

Chapter 11

Environmental Consultation, Review, and Permit Requirement

11.0 ENVIRONMENTAL CONSULTATION, REVIEW, AND PERMIT REQUIREMENTS

This section addresses Federal statutes, implementing regulations, and executive orders potentially applicable to the proposed SOR actions. In each case, the text provides a brief synopsis of the relevant aspects of the law or order and a summary of SOR compliance with these requirements. The conclusions on compliance are based on the impact analysis presented in Section 4.2 and the technical appendices. Unless otherwise noted, the compliance summaries apply specifically to the system operating strategy alternatives.

11.1 NATIONAL ENVIRONMENTAL POLICY

This EIS was prepared pursuant to regulations implementing NEPA (42 USC 4321 *et seq.*). NEPA provides a commitment that Federal agencies will consider the environmental effects of their actions. It also requires that an EIS be included in every recommendation or report on proposals for legislation and other major Federal actions significantly affecting the quality of the human environment. The EIS must provide detailed information regarding the proposed action and alternatives, the environmental impacts of the alternatives, potential mitigation measures, and any adverse environmental impacts that cannot be avoided if the proposal is implemented. Agencies are required to demonstrate that these factors have been considered by decisionmakers prior to undertaking actions.

The SOR EIS was prepared to provide NEPA compliance for four proposed actions: developing a long-term plan for river system operations, providing a means for periodic review and updating of the plan, and renewing or replacing the CEAA and the PNCA. The SOR lead agencies held several series of public meetings to gather public opinions and comments on the scope of the study, proposed alternatives, and the Draft EIS. Public comments received on the Draft EIS were addressed in the Final

EIS. The EIS and the overall SOR process comply with NEPA's requirements for documentation and public involvement.

11.2 ENDANGERED AND THREATENED SPECIES AND CRITICAL HABITAT

The ESA, most recently amended in 1988 (16 USC 1536), establishes a national program for the conservation of threatened and endangered species of fish, wildlife, and plants and the preservation of the ecosystems upon which they depend. Section 7(a) of the ESA requires Federal agencies to consult with the USFWS and the NMFS, as appropriate, to ensure that the actions they authorize, fund, or carry out are not likely to jeopardize the continued existence of endangered or threatened species or adversely modify or destroy their critical habitats. Actions that might jeopardize listed species include direct and indirect effects, and the cumulative effects of other actions.

Section 7(c) of the ESA and the Federal regulations on endangered species coordination (50 CFR § 402.12) also require that Federal agencies prepare biological assessments of the potential effects of major construction actions on listed or proposed endangered species and critical habitat. The SOR lead agencies consulted with USFWS and NMFS concerning listed species that could be affected by the actions addressed in this EIS. The Final EIS reflects the outcome of those consultation processes and the recommendations made by the USFWS and NMFS in their respective 1995 Biological Opinions.

The USFWS identified four listed threatened and endangered species expected to occur in the vicinity of one or more of the projects potentially affected by the SOR. Specifically, resident and migrant peregrine falcons and bald eagles are known to inhabit the area of these projects, and grizzly bears and gray wolves may use some of the project areas. Project-related

impacts on peregrine falcons are not expected because these birds have a substantial and diverse prey base that would not be diminished by SOR actions. Project-related impacts on nesting and wintering bald eagles could be positive or negative depending on the location, time of year, time of day, and degree of operational changes. Project-related effects on grizzly bears are not expected because the timing and location of SOR actions do not overlap with grizzly bear use patterns. Gray wolves, if they use any of the project areas, do not depend on the resources that would be affected by the proposed SOR actions.

The Snake River sockeye salmon was listed by the NMFS as an endangered species on November 10, 1991 (56 Federal Register 58619), effective December 10, 1991, and the Snake River fall and spring/summer chinook salmon were initially listed as threatened on April 22, 1992 (51 Federal Register 14653), effective May 22, 1992. The chinook stocks were subsequently reclassified as endangered in August 1994. In support of these listings, the portions of the Columbia and Snake Rivers that are used by the listed stocks have been designated as critical habitat. The analysis presented in this EIS is partially the result of concerns regarding these species. Several of the system operating strategy alternatives evaluated in the EIS are intended to increase survival of these threatened and endangered species and other anadromous fish by increasing water velocity and thereby decreasing travel time through the system.

The operating alternatives considered in the EIS could have both positive and negative effects on salmon survival. These effects could result from operations that change rearing habitat quality and quantity due to reservoir drafting; gas saturation levels; mortality rates from passage through turbines at the dams; predation conditions; and the distribution of water flows. To comply with the ESA, the SOR alternatives will need to result in a net increase in survival for migrating juvenile salmon, and thereby contribute to the recovery of the listed stocks. The SOR agencies and NMFS have concluded

that the preferred SOS alternative identified in the Final EIS meets this requirement.

11.3 FISH AND WILDLIFE CONSERVATION

11.3.1 Fish and Wildlife Conservation Act

The Fish and Wildlife Conservation Act of 1980 (16 USC 2901 *et seq.*) encourages Federal agencies to conserve and to promote conservation of nongame fish and wildlife species and their habitats. The SOR agencies are responding to this policy through full consideration of fish and wildlife needs in developing operations alternatives and in comprehensive analysis of fish and wildlife impacts and identification of potential mitigation measures.

11.3.2 Fish and Wildlife Coordination Act

The Fish and Wildlife Coordination Act (FWCA) requires consultation with USFWS when any water body is impounded, diverted, controlled, or modified for any purpose. USFWS and state agencies charged with administering wildlife resources are to conduct surveys and investigations to determine the potential damage to wildlife and the mitigation measures that should be taken. The USFWS incorporates the concerns and findings of the state agencies and other Federal agencies, including the NMFS, into a report that addresses fish and wildlife concerns and provides recommendations for mitigating or enhancing impacts to fish and wildlife affected by a Federal project. The Federal project must include justifiable measures that address the USFWS recommendations and concerns. Federal agencies that construct or operate water-control projects are authorized to modify or add to the structures and operation of those projects to accommodate the means and measures for conservation of fish and wildlife.

The SOR lead agencies have coordinated with the USFWS throughout the SOR. The USFWS is a cooperating agency, and USFWS staff have participated in the analyses conducted

by several SOR work groups. The USFWS has completed a Coordination Act Report (Appendix S), which is appended to the EIS. The system operating strategy alternatives considered in the EIS include an operating plan proposed by the USFWS, which received full evaluation in the analysis.

11.3.3 National Wildlife Refuge System Administration Act

The National Wildlife Refuge (NWR) System Administration Act consolidates various categories of wildlife ranges and refuges for management under one program. The Act provides protection for both wildlife and refuge lands from destruction and injury. The Act also provides authority for the regulation of hunting and fishing within refuge boundaries. Two major NWR areas located within the SOR scope are the Umatilla NWR (located near John Day) and McNary NWR (located at the confluence of the Snake and Columbia Rivers). Although most of the system operating strategy alternatives are expected to have minimal impacts on these wildlife areas, Umatilla Refuge lands would be affected by lowered pool operations at John Day. Wetlands in the Umatilla NWR might be lost or species composition might be altered by operating the reservoir several feet below full pool, if the wetlands are dependent on full pool levels for water supply. Extensive wetland areas at the Umatilla NWR would be lost if John Day were operated at minimum pool. Backwater areas at the McNary NWR could experience siltation problems as a result of lower Snake River drawdowns. The SOR agencies will consider mitigation for the impacts to refuge lands or will restore resources.

11.3.4 Migratory Waterfowl Act

The Migratory Waterfowl Act (16 USC 715 *et seq.*) requires that lands, waters, or interests acquired or reserved for purposes established under the Act be administered under regulations promulgated by the Secretary of the Interior. These regulations must conserve and protect migratory birds in accordance with treaties entered into between the

United States and Mexico, Canada, Japan, and the former Union of Soviet Socialist Republics; must protect other wildlife, including threatened or endangered species; and must restore or develop adequate wildlife habitat. The migratory birds protected under this Act are specified in the respective treaties. In regulating these areas, the Secretary of the Interior is authorized to manage timber, range, agricultural crops, and other species of animals, and to enter into agreements with public and private entities.

Some Umatilla NWR lands at Crow Butte on the John Day pool were acquired as Special Law Lands and transferred to the U.S. Department of the Interior. Any migratory birds specified in the aforementioned treaties inhabiting this National Wildlife Refuge are protected under the provisions of this Act and the international treaties. Operating John Day pool near elevation 262.5 feet (80 m) could potentially affect island-nesting waterfowl that are protected under the Migratory Waterfowl Act. These impacts include exposure of mudflats between emergent marsh community and open-water habitat that could result in the loss of ducklings that are unable to use emergent marsh habitat for escape from predators. Impacts to Canada goose nests at the John Day pool with this operation would not be expected because no land bridging of islands is anticipated.

Alternatives that include operating John Day at the minimum pool elevation of 257 feet (78 m) would have more significant impacts on migratory waterfowl. Exposure of mudflats and loss of wetlands would be more extensive, while land bridging would be more likely. Mitigation measures such as construction of dikes, installation of pumps, and provision of water distribution systems to maintain backwater habitat and emergent marsh areas on the NWR would be difficult to implement because of the existing substrate conditions.

11.3.5 Marine Protection, Research, and Sanctuaries Act

The Marine Protection, Research, and Sanctuaries Act regulates dumping of material into the ocean and prevents or strictly limits the dumping of any material that would adversely affect human health, welfare, the marine environment, ecological systems, or economic potentialities. Because none of the proposed SOR actions would result in the dumping of material into the ocean, the Act does not apply.

11.3.6 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 NPPC, an interstate agency whose members are appointed by the Idaho, Montana, Oregon, and Washington governors. NPPC was entrusted with adopting 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. These plans are periodically updated.

NPPC's Fish and Wildlife Program established a number of goals for restoring and protecting fish and wildlife populations in the basin. These goals led to changes in the operation of the Coordinated Columbia River System during the mid-1980s. One of the most notable changes is the Water Budget, which provides for the release of specific amounts of water in the upper Columbia and Snake Rivers to help juvenile salmon migrate downstream in the spring. More recently, the NPPC has developed its own proposals to protect threatened and endangered salmon stocks. The NPPC has completed amendments to its Columbia River Basin Fish and Wildlife Program. The amendments adopted to date include mainstem survival, harvest, production, habitat, and flow measures that can be used to increase salmon and steelhead runs, and resident fish and wildlife measures.

The SOR agencies have been coordinating with the NPPC to integrate the system operating strategy alternatives with the NPPC amendments for priority salmon actions. Several of the alternatives incorporate flow improvement measures adopted by the NPPC in December 1991 and September 1992, while the drawdown alternatives are evaluated in the EIS reflect the NPPC's long-term strategy. NPPC staff have participated in the SOR analysis.

Several of the system operating strategy alternatives would temporarily reduce the power generation capability of some of the hydro affected projects in the study area. The SOR agencies are coordinating with the NPPC regarding these effects and their relation to the regional electric power plan.

11.4 HERITAGE CONSERVATION

A number of Federal laws have been promulgated to protect the nation's historical, cultural, and prehistoric resources.

