Snake River Sockeye Salmon Sawtooth Valley Project: Conservation & Rebuilding Project

Supplemental Final Environmental Assessment

0934
DOE/EA-1038

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SNAKE RIVER SOCKEYE SALMON SAWTOOTH VALLEY PROJECT CONSERVATION AND REBUILDING PROGRAM

Supplemental Environmental Assessment

**U.S. Department of Energy
Bonneville Power Administration
Environmental Project Manager-ECN-1500
P.O. Box 3621
Portland, Oregon 97208**

March 1995

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DEPARTMENT OF ENERGY

Bonneville Power Administration

Finding of No Significant Impact for
Snake River Sockeye Salmon Sawtooth Valley Project
Conservation and Rebuilding Program

AGENCY: Bonneville Power Administration (BPA), Department of Energy (DOE).

ACTION: Finding of No Significant Impact (FONSI).

SUMMARY: This notice announces BPA's proposal to fund three separate, yet interrelated, actions, which are integral components of the overall Sawtooth Valley Project to conserve and rebuild the Snake River sockeye salmon (*Oncorhynchus nerka*) run in the Sawtooth Valley of south-central Idaho. BPA has prepared an Environmental Assessment (EA) (DOE/EA-1038) evaluating the proposed project. The three actions are: (1) Removing a rough fish barrier dam on Pettit Lake Creek and constructing a weir and trapping facilities to monitor future sockeye salmon adult and smolt migration into and out of Pettit Lake; (2) Artificially fertilizing Redfish Lake to enhance the food supply for Snake River sockeye salmon juveniles released into the lake; and (3) Trapping kokanee fry and adults to monitor the fry population and to reduce the population of kokanee in Redfish Lake.

BPA has prepared a Supplemental EA, (DOE/EA-1038) which builds upon an EA completed in 1994, on the Sawtooth Valley Project. The proposed actions in this Supplemental EA were discussed in the 1994 EA, but decisions on them were deferred pending additional scientific study. These studies have subsequently been completed.

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Based on the analysis in this Supplemental EA, BPA has determined that the proposed actions are not major Federal actions significantly affecting the quality of the human environment, within the meaning of the National Environmental Policy Act (NEPA) of 1969. Therefore, the preparation of an Environmental Impact Statement (EIS) is not required and BPA is issuing this FONSI.

ADDRESS: For copies of this FONSI, please call BPA's toll-free document request line: 1-800-622-4520.

FOR FURTHER INFORMATION, CONTACT: Kelly Kittel, Environmental Project Manager, ECN-1500, Bonneville Power Administration, P.O. Box 3621, Portland, Oregon, 97208-3621, phone number 503-230-4960, fax number 503-230-5699.

Public Availability: This FONSI will be distributed to all persons and agencies known to be interested in or affected by the proposed action or alternatives.

SUPPLEMENTARY INFORMATION: On April 2, 1991, the National Marine Fisheries Service (NMFS) proposed to list the Snake River sockeye salmon as endangered under the Endangered Species Act (ESA) of 1973, as amended. On May 3, 1991, the Idaho Department of Fish and Game (IDFG), in coordination with the Shoshone-Bannock Tribes (SBT) and the University of Idaho, requested BPA funding of an interim emergency effort to save Snake River sockeye salmon.

On May 9, 1991, BPA received approval from the Council on Environmental Quality (CEQ) to proceed with funding the emergency effort under alternative arrangements for NEPA compliance, pursuant to 40 CFR 1506.11, of the CEQ regulations. Documents prepared in support of alternative NEPA compliance

arrangements covered the 1991, trapping and rearing of juvenile Snake River sockeye salmon migrating out of Redfish Lake in the Sawtooth Valley of Idaho and the 1991, trapping, holding, and spawning of adult Snake River sockeye returning to Redfish Lake. On November 20, 1991, Snake River sockeye salmon were listed officially by NMFS as endangered under ESA. The listing took effect on December 20, 1991.

In 1992 and 1993, IDFG and the SBT requested additional funding from BPA to continue with the Snake River sockeye salmon conservation and rebuilding program initiated in 1991. On April 19, 1992, DOE issued a Final EA (DOE/EA-0604) and FONSI for the 1993, Juvenile and Adult Trapping Program. The 1993 program was very similar to the 1991 and 1992 programs. In 1994 BPA was again asked to continue funding the program for 1994 and into the future to conserve and rebuild the Snake River sockeye salmon run. On April 26, 1994, BPA issued a Final EA (DOE/BP-2355) and FONSI on the Snake River Sockeye Salmon Sawtooth Valley Project Conservation and Rebuilding program. The document deferred decisions on three actions, which are described as follows, in the 1995 Supplemental EA.

BPA proposes to fund the proposed measures as part of the Snake River Sockeye Salmon Sawtooth Valley Project Conservation and Rebuilding Program. The three actions are: (1) Removing a rough fish barrier dam on Pettit Lake Creek and constructing a weir and trapping facilities to monitor future sockeye salmon adult and smolt migration into and out of Pettit Lake; (2) Artificially fertilizing Redfish Lake to enhance the food supply for Snake River sockeye salmon juveniles released into the lake; and (3) Trapping kokanee fry and adults to monitor the fry population and to reduce the population of kokanee in Redfish Lake.

BPA has considered only the Proposed Action and No Action alternatives in the Supplemental EA. For further discussion of the need for the Proposed Action, the proposal, a description of potential environmental effects, and the alternatives, please refer to the Supplemental EA.

The proposed action enables entities responsible for management of the Snake River sockeye salmon to continue with conservation efforts for the remaining sockeye salmon in order to begin rebuilding the run in the Sawtooth Valley. If no action were taken, the program would continue without these additional activities. Based on the results of research conducted thus far, it is likely that these actions would decrease potential limiting factors in the life cycle of the sockeye and, consequently, shorten the period to attain self-sustaining populations in the Sawtooth Valley. Without fertilization of the lake and kokanee management of some kind, it is likely that the smolts released into Redfish Lake will have difficulty finding enough food to eat. The removal of the barrier dam on Pettit Lake together with proposed collection facilities will make it possible to reintroduce sockeye salmon to historic parts of their range and avoid exceeding the carrying capacity of Redfish Lake.

Consultation with the NMFS, the U.S. Fish and Wildlife Service (USFWS), and the U.S. Forest Service (Sawtooth National Forest and Sawtooth National Recreation Area) have revealed no controversial or unusual environmental concerns associated with the proposed actions. Assessment of the proposed actions did not reveal any unknown or unique risks or any highly controversial effects. Resources which may have potential effects as addressed in the EA include water quality, biological resources, recreation, aesthetics, critical habitat, and archeological, historical, and cultural resources. These

impacts are expected to be minor and/or temporary and monitoring is required where necessary.

Water quality could be affected by both lake fertilization and the barrier dam removal. Lake fertilization impacts could include phytoplankton "blooms" and algal film growths. A monitoring program will be conducted weekly to ensure that these do not occur. If monitoring indicates unfavorable changes in limnological conditions, fertilization would be stopped until the values fall within prescribed ranges. Barrier dam removal may cause short-term changes in water quality during construction, such as minor increases in turbidity or suspended sediments, both of which will be monitored, and sediment control practices as outlined by Watson (1994) will be utilized.

Biological resources may be impacted by all three proposed actions. Lake fertilization will provide additional food resources for all fish species, including "undesirable" or predatory species. The interactions of fish species in the lake will therefore be closely monitored, and the kokanee control measure implemented, to ensure that there are no adverse effects on juvenile sockeye salmon. Removal of the fish barrier could increase the accessible habitat for sockeye and other species of salmon, as well as for undesirable fish. Increased access by undesirable fish is not likely to be significant because the species historically coexisted in Pettit lake and currently co-exist in Redfish Lake without apparent adverse impact on salmonids. Idaho Department of Fish and Game is committed to monitoring the rainbow trout fishery in Pettit Lake to ensure its coexistence with the undesirable fish. Kokanee control will reduce the kokanee population in just one of four lakes in the Sawtooth Valley with kokanee populations. This will benefit sockeye salmon through reduced competition for food.

Recreational resources should be beneficially impacted by lake fertilization, which should improve all fisheries. The barrier dam removal could impact recreational users, as could the lake fertilization, due to additional vehicular traffic. Construction traffic would increase during daylight hours only for one month. Fertilization would be done by boat or plane once a week up to for four months a year for two years. These impacts would be minor and temporary, thus insignificant.

Some minor visual effects could result from lake fertilization in the form of reduced lake clarity and increased algal growth; both will be monitored and should be temporary. Critical habitat effects should be beneficial in that all three proposed actions are designed to increase favorable habitat conditions for sockeye salmon.

No impacts to cultural resources are anticipated. A ground survey will be conducted as soon as ground conditions permit and activities will be modified accordingly, as needed. The SBT will be implementing the proposed actions and, as such, will be required to comply with Section 106 of the National Historic Preservation Act as well as any other applicable laws and regulations and will obtain all necessary permits and licenses before commencing any activity.

BPA has consulted with the USFWS and NMFS pursuant to Section 7 of the ESA. Informal consultation was initiated with NMFS on November 29, 1994, and a biological assessment was prepared in December 1994, which resulted in a conclusion of "no adverse effect" for all three proposed actions for the reasons cited above and as discussed in the Supplemental EA. The biological assessment was transmitted to NMFS on December 29, 1994, and the Draft EA was also sent for their review and comment.

The Supplemental EA has not identified any significant effect on the quality of the human environment as a result of the proposed actions of the Snake River Sockeye Salmon Conservation and Rebuilding Program. The proposed actions should contribute to the quality of the human environment by helping conserve and begin rebuilding a run of salmon in Idaho that has cultural and historical value to the people of that region and much of the rest of the Pacific Northwest.

DETERMINATION: Based on information in the EA, as summarized here, BPA determines that the proposed action is not a major Federal action significantly affecting the quality of the human environment within the meaning of NEPA, 42 U.S.C. 4321, et seq. Therefore, an EIS is not required and will not be prepared and BPA is issuing this FONSI.

Issued in Portland, Oregon, on March 29, 1995..

