Section 10

RESIDENT FISH

Resident fish are freshwater fish that live and migrate within the rivers, streams and lakes of the Columbia River Basin, but do not travel to the ocean. Resident fish exist throughout the basin and are particularly important in areas where anadromous fish runs are blocked by natural or manmade obstructions.

Hydroelectric projects have created a number of problems for resident fish. In the natural state, the Columbia River and its tributaries often ran at high volume and velocity and thereby flushed sediment downstream, keeping gravel spawning beds clean. But hydroelectric projects slowed and decreased the flow, allowing sediment to build up over the spawning beds. Sediment particles also have an affinity for chemical pollutants, creating potentially harmful concentrations in the reservoirs and other resident fish environments.

As with anadromous fish, reservoir manipulation may interfere with the flows needed for resident fish spawning, incubation, emergence, rearing and migration. In addition, reservoir manipulations impair the environment for spawning, incubation and rearing of some reservoir-inhabiting species. For example, discharging water from a reservoir lowers the reservoir water level, which may deprive fish eggs of the water they need, diminish the food supply, crowd fish into a smaller aquatic living space, change water temperatures both above and below the dam, and entrain substantial numbers of fish.

The white sturgeon is a species critically affected by hydroelectric development. Biologically an anadromous fish, the white sturgeon is relatively abundant in the Columbia River below Bonneville Dam. However, some populations are now confined to certain stretches of the river above Bonneville because dams have blocked migration. Because of the sturgeon's extended life cycle (approximately 20 years to spawning size), the white sturgeon may be depleted without an opportunity for quick restoration. Other resident fish species of special interest include kokanee, bull trout, burbot, redband trout and westslope cutthroat trout.

This section of the program addresses resident fish losses caused by hydropower development and operation, as well as substitutions of resident fish to compensate for losses of salmon and steelhead in areas permanently blocked by hydropower projects. A major challenge in protecting, mitigating and enhancing resident fish, as well as anadromous fish and wildlife, is assembling a program that resolves potential conflicts among demands for power generation and other resource development activities, the need for flows for anadromous and resident fish, and a healthy reservoir environment for resident fish. The Council is confident that the measures contained herein, and those that will be added over time, will achieve this necessary balance.

Under the Council's program, limits will be developed on the drawdown of certain reservoirs, and minimum flow requirements will be set to protect fish and their habitat. Other measures call for using storage water to maintain appropriate water temperatures, streambed protection, artificial propagation, and a variety of studies on fish habitat and on the impacts of hydroelectric operation. The Council has also approved resident fish substitution projects that will contribute to these efforts.

To be effective, the fish and wildlife program must be more than a collection of unrelated measures. Individual efforts must be coordinated, and program measures need to support the ongoing efforts of tribal, state and federal fish and wildlife managers in the basin. All goals, principles, priorities and specific objectives in the program are to be integrated.

10.1 RESIDENT FISH GOAL

The program goal for resident fish emphasizes the long-term sustainability of native fish in native habitats where possible, but also recognizes that where impacts have irrevocably changed the native ecosystem, we can only protect and enhance the ecosystem that remains. This systemwide goal has implications for all resident fish program measures. In general, these measures fall into two distinct categories:

Resident Fish Mitigation: Efforts to address the impacts caused by the construction and operation of the hydropower system.

Resident Fish Substitution: Efforts 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.

Measures in both categories achieve the long-term system goals of protecting, mitigating and enhancing the health and viability of resident fish populations to meet consumptive and non-consumptive needs in the Columbia River Basin.

Accomplishing these goals will require the participation of many parties whose practices now adversely affect the health of the ecosystem, including, but not limited to, hydropower facility operators. The responsibilities of such operators will take into account the losses and gains at each hydropower project to determine whether net losses have occurred.[1] Credit will be given for past mitigation actions associated with each hydropower project. Achieving these goals will necessitate basinwide coordination of all resident fish projects and with other basin activities to ensure consistency with the program's systemwide approach.

Additionally, it is the Council's expectation that these fisheries shall be enhanced to allow for consumptive subsistence and recreational fisheries for the region's Indian tribes, as well as consumptive and non-consumptive recreational fisheries for sport anglers. The Council recognizes that fishing pressure on inland fish of the Columbia River Basin has increased appreciably since curtailment of ocean salmon fishing seasons.

A number of resident fish populations throughout the basin are depressed to an extent that they require immediate attention. To be effective, the fish and wildlife program must focus on funding measures that provide immediate on-the-ground benefits to fish and wildlife. To that end, the Council has established the following principles and priorities.

10.1A Principles

To promote comprehensive and cooperative watershed management; ecosystem diversity; productivity and stability as integral components of fish management strategies in the Columbia River Basin; and to conserve the natural genetic diversity within native resident fish species, sub-species and unique stocks, the following principles shall be applied:

- Protect, mitigate and enhance resident fish populations to the extent they were or are affected by construction and operation of dams.
- Protect, mitigate and enhance resident fish in hydropower system storage projects to the fullest extent practicable from negative impacts associated with water releases.
- In areas below storage projects, protect, mitigate and enhance resident fish that are affected by altered annual flow regimes, daily load following, temperature modifications and nutrient trapping.
- Substitution is appropriate for lost salmon and steelhead in areas that previously had anadromous fish, but where anadromous fish access is now permanently blocked by hydropower development and where in-kind mitigation cannot occur.

[1] Gains could include those found at the project site (i.e., in the reservoir or immediately below the dam) and also those found away from the project site (e.g., where reservoir raises the water table in the surrounding area and forms pothole lakes amenable to resident fish production).

- Substitution should occur in the vicinity of the salmon and steelhead losses being addressed, but substitution and mitigation measures may occur on or off-site.

Flexibility in approach is needed to develop a program that complements the activities of the fish and wildlife agencies and tribes and that is based on the best available scientific knowledge.

- For substitution purposes, resident fish may include landlocked anadromous fish (e.g., white sturgeon, kokanee and coho) as well as traditionally defined resident fish species.

10.1B Priorities

The Council has the following priorities for Columbia River Basin resident fish. Bonneville shall implement the program consistent with the ranking criteria adopted by the Council from the priorities listed below. (See Section 3.1B.2.)

Accord highest priority to rebuilding to sustainable levels weak, but recoverable, native populations injured by the hydropower system, when such populations are identified by the fishery managers; then to resident fish substitution measures in areas that previously had salmon and steelhead, but where anadromous fish are now irrevocably blocked by federally operated hydropower development. Because these losses have endured mostly unmitigated for more than 50 years, and because in-kind mitigation cannot occur, the Council intends that in any project ranking and selection process, projects satisfying these priorities be clearly distinguished from other projects. The distinction between these two highest priorities is a narrow one, applicable only to marginal choices among such projects.

Accord high priority to measures that meet the following criteria (not in rank order):

- Resident fish projects that also provide benefits for wildlife and/or anadromous fish.
- Populations that support important fisheries. This priority applies to introduced and native species, including trout, sturgeon, kokanee, burbot, bass, perch and others.
- Development of biological and integrated rule curves that will protect resident fish in storage reservoirs.
- Protecting the health of existing resident fish populations.
- Other native stocks that may be at risk due to the construction and operation of the Federal Columbia River Power System.
- Resident fish mitigation and substitution projects for which a showing has been made that all reasonable precautions will be taken, based on the best available scientific knowledge, to not adversely affect habitat for native resident fish and anadromous fish.
- Projects that address biological objectives that have been adopted by the Council.
- Among resident fish mitigation activities, preference will be given to measures that address losses at hydropower facilities for which an assessment of losses and gains is completed and approved by the Council.
- Substitution measures in areas that previously had salmon and steelhead, but where such fish are now permanently blocked by federally licensed or regulated hydropower facilities.

10.1C Biological Objectives

The Council believes that elements of the framework concept outlined in Sections 2, 3 and 4 need to be applied to resident fish as well as to salmon and steelhead. For this reason, the Council calls for the identification of specific resident fish biological objectives and, to the extent appropriate, associated measures and success indicators. The Council also calls for development of specific rebuilding schedules and an associated monitoring program. This approach should ensure that resident fish actions taken under the program are oriented to results.

Biological objectives relate the needs of fish and wildlife to the development and operation of the hydropower system. Hydropower project development and operation has affected resident fish directly or indirectly by affecting flows and temperature above and below the facilities, passage at or within a project, and reservoir

elevations and volumes. Resident fish biological objectives should describe the biological characteristics needed to address these impacts, halt population declines, protect and rebuild populations, and, ultimately, achieve the overall program goals. Resident fish biological objectives should address hydropower-caused losses; they should not be inconsistent with the conservation of genetic and biological diversity, and, henceforth, they should receive peer review before being adopted into the program.

Resident fish program measures are specific actions to be undertaken to achieve biological objectives, with related timetables for achievement. Success indicators for each action/measure would provide a measurable index that relates the resident fish program measures to the type of biological or physical change intended.

Fishery Managers and Council

10.1C.1 The fishery managers are to complete assessments of resident fish losses and gains related to construction and operation of each hydropower facility throughout the Columbia River Basin and submit to the Council for approval. Use existing loss estimates, where available, and accomplish in a consistent manner. Include assessment of and proposed crediting approach for ongoing and past mitigation activities at each project. The Council will review the recommended loss and gain assessments in a public review process and adopt assessments into the program.

10.1C.2 The fishery managers will develop, as soon as possible, detailed biological objectives for resident fish in each subbasin or other appropriate watershed unit, including objectives for harvest and escapement and artificial and natural production, and submit them to the Council for public review and incorporation into this program. Biological objectives should address any loss and gain assessments that have been adopted under Section 10.1C.1 because the Council will use these objectives to measure progress against the hydropower debt.

Bonneville

10.1C.3 Fund the completion of the assessments of resident fish losses throughout the Columbia River Basin, as called for in Section 10.1C.1, and the development of specific, quantified biological objectives, as called for in Section 10.1C.2. The Council expects Bonneville to act immediately to implement resident fish mitigation and resident fish substitution measures in this program and complete all major actions by 2006. Implementation of resident fish mitigation and substitution measures is not to be delayed pending the completion of loss assessments or the development of specific biological objectives. The Council is convinced that prompt action may forestall Endangered Species Act listings for several species of native resident fish, including kokanee salmon, white sturgeon, bull trout, westslope cutthroat trout and burbot, among others.

10.1D Crediting New and Existing Mitigation

Fish Managers, Bonneville, Corps of Engineers and Bureau of Reclamation

10.1D.1 Initiate consultations by October 1, 1995, to develop a consistent,

systemwide method for determining the amount of credit to be given for existing and future resident fish substitution and mitigation activities undertaken to address the impacts of the federal hydroelectric facilities. The crediting system should reflect the following principles:

- The hydropower system must protect, mitigate and enhance resident fish affected by the hydroelectric facilities of the Columbia Basin. This obligation will be discharged when these effects are fully addressed, i.e., when mitigation actually offsets the loss caused by a hydropower facility and when the operator provides adequate operation and maintenance funding to sustain the mitigation for the life of the hydroelectric project.
- Mitigation agreements may predict a certain level of mitigation, as long as provision is made for funding operation and maintenance and monitoring and evaluation to determine if the predicted benefits were realized. Submit recommendations to the Council for review and approval by June 1996. Implementation of resident fish mitigation and substitution measures is not to be delayed pending the development of the crediting methodology.

Council

10.1D.2 The Council will review the recommended crediting system in a public review process and adopt a system into the program.

10.1E Project Implementation and Selection

The Council expects that measures listed in the resident fish section of the program will be implemented and that these measures will increase resident fish populations. In this regard, the Council calls for the Annual Implementation Workplan to include a list of ranked resident fish projects demonstrating that the program is being implemented. Proposed actions that deviate from the program should be clearly marked and an explanation of the need for deviation provided. The Council will evaluate the proposed workplan and, if necessary, will consider amendments to this section to ensure that resident fish measures are implemented.

The Council recognizes that over time, the desirability of implementing certain projects may change. Likewise, desirable projects that are not currently foreseeable may become evident over time. Proposals for amendment of the program to address these situations can be submitted to the Council. Each proposed project should address and include:

- documented or agreed-upon resident fish losses attributable to the hydroelectric facility at issue;
- adaptive management principles that define anticipated results in terms of hypotheses to be tested (in quantitative terms if possible) and appropriate monitoring and evaluation to determine whether and why those results have been achieved;
- a description of the extent to which the project complements activities of fish and wildlife agencies and tribes;
- compliance with the policies set out in this program;
- likelihood of achieving significant biological results;
- an assessment of trade-offs with anadromous fish and wildlife activities;
- a management plan with sound biological objectives;
- consultation and coordination with interested parties
- estimated costs and a schedule for implementation and evaluation; and

- information on the extent to which it meets the standards of the Northwest Power Act.

Relevant Parties

10.1E.1 By 2006, implement resident fish projects currently identified in the program.

10.2 PRODUCTION AND WATERSHED PRINCIPLES

10.2A Natural and Artificial Propagation

Artificial propagation is one means of increasing or introducing fish populations. These activities must be pursued carefully, because artificial propagation can detrimentally affect the long-term sustainability of native and introduced species that exist in the area where stocking occurs. Concerns include competition, predation and interbreeding with existing resident and anadromous species, especially native and naturally produced species. A full discussion of these types of concerns occurs in Section 7.1. The Council believes that many of the actions called for in that section should also be applied to resident fish. These actions are outlined below.

The Council calls on all relevant parties to complete the following measures to address natural and artificial propagation for Columbia Basin resident fish species. Implementation will require a different scope of activities and level of effort depending on the type of propagation being employed. For example, a thorough and comprehensive approach to conserving genetic diversity is needed for native species. At the other end of the range, non-native species stocked for harvest without any expectation that they will reproduce naturally have minimal genetic diversity requirements. Within this range lie the genetic diversity needs of non-native populations introduced with the intent to encourage natural production. Considering the range addressed above, implement the following in a manner that avoids unnecessary delay and redundancy.

To expedite implementation, where the following are substantially addressed under the National Environmental Policy Act and/or relevant state environmental policy acts, consider that process to be in compliance with this section. In addition, completion dates identified for this section are intended to discourage unnecessary procedural delays.

Relevant Parties

10.2A.1 Address resident fish as well as anadromous fish in developing a plan for conserving genetic diversity as called for in measure 7.1D.1. Complete plan addressing resident fish and submit to the Council by June 30, 1995.