11.4.1 National Historic Preservation Act

Section 106 of the NHPA requires that Federal agencies evaluate the effects of Federal undertakings on historical, archeological, and cultural resources and afford the Advisory Council on Historic Preservation (ACHP) opportunities to comment on the proposed undertaking. The first step in the process is to identify cultural resources included on (or eligible for inclusion on) the National Register of Historic Places that are located in or near the project area. The second step is to identify the possible effects of proposed actions. The lead agency must examine whether feasible alternatives exist that would avoid such effects. If an effect cannot reasonably be avoided, measures must be taken to minimize or mitigate potential adverse effects.

The SOR agencies, in coordination with other Federal agencies, the State Historic Preservation Offices (SHPDs), and Native American Tribes, are identifying cultural resources and sites in the project area for

inclusion on the National Register. In addition, the agencies are evaluating the effects of the proposed alternatives on these sites, and measures that might be implemented to mitigate the potential effects. Implementation of any of the system operating strategy alternatives would affect cultural sites to varying degrees. Larger areas of the cultural sites would be exposed at lower pool levels under some alternatives. Sites normally inundated might be exposed and subject to impacts from traffic, vandalism, and erosion from wind and waves. Repeated cycles of exposure and inundation might accelerate decomposition of organic materials contained within the sites. New reservoir operating conditions might require an accelerated program of site testing to determine National Register eligibility, and increased mitigation efforts.

Section 110 of the NHPA requires active management protection for Federally owned historic properties. This protection pertains specifically to archeological sites, historic sites, and historic structures or objects. The SOR agencies will develop two types of agreement documents to comply with Section 110 of the NHPA. The three SOR lead agencies will sign an interagency agreement, based on a statement of shared principles and commitments, that will identify specific agency roles, responsibilities, and commitments for budget allocations necessary to meet cultural resources requirements for Sections 106 and 110 compliance. The agencies will also develop individual agreements, called Implementation Plans (IPs), covering specific projects or river reaches. IPs will specify appropriate treatments for the effects of the SOR on historic properties, require detailed historic preservation plans, interim measures necessary to carry out the agreed upon treatments, and identify funding actions that may be called for in the historic preservation plans. Whereas the interagency agreement will involve only the lead SOR agencies, the IPs will involve consultation with affected tribes, other cooperating agencies, ACHP, and SHPOs.

11.4.2 Existing Programmatic Agreements

In 1982, the Walla Walla District, U.S. Army Corps of Engineers (Corps) executed a Programmatic Memorandum of Agreement (PMOA; since 1989, these have been termed simply Programmatic Agreements) with the Advisory Council on Historic Preservation (ACHP) and the Idaho, Oregon, and Washington State Historic Preservation Offices (SHPOs) for operation and maintenance of all Corps hydroelectric projects within the Walla Walla District, including McNary, Ice Harbor, Lower Monumental, Little Goose, Lower Granite, and Dworshak Dams. Implementation of the terms of the PMOA satisfies the Corps' Section 106 responsibilities of the NHPA for these specific projects.

In 1991, all of the SOR agencies executed a Programmatic Agreement (PA) with the U.S. Forest Service; the National Park Service; the Confederated Tribes of the Colville Reservation; the Spokane Tribe of Indians; the Idaho, Montana, Oregon, and Washington SHPOs; and the ACHP, regarding Federal Columbia River Power System hydroelectric operations affecting the reservoir drawdown areas of Grand Coulee, Hungry Horse, Dworshak, Libby, and Albeni Falls Dams (i.e., the storage reservoirs). The PA also provides procedures for consistency with the Native American Graves Protection and Repatriation Act. Implementation of the PA is in progress.

11.4.3 Archeological Resources Protection Act

The Archeological Resources Protection Act (ARPA) provides for the protection of archeological sites located on public and Indian lands, establishes permit requirements for the excavation or removal of cultural properties from public or Indian lands, and establishes civil and criminal penalties for the unauthorized appropriation, alteration, exchange, or other handling of cultural properties.

Any of the system operating strategy alternatives would result in continued exposure of cultural sites and subsequent damage. The drawdown or flow augmentation measures included in several of the strategies could result in the new or increased exposure of sites. This in turn could lead to vandalism or an increase in ongoing vandalism at cultural sites. Appropriate monitoring/surveillance methods and awareness programs will be developed to prevent or minimize vandalism, as part of overall monitoring and mitigation for cultural resources. The Corps and Reclamation, as the operating agencies for the Federal projects, are prepared to take appropriate action, including prosecution of individuals caught vandalizing cultural sites.

11.4.4 Native American Graves Protection and Repatriation Act

The Native American Graves Protection and Repatriation Act (NAGPRA) addresses the recovery, treatment, and repatriation of Native American and Native Hawaiian human remains and cultural items (associated funerary objects, unassociated funerary objects, sacred objects, and objects of cultural patrimony).

The implementation of any of the system operating strategy alternatives could result in the exposure of Native American human remains and cultural items. This situation will be addressed by an interagency agreement and project-specific implementation plans on monitoring and mitigation for cultural resources (see Section 11.4.1). In the event this should happen, the appropriate Indian tribe(s) and lineal descendants will be notified and the necessary actions taken to protect the burials as prescribed by law. The Corps and Reclamation have been complying with the provisions of NAGPRA in their operation of the Federal projects and will continue to do so.

11.4.5 American Indian Religious Freedom Act

The American Indian Religious Freedom Act (AIRFA) of 1978 was a joint resolution of Congress establishing a policy that the United

States will protect and preserve American Indians' rights of freedom of belief, expression, and exercise of traditional religions. Courts have interpreted AIRFA to mean that public officials must consider Indians' interests before undertaking actions that might harm those interests. The agreements discussed in Sections 11.4.1 and 11.4.2 include (or will include) provisions for Native American consultation and coordination under AIRFA.

11.5 STATE, AREA-WIDE, AND LOCAL PLAN AND PROGRAM CONSISTENCY

The CEQ regulations for implementing NEPA (40 CFR § 1506.2) require agencies to consider the consistency of a proposed action with approved state and local plans and laws. Given the extremely large number of state and local jurisdictions within the SOR study area, the lead agencies were not able to review all of the individual plans and laws that may be applicable. Based on the orientation and typically limited applicability of state and local authorities to the Federal multipurpose projects, the agencies assume the proposed actions would generally be consistent with state and local plans and laws. Because most local planning ordinances establish restrictions for development and growth in areas, local ordinances would generally not be applicable to the system operating strategy alternatives, or the other SOR actions.

State and local government agencies operate a variety of recreational, infrastructure and related resources along the river system. Impacts to these resources that could result from the various SOS alternatives are identified in Section 4.2, and corresponding mitigation measures are discussed in Section 4.3.3.

In accordance with Executive Order 12372, this EIS will be circulated to the appropriate state clearinghouses to satisfy review and consultation requirements.

11.6 COASTAL ZONE MANAGEMENT CONSISTENCY

The Coastal Zone Management Act of 1972 requires that Federal actions be consistent, to the maximum extent practicable, with approved state coastal zone management programs. A state coastal zone management program (developed under state law and guided by the Act) sets forth objectives, policies, and standards to guide public and private uses of lands and waters in the coastal zone. The coastal zone as defined in the Act extends inland as far as necessary to account for factors that influence coastal shorelines. Washington and Oregon have approved coastal zone management programs, both of which list seven types of Federal activities directly affecting the coastal zone. The upper boundary of the coastal zone is downstream of Bonneville Dam.

The SOR alternatives would have little effect on water levels or river uses downstream of Bonneville Dam. Several of the system operating strategies would result in river flow patterns that more closely resemble the natural hydrograph, which would presumably have beneficial or neutral effects for the coastal zone.

11.7 FLOOD PLAIN MANAGEMENT

If a Federal agency program will affect a flood plain, the agency must consider alternatives to avoid adverse effects in the flood plain or to minimize potential harm. Executive Order 11988 requires Federal agencies to evaluate the potential effects of any actions they might take in a flood plain and to ensure that planning, programs, and budget requests reflect consideration of flood hazards and flood plain management.

The impacts of the system operating strategy alternatives on flood control capability are considered minor or negligible. Some of the alternatives would result in small increases in the calculated average annual flood damages, although it is also acknowledged that the analysis might overstate these impacts. Flood storage capacity at some upstream reservoirs could be

diminished with flow augmentation measures, but this capacity would be shifted elsewhere to maintain overall system flood control capacity. Further, flood storage shifts would only be implemented if projected runoff were relatively low, in which case the risk of flooding would also be reduced. Stable storage project operations would also decrease flood storage capacity at the affected reservoirs, but flood control rule curves specified for these alternatives would maintain flood protection. Lowered pool operation at run-of-river projects under several alternatives would enhance the flood control capacity of the system during drawdowns. None of the alternatives would induce land use changes that would adversely affect flood plain characteristics.

11.8 WETLANDS PROTECTION

Executive Order 11990 authorizes Federal agencies to take actions to minimize the destruction, loss, or degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands when undertaking Federal activities and programs. Any agency considering a proposal that might affect wetlands must evaluate factors affecting wetland quality and survival. These factors should include the proposal's effects on the public health, safety, and welfare due to modifications in water supply and water quality; maintenance of natural ecosystems and conservation of flora and fauna; and other recreational, scientific, and cultural uses.

Emergent wetlands communities are prevalent in several areas under study. If these wetlands depend on full pool levels for water supply through subirrigation or shallow inundation, the wetlands might be lost or species composition might be altered. Alternatively, with some operations, shoreline areas that could support wetland habitat might be exposed. The EIS identifies the expected positive and negative effects of the system operating strategy alternatives on wetlands and addresses measures to minimize impacts to wetlands.

11.9 FARMLAND PROTECTION

11.9.1 Farmland Protection Policy Act

The Farmland Protection Policy Act (7 USC 4201 *et seq.*) requires Federal agencies to identify and take into account the adverse effects of their programs on the preservation of farmlands. Each operating strategy has been evaluated to determine whether it would cause physical deterioration and/or reduction in productivity of farmlands (see Section 11.9.2 below).

11.9.2 CEQ Memorandum on Analysis of Impacts on Prime or Unique Agricultural Lands

This CEQ Memorandum establishes criteria to identify and consider the adverse effects of Federal programs on the preservation of prime and unique farmland; to consider alternative actions, as appropriate, that could lessen adverse effects; and to ensure Federal programs are consistent with all state and local programs for protection of farmland. The proposed SOR actions were determined not to have a direct impact on prime or unique agricultural lands; direct impacts would be confined to the reservoirs. Proposed SOS alternatives have been specified in an attempt to avoid interrupting the supply of water to irrigated prime farmlands. Where this was not possible, the lead agencies have assumed that replacement facilities needed to maintain water delivery would be constructed as mitigation. The SOR actions would not displace or diminish the productive capacity of prime or unique agricultural lands.

11.10 RECREATION RESOURCES

11.10.1 Wild and Scenic Rivers Act

The Wild and Scenic Rivers Act designates qualifying free-flowing river segments as wild, scenic, or recreational. The Act establishes requirements applicable to water resource projects affecting wild, scenic, or recreational rivers within the National Wild and Scenic Rivers System, as well as rivers designated on

the National Rivers Inventory. Under the Act, a Federal agency may not assist the construction of a water resources project that would have a direct and adverse effect on the free-flowing, scenic, and natural values of a wild or scenic river. If the project would affect the free-flowing characteristics of a designated river or unreasonably diminish the scenic, recreational, and fish and wildlife values present in the area, such activities should be undertaken in a manner that would minimize adverse impacts and should be developed in consultation with the NPS.

