watershed Restoration Project* (Project No. 9608300); and the *Implementation of the Wallowa County/Nez Perce Tribe Salmon Habitat Recovery Plan* (Project No. 9702500). Efforts have been concentrated in areas to benefit naturally spawning populations in the Lostine, Wallowa, Bear, Hurricane, Indian, Minum, upper Grande Ronde, and Catherine watersheds. Results of these recent efforts include miles of riparian fencing, _ miles of stream treated with more than _ instream structures; _ miles of road closures or obliteration; _ miles of road improvements for sediment reduction; and _ off-stream livestock water developments. More than _ additional habitat enhancement projects have been completed in Wallowa County. In addition, more than _ diversions have been screened and adult passage problems corrected at _ diversions. As a result virtually all water diversions in the Grande Ronde Subbasin have adequate passage. Earlier habitat improvement projects carried out under the NWPPC Program focused on public lands, particularly US Forest Service-managed lands in Joseph Creek watersheds.

The Oregon Wildlife Coalition (including ODFW, CTUIR, CTWSIRO and BPT) has undertaken two projects in the Grande Ronde Subbasin identified through the OTAP Gap analysis (Project No.9208400 and 9606600). These projects protect priority wetland and native grass/shrubland habitat. By acquiring lands adjacent to existing protected lands (WMAs), the managers avoid habitat fragmentation, add protection to the core lands, and reduce O&M costs.

The Oregon Wildlife Coalition is acquiring and enhancing 470 acres adjacent to the ODFW Ladd Marsh Wildlife Management Area (*Securing Wildlife Mitigation Sites - Ladd Marsh WMA Additions*, Project No. 20114). The

Nature Conservancy (TNC) currently holds title to a property adjacent to the Wildlife Area. The proposal to reimburse TNC for acquisition costs and then for ODFW to restore wetland habitats on the project site was approved for FY 1999 BPA funds. Another Oregon Wildlife Coalition project (*Securing Wildlife Mitigation Sites – Wenaha WMA Additions*, Project No. 20112) was also approved for FY 1999 funds. This project will acquire or ease private lands adjacent to the ODFW Wenaha Wildlife Management Area. Landowner negotiations have begun. In addition, the Nez Perce Tribe purchased more than 1500 acres on Joseph Creek (Project No. 9608000) and is managing it for fish and wildlife benefit.

Hatchery production is managed under two integrated programs. Lookingglass Hatchery, built under the Lower Snake River Compensation Plan (LSRCP) and operated by ODFW, was designed to produce spring chinook (0.9 million smolts), for release at the facility on Lookingglass Creek and Grande Ronde River tributaries. Previously, Carson and Rapid River stocks were used as brood with juveniles and adults released at several locations. Local chinook brood stocks have been under development since 1995. Release of Rapid River stock has been curtailed as brood fish from upper Grande Ronde and Lostine Rivers and Catherine Creek have become available.

Table 4. Current hatchery programs in the Grande Ronde Subbasin.

Stock	Mgmt Intent	Initial Brood	Operating Brood	Central Facility	Acclimation/Release Sites	Status	Program
ChS	Harvest Mitigation	Carson/Rapid River	Lookingglass	Lookingglass Hatchery	Hatchery, Lookingglass Cr.	On-going	LSRCP
ChS	Captive B/ Supplemt	Catherine Cr.	Catherine Cr.	Lookingglass H./Manchester Marine/Bonneville (fw)	Catherine Cr. Facility	On-going	NWPPC
ChS	Captive B/ Supplemt	Lostine & Bear Cr.	Lostine Cr.	Lookingglass H./Manchester Marine/Bonneville (fw)	Lostine Cr. Facility	On-going	NWPPC
ChS	Captive B/ Supplemt	Upper Grande Ronde	Upper Grande Ronde	Lookingglass H./Manchester Marine/Bonneville (fw)	Upper Grande Ronde facility	On-going	NWPPC
StS(A)	Harvest Mitigation	Snake (Lookingglass & Pashimeroi)	Wallowa	Wallowa H./Irrigon H.	Wallowa, Big Canyon - direct Catherine Cr. & Upper Grande Ronde - direct	On-going	LSRCP
StS(A)	Harvest Mitigation	Snake (Lookingglass & Pashimeroi)	Cottonwood	Lyons Ferry	Cottonwood	On-going	LSRCP
Coho	Discussion	Early	Discussion	Discussion	Multiple	Discussion	NWPPC
Sock-eye	Discussion	Wenatchee	Discussion	Discussion	Wallowa Lake	Discussion	NWPPC

BPA has funded additional facilities and their operation under the NWPPC Program. Fish production projects to support and augment natural production included modifications of Lookingglass Hatchery to accommodate separate brood stocks. The co-managers used funds from *the Northeast Oregon Hatchery Master Plan* (Project No. 8805301), and the *Northeast Oregon Hatchery Planning and Implementation Project* (Project 8805305) to plan and build additional adult collection and juvenile acclimation facilities on the Lostine and upper Grande Ronde Rivers and Catherine Creek. Operation and maintenance are funded under the *Northeast Oregon Hatcheries Planning and Implementation Project* (Project No. 8805305), the *Grande Ronde Supplementation – O&M / M&E - Nez Perce Tribe Lostine Project* (Project No. 9800702), and *Facility O&M and Program M&D for Grand Ronde Spring Chinook Salmon* (Project No. 9800703). Captive broodstock production and supplementation of Grande Ronde stocks was also funded under the *Grande Ronde Basin Spring Chinook Captive Broodstock Program* (Project No. 9801001) and (Project No. 9801006). These projects rebuilt portions of the Bonneville Hatchery (below Bonneville Dam) for the freshwater rearing and funded saltwater rearing at the Manchester Marine Lab on Puget Sound. The managers have collected juvenile spring chinook from Catherine Creek, upper Grande Ronde and Lostine Rivers from four brood years (1994-1997), collected and spawned adults, and are rearing the progeny to adulthood as captive brood stock. In addition the managers have collected and spawned adults from these populations, reared the juveniles at Lookingglass Hatchery and released the progeny in their natal streams in a conventional supplementation program.

The Irrigon (1.35 million smolts) and Lyons Ferry (50,000 smolts) facilities produced steelhead under LSRCP for release in the Grande Ronde. Juveniles were released at Wallowa hatchery and Big Canyon (OR) adult traps and at Cottonwood (WA) acclimation ponds. Recently, Wallowa brood stock (originating from trapping at Ice Harbor and Little Goose dams) was trapped at Wallowa Hatchery and Big Canyon (OR) adult traps. Planning for development of local steelhead brood stock was initiated in 1999. Prior to 1982, brood stocks included Skamania, Chelan (Priest Rapids), Chelan (Wells), Snake River (Oxbow), and Pashimeroi. Previously, a portion of smolt releases were unacclimated stream releases.

Research, Monitoring and Evaluation

The *Life History of Spring Chinook Salmon and Summer Steelhead Project* (Project No. 9202604) provided a description of the life history characteristics of naturally produced fish, identified limiting factors, estimated juvenile production, and documented juvenile habitat preference. Monitoring and evaluation of supplementation impacts on genetic characteristics was funded under the project to *Monitor and Evaluate Genetic Characteristics of Supplemented salmon and Steelhead* (Project No. 8909600). Monitoring and evaluation occurred under the *Northeast Oregon Hatcheries Planning and Implementation Project* (Project No. 8805305), the *Grande Ronde Supplementation – O&M / M&E - Nez Perce Tribe Lostine Project* (Project No. 9800702), and *Facility O&M and Program M&D for Grand Ronde Spring Chinook Salmon* (Project No. 9800703).

Monitoring the success of the captive brood program in producing Chinook progeny was funded under the *Grande Ronde Basin Spring Chinook Captive Broodstock Program* (Project No. 9801001), the (Project No. 9801006), and the *Facility O&M and Program M&D for Grand Ronde Spring Chinook Salmon* (Project No. 9800703).

Success of the captive brood and conventional hatchery programs were also evaluated in terms of adult returns and increases in natural production of juvenile and adults. Funding was obtained from the *Grande Ronde Basin Spring Chinook Captive Broodstock Program* (Project No. 9801001), the (Project No. 9801006), the *Facility O&M and Program M&D for Grand Ronde Spring Chinook Salmon* (Project No. 9800703), *the Wallowa Basin Project Planner* (Project No. 9403900), and the *Northeast Oregon Hatchery Master Plan* (Project No. 8805301). Lower Snake Compensation Plan and Forest Service personnel participate in the spawning ground surveys. Smolt monitoring was conducted under the *Life History of Spring Chinook Salmon and Summer Steelhead Project* (Project No. 9202604).

Monitoring of fish health in captive brood and conventional hatchery programs ensured minimal loss to disease. The *Northeast Oregon Hatcheries Planning and Implementation Project* (Project No. 8805305) and the LSRCP provided funding for fish health monitoring.

Specific actions (projects) are funded under BPA to address identified strategies that are deemed critical for accomplishing the objectives in an attempt to achieve the goals (see earlier section on Goals, Objectives and Strategies). These projects included administration, coordination and planning support for habitat enhancement work under the *Grande Ronde Model Watershed Program* (Project No. 9202601), the *Grande Ronde Model Watershed Program Habitat Project Implementation* (Project No. 9402700), and the *Wallowa Basin Project Planner* (Project No. 9403900). Under the auspices of these projects, other contracts for habitat enhancement implementation projects were agreed to, including: *the Protection and Enhancement of Anadromous Fish Habitat in the Grande Ronde Basin Streams* (Project No. 8402500*); CTUIR Grande Ronde Basin Watershed Restoration Project* (Project No. 9608300); and the *Implementation of the Wallowa County/Nez Perce Tribe Salmon Habitat Recovery Plan* (Project No. 9702500).

Production projects to support and augment natural production included Lookingglass Hatchery and satellite facilities, which were built and operated with LSRCP funds. The co-managers used funds from *the Northeast Oregon Hatchery Master Plan* (Project No. 8805301), and the *Northeast Oregon Hatchery Planning and Implementation Project* (Project No. 8805305) to plan additional adult collection and juvenile acclimation facilities on the Lostine and upper Grande Ronde rivers and Catherine Creek. Operation and maintenance, and monitoring and evaluation, of the captive brood and conventional hatchery programs in producing smolts occurred under the *Northeast Oregon Hatcheries Planning and Implementation Project* (Project No. 8805305), the *Grande Ronde Supplementation –O&M/M&E-Nez Perce Tribe Lostine Project* (Project No. 9800702), and *Facility O&M and Program M&D for Grand Ronde Spring Chinook Salmon* (9800703). Captive broodstock production and supplementation of Grande Ronde stocks was also funded under the *Grande Ronde Basin Spring Chinook Captive Broodstock Program* (Project No. 9801001) and ?(Project No. 9801006). Monitoring and evaluation of supplementation impacts on genetic characteristics was funded under the project to *Monitor and Evaluate Genetic Characteristics of Supplemented Salmon and Steelhead* (Project No. 8909600).

The *Life History of Spring Chinook Salmon and Summer Steelhead Project* (Project No. 9202604) provided a description of the life history characteristics of naturally produced fish, identified limiting factors, estimated juvenile production, and documented juvenile habitat preference.

Monitoring the success of the captive brood program in producing Chinook progeny was funded under the *Grande Ronde Basin Spring Chinook Captive Broodstock Program* (Project No. 9801001), the (Project No. 9801006), and the *Facility O&M and Program M&D for Grand Ronde Spring Chinook Salmon* (Project No. 9800703).

Success of the captive brood and conventional hatchery programs were also evaluated in terms of adult returns and increases in natural production of juvenile and adults. Funding was obtained from *the Grande Ronde Basin Spring Chinook Captive Broodstock Program* (Project No. 9801001), the (Project No. 9801006), the Facility O&M and Program M&D for *Grand Ronde Spring Chinook Salmon* (Project No. 9800703), the *Wallowa Basin Project Planner* (Project No. 9403900), and the *Northeast Oregon Hatchery Master Plan* (Project No. 8805301). Lower Snake Compensation Plan and Forest Service personnel participate in the spawning ground surveys. Smolt monitoring was conducted under the *Life History of Spring Chinook Salmon and Summer Steelhead Project* (Project No. 9202604).

Monitoring of fish health in captive brood and conventional hatchery programs ensured minimal loss to disease. The *Northeast Oregon Hatcheries Planning and Implementation Project* (Project No. 8805305) and the LSRCP provided funding for fish health monitoring.

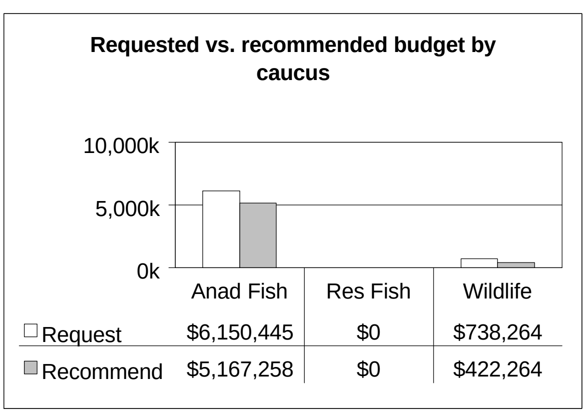
Wildlife surveys and inventories (e.g., big-game aerial surveys) are conducted regularly within the Grande Ronde Subbasin by state, federal, and tribal wildlife managers. Wildlife mitigation projects are habitat based and use the USFWS Habitat Evaluation Procedure (HEP) as a means of tracking project progress. Treatment specific monitoring may also be employed to evaluate methods. Additionally, population monitoring throughout is conducted to address species response to project implementation and for setting of harvest regulations.

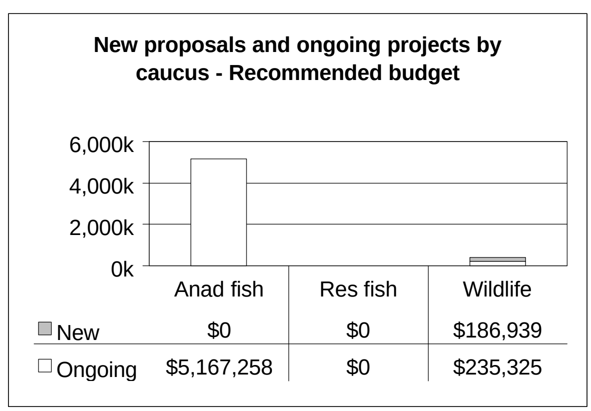
Subbasin Recommendations

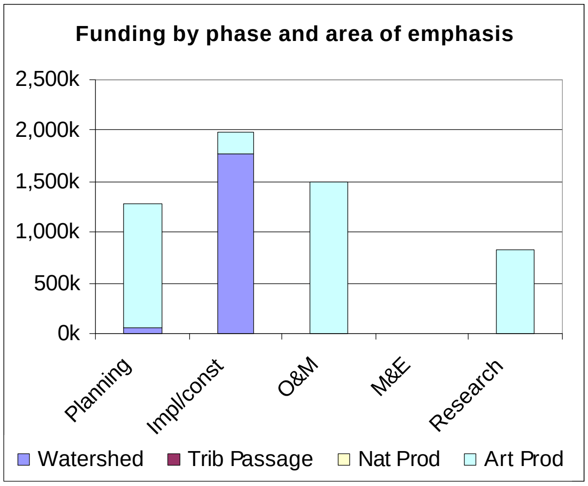
Projects and Budgets

Based on the preceding subbasin description, the CBFWA fish and wildlife managers recommend funding a total of 15 projects at a cost of $5,589,522. Of the projects recommended, 12 focus on anadromous fish, and 3 are directed at wildlife. The managers consider 1 of these projects, for $616,097, to be innovative in technique and application. Another 3 projects support ESA requirements for a total of $1,236,128.

Refer to the following figures for detail on: 1) total recommended and requested budget by caucus, 2) funding for new and ongoing work, 3) funding by project phase and emphasis, and 4) funding by time period (past, current and future). Individual projects are listed in the following table.






Funding by phase and area of emphasis
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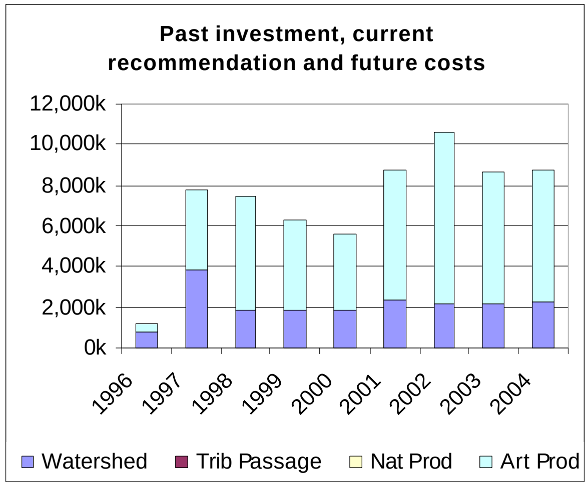
2,000k
1,500k
1,000k
500k
0k
Planning
Impl/const
O&M
M&E
Research
Watershed
Trib Passage
Nat Prod
Art Prod


Past investment, current recommendation and future costs
12,000k
10,000k
8,000k
6,000k
4,000k
2,000k
0k
1996
1997
1998
1999
2000
2001
2002
2003
2004
Watershed
Trib Passage
Nat Prod
Art Prod

ProjectID	Title	Sponsor	FY99 recom.	FY00 recom.	Estimated Outyears FY01	FY02	FY03	FY04
Anadromous Fish Projects								
8402500	Protect and Enhance Anadromous Fish Habitat in Grande Ronde Basin Streams	ODFW	260	273	325	340	355	370
8805301	Northeast Oregon Hatchery Master Plan	NPT	2,300	1,217	3,000	5,000	3,000	3,000
8805305	Northeast Oregon Hatcheries Planning and Implementation - ODFW	ODFW	215	226	600	600	400	400
9202601	Grande Ronde Model Watershed Program	GRMWP	266	930	1,095	1,095	1,095	1,095
9202604	Life History of Spring Chinook Salmon and Summer Steelhead	ODFW	650	700	822	846	872	898
9403900	Wallowa Basin Project Planner	NPT	55	55	61	64	68	71
9608300	Ctuir Grande Ronde Basin Watershed Restoration	CTUIR	180	125	261	274	287	301
9702500	Implement the Wallowa County/Nez Perce Tribe Salmon Habitat Recovery Plan	NPT	40	20	50	50	50	50
9800702	Grande Ronde Supplementation - O&M/M&E - Nez Perce Tribe Lostine	NPT	327	385	450	475	500	500
9800703	* Facility O&M and Program M&E for Grande Ronde Spring Chinook Salmon	CTUIR	323	489	645	697	752	813
9801001	*† Grande Ronde Basin Spring Chinook Captive Broodstock Program	ODFW	493	616	655	688	723	759
9801006	* Captive Broodstock Artificial Propagation	NPT	67	131	155	162	165	170
		Anadromous Fish Totals		**$5,167**	**$8,119**	**$10,291**	**$8,266**	**$8,426**
Wildlife Projects								
20112	Securing Wildlife Mitigation Sites - Oregon, Wenaha WMA Additions	ODFW		42	65	55	45	40
20114	Securing Wildlife Mitigation Sites - Oregon, Ladd Marsh WMA Additions	ODFW		145	283	50	50	30
9608000	Northeast Oregon Wildlife Mitigation Project	NPT	228	235	243	251	259	268
		Wildlife Totals		**$422**	**$591**	**$356**	**$354**	**$338**
	* indicates ESA project, † indicates 'Innovative work'	**SUBBASIN TOTALS**		**$5,590**	**$8,710**	**$10,647**	**$8,620**	**$8,764**

All figures in thousands of dollars

Needed Future Actions

Habitat

Continue watershed restoration projects in the Grande Ronde watershed, which may include land or easement acquisition, fencing of riparian areas, off-stream water developments, and remediation of passage problems. The Oregon Wildlife Coalition will continue to implement their programmatic mitigation project (*Securing Wildlife Mitigation Sites in Oregon, Project No. 9705900)* to identify and implement other potential wildlife protection and enhancement projects within the Grande Ronde Subbasin until remaining wildlife Habitat Unit (HU) losses are mitigated for.

More work is needed on the two Coalition projects occurring to expand ODFW's Wenaha and Ladd Marsh Wildlife Areas. Landowner negotiations will continue at Wenaha to acquire or ease one of two private properties adjacent to the Wildlife Area. Agreements will be drafted between ODFW and BPA and ODFW and TNC to allow transfer of FY 1999 funds from BPA to TNC for property acquisition reimbursement. ODFW will then draft and implement a management plan for the site.

Production

Planning for NEOH spring Chinook will continue with the expected outcome of new production and acclimation facilities to accommodate the Wallowa component of LSRCP production under an endemic production program. NEOH planning will also included fall Chinook production, and the reintroduction of coho and sockeye. Operation and maintenance of adult collection and juvenile acclimation facilities will need to continue into the future.