10.2A.2 Address potential impacts on resident fish, where such impacts exist, in developing basinwide guidelines to minimize genetic and ecological impacts of hatchery fish on wild and naturally spawning species as called for in measure 7.2A.1. Complete guidelines and submit report to Council by December 31, 1994.

10.2A.3 The team of scientific experts that addresses hatchery impact assessment and basinwide hatchery operating guidelines called for in measure 7.2A.5 should address resident fish as well as anadromous fish.

10.2A.4 Regional Assessment of Supplementation Project activities called for in Section 7.3A.1, should address resident fish as well as anadromous fish.

10.2A.5 Measures addressing new program initiatives called for in Section 7.4A and measures 7.4A.1, 7.4B.1 and 7.4C.1, should apply to resident fish as well as anadromous fish.

10.2B Comprehensive Watershed Management

Good habitat is important for resident fish, just as it is for anadromous fish. The degraded condition of resident fish habitat in the Columbia River Basin often rivals that of anadromous fish.

For this reason, the program provisions noted in Section 7.7 (Cooperative Habitat Protection and Improvement with Private Landowners) should also apply to resident fish. The Council believes comprehensive, cooperative watershed management is essential to making good investments in protecting, mitigating and enhancing resident fish in the basin.

Relevant Parties

10.2B.1 Implement Section 7.7 of this program to also apply to resident fish, including the model watershed provisions, where applicable.

10.2C Diversion Screening and Passage

Bonneville, Bureau of Reclamation, U.S. Fish and Wildlife Service, States, Tribes and Irrigation Water Users

10.2C.1 Annually, in January, provide the Council with a prioritized list of tributary screening and passage facility improvements for stream diversions in the Columbia River Basin affecting resident fish. Improvements can include new facilities and the upgrading and maintenance of existing facilities. The list should include gravity and pump diversions. Priority initially should be given to naturally producing weak stocks. Additionally, provide the Council by November 1995 with a list of diversions where fish screening is a secondary problem compared to impaired instream flows. Identify resources that will be needed to accomplish screening and passage work, and prepare a general operation and maintenance budget, including a schedule, budget, proposed cost sharing incentive programs, and monitoring and evaluation plans. To accelerate this effort, immediately identify and allocate a budget from all available sources for implementation of the plan.

Bonneville

10.2C.2 Based on the priorities indicated in Section 10.2C.1, provide funding for state and tribal fish screen programs to implement all priority screening projects. Innovative solutions that accomplish the same purpose as fish screening, i.e., conversion to electric pumping, conversions from surface to ground water, consolidations of diversions, etc., shall be encouraged. Funding shall be sufficient to:

- develop preliminary designs;
- see that necessary permit processes are carried out;
- make certain private landowner and public concerns are addressed;
- review detailed designs to ensure that biological and engineering criteria are met;
- monitor construction phases;
- establish written operating criteria;
- monitor operation and maintenance phases in compliance with criteria and recommend corrective actions if necessary; and
- conduct project evaluations.

Bureau of Land Management (Idaho and Oregon/Washington Offices), U.S. Forest Service (Regions 1, 4 and 6) and Bureau of Reclamation

10.2C.3 Require as a condition of both existing and new water use authorizations that diversion structures have functional fish screens and other passage facilities for man-made barriers to resident fish that meet the criteria developed by the Fish Screening

Oversight Committee (see Section 7.10). For existing authorizations, wherever practical, and especially on high-priority diversions, the three agencies should coordinate with the state fish screen programs and proceed to design and install screens that meet Oversight Committee criteria on a multiagency or shared-cost basis, with authorization renewals contingent on reimbursement to the agency or other arrangements satisfactory to the agency. By March 1 of each year, the three federal agencies should report on their progress, including the number of such permits, estimated screening costs, resources needed to implement and monitor the program, and a time frame for compliance.

Confederated Salish and Kootenai Tribes, Bonneville and Bureau of Indian Affairs

10.2C.4 The Confederated Salish and Kootenai Tribes shall provide a prioritized list of adult and juvenile fish passage needs and accomplishments on the Flathead Indian Reservation annually to the Bureau of Indian Affairs and the Council. Bonneville and the Bureau of Indian Affairs shall fund an accelerated program to accomplish screening and passage work.

Montana, Idaho, Oregon and Washington

10.2C.5 If needed, enact legislation and provide for enforcement of laws to require water users to install, operate and maintain fish screens on water diversions within resident fish waters of the Columbia River Basin. Report to the Council on this measure by June 30, 1995, and annually thereafter.

10.3 RESIDENT FISH MITIGATION MEASURES FOR SPECIFIC DAMS

Wherever in this section the Council has approved specific reservoir operating criteria, the Fish Passage Center and the Columbia Basin Fish and Wildlife Authority, in its supervision of the Fish Passage Center, should incorporate these criteria into their planning and system operational requests, as set forth in Measure 5.1B.1. Bonneville, the U.S. Bureau of Reclamation and the Corps of Engineers should include these operating guidelines in their Pacific Northwest Coordination Agreement data submittals, System Operation Review Environmental Impact Statement, and other pertinent long-term and annual planning and operation of the Columbia River Power System.

10.3A Hungry Horse Dam Resident Fish Mitigation

Bureau of Reclamation

10.3A.1 To aid reproduction of kokanee in the Flathead River and to aid rearing of other fish species and invertebrates, operate Hungry Horse Dam to provide the following instantaneous flows in the Flathead River at Columbia Falls.

- Flows not less than 3,500 cubic feet per second or more than 4,500 cubic feet per second from October 15 through December 15. The 4,500 cubic feet per second cap may be exceeded if kokanee are not present at the spawning sites. Coordinate with Montana Department of Fish, Wildlife and Parks and the Confederated Salish and Kootenai Tribes to determine when this restriction may be lifted.

- A minimum flow for incubation of at least 3,500 cubic feet per second provided 24 hours per day from December 15 through April 30.
- A minimum flow for emergence of 3,500 cubic feet per second provided 24 hours per day during the period from May 1 through June 30.
- A minimum flow of at least 3,500 cubic feet per second provided 24 hours per day from July 1 through October 15 for rearing of bull trout, cutthroat trout and mountain whitefish, and for aquatic invertebrate production.

10.3A.2 Report monthly to the Council the hourly average river flows. Include an estimate of the costs in megawatts and dollars to the hydropower system associated with meeting these flows. Modify the required flows when requested by the Montana Department of Fish, Wildlife and Parks and Confederated Salish and Kootenai Tribes for study purposes.

10.3A.3 Implement the integrated rule curves for Hungry Horse Reservoir submitted to the Council in July 1994 by the Confederated Salish and Kootenai Tribes and the Montana Department of Fish, Wildlife and Parks. Limits on drafting set in the curves should be met in all years. However, exceeding the limits for local flood control is allowed provided that the Council, the Confederated Salish and Kootenai Tribes and the state of Montana are notified prior to drafting, and the reservoirs are not incurring additional flood control responsibilities that have historically been provided by other projects. Exceeding the limits for power purposes is also allowed, but is contingent upon approval by the Council, the Confederated Salish and Kootenai Tribes and the state of Montana. Deviations from the limits will require mitigation as prescribed by the tribes and states, approved by the Council and called for in Sections 10.3A.7 and 10.3A.8. Requests to exceed the limits should be submitted at least 60 days prior to drafting below the limits**.**

The intent of this measure is to improve historic dam operational practices to provide more favorable biological conditions for resident fish in the reservoir and affected river reaches and to help balance conditions for anadromous and resident fish so that the recovery of one is not pursued at the expense of the other.

Confederated Salish and Kootenai Tribes and
Montana Department of Fish, Wildlife and Parks

10.3A.4 Continue to refine integrated rule curves to limit drawdown of Hungry Horse Reservoir to protect resident fish. Prepare a review of the biological effectiveness of integrated rule curves including recommendations for refinement or continuance of the rule curves. Submit to the Council by September of 2005**.**

Council

10.3A.5 Review state and tribal summary and recommendations on the biological effectiveness of and implementation costs associated with integrated rule curves. Based on that review, determine if integrated rule curves should be continued as implemented, refined, or terminated.

Bonneville

10.3A.6 Continue to fund studies to evaluate the effect of Hungry Horse Dam operating procedures on resident fish. Prepare a summary of the costs incurred and adjustments made by the power system as a result of implementation of integrated rule curves.

10.3A.7 In years when the integrated rule curves are exceeded for power purposes at Hungry Horse Dam, immediately fund the mitigation of fish losses to the extent those losses are caused by power operations.

Corps of Engineers

10.3A.8 In years when the integrated rule curves are exceeded for system flood control purposes at Hungry Horse Dam, immediately fund the mitigation of fish losses to the extent those losses are caused by system flood control operations.

10.3A.9 If a conflict occurs between maintaining the minimum flows required by Section 10.3A.1 and maintaining reservoir levels required by Section 10.3A.3, consult with the Confederated Salish and Kootenai Tribes and Montana Department of Fish, Wildlife and Parks to determine which requirements are preferred.

Relevant Parties

10.3A.10 Treat as elements of this program all resident fish loss estimates identified in the Fisheries Mitigation Plan For Losses Attributable to the Construction and Operation of Hungry Horse Dam prepared by Montana Department of Fish, Wildlife and Parks and the Confederated Salish and Kootenai Tribes.

Montana Department of Fish, Wildlife and Parks and the Confederated Salish and Kootenai Tribes

10.3A.11 Implement the mitigation measures in the long-term implementation plan as approved by the Council in March 1993 and in subsequent amendments.

10.3A.12 Initially, limit hatchery supplementation activities called for in the implementation plan to kokanee only. Limit facilities for production of kokanee to those that are temporary and low cost. Use facilities to test the feasibility of increasing kokanee populations in the Flathead Basin. If kokanee populations can meet the criteria for determining success of kokanee reintroduction, as stated in the Hungry Horse Dam Fisheries Mitigation implementation plan, make recommendations to the Council for construction of permanent production facilities, if warranted. Limit supplementation activities for other species to research aimed at development and refinement of supplementation techniques for westslope cutthroat trout and bull trout. Submit recommendations to the Council regarding supplementation of these species based on results of this research.

10.3A.13 Implement habitat improvement projects in the implementation plan to be consistent with maintenance of the genetic integrity of native fish and protection of species that are endangered, threatened, or of special concern that occur in the improved or newly accessible habitat. This concern is critical where passage over natural barriers is considered. In addition, implement fish health monitoring.

Bonneville

10.3A.14 Consult with the state of Montana and the Confederated Salish and Kootenai Tribes to explore alternative methods, including a trust agreement, for financing the long-term, non-operational mitigation features of the implementation plan. Explore cost shares to fund aspects of the implementation plan, especially for projects that mitigate the effects of non-hydropower caused problems (e.g., man-caused passage barriers in reservoir tributaries, fencing of overgrazed riparian areas and sediment control projects). If the parties listed above reach agreement on a suitable method for financing, submit recommendations to the Council for approval. Fund the agreement upon approval.

Council

10.3A.15 The determination of losses and appropriate measures contained in the Hungry Horse Dam mitigation plan assumes that the operation of Hungry Horse Dam will be conducted in accordance with practices current as of 1992. Under those practices: 1) reservoir drawdown for power purposes is limited by Section 10.3A.3 of this program; 2) reservoir drawdown for flood control is conducted in accordance with the assignment of project flood control responsibility in effect prior to the 1992 operating year; and 3) no drawdown of the reservoir, other than proportional drafting for the existing water budget, takes place for the purpose of increasing downstream flows to benefit salmon and steelhead. In the event that any significant changes to current practices are undertaken, reopen this determination for the purpose of setting appropriate drawdown limitations to ensure that the mitigation measures contained in the plan remain adequate and effective.

Bonneville and Bureau of Reclamation

10.3A.16 Complete installation and operate a selective water withdrawal structure at Hungry Horse Dam to allow for temperature control to benefit resident fish.

Bureau of Reclamation, Confederated Salish and Kootenai Tribes, Montana Department of Fish, Wildlife and Parks, and Montana Power Company

10.3A.17 Continue coordinating the Kerr and Hungry Horse dams mitigation programs so that measures taken under those programs are complementary. The Council encourages representatives of Region 6 of the U.S. Fish and Wildlife Service to comment on mitigation and river management plans that affect fish and wildlife in Region 6.

Bonneville

10.3A.18 Fund an Instream Flow Incremental Methodology study of the mainstem Flathead River from the South Fork confluence downstream to the river inlet on Flathead Lake. Include recommenda-tions for seasonal ramping rates and allowable flow fluctuations to benefit westslope cutthroat and bull trout spawners and juveniles, and insect production.

10.3B Libby Dam Resident Fish Mitigation

Corps of Engineers

10.3B.1 Develop operating procedures for Libby Dam to ensure that sufficient flows are provided to protect resident fish in the Kootenai River and Lake Koocanusa. Require a minimum flow of 4,000 cubic feet per second. In years of extremely low runoff, provide no less than 3,000 cubic feet per second. Based on the best available historical record, and in consultation with the Montana Department of Fish, Wildlife and Parks; Confederated Salish and Kootenai Tribes; Kootenai Tribe of Idaho; Idaho Department of Fish and Game; and the Council, include in the operating procedures a definition of "extremely low runoff" that will permit the 4,000 cubic feet per second requirement to be met to the fullest extent practicable. Until new procedures are adopted, operate Libby Dam under existing criteria.

10.3B.2 Implement the integrated rule curves for Libby Reservoir submitted to the Council in July 1994 by the Confederated Salish and Kootenai Tribes and the Montana Department of Fish, Wildlife and Parks. Limits on drafting set in the curves should be met in all years. However, exceeding the limits for local flood control is allowed provided that the Council, the Confederated Salish and Kootenai Tribes and the State of Montana are notified prior to drafting, and the reservoirs are not incurring additional flood control responsibilities that have historically been provided by other projects. Exceeding the limits for power purposes is also allowed, but is contingent upon approval by the Council, the Confederated Salish and Kootenai Tribes and the State of Montana. Deviations from the limits will require mitigation as prescribed by the tribes and states, approved by the Council, and called for in measures 10.3B.5 and 10.3B.6. Requests to exceed the limits should be submitted at least 60 days prior to drafting below the limits.