Several reaches of the Snake River have been designated under the Wild and Scenic Rivers System. The Hells Canyon reach, which is downstream of Brownlee Reservoir, is of primary interest. Several of the system operating strategy alternatives include flow augmentation options involving release of stored water from Brownlee, which would temporarily elevate flows in Hells Canyon over what would otherwise occur. These flow levels would, however, be well within the range of regulated flows normally experienced in Hells Canyon. The SOR lead agencies are coordinating with the USFS, which administers this reach of the river and is a cooperating agency in the SOR.

The Hanford Reach of the Columbia River was recently studied by the NPS and an interagency team as a potential Federal wild and scenic river. The preferred alternative in the Final EIS distributed in June 1994 recommended that the reach be designated as a combination national wildlife refuge and national wild and scenic river. There would be no apparent recreational effects from the SOS alternatives on the Hanford Reach as long as the Vernita Bar agreement is maintained. The SOR lead agencies will consult with the NPS on this matter as appropriate.

Several tributaries to the Snake and Columbia Rivers have also been added to the Wild and Scenic Rivers System. These include portions of the Klickitat and White Salmon Rivers in Washington and the Sandy, Deschutes, John Day, Grande Ronde, and Imnaha Rivers in

Oregon. The SOR actions would not adversely affect resource values of these protected waters.

11.10.2 Columbia River Gorge National Scenic Area Act

On November 17, 1986, Congress established the Columbia River Gorge National Scenic Area (Scenic Area) as a Federally recognized and protected area (PL 99-663). The Scenic Area Act also created the bi-state Columbia River Gorge Commission and directed the Commission and the USFS to jointly develop a management plan for the Scenic Area. The management plan is to reflect legislatively established purposes, which include a mandate to protect and provide for the enhancement of the scenic, cultural, recreational, and natural resources of the Scenic Area.

The Commission adopted a management plan on October 15, 1991. Counties affected by the plan have been encouraged to adopt ordinances consistent with this plan. The plan establishes land use designations for lands within the Scenic Area and specifies broad policies that provide for the protection of resources within the Scenic Area. The system operating strategy alternatives do not include any specific actions at the projects located within the Scenic Area (Bonneville and The Dalles). These projects would continue to operate within their normal ranges.

Therefore, the SOR actions would have no effect on visual, recreational, or other conditions on the Columbia River within the Scenic Area, and would be compatible with the Scenic Area management plan.

11.10.3 Wilderness Act

The Wilderness Act of 1964 established the National Wilderness Preservation System. Areas designated as wilderness under the original act and subsequent wilderness legislation are to be administered for the use and enjoyment of the public in such a manner as to leave them unimpaired as wilderness. Development activities are generally prohibited within wilderness areas, and Federal agencies proposing

actions must consider whether the effects of those actions would impair wilderness values.

Wilderness areas and other Federal protected lands that are located near the SOR reservoirs are identified in Section 2.2.4 of this volume, and in Section 2.2 of Appendix G, Land Use and Development. None of the actions evaluated in this EIS would change conditions evident within wilderness areas so as to impair wilderness values. The Great Bear Wilderness Area in western Montana, which extends to within approximately 1.5 miles (2.4 km) of Hungry Horse Reservoir, is the closest wilderness to the action sites addressed in the SOR. The effects of Hungry Horse operations on the Great Bear Wilderness would be limited to long-distance views of exposed reservoir shoreline from a small portion of the wilderness; such views have been evident since the Great Bear was designated, and would not change greatly in character under the SOS alternatives evaluated.

11.10.4 Water Resources Development Act

Congress generally authorizes water resources projects through biennial legislation, such as the Water Resources Development Act (WRDA) of 1990. Section 310(b) of WRDA 1990 requires public participation in changes to reservoir operation criteria. Section 415(b) specifically requires public notification (hearings) of actions associated with drawdown of Dworshak Reservoir. The SOR has held several meetings in the Dworshak area and is in compliance with these requirements. Section 415 requires a report to Congress concerning the effects of operations on recreation and log transport at Dworshak. The SOR will comply with this provision through the EIS and its appendices.

11.10.5 Federal Water Project Recreation Act

In planning any Federal navigation, flood control, reclamation, or water resource project, the Federal Water Project Recreation Act requires that full consideration be given to the

opportunities that the project affords for outdoor recreation and fish and wildlife enhancement. The Act requires planning with respect to the development of recreation potential. Projects must be constructed, maintained, and operated to provide recreational opportunities, consistent with the purpose of the project.

Recreation sites have been developed at all of the Federal projects in the SOR study area; these are operated by a variety of entities. Developed facilities and informal use areas at several of the Federal projects should experience minimal or no impacts from the alternatives considered. Lowered pool operations at several of the mainstem run-of-river projects under some alternatives would have minor impacts on recreation, but alternatives that involve deep drawdowns at these projects would have significant impacts. Use of recreation facilities at upstream storage reservoirs could be impaired as a result of flow augmentation under some alternatives; this could cause reservoir elevations to be lower than normal under some water conditions. Specific impacts could include dewatering boat ramps, docks, marinas, and swimming beaches. Water-oriented campgrounds and day-use areas could become less desirable because of exposed shoreline and increased distance to water. Stable storage project operation alternatives would enhance recreation at certain reservoirs by maintaining higher water level.

11.10.5 Land and Water Conservation Fund Act

The Land and Water Conservation Fund Act (LWCFA) assists in preserving, developing, and ensuring accessibility of outdoor recreation resources. The LWCFA establishes specific Federal funding for acquisition, development, and preservation of lands, water, or other interests authorized under the ESA and National Wildlife Refuge Areas Act. Funds appropriated under the Act are allocated to Federal agencies or as grants to states and localities. Numerous recreation sites and public land parcels along the SOR projects have been acquired or developed with LWCFA monies. Although maintenance

and use of these resources could be intermittently impaired under some of the system operating strategy alternatives, the intended uses would not be precluded or displaced on a long-term basis. The SOR agencies will consider replacement of facilities or other means for mitigation in cases where the seasonal impacts would be significant. Because the expected impacts would not displace intended uses from LWCFA areas, or because impacts would be mitigated, system operations would be consistent with the LWCFA.

11.11 GLOBAL WARMING

The SOR EIS includes an assessment of potential direct and indirect air quality impacts. Indirect impacts include the potential for increases in chemical emissions from power resources used to replace lost hydro generation. The assessment does not specifically analyze emissions of greenhouse gases and possible contribution to global warming. Instead, it identifies the magnitude of the potential power resource effects, indicates the approximate levels of air emissions that could be associated with obtaining replacement generation, and incorporates by reference the more detailed air quality analysis of BPA's Resource Programs EIS, which addresses global warming in detail.

11.12 PERMITS FOR STRUCTURES IN NAVIGABLE WATERS

The Rivers and Harbors Act of 1899 prohibits constructing bridges, dams, dikes, or causeways over harbors or navigable waters of the United States without approval of the Corps. The Act also prohibits any obstruction to the navigable capacity of any waters of the United States.

The SOR actions would not involve constructing obstacles in navigable waters, although operations being evaluated could impede navigation under certain circumstances. Under most of the alternatives, the impacts to commercial navigation would be minimal or nonexistent. Operation of several mainstem projects at minimum elevations would maintain

water levels at or above the authorized 14-foot (4.3-m) minimum channel required for barge shipping and transfer operations. Log transportation operations at Dworshak would generally experience minimal increases in elevation limitations compared to existing conditions. These operations are currently constrained during annual drawdown periods, generally from late September until early June. Some of the system operating strategies involve drawdown of one or more lower Snake River projects for several months of the year, while one would result in permanent drawdown of these projects to natural river levels. These alternatives would interrupt barge transportation on the affected pools for the duration of the drawdown and refill cycle, and would cause shifts in regional commodity transportation patterns.

11.13 PERMITS FOR DISCHARGES INTO WATERS OF THE UNITED STATES

A Department of the Army permit under Section 404 of the Federal Water Pollution Control Act (Clean Water Act) of 1972, as amended (see Section 10.16.2), is required from the Corps to discharge dredged or fill material into waters of the United States for non-Corps actions. Discharge or fill actions by the Corps require a Section 404 (1)(b) Evaluation to obtain a state water quality certification under Section 401 of the Federal Water Pollution Control Act. The SOR actions addressed in this EIS would not directly involve such discharges, although it is conceivable that future mitigation actions could trigger Section 404 requirements.

11.14 PERMITS FOR RIGHTS-OF-WAY ON PUBLIC LAND

If the proposed action involves the use of public or Indian lands not in accordance with the primary objective of the management of those lands, under the Federal Land Policy and Management Act (43 USC 1701 *et seq.*), a permit for a right-of-way across such lands will be required. No such action is proposed in the system operating strategies.

11.15 ENERGY CONSERVATION AT FEDERAL FACILITIES

Energy conservation at Federal facilities is not addressed in the EIS because the proposed actions do not involve the operation, maintenance, or retrofit of an existing Federal building; the construction or lease of a new Federal building; or the procurement of insulation products.

11.16 POLLUTION CONTROL AT FEDERAL FACILITIES

11.16.1 Clean Air Act

The Clean Air Act (CAA) establishes a comprehensive program for improving and maintaining air quality throughout the United States. The goals of the CAA are achieved through permitting of stationary sources, restricting the emission of toxic and other pollutants from stationary and mobile sources, and establishing AAQS. The CAA programs are implemented through combined Federal, state, and local efforts. The U.S. EPA has generally delegated responsibility for attaining and maintaining the national standards to the states through approval of state implementation plans (SIPs).

Several of the system operating strategy alternatives presented in this EIS would likely increase fugitive dust emissions from the exposed reservoir shorelines and bottom areas. The impact analyses indicated that these emissions would not likely violate existing standards for fine particulate matter in the air at receiving sources, and that the increased particulate matter would not likely affect the status of attainment areas (places where the AAQS are met) or nonattainment areas. The SIPs for Idaho, Montana, Oregon, and Washington do not prescribe any specific fugitive dust requirements beyond the applicable AAQS (see Appendix B, Air Quality). Therefore, by complying with the PM₁₀ standards, the SOS alternatives would also comply with the respective SIPs.

Reduced generation of hydroelectric power as a result of changes in river operations might indirectly cause additional air emissions from thermal power plants in the Pacific Northwest or in California. New Source Performance Standards and permitting requirements restrict the air emissions from such facilities to protect air quality. The EIS addresses this issue in general terms and incorporates by reference the air quality assessment in BPA's Resource Programs EIS.

11.16.2 Clean Water Act

The Clean Water Act (CWA) sets national goals and policies to eliminate discharge of water pollutants into navigable waters, to regulate discharge of toxic pollutants, and to prohibit discharge of pollutants from point sources without permits. The CWA also authorizes EPA to establish water quality criteria that are used by states to set specific water quality standards.