Sue L. Hickey

SNAKE RIVER SOCKEYE SALMON SAWTOOTH
VALLEY PROJECT
CONSERVATION AND REBUILDING
PROGRAM

Supplemental Environmental Assessment

March 1995

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1.0 INTRODUCTION

Special Note: *Oncorhynchus nerka* is the scientific name of the salmon species that is the subject of the Snake River Sockeye Salmon Sawtooth Valley Project (Sawtooth Valley Project). This species has two general life history patterns. The anadromous form, referred to herein as the sockeye salmon, normally lives in fresh water when young, migrates downstream to the ocean where it matures, and then returns to fresh water as an adult to spawn and die. The second form, the kokanee, normally remains in fresh water throughout its entire life. Occasionally, progeny from sockeye salmon adults will remain in fresh water throughout their life. These sockeye salmon are called "residual" sockeye and are considered by the National Marine Fisheries Service (NMFS) as part of the endangered Snake River sockeye salmon run. Similarly, a few progeny from kokanee adults may migrate to the ocean and return to fresh water to spawn. Both types of *O. nerka* are visually indistinguishable in their early life. Therefore, throughout this document the term *O. nerka* is used where there is no certainty as to which type is being discussed.

1.1 RELATIONSHIP TO SOURCE DOCUMENT AND NEPA COMPLIANCE

The Bonneville Power Administration (BPA) is responsible for funding measures consistent with the Northwest Power Planning Council's (Council) 1994 Columbia River Basin Fish and Wildlife Program (Program). The Program is designed to add approximately 2.5 million adult anadromous fish (salmon and steelhead) to the annual runs returning to the Columbia River Basin. Northwest states (Oregon, Washington, Idaho, and Montana) and tribes implement, while BPA funds, many of the projects in the Council's Program.

On April 2, 1991, the National Marine Fisheries Service (NMFS) proposed to list the Snake River sockeye salmon (*Oncorhynchus nerka*) as endangered under the Endangered Species Act of 1973 (ESA). On May 3, 1991, the Idaho Department of Fish and Game (IDFG), in coordination with the Shoshone-Bannock Tribes (SBT) requested that

BPA fund an interim emergency effort to save Snake River sockeye salmon. On May 9, 1991, BPA received approval from the Council on Environmental Quality (CEQ) to proceed with funding of the emergency effort under alternative arrangements for compliance with the National Environmental Policy Act (NEPA), pursuant to 40 CFR 1506.11 of the CEQ regulations.

BPA has been exempted from further NEPA review for preparatory research work that has either been completed or is currently underway in the Stanley Basin (Figure 1). This work includes:

- (1) Determination of genetic, morphological and behavioral characteristics of Snake River sockeye salmon and Redfish Lake and Alturas Lake kokanee;
- (2) Determination of Stanley Basin *O. nerka* kokanee capability to become anadromous;

FIGURE 1
Sawtooth Valley Project area.

- (3) Limnological and water quality studies in the Sawtooth Valley nursery lakes;
- (4) Preliminary studies of existing fish barriers at outlets of nursery lakes in Stanley Basin; and
- (5) Determination of *O. nerka* population characteristics and densities in the Stanley Basin.

BPA may categorically exclude from further NEPA review any research, inventory, and information collection activities directly related to the conservation of fish and wildlife resources that involve only negligible animal mortality or habitat destruction, and no introduction of either contaminants or exotic organisms.

Actions taken in 1991, 1992, and 1993 to conserve and begin rebuilding populations of Snake River sockeye salmon were evaluated in separate environmental assessments (EAs) for each program year. In 1994, BPA issued a Final Environmental Assessment on the Snake River Sockeye Salmon Sawtooth Valley Project, Conservation and Rebuilding Program (BPA 1994) and a Finding of No Significant Impact (FONSI) on additional measures to conserve and rebuild the numbers of Snake River sockeye salmon. The actions covered in the EA and FONSI included:

- (1) Trapping, rearing, and spawning *O. nerka* migrating out of Redfish, Alturas, Stanley, and Pettit lakes and trapping emergent *O. nerka* entering Redfish and Alturas lakes;
- (2) Trapping adult sockeye salmon at Lower Granite Dam (or another downstream location) or at the Redfish Lake Creek trap and trapping adult residual sockeye salmon in Redfish Lake to be maintained in captivity and spawned;
- (3) Releasing juvenile sockeye salmon produced from a captive broodstock program into Redfish, Stanley, Pettit, and/or Alturas lakes;
- (4) Continuing limnological studies in all major Sawtooth Valley lakes to evaluate potential

benefits of artificial fertilization to sockeye salmon production; and

- (5) Continuing to research *O. nerka* genetic and physiological relationships, and habitat and ecological requirements.

The 1994 Final EA also discussed proposed structural modifications or removal of rough fish barriers that prevent anadromous fish from migrating from outlets upstream to Stanley and Pettit lakes, and a program of lake fertilization to occur in Redfish Lake in early 1995. However, these actions were not included in the FONSI. BPA deferred making a decision pending additional scientific information to determine the significance of potential environmental effects of these two actions. This information has subsequently been collected by BPA.

This Supplemental EA builds upon the 1994 Final EA and includes analysis of the effects of fish barrier removal and trap construction in the outlet to Pettit Lake, artificial fertilization of Redfish Lake, and a kokanee management program.

1.2 PROPOSED ACTIONS

Three separate, yet interrelated actions, which are integral components of the overall Sawtooth Valley Project, have been proposed. The actions include:

- (1) Removing a rough fish barrier dam on Pettit Lake Creek and constructing trapping facilities to monitor future sockeye salmon adult and smolt migration into and out of Pettit Lake;
- (2) Artificially fertilizing Redfish Lake to enhance the food supply for Snake River sockeye salmon juveniles released into the lake; and
- (3) Trapping kokanee fry and adults to monitor the fry population and to reduce the population of kokanee in Redfish Lake.

1.2.1 REMOVAL OF PETTIT LAKE CREEK BARRIER

The first proposed action is to remove the Pettit Lake Creek barrier and construct an adult/smolt trapping and enumeration facility downstream from the existing barrier location. In addition to Redfish Lake, four other Stanley Basin lakes historically supported runs of Snake River sockeye salmon: Alturas, Pettit, Stanley, and Yellow Belly lakes (Bjornn et al. 1968). In the 1950s and 1960s, Pettit, Stanley, and Yellow Belly lakes were chemically treated to remove non-game fish species such as suckers, squawfish, and sculpins. Migration barriers were installed to prevent these non-game species from moving back into the lakes and re-establishing populations that could compete with or prey on the trout that were stocked in the lakes. The fish barriers are concrete structures approximately 1.2 meters (m) (4 feet [ft]) high that block the entire stream channel and would block passage of adult sockeye salmon if they are reintroduced into the lakes.

There is likely to be a need to reintroduce sockeye salmon into one or more of the Stanley Basin lakes blocked by barrier dams. In order to avoid exceeding the *O. nerka* carrying capacity of Redfish Lake, it may be necessary to outplant

broodstock progeny into Pettit Lake or other nursery lakes as broodstock production increases.

The Snake River Salmon Recovery Team (Bevan et al. 1994) has also recommended that self-sustaining populations of sockeye salmon be established in at least two Snake River Basin lakes as criterion for delisting. The Stanley Basin Sockeye Salmon Technical Oversight Committee (SBSTOC) considers Pettit Lake to be the most feasible choice for a second lake (in addition to Redfish Lake) for outplanting juvenile sockeye salmon from Redfish Lake broodstock. The reasons for this decision include its relatively high productivity, lack of predators, and beach spawning habitat. Another reason is that the kokanee population does not appear to be indigenous (SBSTOC 1994a). If NMFS approves the release of Snake River sockeye salmon in Pettit Lake through a modification of IDFG Permit 795, the barrier dam would be removed. Consequently, adults would migrate unimpeded into the lake, and trapping facilities would monitor juvenile outmigration and adult returns.

1.2.2 ARTIFICIAL LAKE FERTILIZATION

The second proposed action is to artificially fertilize Redfish Lake. Artificial fertilization would be an attempt to restore the nutrient levels to historical levels found in the lake before the number of sockeye salmon started to decline. These nutrients are needed for phytoplankton to grow. Phytoplankton are consumed by zooplankton (see Figure 2), and, in turn, zooplankton serve as the basis of the freshwater diet of juvenile sockeye salmon in Redfish Lake (Teuscher et al. 1994).

Without artificial fertilization of Redfish Lake, there is a risk of a collapse of the zooplankton population following anticipated releases of large numbers of juvenile sockeye salmon into the lake. Without fertilization, these outplanted fish would probably exceed the lake's carrying (rearing) capacity. Exceeding a lake's carrying capacity would probably have significant negative impacts on the zooplankton population, cause poor sockeye salmon growth, and increase pre-smolt

FIGURE 2
Nutrient cycle.

mortalities (Stockner 1987, Koenings and Kyle 1992). Production capacity of Redfish Lake is approximately 2,600 kilograms (kg) (5,732 pounds [lb]) or 260,000 10-gram (g) (0.35-ounce [oz]) smolts. Most of the estimated production capacity is not available to sockeye salmon because it is being used by kokanee production.

Lake fertilization should increase *O. nerka* production capacity of Redfish Lake by an estimated 570 kg (1,256 lb). Without this added production capacity, most of the sockeye salmon produced by the broodstock program would have to be reared in captivity until they reach smolt

size. Sockeye salmon can be reared to smolt stage, but this practice provides less imprinting opportunity and may result in unnatural smolt size and poor feeding and predator avoidance skills. Juvenile releases are preferred for sockeye salmon enhancement projects in British Columbia and are also used frequently by Alaska Department of Fish and Game (FRED 1993).

1.2.3 TRAPPING KOKANEE FRY AND ADULTS

The third proposed action is to trap kokanee fry and adults. Sockeye salmon rearing lakes generally support limited kokanee populations. In British Columbia kokanee represent less than 5 percent of *O. nerka* populations in sockeye salmon lakes. However, the kokanee population in Redfish Lake is relatively high, with the population estimated at $178,834 \pm 31,980$ fish in early September 1994 (SBSTOC 1994b). Most of the estimated production capacity of Redfish Lake is not available to sockeye salmon juveniles because it is being used for kokanee growth. Kokanee production in 1994 was estimated at 2,500 kg (5,512 lb), or 96 percent of Redfish Lake's total *O. nerka* rearing capacity.

A kokanee reduction program is proposed to free forage resources for additional juvenile sockeye salmon. Without kokanee control measures, kokanee would likely maintain high densities and compete with juvenile sockeye salmon. Based on IDFG and SBT modeling, a 60-percent annual reduction in kokanee fry over the next 4 years would make available additional fish production capacity equal to 150,000 sockeye salmon smolts (about 10 g [0.35 oz] each) per year.