The intent of this measure is to improve on historic dam operational practices to provide more favorable biological conditions for resident fish in the reservoirs and affected river reaches and to help balance conditions for anadromous and resident fish so that the recovery of one is not pursued at the expense of the other.

Confederated Salish and Kootenai Tribes; Montana Department of Fish, Wildlife and Parks; Kootenai Tribe of Idaho; and Idaho Department of Fish and Game

10.3B.3 Continue to refine integrated rule curves to limit drawdown of Libby Reservoir to protect resident fish. Prepare a review of the biological effectiveness of integrated rule curves including recommendations for refinement or continuance of the rule curves. Submit to the Council by September of 2005.

10.3B.4 Review state and tribal summary and recommendations on the biological effectiveness of and implementation costs associated with integrated rule curves. Based on that review, determine if integrated rule curves should be continued as implemented, refined, or terminated.

Bonneville

10.3B.5 Continue to fund studies to evaluate the effect of Libby Dam operating procedures on resident fish. Include a study of the effects of Libby Dam

operations on reproduction and rearing of white sturgeon in the Kootenai River assessing, among other things, when and where fish are present, food requirements and sources, effects of pollutants, population recovery and propagation methods. Coordinate this work with that in Section 10.4. Prepare a summary of the costs incurred and adjustments made by the power system as a result of implementation of integrated rule curves.

10.3B.6 In years when the integrated rule curves are exceeded for power purposes at Libby Dam, immediately fund the mitigation of fish losses to the extent those losses are caused by power operations.

Corps of Engineers

10.3B.7 In years when the integrated rule curves are exceeded for system flood control purposes at Libby Dam, immediately fund the mitigation of fish losses to the extent those losses are caused by system flood control operations.

10.3B.8 If a conflict occurs between maintaining the minimum flows required by measure 10.3B.1 and maintaining reservoir levels required by measure 10.3B.3, consult with Montana Department of Fish, Wildlife and Parks, Confederated Salish and Kootenai Tribes, Idaho Department of Fish and Game, and Kootenai Tribe of Idaho to determine which requirements are preferred.

Bonneville and Corps of Engineers

10.3B.9 In cooperation with the state of Montana, evaluate and, if beneficial to resident fish, feasible, cost-effective under the Council's power plan, and in compliance with all applicable Montana and federal laws, fund adding three generators at Libby Dam. If feasible, during wet years, such additions may allow the reservoir to fill earlier than otherwise and thereby maintain a higher pool level, possibly benefiting fish in the reservoir. Also, project spill could be reduced, providing benefits for fish in the Kootenai River downstream from the project. Include in the evaluation the following:

- Review the adequacy of existing ramping rates. No more than five generators could be used under any circumstances for peaking or load following. This limit is a result of historic proceedings that addressed this issue at Kootenai Falls and Jennings Rapids.
- Assume that operation of all eight units simultaneously would be strictly prohibited except during declared flood emergencies or for demonstrated beneficial resident fish flow operations. At no time would the full capacity be available solely for power purposes.
- Operations are assumed to be an efficiency upgrade (i.e., existing non-power constraints would be met, volume releases would not be increased, and peaking and other operations would be constrained as needed to protect the resident fish resource and dependent ecosystems above and below the dam). The dam is assumed to remain a five-turbine project, albeit with operation of the newer turbines instead of the older units, and not an eight-unit project.
- The project, when modified with additional units, will be expected to comply with present and future non-power constraints. Any

additional generation produced by the project as a result of these changes would go to the federal Columbia River power system to be used to offset the investment in the project and other beneficial purposes as determined by the Bonneville administrator.

- Include analysis of costs, and impacts on fisheries, reservoir operations, water use and water quality.

Bonneville

10.3B.10 Fund the removal of materials that have accumulated in Kootenai River tributary deltas below Libby Dam as a result of the dam's construction and operation, because these materials interfere with the migration of spawning fish.

10.3B.11 In consultation with the Confederated Salish and Kootenai Tribes, the Montana Department of Fish, Wildlife and Parks, the Kootenai Tribe of Idaho and other appropriate entities, fund the design, construction, operation and maintenance of mitigation projects in the Kootenai River System and Lake Koocanusa to supplement natural propagation of fish. These projects are to counter the effects of habitat loss in the Kootenai River System caused by Libby Dam construction and by drawdown and discharges of water from Lake Koocanusa. In consultation with these entities, fund a study to determine levels of fish production necessary to mitigate the effects of the hydropower system. Submit results of the study to the Council by December 31, 1996. The Confederated Salish and Kootenai Tribes, the Montana Department of Fish, Wildlife and Parks, the Kootenai Tribe of Idaho and other appropriate entities are to make recommendations for further action and necessary program amendments at that time.

10.3B.12 In consultation with Montana Department of Fish, Wildlife and Parks, the Kootenai Tribe of Idaho and British Columbia Environment Fisheries Branch, fund, consistent with Section 2.2G, a three-year investigation of transboundary populations of rainbow trout, kokanee, bull trout and westslope cutthroat trout in the British Columbia portion of Lake Koocanusa. This assessment will include mapping of critical spawning and rearing habitats, population estimates, stock identification, collection of biological information (age, growth, movement, etc.) and reservoir habitat preferences. Study results will correlate biological effects with impacts of different operating regimes of Libby Dam on the various species in the reservoir.

10.3C Dworshak Dam Resident Fish Mitigation

Idaho Department of Fish and Game and Nez Perce Tribe

10.3C.1 Analyze methods to avoid or minimize entrainment of kokanee at Dworshak Dam, including behavioral avoidance devices such as strobe lights, pneumatic hammers, bubble screens and sound generators, as part of development of integrated rule curves for Dworshak Reservoir.

10.3C.2 Implement annual mid-water trawling to further define the relationship between the fishery, kokanee densities and the water year, as part of development of integrated rule curves for Dworshak Reservoir.

10.3C.3 Implement annual kokanee spawner counts in appropriate creeks.

10.3C.4 Implement a genetic inventory in the North Fork Clearwater River drainage to determine the genetic status of the endemic westslope cutthroat trout population including genetic introgression of the westslope cutthroat trout population by introduced rainbow trout. Based on the study, make recommendations regarding further planting of rainbow trout in the North Fork drainage. Coordinate this measure with the Corps' resident fish mitigation program and review addressed in measure 10.3C.7.

Bonneville

10.3C.5 Fund Idaho Department of Fish and Game and the Nez Perce Tribe to implement the above measures. Work with the Corps and others to determine cost sharing opportunities on these measures.

10.3C.6 In consultation with the Nez Perce Tribe and appropriate state agencies, fund research, monitoring and evaluation activities to determine the potential impacts of multipurpose flow operations on resident fish in Dworshak Reservoir. This information will be used to develop analytical methods, such as biological and/or integrated rule curves for reservoir operations similar to those developed by the Montana Department of Fish, Wildlife and Parks for Hungry Horse and Libby reservoirs.

Corps of Engineers

10.3C.7 In coordination with appropriate fish and wildlife agencies and the Nez Perce Tribe, fund fish stocking activities in Dworshak Reservoir and in the North Fork of the Clearwater River upstream from the reservoir, consistent with the Memorandum of Understanding between the U.S. Fish and Wildlife Service and the Corps. Fund monitoring to determine the effects of the resident fish mitigation program on endemic fish populations, particularly westslope cutthroat trout upstream from Dworshak Dam. Coordinate with Bonneville, Nez Perce Tribe, Idaho Department of Fish and Game, and U.S. Fish and Wildlife Service to develop and implement a review of this program to address native fish, watershed, and other concerns.

Corps of Engineers and Bonneville

10.3C.8 Fund investigation of the following items as part of development of integrated rule curves for Dworshak Reservoir: 1) the feasibility of avoiding downward fluctuations in Dworshak reservoir pool level from June 1 through August 31 to prevent dewatering smallmouth bass spawning nests; 2) the feasibility of achieving normal full pool during June, if flood runoff forecasting allows, to avoid rising pool levels and associated temperature depressions in near-shore areas when smallmouth bass are spawning; and 3) the feasibility of avoiding reservoir evacuation for winter flood control or hydropower prior to the September 1 date identified in the current flood control operating curve to promote terrestrial invertebrates deposition, which is an important food source for trout and smallmouth bass.

10.3D Big Fork Hydroelectric Project Resident Fish Mitigation

Pacific Power and Light Company

10.3D.1 Continue to operate the Big Fork Hydroelectric Project under provisions included in the project's Federal Energy Regulatory Commission license.

Montana Department of Fish, Wildlife and Parks; Confederated Salish and Kootenai Tribes; and Pacific Power and Light Company

10.3D.2 Examine mitigation alternatives to address losses of westslope cutthroat trout, rainbow trout, bull trout and kokanee in the Flathead River system caused by the Big Fork Hydroelectric Project.

10.3D.3 Continue to work together to ensure coordination of Big Fork Hydroelectric Project operations with Montana Department of Fish, Wildlife and Parks and the Confederated Salish and Kootenai Tribes' fish management objectives.

10.3E Other Projects

Bureau of Reclamation

10.3E.1 Ensure that Anderson Ranch Dam is operated to maintain established minimum flow levels for the wintering and spawning of trout in the South Fork of the Boise River.

10.3E.2 Consult with the Oregon Department of Fish and Wildlife and affected irrigation districts to explore the potential for releasing surplus water when it is available from Owyhee, Warm Springs and Beulah reservoirs. Such releases would be made during the non-irrigation season to benefit downstream resident fish.

Bureau of Reclamation; Pacific Power and Light Company; Corps of Engineers

10.3E.3 Operate Grand Coulee Dam and Lake Roosevelt to provide the maximum

water retention times possible, with a minimum of 40 days, from June 15 through the end of September. By mid-April, have the reservoir as low as it will be drawn down. For the period from April 1 to June 15, operate the lake for the maximum water retention times that have been historically achievable. Minimize reservoir fluctuations.

Meet the following end-of-month elevation targets while attempting to maintain the monthly mean water retention times as follows:

Period	Elevation (feet above sea level)	Retention
January	1,270	45 days
February	Operate reservoir to elevation 1,260	40 days
March-April 15	Operate reservoir no lower than 1,250 feet above mean sea level	30 days
April 16	1,255	30 days
May	1,265	35 days
June-December	Operate reservoir at 1,288 (2 feet below full pool)	40-60 days or maximum historially achievable for each month

Reduce the maximum water level from 1,288 feet above mean sea level to 1,283 feet above mean sea level every other year from June to August to re-establish terrestrial vegetation in littoral areas. Refill to elevation 1,288 feet above mean sea level by September 1. Refill in subsequent years to 1,288 feet above mean sea level.

Agreement data submittals, System Operation Review Environmental Impact Statement, and other pertinent long-term and annual planning and operation of the Columbia River Power System. The guidelines should be treated as a hard constraint. Bonneville, the Bureau of Reclamation and the Corps of Engineers are further directed to develop a biological rule curve, based on these guidelines, that will protect resident fish in Lake Roosevelt.

Include these operating guidelines in the Pacific Northwest Coordination

Fish Passage Center and Columbia Basin Fish and Wildlife Authority

10.3E.4 Incorporate these operating guidelines for Grand Coulee into planning and system operational requests, as set forth in Section 5.1B.1.

10.3E.5 Develop additional scientific information on the benefits and need for a water retention time standard for Grand Coulee and submit to the Council as soon as possible. The Council will review and refine this measure based on anticipated submissions by the Columbia Basin Fish and Wildlife Authority in 1995.

Fish Managers and Council

Federal Energy Regulatory Commission

10.3E.6 To maintain habitat conditions suitable for the survival of resident fish in Georgetown Lake, do not permit alterations of future operations of the Flint Creek project from past practices without considering and incorporating the multiple uses of the project, including the needs of the fish.

Montana Power Company

10.3E.7 Continue funding an evaluation of the Milltown Dam proposed operating procedures to determine whether they will protect resident fish downstream from the project. Include an analysis of suspended sediments, associated heavy metals and organic pollutants, as well as an evaluation of the potential effect of these pollutants on resident fish. Propose mitigation alternatives to the Council if the investigations reveal that an adverse effect on the fish will result from the proposed operation.

Bureau of Reclamation, Corps of Engineers and Other Project Operators

10.3E.8 In consultation with the Council, tribes, and fish and wildlife agencies, use storage, where existing structures allow, to maintain water temperatures within the best ranges for fish habitat.

Shoshone-Bannock Tribes

10.3E.9 Acquire or construct a trout production facility and operate and maintain the facility for the production of native trout species for stocking on the Fort Hall Indian Reservation and elsewhere. Assess opportunities for joint production strategies with the Shoshone-Paiute Tribes, including the training of tribal members in fish culture.

10.3E.10 Implement habitat restoration and enhancement activities in Spring Creek and Clear Creek along the Fort Hall Bottoms located on the Fort Hall Reservation.

Bonneville, Bureau of Reclamation and Other Relevant Entities

10.3E.11 Fund the Shoshone-Bannock Tribes projects listed above.

Washington Water Power Company

10.3E.12 Continue the existing operation of Post Falls Dam to minimize its impact on the fish and wildlife in Lake Coeur d'Alene and the Spokane River. Initiate consultation with the Coeur d'Alene Tribe to develop and conduct an evaluation(s) of the effects of current and projected hydropower operations at Post Falls Dam on fish in Lake Coeur d'Alene and the Spokane River by June 1996. In coordination with this consultation, continue to consult with the Idaho Department of Fish and Game and others. Proposals for further action may be made on the basis of the evaluation(s).

10.4 STURGEON MITIGATION

Sturgeon were once abundant in the Columbia River Basin. Population levels of sturgeon in some areas of the basin have declined, thereby raising concern about the long-term sustainability of the species. The Council believes that studies and evaluations should be

undertaken and completed quickly, and on-the-ground projects identified and implemented as soon as possible to address the needs of this species. In addition, these studies should be coordinated to avoid redundant work and to increase the potential for learning.

10.4A Study and Evaluate Sturgeon Populations

Bonneville

10.4A.1 In consultation with the appropriate tribes and state agencies, fund the implementation of the sturgeon measures listed below.