The primary water quality issues pertaining to the system operating strategy alternatives are increased turbidity, gas saturation levels, and water temperatures. The alternatives could cause departures from required water quality levels, as discussed in Section 4.2.2.

Dissolved gas supersaturation associated with Corps dams in the Columbia-Snake River system has routinely exceeded the EPA criterion and the Oregon and Washington state water quality standards of 110-percent saturation. While the Corps does not consider the release of water from its dams as point sources of discharge, it does everything practicable to meet state water quality standards. Further, the dissolved gas levels result from spilling water at the dams, which is done under agreement with Federal and state fish agencies to assist the downstream migration of juvenile salmon and steelhead. A larger volume of water spilled at the dams, over a longer time, could result in gas saturation values that exceed 130 percent.

Changes in water temperatures are expected to be minimal. Although operating the lower

Snake River projects near minimum pool would cause minimal turbidity, increased flow during spring and summer might increase turbidity for short periods. Turbidity levels would be increased on a seasonal basis under the alternatives (SOS 5, 6, 9a, or 9c) which involve deeper drawdowns on the lower Snake River projects and at John Day. Lowered pool operation might also cause local water quality changes due to modifications in mixing zone characteristics. These changes might violate state water quality standards and state and Federal standards and conditions in NPDES permits (for point source discharges to the river by other parties). Future monitoring activities will seek to address potential effects on compliance with NPDES permits.

11.16.3 Safe Drinking Water Act

The Safe Drinking Water Act (SDWA) is intended to protect the water quality of domestic water supplies and sole source aquifers, as defined under the Act. The EIS addresses the potential effects of system operations on groundwater resources. These effects would consist of seasonal changes in groundwater elevations within a short distance of system reservoirs, which experience significant elevation fluctuations.

11.17 INDIAN TREATIES

The existing Indian tribal and reservation structure in the Columbia River Basin is largely the result of treaties between the United States government and the tribes during the period of Euro-American settlement of the West. Isaac Stevens, Washington Territorial Governor, negotiated a series of major treaties with Columbia River Basin Tribes in 1855 which includes:

- Treaty with the Yakama, June 9, 1855, 12 Stat. 951;
- Treaty with the Nez Perce, June 11, 1855, 12 Stat. 957;

- Treaty with the Tribes of Middle Oregon, June 25, 1855, 12 Stat. 963;
- Treaty with the Flathead Kootenay, and Upper Pend d'Oreille, July 16, 1855, 12 Stat. 975.

A treaty is a contract between sovereign nations (Pevar, 1992). Article VI of the U.S. Constitution makes treaties superior to state laws and constitutions, and equal in weight to Federal laws. Treaties can be abrogated (nullified) by Congress, but must be enforced as long as they remain valid. Furthermore, the courts consider treaty rights to be private property that must be compensated if the rights are abrogated. The preservation of treaty rights is the responsibility of the entire Federal government. The SOR agencies consequently have an affirmative legal duty to protect treaty rights.

With respect to the SOR, key tribal rights based on these treaties include anadromous fish (where present), and resident fish and wildlife. The EIS addresses the expected effects of the SOR alternatives on these resources in general and on treaty rights specifically. The SOR preferred alternative reflects an attempt to contribute to recovery of anadromous fish stocks while balancing concern for resident fish and wildlife.

11.18 OTHER

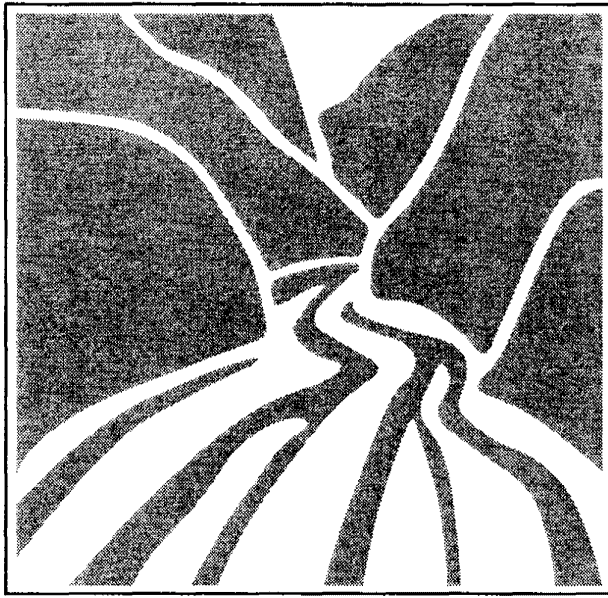
11.18.1 Estuary Protection Act

The purpose of the Estuary Protection Act is to establish a program to protect, conserve, and restore estuaries. It includes provisions for Federal management of estuarine areas in coordination with states and requires that all Federal projects consider impacts on estuarine areas. The Act does not affect an agency's authority for existing programs within an estuary. As described in Section 10.6, the impact of the SOR actions on the Columbia River estuary would likely be minor, and could be positive.

11.18.2 Watershed Protection and Flood Protection Act

The purpose of the Watershed Protection and Flood Protection Act is to protect watersheds from erosion, floodwater, and sediment damages. It provides assistance programs to local organizations to conduct investigations and surveys, prepare plans and estimates, develop soil and water conservation practices, and install improvement works for protection of watersheds. The effects of the SOR alternatives are not likely to conflict with watershed protection programs developed under this Act.





Chapter 12

Distribution of the Final EIS

12.0 DISTRIBUTION OF THE FINAL EIS

This chapter lists those who were sent the complete Final EIS or the main report. Not listed are the many individuals and organizations who requested only the EIS Summary or some appendices.

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Coeur d'Alene Tribe of Idaho
Columbia River Inter-Tribal Fish Commission
Colville Confederated Tribes
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 USDOC, National Technical Information Service, Oakridge, TN
 USDOE, Bonneville Power Administration, Portland, OR, and multiple local offices
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 USDOE, Office of Communication, Richland, WA
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Cominco Ltd. Utility Services, Trail BC, Canada
Conservation Northwest, Tacoma, WA
Convergence Research, Seattle, WA
Consolidated Diking District #1 of Wahkiakum County, Cathlamet, WA
Coos Curry Electric Cooperative, Inc., Myrtle Point, OR
Cope Program, Newport, OR
Cornell University, Department of Natural Resources, Ithaca, NY
County of Benton, Conservation District, Prosser, WA

County of Wahkiakum, Consolidated Diking Impr. District No.1, Cathlamet, WA
Cowlitz County PUD, Longview, WA
Creighton & Creighton Inc., Los Gatos, CA
CRIS, Inc., Umatilla, OR
Crookham Company, Caldwell, ID
Culp Guterson & Grader, Attorneys at Law, Seattle, WA
Cummings Brothers, Spokane, WA
Daily Astorian Chinook Observer, Long Beach, WA
Daily Sun News, Sunnyside, WA
Dames & Moore, Boise, ID
David Evans & Associates, Inc., Portland, OR and Bellevue, WA
David M. Dornbusch Company, Inc., San Francisco, CA
Davis Wright Tremaine, Portland, OR
Direct Services Industries, Inc., Portland, OR
Don Chapman Consultants, Inc., Redmond, WA
Douglas County PUD No. 1, East Wenatchee, WA
Douglas Electric Cooperative, Roseburg, OR
Douglas Parkinson & Associates, Bayside, CA
DPA, Vancouver, WA
Duncan Orchards, Skykomish, WA
Dworshak Excursions, Orofino, ID
East Columbia Basin Irrigation District, Othello, WA
East Fork Economics, Association of Public Agency Customers, La Center, WA
Eco Northwest, Eugene, OR
Eastern Washington University, Archeological and Historic Services and Departments of Biology and Economics, Cheney, WA
Edaw, Inc., Seattle, WA
EG & G Idaho, Inc., Idaho Falls, ID
Eldo R. Murphy & Associates, Salem, OR
Electric Sales & Service, Fall River Mills, CA
Elk Valley Miner, Fernie, BC Canada
Ellisforde Grange No. 1010, Tonasket, WA
Emerald PUD, Governing Board, Springfield, OR
Eugene Water & Electric Board, Eugene, OR
Evergreen Forest Products, Boise, ID
Ewing Street Moorings, Seattle, WA
F. H. Stoltze Land & Lumber Company, Columbia Falls, MT
Fales and Associates, Seattle, WA
Farm Credit Services, Spokane, WA
FBN Radio Network, Olympia, WA
Ferry Conservation District, Republic, WA
First Interstate Bank of Idaho, Weiser, ID
Fishman Environmental Services, Portland, OR
Flathead Basin Commission, Kalispell, MT
Flathead Lakers Inc., Lakeside, MT
Foianini Law Office, Ephrata, WA
Forest Resource Options, Inc., Issaquah, WA
Foss Maritime Company, Portland, OR
Foster Pepper Shefelman, Seattle, WA
Foster Wheeler Environmental Corporation, Bellevue, WA

Fremont-Madison Irrigation District, St. Anthony, ID
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G. H. Bowers Engineering, Seattle, WA
Gallatin Group, Portland, OR
Gary Danielson & Associates, Inc., Jamestown, CA
Gazette Tribune, Oroville, WA
General Electric Company, Tigard, OR
GES Consultants, Los Angeles, CA
Gilliam, SWCD, Condon, OR
Givens & Funke, Coeur d'Alene, ID
Goodman Group, Boston, MA
Golder Associates, Inc., Redmond, WA
Gonzaga University, Spokane, WA
Grant County PUD No. 2, Ephrata, WA
Grand Coulee Project Hydroelectric Authority, Ephrata, WA
Greater Sandpoint Chamber of Commerce, Sandpoint, ID
Grays Harbor County PUD No. 1, Aberdeen, WA
Great Feeder Canal Company, Rigby, ID
Grover & Walker Law Offices, Rigby, ID
HDR Engineering, Inc., Boise, ID and Bellevue, WA
H. H. Burkitt Project Management, Inc., Portland, OR
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Henry's Fork Foundation, Inc., Island Park, ID
Henwood Energy Services, Sacramento, CA
Heritage Research Center, Seattle, WA
Hermiston Development Corporation, Hermiston, OR
Hermiston Herald, Hermiston, OR
Hess Farms, Inc., Ashton, ID
High County News, Paonia, CO
Highline Community College, Department of History, Des Moines, WA
Hoffer Railroad Consultants, Inc., Boise, ID
Holland & Hart, Boise, ID
Horstman Trk., Inc., Kalispell, MT
Hurn Shingle Company, Inc., Concrete, WA
Hydro Review Magazine, Kansas City, MO
Hydroacoustic Technology, Inc., Seattle, WA
Ichthyological Associates, Inc., Lansing, NY
ICIE, Boise, ID
ICL, Ahsahka, ID
Idaho Cattle Association, Boise, ID
Idaho Power Company, Boise, ID
Idaho State University, Pocatello, ID
Idaho Statesman, Boise, ID
Idaho Water Users Association, Boise, ID
Idaho Women in Timber, Lewiston, ID