The Snake River sockeye salmon conservation and rebuilding actions described in this section are intended as habitat enhancement measures for the outplanted juvenile sockeye salmon. These juveniles are produced by the BPA-funded Snake River sockeye salmon captive broodstock program, implemented by the IDFG and the NMFS Northwest Fisheries Science Center. The captive broodstock program (under NMFS Permit 795 issued to IDFG) produced and released approximately 14,000 juvenile sockeye salmon into

Redfish Lake in 1994. In addition, 100,000 to 150,000 juveniles are expected to be released in 1995, and juvenile releases are anticipated for 1996 and beyond.

1.3 PURPOSE AND NEED FOR ACTION

BPA proposes to fund several actions to help meet the need for a naturally reproducing population of Snake River sockeye salmon in the Sawtooth Valley of sufficient numbers to warrant delisting under the ESA. The purposes of the proposed action are to:

- (1) Conserve genetic diversity of remaining Snake River sockeye salmon; and
- (2) Improve productivity of Redfish Lake to increase production of this listed species.

Historically, thousands of Snake River sockeye salmon returned to the Sawtooth Valley to spawn. Evermann (1896) reported that Sawtooth Valley lakes and streams were "teeming" with sockeye salmon. Bjornn et al. (1968) estimated that 4,360 sockeye salmon returned to Redfish Lake in 1955. These numbers no longer exist. Redfish Lake, located near Stanley, Idaho, is the only lake in the Sawtooth Valley that still supports migratory sockeye salmon. Other Sawtooth Valley lakes (Stanley, Yellow Belly, Alturas, and Pettit) historically supported anadromous sockeye salmon; however, they no longer exist in these lakes (Bjornn et al. 1968). Between 1990 and 1993, a total of only 13 sockeye salmon returned to Redfish Lake. One sockeye salmon, a female, returned to Redfish Lake in 1994 (*Sockeye Scene* 1994).

In 1990, the SBT petitioned NMFS to list Snake River sockeye salmon as endangered. On November 20, 1991, NMFS declared the Snake River sockeye salmon "endangered" (effective December 20, 1991) under the ESA.

In 1991, with funding provided by the BPA, the SBT along with IDFG initiated the Sawtooth Valley Project. The Sawtooth Valley Project is

intended to conserve and rebuild populations of Snake River sockeye salmon. The SBT, in cooperation with the IDFG, are directing fish community and limnological studies. IDFG is managing the broodstock enhancement program, and the University of Idaho and NMFS have conducted genetic analyses.

On December 28, 1993, NMFS designated "critical habitat" for the Snake River sockeye, spring and summer chinook (*O. tshawytscha*), and fall chinook salmon under the ESA, as amended (58 CFR 68543).

If no action were taken, the Snake River sockeye salmon would likely become extinct. Therefore, the program, initiated in spring 1991 to conserve and begin rebuilding populations of sockeye salmon in the Sawtooth Valley, should continue to ensure the survival and delisting of this species in the Snake River.

The proposed Sawtooth Valley Project would assist BPA in meeting its obligations under the ESA and Public Law 96-501; the Northwest Power Act, to protect, mitigate, and enhance fish and wildlife resources affected by the development and operation of Federal hydroelectric projects on the Columbia River and its tributaries specifically, the Sawtooth Valley Project Improvements Measure of the Columbia River Basin Fish and Wildlife Program (NPPC 1994).

1.4 RELATIONSHIP TO OTHER ACTIVITIES

The long-term success of the proposed conservation and rebuilding program may ultimately depend on activities outside of the Sawtooth Valley. Snake River sockeye salmon (and other anadromous species) are affected by downstream and upstream passage around dams in the lower Snake and Columbia rivers, harvest in the Columbia River, irrigation water withdrawals, and various land use activities within the watersheds of the Snake and Columbia rivers. These effects, while potentially significant to the goals of the Sawtooth Valley Project, are outside the scope of

this Supplemental EA and, therefore, are not addressed herein. They are being addressed, however, in other documents or forums as follows:

- *Columbia River System Operation Review Environmental Impact Statement (EIS)*. The purpose of this EIS is to establish a set of guidelines for operating the Columbia River System that takes into account impacts on all river users. The study area includes the entire Columbia River Basin, including areas in Canada. Lead agencies include BPA, U.S. Army Corps of Engineers (Corps), and U.S. Bureau of Reclamation (BOR).
- *Interim Columbia and Snake River Flow Improvement Measures for Salmon—Final Supplemental EIS*. The purpose of this Supplemental EIS is to develop actions to improve migration survival of juvenile and adult salmon and steelhead during 1993 through 1995. The study area includes the lower Snake and Columbia rivers. The lead agency is the Corps and cooperating agencies include BPA and BOR.

- *Columbia River Basin Fish and Wildlife Program*. The purpose of this program is to develop and implement near-term and long-term measures to rebuild salmon and steelhead runs in the Columbia River System. The study area includes the entire Columbia River System. The lead organization is the Council.

NMFS has established the Snake River Salmon Recovery Team to develop final recommendations for a Snake River sockeye salmon recovery plan. These recommendations (Bevan et al. 1994) include actions proposed in this Supplemental EA. NMFS will consider the Recovery Team's recommendations and develop a draft Recovery Plan. If the NMFS Recovery Plan is published after this Supplemental EA is released and includes actions within the Sawtooth Valley not identified in this document, BPA may have to prepare a supplemental environmental review of those actions, pursuant to NEPA. The NMFS Recovery Plan might not include some of the actions proposed in this Supplemental EA.

2.0 BACKGROUND

2.1 SAWTOOTH VALLEY PROJECT AREA

Sawtooth Valley lakes and streams, located in south-central Idaho, form the headwaters of the Salmon River, a major tributary to the Snake River (Figure 1). Located entirely within the Sawtooth National Recreation Area (SNRA), most of the land in the valley is higher than 1,970 m (6,463 ft) above sea level. The SNRA encompasses some 350,000 hectares (ha) (864,868 acres [ac]) and is heavily used in the summer for fishing, boating, hiking, picnicking, camping, and livestock grazing. In the winter, the area is used for cross-country skiing, snowmobiling, and other outdoor activities. The SNRA contains five major road-accessible lakes (Alturas, Pettit, Yellow Belly, Redfish, and Stanley) and numerous other lakes and streams. The SNRA is managed by the U.S. Forest Service.

The watershed of the major lakes lie mostly within the Sawtooth Wilderness Area, and drain the east side of the granite Sawtooth and Smoky mountains. The U-shaped lake basins were once heavily glaciated, leaving large moraines behind which the lakes are impounded (Killsgaard et al. 1970, Alt and Hyndman 1989).

2.2 RESULTS OF PREVIOUS INVESTIGATIONS

Final results from the Utah State University's 1994 limnocoaral experiment showed that whole-lake fertilization would be helpful in conserving and rebuilding the sockeye salmon population. The experiment performed in summer 1994 included nine limnocoarals in Redfish Lake. Six of these were controls and three contained a nutrient addition. The limnocoarals were held in the lake for about 5 weeks, until a significant zooplankton response was noticed. Redfish Lake juvenile kokanee were then added to the three nutrient-enriched enclosures and three of the controls. Three of the controls were left empty, to determine the effects of enclosure on the phytoplankton/zooplankton population.

In the nutrient-enriched limnocoarals, the chlorophyll *a* levels increased markedly through July, then dropped sharply in August because the zooplankton population increased dramatically, and began to decrease the numbers of phytoplankton. By early August, chlorophyll *a* in the treated limnocoaral diminished to a level about twice that in the control limnocoarals. The nutrient-treated limnocoarals showed significant increases in both phytoplankton and zooplankton over the previous year's study.

Fish growth in both the control and nutrient-enriched limnocoarals was also studied in the 1994 experiment. Fish in the nutrient-enriched limnocoarals grew faster (by 12 percent) over the 31 days the experiment was conducted. This compares well with the model predictions, which indicated that doubling the zooplankton density translates into 12-percent faster growth. To demonstrate the relationship between sockeye salmon consumption, weight, and survival, four different scenarios were tested, assuming an ambient kokanee population of 200,000 12-g (.42-oz) fish. These scenarios follow:

- Scenario 1—Baseline, or ambient (control) mode
- Scenario 2—A whole-lake fertilization that would boost soluble reactive phosphorous in the lake by 50 percent
- Scenario 3—A 50-percent reduction in the lake's kokanee population
- Scenario 4—A fertilization and reduced kokanee population

The model assumed that the outplanted sockeye salmon would be introduced to the lake weighing 1 g (.04 oz) on June 1. The simulation model was used to determine the average weight of the salmon by October 1. The model predicted that Scenario 4 would produce the largest fish, about 4.5 g (.16 oz) assuming an outplant group size of

100,000 fish and 2.5 g (.09 oz) assuming 300,000 outplants. Scenario 2 produced the next-largest fish, about 4 g (.14 oz) for 100,000 outplants and about 2 g (.07 oz) for 300,000 outplants. Scenario 3 yielded a fish weighing over 3 g (.11 oz) at 100,000 outplants and a fish weighing 1.5 g (.05 oz) at 300,000 outplants. Scenario 1, the Baseline, produced a 2.5-g (.09-oz) fish at 100,000 outplants and a 1.5-g (.05-oz) fish at 300,000 outplants.

This model suggests that a program of lake fertilization and a reduced kokanee population would give the best results, and that a whole-lake fertilization would be helpful under almost any sockeye salmon densities. It also suggests that if the lake were fertilized 200,000 1-g (.04 oz) fingerlings could be stocked and that natural growth at its current levels could be maintained.

2.3 TECHNICAL PLANNING

In June 1991, BPA formed a Technical Oversight Committee (TOC) to review the Snake River sockeye salmon conservation and rebuilding efforts and provide technical recommendations. This committee has met monthly since June 1991. Many of the agencies or groups represented on the TOC are also involved in conducting various conservation and rebuilding activities within the Sawtooth Valley Project. Their roles are as follows:

- BPA—Fund and oversee implementation of the Sawtooth Valley Project.
- IDFG—Conduct and evaluate recovery measures including trapping, spawning, and rearing

sockeye salmon from Sawtooth Valley lakes; trap and spawn adult sockeye salmon returning to Redfish Lake; and conduct research on methods to distinguish kokanee from sockeye salmon.