Research/M&E

Monitoring of captive brood and conventional hatchery programs will continue. Fish health monitoring in captive brood and conventional hatchery programs will ensure minimal loss to disease. Monitoring of juvenile natural production, behavior, migration success, and habitat use will also continue.

The greatest uncertainty we face in the Grande Ronde Subbasin is similar to that which other managers face. We do not have solid evidence that the hatchery programs that were initiated will be successful in supplementing natural populations (and preventing extinction in some). If this is to be critically assessed, any such study needs to include control and treatment areas and experiments outside the Grande Ronde Subbasin.

Little is known about steelhead population status for a majority of the spawning and rearing areas in the subbasin other than steelhead creel data and long-term, but spotty, spawning grounds survey information. There is little information available on early life history, critical rearing habitats and limiting factors for steelhead populations in the Grande Ronde Subbasin.

Other remaining wildlife related work tasks within the Grande Ronde Subbasin include assessment and mitigation of hydropower system operational and secondary losses, development and implementation of a regional Monitoring and Evaluation Plan, and development of both HEP-based and non HEP-based monitoring success criteria.

Actions by Others

We have little evidence that the actions we continue in the Grande Ronde River, on their own, will prevent continued decline and extinction of anadromous salmonids. The captive brood program that has been initiated for chinook populations will prevent extinction in the short term, but can not be counted upon to preserve genetic integrity if most of the genetic material remains removed from the natural environment (within the hatchery for the captive brood program). Significant changes need to occur in the mainstem Snake and Columbia rivers before these populations can be expected to recover under the definitions of the ESA. If changes are not made soon, we may also be contemplating captive programs for steelhead as well, or face the possibility of functional extinctions.

Genetic profiles of naturally spawning populations should be funded by NMFS out of monies provided to it for ESA activities. Private and public (particularly USFS) landowners should manage logging, grazing, and irrigation to minimize impacts in the watershed. A large portion of the artificial production for anadromous fish is expected to continue to be funded under LSRCP.

References

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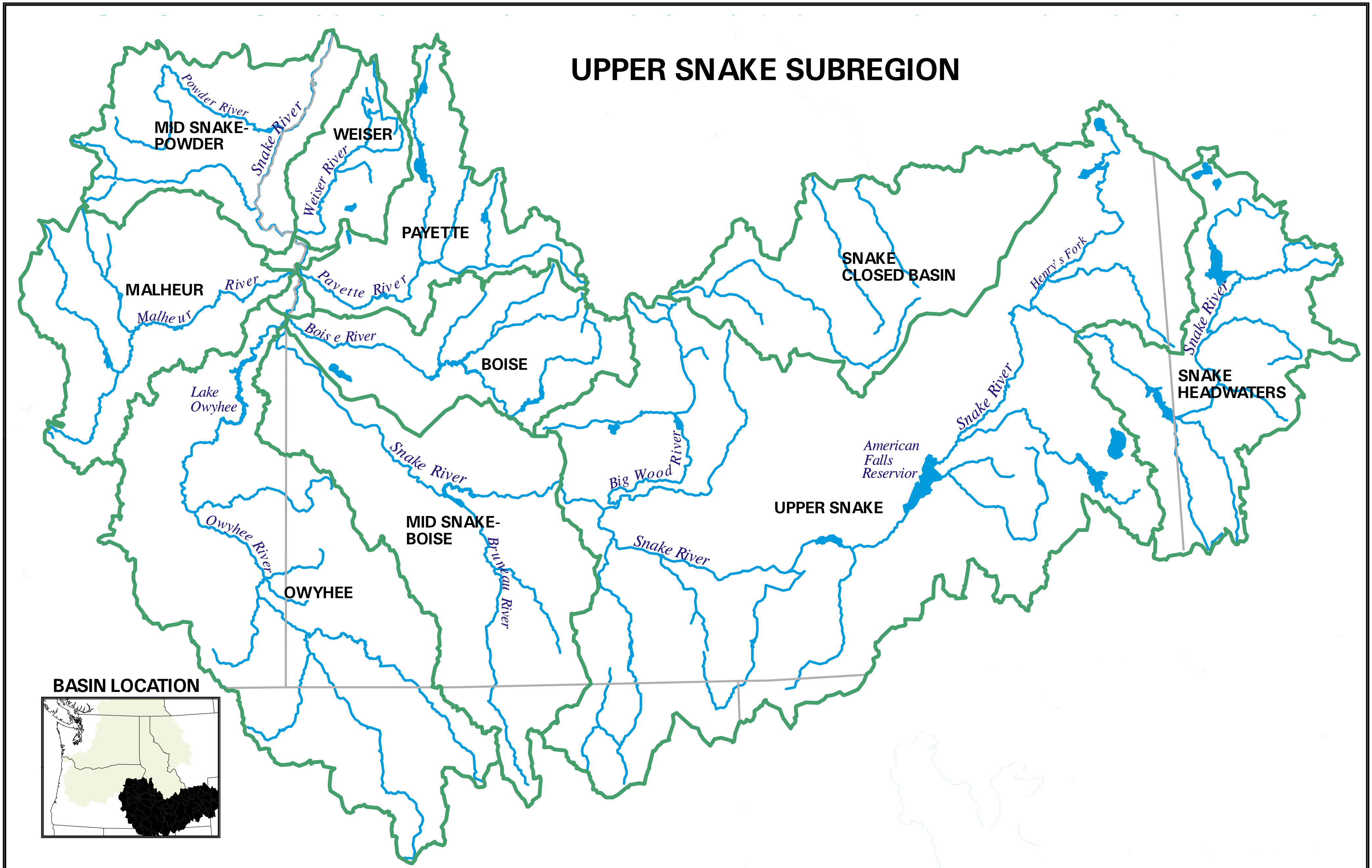
UPPER SNAKE SUBREGION



Upper Snake Subregion

The Upper Snake Subregion is defined as the Snake River and its tributaries from the Hells Canyon Dam to the headwaters. This subregion covers approximately 72,300 square miles and includes the following subbasins: Upper Snake Mainstem, Palouse, Weiser, Payette, Malheur, Boise, Owyhee, and the Closed Snake.

The overall goal of the Upper Snake Subregion is to mitigate and compensate for resident and anadromous fish losses caused by the construction and operation of federally-regulated and federally-operated hydropower projects. The primary native resident fish species that are targeted for active management in this region include bull trout, redband trout, cutthroat trout and white sturgeon. The management intent of these populations by the area fish managers can be expressed by two main goals. The first and primary goal of this subregion is to protect, enhance and restore, where needed, these fish in their historical habitat. The second goal is to provide fisheries and harvest opportunities of native fisheries and also of introduced game fish where native fisheries have been irrevocably altered. Both of these goals have been further defined by a specific set of management objectives that describe desired population levels, water quality levels, and habitat standards. These objectives are outlined in the Multi-Year Implementation Plan in a Basin wide description of fish management plans developed by regional fish managers in the Columbia Basin.

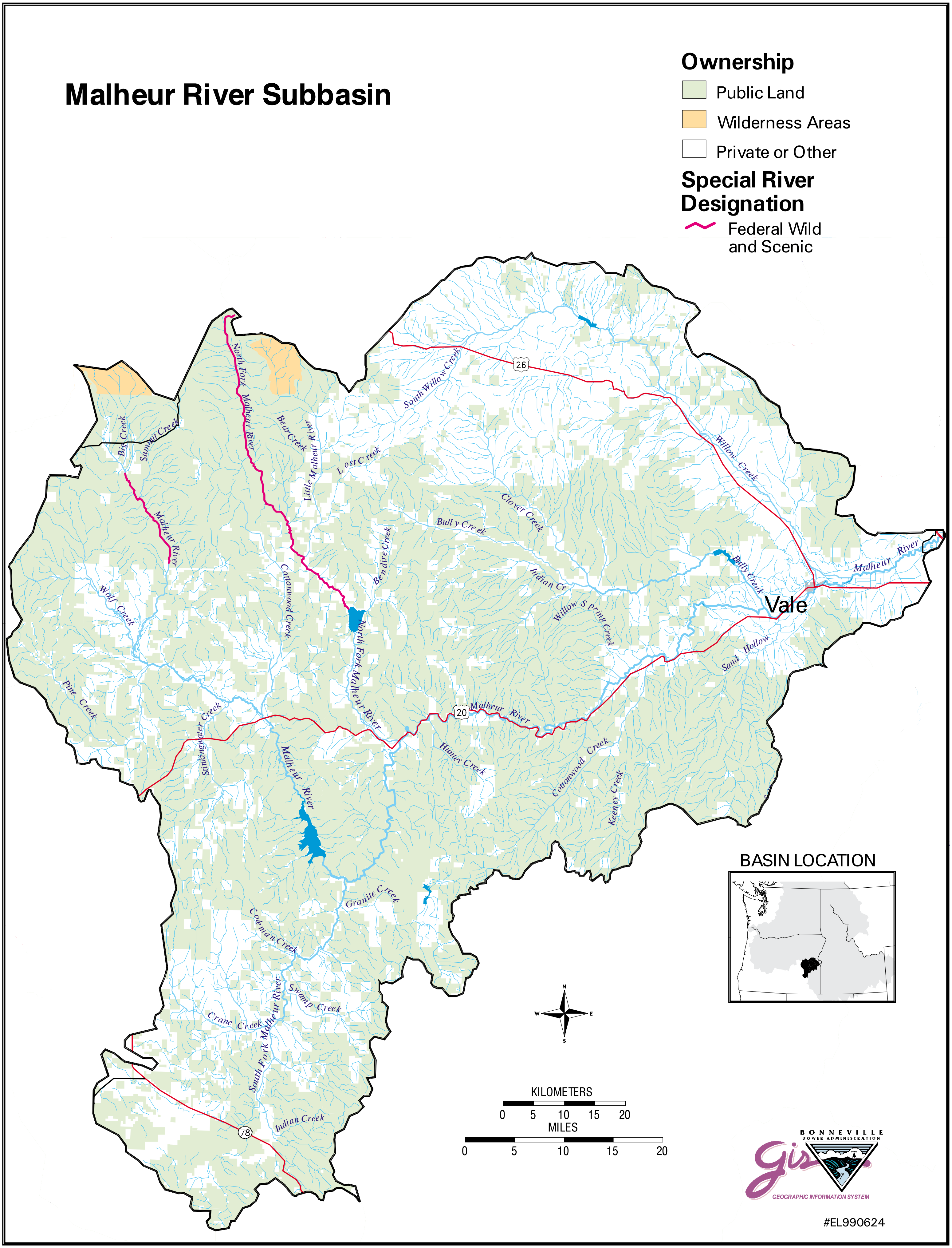
To achieve management objectives in the Upper Snake for the fish species of interest, fish managers have outlined several broad strategies. From a population perspective, the strategic intent is to protect, maintain and enhance native fish production, identify populations with unique genetic characteristics and maintain this diversity, and re-establish populations, where possible, in areas where native populations have been eliminated. From a management perspective, the strategic intent focuses on learning more about the condition of existing fish populations and the habitat in which they live, protecting and enhancing this habitat, and creating harvest opportunities and managing angling demand consistent with healthy fish populations.

Specific actions can be defined for each of these strategies. Fish production is maintained and enhanced by managing habitat and harvest and in some cases, using artificial production to supplement populations. Genetic diversity and adaptiveness of fish populations is maintained by establishing protection refuges for wild populations in the absence of hatchery fish. Populations are re-established within historic ranges by connecting habitats, and re-establishing historical habitat conditions. Learning is accomplished by assessing fish population status, fish distribution and habitat conditions, and monitoring responses of each to management actions. Habitat is protected and enhanced by providing necessary stream flows, improving water quality and halting and reversing habitat degradation. Using artificial production and improving natural production creates harvest opportunities. Angling demand is managed by promoting angling opportunities, controlling angler access and managing introduced gamefish such as bass, crappie, catfish and hatchery trout; however, these actions are of lower priority to fish managers than maintaining and enhancing native populations.

BPA funded projects in this area include several habitat and fish survey studies that assess habitat conditions and fish populations, radio implanting and pit tagging throughout the subregion, as well as one hatchery stocking project in two small off channel reservoirs where native species never existed. These projects are administered by local tribal entities such as the Shoshone-Paiutes, Shoshone-Bannocks and the Burns Paiute Tribe, and local agencies such as Idaho Fish and Game and the Oregon Department of Fish and Wildlife. These tribes work closely with local agencies, often in cost-share arrangements, to manage the fisheries in this subregion.

The specific wildlife mitigation goal for the Upper Snake Subregion is to fully mitigate for the wildlife losses caused by the construction and operation of the hydroelectric projects located in the subregion. These hydro projects are listed below, with the estimated losses due to hydropower construction and habitat mitigation priorities as listed in the NWPPC's Fish and Wildlife Program.

Malheur River Subbasin



Malheur Subbasin

Res fish	2	projects	$315
Wildlife	2		0

Fish and Wildlife Resources

Subbasin Description

The Malheur River, situated in southeast Oregon, is a tributary to the Snake River entering at river mile 370. The Malheur River is 90 miles long, and drains an area of 5,000 square miles. It begins at 6,600 feet in the Blue Mountains, and flows to an elevation of 2,000 feet at its confluence with the Snake River. The North Fork Malheur River, the largest tributary, flows 60 miles before entering the mainstem at RM 96. Warm Springs Dam at RM 123 of the mainstem Malheur River and Agency Dam at RM 18 of the North Fork Malheur River effectively isolate fish populations.

Fish and Wildlife Status

Fish

Construction of Warm Springs Dam in 1919 and the construction of Agency Dam in 1934 ended the migration of anadromous fish to the upper Malheur. Construction of Brownlee Dam on the Snake River in 1958 blocked anadromous fish from the Malheur River entirely. Prior to construction of Brownlee Dam, large runs of chinook salmon and steelhead had access to the Malheur subbasin. Currently there is no minimum pool associated with either Agency or Warm Springs Dam. Operation of the reservoirs to benefit fish and wildlife is not a part of the authorization for these projects.

In addition to the loss of anadromous fish, dam construction has severely impacted native resident fish, such as bull trout and redband trout. Warm Springs and Agency dams have isolated populations of these two species. Access to the Malheur River from the Snake River was further limited by the construction and operation of the Nevada Diversion Dam at RM 19 on the Malheur River. Declining numbers of bull trout have led to their listing as threatened under the Endangered Species Act.
Bull trout and redband trout have also suffered significant habitat loss and degradation due to timber harvest, livestock production and irrigation withdrawals. The presence of introduced brook trout and hatchery rainbow trout have also contributed to declines in bull trout and native redband populations.

Wildlife

The development of the hydropower systems and irrigation dams in the Columbia River Basin has affected many species of wildlife as well as fish. Some floodplain and riparian habitats important to wildlife were inundated when reservoirs were filled. In some cases, fluctuating water levels caused by dam operations have created barren vegetation zones that leave some species vulnerable to predation, impact rearing and recruitment and reduce winter forage availability. The construction of roads, urban developments, irrigation withdrawals from streams and rivers and the channelization and diversions of natural waterways, have had many adverse affects on all life history stages of wildlife.

Managers in the Malheur basin have recognized the need for changes in management and land use strategies and for the protection of critical habitat that benefit fish and wildlife species. Although there are no current BPA wildlife mitigation activities in the Basin, the Burns Paiute Tribe has proposed two wildlife mitigation projects to protect, enhance and restore critical fish and wildlife habitat; 1) Logan Valley Wildlife Mitigation Project # 20090 and 2) Acquisition of Malheur Wildlife Mitigation Site # 20137.

Habitat Areas and Quality

Agriculture production and processing are the basin’s primary economic activities. River valleys from Harper eastward are devoted to intensive and diversified agriculture. The most important crops produced are alfalfa, clover, sugar beets, onions and potatoes. Livestock production dominates river valleys in the upper portion of the basin where irrigation lands are used primarily for growing hay and forage crops. Rangelands throughout the basin also provide livestock forage during the spring and summer months. Timber harvest occurs in the northwest portion of the subbasin as well.

Land Use	Acres	% of Basin
Range	2,694,519	83.0
Forest	311,936	9.6
Irrigated Agriculture	214,063	6.6
Non-irrigated Agriculture	8,017	0.3
Water	7,991	0.2
Other	5,197	0.2
Urban	4,357	0.1
Total	**3,246,080**	**100.0**

Physical and Biological Characteristics

The climate in the Malheur Basin is semi-arid, characterized by hot dry summers and cold winters. Summer temperatures may exceed 100 F and winter temperatures may drop below -20 F. Average annual precipitation over the Malheur basin is 12 inches and ranges from 40 inches in the upper mountains to less than 10 inches in the lower valleys. Most of the precipitation occurs in the winter as snow. Mountain snowpack is the principle source of stream flow (Malheur County 1978).

Most of the Malheur River basin consists of gently sloping to rolling lava plateau upland dissected by canyons or valleys. The Northwest portion of the Basin lies in mountainous terrain.

Wooded areas consist primarily of mixed fir and pine forest in the higher elevations with ponderosa pine and western Juniper in the transition zones. Sagebrush and grass communities dominate the uplands. Low-elevation terraces and flood plains are occupied primarily by irrigated cropland in the lower basin valleys.

Stream gradient in the Malheur River is characteristic of southeastern Oregon streams as described by Bowers et al. (1979). Headwater streams of the Middle Fork and North Fork Malheur begin at an elevation of 6,500 to 7,500 ft, drop 100ft/mile or more, and are characterized by high water velocity and substantial downstream movement of coarse bedload material. Steep gradient limits fish movement.

The mainstem through the forest down stream to Namorf Dam has stream gradient and riffle frequency characteristic of trout habitat. The stream gradient gradually decreases to an average of 20ft/mile. Sediment loads consist of coarse (sand to baseball size) material and floodplains have developed where velocity and gradient permit. Gravel bar deposits, islands and new channels are formed by constantly shifting bedload.

Below the town of Harper, gradient averages 1ft/mile, and stream velocity is reduced. Fine bedload material settles out forming compact banks and a deep meandering single channel. The lower velocity combined with poor water quality limit game fish production.

In, general, the streams of the Malheur subbasin possess characteristics attributable to the semi-arid climate. On an average annual basis, low precipitation produces relatively low runoff although large variations can be expected on an annual and seasonal basis. Natural flow, except for that resulting from snowmelt in the spring, is usually quite low. Occasional high flow occurs in the winter and spring from rainstorms augmented by snowmelt, frozen ground, or both (SWRB 1969).

Large Reservoirs constructed for irrigation storage on the mainstem Malheur and several tributaries have altered stream flow characteristics in the lower Malheur Basin. Stream flow is regulated primarily by the following reservoirs:

- Warm Springs Reservoir, Malheur River
- Beulah Reservoir, North Fork Malheur River
- Bully Creek Reservoir, Bully Creek
- Malheur Reservoir, Willow Creek

Warm Springs, Beulah, and Bully Creek reservoirs are major components of the Bureau of Reclamation's Vale Project, an irrigated area of about 35,000 acres located along the Malheur River and lower Willow Creek around the town of Vale. The stored water in Warm Springs and Beulah Reservoirs, together with natural stream flow, is diverted from the Malheur River by the Namorf Diversion Dam to the Vale Main Canal. The project is operated and maintained by Vale Irrigation District.

Major diversions occur in the lower Malheur below Namorf and in the Drewsey Valley. Water is also diverted in Logan Valley. The Malheur subbasin has no appreciable quantity of unappropriated surface water subject to the jurisdiction of the State Water Resources Commission (Formerly the State Water Resource Board). Legal rights exceed yield in all years except those of unusually high amounts (SWRB 1969).

Surface water quality in the Malheur system varies from excellent in the headwaters to poor in the lower basin. The majority of water quality problems in the basin result from non-point source pollution associated with land use practices.

The Malheur basin was inventoried for non-point pollution problems in 1978, and moderate and severe areas in the basin were mapped. Problems include sedimentation, streambank erosion, elevated water temperate, nuisance algae and decreased stream flow (Malheur County 1978). An inventory by DEQ indicated that in addition to those problems identified in 1978, turbidity and insufficient stream structure are also problems throughout the basin. In addition, the lower Malheur basin has problems with nutrients, pesticides salt-water intrusion, bacteria and viruses (Department of Environmental Quality 1988).

Watershed Assessment

No formal watershed assessments have been conducted in the Malheur Subbasin; however, evaluations of existing fish and wildlife populations and available habitat have been conducted. Pribyl and Hosford (1985). Buckman et al. (1992) and Bowers et al. (1993) summarized information on bull trout populations in the subbasin. The U.S. Department of Agriculture (1993) published the North Fork Malheur Scenic River Management Plan and the Malheur Wild and Scenic River Management Plan (1993).

Oregon Department of Fish and Wildlife conducted aquatic habitat inventories on the Little Malheur and 5 of its major tributaries in 1990 totaling 12 identified reaches. In 1991 & 1992 ODFW inventoried the North Fork Malheur River and 8 of its major tributaries totaling 40 identified reaches. According to ODFW, these generalized inventories are used as guidelines for a watershed management.