IMS, Natick, MA
Independent Hydro Developers Inc., Minneapolis, MN
Intercompany Pool, Spokane, WA
International Longshoreman's & Whse. Union No. 7, Bellingham, WA
IRZ Consulting, Hermiston, OR
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James River Corporation, Camas, WA
Jean Terra Communications, Boise, ID
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Johnstone Supply, Eugene, OR
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Juniper Flat District Improvement Company, Maupin, OR
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KIHR, News Director, Hood River, OR
Kittitas County PUD, Ellensburg, WA
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Kootenai Angler, Libby, MT
Kootenai Electric Cooperative, Inc., Hayden Lake, ID
Kramer Chin & Mayo Inc., Seattle, WA
KSRA, News Room, Salmon, ID
KV Rec Association, Bonners Ferry, ID
KYLT 100 FM, News Room, Missoula, MT
Lafferty Transportation Company, Coeur d'Alene, ID
Lake Roosevelt Property Owners Association, Ephrata, WA
Lane Electric Cooperative, Inc., Eugene, OR
Lanox Institute of Water Technology, Lenox, MA
League of Oregon Cities, Salem, OR
Les Tumidaj & Associates, Portland, OR
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Lewiston Chamber of Commerce, Lewiston, ID
Lewiston Tribune, Lewiston, ID
LFG Company, Seattle, WA
Libby Area Chamber of Commerce, Libby, MT
Lincoln Electric Coop., Inc., Davenport, WA
Ling, Nielsen, & Robinson, Rupert, ID
Litchfield Consultants Inc., Portland, OR
Lockheed Idaho Technologies Company, Idaho Falls, ID
Louis Berger & Associates, Inc., Seattle, WA
MacKay and MacDonald, Vancouver, WA
Malacha Hydro, Boise, ID
Mariners Haven, Eureka, MT
Mason County PUD No. 3, Shelton, WA
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Michigan State University, Department of Resource Development, East Lansing, MI
Microdesign Northwest, Olympia, WA

Mid-Columbia Economic Development District, The Dalles, Or
Mid-Columbia PUD Regional Coordination Office, Portland, OR
Middle Snake Regional Water Resource Commission, Wendell, ID
Mission Energy, Irvine, CA
Missoulain, Kalispell, MT
Modern Electric Water Company, Spokane, WA
Monahan & Robinson, Seattle, WA
Monsanto Company, Soda Springs, ID
Montana Power Company, Butte, MT
Moody's Investors Service, Inc., New York, NY
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Municipal Research & Services Center, Kirkland, WA
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Nickel Joint Venture, Riddle, OR
Non-Generating Public Utilities, Portland, OR
North Beach & Pacific Company, Seattle, WA
North Side Canal Company, Jerome, ID
Northeast Utilities Service Company, Hartford, CT
Northeast Washington Rural Resource, Colville, WA
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Northwest Economic Associates, Vancouver, WA
Northwest Irrigation Utilities, Portland, OR
Northwest Natural Gas Company, Astoria and Portland, OR
Northwest Power Pool, Portland, OR
Northwest Small Hydro Association, Salem, OR
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NW Cogeneration & Industrial Power Coalition, Seattle, WA
Ogden Environmental, San Diego, CA
Ohio State University, Columbus, OH
Okanogan County Electric Coop., Inc., Winthrop, WA
Okanogan County PUD No. 1, Okanogan, WA
Omak Okanogan County Chronicle, Omak, WA
Ore Ida Foods Inc., Boise, ID
Oregon Farm Bureau Federation, Salem, OR
Oregon Grains Commission, Portland, OR
Oregon Insider, Eugene, OR
Oregon State University, Departments of Agriculture & Resource Economy, Anthropology, Fish and Wildlife, and Geosciences, Corvallis, OR
Oregon State University, Extension Service, Enterprise, OR
Oregon State University, Water Resource Research Institute, Corvallis, OR
Oregon Water Coalition, Hermiston, OR
Oregon Wheat Growers League, The Dalles, OR
Orofino Chamber of Commerce, Orofino, ID
Oroville-Tonasket Irrigation District, Oroville, WA

Otley Brothers, Inc., Diamond, OR
Outdoor Press, Spokane, WA
Pacific County Economic Development Council, Raymond, WA
Pacific Gas & Electric Company, Department of Power Contracts, San Francisco, CA
Pacific Power and Light Company, Portland, OR
Pacific Marine Technology, Duvall, WA
Pacific NW Utilities Conference Committee, Portland, OR
Pacific Northwest Project, Kennewick, WA
Pacific Northwest Waterways Association, Vancouver, WA
Pacific States Marine Fisheries Commission, Gladstone, OR
PacifiCorp Regulatory & Agency Affairs, Portland, OR
Paine, Hamblin, Coffin, Brooke, & Miller, Spokane, WA
Parametrix Inc., Kirkland, WA
Parsons, Smith, Stone, & Fletcher, Burley, ID
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Plum Creek Timber Company, Seattle, WA
PMC Hydro, Inc., Bellevue, WA
Point Grey RPO, Vancouver, BC Canada
Pomeroy Grain Growers, Inc., Pomeroy, WA
Ponderay Newsprint Company, Usk, WA
Portland General Electric, Portland, OR
Potlatch Corporation, San Francisco, CA
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Power Resource Managers, Bellevue, WA
Preston Gates & Ellis, Seattle, WA
Priestley Associates, Berkeley, CA
Public Power Council, Portland, OR
Puget Sound Power & Light Company, Bellevue, WA
Quincy-Columbia Basin Irrigation District, Quincy, WA
Quincy Grange No. 990, Quincy, WA
R W Beck & Associates, Seattle, WA
Raft River Rural Electric Cooperative, Inc., Declo, ID
Ravalli County Electric Coop., Inc., Stevensville, MT
Reddy Communications, Inc., Albuquerque, NM
Regional Services, Inc., Challis, ID
Resource Management International, Inc., Portland, OR and Sacramento, CA
Resource Writers, Inc., Seattle, WA
Resources for the Future, Lake Oswego, OR, and Washington, DC
Robert L. Teeter, Inc., Harrisonburg, VA
Roosevelt Recreational Enterprises, Coulee Dam, WA
Royal Paacific Orchards, Royal City, WA
RR Warehouse, Inc., Ritzville, WA
R S Anderson & Associates, Inc., Vancouver, WA
S & K Holding Company, Inc., Polson, MT
S. Martinez Livestock, Inc., Moxee, WA
Sacramento Municipal Utility District, Sacramento, CA

Salem Public Schools, Keizer School District 24J, Salem, OR
Salt River Project, Phoenix, AZ
SCLDS, Seattle, WA
Seattle City Light, Seattle, WA
Seattle Post Intelligencer, Seattle, WA
Semi Tech International, Seattle, WA
Shapiro & Associates, Inc., Seattle, WA
Shaver Transportation Company, Portland, OR
Sierra Energy & Risk Assessment, Roseville, CA
Sithe Energies, Inc., San Diego, CA
Small Towns Institute, Ellensburg, WA
Snake Dancer Excursions, Lewiston, ID
Snohomish County PUD No. 1, Everett, WA
Solar Wind Energy Conversion, Libby, MT
South Columbia Basin Irrigation District, Pasco, WA
Southern California Edison Company, Rosemead, CA
Spokesman Review, Spokane, WA
Stanley Redwood Motel, Boise, ID
Star Newspaper, Grand Coulee, WA
Stegner Grain & Seed Company, Lewiston, ID
Stetson Engineers, San Rafael, CA
Stoel Rives Boley Jones & Grey, Portland, OR
Sustainable Resource Development Group, Underwood, WA
Sverdrup Corporation, Kirkland, WA
Synergic Resources Corporation, Oakland, CA
Tacoma Public Utilities, Tacoma, WA
Taylor Economic Research, Portland, OR
Tetra Tech, Inc., Alexandria, WA
Texas A&M University, College Station, TX
Tigard Sand & Gravel Company, Tigard, OR
Tillamook County PUD, Tillamook, OR
Tobacco Valley Economic Development Council, Eureka, MT
Traffic Safety Supply Company, Portland, OR
Trans Pacific Geothermal, Inc., Oakland, CA
Tree Top, Inc., Selah, WA
Tri Cities Technical Council, West Richland, WA
Truman Price, Inc., Bethesda, MD
Tualatin Valley Irrigation District, Forest Grove, OR
Turlock Irrigation District, Turlock, CA
Umatilla Electric Cooperative Association, Hermiston, OR
Union County Economic Development Corp., LaGrande, OR
Union Pacific System, Omaha, NE
University of Idaho, College of Law, Moscow, ID
University of Idaho, Departments of Agricultural Economics, Economics, Fish & Wildlife Resources, and Fisheries, Moscow, ID
University of Idaho, Kimberly and Moscow, ID
University of Montana, Departments of Environmental Studies and Geology, Missoula, MT
University of Montana, Flathead Lake Biological Station, Polson, MT
University of Washington, Departments of Civil Engineering and History, Institutes for Environmental Studies and Marine Studies, and School of Fisheries, Seattle, WA

University of Wyoming, Department of Geography and Recreation, Laramie, WY
Upper Columbia United Tribes, Eastern Washington University, Cheney, WA
Upper Grant Conservation District, Ephrata, WA
USA Dry Pea and Lentil Council, Moscow, ID
USA Emerald Corporation, Spokane, WA
US Bancorp, Portland, OR
Venture Motor Inn, Libby, MT
W&H Pacific, Boise, ID
Walla Walla College, Technical Services, Walla Walla, WA
Walla Walla Union Bulletin, Walla Walla, WA
Washington Association of Wheat Growers, Ritzville, WA
Washington Public Power Supply System, Richland, WA
Washington State Grange, Pasco, WA
Washington State University, Office of Applied Energy Studies; Social & Economic Sciences Research Center; Departments of Engineering, Rural Sociology, Agricultural Economics, and Applied Energy Studies; and Water Research Center, Pullman, WA
Washington State Water Resources Association, Yakima WA
Washington Water Power Company, Spokane, WA
Washington Wheat Commission, Spokane, WA
Washington Wool Growers Association, Roy, WA
Water Resource Management, Portland, OR
Watermaster District No. 6, La Grande, OR
Webster's Dictionary, Banks, OR
Wells Rural Electric Company, Carlin, NV
West Extension Irrigation District, Umatilla, OR
Western Empires Corporation, Irrigon, OR
Western Environmental Trade Association, Helena, MT
Western Farmer Stockman Magazines, Spokane, WA
Western Forest Industries Association, Portland, OR
Western Montana Electric Generating & Transmission Cooperative, Missoula, MT
Western New England College, School of Law, Springfield, MA
Western News, Libby, MT
Western Pulp Products Company, Corvallis, OR
Western Washington University, Department of Economics, Bellingham, WA
Westinghouse, Moxee, WA
Westinghouse Hanford Company, Richland, WA
Weyerhaeuser Company, Federal Way, WA
Wilbur Gem Mineral Club, Wilbur, WA
Wilbur Register, Wilbur, WA
Wild River Ranch, Kooskia, ID
Willamette Manufacturing Supply Company, Inc., Tualatin, OR
Wm. J. Melcher & Associates, Libby, MT
Wolfkill Feed & Fertilizer Corporation, Mattawa, WA
Wyatt Jaykim Engineers, Lewiston, ID
Yakima Valley Grape Producers, Inc., Grandview, WA

LIBRARIES

Blue Mountain Community College Library, Pendleton, OR
Boise Public Library, Boise, ID