- SBT—Conduct limnological studies of Sawtooth Valley lakes; evaluate and recommend strategies for lake fertilization; evaluate and recommend strategies for fish barrier modification; and evaluate and recommend strategies for release of juvenile sockeye salmon back into Sawtooth Valley lakes. Conduct *O. nerka* habitat investigations (e.g., conditions of existing spawning beaches in Redfish Lake).
- NMFS—Provide regulatory oversight of the ESA as applied to Snake River sockeye salmon; conduct genetic research on the relationship of sockeye salmon to kokanee and rear *O. nerka* (in addition to rearing efforts by the IDFG).
- University of Idaho (in association with Washington State University)—Conduct genetic research on the relationship of sockeye salmon to kokanee (in cooperation with NMFS and IDFG).
- U.S. Forest Service—Provide technical review and coordination on Sawtooth Valley Project proposals affecting the SNRA.
- Idaho Division of Environmental Quality (DEQ)—Provide technical review and coordination on Sawtooth Valley Project proposals that may affect water quality.

3.0 ALTERNATIVES INCLUDING PROPOSED ACTION

3.1 PROPOSED ACTION

3.1.1 PETTIT LAKE BARRIER REMOVAL

The proposed action is to remove the Pettit Lake Creek barrier and to construct an adult/smolt trapping and enumeration facility downstream from the barrier location. Construction would begin in September 1995 and continue through October 1995. Detailed drawings of the proposed action, together with hydrologic information, are provided in the feasibility report prepared for the SBT by Montgomery Watson (1994).

The only part of the barrier structure that would need to be removed is the vertical wall that forms the weir and the angled supports. The slab and wingwalls would remain in place, resulting in less disturbance to the stream bed and water quality. The remaining slab or apron would help protect the stream bed from erosion. Removing the Pettit Lake Creek barrier would lower the stream for approximately 27 m (90 ft) upstream of the structure and could eliminate jurisdictional wetlands occurring along the stream's south bank. Low riprap rock weirs would be constructed across the stream channel to raise the water surface approximately 30 cm (1 ft) every 4.5 to 9 m (15 to 30 ft) (Figure 3). These riprap weirs would maintain the water level for the wetlands and provide stream bed stabilization protection for the existing U.S. Forest Service bridge over Pettit Lake Creek upstream of the existing barrier site.

Barrier removal should not affect the stream channel hydraulics or stability downstream of the barrier structure site. Sediment deposited in the pool upstream of the barrier ranges from approximately 1 to 2 inches (2.5 to 5.1 cm) (Montgomery Watson 1994). This sediment consists primarily of organic materials including diatoms and decomposed plants. Larger material consisting of rocks and gravel appears to have been used as backfill upstream of the barrier during earlier

construction. The barrier crest has backed water upstream in the channel approximately 91 m (300 ft) for more than 30 years. The resulting pool has very slow water velocity and does not allow transport of sediment to the barrier. Pettit Lake is situated less than 244 m (800 ft) upstream of the barrier and acts as a sediment trap, except for organic materials. The organic sediments deposited upstream of the barrier are easily mobilized and settle fairly quickly. Stored organic sediments could be suctioned off of the bottom of the pool and pumped out to an off-channel temporary settling pond. The settling pond could be allowed to evaporate, and the sediments would be buried in a trench or disposed of in another off-site location. The temporary settling pond would be reclaimed to its pre-disturbance condition.

Removal of the Pettit Lake Creek barrier structure would require construction of a new facility for adult collection and enumeration. Existing roads would be used to access the site during construction. The site would have enough parking area to accommodate any vehicles or construction equipment. During peak construction, a 5-person crew would be at the site. Support vehicles would include a fuel truck for servicing project equipment, a water truck for spraying roads to minimize construction-related dust, an excavator for moving materials at the site, a grader to maintain any roads disturbed by construction, and trucks to deliver concrete. Any construction materials that are not part of the structure (e.g., wood, surplus rebar, or other materials) would either be removed to an approved disposal site or used by the contractor at other sites.

The adult fish trap would be located approximately 27 m (90 ft) downstream of the existing Pettit Lake Creek barrier. Adult sockeye salmon would be collected using a picket fence trap on a concrete slab (Figure 4). The picket fence barrier would be constructed using panels and would be installed each summer in the stream prior to the

FIGURE 3

Pettit Lake Creek barrier adult collection and smolt enumeration (source: Montgomery Watson 1994).

FIGURE 4

Adult sockeye salmon trap (schematic representation).

arrival of migrating adult sockeye salmon. A 2.4-m-wide (8-ft-wide) slab would be installed diagonally across the stream, with short columns located at appropriate spacing.

The picket fence barrier is angled across the stream to direct adult sockeye salmon to the trap (Figure 5). Stoplogs would be placed in the downstream end of the trap to prevent adult sockeye salmon from swimming up into the smolt trap area. The adult trap and holding pen, located at the upstream end of the picket fence barrier, would be 1.2 m (4 ft) wide. Adult sockeye salmon entering the holding pen would pass through a "V"-trap and hold in the pen until they are counted and released upstream of the picket fence barrier. A low flow channel would be constructed on the trap side of the channel for approximately 60 m (200 ft) to concentrate low stream flows. The picket barrier panels would be removed following the end of the adult migration period. The short columns would be removable, so debris build-up across the concrete slab area could be removed.

The smolt trap would use the same basic structure as the adult sockeye salmon trap. It would be located approximately 27 m (90 ft) downstream of the existing Pettit Lake Creek barrier. Rather than a picket fence (Figure 5), vertical plate screens would be installed across the concrete slab each spring prior to the smolt outmigration period.

The entire flow of Pettit Lake Creek would pass through the screens, which would collect and enumerate the smolts. Screens would be placed in slots in the removable columns. The screens would be angled across the stream to direct smolts to the trap on the downstream side of the concrete slab. Stoplogs would be placed across the exit of the adult trap portion of the structure. Wood planks would be placed on top of the bracing to allow a walkway for cleaning the screens. The screens would require continuous cleaning and maintenance by hand methods during operation. The smolt trap and live box, located at the downstream end of the screens, would be 1.2 m (4 ft) wide.

Sockeye salmon smolts would enter the trap area through a "V"-trap and would be held in the live box until they are enumerated and released to continue their downstream migration. The plate screens would be removed following the end of the smolt outmigration period. The screen area has been calculated using the estimated peak spring runoff flow of 1.47 m³/sec (52 cfs) and applying a safety factor of 1.4 to yield a design flow of 2.07 m³/sec (73 cfs).

Temporary camp facilities would be required at the site for personnel operating the fish passage and collection and enumeration structures. The camp facilities would be occupied during the spring runoff because the structures require continuous monitoring during the nights when smolts are outmigrating and because the screens must be cleaned manually (Montgomery Watson 1994). The camp would also be occupied in the late summer and early fall to monitor the adult trap and to prevent vandalism to the structures. The camp may also need to be in place beyond periods of normal public access (e.g., after the peak summer season) to provide shelter for persons working on endangered species activities.

The temporary camp facilities would include a wooden platform with a portable tent set up over the platform. The platform would cover 170 square feet. The shelter would provide an area for sleeping, cooking, eating, and work areas for two people. The platform and fish passage equipment would be transported to the sites by pickup trucks in October before snow accumulates and would be marked for location during the spring.

Water used for drinking and cooking would be transported into the temporary camp facilities. Sanitary facilities would include an approved dry pit that would be constructed at least 300 feet from the stream. Accumulated wastes would be pumped out and removed from the site by a septic tank truck. Power at the site would be provided by portable generators.

FIGURE 5

Sawtooth Valley nursery lakes schematic picket fence on concrete slab (source: Montgomery Watson 1994).

3.1.2 LAKE FERTILIZATION

Two application techniques, fixed wing aircraft (or alternatively helicopter) and boat application, are being considered for lake fertilization. The volume of Redfish Lake is about 261 million cubic meters (689.6×10^8 gallons). Approximately 248 kg (547 lb) of a phosphorus:nitrogen mixture and 344.7 kg (760 lb) of nitrogen (a pharmaceutical-grade commercial fertilizer) would be applied weekly to the lake. This epilimnetic addition of nutrients would stimulate phytoplankton and zooplankton production in areas the juvenile sockeye salmon would likely inhabit.

Beginning in early June and extending through the ice-free season (late November), small weekly additions of the fertilizer would be made. Ammonium nitrate would be added to the 5-percent phosphorus and 20-percent nitrogen fertilizer in order to keep the nitrogen:phosphorus ratio at 30:1. This ratio would provide the phytoplankton populations with an excess of nitrogen so that the chances of creating nitrogen limitation of phytoplankton would be reduced as well as reducing the growth of blue-green algae which fix atmospheric nitrogen. Approximately 6.3 metric tons (6.9 tons [t]) of the nitrogen:phosphorus mixture and 1,366 metric tons (1,506 t) of the nitrogen fertilizer would be used during the year.

The limnological condition of Redfish Lake would be monitored weekly. The parameters that would be measured include total and dissolved nitrogen and phosphorus, Secchi disk transparency, chlorophyll *a* concentration, and phytoplankton and zooplankton densities. The samples would be collected in epilimnetic (near surface), metalimnetic (middle depth), and hypolimnetic (deep water) regions of the lake. If limnological parameters exceed set standards, fertilization would be stopped until the values fall within prescribed ranges. Redfish Lake Creek would be monitored for total and dissolved nitrogen and phosphorous biweekly during the initial phase of fertilization. If conditions warrant, monitoring would continue until it can be ascertained that there is no effect on water quality.

Total increases in chlorophyll *a* concentrations by 60 percent in the epilimnion are anticipated for this fertilization program. Increases of 50 percent in total zooplankton production are anticipated. A 25-percent reduction in summer water transparency as a result of increased algae density may also occur. However, even with lake fertilization, an anticipated mid-summer transparency should average 10 m (33 ft), a value associated with lakes of high water quality and similar to natural levels (with no fertilization) observed during the spring season in Redfish Lake.

3.1.3 REDFISH LAKE KOKANEE FRY/ADULT TRAPPING

Snake River sockeye salmon are considered an Evolutionarily Significant Unit (ESU). This means that they are considered distinct, and hence a "species," for purposes of conservation under the ESA. Fishhook Creek kokanee are not part of the Snake River sockeye salmon ESU and therefore are not listed under ESA.