Limiting Factors

Historic land uses affecting bull trout habitat is the Malheur Basin include livestock grazing, timber harvest, road building, dispersed recreation and irrigated agriculture. Effects have included: increased stream temperatures as a result of removal of riparian vegetation, increased sediment loading to stream channels, loss of potential for large woody inputs to streams, loss of streambank integrity, reduced flows from irrigation withdrawals, loss of fish at unscreened diversions and blocks at major dams constructed for storage and smaller irrigation diversion dams. In addition, chemical-treatment projects conducted between 1950 and 1987 on the North Fork Malheur River and in 1955 on the Middle Fork Malheur River may have killed bull trout (Bowers et al. 1993).

Naturally occurring ecological events, such as the drought from 1985 to 1994, may have stressed bull trout populations further. Major forest fires occurred in both subbasins in 1989 and 1990. Tributaries affected by these fires include Snowshoe, Corral Basin and Big Creek in the Middle Fork Malheur River Subbasin and Sheep, Swamp, North and South Fork Elk and upper Little Crane creeks in the North Fork Malheur River Subbasin. Guidelines for fire damaged trees, including maintenance of no-cut buffers and exclusions for a minimum of three grazing seasons, were included in fire salvage and resource recovery plans developed by the Malheur National Forest. Increases in water temperature may be expected until the riparian vegetation has regrown, but long term impacts from these fires are not anticipated. Loss of large wood recruitment will continue as a result of past logging until trees in the riparian zone mature.

Livestock grazing and irrigation withdrawals continue to affect bull trout habitat in the lower stream reaches. Several diversions on private land remains unscreened in both the North and Middle Fork Malheur River subbasins.

However, efforts are being made to coordinate screening of diversions with monetary assistance from the statewide screening program. The Forest Service has screened or closed their diversions in both the North and Middle forks of the Malheur River.

Habitat surveys conducted in the North Fork Malheur River Subbasin between 1990 and 1992 showed high silt (37%), a scarcity of pools (7.3%) and a lack of wood (5.3 pieces/100m). The quantity of spawning habitat does not appear to be limiting, except in Elk and Sheep creeks, however, it's quality is questionable because of the high quantities of fine sediment within the substrate. Fine sediments ranged from 31% in sheep Creek to 58% in Roaring Springs Fork of Little Crane Creek in 1992.

Optimum water temperature for adult bull trout is near 12 to 15 C and optimum juvenile growth is found in waters from 4 to 10 C (McPhail and Murray 1979, Shepard et al. 1984, Buckman et al. 1992, Ratliff 1992, Buchanan and Gregory 1997). Temperature modeling has shown that temperature is limiting in most of the North Fork Mainstem during July (Bowers et al. 1993). The highest temperatures are found in the North Fork Malheur River.

Past Efforts

Local fish managers from various agencies are currently implementing specific actions for this subbasin in an attempt to achieve the management goals. These actions include managing habitat and harvest, inventorying genetic diversity of current fish populations, assessing these populations and their distribution and monitoring the responses of these actions. Managers are using artificial production and improving natural production to create harvest opportunities. However, stocking programs will be curtailed if there is evidence that indicates that it adversely affects native populations.

Currently, there is only one BPA funded project, Evaluate the Life History of Native Salmonids in the Malheur Basin (project #9701900), sponsored by the Burns Paiute Tribe, in this subbasin. The North Fork Malheur Bull Trout and Redband Trout Life History project proposed for FY99 funding has been incorporated into project #9701900. Both of these projects attempt to achieve the management goals in this subbasin by assessing habitat conditions and fish populations, using screw traps and radio implanting. The Burns Paiute Tribe is working closely with the Oregon Department of Fish and Wildlife, US Forest Service, Bureau of Land Management and the Bureau of Reclamation and has cost-share agreements with these agencies as well.

Subbasin Management

Goals, Objectives and Strategies

Construction of federally regulated and federally-operated hydropower projects has resulted in the total loss of anadromous fish in this subbasin and has greatly reduced native resident fish habitat. Bull trout and redband trout are the only remaining native game fish and are the focus of current management activities. The goal for this subbasin is to protect, enhance and restore fish populations to their historical habitat and provide fisheries and harvest opportunities on native fish and on introduced game fish where native fish have been extirpated from habitat alteration.

To achieve this goal the managers have adopted objectives to: 1) improve survival of all life history phases for salmonid populations; 2) re-establish extirpated salmonid populations to productive levels; and 3) establish productive populations of non-native game fish where habitat has been altered to the extent that maintaining viable populations of native fish is no longer feasible.

In the Malheur Subbasin area managers have outlined several strategies to achieve these objectives. From a population perspective, the strategic intent is to protect, maintain and enhance native fish production, identify populations with unique genetic characteristics and maintain this diversity and release appropriate stocks of non-native game fish in areas where native populations have been eliminated by habitat alteration. From a management perspective the strategic intent focuses on learning more about the condition of existing fish populations and the habitat in which they live, protecting and enhancing this habitat and creating harvest opportunities and managing angling demand consistent with healthy fish populations.

Research, Monitoring and Evaluation

In FY 99 the Burns Paiute Tribe will continue to conduct investigations with cooperators on bull trout and redband trout in the Malheur Basin. The goal of the two funded resident fish BPA projects is to gain an understanding of the life history of bull trout and redband trout in the Malheur River Basin and to apply this knowledge to better the management and conditions of the ecosystem that these fish depend on. Little information is available concerning their population, seasonal migration and distribution and movements throughout the basin. What information there is indicates that management and land practices need to be revised in order to preserve the persistence of these species. These projects outline a plan to assess habitat conditions, trends in populations, distributions, genetic compositions and migration characteristics. The project will assist in achieving the goals and objectives defined in the Northwest Power Planning Council's 1994 Columbia River Fish and Wildlife Program. These projects also compliment the management plans outlined in the Malheur Wild and Scenic River Management Plan and the Oregon Department of Fish and Wildlife's Malheur River Fish Management Plan. Assessments of these surveys will be the basis of recommendations for enhancement and protection strategies that are in line with Councils measures. Implementation of these strategies will provide native fishes with suitable habitat and enhance their survivability. Research and restoration measures are also in line with the recent US Fish and Wildlife Service (USFWS) listing of bull trout as a threatened species.

Remaining Work

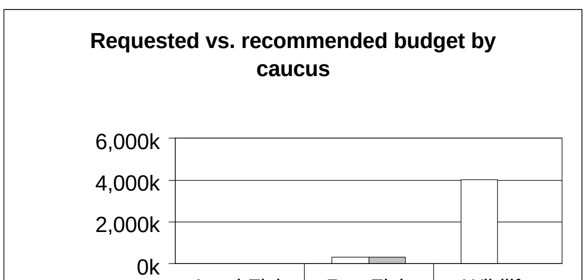
Projects 9701900 and 9701901 will be completed in FY 2002. The objectives from may vary slightly from year to year, but the focus of the research will be consistent with the current proposed activities

Subbasin Recommendations

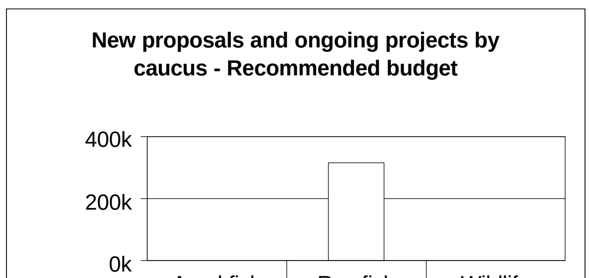
Projects and Budgets

Based on the preceding subbasin description, the CBFWA fish and wildlife managers recommend funding a total of 4 projects for a total cost of $315,010. Of the projects recommended two focus on resident fish and two are directed at wildlife. The two resident projects support ESA requirements.

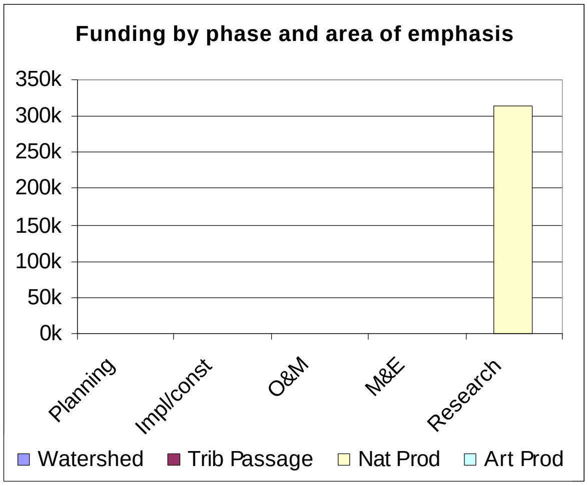
Refer to the following figures for detail on: 1) total recommended and requested budget by caucus, 2) funding for new and ongoing work, 3) funding by project phase and emphasis, and 4) funding by time period (past, current and future). Individual projects are listed in the following table.

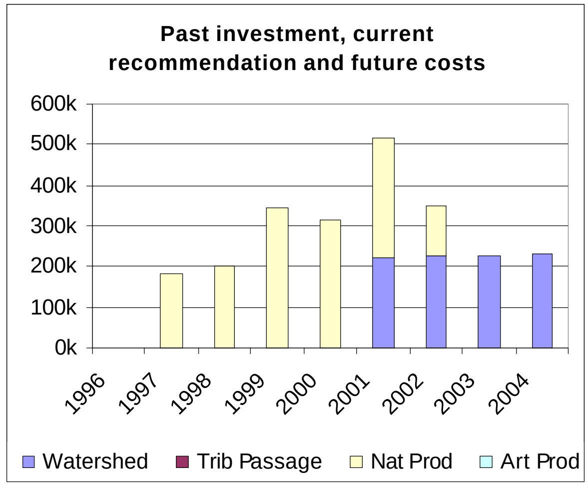


	Anad Fish	Res Fish	Wildlife
Request	$0	$315,010	$4,032,380
Recommend	$0	$315,010	$0



	Anad fish	Res fish	Wildlife
New	$0	$0	$0
Ongoing	$0	$315,010	$0


Funding by phase and area of emphasis
350k
300k
250k
200k
150k
100k
50k
0k
Planning
Impl/const
O&M
M&E
Research
Watershed
Trib Passage
Nat Prod
Art Prod


Past investment, current recommendation and future costs
600k
500k
400k
300k
200k
100k
0k
1996
1997
1998
1999
2000
2001
2002
2003
2004
Watershed
Trib Passage
Nat Prod
Art Prod

ProjectID	Title	Sponsor	FY99 recom.	FY00 recom.	Estimated Outyears FY01	FY02	FY03	FY04
Resident Fish Projects								
9701900	* Evaluate the Life History of Native Salmonids in the Malheur Basin	BPT	200	201	200	124	0	0
9701901	* North Fork Malheur River Bull Trout and Redband Life History Study	BPT	142	114	96	0	0	0
			Resident Fish Totals	**$315**	**$296**	**$124**	**$0**	**$0**
Wildlife Projects								
20090	Logan Valley Wildlife Mitigation Project	BPT			120	124	127	131
20137	Acquisition of Malheur Wildlife Mitigation Site	BPT			101	101	101	101
			Wildlife Totals		**$221**	**$224**	**$228**	**$232**
	* indicates ESA project, † indicates 'Innovative work'		**SUBBASIN TOTALS**	**$315**	**$517**	**$348**	**$228**	**$232**

All figures in thousands of dollars

Needed Future Actions

Fish

Watersheds may take decades to respond to improvements in management actions. Response of the fish to improved habitat conditions can take even longer. It is important that actions to conserve and protect habitat begin immediately as changes to the habitat can be detected earlier than changes to the populations. It is critical that managers in the Subbasin start now to reverse the declining trends in habitat conditions. Our forecasts must be focused on positive management that reflects native populations and the conditions that surround them.

1. Screen all irrigation diversions in the Malheur Basin
2. Establish minimum pools for dams that would not harm or stress fluvial and resident populations of bull trout and redband trout
3. Eliminate fish entrainment through irrigation dams during withdrawals
4. Protect, restore and enhance critical spawning and rearing habitat
5. Control or eliminate introduced brook trout in the Malheur River where bull trout are present
6. Strive to reduce water temperatures and sedimentation (303d listed streams in the Basin)
7. Reduce or eliminate the possible hybridization of 1) native chars with introduced species 2) redband trout with hatchery rainbow
8. Increase instream flows
9. Protect current bull trout refugias
10. Improve connectivity by providing both upstream and downstream passage
11. Restore occupiable habitat i.e. migratory corridors or seasonal habitat for specific life history stages of native salmonids

Wildlife

The Council's Fish & Wildlife Program is very clear in stating that construction and operation of the federal Columbia Basin hydropower system is a cause of habitat loss for wildlife and that it is Bonneville's responsibility to mitigate for those losses. The losses due to construction have been assessed, independently audited and verified and adopted into the Council's Program. These losses include losses of Habitat Units (HU's) for all major wildlife species at each hydro project and have been prioritized by habitat types for target species. The Council's Wildlife Program goal is to "fully mitigate for wildlife losses from hydropower in the Columbia River Basin". Specifically the program says "The goal of this program's wildlife strategies is to achieve and sustain levels of habitat and species productivity as a means of fully mitigating wildlife losses…" Acquisition of HU's is the Council's "preferred method" for wildlife mitigation. This can be done either by enhancing habitat to provide additional HU's (if possible) or by protecting habitat on lands scheduled for development. The implementation component of projects 20090 and 20137 consists of implementation of measures to provide HU's of the highest possible priority habitat types for target species and provide crediting to BPA for documented hydropower losses.

1. Implement proposed wildlife mitigation projects to begin the needed protection of critical wildlife habitat.
2. Address habitat degradation in the Basin that adversely affects migratory and resident forms of target wildlife species.
3. Work with state and federal agencies as well as neighboring landowners to complete a wildlife mitigation plan to fulfill the project's obligations towards wildlife.

Actions by Others

- USFWS **-** Continue to coordinate with all managers in the Basin to restore and enhance ESA species associated with BPA funded projects.
- USFS Malheur National Forest **-** Must continue funding for forest biologist to continue cooperative BPA research activities in the Basin. Forest biologist must get an "on the ground" understanding of management strategies that need to change to comply with declining fish and wildlife species in the basin.
- USDI Bureau of Land Management **-** Revise and coordinate grazing strategies to comply with ESA species in the Basin. BLM will continue to coordinate with the Burns Paiute Tribe in the proposed acquisition on the Malheur River (Project # 20137). This project would allow 24, 000 acres of BLM grazing allotment to follow a rest rotation program directed by the Tribe.

- Oregon Department of Fish and Wildlife **-** Continue cooperative efforts associated with BPA funded research projects to revise management strategies that benefit native fish and wildlife species.
- Bureau of Reclamation **-** Continue cost-share agreements with BPA funded projects to comply with fish entrainment guidelines through three irrigation dams on the Malheur River Basin. Reclamation needs to establish minimum pool requirements for fish species and stop dewatering of major tributaries below reservoirs.

Watershed References

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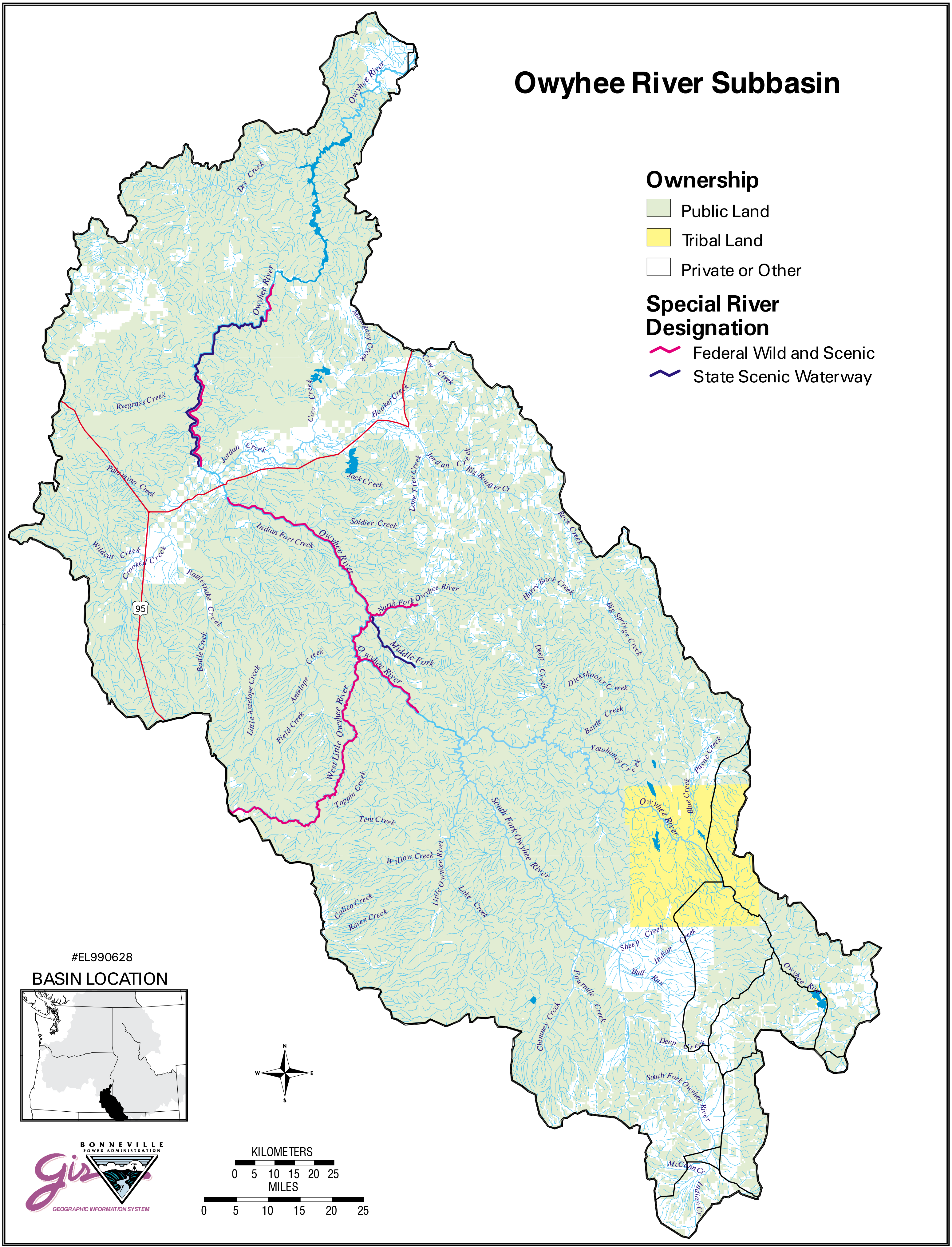
Owyhee River Subbasin



Fish and Wildlife Resources

Subbasin Description

The Owyhee River flows over 300 miles from headwaters in northwest Nevada through southwest Idaho and southeast Oregon to its confluence with the Snake River at river mile (RM) 392. The Owyhee River drains a high plateau of about 11,300 square miles, of which about 2,300 are in Nevada, 2,800 are in Idaho, and 6,200 are in Oregon. About 93% of the land in the subbasin is used for range; only about 0.5% is forest.

The upper river is impounded by Wildhorse Reservoir in Nevada, then flows freely through the Duck Valley Indian Reservation (DVIR) and southwest Idaho. After entering Oregon, the river is impounded by Owyhee Dam at RM 28. Owyhee Reservoir covers about 13,900 acres along its 52-mile length.

Fish and Wildlife Status

Construction of Brownlee (1958), Oxbow (1961), and Hells Canyon (1967) dams on the Snake River have precluded anadromous fish reaching the Owyhee River. Prior to construction of these dams, large runs of chinook salmon and steelhead had access to the subbasin. In addition to the loss of anadromous fish, dam construction and other human-induced impacts have severely impacted native resident fish such as bull trout and redband trout, as well as impacting the wildlife associated with the anadromous fish runs.

From the confluence with the Snake River upstream to a diversion at RM 18, fish in the Owyhee River consist primarily of warmwater species, including largemouth bass, smallmouth bass, and channel catfish. From the diversion upstream to Owyhee Dam at RM 28, releases of cold water from the dam provide temperatures suitable to trout. Lack of suitable spawning habitat precludes sufficient natural production to support a fishery; therefore hatchery-produced rainbow trout and brown trout have been released. Owyhee Reservoir provides a fishery for black crappie, largemouth bass, and smallmouth bass. Little trout rearing occurs in the reservoir.

Excellent trout habitat exists throughout most of the river upstream from Owyhee Reservoir. Limited work on the DVIR and upstream to Wildhorse Dam has found the river to support rainbow trout, redband trout, brown trout, smallmouth and largemouth bass, and various non-game fish (doublelip minnow, suckers, etc.).