Boise State University Library, Boise, ID
California State Library, Sacramento, CA
California State University Library, Documents Section, Sacramento, CA
Camas Public Library, Camas, WA
Canby Public Library, Canby, OR
Central Washington University Library, Ellensburg, WA
City of Albany, Public Library, Albany, OR
Clackamas County Library, Oak Grove, OR
County of Multnomah, Law Library, Portland, OR
Denver Public Library, Regional Depository, Denver, CO
East Bonner City Library, Sandpoint, ID
Eastern Oregon College Library, La Grande, OR
Eastern Washington University Library, Documents Department, Cheney, WA
Environment Canada Library, North Vancouver BC, Canada
Fort Vancouver Regional Library, Vancouver, WA
Huntington Public Library, Huntington, OR
Idaho State Library, Boise, ID
Idaho State Law Library, Boise, ID
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Kirkland Public Library, Kirkland, WA
Lake Oswego Public Library, Lake Oswego, OR
Lewis & Clark College Library, Lewiston, ID
Lewis & Clark College Library, Portland, OR
Library Association of Portland, Portland, OR
Lincoln County Library, Eureka, MT
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Montana State Library, Documents Section, Helena, MT
Montana State University Library, Bozeman, MT
North Central Regional Library, Wenatchee, WA
Odessa Public Library, Odessa, WA
Oregon State Library, Salem, OR
Oregon State University, Kerr Library Documents Division, Corvallis, OR
Oregon Supreme Court Library, Salem, OR
Pacific University Library, Forest Grove, OR
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Ritzville Public Library, Ritzville, WA
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Springfield Public Library, Springfield, OR
Tacoma Public Library, Tacoma, WA
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University of Montana, Mansfield Library, Missoula, MT
University of Nevada Library, Reno, NV

University of Oregon Libraries, Eugene, OR
 University of Washington Libraries, Seattle, WA
 University of Washington Law Library, Seattle, WA
 US Court of Appeals, 9th Circuit Library, Seattle, WA
 Washington State Law Library, Olympia, WA
 Washington State Library, Olympia, WA
 Washington State University Library, Pullman, WA
 Western Washington University, Mabel Zoe Wilson Library Documents Division Bellingham, WA
 Whitman College, Penrose Library, Walla Walla, WA
 Willamette University Law Library, Salem, OR
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 Wyoming State Library, Cheyenne, WY
 Yakima Public Library, Department of Reference, Yakima, WA

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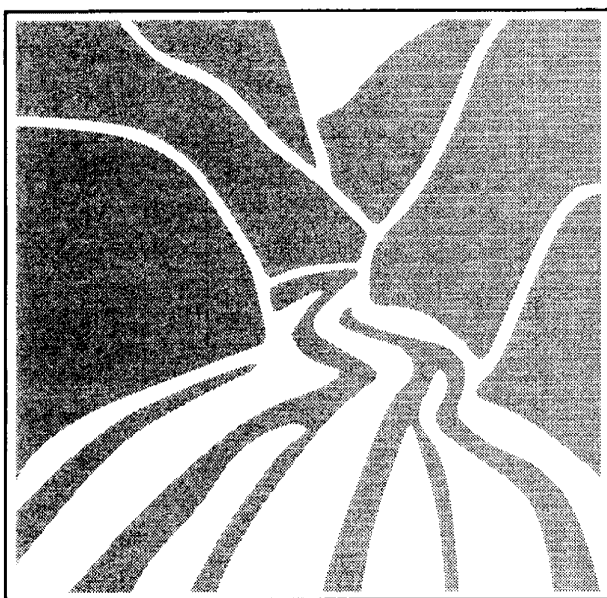
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Laura Stalsberg
Marjorie Stanley
Francis Stanton
J. Stegner
Michael M. Stensen
Jerry Stensgar
Don Stephens
Don Stevens
Mimi Stieler
W. Stiffler
A. K. Stirling
Quentin J. Stober
G. Stone
Douglas W. Strebin
J. Stringer
Rich Sturim
Roger Sullivan
Christopher J. Suter
Jerry M. Sweeney
E. Syrjala
Amy J. Tattersall
Aubrey Taylor
K. Taylor
S. Taylor
John T. Taylor
Bill Tehan
T. and K. Templeton
Michael Thiede
E. Thomason
Fred Thompsen
Olcott Thompson
Pete Thompson
Donald E. Thurber
Kevin Tice
W. Tiffany
S. Toller
Mike Tomasini
Tom Townsend
Scott Trefethen
J. Trimble
C. Trinkle
Eric Trued
Tom Trulove
L. Trumbull
Ted Tschirky
Robert Tuck
R. Turner
Mike Tuthill
George Tyler
M. Tyynismaa
J. Valerio
Margie VanCleve
Charles P. Vanepps
R. Vanfossen
W. Vonpertz
Ron Wagar
M. Walker
Anita Ward
M. Ware
Clint Watkins
K. Watson
Leland Watts
O. Weimann
Richard T. Weinham
J. Weiser
S. Weiss
D. Wernham
Robert S. West
R. White
P. Whitehill
Keith Wiest
Sarah Wik
Paul A. Wildung
Lena Williams
Harry E. Wilson
R. Wilson
Rita Windom
Vince Witt
D. Wittinger
Kenneth L. Witty
Jerry Wolcott
Gary F. Wolf
C. Wolfe
Glenn Wollweber
A. Wright
Eugene Yahvah
Rodger W. York
Alfred L. Youso
E. Zahn
R. and R. Zeller
Robert Zitterkopf
Ralph Zusman

**Chapter
13**

EIS Preparers



13.0 EIS PREPARERS

The System Operation Review EIS was prepared by an interdisciplinary team consisting of staff from the Bonneville Power Administration, the Bureau of Reclamation, and the Corps of Engineers.

Foster Wheeler Environmental Corporation (formerly Enserch Environmental), a consulting firm under contract to BPA, helped the interagency team in developing the EIS. Staff from three other contractors also contributed directly to the EIS.

Individuals responsible for preparing the main EIS volume are listed in Tables 13-1 through 13-5, organized by agency and contractor. Because of the number of people involved in coordinating this study, the information presented in these tables is limited to the names, education, experience, expertise, and general roles these individuals had in developing the EIS. Each technical appendix provides a separate list of preparers. Appendix contributors include a large number of staff from the three lead agencies, the three cooperating agencies, state agencies, Indian tribes, and contractor organizations. Contributions to the EIS and appendices by individual preparers were subject to revision during the internal review process.

Table 13-1. List of preparers, Bonneville Power Administration

<u>Name</u>	<u>Education/Years of Experience</u>	<u>Experience and Expertise</u>	<u>Role in SOR Preparation</u>
Linda Burbach	15 years	NEPA compliance	Contract management Review
Audrey Perino	M.A. Economics B.A. Mathematics 14 years	Economics Project management and coordination	Power analysis
Robyn MacKay	B.S. Mechanical Engineering 15 years	Long term hydrosystem operations planning	Anadromous fish analysis
Robert Shank	M.R.P. Regional Planning B.S. Biology 13 years	NEPA compliance Land use, recreation, environmental planning	Wildlife analysis Review
Philip Thor	B.S. Mechanical Engineering 19 years	Project management and coordination Operational analysis NEPA compliance	Project management Review
John Rowan	B.S. Biology/Soil Science 10 years	NEPA compliance Environmental analysis, project management, and coordination	Anadromous fish analysis
Kelly Wallace	B.A. International Studies 4 years	Contract management Public involvement	Contract management Recreation analysis

Table 13-2. List of preparers, Bureau of Reclamation

<u>Name</u>	<u>Education/Years of Experience</u>	<u>Experience and Expertise</u>	<u>Role in SOR Preparation</u>
John Dooley	B.S. Civil Engineering 29 years	Hydrology Reservoir operations Project management and coordination	Project Management Review
Jim Fodrea	B.S. Civil Engineering 20 years	Hydrology Reservoir operations/planning Project management	PNCA Work Group Coordinator Project Review
Ronald McKown	Ph.D. Speciation 24 years	NEPA compliance Biological studies	Grand Coulee Dam effects EIS coordination/SOR study management

Table 13-3. List of preparers, U.S. Army Corps of Engineers

<u>Name</u>	<u>Education/Years of Experience</u>	<u>Experience and Expertise</u>	<u>Role in SOR Preparation</u>
Witt Anderson	M.S. Resource Management B.S. Botany 17 years	Water resources planning	Project manager
Lynne Hamilton	M.A. Geography/Biology B.A. Geography 21 years	EIS coordination, writing, editing Community planning Outdoor recreation planning	NEPA coordination Review
Ray Jaren	B.S. Civil Engineering 35 years	Water resources planning	Project manager Technical project management
John Tyger	B.S. Resource Management 23 years	EIS Coordination Planning	NEPA Coordination Review

Table 13-4. List of preparers, Foster Wheeler Environmental (contractor)

<u>Name</u>	<u>Education/Years of Experience</u>	<u>Experience and Expertise</u>	<u>Role in SOR Preparation</u>
Chris Lawson Resource Planner	M.A. Geography B.S. Geography 16 years	Multidisciplinary environmental studies and planning Environmental assessments Regulatory compliance	Project manager Review
Judith Schneider Communications Specialist	B.A. English/History 26 years	Public involvement Communications Multidisciplinary environmental studies Project management	Assistant project manager Review
Dennis Burns Resource Planner	M.A. Recreation and Resource Development B.S. Economics 11 years	Recreation planning Natural resource economics Environmental planning Survey research	Flood control Navigation Irrigation Socioeconomics
John Cannon Ecologist	M.F.S. Forest Ecology B.A. Biology 20 years	Terrestrial ecology	Vegetation and wildlife
Peter Carr Public Involvement Specialist/ Technical Editor/Writer	B.S. Journalism 6 years	Technical editing and writing Public involvement	Writer/editor
Doug Davy Archeologist	Ph.D. Archeology M.A. Ethnology B.A. Anthropology 17 years	Prehistory Historic engineering and architecture Cultural resources management	Cultural resources
Domoni Glass Fisheries Biologist	B.S. Fisheries Biology 13 years	Fisheries management Fisheries biology	Resident fish
Mark Greenig Landscape Resource Planner	M.U.P. Urban Planning B.S. Landscape Arch. 13 years	Visual resources Recreation planning and design Site planning and design	Recreation and aesthetics
Ellen Hall Economist	Ph.D. Resource Economics M.Ag. Agricultural Economics B.A. History/Economics 20 years	Agricultural economics Economics Land Use	Agricultural economics Navigation economics
Garrett Jackson Geomorphologist	M.S. Geosciences B.S. Geosciences 7 years	Geomorphology Soil-vegetation associations Mapping stream channels Geologic hazard evaluation	Shoreline erosion Groundwater

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Table 13-4. List of preparers, Foster Wheeler Environmental (contractor)