The proposed action is to limit the number of Fishhook Creek kokanee entering Redfish Lake to 50,000 each year. That level of fry recruitment would result in about 3,000 adult kokanee spawners and also allow for substantial sockeye salmon supplementation. The mean fry recruitment for 1993 and 1994 was about 150,000. At those recruitment levels, the fry population would have to be reduced by about 60 percent. However, the reduction effort will be adjusted to reflect natural variation in fry recruitment and never drop below the 50,000 goal.

The kokanee management program is proposed to continue for 4 years, or one complete *O. nerka* life cycle. Kokanee fry trapping for monitoring purposes would continue for a longer period in conjunction with the overall monitoring program for the sockeye salmon conservation and rebuilding effort.

Fry trapping would begin April 1 and continue through July 10 each year. Drift net traps (Figure 6) would be used to capture kokanee fry. The drift nets would be located under Fishhook

FIGURE 6
Schematic drift net kokanee fry trap.

Creek Bridge. Past experience indicates that approximately six traps would be needed to meet the 60-percent reduction goal. Sufficient kokanee fry would be removed to meet the 60-percent reduction. Any kokanee fry not needed to meet the reduction goal as well as any incidentally trapped spring/summer chinook, bull trout (*Salvelinus confluentus*), and other non-target species would be released unharmed into Fishhook Creek.

The success of the fry or adult escapement control would be evaluated using trawl and hydroacoustic methods in Redfish Lake. If fry populations in Redfish Lake are higher than expected, control of kokanee spawning densities may be implemented.

If necessary, adult kokanee spawning would be controlled by setting a net weir at the mouth of Fishhook Creek to block upstream migration. Escapement would be reduced accordingly to meet the 60-percent reduction goal. Each female carries approximately 300 eggs. Mean egg-to-fry survival for Fishhook Creek is about 10 percent (Teuscher et al. 1994). These factors would be considered when determining escapement goals.

The weir would be operated during August and September. This period overlaps the peak spawn-

ing period for upper Salmon River spring chinook (Kiefer and Lockhart 1993). Any adult chinook salmon migrating to Fishhook Creek would be observed at the Redfish Lake Creek sockeye salmon adult trap, which the IDFG operates from mid-July through mid-October. If an adult chinook is observed at the Redfish Creek trap and passed upstream, the SBT would immediately remove the kokanee weir net and not resume kokanee trapping until the adult chinook was observed in Fishhook Creek above the kokanee weir site.

3.2 No ACTION ALTERNATIVE

If no action were taken, Snake River sockeye salmon might become extinct. Therefore, the proposed actions discussed in this Supplemental EA, together with other ongoing programs comprising the overall Sawtooth Valley Project, are needed to conserve and begin rebuilding the Snake River sockeye salmon run.

However, implementation of the action alternative, together with the overall Sawtooth Valley Project, would probably not result in the delisting of Snake River sockeye salmon. NMFS, in its decision to list the Snake River sockeye salmon as endangered under the ESA, identified several

factors including hydropower development, water withdrawal and diversions, water storage, harvest, predation, and inadequate regulatory mechanisms as contributing to the decline of sockeye salmon. Recovery of the Snake River sockeye salmon likely requires that all of these factors be ad-

ressed. Thus, the Sawtooth Valley Project is intended to help begin rebuilding the Snake River sockeye salmon population while other efforts to address these factors continue.

4.0 AFFECTED ENVIRONMENT

The alternatives proposed in Section 3.0 might affect the existing environment. This section discusses the baseline information against which potential effects from the Sawtooth Valley Project can be evaluated, including physical, biological, recreational, archeological, historical and cultural environments.

4.1 WATER RESOURCES

The Sawtooth Valley is a major sub-basin of the Salmon Basin (one of six major drainage basins in Idaho). The Sawtooth Valley is located within the SNRA, with headwaters in the Sawtooth Wilderness. The primary surface waters are defined as pristine subalpine and alpine lakes with interconnecting streams and creeks. The state of Idaho designated uses for waters within this basin include domestic and agricultural water supply, cold-water biota and salmonid spawning, recreation (i.e., fishing, boating, etc.), and special resource water (which generally implies a high quality water of unique ecological, aesthetic, or recreational value requiring special protection).

All five major Sawtooth Valley lakes are relatively deep (Table 1) and thermally stratify during certain times of the year (surface water does not mix with bottom water) (Luecke and Wurtsbaugh 1993). Utah State University is conducting ongoing limnological studies for the SBT to assess the period and frequency of stratification and subsequent turnover (vertical mixing).

Maximum Secchi disk readings (measurements of water clarity) of approximately 10 m (33 ft) in the shallower lakes and approximately 14 m (46 ft) in the deeper lakes indicate they can be very clear, with little suspended particulate matter. During the early summer, when productivity is generally highest, Secchi disk readings are less (i.e., Redfish Lake Secchi disk readings have been recorded at 7 m (23 ft) in June).

Water quality data for the five major lakes and their outlet streams in the Sawtooth Valley are limited. Information presented in Table 2 is taken

from data collected in the sampling program conducted May through October 1993 by SBT and Utah State University.

All of the lakes, except Redfish Lake, have relatively low dissolved oxygen concentrations (less than 4 milligrams per liter [mg/l]) in their deeper waters. Much of the volume of Pettit and Stanley lakes is nearly void of dissolved oxygen (anoxic) (Luecke and Wurtsbaugh 1993). The oxygen depletion, conductivity profiles, and water temperatures indicate that these four lakes probably do not have frequent and complete turnover. Their deeper waters are poor salmonid habitat because good salmonid habitat conditions require at least 5 mg/l dissolved oxygen.

Chlorophyll *a* levels appear to be low in all five lakes, indicating low levels of primary productivity. Thus, the food supply for higher trophic organisms (such as fish) might be limited by a lack of nutrients.

Data are not available on silica, another nutrient important to lake productivity. Depending on existing conditions, silica could also be a nutrient that is deficient in the lakes, potentially limiting phytoplankton and zooplankton production.

Limited information is available for other physical/chemical water quality parameters including pH (acidity), conductivity, hardness, carbonates, organic carbon, biochemical oxygen demand (BOD), turbidity, trace metals, and trace organics. Given the pristine environment these parameters are expected to have water quality values similar to other pristine (unpolluted) alpine or subalpine surface waters.

Physical characteristics of two other well known Pacific Northwest lakes (Crater Lake and Lake Washington) also are presented in Table 1. These values are provided only for comparative purposes because there is likely to be variability between these lakes based on where and when samples were collected. Crater Lake, located in southern

TABLE 1

Characteristics of Sawtooth Valley lakes (with comparison to Crater Lake, Oregon, and Lake Washington, Washington).

Lake	Secchi Reading		Surface Area		Maximum Depth	
	m	(ft)	hectares	(acres)	m	(ft)
Stanley ¹	7	(23)	81	(200)	26	(85)
Redfish ¹	12	(39)	615	(1,519)	91	(299)
Alturas ¹	10	(33)	338	(835)	53	(174)
Yellow Belly ¹	9	(30)	81	(200)	26	(85)
Pettit ¹	13	(43)	162	(400)	52	(171)
Crater Lake ⁴	20-40	(66-131)	5,317	(13,133)	589	(1,932)
Lake Washington ⁵	6.4	(21)	8,739	(21,585)	77	(253)

Sources: 1 Teuscher et al. (1994)
2 Bowles and Cochnauer (1984)
3 Utah State Data
4 Johnson et al. (1985)
5 EPA (1990)

Oregon, is known for its extremely clear and pure water that originates from rain and snow. Secchi disk readings in this lake are almost two to three times greater than Sawtooth Valley lakes. Lake Washington, adjacent to Seattle, Washington, has maximum Secchi disk readings to about 6.4 m (21 ft). This lake has significant runs of sockeye salmon that in 1986 exceeded 500,000 fish. Similarly, nutrient concentrations for Crater Lake and Lake Washington are presented in Table 2 for comparative purposes.

4.2 BIOLOGICAL RESOURCES

4.2.1 FISH

Trout and salmon contribute to recreational fisheries within the Snake River basin and recreational and commercial fisheries downstream in the Columbia River. Native resident species

include rainbow trout (*O. mykiss*), cutthroat trout (*O. clarki*), bull trout, and kokanee salmon. Non-native species include brook trout (*S. fontinalis*) and lake trout (*S. namaycush*). Kokanee live in Redfish, Alturas, Pettit, and Stanley lakes. Bull trout, squawfish, and suckers are found in Redfish and Alturas lakes. Alturas Lake also includes whitefish at lower frequencies. In Pettit Lake, redbside shiners are well represented. Lake trout are found only in Stanley Lake. All lakes in the Sawtooth Valley, except Yellow Belly Lake, are typically stocked with hatchery-reared, put-and-take rainbow trout. However, none were stocked in Redfish Lake beginning in 1993. Rainbow trout are also the major resident trout species found downstream of the lakes. Yellow Belly Lake was chemically treated in 1990 to reduce brook trout populations. It was then stocked with westslope cutthroat trout.

TABLE 2

Mean nutrient concentrations measured in epilimnetic water samples from five Sawtooth Valley lakes, May through October 1993 (with comparison to Crater Lake, Oregon, and Lake Washington, Washington).

Nutrient	-----Lake-----						
	Redfish ¹	Alturas ¹	Pettit ¹	Yellow Belly ¹	Stanley ¹	Crater Lake ²	Lake Washington ³
Nitrate-N (µg/l)	2.4	3.0	2.1	5.0	4.7	<1-2	58
Ammonia-N (µg/l)	3.2	2.6	3.0	12.5	11.6	N.D.	58
Total nitrogen (µg/l)	65	95	76	79	94	17	201
Soluble reactive phosphorus (µg/l)	1.0	1.2	2.2	1.7	1.2	—	9
Total phosphorus (µg/l)	6.8	8.6	6.5	4.3	7.9	10-15	19
Nitrogen:phosphorus ratio	9.7	11.0	11.7	18.4	11.9	<1	15
Chlorophyll a (µg/l)	0.61	0.76	0.54	0.63	1.05	0.385	3
Sources: 1 Wurtsbaugh et al. (1993)							
2 Johnson et al. (1985)							
3 EPA (1990)							

Listed anadromous species found in Sawtooth Valley streams and mainstem Salmon River include sockeye salmon and spring/summer chinook salmon. Snake River sockeye salmon, the primary subject of this Supplemental EA, were listed as endangered on December 20, 1991.