10.4A.2 In consultation with the appropriate state agencies and tribes, fund research to determine the impact of development and operation of the hydropower system on sturgeon in the Columbia River Basin. These studies may include: 1) habitat requirements, 2) maintenance of genetic integrity, 3) stock assessment, 4) potential for artificial propagation, and 5) migration potential. Specific recommendations for the protection, mitigation and enhancement of sturgeon may be submitted to the Council upon completion of these studies.

10.4A.3 In consultation with the Umatilla Tribes and other appropriate state agencies and tribes, fund an evaluation, including a biological risk assessment (see measure 7.3B.1), of potential means of rebuilding sturgeon populations between Bonneville Dam and the mouth of the Snake River.

10.4A.4 In consultation with the Nez Perce Tribe, Idaho Department of Fish and Game, Oregon Department of Fish and Wildlife and other appropriate state agencies and tribes, fund an evaluation, including a biological risk assessment (see Measure 7.3B.1), of potential means of rebuilding sturgeon populations in the Snake River between Lower Granite and Hells Canyon dams.

10.4A.5 In consultation with the Nez Perce Tribe, Idaho Department of Fish and Game, Oregon Department of Fish and Wildlife, and other appropriate state agencies and tribes, fund an evaluation of a put-and-take consumptive sturgeon fishery in Hells Canyon and Oxbow Reservoirs. The study may include the production of test fish at the existing Nez Perce Tribe sturgeon rearing facility. Submit for Council review and approval prior to implementation.

10.4A.6 In consultation with the Spokane Tribe, the Colville Tribes and other appropriate state agencies and tribes, fund a three-year base-line assessment of sturgeon in Lake Roosevelt from Grand Coulee Dam to the international border, including the Spokane River arm on the Spokane Indian Reservation. Include estimates of: current population size, abundance of each age class, age/length frequency, recruitment rate, natural and fishing mortalities, distribution and migration patterns, harvest, life history, habitat usage, environmental factors affecting abundance and an assessment of the potential for artificial propagation. Submit recommendations from these studies to the Council.

10.4A.7 In consultation with the appropriate tribes and state agencies, fund an evaluation of the development and maintenance of operations and facilities to enhance white sturgeon production by supplementation for depressed populations in the impounded portions of the Columbia and Snake rivers. Submit for Council review and approval prior to implementation.

10.4A.8 In consultation with the appropriate tribes and state agencies, fund an evaluation of the development and maintenance of an experimental white sturgeon research facility for research on contaminants, reproduction and genetics of white sturgeon. Submit for Council review and approval prior to implementation.

10.4A.9 In consultation with the appropriate tribes and state agencies, fund white sturgeon population research in Lake Roosevelt, mid-Columbia and lower Snake river reservoirs.

Corps of Engineers

10.4A.10 In consultation with the appropriate tribes and state agencies, fund research regarding feasibility of additional sturgeon passage opportunities at The Dalles Dam by restoring existing fish lock facilities.

10.4B Kootenai River White Sturgeon

The Council recognizes that white sturgeon in the Kootenai River are a species of special cultural significance to the Kootenai Tribe of Idaho. Further, the Council notes that since the construction of Libby Dam in 1972, recruitment has been nil and the population has been in steady decline. In the 76 kilometer section of the Kootenai River between Bonners Ferry, Idaho, downstream to the Canadian Border, the population was estimated at 1,148 individuals in 1982 and 880 individuals in 1990. Absence of smaller-sized sturgeon and an increase in the overall size distribution of the population to larger-sized, older fish between 1982 and 1990 points to an absence in recruitment. The Council has been presented with testimony from the fishery managers that this decline in all probability is caused by two factors, altered flow regimes and load following, resulting from the operation of Libby Dam. The fishery managers believe that spring/summer flows in excess of 30,000 to 35,000 cubic feet per second at Bonners Ferry are needed to ensure adequate spawning and recruitment. Kootenai River white sturgeon were listed as an endangered species by the U.S. Fish and Wildlife Service in 1994. Degraded water quality, loss of sloughs and marshes (which may have formerly been potential fry habitat) due to diking, and reduced prey densities owing to Libby Dam trapping nutrients have also been suggested as contributing to the problem.

Since the Kootenai River white sturgeon population has had virtually no recruitment in the last 20 years, the Council has two recovery objectives. The first (short-term) is to act immediately to prevent further loss of genetic variability in the population. The second (long-term) is to restore natural reproduction and recruitment. These objectives will be accomplished in two ways. First, flow experiments will be conducted, in a manner consistent with the integrated rule curves for Libby Dam, in an attempt to identify the level of flows necessary for successful spawning and recruitment to occur. Second, to prevent additional losses of genetic variability to the population, owing to continued mortality with no replacement, genetically sound artificial propagation utilizing the Kootenai Tribal sturgeon culture station will be employed.

Until successful repeatable natural spawning of white sturgeon in the Kootenai River is shown to result in repeatable recruitment, recovery will include artificial production. Artificial production will follow guidelines set forth in the “Kootenai River White Sturgeon Recovery Strategy” developed by the Kootenai Tribe of Idaho Fisheries Program, in collaboration with the Upper Columbia United Tribes Fisheries Research Center. The guidelines incorporate a breeding plan developed by Dr. Harold Kincaid, a U.S. Fish and Wildlife Service geneticist in a report to Bonneville published in 1993. Kincaid's plan protects the genetic integrity (by maintaining genetic variability) of the wild Kootenai River white sturgeon stock, utilizing conservation aquaculture, while simultaneously restoring the

natural age structure to the population. The Council, by this action, approves both the Kootenai Tribe of Idaho/Upper Columbia United Tribes recovery plan and Kincaid breeding plan and incorporates them as part of this program. When the U.S. Fish and Wildlife Service develops a recovery plan for the Kootenai River white sturgeon, the Council will consult with the Kootenai Tribe and the Fish and Wildlife Service and other interested entities to determine if the recovery plan is consistent with the recovery strategy adopted here, and if not, to determine whether and how this recovery strategy should be revised.

The captive breeding program will use three to six females and an equal or greater number of males captured from the Kootenai River each spring. Fish will be spawned in pairs or in diallel mating designs to produce a minimum of five to six individual families that will be reared separately to maintain family identify. After hatching, approximately half the offspring shall be transferred to either Sandpoint or Cabinet Gorge hatchery in case catastrophic losses were to occur at one facility. Fish will be marked to identify family and year class before return to the river. Fish should be returned to the river as fall fingerlings to minimize potential adaptation to the hatchery environment. Initially, while tagging methods are tested to ensure positive identification after return to the river, it may be necessary to plant fish as spring yearlings. Total number of fish planted will be 5,000 to 7,000 if fall fingerlings or 1,000 to 1,200 if spring yearlings, with the number planted from each family equalized. Assuming annual survival rates of 20 percent during the first winter for fall fingerling plants and 50 percent for years one to three, and 85 percent for years four to 20 of all fish planted, the target numbers would yield 7.9 progeny per family or about four breeding pairs at age 20. Natural survival in the river environment during the 19+ years from planting to maturity would result in variability in genetic contribution of families to the next broodstock generation. Fish planted per family would be adjusted in future years when actual survival rate information is known. Broodfish will be tagged when captured to minimize multiple spawning of the same fish.

The annual number of progeny produced per family is determined by the number of successfully spawned females in a given year. If six distinct white sturgeon families are produced, the annual production goal of 1,200 age 1 fish will be met with 200 individuals per family. If 12 distinct families are produced, the annual production goal of 1,200 age 1 fish will be met with 100 fish per family. Producing an intermediate number of families (>6, <12) will meet the 1,200 fish target by adjustment of numbers of fish per family at age 1.

The following mating options are designed to preserve the population's remaining genetic variability, maximize the effective population number and begin rebuilding a natural age class structure.

# Females	# Males
2	8
3	9
4	4
5	5
6	6

After a fish, male or female, has produced one progeny family, it shall not be spawned again for a minimum of five years. After five years, a fish could be used to produce a second family only if no other unused fish are available for spawning. No fish will be used more than twice.

Biological objectives for endangered Kootenai River white sturgeon:

- Preserve existing gene pool and re-establish natural age structure of the population. To accomplish this goal, it will be necessary to have a minimum “successful recruitment” by 100 families, with a family unit defined as one female crossed with one male, during the next 20 years (by 2015). “Successful recruitment” is defined as enough

fish to produce 4 to 10 sexually mature adults/family unit (average 7.9 adults/family unit) at 20 years of age. To reproduce natural age structure this will require that an average of five family units per year be spawned successfully, with approximately 200 age 1 individuals from each family recruited into the population each year for the next 20 years. This will result in a population of approximately 640 age 20 or older adults by 2035, which, when added to the number of individuals surviving from the wild population (223 estimated in 2035 based upon a current estimated 3.3 percent annual mortality) would stabilize the population at approximately the current population of 880 individuals older than age 20. Assuming that between 2015 and 2035, five families reproduce annually at the same rate, an additional 3,200 fish younger than age 20 would also be present. Of equal importance, the age structure of the population would be restored, thus allowing additional time to recover this stock. In essence, this objective boils down to producing 1,000 to 1,200 age 1 fish composed of five to six families of 20 fish each annually.

- Restore recruitment produced by naturally spawning adult sturgeon in the Kootenai River.
- At present, given the length of time anticipated for recovery to take place, no harvest or escapement targets have been established. However, it is a long range management objective of the Kootenai Tribe of Idaho to eventually restore this stock of sturgeon to a sufficient abundance and age distribution to allow for ceremonial, subsistence and recreational harvest by tribal members and recreational harvest by sport anglers.

Strategies to achieve biological objectives for Kootenai River white sturgeon:

- The Council's measures to restore endangered Kootenai River white sturgeon will undertake concurrent thrusts: 1) obtain higher water flows in the river to re-establish natural spawning, and 2) initiate a captive culture program to preserve existing genetic variation until natural spawning is restored.
- Utilize the Kootenai Tribal sturgeon culture station to augment recruitment until evidence is available to show that natural reproduction is yielding adequate recruits to sustain the genetic variability. Additionally, the captive culture program will utilize "preservation stocking" techniques to minimize inbreeding, genetic bottlenecks and other detrimental effects that conventional supplementation programs have on wild fish populations. A parent stock of wild fish collected from the Kootenai River with an effective population size of 200 individuals (100 females and 100 males) or 100 families will be used to ensure genetic integrity. A constraint will be placed on the captive culture program to ensure that at least 70 percent of mature females in any given year are retained in the river and allowed to spawn naturally if river conditions permit. Available scientific evidence indicates that 22 to 42

females become mature each year, so using the more conservative lower value, up to six females could be captured annually and spawned to produce fish for the culture program. At a current 3.26 percent annual mortality rate, calculated from the difference between two population estimates made in 1982 (1,148 individuals) and 1990 (880 individuals), the number of females that could be used in future years would decline to five in five years, four in 10 years, and three in 15 years. The recruitment goal for each family in this program is enough fish to produce 4 to 10 adults at 20 years of age. This would require stocking approximately 5,000 to 7,000 total age 0 fish or 1,000 to 1,200 total age 1 fish with equal numbers stocked from each family.

- The captive breeding program will use three to six females and an equal or greater number of males captured from the Kootenai River each spring. Fish will be spawned in pairs or in diallel mating designs to produce individual families that will be reared separately to maintain family identity. Fish will be marked to identify family and year class before return to the river. Fish should be returned to the river as fall fingerlings to minimize potential adaptation to the hatchery environment. Initially, while tagging methods are tested to ensure positive identification after return to the river, it may be necessary to plant fish as spring yearlings. Total number of fish planted will be 5,000 to 7,000 if fall fingerlings or 1,000 to 1,200 if spring yearlings, with equal numbers planted from each family. Assuming annual survival rates of 20 percent during the first winter for fall fingerling plants and 50 percent for years one to three, and 85 percent for years four-20 of all fish planted, the target numbers would yield 7.9 progeny per family or about four breeding pairs at age 20. Natural survival in the river environment during the 19+ years from planting to maturity would result in variability in genetic contribution of families to the next broodstock generation. Broodfish will be tagged after spawning to minimize multiple spawnings of the same fish.
- Operate Libby reservoir according to the Integrated Rule Curve guidelines in an attempt to provide for natural spawning and recruitment within the Kootenai River. Implementation and duration of discharge will be consistent with Section 10.3B.1 and 10.3B.2.

Measures to achieve biological objectives for Kootenai River white sturgeon:

Kootenai Tribe of Idaho

10.4B.1 Operate and maintain a low-capital sturgeon hatchery on the Kootenai Indian Reservation. With Bonneville, explore alternative ways to make effective use of the hatchery facility year-round.

10.4B.2 Survey the Kootenai River downstream from Bonners Ferry, Idaho, to the Canadian border to: 1) evaluate the effectiveness of the hatchery, and 2) assess the impact of water-level fluctuations caused by Libby Dam on hatchery operations for outplanting of sturgeon in the Idaho portion of the Kootenai River.

Bonneville and Corps of Engineers

10.4B.3 Release water from Libby Dam to augment river discharge during the historic white sturgeon spawning period (May-July) to accomplish flow experiments and attempt to encourage natural spawning and recruitment. The purpose of these experiments shall be to identify the minimum flows required to achieve natural spawning and recruitment of year classes. Implementation and duration of discharge will be consistent with Section 10.3B.1 and 10.3B.2.

10.4B.4 Follow the accompanying operating guidelines at Libby Dam when augmenting discharges:

- Variation in discharge ("load factoring" or "load following") should be eliminated or minimized during wettest 66 percent of water years. Load factoring is permissible during the driest 33 percent of water years, but efforts to minimize load factoring every year are strongly encouraged.
- A minimum stream flow of 12,000 cubic feet per second should be maintained from May 1 through August 25 at Bonners Ferry during the 66 percent wettest years to eliminate stranding of larvae and juvenile fishes, and to reduce the chances of the river reaching lethally high temperatures during the white sturgeon egg incubation and larval development periods.
- Augmented discharge in the 66 percent wettest years should occur in such a way as to maintain 8° to 14° centigrade water temperature at Bonners Ferry from the first to the 45th day of augmented discharge.
- Ramping up and down to and from augmented discharge levels should occur over at least a 96-hour period.
- During the 66 percent wettest years, water temperature should be 18° centigrade between the 45th day of augmented discharge and August 25 (during the 12,000 cubic feet per second minimum discharge period) to maximize survival of white sturgeon eggs and larvae.
- Experimental discharges should be provided during average water years (33-66 percent wettest years) to test how incremental discharge increases affect natural spawning and recruitment of white sturgeon in the Kootenai River. The emphasis during such years should be on providing different discharge regimes to determine if natural reproduction and recruitment can be achieved with moderate discharge.
- Natural spawning experiments will also be conducted to determine if moderate discharge regimes, shaped differently than current discharge patterns, can satisfy the recovery objective of reestablishing natural spawning and recruitment of white sturgeon in the Kootenai River. In addition to shaping augmented discharge, effects of increased discharge duration will be evaluated. The aim of these natural spawning experiments is to use adaptive river management to test hypotheses concerning natural spawning requirements of white sturgeon in the Kootenai River.
- Augmented discharge will not occur during below average water (<33 percent wettest years) to better allow reservoir refill, thereby enabling greater water availability

for natural spawning tests in subsequent years. Not releasing water through Libby Dam during below average water years will also reduce negative effects on resident fisheries and recreation in Lake Koocanusa currently caused by low reservoir surface elevations.