A variety of wildlife species, including large and small mammals, waterfowl, passerines, raptors, reptiles, and amphibians, are associated with Owyhee subbasin riverine, wetland, and upland habitats. Although the status of wildlife populations varies throughout the basin and by species, many wildlife species within the basin are listed as Federal and/or State Threatened, Endangered, Sensitive, or At-Risk (Puchy and Marshall 1993). Certain populations of wildlife species are being managed by federal and state wildlife managers throughout the subbasin, including big game, furbearers, upland birds, and waterfowl species. California big horn sheep inhabit the Owyhee corridor and as a population have not been doing well recently. Survival of adults and lambs is poor. Mortalities of radio-collared ewes have occurred every month of the year, possibly suggesting a susceptibility to mountain lion predation. Pronghorn and mule deer populations are at low densities relative to populations of these species in other areas of Oregon and other states. Sage grouse inhabit the sage brush/bunch grass steppe habitat throughout the basin and are characterized as a stable population. Environmental groups have petitioned to federally list the sage grouse and have initiated a status review of sage grouse populations. Bald eagles overwinter within the basin.

Habitat Areas and Quality

Riparian areas in the river downstream from Owyhee Dam are in good condition; however, little spawning habitat is available for trout. The high pool to riffle ratio is considered good for trout rearing.

Much of the habitat upstream of Owyhee Reservoir is suitable for native trout reproduction. There is little human impact through Owyhee Canyon and upstream to Wildhorse Dam. High pool to riffle ratios continue throughout much of the free-flowing river. There is excellent cover to help maintain cool water temperatures in the summer. Some of the impacts to the riparian areas include cattle grazing upstream of the DVIR, which has reduced the quality of habitat in a stretch of 5 miles of river.

Wildlife habitat in the Owyhee corridor is characterized by irrigated high-value cropland on the floodplain in the lower subbasin, becoming sagebrush/bunch grass steppe further up the watershed. Habitat outside agricultural areas is largely intact, although wild fires due to fine fuels being created during wet years and remaining during dry periods have negative impacts on wildlife. Some land in the Vale area has been converted from native vegetation to crested fescue. Wildlife are associated with riverine and adjacent riparian forest, wetland, mixed coniferous and deciduous forest, shrub/steppe, and agricultural habitats in the Owyhee subbasin. Habitat quality is variable depending on the degree to which habitats have been converted into other land uses and impacted by human activities and invasion of noxious weeds. Habitat has generally been degraded due to hydropower development (i.e., by the Snake River hydroelectric facilities), past and present land management activities, the spread of non-native plant species, and human development. Agricultural lands provide limited habitat value for wildlife. Hydropower development has altered riverine and riparian habitats through flow regulation, channel modification, diking, and dredging. Other activities related to hydroelectric development (e.g., road construction) have altered land and stream areas in ways that affect wildlife. In some cases, the construction and maintenance of power transmission corridors altered vegetation, increased access to and harassment of wildlife, and increased erosion and sedimentation in Owyhee subbasin. Forest management practices on both public and private lands have also affected wildlife habitat quantity and quality.

A small portion of the Owyhee subbasin is protected and managed specifically for wildlife. Only 2% of the current land base within the subbasin has a high level of protection for wildlife.

Watershed Assessment

No formal watershed assessments have been conducted in the Owyhee Subbasin; however, evaluations of existing fish and wildlife populations and available habitat have been conducted. Fortune and Thompson (1969) characterized the fish and wildlife resources of the subbasin in Oregon. Rien et al. (1992) provided population and fishery statistics and limnology information for Owyhee Reservoir. Hanson (1991) summarized the fishery resources and habitat in Owyhee Reservoir and the river downstream from the reservoir, and Zoelick (1991) conducted stream and fishery surveys upstream of the reservoir. Limited habitat evaluations and fishery surveys have been conducted on the DVIR and upstream to Wildhorse Dam. Johnson et al. (1985) summarized the abiotic characteristics of Owyhee Reservoir, and Rinella et al. (1992) investigated the water quality, sediment, and biota associated with irrigation drainage in the subbasin.

The Natural Heritage Program maintains a database on habitats and species occurrences throughout the State of Oregon. The Oregon Trust Agreement Planning Project (BPA 1993) and Oregon GAP Analysis Project (ODFW 1997) identified gaps in biodiversity, needs for terrestrial habitat restoration, and prioritized list of potential habitat restoration opportunities in the Upper Snake River subregion, including the Owyhee subbasin. The Gap Analysis project concluded that of the current land base, 14% is in a low protected status for wildlife, 84% is in a moderate protected status for wildlife, and 2% is in a high protected status for wildlife.

Limiting Factors

The complex of dams on the Snake River and Owyhee Dam on the Owyhee River preclude restoration of anadromous fish to the subbasin. Loss of anadromous fish also limits production of wildlife.

Resident fish, including native bull trout and redband trout are limited by a number of human-induced impacts. Low summer flows below Owyhee Dam are aggravated by irrigation withdrawals. Flows are also low during the non-irrigation season while the reservoir is filling. Turbidity in the lower river is high because of irrigation return flows, and some irrigation diversions are unscreened. Lack of structure limits production in the reservoir. High turbidity from in-flowing streams limits plankton production.

Limiting factors affecting the upper Owyhee River include low flows during the summer due to irrigation on and upstream from the DVIR. Some cattle grazing on the DVIR may affect water quality, but effects appear to be minimal. Upstream of the DVIR there is substantial grazing that has decreased much of the riparian vegetation, increased water temperatures, and made the banks very unstable. This has also contributed to increased sedimentation in the river. Another limiting factor is the Rio Tinto mine, which is approximately 15 miles upstream of the DVIR. The mine was reclaimed but there is still runoff into the river, which is currently being monitored by the Tribes.

Wildlife abundance is currently limited by the results of past hydropower development (e.g., habitat loss and degradation, the decrease in fish abundance), past and current land management practices (e.g., irrigation, logging, livestock and agricultural practices, road construction), and the spread of non-native plant and wildlife species. Loss of wintering range for deer and elk due to conversion of historic ranges to agricultural use limits big game populations. Poor survival of big horn sheep, pronghorn, and mule deer lambs, kids, and fawns limit stable or increasing population sizes for these species. Conversion of shrub-steppe habitat to other uses and competition with native plant assemblages by noxious weeds limit populations of wildlife dependent on that habitat type. Water use practices (e.g., irrigation) can negatively affect quality and quantity, and are also factors limiting to wildlife. Extirpation of salmon and other fish species caused by construction of the Snake River dams resulted in a loss of overall biomass being contributed to the subbasin. This reduction has negative effects on wildlife abundance. Any of these influences can be, and are, limiting factors to local populations. Changes in local populations can affect species integrity on a larger scale. Opportunities to restore wildlife populations and improve wildlife habitat diminish over time as habitat loss and degradation continues.

Goals Objectives and Strategies

Construction of federally regulated and federally-operated hydropower projects has resulted in the total loss of anadromous fish in this subbasin and has greatly reduced native resident fish habitat. Bull trout and redband trout are the only remaining native game fish and are the focus of current management activities. The goal for this subbasin is to protect, enhance and restore fish populations to their historical habitat and provide fisheries and harvest opportunities on native fish and on introduced game fish where native fish have been extirpated from habitat alteration.

To achieve this goal the managers have adopted objectives to: 1) improve survival of all life history phases for salmonid populations; 2) re-establish extirpated salmonid populations to productive levels; and 3) establish productive populations of non-native game fish where habitat has been altered to the extent that maintaining viable populations of native fish is no longer feasible.

In the Owyhee Subbasin, area managers have outlined several strategies to achieve these objectives. From a population perspective, the strategic intent is to protect, maintain and enhance native fish production, identify populations with unique genetic characteristics and maintain this diversity, and release appropriate stocks of non-native game fish in areas where native populations have been eliminated by habitat alteration. From a management perspective, the strategic intent focuses on learning more about the condition of existing fish populations and the habitat in which they live, protecting and enhancing this habitat, and creating harvest opportunities and managing angling demand consistent with healthy fish populations.

The wildlife mitigation goal for the Columbia River Basin is to achieve and sustain levels of habitat and species productivity in order to fully mitigate for all wildlife and wildlife habitat losses caused by the development and operation of the federal and non-federal hydropower system (NWPPC 1995). The two hydroelectric facilities within the Upper Snake River Subregion, Brownlee and Oxbow dams, are owned and operated by Idaho Power Company. Therefore, BPA funded loss assessments were not completed for these dams. The NWPPC’s Fish and Wildlife program does identify priority wildlife mitigation habitats for the Snake River.

Past Efforts

Project 8815600, Implementation of a Stocking Program Consistent With Native Fish Conservation, began in 1988 with the stocking of fish in two reservoirs on the DVIR. Fish have been stocked annually since 1988 in Mountain View Reservoir, ID, and Sheep Creek Reservoir, NV. A second BPA-funded project, Billy Shaw Reservoir Development (#9501500), was started in 1995. This project was funded as substitution for the loss of fish habitat caused by construction of hydroelectric dams. Development of the reservoir was completed in 1998, and by 1999 part of the shoreline had been fenced to protect the shoreline from degradation. A third BPA-funded project, Shoshone-Bannock/Shoshone Paiute Joint Culture Facility, was started in 1995 to supply fish for the two existing reservoirs and for Lake Billy Shaw.

One BPA-funded project related to the second strategy, Enhance and Protect Habitat and Riparian Areas on the DVIR (#9701100), began in 1997. Results to date include compilation of water quality and habitat information on the Owyhee River and many tributaries, and completion of numerous erosion prevention and habitat restoration projects.

From 1989-91 the U.S. Bureau of Reclamation (USBR) funded ODFW to summarize fish and wildlife information to assist the USBR in the management of lands at Owyhee Reservoir and on the lower Owyhee River. In 1991-92, ODFW used Federal Aid in Sport Fish Restoration Act funds to investigate the fish populations and limnology of Owyhee Reservoir and prepare a management summary.

No wildlife projects funded by BPA have been conducted in the Owyhee subbasin to date.

Research, Monitoring and Evaluation

Current work includes the ongoing BPA-funded projects. The Shoshone-Bannock/Shoshone Paiute Joint Culture Facility will supply fish for stocking in the DVIR reservoirs. Fencing of the shoreline of Lake Billy Shaw will continue, as will operation and maintenance of screens and dam structures. Efforts to enhance and protect habitat and riparian areas on the DVIR will include snorkel and electrofishing surveys to identify resident trout populations, surveys to identify and protect spawning areas, activities to protect and repair natural springs, and activities to enhance stream habitat.

Big horn sheep, pronghorn, mule deer, and sage grouse populations are routinely surveyed by ODFW wildlife biologists.

Remaining Work

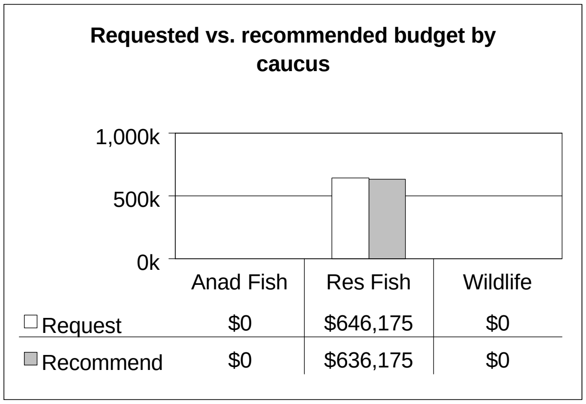
Work remaining to accomplish objectives primarily involves completing ongoing BPA-funded projects. Lake Billy Shaw will be protected from shoreline degradation when fencing is completed and habitat is enhanced by planting native vegetation. Naturally spawning populations of resident trout and a self-sustaining fishery are the eventual goals of this project. Work to enhance and protect habitat and riparian areas on the DVIR will continue until population estimates of resident trout are complete, spawning areas are identified and protected, natural springs are protected, and stream habitat enhancement activities are completed.

Subbasin Recommendations

Projects and Budgets

Based on the preceding subbasin description, the CBFWA fish and wildlife managers recommend funding a total of 3 resident fish projects at a cost of $636,175.

Refer to the following figures for detail on: 1) total recommended and requested budget by caucus, 2) funding for new and ongoing work, 3) funding by project phase and emphasis, and 4) funding by time period (past, current and future). Individual projects are listed in the following table.


Requested vs. recommended budget by caucus
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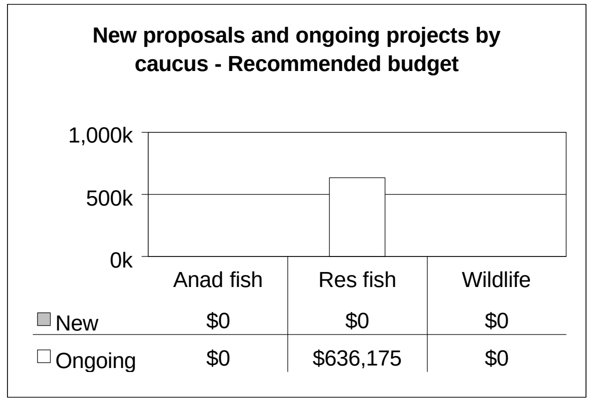
500k
0k
Anad Fish
Res Fish
Wildlife
Request
$0
$646,175
$0
Recommend
$0
$636,175
$0


New proposals and ongoing projects by caucus - Recommended budget
1,000k
500k
0k
Anad fish
Res fish
Wildlife
New
$0
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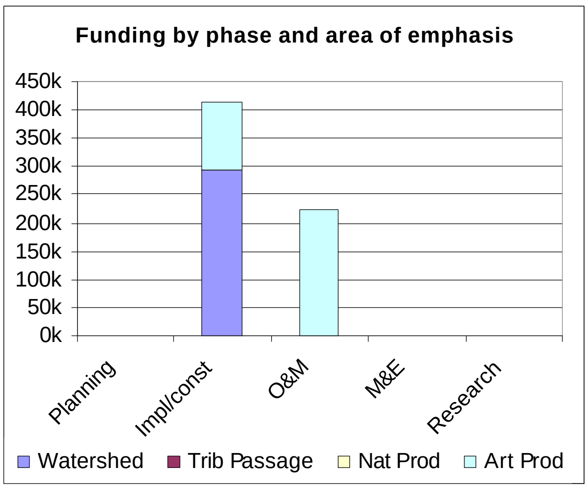
$0
Ongoing
$0
$636,175
$0


Funding by phase and area of emphasis
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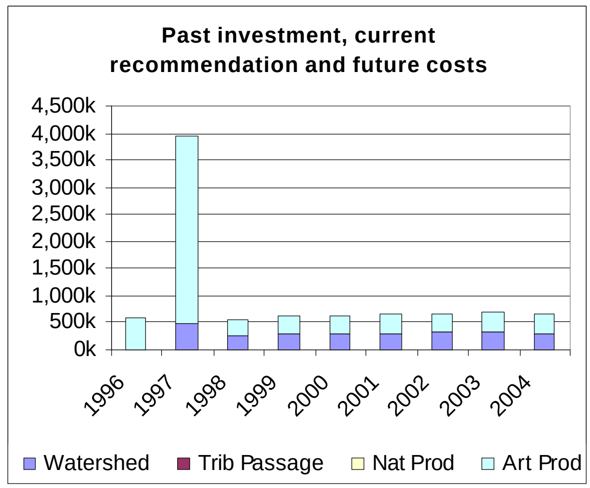
400k
350k
300k
250k
200k
150k
100k
50k
0k
Planning
Impl/const
O&M
M&E
Research
Watershed
Trib Passage
Nat Prod
Art Prod


Past investment, current recommendation and future costs
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4,000k
3,500k
3,000k
2,500k
2,000k
1,500k
1,000k
500k
0k
1996
1997
1998
1999
2000
2001
2002
2003
2004
Watershed
Trib Passage
Nat Prod
Art Prod

ProjectID	Title	Sponsor	FY99 recom.	FY00 recom.	Estimated Outyears FY01	FY02	FY03	FY04
Resident Fish Projects								
8815600	Implement Fishery Stocking Program Consistent With Native Fish Conservation	SPT - DVIR	110	120	139	143	147	152
9501500	Lake Billy Shaw Operations and Maintenance and Evaluation (O&M, M&E)	SPT - DVIR	215	222	222	222	222	222
9701100	Enhance and protect habitat and riparian areas on the DVIR	SPT - DVIR	293	295	310	317	325	300
		Resident Fish Totals	**$636**	**$670**	**$682**	**$694**	**$673**	
	* indicates ESA project, † indicates 'Innovative work'	**SUBBASIN TOTALS**	**$636**	**$670**	**$682**	**$694**	**$673**	

All figures in thousands of dollars

Needed Future Actions

Planned future work includes inventorying fish and wildlife species, assessing resident fish stocks, and developing management plans.

Actions by Others

Research needs to be conducted to determine why deer, pronghorn, and bighorn sheep fawns, kids, and lambs do not survive. There are opportunities for private and public landowners, as well as non-profit organizations (e.g., watershed councils, The Nature Conservancy) to work together to benefit wildlife and wildlife habitat within the subbasin.

Watershed References

<u>Fish</u>

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Hanson, M. L. 1991. Fishery resources of the Owyhee study area. Report to the U. S. Bureau of Reclamation by the Oregon Department of Fish and Wildlife, Portland, Oregon.

Johnson, D. M., R. R. Petersen, D. R. Lycan, J. W. Sweet, M. E. Neuhaus, and A. l. Schaedel. 1985. Atlas of Oregon lakes. Oregon State University Press, Corvallis, Oregon.

Rien, T. A., R. A. Farr, J. A. North, E. S. Tinus, and R. C. Beamesderfer. 1992. population and fishery statistics for largemouth bass, smallmouth bass, and black crappie, and limnology of Owyhee Reservoir, Oregon, 1992. Oregon Department of Fish and Wildlife, Portland, Oregon.

Rinella, F. A., W. H. Mullins, and C. A. Schuler. 1992. Reconnaissance investigation of water quality, bottom sediment, and biota associated with irrigation drainage in the Owyhee and Vale projects, Oregon and Idaho, 1990-91.

Zoelick (1991) *Need this reference from V. Pero, Shoshone Paiute Tribes*

<u>Wildlife</u>

BPA. 1993. Oregon Trust Agreement Planning Project: Potential mitigation to the impacts on Oregon wildlife resources associated with relevant mainstem Columbia River and Willamette River hydroelectric projects. BPA, U.S. Dept. of Energy, Portland, OR. DOE/BP-299-1. 53 pp.

BPA. 1997. Watershed management program final environmental impact statement. DOE/EIS – 0265. BPA, Portland, OR.

BPA. 1997. Wildlife mitigation program final environmental impact statement. DOE/EIA – 0246, BPA, Portland, OR.

BPA. 1997. Wildlife mitigation program record of decision. DOE-EIS – 0246. BPA, Portland, OR.

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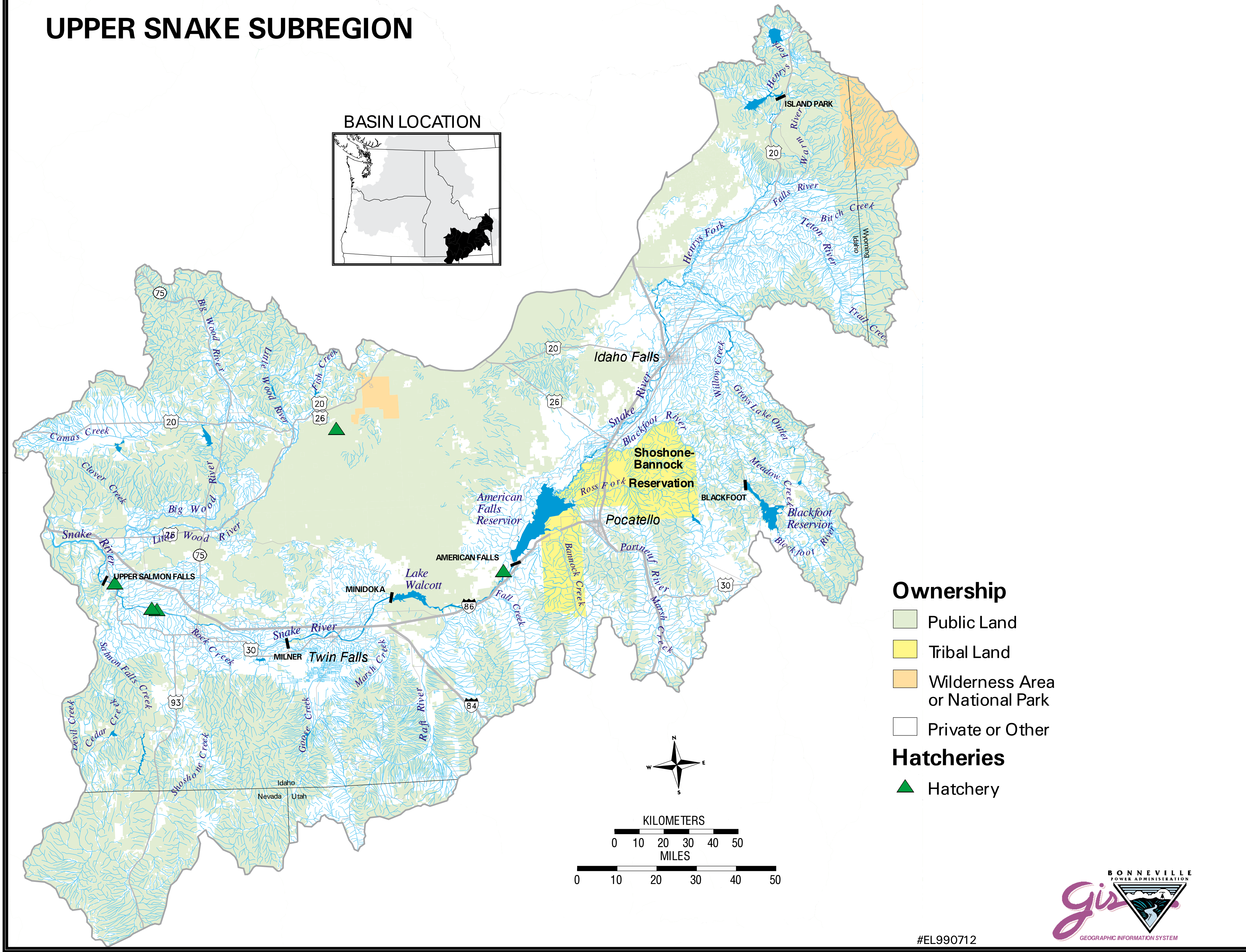
ODFW 1997. Assessing Oregon Trust Agreement Planning Project Using Gap Analysis. In fulfillment of Project Number 95-65, Contract Number DE-BI179-92BP90299. Prepared for: BPA; project cooperators: USFWS, CTUIR,CTWSRO, BPT, Oregon Natural Heritage Program, Portland, OR.