<u>Name</u>	<u>Education/Years of Experience</u>	<u>Experience and Expertise</u>	<u>Role in SOR Preparation</u>
Amichay Greenstein	M.A. Development Economics A.S. Business Administration/Accounting 5 years	Economic analysis Socioeconomics Feasibility analysis	Economics
Coreen Johnson-Dean Technical Editor/Writer	B.A. English 6 years	Technical writing and editing Document production	Lead writer/editor Document production manager
Marthlyn Jones Environmental Medicine Specialist	M.D. M.P.H. Environmental Health B.A. Biology 15 years	Toxicology Environmental health risk assessment	Human health evaluation
John Knutzen Aquatic Scientist	M.S. Fisheries B.S. Biology 17 years	Aquatic resources Water quality Fisheries	Anadromous fish
Tom Martin Civil Engineer	B.S. Civil Engineering 14 years	Water quality modeling	Water quality
Patricia Reynolds Resource Planner	B.A. Economics 3 years	Socioeconomics Recreation and land use planning	Land use and economics
Tim Richards Graphic Artist	19 years	Graphic design/production Computer-generated graphics Illustration Architectural design	Graphics, illustrations
Stacie Seaver Technical Editor	B.A. English 4 years	Technical writing and editing Document production	Editing Document production
Lynn Skaves Graphic Artist	A.S. Business 12 years	Graphic design Desktop publishing Computer-generated graphics	Graphics
Bruce Stoker Geomorphologist	M.S.E. Civil Engineering M.S. Remote Sensing/Geology B.S. Geology 17 years	Geology Sediment transport Hydrology Slope stability	Geology and soils
Danene Warnock Graphic Artist	B.A. Anthropology 15 years	Graphic design Computer-generated graphics Desktop publishing	Graphics

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Columbia River SOR Final EIS

Table 13-4. List of preparers, Foster Wheeler Environmental (contractor)

<u>Name</u>	<u>Education/Years of Experience</u>	<u>Experience and Expertise</u>	<u>Role in SOR Preparation</u>
Kristin Avery Technical Editor	B.A. (pending) English-Writing Arts/Philosophy 5 years	Technical writing and editing Document production Public involvement	Editing Document production
Peter Hummer Air Quality Specialist	M.S. Physical Oceanography B.S. Meteorology and Oceanography 19 years	Air quality and meteorological monitoring, dispersion modeling, emission estimates	Air quality

Table 13-5. List of preparers, other contractors

<u>Name</u>	<u>Education/Years of Experience</u>	<u>Experience and Expertise</u>	<u>Role in EIS Preparation</u>
Sonya Bruce, Resource Writers Inc.	M.A. Journalism B.A. Community Service 17 years	Communications Writing and editing	Summary Editing
Jim Creighton, Creighton & Creighton	Ph.D. Psychology 25 years	Public involvement Dispute resolution Social impact assessment	Public involvement Forum process development
Steve Derby, Strategic Decisions Group	Ph.D. Engineering Economics 25 years	Decision analysis	Technical Review Forum process development
Susan Whittington, Resource Writers, Inc.	M.P.A. Public Administration B.A Political Science 19 years	Communications Writing and editing	Summary Editing



Chapter 14

Glossary of Terms and Acronyms

14.0 GLOSSARY OF TERMS AND ACRONYMS

AAQS: Ambient Air Quality Standards

ACEC: Areas of Critical Environmental Concern

ACHP: Advisory Council on Historic Preservation

AIRFA: American Indian Religious Freedom Act

Acre-foot: The volume of water that will cover an area of 1 acre to a depth of 1 foot.

AER: Actual Energy Regulation

AIRFA: American Indian Religious Freedom Act

AIWP: Annual Implementation Work Plan

Ambient air: Ambient air is the air surrounding a particular spot, such as a powerplant.

AMG: Analysis Management Group

Anadromous fish: Fish, such as salmon or steelhead trout, that hatch in fresh water, migrate to and mature in the ocean, and return to fresh water as adults to spawn.

Annual operating plan: A yearly plan for operating reservoirs on the Columbia River. Such a plan is specifically required by the Columbia River Treaty and by the Pacific Northwest Coordination Agreement.

Aquifer: Any geological formation containing water, especially one that supplies water to wells, springs, etc.

ARPA: Archeological Resources Protection Act

Artifact: An object of any type made by human hands. Tools, weapons, pottery, and sculptured and engraved objects are artifacts.

ASIL: Acceptable Source Impact Level

Assured refill curve: A curve showing minimum elevations that must be maintained at each storage project to ensure refill even if the third lowest historical water year occurred; it sets limits on the production of energy.

Augmenting: Increasing; in this application, increasing river flows above levels that would occur under normal operation by releasing more water from storage reservoirs.

Average megawatts (aMW): The average amount of energy (number of megawatts) supplied or demanded over a specified time.

Baseload: In a demand sense, a load that varies only slightly over a specified time period. In a supply sense, a plant that operates most efficiently at a relatively constant level of generation.

B.C. Hydro: The British Columbia Hydro and Power Authority. This Crown corporation was formed in 1962 following the merger of an expropriated private utility and the B.C. Power Commission.

BIA: Bureau of Indian Affairs

Biological rule curve: A reservoir operation guideline indicating monthly elevation targets, intended to provide improved conditions for resident fish. Biological rule curve (currently termed integrated rule curve) operations have been simulated in the SOR for the Hungry Horse and Libby storage projects in Montana.

BKD: Bacterial kidney disease of salmonid fish

BLM: Bureau of Land Management

BNRR: Burlington Northern Railroad

BP: Before the present time

BPA: Bonneville Power Administration

BRC: Biological Rule Curve

Bypass system: Structure in a dam that provides a route for fish to move through or around the dam without going through the turbines.

CAA: Clean Air Act

Canadian Entitlement: The Canadian Entitlement is Canada's 50-percent share of the downstream power benefits of Canada's three large storage dams, Duncan, Keenleyside, and Mica. These dams were built as part of the Columbia River Treaty. Canada offered the rights to this Entitlement for sale in the United States for an agreed upon period of 30 years, beginning with the operational dates of the Canadian storage project dams.

Canadian Entitlement Allocation Agreements (CEAA): Contracts that specify how much power is to be provided by five mid-Columbia projects as a result of increased flows made possible by the Columbia River Treaty projects.

Capacity: The maximum sustainable amount of power that can be produced by a generator or carried by a transmission facility.

Capacity/energy exchange: A transaction in which one utility provides another with capacity service in exchange for additional amounts of firm energy (exchange energy) or money, under specified conditions, usually during offpeak hours.

Carcinogen: A substance capable of causing cancer.

CBFWA: Columbia Basin Fish and Wildlife Authority

CEAA: Canadian Entitlement Allocation Agreements

CEQ: Council on Environmental Quality

cfs: Cubic feet per second

cms: Cubic meters per second

COE: U.S. Army Corps of Engineers

Cogeneration: The generation of power in conjunction with (usually) an industrial process, using waste heat from one process to fuel the other.

Columbia River Treaty: A treaty signed by the United States and Canada on September 16, 1964, for joint development of the Columbia River. Under the Treaty, Canada built three large storage dams (Duncan, Keenleyside, and Mica) on the upper reaches of the Columbia River, which originates in Canada. It is a U.S.-Canadian agreement for bilateral development and management of the Columbia River to achieve flood control and increased power production.

Columbia Storage Power Exchange (CSPE): A non-profit corporation of 11 Northwest utilities that issued revenue bonds to purchase the Canadian Entitlement and sold it to 41 Northwest utilities through a Bonneville Power Administration exchange agreement.

Consumer surplus: Economic value received by the consumer of a good, service, or resource (e.g., by a recreational user) that is above the price actually paid.

Corps: U.S. Army Corps of Engineers

Council: Northwest Power Planning Council

CPO: Coordinated plan of operations

CRBG: Columbia River Basalt Group

CRGNSA: Columbia River Gorge National Scenic Area

CRiSP: Columbia River Salmon Passage Model

CRITFC: Columbia River Inter-Tribal Fish Commission

Critical period: The portion of the 50-year streamflow record that would produce the least amount of energy with all reservoirs drafted from full to empty.

Critical rule curves: A set of curves that define reservoir elevations that must be maintained to ensure that firm energy requirements can be met under the most adverse historical streamflow conditions. Critical rule curves are derived for all four years in the critical period. They are used to guide reservoir operation for power.

CRM: Columbia River Mile

CROHMS: Columbia River Operational Hydromet Management System

CRSMA: Columbia River Salmon Mitigation Analysis; a Corps of Engineers study program that includes evaluations of short-term (such as the 1992 Lower Granite and Little Goose reservoir drawdown) and long-term measures.

CRWMG: Columbia River Water Management Group

CSPE: Columbia Storage Power Exchange

Cubic feet per second (cfs): A unit of measurement pertaining to flow or discharge of water. One cfs is equal to 449 gallons (1.7 m³) per minute.

Cultural resources: The nonrenewable evidence of human occupation or activity as seen in any district, site, building, structure, artifact, ruin, object, work of art, architecture, or natural feature that was important in human history at the national, state, or local level.

CWA: Clean Water Act

Damage center: A geographic location on the river system that has historically been subject to damage from flooding.

DEIS: Draft Environmental Impact Statement

Demand: The rate at which electric energy is used, whether at a given instant or averaged over any designated period of time.

Depletions: Withdrawals of water from a stream, thereby reducing the volume of instream flow.

Direct-service industries (DSIs): Industrial customers, primarily aluminum smelters, that buy power directly from BPA at relatively high voltages.

Discharge: Volume of water flowing at a given time, usually expressed in cubic feet per second.

Displacement: The substitution of less-expensive energy generation for more-expensive energy generation (usually hydroelectric energy transmitted from the Pacific Northwest or Canada is substituted for more expensive coal and oil-fired generation in California). Such displacement usually means that a thermal plant can reduce or shut down its production, saving money and often reducing air pollution.

Dissolved gas concentrations: The amount of chemicals normally occurring as gases, such as nitrogen and oxygen, which are held in solution in water, expressed in units such as milligrams of the gas per liter of liquid.

Draft: Release of water from a storage reservoir.

Drawdown: The distance that the water surface of a reservoir is lowered from a given elevation as water is released from the reservoir. Also refers to the act of lowering reservoir levels.

DSIs: Direct service industries

Edaphic: Pertaining to the soil.

EIS: Environmental impact statement

ELCM: Empirical Life-Cycle Model

Endangered: A plant or animal species which is in danger of extinction throughout all or a significant portion of its range because its habitat is threatened with destruction, drastic modification, or severe curtailment, or because of overexploitation, disease, predation, or other factors; Federally endangered species are officially designated by the U.S. Fish and Wildlife Service or the National Marine Fisheries Service and published in the *Federal Register*.

Endemism: Native or limited to a certain region (endemic).

Energy content curves: A set of curves that establishes limits on the amount of reservoir drawdown permitted for nonfirm energy production.

Entrainment: The drawing of fish and other aquatic organisms into tubes or tunnels carrying water for cooling purposes into thermal plants, or for power generating purposes into hydroelectric plants. Entrainment increases mortality rates for those organisms.

EPA: Environmental Protection Agency

ESA: Endangered Species Act

Escapement: Number of salmon that actually return to a stream to spawn.

Exotic species: Introduced species not native to the place where they are found.

F: Fahrenheit

FCRPS: Federal Columbia River Power System

FEIS: Final Environmental Impact Statement

FELCC: Firm Energy Load Carrying Capability

Firm Energy Load Carrying Capability (FELCC): The amount of energy the region's generating system, or an individual utility or project, can be called on to produce on a firm basis during actual operations. FELCC is made up of both hydro and non-hydro resources, including power purchases.