- Discharge augmentation in above average water years will be automatically implemented once the predetermined adequate amount of water is available. The Corps of Engineers should provide reports including runoff forecast and water availability data to all involved management agencies (Kootenai Tribe of Idaho, Idaho Department of Fish and Game, Montana Department of Fish, Wildlife and Parks, U.S. Fish and Wildlife Service, Bonneville, Pacific Northwest Utilities Conference Committee). Annual implementation of augmented discharge will be based on run-off forecasts and water availability data provided by these reports made available and updated from January to March of every year.
- By March 15, the Corps of Engineers shall provide an annual report of runoff and water availability, which will determine the targeted Kootenai River Water Budget for white sturgeon, to the Council and to appropriate fisheries management agencies (Kootenai Tribe of Idaho, Idaho Department of Fish and Game, Montana Department of Fish, Wildlife and Parks, U.S. Fish and Wildlife Service). These four agencies (water budget team) will consult with Bonneville and the Corps of Engineers to develop an annual implementation plan that shapes the flows for conducting adaptive management experiments. The report will be submitted to the Council by the water budget team annually by April 1. This report will describe the dates and times, ramping rates, shapes of flows and temperature guidelines for the sturgeon spawning experiment to be conducted that year.
- The range of augmented discharge during average water years (15,000-25,000 cubic feet per second) is designed to investigate white sturgeon spawning over a wide range of discharge regimes.
- The furthest downriver suspected spawning habitat for white sturgeon exists near Shorty's Island, located downstream from Bonners Ferry. Due to braided channel morphology in this area of the river, an increase of discharges from 22,000 to 23,000 cubic feet per second provides a nearly five-fold increase in predicted spawning habitat. Therefore, during average water years, effort should be made when possible to provide discharge between 23,000 and 25,000 cubic feet per second at Bonners Ferry. However, effects of discharge on spawning should also be evaluated at discharges ranging from 15,000 to 22,000 cubic feet per second at Bonners Ferry in average water years.

Kootenai Tribe of Idaho, Idaho Department of Fish and Game, and Montana Department of Fish, Wildlife and Parks

10.4B.5 As part of the Kootenai sturgeon recovery strategy (see measure 10.4B.4 above):

- The Kootenai Tribe of Idaho is to operate the Kootenai Tribal sturgeon hatchery and develop propagation methods that ensure healthy sturgeon are outplanted into the Kootenai River commencing in 1995. Also, mark all hatchery-released fish to distinguish from naturally produced fish. The Idaho Department of Fish and Game is to rear white sturgeon at Sandpoint or Cabinet Gorge hatcheries commencing in 1995.
- The Kootenai Tribe of Idaho, Idaho Department of Fish and Game and Montana Department of Fish, Wildlife and Parks will participate on the water budget team, commencing in 1996.
- The Kootenai Tribe of Idaho, Idaho Department of Fish and Game and Montana Department of Fish, Wildlife and Parks are to conduct monitoring and evaluation to assess the effectiveness of these measures, and investigate critical uncertainties about other factors that may contribute to reduced sturgeon recruitment, commencing in 1995. The monitoring and evaluation program shall include: 1) an assessment of spawning success and natural recruitment to the juvenile population under high discharge in high runoff years, experimental discharges in moderate runoff years and no flow augmentation in below average runoff years; 2) an assessment of hatchery releases; 3) an assessment of exactly how and why low Kootenai River discharges affect sturgeon recruitment; and 4) an assessment of factors other than discharge that may be contributing to the lack of Kootenai River white sturgeon spawning success and recruitment. Such factors potentially include pollutants, limited food resources (at various life history stages), predation, combination of altered thermal regimes and limited food availability that could cause poor winter survival of young-of-the-year sturgeon, and lack of habitat for fry, juvenile or subadult life history stages. In particular, data shall be collected to develop bioenergetics models that assess the impact of predatory fish consumption of sturgeon eggs and larvae to recruitment of sturgeon year classes. As part of this study, the impact of low versus high discharges on the intensity and rates of predation on sturgeon eggs and larvae shall be investigated. The project will determine the feasibility of utilizing predator management as a tool to improve sturgeon recruitment. This investigation shall also focus on assessing larval and overwinter survival of age 0 sturgeon as it relates to the current levels of primary and secondary production in the river and Kootenay Lake.

10.5 BULL TROUT AND OTHER NATIVE SALMONID MITIGATION

10.5A Study and Evaluate Bull Trout Populations

Bull trout were once abundant in the Columbia River Basin. Population levels have declined in some areas, thereby raising concerns about the long-term sustainability of the species. The measures below call for studies and evaluations. The Council believes these studies and evaluations should be undertaken and completed quickly, and on-the-ground projects identified and implemented as soon as possible to

address the needs of this species. In addition, these studies should be coordinated to avoid redundant work and to increase the potential for learning.

Bonneville, Other Federal Agencies, States, Hydroelectric Project Owners and Other Entities as Appropriate

10.5A.1 Fund bull trout population and habitat surveys in the Middle Fork Willamette and McKenzie River systems and habitat improvements identified in the surveys to benefit bull trout.

10.5A.2 Fund a study of the status, life history, habitat needs and limiting factors for bull trout populations in the Deschutes, Grande Ronde, Hood, John Day and Umatilla subbasins.

10.5A.3 Fund the Confederated Salish and Kootenai Tribes and Montana Department of Fish, Wildlife and Parks to initiate a comprehensive genetic sampling program for bull trout in the Flathead River Basin.

Confederated Salish and Kootenai Tribes and Montana Department of Fish, Wildlife and Parks

10.5A.4 Initiate a comprehensive genetic sampling program for bull trout in the Flathead River Basin to provide basic genetic information needed for rebuilding bull trout populations, including the use of supplementation for rebuilding purposes, as well as to identify non-lethal genetic sampling techniques.

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10.5A.5 In consultation with the Idaho Department of Fish and Game and appropriate tribes, fund an investigation of the life history, habitat needs and threats to persistence of bull trout and a genetic sampling program for bull trout in the Lake Pend Oreille system.

10.5A.6 In consultation with the Washington Department of Fish and Wildlife and the Yakama Indian Nation, fund a study of the life histories and limiting factors for bull trout populations residing in the following Bonneville Reservoir tributaries: Wind, Little White Salmon, White Salmon and Klickitat rivers. The purposes of the study include:

- determine presence and abundance of juvenile and adult bull trout;
- compare the genetic make up of stocks found with each other and stocks outside the study area;
- determine the amount of suitable bull trout habitat available in the tributaries;
- determine limiting factors for bull trout production; and
- develop a management plan for bull trout on tributaries to the Bonneville Reservoir.

10.5B Study and Evaluate Native Salmonid Populations Above Hells Canyon Dam

Bonneville, Other Federal Agencies, States, Hydroelectric Project Owners and Other Entities as Appropriate

10.5B.1 In consultation with the Idaho Department of Fish and Game, Oregon Department of Fish and Wildlife, Shoshone-Bannock Tribes, Shoshone-Paiute Tribes and Burns Paiute Tribe, fund an investigation of the life history, habitat needs and threats to persistence of native salmonids upstream of Hells Canyon Dam in the Snake River and its tributaries.

10.5B.2 In consultation with the Idaho Department of Fish and Game, Oregon Department of Fish and Wildlife, Shoshone-Bannock Tribes, Shoshone-Paiute Tribes and Burns Paiute Tribe, fund the initiation of a comprehensive genetic sampling program for native salmonids upstream of Hells Canyon Dam in the Snake River and its tributaries.

10.6 OTHER RESIDENT FISH POPULATIONS

10.6A Rainbow Trout in the Clearwater River

Idaho Department of Fish and Game

10.6A.1 Provide information to the Council on whether habitat in the Clearwater River below its North Fork is suitable for rainbow trout. If the habitat is suitable and production of rainbow trout will not conflict with production of chinook salmon, provide a plan to stock the river with rainbow trout. Coordinate development of this plan with the Nez Perce Tribe and the National Marine Fisheries Service.

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10.6A.2 Upon completion of the actions specified in Section 10.6A.1, and upon Council review and approval, fund the program for stocking rainbow trout in the Clearwater River.

10.6B Salmonids and Spiny-Rayed Fish in Pend Oreille River

Corps of Engineers

10.6B.1 Fund a study to evaluate the existing and potential salmonid and spiny-rayed fish and their habitat in the Pend Oreille River from Lake Pend Oreille downstream to Albeni Falls Dam. Coordinate this study with the Idaho Department of Fish and Game, Washington Department of Fish and Wildlife and Kalispel Tribe of Indians. Submit recommendations based on results of these studies. Upon approval by the Council, fund recommendations.

10.6C Sturgeon and Burbot in Kootenai River

Bonneville

10.6C.1 Fund efforts to restore sturgeon and burbot populations in the Kootenai River. These populations are dependent on the productivity of fish habitats in the entire Kootenai River system including the Kootenay River and Kootenay Lake in British Columbia. Coordinate and share the cost of this measure with Canadian fishery managers.

10.6D Kokanee in Banks Lake

Bureau of Reclamation or Appropriate Irrigation Districts

10.6D.1 Fund maintenance of the barrier net system at the outlet from Banks Lake into the main irrigation canal to conserve the spawning population of kokanee in the lake.

10.6E Kokanee in Lake Pend Oreille

The Council endorses adaptive management techniques and targeted research to improve environmental conditions and provide data

concerning critical uncertainties. The same approach should be applied to uncertainties regarding Lake Pend Oreille.

The decline in kokanee populations from the 1960s to the mid 1990s has been debated in terms of magnitude of decline and factors causing the decline. Shoreline spawning counts have declined from 39,400 in 1953 to 1,900 in 1992. The Idaho Department of Fish and Game believes that there would be an increase in spawning habitat if lake levels were held up. Other factors such as predation, mysis shrimp introduction and other food web changes have also been suggested as possible causes of decline and limits on population size.

An experimental regime in which winter water levels are maintained above 2,051 feet would test whether spawning habitat limits kokanee populations, and whether recruitment would be significantly enhanced by higher water levels. Managing winter water levels to 2,054 feet in 1995-96, 2,055 feet in 1996-97 and 2,056 feet in 1997-98 would provide sufficient new spawning habitat to permit such a test.

Because the kokanee population is low and variable, and weak year classes are forecast, there is an urgent need to understand the causes of decline. Research should provide data to address uncertainties regarding: movements of shoreline gravel; any impacts or benefits to Box Canyon Reservoir; a lake energy budget including zooplankton; predation levels and predator abundance; mysis shrimp and kokanee; changes in the abundance of warmwater fish species; concerns about Eurasian water milfoil; and effects on wildlife and waterfowl. Many elements of this research are needed prior to making long-term decisions regarding lake level management.

Therefore, the Council calls for maintaining Lake Pend Oreille levels at an elevation of 2,054 feet in 1995-96, 2,055 feet in 1996-97 and 2,056 feet in 1997-98 from early November until April for three winters.

Idaho Department of Fish and Game and Appropriate Tribes and State Agencies

10.6E.1 Prepare a study plan for Council review by September 1995 to investigate the effect of changing water level management of Lake Pend Oreille starting in the fall of 1995. Address as a part of the study: the effect of lake level changes on kokanee production; possible movements of shoreline gravel and sediment; any impacts or benefits to Box Canyon Reservoir; a lake energy budget, including zooplankton; predation levels and predator abundance; mysis shrimp and food availability for larval and adult kokanee; changes in the abundance of warm water fish species; concerns about Eurasian water milfoil; and effects on wildlife and waterfowl. During the term of the study implement hatchery improvements identified in previous studies on Cabinet Gorge Hatchery, maintain current levels of kokanee production and maintain current levels of harvest.

Independent Scientific Group

10.6E.2 Review the study design and implementation, including appropriate lake levels, at the earliest opportunity and submit a review to the Council by September 1, 1996. The Council will then confirm or modify the final study design.

Bonneville

10.6E.3 Fund the Lake Pend Oreille kokanee study as approved by the Council.

Corps of Engineers

10.6E.4 Change lake level minimums to 2,054 feet, 2,055 feet and 2,056 feet during the next three winters. These lake levels should be implemented only if monitoring and evaluation measures (spawning related studies) are in place. Drafts below these levels are permissible in case of power emergencies to protect system reliability (see Section 1.8 on system reliability and emergencies). Any replacement energy for these operations must not come from Columbia River Basin storage projects. Funding for research associated with these operations is subject to the ongoing process for project ranking and prioritization.

10.7 PROVIDE AND EVALUATE USE OF SHORELINE VEGETATION

10.7A Vegetation Plantings

Bonneville, Other Federal Agencies, States, Hydroelectric Project Owners and Other Entities as Appropriate

10.7A.1 Fund test vegetation plantings at appropriate reservoirs and evaluate results. Appropriate reservoirs might include Hills Creek, Dworshak, Libby, Hungry Horse, Lake Roosevelt and others. Incorporate the results of shoreline vegetation studies at Revelstoke and other reservoirs into this test. Based on the results of the test plantings, fund a feasibility study to identify which hydroelectric projects in the basin would benefit from revegetation improvements.

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10.7A.2 Combine the information developed from test plantings in all reservoirs in the basin with a site-specific examination of the effect of operation levels on plant species and survival, the identification of areas likely to produce the most beneficial impacts on targeted fisheries, as well as an assessment of cost/benefit, permitting, environmental impact and overall feasibility. The results and recommendations of this study are to be submitted to the Council by December 31, 1998. Upon Council approval, fund implementation of recommendations.