UPPER SNAKE SUBREGION



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Upper Snake Subbasin

Res fish	5	projects	$1,010
Wildlife	1		1,154
	6		$2,164

Fish and Wildlife Resources

Subbasin Description

The subbasin includes the Upper Snake River Subbasin, the Boise Subbasin, Payette Subbasin, the Weiser Subbasin, the Mid Snake-Boise Subbasin, and the Mid Snake-Payette Subbasin.

The Upper Snake River Subbasin is located above Shoshone Falls in Idaho, and is an area that historically was not accessible to anadromous fish. A small portion of the subbasin is in northern Nevada and Utah.

Anadromous fish existed in the remaining subbasins but were eliminated by a series of federal hydropower projects in portions of several tributaries. These include the Boise Diversion Dam (1908), Anderson Ranch (1950) in the Boise Basin and Black Canyon (1924) and Deadwood Dams (1932) in the Payette Basin. The remaining areas were blocked to anadromous fish by the construction of the Hells Canyon Dam complex in the 1950’s and 1960’s.

The Boise, Payette, and Weiser rivers are three of the major subbasins in the western part of the Upper Snake Subregion. The Boise River drains about 4,130 square miles; the Payette drains 3,270 square miles, and the Weiser drains 1,660 square miles.

Fish and Wildlife Status

The distribution and abundance of white sturgeon, bull trout, redband trout, and yellowstone cutthroat trout have declined throughout their historic range. In 1998, the U. S. Fish and Wildlife Service listed Columbia Basin bull trout as a threatened species under the Endangered Species Act (ESA). In addition, redband trout and yellowstone cutthroat trout have been petitioned for listing under ESA. All four species have been listed by the Idaho Department of Fish and Game as species of special concern, category A, the highest priority, and by the Bureau of Land Management as sensitive species. The U. S. Forest Service has designated the three native salmonid species as sensitive. They all face threats from habitat degradation (from agriculture, mining, logging, road building, etc.), major habitat alteration (channelization, altered flow regimes, etc), and harvest. Moreover, bull trout, redband trout, and yellowstone cutthroat trout face threats from competition and genetic introgression (hybridization) with non-native salmonids. Bull trout face threats from brook trout, while redband trout and yellowstone cutthroat trout face threats from years of stocking domestic rainbow trout. Despite their sensitive status, quantified data on the current distribution, trends, habitat, life history needs, limiting factors, extent of genetic introgression, and threats to persistence of these species is minimal for most populations throughout the subregion.

White sturgeon populations in the Snake River historically migrated freely throughout the Snake (up to Shoshone Falls) and Columbia rivers to the ocean. White Surgeon numbers in the Upper Snake Mainstem have been dramatically reduced. The development of the hydropower system has significantly altered habitat, modified flows, and blocked migration of white sturgeon and it’s food source. As a result, natural production of white sturgeon in Oxbow and Hells Canyon Reservoirs no longer occurs, and the distributions and abundance of white sturgeon in the remainder of the upper mainstem Snake River has been dramatically reduced and fragmented. It is hypothesized that White Sturgeon production in the Upper Snake River sub-region can be significantly enhanced by supplementation (Resident Fish Multi-Year Implementation Plan Upper Snake Subregion; CBFWA 1997).

Wildlife populations in the subbasin fluctuate in response to natural environmental conditions and natural and human caused habitat changes as well as direct wildlife population management (i.e., hunting, trapping, etc.). Wildlife species present in the subbasin include actively managed larger mammals (i.e., big game species), native (i.e., sage grouse) and non-native (i.e. chukar) game birds and waterfowl. A much larger number of non-game mammals, birds and herptiles also occur. Grizzly bears and grey wolves inhabit a portion of the subbasin.

Habitat Areas and Quality

It is well known that much of the upper Snake River Subregion has been significantly altered by human development since the late 1880's when the first major irrigation diversion was built. Impacts include mining, dam construction and operation, agriculture, irrigation withdrawal, logging, road building, livestock grazing, channelization, and floodplain encroachment. The natural hydrograph no longer resembles the historic condition in much of the subregion. Often the timing and volumes of flows are insufficient for the maintenance of fisheries, riparian and floodplain habitats, and water quality. Generally, the Snake River upstream of Milner Dam (a privately owned irrigation dam upstream of the town of Twin Falls, at approximately river mile 640) and the lower reaches of major tributaries like the Boise and Payette rivers are characterized by reduced spring runoff, higher summer flows, and dramatically reduced late fall and winter flows compared to historic conditions. Downstream of Milner Dam, the flow regime in the Snake River is characterized by a lack of a spring runoff, drastically reduced summer flows, and lower than historic winter flows. The lower Boise River (downstream from Lucky Peak Dam), the lower Payette River (downstream of Black Canyon Dam), and most of the mainstem Snake River has been designated "water quality limited" by the Environmental Protection Agency.

Most of the existing good quality habitat is in the upper reaches of the tributary drainages, upstream of most of the major impoundments and in the upper portion of the basin in the Henrys Fork and South Fork Snake River drainages. Much of this is on land administered by the U. S. Forest Service or Bureau of Land Management. Habitat conditions range from very poor in some of the heavily used lowland or forest areas to pristine in the high mountain wilderness areas.

Wildlife populations in the subbasin use a mixture of public and private ownership lands as habitat. The quality of both types is variable. A very small percentage of land (i.e., land which is managed primarily for wildlife habitat) is in good condition. The ICBEMP (1996) found that most land in the subbasin had a LOW ecological integrity rating. Wildlife mitigation projects in the subbasin have or will provide areas with HIGH ecological integrity.

Watershed Assessment

Southern Idaho Wildlife Mitigation references several, regional fish and wildlife programs. The Nature Conservancy has developed wetland conservation strategies for the Big Wood drainage (Jankovsky-Jones 1997), southeast Idaho wetlands (Jankovsky-Jones 1997), and Henrys Fork basin (Jankovsky-Jones 1996) and has developed Eco-regional Planning as a conservation planning tool. The Interior Columbia Basin Ecosystem Management Project (USFS 1996) identified conservation and management needs. The U.S. Bureau of Reclamation's Snake River Resources Review is collecting existing information to develop a decision-support system for running different river operations scenarios to better balance the competing interests in Snake River water. Idaho Power Company is collecting hordes of information for FERC relicensing of Hells Canyon Complex and Middle Snake hydro facilities. The following documents refer to the need to protect wildlife habitats in the Upper Snake subbasin: Bonneville Power Administration Wildlife Mitigation Program Final Environmental Impact Statement (BPA 1997); FS/BLM Snake River Activity/Operations Plan (1991); USFWS Pacific Bald Eagle Recovery Plan (1986); Idaho Department of Water Resources South Fork Basin Plan (1997); Idaho Department of Water Resources Henrys Fork Basin Plan (1991); Targhee National Forest Plan (USFS 1997); Rivers of Life: Critical Watersheds for Protecting Freshwater Biodiversity (Master et. al. 1998); Ada County Land Use Plan; 1997 Boise City Comprehensive Plan; City of Boise Foothills Plan; Bureau of Land Management Resource Management Plans for Medicine Lodge Resource Area, Pocatello Resource Area, Shoshone Resource Area, Bruneau Resource Area, Cascade Resource Area, IDFG 5-Year Mule Deer Plan (Scott et al. 1991); IDFG 5-Year Nongame Plan (Groves and Melquist 1991); IDFG 5-Year Upland Game Plan (Smith et. al. 1990); IDFG 5-Year Waterfowl Plan (Connelly and Wackenhut 1990); A Vision for the Future: IDFG Policy Plan 1990-2005 (IDFG 1991).

Limiting Factors

Snake River subbasins above Hells Canyon complex have been directly impacted by many dams, including; Palisades, Anderson Ranch, Boise Diversion Dam, Black Canyon, Deadwood, Cascade, American Falls, Island Park, Milner, the Hells Canyon complex, and Minidoka, et al. Seasonally predictable hydrographs have been replaced by flow regimes keyed to rapid flooding and drafting of reservoirs in the basin. Stream temperature, physical, and chemical attributes of the mainstem Snake have been altered since construction of these dams. Indigenous populations of Yellowstone cutthroat trout, whitefish, redband trout, bull trout, and white sturgeon have all been negatively impacted by reservoir construction and operations, either directly through barriers to passage, or indirectly through changes in the biotic and abiotic environment of stream ecosystems in the basin. Spawning and rearing habitat for white sturgeon in the mainstem have been severely altered, fragmented, or eliminated. As a result, distribution of white sturgeon within the system has also been fragmented and drastically reduced. Native stocks of resident fish have also been reduced throughout their range through genetic introgression and competition with nonnative fishes and exploitation. In addition, habitat for terrestrial wildlife has been lost due to construction and operation of the aforementioned reservoirs.

Water regimes influence the potential of a site to be restored. For example, groundwater pumping has lowered water tables, thus limiting the restoration potential for a permanent emergent herbaceous wetland. The Hells Canyon Dam complex blocked anadromous runs from the Upper Snake (below Shoshone Falls), and secondary losses have impacted wildlife such as bald eagles, bears, and other fish- and carrion-eaters. The alteration of natural fire regimes because of widespread cheat grass invasions has limited the potential for restoring natural shrub-steppe.

Logistically, wildlife mitigation projects may be limited by water allocation/rights, conflicting land uses, and public sentiment.

Subbasin Management

Goals, Objectives and Strategies

The primary goal in these subbasins is to mitigate for resident fish and wildlife losses caused by the construction and operation of the many dams in the subregion in order to reestablish healthy, functioning ecosystems and fish and wildlife populations.

To accomplish this goal the managers have adopted the following objectives: 1) improve survival for all life history stages for target species; 2) re-establish extirpated populations; and 3) restore depressed populations to productive levels.

Management strategies to accomplish these objectives include adjustment of flows to benefit fish e.g., restored spawning areas and increased mainstem and tributary passage. This includes restoration of a natural hydrograph and historic ecosystem functions. Other strategies include restoration of instream, riparian, and floodplain habitats to provide conditions for self sustaining populations of native species assemblages, re-introduction of native species to restored habitats, and identification of specific limiting factors that may impede the protection and restoration of native stream biota, provide fishery opportunities for white sturgeon to maximum extent allowable by existing habitat capacity in mainstem reservoirs given reductions caused by hydropower development and operations, and supplement sturgeon populations with artificially produced fish such that risks are minimal to naturally spawning populations downstream from Hells Canyon Dam and upstream from Brownlee Reservoir (Resident Fish Multi-Year Implementation Plan -Upper Snake Sub-region; CBFWA 1997).

The goal of the Wildlife Section of the NWPPC FWP is to “achieve and sustain levels of habitat and species productivity as a means of fully mitigating wildlife losses caused by construction and operation of the federal and non-federal hydroelectric system.” (Sec. 11.1, 1995 Amendments). To achieve that goal, we have protected, enhanced, and maintained native riparian, wetland, and shrub-steppe habitats in perpetuity. We accomplish this by acquiring fee-title or conservation easements and by enhancing those lands. Existing public lands may also be enhanced. Habitat enhancements and operation and maintenance are consistent with the guidelines established by the CBFWA Wildlife Caucus (CBFWA 1998). Emphasis is on blocked areas of high-priority habitat and on on-site, in-kind mitigation (although off-site, out-of-kind may be appropriate in some cases). The operating philosophy for wildlife mitigation is “Protect the best, restore the rest.”

Past Efforts

Past efforts have included habitat restoration and enhancement on the Fort Hall Reservation, continued implementation of a Joint Culture Facility for the propagation of native salmonids (yellowstone cutthroat trout and redband trout) for reintroduction in historical habitats in the subbasins, protection and enhancement of wildlife habitats through the purchase of property and permanent easements, quantification of resident fish habitat provided by flow augmentation for downstream anadromous fish needs and evaluation of the impacts of the flow augmentation releases on resident fish in the subregion, development of flow scenarios (following the normative river concept) throughout the subregion sufficient to allow recovery of weak native fish populations, population and spawning surveys of bull trout and redband trout in the North Fork Payette, upper Weiser River, and Boise River drainages, and the implementation of a plan to construct a wetland in Warm Springs.

Regional Co-managers have identified that hydropower has limited white populations production in Oxbow and Hells Canyon Reservoirs and that supplementation may significantly enhance the population and provide fishery for white sturgeon opportunities. (Resident Fish Multi-Year Implementation Plan -Upper Snake Sub-region; CBFWA 1997).

Under the cooperative agreement between Idaho Department of Fish and Game and the Shoshone-Bannock Tribes, about 9,000 acres (14,982 habitat units) have been protected in perpetuity as partial mitigation for Palisades Dam and reservoir. Fourteen percent of the land protected is riparian and wetlands, 48% is native grasslands and shrub-steppe, and 38% is agriculture (all can be restored to native habitat). The Deer Parks, Menan Butte, and Beaver Dick parcels together protect about 4 miles along the South Fork Snake River including breeding bald eagle habitat. The Soda Hills project protected an additional 2,500 acres for wintering mule deer that migrate through the Palisades corridor. One parcel that will close in April 1999 protects a narrow bottleneck to the Boise Foothills that provides winter range to 35-45% of the mule deer in a 2,100-square mile area.

Research, Monitoring and Evaluation

All of the ongoing projects have or are currently identifying actions needed to improve native fish and wildlife resources in the basin. These include the consumptive sturgeon fishery in Hells Canyon and Oxbow reservoirs, the Shoshone-Bannock/Shoshone Paiute joint culture facility, the Idaho water rental: resident fish impacts phase III project, and the Snake River native salmonid assessment project.

Habitat restoration/enhancement has on the Fort Hall Reservation has been successful over the past seven years increasing fish biomass and densities, decreasing unstable bank area, increasing usable spawning gravel, and habitat for all life stages of salmonids.

The native salmonid assessment project is currently inventorying fish populations and their habitats. This will continue through the first several years of the project including FY 2000. Data collected from the first year (FY 98) will be entered into a Columbia Basin-wide database. We are beginning the work to identify factors limiting these populations.

The water rental project is continuing to quantify and evaluate impacts to resident fish resulting from the salmon flow augmentation releases and is continuing to refine fisheries/ecosystem flow recommendations. This project is also continuing to coordinate with the Bureau of Reclamation to model these flow recommendations.

Currently, the Nez Perce Tribe, in coordination with other regional co-managers, is developing a plan to augment the remaining white sturgeon in Hells Canyon and Oxbow Reservoirs in order to provide white fishery opportunities to partially mitigate for lost fishing opportunities in the Lower Snake Subregion. The NPT Consumptive Sturgeon Fisheries Project (BPA # 9903200) plans to provide an estimated annual harvest of at least 250 white sturgeon greater than 90 cm in both Hells Canyon and Oxbow Reservoirs for tribal and non-tribal fishers.

We have measured baseline conditions of wildlife and vegetation and developed management plans with desired future conditions for most of the projects referenced above. Progress towards desired future conditions would be monitored programmatically by measuring standardized target species habitat variables from HEP models (USFWS 1980) and compared to baseline measured at the time of acquisition. Some wildlife populations (i.e., big game, waterfowl, upland birds, bald eagles, neotropical migrants and others), native plant communities, noxious weed infestations, livestock trespass, and public use are routinely monitored by agencies and tribes throughout the subbasin. Plant and animal species of special concern will be monitored periodically by the Idaho Conservation Data Center staff. In addition, IDFG will monitor neotropical bird populations at Big Cottonwood WMA, Deer Parks, and Centennial Marsh WMA. Sharp-tailed grouse will be considered on several of the properties. The NRCS will be monitoring responses of noxious weeds to insect biocontrol. Mergliano (1996) currently is studying cottonwood regeneration along the South Fork Snake. New HEP models will establish baseline monitoring evaluations and the

Wildlife Caucus is recommending some research priorities to the ISRP for consideration on a basin-wide approach to monitoring. Monitoring and evaluation are being cost-shared by the managing agencies (BLM, SBT, and IDFG) and other entities such as the Salmon Corps.

Remaining Work

Specific actions which will achieve these objectives include: 1) Implement and monitor flow recommendations to insure the flows are reestablishing a natural hydrograph and proper functioning of the ecosystem; 2) identify and correct fish passage problems; 3) identify historic and current stocks, population levels, and habitat conditions; 4) assess watershed health; 5) restore habitat; 6) identify genetic purity of native fishes; 7) supplement and reintroduce native species using artificial production; 8) develop put and take fisheries in enclosed terminal water bodies to provide recreational and subsistence fishery opportunities and ease pressure on native fish stocks; 9) monitor and evaluate reintroduction and supplementation programs; 10) monitor and evaluate natural reproduction and recruitment; and, 11) protect terrestrial habitats on private land through acquisition and easements and enhance wildlife habitats on public land.

The native salmonid assessment project began inventorying populations in the summer of 1998 in the Payette and Weiser basins. By the end of FY99, inventorying will be finished in the Payette and Weiser basins, and partially completed in the Boise and Owyhee basins. The remaining basins in the upper Snake Subregion will be surveyed in subsequent years. Once the inventorying is complete, we will know where populations are at risk and what some of the limiting factors are. Then we can design and implement recovery strategies, and monitor their success.

The water rental project will work with the Bureau of Reclamation to complete the modeling of the flow recommendations. The project will need to quantify and evaluate the impacts to resident fish resulting from any changes in the flow augmentation program that would be caused by the upcoming NMFS 1999 salmon recovery strategy decision . The project also needs to work with the Bureau of Reclamation et al. to implement changes in the flow augmentation releases to increase benefits to resident fish.

Co-managers plan to implement and monitor white sturgeon fisheries in Hells Canyon and Oxbow Reservoirs to provide fishery opportunity to partially mitigate for lost white sturgeon fishing in the Lower Snake River due to hydropower development.

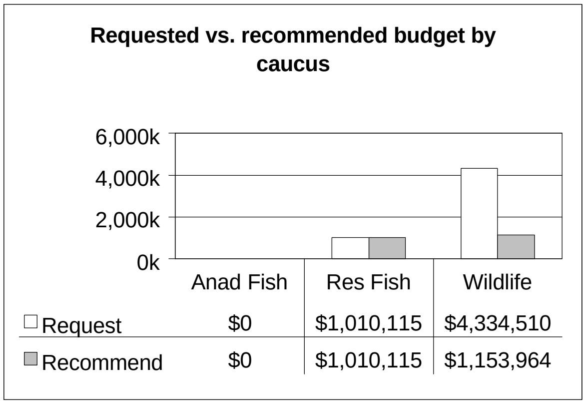
To date, about 15,000 HU have been protected in perpetuity as partial mitigation for Palisades, Minidoka, Anderson Ranch, and Black Canyon hydro facilities, which is less than 30% of the losses for these four projects as listed in the NWPPC FWP (54,292 HU; Table 11-4). At a *minimum*, we need to continue mitigating for those losses and those only account for construction and inundation losses. Operational losses for wildlife have yet to be quantified and mitigation for those will be in addition to the current efforts. Furthermore, the Wildlife Caucus currently is deciding what “full mitigation” for construction/inundation losses means. For example, just because there are 54,292 HU listed in the FWP, that doesn’t mean that once we have protected 54,292 HU that we have fully mitigated for those initial losses. Additionally, no projects have been implemented thus far to mitigate for Deadwood, and many wildlife managers agree that Cascade and American Falls reservoirs should be amended into the FWP. Secondary losses may also be addressed in the future

Subbasin Recommendations

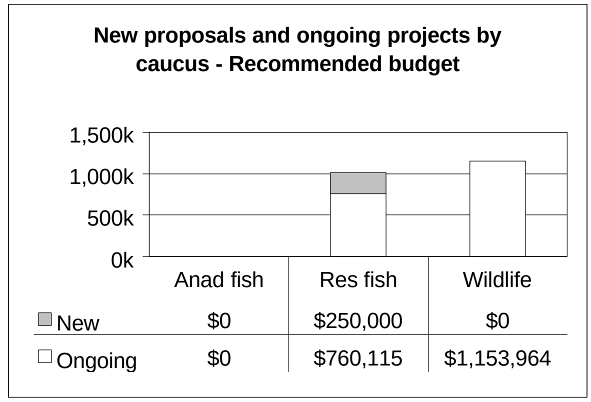
Projects and Budgets

Based on the preceding subbasin description, the CBFWA fish and wildlife managers recommend funding a total of 6 projects at a cost of $2,164,079. Of the projects recommended, 5 focus on resident fish, and 1 is directed at wildlife. The managers consider one of these projects, for $1,153,964, to be innovative in technique and application. Another project supports ESA requirements for a total of $225,208.