Snake River spring/summer chinook salmon were listed by NMFS on April 17, 1992 as threatened. On August 18, 1994, this status was later changed to endangered through emergency action. However, NMFS plans (59 FR 66784) to determine whether to make this final prior to expiration of the emergency action on April 15, 1995.

Spring chinook salmon in the Snake River typically spawn earlier and higher in the watershed than summer chinook salmon. However, because the two races overlap somewhat during migration and might occupy the same region of a river

during the spawning period, interbreeding between these races cannot be ruled out. For this reason, they could not be classified under the ESA as two separate races (Matthews and Waples 1991).

Total annual chinook salmon production from the Snake River Basin before 1850 has been conservatively estimated at 1.4 million. This estimate was based on habitat available to the fish. However, other estimating methods suggest that the runs could have been twice this size. By the mid-1900s, historical abundance of spring and summer chinook salmon from the Snake River had been reduced by 95 percent. In the last 30 to 40 years, abundance has decreased another 10-fold; current populations of non-hatchery or native fish are only 0.5 percent of historical levels (Matthews and Waples 1991). Snake River native spring/

summer chinook salmon spawning declined from 13,000 redds (spawning nests) in 1957 to 620 redds in 1980. The number of redds peaked at 3,395 in 1988. But, in 1989, only 1,008 redds were counted, and in 1990, 1,224 redds were observed (Matthew and Waples 1991).

Most adult Snake River spring/summer chinook salmon migrate above Lower Granite Dam to spawn in small, high-elevation streams (Matthews and Waples 1991). These stocks spawn in two major spawning and rearing basins (Clearwater and Salmon), and three smaller basins (Tucannon, Grand Ronde, and Imnaha).

The primary spawning and rearing areas of spring/summer chinook salmon in the Sawtooth Valley are below all of the lake outlets. A few spring/summer chinook salmon have spawned in Redfish Lake Creek. Although spring/summer chinook salmon can travel through Redfish Lake to spawn in the tributaries, few apparently do. Spawning surveys of Fishhook Creek for kokanee noted only three spring/summer chinook salmon in 1992. The other major tributary at the head of the lake has very limited spawning area. From 1991 to 1993, a few spring/summer chinook salmon outmigrants were collected in the sockeye salmon trap and released below the trap. This indicates that few spring/summer chinook salmon use this region of the creek for spawning and rearing.

From 1985 through 1991, about 550 to 1,800 adult chinook salmon were trapped per year at the Sawtooth Hatchery weir on the mainstem Salmon River. Approximately two-thirds of these chinook were used in the hatchery. The remaining one-third were manually passed above the weir on their migration to upstream spawning areas (Kiefer and Forster 1990a, 1990b). From 1988 to 1989, about 30,000 juvenile chinook salmon outmigrants passed downstream through the juvenile trap site at the weir. Approximately 6 to 8 percent of these juveniles are trapped, marked, and released below the weir as part of a fish population monitoring program (Kiefer and Forster 1990a, 1990b).

4.2.2 WILDLIFE

The wildlife habitat in the study area (Figure 1) is characterized by stands of coniferous forests that include lodgepole pine, Douglas-fir, ponderosa pine, juniper, and pinyon pine (U.S. Forest Service 1987a, 1987b). Aspen and black cottonwood dominate the riparian forests surrounding the lake outlets and streams (U.S. Forest Service 1987a).

Shrub-steppe grasslands and rangelands are interspersed throughout the valley (U.S. Forest Service 1987a). Typical shrub-steppe species include bitter-brush, creeping Oregon grape, common chokecherry, and big sagebrush (U.S. Forest Service 1985).

Wildlife species representative of the higher elevation areas of the Sawtooth Mountains and likely to be found in the study area include the black bear, pileated woodpecker, snowshoe hare, mountain lion, bobcat, and mountain goat (U.S. Forest Service 1987a). Elk and mule deer are summer residents in the study area but migrate to lower elevations during the fall and winter (U.S. Forest Service 1987a).

Upland birds characteristic of the sagebrush communities in the study area might include sage grouse, sharp-tailed grouse, and Brewer's sparrow (U.S. Forest Service 1987a). Lewis' woodpecker is common in the riparian woodlands of the Sawtooth Mountains (U.S. Forest Service 1987a).

The aquatic and riparian habitats of Redfish and Alturas lakes support beaver, mink, and muskrat, as well as several species of amphibians and waterfowl. The common loon, a U.S. Forest Service Region 4 sensitive species, is occasionally observed at Redfish Lake, but they do not nest (Spar 1991).

The grey wolf is the only federally endangered wildlife species listed by the U.S. Fish and Wildlife Service (Lobdell 1991) found in the Sawtooth Valley study area. However, the

endangered bald eagle may also be present (Phalen 1991). The Sawtooth Valley study area most likely provides habitat for eight species that are listed by IDFG as protected or a species of concern. The U.S. Forest Service has listed an additional nine species as sensitive.

Two to four bald eagles roost and feed from December through March in the forested areas along the Salmon River, from Redfish Lake downstream approximately 32 km (20 mi) to Slate Creek. No nesting sites are believed to occur in the Sawtooth Valley study area (U.S. Forest Service 1987a).

There have been grey wolf sightings in the Sawtooth Valley during the snow-free season. However, wolf observations appear to be limited to single animals, and there is no evidence of pack activity or reproduction (U.S. Forest Service 1987a).

The peregrine falcon, also a federally listed endangered species, might occur in the Sawtooth Valley study area. However, these birds infrequently move through the area (Phalen 1991).

The wolverine, a candidate for listing, might use the study area (Stephens 1991). The wolverine prefers a habitat with Douglas-fir, mixed conifer, and lodgepole pine forests and preys on smaller mammals, waterfowl, and, when available, carrion (Wilson 1982).

4.3 RECREATION

The SNRA is heavily used for recreation during the summer season. Visitors come from all areas of the United States and foreign countries.

The lakes of the SNRA have numerous recreational facilities such as campgrounds and picnic areas. Camping, fishing, scuba diving, hiking, sightseeing, swimming, boating, jet skiing, and other day-use activities are common on each of the five major Sawtooth Valley lakes. Table 3 lists the recreational facilities and activities at each lake.

4.4 CRITICAL HABITAT

Several federally listed species are found in the Sawtooth Valley project area. On December 28, 1993, NMFS specifically designated Alturas, Pettit, Redfish, Stanley, and Yellow Belly lakes, including outlets and areas downstream to the Pacific Ocean, as "critical habitat" under the ESA for Snake River sockeye salmon and spring/summer chinook salmon (58 CFR 68543). The outlet streams that the fish would use to travel from these lakes generally cross private agricultural lands before entering the Salmon River. These private lands with some dude ranches and scattered residences are used for extensive cattle grazing. All of the fish barriers are located on public lands. The Sawtooth Valley lakes under consideration for conserving and rebuilding Snake River sockeye salmon runs are located on U.S. Forest Service lands within the SNRA. Based on the SNRA Act (P.L. 92-400), the U.S. Forest Service has set forth management objectives which include protection of habitat for salmon and other fisheries. Under these objectives, special consideration is given to habitats of endangered, threatened, or unique species (U.S. Forest Service 1987a, 1987b).

4.5 ARCHAEOLOGICAL, HISTORICAL, AND CULTURAL RESOURCES

The study area has potentially significant archaeological, historical, and cultural resources. Groups that have occupied the area include American Indians, early miners, and ranchers. Prehistoric, historic, and architectural sites have been recorded and ethnographic data for local Indian groups have been gathered (U.S. Forest Service 1987a).

Donald McKenzie made early historical recordings of the area in 1819. From that time through the settling of Idaho in the late 1800s, a considerable amount of activity occurred as evidenced by ghost towns, abandoned ranches, trails, and solitary cabins found throughout the Sawtooth National Forest area (U.S. Forest Service 1987a).

TABLE 3

Recreation facilities and activities on Sawtooth Valley lakes.

Lake	Facilities	Activities
Stanley	3 campgrounds (39 sites) 1 boat ramp 1 picnic and overlook area	Fishing, motorboating, sailboating, canoeing, and snowmobiling
Redfish	Visitor Center Lodge (holds 125 persons) 5 campgrounds (105 sites) 1 boat ramp 2 swimming beaches 3 picnic areas	Fishing, swimming, all types of boating, and waterskiing on 380-acre lake, 5 miles in length Cross-country skiing, horseback riding, and boat tours
Little Redfish	2 campgrounds (20 sites)	Fishing and non-motorboating on 40-acre lake
Yellow Belly	No improved facilities	Fishing, dispersed camping, and boating with horsepower restrictions
Pettit	Campground (5 sites) Boat ramp Day use area	All types of boating, waterskiing, fishing, snowmobiling, and cross-country skiing
Alturas	3 campgrounds (55 sites) Picnic area for up to 125 persons	All types of boating, waterskiing, fishing, snowmobiling, cross-country skiing, and amphitheater events

The U.S. Forest Service, in its Land and Management Plan (U.S. Forest Service 1987b), stated that approximately 2.8 percent of the Sawtooth National Forest has been surveyed for cultural resources. From these surveys, 692 sites were identified. Of the 692 sites, 509 are prehistoric (campsites, rock shelters, and stone quarries) and 183 are historic (mines, townsites, ranches and trails).

The Shoshone-Bannock and the Nez Perce Indian Tribes have hunting and fishing rights in the Sawtooth National Forest that have been reserved by treaty.

Green (1992) confirmed that no specific historic or cultural sites have been identified in areas that could be affected by the Sawtooth Valley Project.

5.0 ENVIRONMENTAL EFFECTS

5.1 PROPOSED ACTION

5.1.1 WATER QUALITY

Lake fertilization could adversely affect water quality. Redfish Lake is deficient in specific nutrients, primarily nitrogen and phosphorus. These nutrients are required for optimum productivity of sockeye salmon. Adding nitrogen and phosphorus to the lake has been demonstrated to increase productivity because the amount of phytoplankton increases.

Previous long-term studies of lake fertilization in Alaska, British Columbia, and the Yukon have yielded varying results (Stockner 1977). Effects on water quality are highly variable, even between lakes within the same drainage basin, and are difficult to accurately predict. Therefore, the ability to precisely determine potential effects is limited.