10.8 RESIDENT FISH SUBSTITUTIONS

Salmon and steelhead probably never will be able to return to some areas of the basin because of blockages by dams. These include the areas above Chief Joseph and Grand Coulee dams and the Hells Canyon Complex, as well as other smaller blocked areas. In its analysis of the contribution of the hydropower system to salmon and steelhead losses (see Council documents 87-15, 87-15A and 87-15B), the Council has addressed the extent to which resident fish substitutions should be used to mitigate losses of salmon and steelhead production in these areas.

The Council has concluded that: 1) mitigation in blocked areas is appropriate where salmon and steelhead were affected by the development and operation of the hydroelectric projects; 2) to treat the Columbia River and its tributaries as a system, resident fish substitutions are reasonable for lost salmon and steelhead in areas where in-kind mitigation cannot occur; and 3) flexibility in approach is needed to develop a program that complements the activities of the fish and wildlife agencies and tribes and is based on the best available scientific knowledge. For substitution purposes, resident fish may include landlocked anadromous fish (e.g., white sturgeon, kokanee and coho), as well as traditionally defined resident fish species.

10.8A Resident Fish Substitutions Policy

The substitution of resident fish to make up for losses of anadromous fish in areas now permanently blocked to salmon and steelhead reflects the Council's resolve to address complex, long-term problems. Historical records show that the Columbia River Basin Indian tribes relied extensively on salmon and steelhead, and the permanent loss of these resources has had incalculable impacts on tribal economies, cultures and religions.

Historically, the Council approved projects in the areas above Chief Joseph/Grand Coulee, and in the blocked areas above Hell's Canyon Dam. Examples of substitution activities are at Lake Roosevelt, tributaries and reservoirs of Box Canyon Reach of the Pend Oreille River, tributaries of the Coeur d'Alene Indian Reservation, Kootenai River, lakes and streams of the Colville Indian Reservation, as well as above Hell's Canyon Dam on the Duck Valley Reservation, C.J. Strike Reservoir, the Fort Hall Reservation, and Cascade Reservoir. In the Council's 1993 resident fish and wildlife amendment process, the Council expanded its historic substitution areas to include projects outside of the historical blocks, above the blocked areas at Dworshak and Pelton dams.

Substitution activities are one of the two highest priorities in the resident fish program, as provided in Section 10.1B.

The Council has determined that until on-the-ground measures are achieved and the level of rebuilding is known, this priority is the best biological approach.

The resident fish substitution policy is guided by and encompasses Sections 10.1, 10.1A, 10.1B and 10.2 of this program.

10.8B Resident Fish Substitution Biological Objectives and Measures Above Chief Joseph/Grand Coulee Dams

The fishery managers, including the Colville Confederated Tribes, Coeur d'Alene Tribe, Kalispel Tribe, Kootenai Tribe of Idaho, Spokane Tribe and Washington Department of Fish and Wildlife collectively identified the following biological objectives as partial mitigation for the loss of anadromous salmon and steelhead blocked by Chief Joseph and Grand Coulee Dams. The Council approves these biological objectives and seeks implementation of the associated strategies and measures to achieve them, as a reasonable interim goal whose completion will partially offset the historic and contemporary losses incurred.

The best available scientific information presented to the Council indicates that the full, complete and sustained achievement of the following biological objectives will redress approximately 10 percent to 13 percent of the total losses of anadromous fish previously harvested by the tribes above the block at Chief Joseph and Grand Coulee dams. Monitoring and evaluation of the performance of the strategies designed to achieve the stated biological objectives will determine the actual amount of credit to be applied to the underlying losses. The methodology for calculating the credit to be applied against the obligation of the hydrosystem will be developed as described in Measure 10.1D.1.

Lake Roosevelt biological objectives:

Biological objectives at Lake Roosevelt include the following annual targets of harvestable sized adult fish:

Species	Stock	Harvest goal (#)	Escapement goal (#)	Total adult fish #	lbs.	Year
kokanee	hatchery	290,000	10,000	300,000	2.0	2000
kokanee (adfluvial)	wild	120,000	60,000	180,000	2.0	*
rainbow trout	net pen	190,000	NA	190,000	1.5	1997
rainbow trout (interim) (adfluvial)	wild	12,000	6,000	18,000	2.0	2000
rainbow trout (adfluvial)	wild	150,000	74,000	224,000	2.0	final[t]
walleye	wild	131,000	U	131,000	1.5	1996

NA = not applicable, U = unknown at the present time, * target date will be determined upon completion of baseline investigations, t = target date will be determined after interim goal is achieved.

Additionally, operate Grand Coulee Reservoir to produce successful year classes of yellow perch as forage for walleye.

To help reduce entrainment and ensure adequate food supplies for resident fish in Lake Roosevelt, operate Grand Coulee Dam to meet the following minimum monthly elevation targets while attempting to maintain the minimum monthly mean retention times as follows:

Period	Elevation (feet above sea level)	Retention
January	1,270	45 days
February	Operate reservoir to elevation 1,260	40 days
March-April 15	Operate reservoir no lower than 1,250 feet above mean sea level	30 days
April 16	1,255	30 days
May	1,265	35 days
June-December	Operate reservoir at 1,288	40-60 days or maximum

(2 feet below full pool)

Reduce maximum water level from 1,288 feet above mean sea level to 1,283 feet above mean sea level every other year to re-establish terrestrial vegetation in littoral areas. By September in those years be at 1,288 feet above mean sea level. Reflood in subsequent years to 1,288 feet above mean sea level. These operating guidelines are to remain in effect until biological and integrated rule curves for Lake Roosevelt have been approved by the Council.

Timelines to achieve targets for individual species are:

- Hatchery kokanee: three years after 1 million age 1+ residualized smolts are released into the reservoir. It is expected that Bonneville will provide funding to increase the water supply to the Spokane Tribal Hatchery and develop kokanee net pens by 1996, to allow the release of 1 million 1+ residualized kokanee smolts by 1997, resulting in a target date of the year 2000.
- Wild kokanee: not specified until current stock status is determined in measure 10.8B.7.
- Net pen rainbow: the year in which net pen expansion allows for holding and release of 500,000 rainbow trout. At the present time, approximately 140,000 rainbow are harvested per year based upon the release of 350,000 net pen fish. The Council expects Bonneville to complete expansion of the rainbow net pens, sufficient to rear 500,000 rainbow trout by 1997.
- Wild rainbow: adaptive management experiments are currently under way, employing historically achievable for each month pilot projects in selected tributaries. Interim targets totaling 18,000 wild adult rainbow, including 6,000 escapement and 12,000 harvestable surplus for five selected tributaries were established. These targets compared to pre-habitat improvement estimates of 1,089 total wild rainbow, including 363 escapement and 726 harvested, in the five tributaries. Habitat enhancement commenced in 1992 and will be completed by 1995 under measure 10.8B.9. Interim targets are expected to be fully achieved after one complete four-year life cycle (by the year 2000). If interim targets are met by that date, the Council will expect to receive a recommendation to complete habitat restoration for wild rainbow trout in other tributaries. If interim targets are not met by that date, the Council expects continued monitoring through 2004 (four complete life cycles) to develop information about long-term success or failure of the pilot projects.
- Walleye: 1996
- Yellow perch: 1996
- Lake Roosevelt Operating Guidelines: 1996

Strategies for achieving Lake Roosevelt biological objectives:

The following strategies will be employed to achieve Lake Roosevelt biological objectives:

- Operate the Lake Roosevelt kokanee hatcheries to produce 1 million age 1+ residualized smolt kokanee for release into Lake

Roosevelt, including 500,000 reared in the hatcheries and 500,000 reared in net pens, and also produce 500,000 age 0+ rainbow fingerlings for the net pen program.

- Mark all hatchery kokanee to separate them from wild fish. Allow harvest of both marked and unmarked fish in warmwater months (May-September), but only marked fish in coldwater months (October-April). The intent of this strategy is that by marking all hatchery fish, catch-and-release strategies can be employed for wild fish, thereby reducing harvest on wild kokanee and, in effect, creating a terminal fishery for hatchery fish.
- Perform baseline investigation to assess current status, determine habitat improvements necessary to achieve wild kokanee biological objectives and develop harvest management regulations to protect wild kokanee.
- Construct and then continue to operate and maintain both kokanee and rainbow trout net pens.
- Complete habitat improvements in selected tributaries to improve passage/habitat for adfluvial rainbow trout. Eliminate 10 migration barriers, reduce embeddedness by 25 percent, increase average canopy cover to 60 percent, introduce 100 pieces of large organic debris per mile (short-term), manage vegetation to promote large organic debris in future (long-term) and increase sinuosity to provide habitat diversity. Monitor tributaries to assess effectiveness and determine if interim targets are achieved.
- Mark all net pen rainbow to separate them from wild fish.
- Continue Lake Roosevelt Fisheries Monitoring Program to monitor effectiveness of these measures, assess impact of reservoir operations on achieving biological objectives, and develop biological and integrated rule curves.

Coeur d'Alene Reservation Tributaries biological objectives:

Biological objectives for wild adfluvial cutthroat trout in tributaries on the Coeur d'Alene Indian Reservation include rebuilding to 75 percent of the optimal level for adult fish. This will be accomplished by achieving interim biological objectives (25 percent and 50 percent of optimal level) by the target dates noted in the following table:

Tributary	Target level (percent)*	Escapement target	+	Harvest target	=	Biological objective	Year
Lake Creek	25	5,346		12,877		8,223	2001
	50	10,695		5,751		16,446	2005
	75	16,042		8,626		24,668	2009
Benewah Creek	25	9,277		4,880		14,157	2001
	50	18,555		9,759		28,314	2005
	75	27,832		14,648		42,471	2009
Alder Creek	25	7,562		4,113		11,675	2001
	50	15,125		8,226		23,351	2005
	75	22,687		12,339		35,026	2009
Evans Creek	25	5,420		2.944		8,364	2001
	50	10,840		5,888		16,728	2005
	75	16,260		8,832		25,092	2009

* Percent improvement over current conditions.

Achievement of cutthroat trout biological objectives are related to enhancing habitat in each tributary to achieve the following conditions:

Lake Creek

Habitat Characteristics	Current Condition	Optimal Condition	Future Desired Condition *(percent over current)*			Difference		
			25	**50**	**75**	**25**	**50**	**75**
Average residual pool depth	1.9 ft	5.0 ft	2.4	2.9	3.4	0.5	1.0	1.5
Average canopy cover (thermal cover)	13.9%	75%	17.4	20.9	24.4	3.5	7.0	10.5
# Large woody debris/ Lineal distance	<0.1/m							
Rifflepool ratio	3.6:1	3:2	3:1	3:2	3:2	-.6	-1	0
Average percent fines	19.1%	<10%	14.3	8.4	3.2	-4.8	10.7	-15.5

Benewah Creek

Habitat Characteristics	Current Condition	Optimal Condition	Future Desired Condition *(percent over current)*			Difference		
			25	**50**	**75**	**25**	**50**	**75**
Average residual pool depth	2.0 ft	5.0 ft	2.5	3.0	3.5	0.5	1.0	1.5
Average canopy cover (thermal cover)	36.6%	75%	45.8	56.4	65.6	9.2	18.4	27.6
# Large woody debris/ Lineal distance	<0.1/m							
Rifflepool ratio	1.8:1	3:2	5:1	3:2	3:2	-.3	0	0
Average percent fines	10.9%	<10%	8.1	5.3	5.3	2.8	5.6	0

Alder Creek

Habitat Characteristics	Current Condition	Optimal Condition	Future Desired Condition *(percent over current)*			Difference		
			25	**50**	**75**	**25**	**50**	**75**
Average residual pool depth	2.0 ft	5.0 ft	2.5	3.0	3.2	0.5	1.0	1.5
Average canopy cover (thermal cover)	23.8%	75%	29.8	35.7	41.6	5.9	11.8	17.7
# Large woody debris/ Lineal distance	<0.1/m							
Rifflepool ratio	1.2:1	3:2	1.2:1	NC	NC	0	0	0
Average percent fines	37.6%	<10%	28.2	18.8	9.4	9.4	18.8	28.8

Evans Creek

Habitat Characteristics	Current Condition	Optimal Condition	Future Desired Condition *(percent over current)*			Difference		
			25	**50**	**75**	**25**	**50**	**75**
Average residual pool depth	2.5 ft	5.0 ft	3.1	3.6	4.3	0.6	1.2	1.8
Average canopy cover (thermal cover)	40.1%	75%	50	60	70	10	20	30
# Large woody debris/ Lineal distance	<0.1/m							
Rifflepool ratio	10.9:1	3:2	7.9:1	5.3:1	2.6:1	-2.6	-5.3	-7.9
Average percent fines	16.8%	<10%	12.6	8.4	4.2	4.2	8.4	12.6

Additionally, produce 25,000 catchable rainbow trout for stocking into trout ponds to provide an interim subsistence and recreation fishery for Coeur d'Alene Tribal members.

Strategies for achieving Coeur d'Alene Reservation Tributaries biological objectives:

The following strategies will be employed to achieve Coeur d'Alene tributaries biological objectives:

- Enhance habitat on Alder, Benewah, Evans and Lake Creeks to achieve interim 25 percent, 50 percent, and final 75 percent habitat improvement targets by specified dates.
- Purchase critical watershed areas (riparian corridors and associated uplands) along these

four tributaries within the boundaries of the Coeur d'Alene Indian Reservation.Construct and operate a low-capital trout hatchery and trout ponds.

- Monitor tributaries to determine if habitat remains improved, and harvest and escapement goals are met.

Biological objectives for kokanee salmon in the Kootenai River:

- Restore the historic kokanee fishery exploited by the Kootenai Tribe of Idaho in four Kootenai River tributaries to meet the following total population, harvest and escapement targets. Fish should weigh about a half pound apiece.