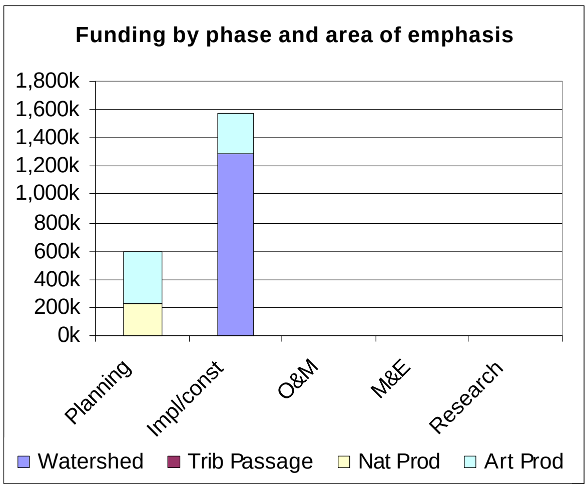
Refer to the following figures for detail on: 1) total recommended and requested budget by caucus, 2) funding for new and ongoing work, 3) funding by project phase and emphasis, and 4) funding by time period (past, current and future). Individual projects are listed in the following table.



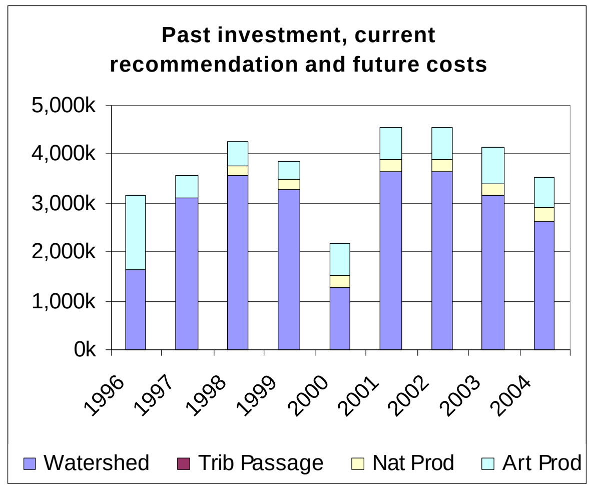
Requested vs. recommended budget by caucus



New proposals and ongoing projects by caucus - Recommended budget



Funding by phase and area of emphasis



Past investment, current recommendation and future costs

ProjectID		Title	Sponsor	FY99 recom.	FY00 recom.	Estimated Outyears FY01	FY02	FY03	FY04
Resident Fish Projects									
20135		Consumptive Sturgeon Fishery-Hells Canyon and Oxbow Reservoirs	NPT		250	250	250	250	150
9106700		Idaho Water Rental: Resident Fish and Wildlife Impacts - Phase III	IDFG	110	119	120	125	125	125
9201000		Habitat Restoration/Enhancement Fort Hall Reservation	SBT	163	133	135	135	140	140
9500600		Shoshone-Bannock/Shoshone Paiute Joint Culture Facility	SBT	249	283	300	300	350	350
9800200	*	Snake River Native Salmonid Assessment	IDFG	225	225	250	250	262	262
				Resident Fish Totals	**$1,010**	**$1,055**	**$1,060**	**$1,127**	**$1,027**
Wildlife Projects									
9505700	†	Southern Idaho Wildlife Mitigation	IDFG, SBT	3,111	1,154	3,500	3,500	3,000	2,500
				Wildlife Totals	**$1,154**	**$3,500**	**$3,500**	**$3,000**	**$2,500**
		* indicates ESA project, † indicates 'Innovative work'		**SUBBASIN TOTALS**	**$2,164**	**$4,555**	**$4,560**	**$4,127**	**$3,527**

All figures in thousands of dollars

Needed Future Actions

Future needed actions include the continued funding of projects that focus on the recovery of native fish populations in the subregion. Focus efforts on projects that reestablish ecological processes and functions of a healthy functioning ecosystem such as a return to more normative river conditions (e.g. natural hydrographs, connectivity between the river, riparian habitat, and floodplain), habitat restoration and protection projects, and projects that help restore weak, native fish populations to healthy, self-sustaining, and harvestable levels, and that protect existing strong populations.

Funding for the Joint Culture Facility is predicted to extend to the year 2020 or until native salmonids have been reintroduced into their historic habitats in the subregion.

Continue funding the Snake River native salmonid assessment project so that all the phases and objectives can be met. This is a long-term multi-phased project scheduled to extend to 2015.

Continue funding the water rental project so that resident fish impacts resulting from changes in the flow augmentation due to the NMFS 1999 decision point can be quantified and evaluated.

Purchase storage space from Reclamation reservoirs for the purpose of establishing minimum pools and for stream channel maintenance to protect and recover resident fish populations.

Develop and implement biological and integrated rule curves for reservoirs in the upper Snake River subregion.

Conduct instream flow evaluations to determine the flow requirements for the maintenance and recovery of instream, riparian, and flood plain habitats, as well as resident fish populations.

Wildlife mitigation in the Upper Snake subbasin has been ongoing and 9,000 acres have been protected in three years. However, yearly funding certainty is critical to the success of these projects; the annual funding process limits the total acquisition requirements to a minimum prescribed amount that disables the mitigation program to effectively implement habitat acquisitions based on the programs goals and objectives for blocking critical fish and wildlife areas. Cooperating agencies, local interest groups, and landowners have a hard time understanding the complexities of the funding issues and are soon reluctant to enter into any long-term negotiations. Likewise, long-term operation, maintenance, and monitoring funding is needed -- O&M should not be an annual procedure.

The IDFG and SBT have submitted the Southern Idaho Wildlife Mitigation project as a multi-year, milestone-based, programmatic project to maximize flexibility and efficiency in putting money on the ground for habitat acquisitions and enhancements.

Actions by Others

We need to continue to work with the Bureau of Reclamation on their development of a Decision Support System that will enable users to estimate the tradeoffs or impacts of various flow scenarios on the vast array of interests in the subregion from fish and wildlife to hydropower, irrigation, agriculture, municipalities, Native Americans, and recreation etc.

Reclamation is currently funding research on bull trout life histories and habitat needs in the upper Boise River basin in Arrowrock and Anderson Ranch reservoir and the streams tributary to these reservoirs.

Reclamation is also funding research on Cascade Reservoir to identify the reasons for the collapse of the perch population.

We need to continue to support and work with the land management agencies in their efforts to monitor, protect, and restore habitats.

We need to get the cooperation and assistance from Reclamation to support efforts to establish minimum pools, develop biological and integrated rule curves, and develop and implement flow scenarios that will help recover the upper Snake River subregion ecosystem.

Recommend the complete cessation of stocking non-native fishes in areas historically and presently occupied by native fish. Continue the protection of riparian and other terrestrial habitats through purchase and easements.

Wildlife populations would benefit if lands throughout the subbasins were managed for increased Ecological Integrity Ratings.

SUMMARY OF SUBBASIN RECOMMENDATIONS

ProjectID	Title	Sponsor	Subbasin	Caucus*	Tier	FY99	FY00 req	FY00 rec
Systemwide								
20014	Evaluate Songbird Use of Riparian Areas During Fall Migration	U of I	Systemwide	W	3		33	
20025	Deschutes River Stray Summer Steelhead Assessment	ODFW	Systemwide	A	1		65	65
20027	Electronic Columbia Basin Watershed Newsletter	Intermountain Communications	Systemwide	A	3		57	
20029	Electronic Columbia Basin Fish & Wildlife Research Report	Intermountain Communications	Systemwide	A	3		57	
20030	Impact of Nutrients on Salmon Production in the Columbia River Basin	U of BC	Systemwide	A	2		186	
20043	Intracytoplasmic Sperm Injection: Genetic Retrieval From Single Sperm	U of I	Systemwide	A	3		224	
20044	Endocrine Control of Ovarian Development in Salmonids	U of I	Systemwide	A	3		222	
20045	Analyzing Genetic and Behavioral Changes During Salmonid Domestication	WSU	Systemwide	A	3		210	
20046	Induction of Precocious Sexual Maturity and Enhanced Egg Production in Fish	U of I	Systemwide	A	3		197	
20047	Enhancement of salmonid gamete quality by manipulation of intracellular ATP	U of I	Systemwide	A	3		183	
20048	Viral Vaccines and Effects on Reproductive Status	WSU	Systemwide	A	3		205	
20050	Remove Excess Heat from Streams and Store it for Future Application	Parker's Inc (a close held general corp) dba BETTERFISH	Systemwide	A	3		29	
20056	Elucidate Traffic Patterns of Ihn Virus in the Columbia River Basin	USGS-WFRC	Systemwide	A	3		75	
20057	Strategies for Riparian Recovery: Plant Succession & Salmon	OSU	Systemwide	A	3		429	
20059	Infrastructure to Complete FDA Registration of Erythromycin	U of I-FWR	Systemwide	A	1		71	71
20061	Influence of Marine-Derived Nutrients on Juvenile Salmonid Production	USGS-BRD	Systemwide	A	2		310	
20065	Identification of larval Pacific lampreys (Lampetra tridentata), river lamp	USGS-BRD, CRRL	Systemwide	A	1		79	79
20069	Innovation Proposal Fund: Construct fuzzy logic decision support system…	E&S Environmental Chemistry, Inc.	Systemwide	A	3		100	
20075	Engineered Anadromous Salmonid Habitat	U of I	Systemwide	A	2		61	
20099	System for Salmon Migrating Through Dams	Krick Salmon Survival Systems	Systemwide	A	3		145	
20103	Indexing Salmon Carrying Capacity to Habitat, Population & Physical Fitness	OSU	Systemwide	A	3		363	
20104	Sources of Myxobacterial Pathogens in Propagated Salmonids	USFWS/SCTC	Systemwide	A	2		90	
20105	Develop New Feeds for Fish Used in Recovery and Restoration Efforts	USFWS/SCTC	Systemwide	A	3		100	

ProjectID	Title	Sponsor	Subbasin	Caucus*	Tier	FY99	FY00 req	FY00 rec
20106	Heritability of Disease Resistance and Immune Function in Chinook Salmon	USFWS	Systemwide	A	2		399	
20111	Preserve Cryogenically the Gametes of Selected Mid-Columbia Salmonid Stocks	CRITFC	Systemwide	A	2		90	
20537	Bonneville Power Administration Non-Discretionary Projects Umbrella	BPA	Systemwide	A			0	
8740100	Assessment of Smolt Condition: Biological and Environmental Interactions	USGS-BRD, CRRL	Systemwide	A	1	199	199	199
8810804	Streamnet: the Northwest Aquatic Information System	PSMFC	Systemwide	A	1	1800	1936	1936
8906200	Fish and Wildlife Program Implementation	CBFWA	Systemwide	A	1	1769	2181	2042
8907201	Independent Scientific Advisory Board Support	DOE/ORNL	Systemwide	A	1		100	50
9005200	Performance/Stock Productivity Impacts of Hatchery Supplementation	BRD	Systemwide	A	1	460	495	460
9009300	Genetic Analysis of Oncorhynchus Nerka (Modified to Include Chinook Salmon)	U of I	Systemwide	A	1	139	145	139
9105500	N a T U R E S [Formerly Supplemental Fish Quality (Yakima)]	NMFS	Systemwide	A	1	500	500	500
9305600	Assessment of Captive Broodstock Technology	NMFS	Systemwide	A	1	1200	1310	1237
9402600	Pacific Lamprey Research and Restoration	CTUIR	Systemwide	A	1	320	381	381
9600500	Independent Scientific Advisory Board	CBFWF	Systemwide	A	1	664	684	342
9800401	Electronic Fish and Wildlife Newsletter	Intermountain Communications	Systemwide	A	1		150	150
9800800	Regional Forum Facilitation Services	DS Consulting	Systemwide	A	1		184	75
9803100	Implement Wy-Kan-Ush-Mi Wa-Kish-Wit Watershed Assessment & Restoration Plan	CRITFC	Systemwide	A	1	121	355	267

Mainstem

ProjectID	Title	Sponsor	Subbasin	Caucus*	Tier	FY99	FY00 req	FY00 rec
20011	Evaluate Whole System Effects on Migration and Survival of Juvenile Salmon	OCFWRU	Mainstem	A	2		401	
20012	Develop New Technology for Telemetry and Remote Sensing of Fish Quality	OCFWRU	Mainstem	A	3		324	
20023	Hanford Reach Steelhead Stock Investigation	WDFW	Mainstem	A	1		99	92
20052	Strategies to Limit Disease Effects on Estuarine Survival	OSU, NMFS	Mainstem	A	2		334	
20053	Anadromous Salmonid Transit System	Morrison-Knudsen Corp	Mainstem	A	3		699	
20054	Evaluate Effects of Hydraulic Turbulence on the Survival of Migratory Fish	ORNL	Mainstem	A	3		341	
20060	Juvenile Anadromous Fish Prototype-Scale Evaluation Facility	Northwest Hydraulic Consultants, Inc.	Mainstem	A	3		128	
20062	Adaptive Management of White Sturgeons	USGS-BRD, CRRL	Mainstem	R	3		185	
20063	Evaluate Effects of Catch and Release Angling on White Sturgeon	USGS, IDFG	Mainstem	R	3		271	
20066	Inventory Resident Fish Populations in the Bonneville, the Dalles, and John	USGS-BRD	Mainstem	R	3		267	
20067	Effects of Supersaturated Water on Reproductive Success of Adult Salmonids	USGS	Mainstem	A	3		840	

ProjectID	Title	Sponsor	Subbasin	Caucus*	Tier	FY99	FY00 req	FY00 rec
20068	Numerical Study of Flow-Field Structure on Salmonid Migration	UMICH	Mainstem	A	3		95	
20074	Eagle Lakes Ranch Acquisition and Restoration	USFWS	Mainstem	W	1		854	287
20076	Diet, Distribution & Life History of Neomysis Mercedis in John Day Pool	UMT	Mainstem	A	3		176	
20082	Rainwater Wildlife Area Operations & Maintenance	CTUIR	Mainstem	W	1		275	275
20095	Evaluate Interactions of American Shad With Salmon in the Columbia River	USGS-BRD	Mainstem	A	2		152	
20100	Characterize Historic Channel Morphology of the Columbia River: Mcnary Pool	PNNL	Mainstem	A	2		120	
20101	Connectivity and Productivity of Mainstem Alluvial Reaches	PNNL	Mainstem	A	3		167	
20110	Develop Wheels, Pools and Falls Approach for Fish Passage at Dams	Sun Mountain Reflections	Mainstem	A	3		199	
20115	Securing Wildlife Mitigation Sites - Oregon, Irrigon WMA Additions	ODFW	Mainstem	W	1		25	25
20116	Securing Wildlife Mitigation Sites - Oregon, Horn Butte	ODFW	Mainstem	W	1		442	42
20122	Test Guidance Flows and Strobe Lights at a SBC to Increase Smolt FCE & FGE	WDFW	Mainstem	A	3		295	
20142	Snake River Temperature Control Project, Phase III	CRITFC, UI, OGI	Mainstem	A	3		564	
20143	Monitor Symptoms of Gas Bubble Trauma in Adult Salmonids	CRITFC	Mainstem	A	1		113	113
20149	Develop Research Priorities for Fall Chinook in the Columbia River Basin	PNNL	Mainstem	A	3		70	
20157	Gas Bubble Trauma Monitoring in the Clearwater River	IDFG	Mainstem	A	1		0	59
20515	Mainstem Columbia River Umbrella Proposal	ODFW	Mainstem	A			0	
20541	Snake River Fall Chinook Salmon Studies (Umbrella Proposal)	NPT, USFWS, USGS	Mainstem	A			0	
20542	Biological Monitoring of Columbia River Basin Salmonids	Multi-agency: recommendation for continued biological smolt monitoring	Mainstem	A			0	
20543	Coded Wire Tag Program	WDFW, ODFS, USFWS, PSMFC	Mainstem	A			0	
20552	Smolt Monitoring Program Umbrella	PSMFC, IDFG, NP, USGS	Mainstem	A			0	
8201300	Coded-Wire Tag Recovery	PSMFC	Mainstem	A	1	1731	1923	1923
8331900	New Fish Tagging System	NMFS	Mainstem	A	1	1202	1389	1389
8332300	Smolt Monitoring at the Head of Lwr. Granite Reservoir & Lwr. Granite Dam	IDFG	Mainstem	A	1	382	397	397
8401400	Smolt Monitoring Program Marking	USFWS	Mainstem	A	1	668	121	121
8605000	White Sturgeon Mitigation and Restoration in the Columbia and Snake Rivers	ODFW	Mainstem	R	1	1960	1919	1919
8712700	Smolt Monitoring by Federal and Non-Federal Agencies	PSMFC	Mainstem	A	1	1262	1870	1870
8712702	Comparative Survival Rate Study (CSS) of Hatchery Pit Tagged Chinook	PSMFC	Mainstem	A	1	1216	936	936
8712703	Imnaha River Smolt Monitoring Program Project	NPT	Mainstem	A	1	175	189	189
8906500	Annual Stock Assessment - CWT (USFWS)	USFWS	Mainstem	A	1	399	111	111

ProjectID	Title	Sponsor	Subbasin	Caucus*	Tier	FY99	FY00 req	FY00 rec
8906600	Annual Stock Assessment- Coded Wire Tag Program (WDFW)	WDFW	Mainstem	A	1	335	374	374
8906900	Annual Stock Assessment - CWT (ODFW)	ODFW	Mainstem	A	1	190	216	216
8910700	Statistical Support for Salmonid Survival Studies	UW	Mainstem	A	3	180	185	
8910800	Monitor and Evaluate Modeling Support	UW	Mainstem	A	3		411	
9007700	Northern Pikeminnow Management Program	PSMFC	Mainstem	A	1	3306	3306	2506
9007800	Evaluate Predator Removal: Large-Scale Patterns	USGS	Mainstem	A	1	40	118	118
9008000	Columbia River Basin Pit Tag Information System	PSMFC	Mainstem	A	1	1041	1365	1365
9009200	Wanaket Wildlife Mitigation Project Operations & Maintenance	CTUIR	Mainstem	W	1	150	200	200
9102900	Life History and Survival of Fall Chinook Salmon in Columbia River Basin	USGS	Mainstem	A	1	900	800	744
9105100	Monitoring and Evaluation Statistical Support	UW	Mainstem	A	3		340	
9202200	Physiological Assessment of Wild and Hatchery Juvenile Salmonids	NMFS	Mainstem	A	1	349	358	350
9202400	Protect Anadromous Salmonids in the Mainstem Corridor	CRITFE	Mainstem	A			388	
9204101	Lower Columbia River Adult Study	COE	Mainstem	A	1	200	200	0
9302900	Survival Estimates for the Passage of Juvenile Salmonids Through Dams and R	NMFS/NWFSC	Mainstem	A	1	1081	1199	1199
9303701	Stochastic Life Cycle Model Technical Assistance	PER Ltd.	Mainstem	A	1	70	180	70
9403300	The Fish Passage Center (FPC)	PSMFC	Mainstem	A	1	1060	1079	1079
9406900	A Spawning Habitat Model to Aid Recovery Plans for Snake River Fall Chinook	PNNL	Mainstem	A	1	165	333	150
9600600	Facilitation, Technical Assistance and Peer Review of Path	ESSA	Mainstem	A	1	450	450	450
9600800	Stufa Participation in a Plan for Analyzing and Testing Hypotheses (PATH	ODFW	Mainstem	A	1	698	745	745
9600801	Technical Support for PATH	NMFS	Mainstem	A	1	75	75	75
9601700	Provide Technical Support for PATH	BioAnalysts, Inc.	Mainstem	A	1	27	109	27
9601900	Second Tier Database Support for Ecosystem Focus	BPA	Mainstem	A	3		180	
9602100	Gas Bubble Disease Research and Monitoring of Juvenile Salmonids	USGS-BRD, CRRL	Mainstem	A	1	652	44	44
9603201	Begin Implementation of Year 1 of the K Pool Master Plan Program	YIN	Mainstem	A	2	283	428	
9700200	Path - UW Technical Support	UW	Mainstem	A	1	182	301	182
9700900	Evaluate Rebuilding the White Sturgeon Population in the Lower Snake Basin	NPT	Mainstem	R	1	400	419	409
9701000	PIT Tag System Transition	COE; PSMFC; NMFS-CZES	Mainstem	A	1	800	853	853
9701400	Evaluation of Juvenile Fall Chinook Stranding on the Hanford Reach	WDFW	Mainstem	A	1	384	217	217
9702400	Avian Predation on Juvenile Salmonids in the Lower Columbia River	OSU/CRITFC	Mainstem	A	1	280	643	643
9702600	Ecology of Marine Predatory Fishes: Influence on Salmonid Ocean Survival	NMFS/NWFSC	Mainstem	A	1	0	200	0
9800100	Analytical Support-PATH and ESA Biological Assessments	Hinrichsen Environmental	Mainstem	A	1	120	125	120