Increases in productivity from adding nitrogen and phosphorus to the lake would, in turn, increase phytoplankton (a rapid increase is often referred to as a phytoplankton "bloom"). Water clarity could be measurably reduced, and the numbers and kinds of aquatic organisms would change. Suspended particulate (organic) matter would likely increase. The blooms could also affect water color. An increase in turbidity may violate Idaho's water quality standards. The turbidity standards for cold-water biota are instantaneous increases of 50 nephelometric turbidity units (NTUs) and increases of 25 NTUs for 10 consecutive days.

Lake fertilization would also likely increase the amount of algal films (periphyton) growing on rocks in the shallow littoral zone of the lake (Teuscher et al. 1994). This increased growth would likely increase the production of bottom-dwelling insects that are a food resource for kokanee and sockeye salmon, as well as for other fishes in the lake.

The pattern of nutrient cycling in a lake over a season is also uncertain; in some cases, there is potential for long-term (not just single season) effects from lake fertilization. For example, based on the dissolved oxygen profiles recorded thus far, it may be that portions of the lake bottom sediments have no oxygen. Such conditions can allow some nutrients to be released into the water column (i.e., sediments can act as sources as well as sinks for nutrients). When the deeper water mixes with the surface water (referred to as turnover), these added nutrients are reintroduced into the upper water column.

Another possible effect of lake fertilization would be reduced dissolved oxygen associated with increased primary productivity and decaying organic matter. Increased productivity and suspended and dissolved organic matter would likely result in noticeable increases in biological oxygen demand (BOD) and chemical oxygen demand (COD).

Water quality of the associated lake outlet stream would reflect that of the lake water itself; thus, the potential also exists for the degradation of water quality in the outlet stream, depending upon the level of nutrient addition. Nutrients could also increase productivity in the stream, with similar effects as those described for the lake. Groundwater resources would likely not be affected because nutrients would be used by living organisms rather than being absorbed directly into the subsurface aquifers.

Barrier removal may cause short-term changes in water quality during construction, including minor increases in turbidity or suspended sediments. Turbidity and suspended sediments would be monitored during construction. The sediment control practices proposed by Montgomery Watson (1994) should adequately protect any juveniles or incubating eggs downstream from the project area from adverse effects due to suspended or deposited organic or inorganic sediment.

Trapping fry and adults would not affect water quality.

5.1.2 BIOLOGICAL RESOURCES

Lake fertilization would be designed to mimic the nutrient release patterns that occur when fish decompose after a spawning event. Since Redfish Lake naturally has very low nutrients, juvenile sockeye salmon released into the lake could rapidly exceed its carrying capacity. Lake fertilization should increase the capacity of the lake to produce sockeye salmon.

Lake fertilization could result in phytoplankton and zooplankton blooms, which would increase food resources for juvenile sockeye salmon and other fish species. The interactions of fish species in the lake could be closely monitored, along with chemical (i.e., dissolved oxygen and nutrients) and physical (i.e., clarity) parameters because altering the food chain might inadvertently benefit undesirable or predatory species, a situation that could adversely affect juvenile sockeye salmon or other fish.

Lake fertilization should have no adverse effects on terrestrial wildlife, vegetation, or threatened and endangered species.

Removal of the fish barrier would require minor clearing of access roads used during the original construction. This might allow fine-grained soil materials to enter creeks.

Barrier removal could increase accessible habitat for sockeye salmon and other species such as chinook salmon. Barrier removal could also provide opportunities for undesirable fish, such as suckers and squawfish, to gain entry to Pettit Lake and reduce numbers of sockeye salmon or trout species through predation. Although this potential exists, the recreational trout fishery at Pettit Lake, which is based on hatchery plantings, can likely be maintained despite the presence of rough fish. For example, Redfish Lake, which has an existing population of squawfish, supported a trout and kokanee fishery until recent years when closures were made to prevent potential harvest of sockeye salmon.

As noted above, lake trout, bull char, and squawfish prey on *O. nerka* populations. Although the magnitude of losses cannot be determined through diet analysis, several generalities can be mentioned. First, even though squawfish in Alturas Lake do not appear to select any one fish species, their numbers are so great that they probably exert greater impacts on *O. nerka* populations than the less abundant bull trout. Second, the lake trout population in Stanley Lake may be controlling *O. nerka* growth. Forage resources (zooplankton and benthic production) are greatest in Stanley Lake, but *O. nerka* growth is comparable to systems with lower forage resources (i.e., Redfish Lake).

In order to assess predation from squawfish on the sockeye recovery efforts, diet analyses were conducted in June, September, and December of 1993. Northern squawfish currently reside in significant numbers in Redfish and Alturas lakes as well as in companion tributaries. Squawfish diets were very different among seasons. In June and September squawfish prey consisted of 16 percent *O. nerka*. *O. nerka* were absent from squawfish diets in winter samples. Stomach contents from bull trout were also analyzed. Bull trout preferred *O. nerka*, which made up 89 percent of their stomach contents. Lake trout in Stanley Lake showed a diet composition of only 3 percent *O. nerka*.

Controlling the kokanee population would likely reduce their numbers in Redfish Lake. According to models developed by the SBT, the IDFG, and Utah State University, kokanee controls would likely increase the available phytoplankton and zooplankton populations for other fish, such as sockeye salmon, and increase their survival rates.

5.1.3 RECREATION

Lake fertilization measures might improve all fisheries. If the sockeye salmon population increases to a naturally sustainable level, a sockeye salmon sport or Tribal fishery could be developed.

The additional vehicular traffic on lake access roads and associated construction operations for

barrier removal would have a very minor effect on campers, sightseers, and homeowners because most of this activity should occur during the offseason. Fertilization application by boat or barge might pose a temporary inconvenience to boaters, jet skiers, anglers, scuba divers, and swimmers. Aerial application by fixed wing aircraft or helicopter would produce a short-term increase in ambient noise levels.

The temporary camp facilities for personnel operating the fish passage and collection and enumeration structures on Pettit Lake Creek would not affect existing recreational use. Also, the facilities would not affect access to this reach of the creek.

No harvest is currently allowed on kokanee in the Redfish Lake. Therefore, the measures proposed to control kokanee populations would not affect the recreational fishery.

5.1.4 AESTHETICS

Some minor negative visual effects could result from lake fertilization. These effects would be temporary and should not be objectionable to visitors. Lake fertilization might slightly reduce lake clarity and increase the amount of periphyton growing on rocks and in the shallows. However, the overall scenic quality of the lake should be maintained.

Barrier removal and kokanee population control would likely have no adverse effects on aesthetics, although the trapping sites would be relocated within areas that have Visual Quality Objectives in the Forest Service's Land and Resource Management Plan for "foreground retention" (U.S. Forest Service 1987a).

5.1.5 CRITICAL HABITAT

Because the higher productivity periods naturally occur in the spring, artificial lake fertilization would extend through the summer. Although this would change limnological conditions during the summer, critical habitat and sockeye or chinook salmon probably would not be adversely affected.

The increased productivity of Redfish Lake caused by artificial fertilization should increase adult returns of the juveniles outplanted in Redfish Lake (Hyatt and Stockner 1985). Progeny of residual sockeye salmon would also benefit through enhanced food resources. Discontinuing fertilization probably would result in lake productivity returning to naturally existing conditions.

Barrier removal and fish trapping would not adversely affect the Snake River sockeye salmon because this species does not occur in Pettit Lake, Pettit Lake Creek, or Alturas Lake Creek. The removal of the barrier dam would have a beneficial effect on critical habitat by making Pettit Lake accessible to adult sockeye salmon. No additional disturbances to designated critical habitat are expected.

5.1.6 ARCHEOLOGICAL, HISTORICAL, AND CULTURAL RESOURCES

No known archaeological, historical, or cultural resources would be affected by the proposed actions. A field inventory has not been conducted because of winter snowpack. However, a survey is planned as soon as ground conditions permit. A report will be prepared and reviewed by the U.S. Forest Service and the Idaho State Historic Preservation Officer in compliance with Section 106 of the National Historic Preservation Act. If any such resources are discovered during construction, activity would be immediately stopped and the Idaho State Historic Preservation Officer and the U.S. Forest Service would be contacted.

5.2 NO ACTION ALTERNATIVE

If no action is taken to conserve and begin rebuilding the numbers of Snake River sockeye salmon, this run probably would remain extremely low in numbers or become extinct (particularly any progeny from the 1993 and 1994 adult spawning year classes). Agency and Tribal biologists agree that extinction would not be a desirable outcome. The no action alternative would, however, ensure that water quality,

recreational fisheries, and terrestrial habitats would not change over existing conditions.

The actions proposed in this Supplemental EA are part of an overall program being conducted to avoid extinction and increase the number of sockeye salmon to a self-sustaining level. Although the program could be successful without these proposed actions, based on the results of research conducted thus far, it is likely that these actions would decrease potential limiting factors in the life cycle of Snake River sockeye salmon and, consequently, shorten the period to attain a naturally reproducing population of Snake River sockeye salmon in the Sawtooth Valley.

5.3 CUMULATIVE EFFECTS

The purpose of the proposed action is to continue the conservation and rebuilding program, which began in spring 1991. The anticipated long-term cumulative effects from the project should be a larger Snake River sockeye salmon run in the Sawtooth Valley.

Removing the barrier on Pettit Lake Creek would expand the habitat currently available to sockeye salmon. It would also potentially provide access for species such as chinook salmon and rough fish species such as squawfish. Re-establishing sockeye salmon in Pettit Lake might also require restrictions on recreational fishing until the run becomes established.

Lake fertilization would temporarily increase Redfish Lake's capacity to support sockeye salmon and other species. However, if fertilization were discontinued, the lake would likely return to its oligotrophic status.

Other activities both within and outside of the Sawtooth Valley might affect the success of the proposed actions. Activities outside of the Sawtooth Valley include ocean harvest, harvest in the Columbia River Basin, regulation of flows in the mainstem Columbia and Snake rivers, modifications to upstream and downstream anadromous fish passage structures, and predator control. Activities within the Sawtooth Valley include screening of irrigation withdrawals, habitat improvements, anadromous fish production, and management of livestock grazing on Federal lands in the Sawtooth Valley.