Stream	Harvest + pop.#	Escapement = pop.#	Biological Objective	Type of Objective	Year Accomplished
Parker Creek	0	350	350	interim	2000
	200	500	700	long-term	2008
Long Canyon creek	800	800	1,600	interim	2000
	2,144	1,056	2,300	long-term	2008
Smith Creek	100	500	600	interim	2000
	700	500	1,200	long-term	2008
Boundary Creek	550	550	1,100	interim	2000
	1,474	726	2,200	long-term	2008

Strategies to achieve Kootenai River kokanee salmon biological objectives:

- Restore spawning habitat in Parker, Long Canyon, Smith and Boundary creeks, tributaries to the Kootenai River.
- Explore various strategies including instream incubation of eggs and supplementation to enhance survival.

Biological objectives for largemouth bass, bull trout and cutthroat trout in the Box Canyon Reservoir and tributary streams:

These biological objectives are for the entire system. Specific interim and final targets for each tributary will be established upon completion of detailed habitat and fish population assessments that are currently under way.

- Increase the biomass of harvestable largemouth bass in the Box Canyon Reservoir from current 6 pounds/acre (44,400 pounds for entire reservoir) to an interim target of 8 pounds/acre (59,200 pounds for entire reservoir) by 2003 and final target of 12 pounds/acre (88,800 for entire reservoir) by 2008. The interim net gain will be 14,800 pounds of harvestable largemouth bass. The final net gain will be 44,400 pounds of harvestable largemouth bass.
- Increase 0+ largemouth bass overwinter survival from current levels of 0.4-3.9 percent to approximately 15-20 percent. This increase in overwinter survival will contribute to the goal of 12 pounds/acre of harvestable bass.
- Attain densities (all age classes) of 9.8 bull trout/100 square meters (or 390 fish/linear mile) age class in the upper one third of each major tributary system. This equates to 97,410 bull trout (all age classes) in approximately 250 miles of suitable tributary habitat in the system . Total numbers of adult bull trout recruited to the fishery will be 4,410 fish, composed of an escapement of 2,205 fish and harvest of 2,205 fish, by 2016.

- Interim bull trout targets are established at 48,855 total fish (all age classes), including a total of 2,205 fish recruited to the fishery, composed of an escapement of 1,102 fish and harvest of 1,103 fish, by 2006.
- Attain population of 242,212 adult fish in 500 miles of suitable cutthroat trout habitat in the system, including an escapement of 156,800 fish and harvest of 85,412 fish by 2016.
- Interim cutthroat trout targets are established at 121,106 total adults recruited to the fishery, composed of an escapement of 78,400 fish and harvest of 42,706 fish by 2006.

Strategies to achieve biological objectives for largemouth bass, bull trout and cutthroat trout in Box Canyon Reservoir and tributary streams:

- Operate and maintain low-capital warm water hatchery constructed on the Kalispel Indian Reservation to produce 100,000 largemouth

bass fry and 50,000 fingerlings for release into Box Canyon Reservoir. Stocking will include 50,000 age 0 fry and 50,000 age 1 fingerlings released directly into Box Canyon Reservoir and 50,000 fry to be stocked into and reared to fingerling size in two rearing sloughs located on the Pend Oreille wetlands wildlife mitigation project.

- Construct, operate and maintain water control structures on the Pend Oreille wetlands wildlife project for the purpose of creating bass nursery sloughs.
- Construct, place and maintain artificial cover structures to increase the amount of bass age 0 fry winter cover in the Box Canyon Reach of the Pend Oreille River. The purpose of placing cover is to increase overwinter survival of age 0 largemouth bass.
- Monitor effectiveness of largemouth bass supplementation.
- Complete bull trout and cutthroat trout habitat and population inventories to develop specific biological objectives and conduct advance designs for habitat improvements in each tributary.
- Construct, operate and maintain habitat improvements for bull trout and cutthroat trout in tributary streams.
- Monitor effectiveness of habitat enhancement projects.

Biological objectives for lakes and streams on the Colville Indian Reservation:

Biological objectives for lakes and streams on the Colville Indian Reservation include production of 50,000 pounds of resident fish at the Colville Tribal Hatchery for distribution into reservation waters, including boundary waters, to provide a high quality subsistence/recreational fishery for Colville Tribal members as well as a non-member sport fishery. For the purposes of this program, a high quality fishery on the Colville Reservation is defined as: subsistence/ recreational fisheries that provide at a minimum 1 fish per hour catch-per-unit-effort and average fork lengths of 13.5 inches for rainbow trout (KFL $\geq$ 1.0), 12.0 inches for brook trout (KFL $\geq$ 1.0), and 20.0 inches for Lahontan cutthroat trout (KFL $\geq$ 0.9). Specific annual production targets include:

-- Production of 2,500 pounds of fingerling rainbow trout (200,000 fish).
-- Production of 13,000 pounds of subcatchable rainbow trout (300,000 fish).
-- Production of 15,000 pounds of catchable rainbow trout (81,000 fish).
-- Production of 2,200 pounds of fingerling brook trout (176,000 fish).
-- Production of 13,200 pounds of subcatchable brook trout (300,000 fish).
-- Production of 4,500 pounds of Lahontan cutthroat (90,000 fish).

Additionally, in reservation waters, increase natural production of brook trout by 10 percent and rainbow trout by 15 percent by 2000.

Strategies for achieving biological objectives for lakes and streams on the Colville Indian Reservation:

- Continue Bonneville funding of the operation and maintenance of the Colville Tribal Fish Hatchery to produce 50,000 pounds of resident fish consistent with biological

objectives. Monitor and evaluate success in terms of achieving catch-per-unit-effort and fish growth targets.
- Continue the current on-reservation brood sources for brook and Lahontan cutthroat trout, and develop an on-reservation brood source for rainbow trout.
- Provide rearing conditions that prevent fin abrasion, prevent bacterial and viral diseases and prevent parasitic infestations.
- Initiate a fish marking program to access the contribution of various size fish to the fishery, including both the creel and natural production.
- Improve reservation lake and stream spawning and rearing habitat.
- Monitor and evaluate effectiveness of enhancement measures.

Biological objectives for Moses Lake and Ford Hatchery:

Specific biological objectives have not yet been identified for enhancing the warm water fishery at Moses Lake, pending recommendations of a baseline investigation being performed by the Washington Department of Fish and Wildlife. The biological objective for the Ford Hatchery is production of 35,000 additional pounds of resident trout for planting in northwest Washington lakes and streams.

Strategies for achieving biological objectives at Moses Lake and Ford Hatchery:

- Perform baseline investigations to determine biological objectives and identify fishery enhancement measures. Complete these studies and make recommendations to the Council by December 31, 1998.
- Improve water supply at Ford Hatchery to rear additional 35,000 lb. of resident trout and provide operation and maintenance expenses to rear these fish.

Measures and time frames for Resident Fish Substitution above Chief Joseph and Grand Coulee Dams:

The resident fish substitution projects for above Chief Joseph/Grand Coulee also include the operating criteria for Grand Coulee Dam described in Measures 10.3E.3 to 10.3E.5.

Bonneville

10.8B.1 Fund the following resident fish substitution activities and in the blocked area above Chief Joseph Dam to partially mitigate for salmon and steelhead losses incurred as a result of the construction and operation of Chief Joseph and Grand Coulee dams.

Spokane Tribe

10.8B.2 Operate and maintain kokanee salmon hatcheries at Galbraith Springs and Sherman Creek. Use the Sherman Creek hatchery as an imprinting site and egg collection facility to provide a source of kokanee fry for transferring to Galbraith Springs hatchery for

rearing to the residualized smolt stage before planting into Lake Roosevelt. Coordinate decisions on hatchery production, stocking and outplanting locations through a three-member committee consisting of one representative each appointed by the Confederated Tribes of the Colville Reservation, the Spokane Tribe of Indians and the Washington Department of Fish and Wildlife.

10.8B.3 Add a new production well, capable of producing 2.5 to 3.0 cubic feet per second of additional flow, for the Spokane Tribal Kokanee Hatchery by January 1996. The purpose of this action is to allow for 500,000 kokanee to be reared to residualized smolt size at the Spokane Tribal Hatchery before release into Lake Roosevelt.

10.8B.4 The Council has been presented with evidence that kokanee released as residualized smolts contribute more to the fishery and return to egg collection sites at a higher rate than fish released as fry. In collaboration with the Washington Department of Fish and Wildlife and Colville Tribes, construct and operate 20 net pens for rearing kokanee salmon (25,000 fish/pen) to post-smolt size in Lake Roosevelt. This shall include 16 net pens, dock and anchoring system at Sherman Creek and four net pens at Seven Bays. Bonneville shall conduct an environmental assessment for the project in 1995, with construction in 1996.

10.8B.5 In collaboration with the Colville Confederated Tribes and the Washington Department of Fish and Wildlife, monitor and evaluate the Lake Roosevelt biota to assess the effectiveness of Measures 10.8B.2 to 10.8B.4, 10.8B.9, 10.8B.11 and 10.3E.3 to 10.3E.5 and determine impacts of reservoir operations on achieving the biological objectives addressed by these measures. Specifically, this measure will identify changes in the kokanee, rainbow and walleye fisheries as a result of the above measures and develop biological and integrated rule curves for Lake Roosevelt to define the operations necessary to sustain the resident fish populations. The following tasks will be completed as part of this measure:

- Conduct a year-round reservoirwide creel survey to determine angler use, catch rates and composition, harvest by species, harvest of wild versus hatchery (or net pen) fish growth and condition of fish harvested number of anglers using Lake Roosevelt and the angler's contribution to the local economy. This information will determine if the biological objectives are being met, identify hatchery release strategies that provide the most fish for harvest and indicate changes in the number of harvested fish in relation to lake operations.
- Conduct monthly relative-abundance surveys by electrofishing, hook and line, gill netting, and/or trawling at nine index sites to collect fisheries population information (i.e., fish growth and condition, species composition, number of wild versus hatchery fish, diet habits of kokanee, rainbow and walleye, and prey availability). Tagged and marked fish will be collected to determine the most effective hatchery release strategies and kokanee ability to home back to the release sites during spawning migration. The data collected will

also be used to determine the health of the fisheries.

- Collect zooplankton weekly at 9 sites within Lake Roosevelt and two sites in Rufus Woods. The biomass of each species collected will be determined in order to identify the biomass availability for fish consumption, correlate lake water retention time with zooplankton biomass, determine the potential productivity of zooplankton and determine entrainment rates of zooplankton during different lake operations.
- Model zooplankton population dynamics and reproduction rates to identify the effect of water retention time, water temperature and fish predation on zooplankton's population dynamics. The model will predict biomass of zooplankton during different hydrological lake conditions.
- Monitor reservoir hydrology weekly at 11 sites (i.e., lake elevation, water retention time, water temperature, pH, conductivity, etc.). Biological productivity of the lake will be related to reservoir hydrology in order to develop the biological rule curve.
- Conduct a mark/recapture study of hatchery-reared kokanee and rainbow by tagging 50 percent of hatchery kokanee with coded-wire tags and tag 20 percent of the hatchery rainbow trout reared in net pens with floy tags. Mark all remaining hatchery fish (both kokanee and rainbow) with fin clips. Tagged fish recovered by anglers and relative abundance surveys will be used to determine the release strategies that maximize harvest and adult returns to egg collection facilities while minimizing entrainment.
- Monitor the number of tagged kokanee and rainbow entrained through Grand Coulee Dam by creel surveys in Rufus Woods Reservoir and monitor the number of tagged fish collected at Rock Island Dam fish passage facility. This task will identify the entrainment rate of kokanee and rainbow, which will be related to lake operations in order to identify operations that cause entrainment.
- Drip synthetic chemicals at hatcheries to imprint hatchery-reared kokanee, and drip synthetic chemicals at egg collection facilities to encourage the return of spawning adults. This task will increase the number of kokanee returning to egg collection facilities so that a self-sustaining egg source can be developed.
- Conduct daily creel surveys and weekly electrofishing surveys at egg collection sites from September 1 to October 31 to collect tagged kokanee. The collected tagged fish will indicate kokanee release strategies that maximize the number of adults returning. This information also will be used to determine the ability of kokanee to follow the scent of synthetic chemicals to egg collection sites.
- Map the availability of fish habitat in Lake Roosevelt at different lake elevations. The map will be used to estimate the change in fish habitat availability with changes in lake elevations.
- In collaboration with appropriate states and tribes, compile and analyze data from studies completed by other investigators in Lake Roosevelt. The information gathered from other studies, past and present, will be used to evaluate kokanee and rainbow

release strategies and develop biological rule curves.

- In collaboration with appropriate state and federal agencies, develop a computer simulation model that will predict the best reservoir operations for the resident fish populations in Lake Roosevelt. This model will be used to create the biological rule curve. The development of a biological rule curve will stabilize the ecosystem, facilitating the development of a viable fishery. This rule curve will also balance reservoir conditions needed for resident fish with flows needed for anadromous fish.
- In collaboration with appropriate state and federal agencies, develop an integrated rule curve that will incorporate the biological rule curve with the flood control, power irrigation rule curves, and anadromous fish and wildlife rule curves.
- In collaboration with appropriate state and federal agencies, continue the monitoring and evaluation program at least through the year 2005. A biological rule curve will be presented to the Council in 1998. An integrated rule curve will be presented in 1999. The rule curve will be evaluated through the year 2005.

Colville Tribes

10.8B.6 Operate and maintain the resident trout hatchery on the Colville Indian Reservation. Monitor and evaluate this measure.

10.8B.7 In collaboration with the Spokane Tribe and Washington Department of Fish and Wildlife, evaluate natural production of kokanee above Chief Joseph Dam including Nespelem River, Big Sheep Creek, Alder Creek, Deep Creek, Orapaken Creek, Onion Creek and the San Poil River. The purpose of this measure is to evaluate the status of naturally producing kokanee, determine what measures are necessary to ensure self-sustaining populations and determine the feasibility of using these fish in the ongoing kokanee hatchery program in this area. The evaluation will involve electrophoretic evaluation, egg-fry survival determination, kokanee spawning escapement and kokanee entrainment. This project will be initiated in 1995 and completed by 2000.

10.8B.8 Identify and study the feasibility of alternatives for preventing resident fish from being swept downstream out of Grand Coulee Reservoir. This investigation will assess the number of individuals entrained, by species and life stage, at different seasons and under different operating conditions. It will also establish routes by which fish are entrained under different reservoir elevations and operating conditions. This investigation will be coordinated with the Lake Roosevelt Monitoring Program (Section 10.8B.5). Complete these studies and make recommendations to the Council by December 31, 1997.