ProjectID	Title	Sponsor	Subbasin	Caucus*	Tier	FY99	FY00 req	FY00 rec
		Services						
9800600	PATH Technical Support - James J. Anderson	Anderson Consulting	Mainstem	A	3		50	
9801003	Spawning Distribution of Snake River Fall Chinook Salmon	USFWS	Mainstem	A	1	126	183	178
9801004	M&E of Yearling Snake R. Fall Chinook Released Upstream of Lower Granite	NPT	Mainstem	A	1	301	273	273
9801400	Ocean Survival of Juvenile Salmonids in the Columbia River Plume	NMFS/NWFSC	Mainstem	A	1	0	826	0
9808001	PIT Tag Purchase and Distribution	PSMFC	Mainstem	A			0	
9900300	Evaluate Spawning of Salmon Below the Four Lowermost Columbia River Dams	WDFW, ODFW, USFWS, PNNL	Mainstem	A	1		386	356
9902200	Assessing Genetic Variation Among Columbia Basin White Sturgeon Populations	U of I	Mainstem	R	1		147	147

Lower Columbia

ProjectID	Title	Sponsor	Subbasin	Caucus*	Tier	FY99	FY00 req	FY00 rec
20013	Restore Unobstructed Fish Passage to Duncan Creek	SLOA	Lower Columbia Mainstem	A	3		190	
20098	Develop and Evaluate Selective Commercial Fishing Gear: Tangle Nets	WDFW	Lower Columbia Mainstem	A	2		185	
20107	Reconnect the Westport Slough to the Clatskanie River	LCRWC	Lower Columbia Mainstem	A	3		30	
20108	Recruit, Train, Organize & Support River Stewards	Oregon Trout	Lower Columbia Mainstem	A	3		76	
20109	Cedar Creek Natural Production and Watershed Monitoring Project	WDFW	Lower Columbia Mainstem	A	3		226	
20120	Evaluate Factors Limiting Columbia River Gorge Chum Salmon Populations	USFWS	Lower Columbia Mainstem	A	1		190	190
20121	Evaluate Habitat Use and Population Dynamics of Lampreys in Cedar Creek	USFWS	Lower Columbia Mainstem	A	1	151	139	135
20125	Restore Riparian and Anadromous Fish Habitat in the Upper Sandy Basin	Mt. Hood NF	Lower Columbia Mainstem	A	3		98	
9306000	Select Area Fishery Evaluation Project	ODFW, WDFW, CEDC	Lower Columbia Mainstem	A	1	1400	1500	1400
9902500	Lower Columbia River Wetlands Restoration and Evaluation Program	USFS-CRGNSA	Lower Columbia Mainstem	W	1	125	125	125
9902600	Sandy River Delta Riparian Reforestation	USFS-CRGNSA	Lower Columbia Mainstem	W	1	22	24	24
20088	Assess Mckenzie Watershed Habitat and Prioritize Projects	McKenzie Watershed Council	Willamette	A	1		183	183
20089	Increase Instream Water Rights for Crabtree Creek	SSWC	Willamette	A	3		1403	
20128	Riparian Restoration and Enhancement Planning for Multnomah Channel	Metro	Willamette	W	1		30	30
20140	Tualatin River National Wildlife Refuge Additions	USFWS	Willamette	W	1		1250	250
20550	Willamette Basin Mitigation Program Umbrella	ODFW	Willamette	A			0	
8816000	Willamette Hatchery Oxygen Supplementation	ODFW	Willamette	A	1	43	33	33

ProjectID	Title	Sponsor	Subbasin	Caucus*	Tier	FY99	FY00 req	FY00 rec
9107800	Burlington Bottoms Wildlife Mitigation	ODFW	Willamette	W	1	58	117	117
9205900	Amazon Basin/Eugene Wetlands Phase Two	TNC	Willamette	W	1	50	2376	50
9206800	Implement Willamette Basin Mitigation Program	ODFW	Willamette	W	1	400	230	230
9405300	Bull Trout Assessment - Willamette/Mckenzie	ODFW	Willamette	R	1	46	59	59
9607000	Mckenzie River Focus Watershed Coordination	McKenzie Watershed Council	Willamette	A	1	105	105	105
Lower Mid-Columbia								
20026	Evaluate Status of Coastal Cutthroat Trout Above Bonneville Dam	ODFW	Hood	A	2		255	
20513	Hood River / Fifteenmile Creek Umbrella	ODFW and CTWSRO	Hood	A			0	
20519	Multi-Year Hood River Anadromous Fish Plan	CBFWA	Hood	A			0	
8805303	Hood River Production Program - M&E	CTWSRO	Hood	A	1	500	500	500
8805304	Hood River Production Program - ODFW M&E	ODFW	Hood	A	1	412	424	424
8902900	Hood River Production Program-Pelton Ladder-Hatchery	ODFW	Hood	A	1	132	115	115
9301900	Powerdale, Parkdale, and Oak Springs O&M	ODFW and CTWSRO	Hood	A	1	468	487	487
9802100	Hood River Fish Habitat Project	CTWSRO	Hood	A	1	117	228	228
9801900	Wind River Watershed Restoration	UCD, USFS, USGS, WDFW	Wind	A	1	350	1146	554
9802600	Document Native Trout Populations	Washington Trout	Wind	R	2	52	61	
9902400	Bull Trout Population Assessment in the Columbia River Gorge, WA	WDFW	Wind	R	2	150	200	
20520	Multi-Year Fifteen Mile Anadromous Fish Plan	CBFWA	Fifteenmile	A			0	
9304000	Fifteenmile Creek Habitat Restoration Project (Request Multi-Year Funding)	ODFW	Fifteenmile	A	1	220	247	247
9304001	Fifteenmile Creek Wild Steelhead Smolt Production	ODFW	Fifteenmile	A	1		27	27
20118	Klickitat River Subbasin Assessment	YIN	Klickitat	A	1		235	141
20525	Multi-Year Klickitat Anadromous Fish Plan	CBFWA	Klickitat	A			0	
9705600	Lower Klickitat River Riparian & In-Channel Habitat Enhancement Project	YIN	Klickitat	A	1	296	300	270
20070	Water Conservation and Stream Enhancement Project	Tumalo Irrigation District	Deschutes	R	3		18382	
20113	Securing Wildlife Mitigation Sites - Oregon, South Fork Crooked River	ODFW	Deschutes	W	3		14	
20126	Habitat Enhancement Within Transmission Corridors	USFS	Deschutes	W	3		309	
20511	Deschutes River Umbrella Proposal	ODFW and CTWSRO	Deschutes	A			0	
20521	Multi-Year Deschutes Anadromous Fish Plan	CBFWA	Deschutes	A			0	
9404200	Trout Creek Habitat Restoration Project Multi Year Funding Proposal	ODFW	Deschutes	A	1	298	381	359
9405400	Bull Trout Genetics, Habitat Needs, L.H., etc. in Central and N.E. Oregon	ODFW	Deschutes	R	1	340	425	380
9500700	Hood River Production Program - Pge: O&M	PGE	Deschutes	A	1	95	50	50
9705900	Securing Wildlife Mitigation Sites - Oregon	ODFW, CTWS, CTUIR, BPT…	Deschutes	W	1	4000	5000	3900
9802400	Monitor Watershed Conditions on the Warm Springs Reservation	CTWSRO	Deschutes	A	1		161	35
9802800	Trout Creek Watershed Improvement Project Multi Year	JCSWCD	Deschutes	A	1		484	231

ProjectID	Title	Sponsor	Subbasin	Caucus*	Tier	FY99	FY00 req	FY00 rec
	Funding Proposal							
9900600	Restoration of Riparian Habitat in Bakeoven / Deep Creeks	WCSWCD	Deschutes	A	1	35	80	80
20015	Characterize and Assess the John Day Watershed Using Landsat Tm Imagery	Northwest Habitat Institute	John Day	W	3		215	
20035	Water Right Acquisition Program (Multi-Year Fy 2000-2002)	Oregon Water Trust	John Day	A	1		130	130
20064	Upstream Migration of Pacific Lampreys in the John Day R: Behavior, Timing	USGS-BRD, CRRL	John Day	A	2		299	
20077	Inventory & Assessment of Irrigation Diversion Alternatives to Push-up Dams	USBOR	John Day	A	3		188	
20131	Enhance North Fork John Day River Subbasin Anadromous Fish Habitat	CTUIR	John Day	A	1		206	206
20134	Acquire Oxbow Ranch -- Middle Fork John Day River	CTWSRO	John Day	A	1		2628	1300
20514	John Day River Umbrella	ODFW	John Day	A			0	
20522	Multi-Year John Day Anadromous Fish Plan	CBFWA	John Day	A			0	
8402100	Protect and Enhance Anadromous Fish Habitat in the John Day Subbasin	ODFW	John Day	A	1	380	426	426
9303800	North Fork John Day Area Riparian Fencing	USFS	John Day	A	2	58	68	
9306600	Oregon Fish Screening Project - FY’00 Proposal	ODFW	John Day	A	1	523	642	642
9605300	Upper Clear Creek Dredge Tailings Restoration	USFS/CTUIR	John Day	A	1	75	85	85
9703400	Monitor Fine Sediment and Sedimentation in John Day and Grande Ronde Rivers	CRITFC	John Day	A	1	30	32	32
9801600	Monitor Natural Escapement & Productivity of John Day Basin Spring Chinook	ODFW	John Day	A	1	125	180	160
9801700	Eliminate Gravel Push-Up Dams on Lower North Fork John Day	NFJDWC	John Day	A	1	67	90	90
9801800	John Day Watershed Restoration	CTWSRO	John Day	A	1	215	460	425
9802200	Pine Creek Ranch Acquisition	CTWSRO	John Day	W	1		98	95
9901000	Mitigate Effects of Runoff & Erosion on Salmonid Habitat in Pine Hollow	Sherman SWCD	John Day	A	1	27	34	34
20516	Umatilla Subbasin Umbrella	ODFW	Umatilla	A			0	
20523	Multi-Year Umatilla Subbasin Anadromous Fish Plan	CBFWA	Umatilla	A			0	
8343500	Operate and Maintain Umatilla Hatchery Satellite Facilities	CTUIR	Umatilla	A	1	735	822	775
8343600	Umatilla Passage Facilities O & M	Westland Irrigation District	Umatilla	A	1	400	703	502
8710001	Enhance Umatilla River Basin Anadromous Fish Habitat	CTUIR	Umatilla	A	1	270	305	260
8710002	Protect and Enhance Anadromous Fish Habitat in the Umatilla River Subbasin	ODFW	Umatilla	A	1	481	465	353
8802200	Umatilla River Fish Passage Operations	CTUIR	Umatilla	A	1	420	379	360
8805302	Plan, Site, Design and Construct Neoh Hatchery - Umatilla/Walla Walla Comp.	CTUIR	Umatilla	A	1	400	6400	2800
8902401	Evaluate Juvenile Salmonid Outmigration and Survival in the Lower Umatilla	ODFW	Umatilla	A	1	240	300	251
8902700	Power Repay Umatilla Basin Project	BPA	Umatilla	A	1	500	650	550
8903500	Umatilla Hatchery Operation and Maintenance	ODFW	Umatilla	A	1	797	895	850

ProjectID	Title	Sponsor	Subbasin	Caucus*	Tier	FY99	FY00 req	FY00 rec
9000500	Umatilla Hatchery Monitoring and Evaluation	ODFW	Umatilla	A	1	616	722	650
9000501	Umatilla River Basin Natural Production Monitoring and Evaluation	CTUIR	Umatilla	A	1	611	609	480
9506001	Protect & Enhance Wildlife Habitats in the Squaw Creek Watershed	CTUIR	Umatilla	W	1	200	201	201
20021	Estimate natural steelhead production in two tributaries of the Walla Walla	WDFW	Walla Walla	A	2		333	
20022	NE Oregon Hatchery Planning & Coordination - WDFW	WDFW	Walla Walla	A	1		13	10
20127	Walla Walla River Basin Monitoring and Evaluation Project	CTUIR	Walla Walla	A	1		157	134
20138	Design and Construct Neoh Walla Walla Hatchery	CTUIR	Walla Walla	A	1		1380	250
20139	Walla Walla River Fish Passage Operations	CTUIR	Walla Walla	A	1		83	73
20145	Evaluate Little Walla Walla Screening Facility	ODFW	Walla Walla	A	2		243	
20524	Multi-Year Walla Walla Anadromous Fish Plan	CBFWA	Walla Walla	A			0	
9601100	Walla Walla River Juvenile and Adult Passage Improvements	CTUIR	Walla Walla	A	1	2600	2840	2840
9604601	Walla Walla Basin Fish Habitat Enhancement	CTUIR	Walla Walla	A	1	230	275	240
9901100	Assess Fish Habitat & Salmonids in the Walla Walla Watershed in Washington	WDFW	Walla Walla	A	1	184	185	170
20004	White Salmon River Watershed Enhancement Project	White Salmon River Watershed Management Committee c/o Underwood Conservation District	Little White Salmon	A	3		206	

Upper Mid-Columbia

ProjectID	Title	Sponsor	Subbasin	Caucus*	Tier	FY99	FY00 req	FY00 rec
20003	Enhance Fish Habitat by Improving Water Quality	SYCD	Yakima	A	3		200	
20006	Yakima Basin Benthic Index of Biotic Integrity (B-Ibi)	Washington Trout	Yakima	A	3		48	
20010	Improve Fish Habitat by Reducing Farm Sediment Runoff	Benton Conservation District	Yakima	A	3		1500	
20039	Comparative Population Study: Naneum, Coleman, Cooke Creeks	Washington Trout	Yakima	R	3		52	
20072	Restoring Perennial Instream Flows at Ahtanum Creek	Dames and Moore	Yakima	A	3		185	
20117	Yakima River Subbasin Assessment	YIN	Yakima	A	3		235	
20119	Rock Creek Watershed Assessment and Restoration Project	YIN	Yakima	A	1		240	156
20132	Yakima River Basin Water Temperature Monitoring and Modeling Project	Yakima Basin Joint Board	Yakima	A	2		85	
20141	Recondition Wild Steelhead Kelts	CRITFC	Yakima	A	1		90	73
20150	Evaluate Return Flow Recovery	RSBOJC	Yakima	A	3		35	
20151	Landowner Communication Program	RSBOJC	Yakima	A	3		12	
20152	Improve Yakima River Water Quality by Incorporating Buffer Strips	RSBOJC	Yakima	A	3		161	
20153	Construct Sediment Settling Basins	RSBOJC	Yakima	A	3		265	
20154	Improve Water Quality Monitoring Program	RSBOJC	Yakima	A	3		161	
20155	Inventory On-Farm Irrigation Practices	RSBOJC	Yakima	A	3		10	
20510	Yakima/Klickitat Fisheries Project -- Umbrella	YIN	Yakima	A			0	
20526	Multi-Year Yakima Anadromous Fish Plan	CBFWA	Yakima	A			0	

ProjectID	Title	Sponsor	Subbasin	Caucus*	Tier	FY99	FY00 req	FY00 rec
20547	Yakima Subbasin Habitat/Watershed Project Umbrella	YIN	Yakima	A			0	
8506200	Passage Improvement Evaluation	PNNL	Yakima	A	1	100	100	100
8811525	Yakima/Klickitat Fisheries Project Design and Construction	YIN	Yakima	A	1		1565	1565
8812025	Ykfp Management, Data and Habitat	YIN	Yakima	A	1		750	750
9105700	Yakima Phase 2 [Fish] Screen Fabrication	WDFW, YSS	Yakima	A	1	186	293	293
9107500	Yakima Phase II Screens - Construction	USBOR	Yakima	A	1	1500	1000	1000
9200900	Yakima [Fish] Screens - Phase 2 - O&M	WDFW, YSS	Yakima	A	1	156	134	134
9206200	Yakama Nation - Riparian/Wetlands Restoration	YIN	Yakima	W	1	1600	1750	1550
9405900	Yakima Basin Environmental Education	ESD 105	Yakima	A	1	119	125	125
9503300	O&M of Yakima Phase II Fish Facilities	USBOR	Yakima	A	1	220	100	100
9506325	Yakima/Klickitat Fisheries Project Monitoring and Evaluation	YIN	Yakima	A	1		4640	4310
9506425	YKFP - WDFW Policy and Technical Involvement in the YKFP	WDFW	Yakima	A	1		275	275
9603501	Satus Watershed Restoration	YIN	Yakima	A	1	500	502	472
9609400	WDFW Habitat Unit Acquisition	WDFW	Yakima	W	1	3130	1912	1912
9701325	Yakima/Klickitat Fisheries Project Operations and Maintenance	YIN	Yakima	A	1		2260	2260
9705000	Little Naches River Riparian & In-channel Enhancement Project	YIN	Yakima	A	2		96	
9705100	Yakima Basin Side Channels	YIN	Yakima	A	1	1000	802	602
9705300	Toppenish-Simcoe Instream Flow Restoration and Assessment	YIN	Yakima	A	1		232	164
9803300	Restore Upper Toppenish Creek Watershed	YIN	Yakima	A	1	100	207	195
9803400	Reestablish Safe Access into Tributaries of the Yakima Subbasin	YIN	Yakima	A	1		772	772
9901200	Coordinate/Facilitate Watershed Project Planning/Implementation	Ki-Yak	Yakima	A	1	75	70	70
9901300	Ahtanum Creek Watershed Assessment	YIN	Yakima	A	1	150	240	240
20002	Hydrologic Study of Stangland, Tyler and Clear Lake Area	Stangland-Tyler Aquifer Study	Crab	R	3		171	
20071	Restore Crab Lake and Adjacent Reaches of Crab Creek	Ducks Unlimited, Inc.	Crab	R	3		365	
20083	Evaluate, Restore & Enhance 14 Miles of Instream and Riparian Habitat on…	USFWS	Crab	A	3		103	
9502800	Restore Moses Lake Recreational Fishery	WDFW	Crab	R	1	269	235	235
20001	Remove 23 Migrational Barriers and Restore Instream and Riparian Habitat on	USFWS	Wenatchee	A	1		305	160
20058	Leavenworth Hatchery Complex	BOR	Wenatchee	A	3		630	
20527	Multi-Year Wenatchee River Anadromous Fish Plan	CBFWA	Wenatchee	A			0	
9604000	Evaluate the Feasibility and Risks of Coho Reintroduction in Mid-Columbia	YIN	Wenatchee	A	1	700	1418	100
20033	Rehabilitate Instream and Riparian Habitat on the Similkameen and Okanogan	USFWS	Okanogan	A	3		485	
20037	Improvement of Anadromous Fish Habitat and Passage in Omak Creek	CCT	Okanogan	A	1		350	350
20042	Integrating Okanogan and Methow Watershed Data for Salmonid Restoration	Okanogan Conservation District	Okanogan	A	3		269	

ProjectID	Title	Sponsor	Subbasin	Caucus*	Tier	FY99	FY00 req	FY00 rec
20073	Evaluate Relationship Between Land Use, Water Quality, and Fish Health	USGS	Okanogan	R	3		261	
20123	Restoration of Sockeye Salmon Into Palmer Lake	Salmonsoft	Okanogan	A	2		101	
20124	Evaluate An Experimental Re-Introduction of Sockeye Salmon Into Skaha Lake	CCT	Okanogan	A	1		219	171
20529	Multi-Year Okanogan Anadromous Fish Plan	CBFWA	Okanogan	A			0	
9604200	Restore and Enhance Anadromous Fish Populations & Habitat in Salmon Creek	CCT	Okanogan	A	1	175	2428	578
20031	Community Ecology and Food Web Studies in the Columbia River Basin	USFS	Chelan	A	3		66	
20528	Multi-Year Methow Anadromous Fish Plan	CBFWA	Methow	A			0	
9803500	Watershed Scale Response of Stream Habitat to Abandoned Mine Waste	UW	Methow	A	3		54	