These activities are being addressed in other forums such as the Pacific Fisheries Management Council, Columbia River Compact, Pacific Northwest Power Planning Council's Fish and Wildlife Program, NMFS Recovery Plan, System Operation Review, and the U.S. Forest Service's Sawtooth National Forest Stanley Basin Cattle and Horse Allotment Management Plan Final EA (U.S. Forest Service 1993). Over time, these activities might change. At the time this Supplemental EA was written, it was unclear what those changes might be. However, for purposes of this Supplemental EA, it was assumed that decisions to be made in these areas are likely to benefit the long-term survival of anadromous fish in the Columbia River Basin. Even though the cumulative effects of the proposed action, in conjunction with these other activities, cannot be definitively determined at this point, they should increase annual adult returns of anadromous fish to the Sawtooth Valley.

6.0 COMPLIANCE WITH ENVIRONMENTAL STATUTES AND REGULATIONS

This section provides a discussion of laws and regulations that might apply to the proposed actions.

■ National Environmental Policy Act of 1969, as amended

NEPA requires Federal agencies to assess potential effects of proposed actions on the environment. This Supplemental EA was prepared according to NEPA (42 USC 3421 et seq.).

■ Endangered Species Act of 1973, as amended

The ESA provides a means for conserving various species of fish, wildlife, and plants that are threatened with extinction. The draft Supplemental EA was submitted to NMFS and the U.S. Fish and Wildlife Service pursuant to Section 7 of the ESA. A Biological Assessment was prepared which resulted in a conclusion of no adverse effect for all three proposed actions.

A Section 10(a)(1)(A) permit, issued by NMFS on July 29, 1992, authorizes the Idaho Department of Fish and Game to conduct the Juvenile and Adult Trapping Program. Permit No. 795 expires on July 31, 1997. The permit authorizes the Idaho Department of Fish and Game to trap up to 4,500 juvenile Snake River sockeye salmon, tag up to 4,500 juveniles and maintain up to 450 juveniles in captivity, while releasing the rest back into Redfish Lake Creek. The permit also authorizes the Idaho Department of Fish and Game to trap and retain up to 20 adult Snake River sockeye salmon and up to 20 residual sockeye salmon

from Redfish Lake annually. The permit authorizes the adults to be measured, maintained, spawned, and the resulting progeny reared by the Idaho Department of Fish and Game for use as broodstock.

■ Clean Water Act

Section 401 (Water Quality Certification) and 404 (construction on submerged lands) will be required and complied with for certain actions proposed in this Supplemental EA.

■ U.S. Forest Service Special-Use Permit

The U.S. Forest Service has jurisdiction over land use activities within the SNRA as mandated by P.L. 92-400. An existing Special-Use Permit includes continued use of the trapping facilities on Redfish Lake Creek and at the Sawtooth Hatchery. It also covers research activities being conducted by the University of Idaho, Utah State University, and the SBT. However, a new permit would be required for modification of fish barriers, operation of a new trap on the outlet of Pettit Lake, and lake fertilization.

■ Protection of Wetlands (Executive Order 11990)

Wetlands are areas inundated by surface or groundwater sufficient to support vegetative or aquatic life requiring saturated or seasonally saturated soil conditions and reproduction. Examples include swamps, marshes, bogs, and similar areas such as sloughs, potholes, wet meadows, and river overflow areas. Under Executive Order 11990, con-

struction in wetlands is discouraged whenever there is a practicable alternative.

Proposed actions such as lake fertilization and modification of fish barriers along with accompanying mitigation measures (Montgomery Watson 1994) would not likely affect wetlands.

■ **Floodplains Management (Executive Order 11988)**

Floodplains are the lowlands adjoining streams. Under Executive Order 11988, development in floodplains is discouraged whenever there is a practicable alternative. As with wetlands, the proposed measures are not likely expected to affect floodplains.

■ **Heritage Conservation**

The nation's historical, cultural, and prehistoric resources are protected under a number of Federal laws including the National Historic Preservation Act, the National Landmarks Program, and the World Heritage List. Both the Idaho State Historic Preservation Officer and the U.S. Forest Service have been contacted regarding possible sites that might be affected by the Sawtooth Valley Project. A ground survey will be conducted to identify and protect any potential resources.

■ **Pacific Northwest Electric Power Planning and Conservation Act**

The Northwest Power Act was passed by Congress on December 5, 1980. This law created the eight-member Northwest Power Planning Council. The Council was entrusted with preparing a Fish and Wildlife Program for the Columbia River Basin by November

1982 and preparing a 20-year Regional Electric Power and Conservation Plan by April 1983. The plans are periodically updated. The Council's Fish and Wildlife Program established a number of goals for restoring and protecting fish populations in the basin. The objective of the Sawtooth Valley Project is to increase the numbers of sockeye salmon, thereby helping to achieve one of the goals of the Fish and Wildlife Program.

■ **State of Idaho**

Several permits might be required from the state of Idaho. These permits will depend on which Sawtooth Valley Project measures are implemented, their design, and their operation. For example, lake fertilization would require water quality certification and/or permits from the Idaho Division of Environmental Quality. Removal or modification of a barrier would require a Stream Alteration Permit.

State of Idaho laws and regulations that may apply to the actions proposed in this EA include Idaho Water Quality Standards and Wastewater Treatment Requirements, the Idaho Stream Channel Protection Act, and the Idaho Antidegradation Policy.

7.0 GLOSSARY AND ABBREVIATIONS

Adipose fin	A small fleshy fin on the back, behind the dorsal fin.
Anoxic	The condition of having little or no oxygen present.
Anadromous	Fish that migrate up freshwater rivers and streams to reproduce after maturing in the ocean.
BOD	Biological Oxygen Demand, the rate of oxygen consumption by organisms during the decomposition (respiration) of organic matter.
BOR	U.S. Bureau of Reclamation.
BPA	Bonneville Power Administration.
Captive Broodstock	Fish that are held in captivity for the purpose of artificial spawning to obtain fertilized eggs.
Carrying Capacity	The upper limit in physical, biological, and chemical characteristics of a lake, stream, or other discrete area that can support a given number of organisms on a sustained basis.
CEQ	Council on Environmental Quality.
Chlorophyll <u>a</u>	A form of chlorophyll (the green pigment in algae) used as a measure of productivity.
Council	Northwest Power Planning Council.
COD	Chemical Oxygen Demand.
Cryopreserve	A process where living tissue (i.e. eggs or sperm) is frozen at extremely low temperature, stored, and later brought back to normal living condition.
DEQ	Division of Environmental Quality.
EA	Environmental Assessment.
EIS	Environmental Impact Statement.
Epilimnetic	Pertaining to the turbulent superficial layer of a lake lying above the metalimnion which does not have a permanent thermal stratification (see stratification and metalimnion).
ESA	Endangered Species Act of 1973, as amended.

ESU	Evolutionarily Significant Unit, a population or group of populations that are considered distinct (and hence a "species") for purposes of conservation under the ESA. To qualify as an ESU, a population must: 1) be reproductively isolated from other conspecific populations; and 2) represent an important component in the evolutionary legacy of the biological species.
Eyed-up	The stage of fish egg development in which the eye becomes visible.
FONSI	Finding of No Significant Impact.
Fry	The life stage of a fish from the hatching of the egg through absorption of the yolk sac to the growth to a size of one inch in length.
Genetic Diversity	All of the genetic variation within a species. Genetic diversity includes both genetic differences between individuals in a breeding populations and genetic differences between different breeding populations.
Hypolimnion	The layer of a lake lying below the metalimnion.
IDFG	Idaho Department of Fish and Game.
Juvenile	Fish from one year of age until sexual maturity.
Juvenile Outmigrant	A fish that is actively migrating downstream to the ocean from its stream or lake of origin.
Limnocorral	A transparent plastic tube used in a lake to isolate a column of water from the surrounding water. No exchange of water occurs between the limnocorral and the lake water.
Limnology	The study of the physical, chemical, meteorological, and biological conditions of fresh waters.
Mainstem	The main channel of a river.
Metalimnion	The layer of water in a lake between the epilimnion and hypolimnion in which the temperature exhibits the greatest difference in a vertical direction (see hypolimnion).
NEPA	National Environmental Policy Act.
NMFS	National Marine Fisheries Service.
NTU	Nephelometric Turbidity Unit, a measure of the amount of suspended sediment in water.
Nutrient	An element or chemical essential to life, such as carbon, oxygen, nitrogen, and phosphorus.
Oligotrophic	Lakes having low nutrient supplies which are poor producers of organic matter.

Outmigration	Juvenile fish moving from fresh water toward the ocean.
Passage	The movement of migratory fish through around, or over dams or other obstructions in a stream or river.
Phytoplankton	Small, usually microscopic aquatic plants.
Progeny	The young or offspring of a given set of parents.
Program	Columbia River Basin Fish and Wildlife Program.
Rearing	The life stage of anadromous fish spent in freshwater rivers, lakes, and streams (or hatcheries) before migrating to the ocean.
Redd	A salmon or steelhead trout spawning nest in river, stream, or lake gravel.
Resident fish	Fish species that reside in fresh water during their entire life cycle.
Nongame fish	Resident fish of low value as sport or food.
Run	A group of fish of the same species consisting of one or more stocks migrating at a discrete time.
SBSTOC	Stanley Basin Sockeye Salmon Technical Oversight Committee.
SBT	Shoshone-Bannock Tribes.
Secchi depth	A measure of transparency of water, obtained by lowering a white disk into water until it is no longer visible.
Secchi disk	A weighted black and white, or all white, disk (about 20 cm [8 in.] in diameter) used to provide a measure of water transparency.
Smolt	A juvenile salmon migrating to the ocean and undergoing physiological changes (smoltification) to adapt its body from a freshwater to a saltwater existence.
SNRA	Sawtooth National Recreation Area.
Spawning	The act of fish releasing and fertilizing eggs.
Stock	The fish spawning in a particular stream during a particular season which to a substantial degree do not interbreed with any group spawning in a different stream or at a different time.
Stratification	The horizontal layering of waters in a lake or reservoir due to water density or temperature differences.
Zooplankton	Small, often microscopic, aquatic animals.

8.0 AGENCIES AND ORGANIZATIONS CONSULTED

This section summarizes the agencies and organizations that were consulted in the preparation of the Supplemental EA.

- U.S. Fish and Wildlife Service
- National Marine Fisheries Service
- U.S. Forest Service (Twin Falls, Idaho)
- Idaho Department of Fish and Game
- Idaho Division of Environmental Quality
- Shoshone-Bannock Tribes
- Pacific Northwest Utilities Conference Committee
- University of Idaho
- Utah State University

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