10.8B.9 In collaboration with the Spokane Tribe and Washington Department of Fish and Wildlife, operate and maintain pilot projects for improving habitat and passage into and out of Lake Roosevelt tributary streams for rainbow trout. The aim of this measure is to emphasize natural production by: 1) facilitating passage of migratory rainbow trout between Lake Roosevelt and its tributary streams; and 2) improving fry and fingerling rearing habitat in these streams.

10.8B.10 In collaboration with the Spokane Tribe and Washington Department of Fish and Wildlife, monitor and evaluate effectiveness of the pilot projects in Section 10.8B.9 by trapping and marking adult and juvenile fish in tributary streams, estimating fish populations and habitat within the tributaries, and conducting creel surveys on each tributary. Contribution of these fish to the Lake Roosevelt fishery shall be determined by the Lake Roosevelt Monitoring Program (Section 10.8B.5). Pilot projects will be completed in 1995. Monitoring and evaluation will start in 1996 and continue to 2000. At that time, the Council will expect to receive a report that recommends one of the following alternatives: 1) continued operation and maintenance of pilot projects, plus improving habitat in additional tributaries if interim biological objectives of pilot projects are achieved; 2) additional monitoring, in the event the interim biological objectives are not met by 2,000 but there is reason to suspect they may be achieved in the near future; or 3) discontinue project if the interim biological objectives are not met and the reason for failure is understood and not correctable.

Lake Roosevelt Forum

10.8B.11 Implement the rainbow trout net pen rearing program in Lake Roosevelt including: 1) operation and maintenance of 26 existing net pens; and 2) procurement, operation and maintenance of 10 additional net pens. As a condition of Bonneville funding, operation of the net pen rearing program will be coordinated and consistent with the management policies of the Lake Roosevelt Fisheries Management Committee (see Section 10.8B.2), including those addressing stock selection and release strategies. In addition, continue voluntary contributions and private sector funding as a cost-share for the net pen rearing program.

Kalispel Tribe

10.8B.12 Design, construct, operate and maintain a warmwater low-capital bass hatchery on the Kalispel Indian Reservation. Mark all hatchery production. Design will commence in 1995, and construction will be completed by 1996.

10.8B.13 Design, construct, operate and maintain for two years, a yellow perch aquaculture facility on the Kalispel Indian Reservation. Design will commence in 1996, with construction completed by 1998.

10.8B.14 In collaboration with the Washington Department of Fish and Wildlife, conduct studies to determine the status of existing bull trout and cutthroat trout populations in the Pend Oreille River and its tributaries. Studies to be performed shall include: 1) determination of population densities, population abundance of each age class, growth, and feeding habits of bull trout in the Pend Oreille River and its tributaries; 2) radiotelemetry studies will be performed to identify migration patterns and areas that are utilized for spawning; 3) electrofishing, migration trapping and netting, in combination with mark/recapture investigations, will be performed to identify resident and adfluvial stocks that remain in the mainstem Pend Oreille and its tributaries; and 4) non-lethal biopsy samples will be collected to investigate genetic variability among different tributaries. This investigation will occur from 1995 to 1997.

10.8B.15 In collaboration with the Washington Department of Fish and Wildlife, complete advanced designs, and construct, operate and maintain habitat improvement projects to enhance bull trout and cutthroat trout in all tributaries in the Box Canyon Reach of the Pend Oreille River. Designs for three demonstration tributaries, Cee Cee Ah Creek, Skookum Creek and LeClerc Creek, will be completed in 1995, with construction occurring in 1996 and 1997. The remaining tributaries will be prioritized upon completion of Section 10.8B.14. The Washington Department of Fish and Wildlife and Kalispel Tribe will submit recommended habitat improvements, implementation schedules and detailed biological objectives for each tributary to the Council for approval in 1997. The Council will act promptly to consider these recommendations.

10.8B.16 Working with the U.S. Forest Service and Washington Department of Fish and Wildlife, remove exotic brook trout in Cee Cee Ah Creek in 1996.

10.8B.17 Design, construct, operate and maintain water control structures and repair dikes on the Pend Oreille wetlands wildlife mitigation project for the purpose of creating a bass nursery slough. Stock a portion of the bass production from the Kalispel Tribal hatchery (Measure 10.8B.12) into this slough in an attempt to cut hatchery production costs because fry can prey on natural foods. Screen the water control structures to prevent access by reservoir species that prey on bass fry. Design will occur in 1995, with construction and operation commencing in 1996.

10.8B.18 Construct and place artificial cover structures to increase the amount of bass fry winter cover in the Box Canyon Reach of the Pend Oreille River. Design will occur in 1995, with construction and placement of the structures in 1996 and 1997.

10.8B.19 In collaboration with the Washington Department of Fish and Wildlife, conduct a four-year monitoring program to assess effectiveness of bull trout and cutthroat trout habitat improvements in tributary streams and hatchery supplementation of largemouth bass in the Pend Oreille River. Monitoring will start in Cee Cee Ah, Skookum and LeClerc Creeks starting in 1998 (for cutthroat and bull trout) and in the Pend Oreille River in 1997 (for largemouth bass).

Coeur d'Alene Tribe

10.8B.20 Implement habitat restoration and enhancement measures in Lake, Benewah, Evans and Alder Creeks located within the Coeur d'Alene Indian Reservation including: 1) construct, operate and maintain water storage facilities adjacent to streams for water recruitment and to provide juvenile rearing habitat (trout refugia); 2) restore stream riparian zone through plantings, fencing and stream bank stabilization; 3) provide for off-site livestock watering areas; 4) construct lateral/side channels for juvenile rearing habitat and provide overflow or "flood" channels to help relieve peak flow increases; and 5) place large woody debris in channels to increase instream cover.

Also, 1) purchase critical watershed areas (riparian corridors, sensitive wetland and upland areas) for protection of fisheries habitat; 2) conduct an educational/outreach program for private landowners and the general public within the Coeur d'Alene Reservation to develop a "holistic" watershed protection process; 3) develop an interim fishery for tribal and non-tribal members of the reservation through construction, operation and maintenance of trout ponds; 4) design, construct, operate and maintain a trout production facility on the Coeur d'Alene Reservation; and 5) implement a five-year monitoring program to evaluate the effectiveness of the hatchery and habitat improvement projects.

Implementation of the above measures should be according to the following schedule: (i) in 1995, develop master plan and environmental assessment of the program, conduct habitat demonstration projects on Lake and Benewah Creeks and develop an educational outreach program; (ii) in 1996, complete master planning process and environmental assessment of the project, implement habitat improvement projects on Lake and Benewah Creeks, conduct an educational outreach program, advanced designs of hatchery and trout ponds and purchase land for hatchery and trout ponds; (iii) in 1997, construct and operate trout ponds and wells, begin construction of hatchery and well, implement habitat improvement projects on Lake, Benewah and Evans Creeks, continue educational outreach program; (iv) in 1998, continue hatchery and trout pond operation and maintenance, weir trapping of spawners, habitat improvements on Evans and Alder Creeks, and educational outreach program; (v) in 1999, continue habitat improvement projects, as well as operation and maintenance for hatchery, trout ponds, weir trapping of spawners and habitat improvement projects; (vi) from 2000 - 2004, monitor and evaluate restoration projects and (vii) for an indefinite period, continue to operate and monitor hatchery, trout pond and habitat improvement projects.

10.8B.21 Conduct a NEPA analysis, a habitat analysis and a land value appraisal of a 2,100 acre wetland/riparian and associated upland parcel in the Lake Creek drainage and Windy Bay area of Lake Coeur d'Alene in Fiscal Year 1996. This is to be credited for: 1) 250 acres of wildlife habitat losses due to Albeni Falls Dam (Table 11-04 in the Wildlife Section) on Lake Pend Oreille, an aboriginal use area of the Tribe, and 2) as a resident fish substitution for extensive salmon losses due to Grand Coulee Dam. Bonneville is to purchase a land option and transfer title to the Bureau of Indian Affairs to be put into

trust for the Coeur d'Alene Tribe. In Fiscal Year 1997, complete the land purchase and begin habitat enhancement activities, initiating long-term operation and maintenance and monitoring and evaluation.

Kootenai Tribe of Idaho

10.8B.22 Perform a five-year Kootenai River ecosystem status determination and improvement study. The study should include elements that will: 1) provide a comprehensive ecosystem status report; 2) evaluate the biological feasibility of restoring system productivity; 3) identify effects of hydropower operations (Libby Dam) on aquatic biota and fish assemblages; and 4) develop, evaluate, test and analyze solutions to ecosystem problems caused by factors currently limiting system productivity, such as nutrient limitation and hydropower effects.

Washington Department of Fish and Wildlife

10.8B.23 Conduct baseline investigations to identify biological objectives for Moses Lake and determine the most feasible measures for enhancing the Moses Lake fishery to achieve these objectives. Include assessment of the current availability and use of spawning, rearing and cover habitats including hydrological and limnological factors associated with each as well as evaluating the age class structure, species composition and biological interaction occurring within the lake. The Council expects this investigation to start in Fiscal Year 1996 and be completed by December 31, 1998. The Department shall submit biological objectives and recommendations for fishery improvement to the Council for consideration in the next amendment process after that date.

10.8B.24 Improve water supply at Ford Hatchery to rear 35,000 pounds of resident trout and kokanee for stocking into Banks Lake and other northeastern Washington Lakes. Fund operation and maintenance cost for rearing these fish.

Washington Department of Fish and Wildlife and Appropriate Tribes

10.8B.25 Plan, engineer, design, construct, operate and maintain improvements to the Department's Phalon Lake wild rainbow trout trapping facility. These improvements will allow the continuation and possible expansion of the Kettle River wild rainbow stocking program into other upper Columbia River Basin waters.

Bonneville

10.8B.26 Fund a cooperative project among the Confederated Colville Tribes, Kalispel Tribe, Spokane Tribe, and the Washington Department of Fish and Wildlife to assess stock status of resident fish species and associated habitats in the areas above Chief Joseph and Grand Coulee Dams.

(a) Phase I. Assess existing data and develop a database, identify data gaps and develop standardized data collection methodologies.

(b) Phase II. Conduct field sampling to gather the needed data, assess data and identify management, protection and recovery efforts.

(c) Phase III. Implement management, protection, recovery, monitoring and evaluation.

10.8C Resident Fish Substitution Projects Above Hells Canyon Dam

The following resident fish substitution activities and projects in the blocked area above Hells Canyon Dam will partially mitigate for salmon and steelhead losses incurred in this blocked area as a result of the construction and operation of hydropower projects in the Columbia River Basin.

Shoshone-Paiute Tribes

10.8C.1 Annually stock catchable and fingerling trout of the appropriate stocks in Duck Valley Indian Reservation lakes and streams.

10.8C.2 Review Duck Valley Indian Reservation surface water and groundwater suitability for resident fish production facilities. Initiate a comprehensive genetic sampling program of the redband trout in Owyhee Basin. Based on results of these studies, develop and implement strategies to protect wild redband trout populations from potential impacts caused by hatchery programs.

10.8C.3 Evaluate alternative sources of catchable and fingerling resident fish.

10.8C.4 Analyze feasibility of developing an additional lake fishery at Coyote Sink. Submit feasibility study with recommendations to the Council. Implement upon Council approval of recommendations.

10.8C.5 Implement, monitor and evaluate resident fish habitat improvement and protection measures at the Duck Valley Indian Reservation. Include the following habitat protection and improvement measures: 1) management recommendations for reservoir pool levels; 2) reservoir rehabilitation measures for non-game fish and aquatic vegetation control; 3) reservoir inlet and outlet screening; 4) improvement of recreational fishing sites; 5) stream riparian zone restoration by planting vegetation, fencing overgrazed areas and stream bank stabilization; and 6) base-line water quality survey to assess contaminants that may affect trout populations.

10.8C.6 Acquire or construct a trout production facility and operate and maintain the facility for the production of trout for stocking on the Duck Valley Indian Reservation and elsewhere. Assess opportunities for joint production strategies with the Shoshone-Bannock Tribe, including the training of tribal members in fish culture.

Bonneville

10.8C.7 Fund the Shoshone-Paiute Tribe projects listed above.

Bonneville, Bureau of Reclamation, Idaho Power Company, Fish and Wildlife Managers

10.8C.8 In cooperation with other relevant entities as listed in Section 3.1D, develop and implement the subregional process for the area above Hells Canyon Dam. Immediately meet to identify an approach for developing the subregional process, and identify funding responsibilities for developing

the process. The process will identify funding commitments for additional resident fish substitution projects by Bonneville, by Idaho Power Company through hydropower project relicensing activities, by the Bureau of Reclamation through operation and management responsibilities, as well as by other appropriate parties. Additional resident fish substitution projects may include propagation and release of kokanee and coho stocks into Lucky Peak and Cascade reservoirs. Include in this process the development of a comprehensive approach to coordinating anadromous fish, resident fish and wildlife activities. Submit to the Council by December 31, 1994.

10.8D Resident Fish Substitution Projects Above Dworshak Dam

Bonneville

10.8D.1 Fund the following resident fish substitution actions in the blocked area above Dworshak Dam to mitigate partially for salmon and steelhead losses incurred as a result of the construction and operation of hydropower projects in the Columbia River Basin.

Nez Perce Tribe

10.8D.2 Develop, maintain and manage trout ponds within the Nez Perce Indian Reservation including: 1) physically improve, maintain, monitor and stock two existing trout ponds; 2) identify through site inventory and analysis additional sites suitable for fish pond construction; 3) construct six to 12 additional fish ponds, depending on availability of suitable sites; and 4) maintain, monitor and stock the additional fish ponds.

10.8E Resident Fish Substitution Projects Above Pelton Dam

Bonneville and Portland General Electric Company

10.8E.1 Fund resident fish substitution projects above Pelton Dam on an equal-share basis. These projects will partially mitigate for salmon and steelhead losses in this blocked area as a result of the construction and operation of hydropower projects in the Columbia River Basin.

Warm Springs Tribe

10.8E.2 Determine how the crayfish population in Lake Billy Chinook fits into the altered ecosystem. Include specific objectives of determining sex, size composition, growth rate and size at maturity of the crayfish population; size, relative abundance, and seasonal movement of the crayfish population; potential availability as a significant food item, especially for bull trout; and management recommendations.

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