Upper Columbia

ProjectID	Title	Sponsor	Subbasin	Caucus*	Tier	FY99	FY00 req	FY00 rec
20038	Assess Habitat and Passage for Anadromous Fish Upriver of Chief Joseph Dam	CCT	Upper Columbia Mainstem	A	2		274	
20081	STOI Wildlife Land Acquisition and Enhancements	STOI	Upper Columbia Mainstem	W	2		2033	
20091	Construct Warm Springs Wetland	SWID RC&D	Upper Columbia Mainstem	R	3		47	
20096	Ford Hatchery Improvement, Operation and Maintenance	WDFW	Upper Columbia Mainstem	R	2		333	
20097	Phalon Lake Wild Rainbow Trap Improvements and O&M	WDFW	Upper Columbia Mainstem	R	2		25	25
20146	Lake Roosevelt Kokanee Net Pens	WDFW	Upper Columbia Mainstem	R	1		186	186
20509	Hellsgate Big Game Winter Range Umbrella Project	CCT	Upper Columbia Mainstem	W			0	
8503800	Colville Tribal Fish Hatchery	CCT	Upper Columbia Mainstem	R	1	360	361	361
9001800	Evaluate Rainbow Trout/Habitat Improvements of Tribs. to Lake Roosevelt	CCT	Upper Columbia Mainstem	R	1	168	190	190
9104600	Spokane Tribal (Galbraith Springs) Hatchery Operation & Maintenance	STOI	Upper Columbia Mainstem	R	1	453	522	522
9104700	Sherman Creek Hatchery O&M	WDFW	Upper Columbia Mainstem	R	1	319	201	201
9106100	Swanson Lakes Wildlife Area	WDFW	Upper Columbia Mainstem	W	1	233	248	248
9204800	Hellsgate Big Game Winter Range Operation and Maintenance Project	CCT	Upper Columbia Mainstem	W	1	250	383	350
9404300	Monitor, Evaluate, and Research the Lake Roosevelt Fishery	STOI	Upper Columbia Mainstem	R	1	1400	1500	1500

ProjectID	Title	Sponsor	Subbasin	Caucus*	Tier	FY99	FY00 req	FY00 rec
9500900	Rainbow Trout Net Pen Rearing Project	LRDA	Upper Columbia Mainstem	R	1	100	100	100
9501100	Chief Joseph Kokanee Enhancement Project	CCT	Upper Columbia Mainstem	R	1	600	597	397
9502700	Collect Data on White Sturgeon Above Grand Coulee Dam	STOI	Upper Columbia Mainstem	R	2		342	75
9506700	Colville Tribes Performance Contract for Continuing Acquisition	CCT	Upper Columbia Mainstem	W	1	100	1500	400
9700400	Resident Fish Stock Status Above Chief Joseph and Grand Coulee Dams	KNRD	Upper Columbia Mainstem	R	1	405	421	421
9800300	O&M Funding of Wildlife Habitat on STOI Reservation for Grand Coulee Dam	STOI	Upper Columbia Mainstem	W	1	97	97	97
9004400	Implement Fisheries Enhancement Opportunities: Coeur D'alene Reservation	CDA Tribe	Coeur d'Alene	R	1	859	685	685
9004401	Lake Creek Land Acquisition and Enhancement	CDA Tribe	Coeur d'Alene	W	1	186	140	140
9004402	Coeur d' Alene Tribe Trout Production Facility	CDA Tribe	Coeur d'Alene	R	1		1553	1500
9106000	Pend Oreille Wetlands Wildlife Mitigation Project - Kalispel	KNRD	Lower Pend Oreille	W	1	116	154	154
9500100	Kalispel Tribe Resident Fish	KNRD	Lower Pend Oreille	R	1	286	297	297
9700300	Box Canyon Watershed Project	KNRD	Lower Pend Oreille	R	3	71	70	
20007	Acquire and Conserve Priority Bull Trout Habitat in Trestle Creek Watershed	River Network	Upper Pend Oreille	R	2		276	50
9206100	Albeni Falls Wildlife Mitigation	Albeni Falls Interagency Work Group	Upper Pend Oreille	W	1	700	4418	2195
9404700	Lake Pend Oreille Fishery Recovery Project	IDFG	Upper Pend Oreille	R	1	361	379	379
20005	West Fisher Watershed Restoration	USFS	Kootenai	R	3		288	
20008	Monitor and Protect Wigwam River Bull Trout for Koocanusa Reservoir	British Columbia Ministry of Environment, Lands and Parks	Kootenai	R	1		60	60
20009	Fertilization of Kootenay Lake and Arrow Reservoir	B.C. Ministry of Environment, Lands and Parks	Kootenai	R	2		175	
20028	Purchase Conservation Easement from Plum Creek Timber Company along Fisher	MFWP	Kootenai	R	2		500	250
20049	Evaluate Sediment Transport in Spawning Habitat, Kootenai R., Idaho	USGS	Kootenai	R	1		97	97
20517	Libby Fisheries Mitigation	MFWP	Kootenai	R	3		0	
8346700	Mitigation for the Construction and Operation of Libby Dam	MFWP	Kootenai	R	1	500	500	500
8806400	Kootenai River White Sturgeon Studies and Conservation Aquaculture	KTOI	Kootenai	R	1	1281	2750	1150
8806500	Kootenai River Fisheries Recovery Investigations	IDFG	Kootenai	R	1	604	617	617
9401001	Mitigation for Excessive Drawdowns at Libby Reservoir	MFWP and CSKT	Kootenai	R	1	374	378	378
9404900	Improve the Kootenai River Ecosystem	KTOI	Kootenai	R	1	246	300	270
9608720	Focus Watershed Coordination-Kootenai River Watershed	MFWP and CSKT	Kootenai	R	1	100	100	100
20034	Impact of Flow Regulation on Riparian Cottonwood Ecosystems	BioQuest International Consulting Ltd.	Flathead	W	3		148	

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20144	Create Stream Reference Condition Data Set for the Upper Flathead R Basin	Flathead National Forest	Flathead	R	2		26	
20554	Hungry Horse Fisheries Mitigation Umbrella	MFWP	Flathead	R	3		0	
9101901	Flathead Lake Monitoring and Habitat Enhancement	CSKT	Flathead	R	1	65	95	95
9101903	Hungry Horse Mitigation - Watershed Restoration & Monitoring (MFWP Umbrell	MFWP	Flathead	R	1	474	498	498
9101904	Hungry Horse Mitigation - Nonnative Fish Removal / Hatchery Production	USFWS	Flathead	R	1	389	429	429
9401002	Flathead River Native Species Project (MFWP Sub-proposal)	MFWP	Flathead	R	1	248	267	267
9502500	Flathead River Instream Flow Project (Mfwp Umbrella Subproposal)	MFWP	Flathead	R	1	100	100	100
9608701	Focus Watershed Coordination-Flathead River Watershed	CSKT	Flathead	R	1	100	103	103
Lower Snake								
20016	Snake River Steelhead Hooking Mortality Study	WDFW	Lower Snake Mainstem	A	2		117	
20533	Multi-Year Lower Snake River Mainstem Anadromous Fish Plan	CBFWA	Lower Snake Mainstem	A			0	
9801005	Pittsburg Landing,Capt. John Rapids, Big Canyon Acclimation Facilities	NPT	Lower Snake Mainstem	A	1	624	686	654
20018	Tucannon River and Asotin Creek Riparian Enhancement	WDFW	Tucannon	A	2		134	
20020	Tucannon River Spring Chinook Captive Broodstock Program	WDFW	Tucannon	A	1		284	134
20024	Evaluate Fall Chinook Natural Production and Spawning Habitat Conditions in	WDFW	Tucannon	A	2		121	
20036	Evaluate Bull Trout Movements in the Tucannon and Lower Snake Rivers	USFWS-IFRO	Tucannon	R	2		111	107
20530	Multi-Year Tucannon Anadromous Fish Plan	CBFWA	Tucannon	A			0	
8909600	Monitor and Evaluate Genetic Characteristics of Supplemented Salmon & Stlhd	NMFS	Tucannon	A	1	225	249	175
9401806	Implement Tucannon River Watershed Plan to Restore Salmonid Habitat	Columbia Conservation District	Tucannon	A	1	253	330	253
9401807	Continue with Implementation of Pataha Creek Model Watershed Projects	PCD	Tucannon	A	1	180	213	120
20019	Evaluate Status of Pacific Lamprey in Clearwater River Drainage, Idaho	IDFG	Clearwater	A	1	72	119	73
20080	Evaluate a Modified Feeding Strategy to Reduce Residualism and Promote Smol	IFRO-USFWS	Clearwater	A	1		168	147
20084	Protect and Restore the North Lochsa Face Analysis Area Watersheds	NPT	Clearwater	A	1		205	155
20085	Analyze and Improve Fish Screens	NPT	Clearwater	A	3		129	
20086	Rehabilitate Newsome Creek - S.F. Clearwater River	NPT	Clearwater	A	1		365	302
20087	Protect and Restore Mill Creek Watershed	NPT	Clearwater	A	1		63	63
20147	Evaluate Bull Trout Population Status/N.F. Clearwater R - NPT	NPT	Clearwater	R	2		188	
20148	Evaluate Bull Trout Population Status/N.F. Clearwater R -	IDFG, NPT	Clearwater	R	2		155	

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	IDFG							
20156	Identification Of Redband And Rainbow Trout In The N F Clearwater Basin	NPT	Clearwater	R	3		111	
20534	Multi-Year Clearwater Anadromous Fish Plan	CBFWA	Clearwater	A			0	
20557	Evaluate Bull Trout Population Status/N.F. Clearwater R. - NPT & IDFG	NPT	Clearwater	R	3		0	
8335000	Nez Perce Tribal Hatchery	NPT	Clearwater	A	1	7918	20189	14590
8335003	Nez Perce Tribal Hatchery Monitoring and Evaluation	NPT	Clearwater	A	1		993	993
8709900	Dworshak Dam Impacts Assessment and Fisheries Investigation	IDFG	Clearwater	R	1	120	285	285
8740700	Dworshak Impacts/M&E and Biological/Integrated Rule Curves	NPT	Clearwater	R	1	200	199	199
9202409	Enhance Conser. Enforcement for Fish & Wildlife,Watersheds of the Nez Perce	NPT	Clearwater	A	1	425	425	
9303501	Enhance Fish, Riparian, and Wildlife Habitat Within the Red River Watershed	ISWCD	Clearwater	A	1	500	550	450
9403400	Assessing Summer and Fall Chinook Restoration in the Snake River Basin	NPT	Clearwater	A	1	305	317	317
9501300	Nez Perce Tribe Resident Fish Substitution Program	NPT	Clearwater	R	1	749	850	750
9501600	Genetic Inventory of Westslope Cutthroat Trout in the N F Clearwater Basin	NPT	Clearwater	R	1	190	200	180
9607708	Protect and Restore the Lolo Creek Watershed	NPT	Clearwater	A	1	361	204	204
9607709	Protect and Restore the Squaw to Papoose Creeks Watersheds	NPT	Clearwater	A	1	242	354	304
9607711	Restore Mccomas Meadow/ Meadow Creek Watershed	NPT	Clearwater	A	1		167	167
9608600	Clearwater Subbasin Focus Watershed Program - ISCC	ISCC	Clearwater	A	1	85	89	89
9706000	Clearwater Subbasin Focus Watershed Program - NPT	NPT	Clearwater	A	1	93	99	99
9901400	Restore Anadromous Fish Habitat in the Little Canyon Creek Subwatershed	ISCC	Clearwater	A	1	197	218	197
9901500	Restore Anadromous Fish Habitat in the Nichols Canyon Subwatershed	ISCC	Clearwater	A	1	182	211	186
9901600	Protect & Restore Big Canyon Creek Watershed	NPT	Clearwater	A	1	162	61	61
9901700	Protect & Restore Lapwai Creek	NPT	Clearwater	A	1	150	61	61
9901800	Characterize and quantify residual steelhead in the Clearwater River, Idaho	USFWS-IFRO	Clearwater	A	1	133	84	84
20532	Multi-Year Imnaha Anadromous Fish Plan	CBFWA	Imnaha	A			0	
9401805	Continued Implementation of Asotin Creek Watershed Projects	Asotin County Conservation District	Asotin	A	1	239	239	235
20017	Restore Habitat Within Dredge Tailings on the Yankee Fork Salmon River	SBT, IDFG, USFS	Salmon	A	1		207	65
20032	Protect Bear Valley Wild Salmon, Steelhead, Bull Trout Spawning Habitat	SBT & IDFG	Salmon	A	1		310	310
20055	Evaluate a Mark-Resight Survey for Estimating Numbers of Redds	RMRS	Salmon	A	3		43	

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20079	Assessing Adult Steelhead Escapement & Genetics in the South Fork Salmon	NPT	Salmon	A	1		278	175
20535	Multi-Year Salmon Anadromous Fish Plan	CBFWA	Salmon	A			0	
20545	Idaho Supplementation Studies - Umbrella Proposal	IDFG	Salmon	A			0	
8909800	Idaho Supplementation Studies	IDFG	Salmon	A	1	906	974	974
8909801	Evaluate Salmon Supplementation in Idaho Rivers (ISS)	USFWS-IFRO	Salmon	A	1	147	130	130
8909802	Evaluate Salmon Supplementation Studies in Idaho Rivers	NPT	Salmon	A	1	339	377	377
8909803	Evaluate Salmon Supplementation Studies in Idaho Rivers	SBT	Salmon	A	1	226	228	228
9005500	Steelhead Supplementation Studies in Idaho Rivers	IDFG	Salmon	A	1	258	561	408
9102800	Monitoring Smolt Migrations of Wild Snake River Sp/Sum Chinook	NMFS	Salmon	A	1	275	385	325
9107100	Snake River Sockeye Salmon Habitat and Limnological Research	SBT	Salmon	A	1	405	438	427
9107200	Redfish Lake Sockeye Salmon Captive Broodstock Program	IDFG	Salmon	A	1	680	680	680
9107300	Idaho Natural Production Monitoring and Evaluation	IDFG	Salmon	A	1	732	768	768
9202603	Idaho Model Watershed Administration/Implementation Support	SCC	Salmon	A	1	175	185	185
9204000	Redfish Lake Sockeye Salmon Captive Broodstock Rearing and Research	NMFS	Salmon	A	1	500	500	475
9306200	Salmon River Anadromous Fish Passage Enhancement	LSWCD, CSWCD	Salmon	A	1	100	100	100
9401500	Idaho Fish Screen Improvement - O&M	IDFG	Salmon	A	1	1000	1000	1000
9401700	Idaho Model Watershed Habitat Projects	LSWCD, CSWCD	Salmon	A	1	400	400	400
9405000	Salmon River Habitat Enhancement M&E	SBT	Salmon	A	1	257	245	245
9600700	Irrigation Diversion Consolidations & Water Conservation; Upper Salmon R	LSWCD	Salmon	A	1	446	754	293
9604300	Johnson Creek Artificial Propagation Enhancement Project	NPT	Salmon	A	1	1300	2800	2800
9606700	Manchester Spring Chinook Broodstock Project	NMFS	Salmon	A	1	450	500	450
9700100	Captive Rearing Initiative for Salmon River Chinook Salmon	IDFG	Salmon	A	1	145	546	546
9703000	Monitor Listed Stock Adult Chinook Salmon Escapement	NPT	Salmon	A	1	160	163	156
9703800	Preserve Listed Salmonid Stocks Gametes	NPT	Salmon	A	1	161	185	185
9705700	Salmon River Production Program	SBT	Salmon	A	1	220	931	931
9901900	Restore the Salmon River, in the Challis, ID area, to a Healthy Condition	Custer Co	Salmon	A	1	100	50	50
9902000	Analyze the Persistence and Spatial Dynamics of Snake River Chinook Salmon	RMRS	Salmon	A	1	50	104	50
20051	Decrease Sedimentation and Temp. in Streams, Educate Resource Managers	OSU EXT	Grande Ronde	A	3		883	
20102	Research/Evaluate Restoration of NE Ore Streams and Develop Mgmt Guidelines	OSU/UO	Grande Ronde	A	2		310	
20112	Securing Wildlife Mitigation Sites - Oregon, Wenaha WMA Additions	ODFW	Grande Ronde	W	1		142	42
20114	Securing Wildlife Mitigation Sites - Oregon, Ladd Marsh WMA Additions	ODFW	Grande Ronde	W	1		361	145

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20129	Dworshak Mitigation Cultural Resource Survey Project	NPT	Grande Ronde	W	3		45	
20130	Northeast Oregon Mitigation Trust Fund	NPT	Grande Ronde	W	3		4500	
20133	Irrigation as a Management Tool for Stream Temperature	OSU	Grande Ronde	A	3		81	
20512	Grand Ronde River Basin Umbrella	ODFW	Grande Ronde	A			0	
20531	Multi-Year Grande Ronde Anadromous Fish Plan	CBFWA	Grande Ronde	A			0	
20556	Grande Ronde Endemic Spring Chinook Supplementation Program Umbrella		Grande Ronde	A			0	
8402500	Protect and Enhance Anadromous Fish Habitat in Grande Ronde Basin Streams	ODFW	Grande Ronde	A	1	260	367	273
8805301	Northeast Oregon Hatchery Master Plan	NPT	Grande Ronde	A	1	2300	1217	1217
8805305	Northeast Oregon Hatcheries Planning and Implementation - ODFW	ODFW	Grande Ronde	A	1	215	660	226
9202601	Grande Ronde Model Watershed Program	GRMWP	Grande Ronde	A	1	266	930	930
9202604	Life History of Spring Chinook Salmon and Summer Steelhead	ODFW	Grande Ronde	A	1	650	798	700
9403900	Wallowa Basin Project Planner	NPT	Grande Ronde	A	1	55	58	55
9608000	Northeast Oregon Wildlife Mitigation Project	NPT	Grande Ronde	W	1	228	235	235
9608300	CTUIR Grande Ronde Basin Watershed Restoration	CTUIR	Grande Ronde	A	1	180	250	125
9702500	Implement the Wallowa County/Nez Perce Tribe Salmon Habitat Recovery Plan	NPT	Grande Ronde	A	1	40	50	20
9800702	Grande Ronde Supplementation - O&M/M&E - Nez Perce Tribe Lostine	NPT	Grande Ronde	A	1	327	431	385
9800703	Facility O&M and Program M&E for Grande Ronde Spring Chinook Salmon	CTUIR	Grande Ronde	A	1	323	598	489
9801001	Grande Ronde Basin Spring Chinook Captive Broodstock Program	ODFW	Grande Ronde	A	1	493	646	616
9801006	Captive Broodstock Artificial Propagation	NPT	Grande Ronde	A	1	67	146	131
Upper Snake								
20090	Logan Valley Wildlife Mitigation Project	BPT	Malheur	W	1		2002	
20136	Burns Paiute Mitigation Coordinator	BPT	Malheur	W	3		50	
20137	Acquisition of Malheur Wildlife Mitigation Site	BPT	Malheur	W	1		2030	
9701900	Evaluate the Life History of Native Salmonids in the Malheur Basin	BPT	Malheur	R	1	200	201	201
9701901	North Fork Malheur River Bull Trout and Redband Life History Study	BPT	Malheur	R	1	142	114	114
20040	Develop a Fish & Wildlife Management Plan for the Owyhee Basin, D.V.I.R.	SPT - DVIR	Owyhee	R	3		22	
20041	Develop a Fish & Wildlife Conservation Law Enforcement Plan, D.V.I.R.	SPT - DVIR	Owyhee	R	3		41	
20092	Inventory Wildlife Species & Populations of the Owyhee Basin, D.V.I.R	SPT - DVIR	Owyhee	W	3		186	
20093	Evaluate the Feasibility for Anadromous Fish Reintroduction in the Owyhee	SPT - DVIR	Owyhee	A	3		57	

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20094	Assess Resident Fish Stocks of the Owyhee Basin, D.V.I.R.	SPT - DVIR	Owyhee	R	2		221	200
20536	Develop Management Plan & Assess Fish &Wildlife - Owyhee Basin, D.V.I.R.	SPT - DVIR	Owyhee	R	3		134	
8815600	Implement Fishery Stocking Program Consistent With Native Fish Conservation	SPT - DVIR	Owyhee	R	1	110	130	120
9501500	Lake Billy Shaw Operations and Maintenance and Evaluation (O&M, M&E)	SPT - DVIR	Owyhee	R	1	215	222	222
9701100	Enhance and Protect Habitat and Riparian Areas on the DVIR	SPT - DVIR	Owyhee	R	1	293	295	295
20135	Consumptive Sturgeon Fishery-Hells Canyon and Oxbow Reservoirs	NPT	Upper Snake	R	1		250	250
9106700	Idaho Water Rental: Resident Fish and Wildlife Impacts - Phase III	IDFG	Upper Snake	R	1	110	119	119
9201000	Habitat Restoration/Enhancement Fort Hall Reservation	SBT	Upper Snake	R	1	163	133	133
9500600	Shoshone-Bannock/Shoshone Paiute Joint Culture Facility	SBT	Upper Snake	R	1	249	283	283
9505700	Southern Idaho Wildlife Mitigation	IDFG, SBT	Upper Snake	W	1	3111	4335	1154
9800200	Snake River Native Salmonid Assessment	IDFG	Upper Snake	R	1	225	225	225

All figures in thousands of dollars.