FERC: Federal Energy Regulatory Commission

Firm energy: The amount of energy that can be generated given the region's worst historical water conditions. It is energy produced on a guaranteed basis.

Fish Guidance Efficiency (FGE): The efficiency of juvenile fish screens at diverting downstream juvenile migrants from the turbine intakes, measured as the percentage fish approaching the powerhouse that are routed through the collection and bypass facilities.

Fish hatchery: A facility in which fish eggs are incubated and hatched and juvenile fish are reared for release to rivers or lakes.

Fish ladders: A series of ascending pools constructed to enable salmon or other fish to swim upstream around or over a dam.

Fish passage facilities: Features of a dam that enable fish to move around, through, or over without harm. Generally an upstream fish ladder or a downstream bypass system.

Flip lips: Also known as spill deflectors; structural modifications made to the spillways of some Columbia-Snake River projects to deflect flows and reduce the deep plunging flows that create high dissolved gas levels.

Flood control rule curve: A curve, or family of curves, indicating reservoir drawdown required to control floods. (Also called Mandatory Rule Curve or Upper Rule Curve.)

Flow: The volume of water passing a given point per unit of time.

FLUSH: Fish Leaving Under Several Hypotheses

FOB: Free-on-board, without charge for delivery to and placing on board a carrier at a specific point of origin.

Forebay: The portion of the reservoir at a hydroelectric plant which is immediately upstream of the generating station.

Forum: Columbia River Regional Forum

FPC: Fish Passage Center

FPDEP: Fish Passage Development and Evaluation Program

fps: Feet per second

Freshet: A rapid temporary rise in streamflow caused by heavy rains or rapid snowmelt.

Full pool: The maximum level of a reservoir under its established normal operating range.

FY: Fiscal year

Gas supersaturation: Concentrations of dissolved gas in water that are above the saturation (100 percent capacity) level of the water.

Generation: Act or process of producing electric energy from other forms of energy. Also refers to the amount of electric energy so produced.

ha: Hectare

HCNRA: Hells Canyon National Recreation Area

Historical streamflow record: The unregulated streamflow data base of the 50 years beginning in July 1928; data are modified to adjust for factors such as irrigation depletions and evaporations for the particular operating year being studied.

HMU: Habitat Management Unit

Housepit villages: Archeological sites where prehistoric peoples constructed villages of semi-subterranean pit houses.

Hydraulic head: The vertical distance between the surface of the reservoir and the surface of the river immediately downstream from the turbine and dam.

Hydraulic jump: A transition in water flow when water accelerates over a local steep gradient and enters a lower gradient immediately downstream. The water accelerates, its surface lowers, and accumulates energy. At the lower gradient, the flow accelerates, the water surface rises, and the accumulated energy is dissipated in an area of extremely turbulent flow.

Hydroelectric: Referring to the production of electric power through use of the gravitational force of falling water.

Hydrology: The science of dealing with the continuous cycle of evapotranspiration, precipitation, and runoff.

Hydrometeorological observations: Data that combine snowpack measurements and climatic forecasts to predict runoff.

Hydroregulation model: A computer-based mathematical model that simulates the regulation of water in the coordinated operation of a river system.

ICC: Interstate Commerce Commission

IDFG: Idaho Department of Fish and Game

IDWR: Idaho Department of Water Resources

IJC: International Joint Commission

Independent power producers: Non-utility producers of electricity who operate generation plants under the 1978 Public Utilities Regulatory Policy Act of 1978 (PURPA). Many independent power producers are cogenerators who produce power as well as steam or heat for their own use and sell the extra power to their local utilities.

Inflow: Water that flows into a reservoir or forebay during a specified period.

INHP: Idaho Natural Heritage Program

Intake: The entrance to a conduit through a dam or water facility.

Integrated rule curve: A reservoir operation guideline indicating monthly elevation targets intended to provide improved conditions for resident fish in balance with flood control and power generation needs. Integrated rule curve (formerly known as biological rule curve) operations have been simulated in the SOR for the Hungry Horse and Libby storage projects in Montana.

Interchange energy: Electric energy received by one utility system usually in exchange for energy to be delivered to another system at another time or place. Interchange energy is different from direct purchase or sale, although accumulated energy balances are sometimes settled in cash.

Interruptible: A supply of power which, by agreement, can be shut off on relatively short notice (from minutes to a few days).

Intertie: A transmission line or system of lines permitting a flow of energy between major power systems. BPA has several interties, both AC and DC, connecting the Pacific Northwest to the Southwest.

IPC: Idaho Power Company

IRC: Integrated Rule Curve

ITD: Idaho Transportation Department

Juvenile: The early stage in the life cycle of anadromous fish when they migrate downstream to the ocean.

KAF: Thousand acre-feet

kafs: Thousand cubic feet per second; a measurement of water flow equivalent to 1,000 cubic feet of water passing a given point in one second.

km: Kilometer (1,000 meters)

Ksfd: Thousand second-foot day, a measure of water volume equivalent to 1,000 cubic feet per second for an entire day.

kV: Kilovolt (1,000 volts)

kW: Kilowatts (1,000 watts)

kWh: Kilowatt hour

Lateral: A side ditch or conduit in an irrigation water delivery system.

Levee: An embankment constructed to prevent a river from overflowing.

Littoral zone: The shallower waters near the shore of a reservoir or lake.

Load: The amount of electric power or energy delivered or required at any specified point or points on a system. Load originates primarily at the energy-consuming equipment of customers.

Load shaping: The adjustment of storage releases so that generation and load are continuously in balance.

Local flood control: Flood protection for nearby downstream areas provided by a portion of the allocated flood storage space at a reservoir.

Lock: A chambered structure on a waterway closed off with gates for the purpose of raising or lowering the water level within the lock chamber so ships can move from one elevation to another along the waterway.

Low pool: At or near the minimum level of a reservoir under its established normal operating range.

LTSA: Long-Term Spill Agreement

LWCFA: Land and Water Conservation Fund Act

m³: cubic meters

Macrophytes: Aquatic plants that are macroscopic, or large enough to be seen with the naked eye.

MAF: Million acre-feet

Mainstem: The principal river in a basin, as opposed to the tributary streams and smaller rivers that feed into it.

MDFWP: Montana Department of Fish, Wildlife and Parks

Megawatt (MW): A megawatt is one million watts, a measure of electrical power.

Megawatt-hour (MWh): A unit of electrical energy equal to 1 million watts, or 1,000 kilowatts.

mg/l: Milligram per liter

Mid-Columbia: The section of the Columbia River from the Canadian border to its junction with the Snake River.

Mill: A tenth of one cent. A thousand mills equals one dollar. The cost of electricity is often expressed in mills per kilowatt hour.

Model: A mathematical function with parameters that can be adjusted so that the function closely describes a set of empirical data. A "mathematical" or "mechanistic" model is usually based on biological or physical mechanisms and has model parameters that have real-world interpretation. In contrast, "statistical" or "empirical" models involve curve-fitting to data where the math function used is selected for its numerical properties. Extrapolation from mechanistic models (e.g., pharmacokinetic equations) usually carries higher confidence than extrapolation using empirical models (e.g., logic).

MOP: Minimum operating pool; the minimum elevation of the established normal operating range of a reservoir.

MPC: Montana Power Company

MPN: Most probable number

MRCs: Mandatory flood control rule curves

MW: Megawatt

MWh: Megawatt hour(s)

NAAQS: National Ambient Air Quality Standards

NAGPRA: Native American Grave Protection and Repatriation Act

NED: National economic development

NEPA: National Environmental Policy Act

NFH: National Fish Hatchery

NGVD: National geodetic vertical datum (mean sea level)

NHPA: National Historic Preservation Act

Nitrogen supersaturation: A condition of water in which the concentration of dissolved nitrogen exceeds the saturation level of water. Excess nitrogen can harm the circulatory systems of fish.

NMFS: National Marine Fisheries Service

Nonfirm energy: Energy available when water conditions are better than the worst historical pattern; generally such energy is sold on an interruptible (nonguaranteed) basis. Sometimes called secondary energy.

Nonpower operating requirements: Operating requirements at hydroelectric projects that pertain to navigation, flood control, recreation, irrigation, and other nonpower uses of the river.

Non-Treaty Storage Agreement (NTSA): Three storage dams were built under the Columbia River Treaty—Mica, Duncan, and Keenleyside—together, these dams provide more storage than is required under the Treaty. This additional storage space was not covered by the Treaty. In November 1990, BPA and B.C. Hydro signed an agreement to share and coordinate the use of 4.5 million acre-feet of this storage.

Northwest Power Pool (NWPP): An associate of generating utilities serving the Pacific Northwest, British Columbia, and Alberta. Members include BPA, the Corps, Reclamation, and public and private utilities. The group's primary functions are administering the Pacific Northwest Coordination Agreement and coordinating operations and transmission.

Northwest Power Pool Coordinating Group: One of three subcommittees of NWPP, responsible for coordinating operations among generating utilities belonging to the pool.

NPDES: National Pollutant Discharge Elimination System

NPPC: Northwest Power Planning Council

NPS: National Park Service

NRHP: National Register of Historic Places

NTSA: Non-Treaty Storage Agreement

NTU: Nephelometric turbidity units; a measure of the amount of suspended sediment in the water.

NWR: National Wildlife Refuge

OA/EIS: 1992 Options Analysis/Environmental Impact Statement

ODFW: Oregon Department of Fish and Wildlife

Offpeak hours: Period of relatively low demand for electrical energy, as specified by the supplier (such as the middle of the night).

ONHP: Oregon National Heritage Program

Operating limits: Limits or requirements that must be factored into the planning process for operating reservoirs and generating projects. (Also see operating requirements, below.)

Operating requirements: Guidelines and limits that must be followed in the operation of a reservoir or generating project. These requirements may originate in authorizing legislation, physical plant limitations, or other sources.

Operating rule curve: A curve, or family of curves, indicating how a reservoir is to be operated under specific conditions and for specific purposes.

Operating year: The 12-month period from August 1 through July 31.

Outages: Periods, both planned and unexpected, during which the transmission of power stops or a particular power-producing facility ceases to provide generation.

Outflow: The volume of water per unit of time discharged at a hydroelectric project.

PA: Programmatic Agreement

Pacific Northwest Coordination Agreement: A binding agreement among BPA, the Corps, Reclamation, and the major generating utilities in the Pacific Northwest that stemmed from the Columbia River Treaty. The Agreement specifies a multitude of operating rules, criteria, and procedures for coordinating operation of the system for power production. It directs operation of major generation facilities as though they belonged to a single owner.

Pacific Northwest Electric Power Planning and Conservation Act: In December 1980, Congress passed this Act, Public Law 96-501 (referred to as the Northwest Power Act). This Act authorized the four Pacific Northwest States—Idaho, Montana, Oregon, and Washington—to enter into an interstate compact for long-range planning and protection of shared resources. As a result of the Act, each of the four States passed enabling legislation to create the Northwest Power Planning Council in April 1981.

PAHs: Polyaromatic hydrocarbons

PAM: Passage Analysis Model

Particulates: Substances that consist of minute separate particles, such as dust or soot.

PCBs: Polychlorinated biphenyls

PCPI: Per capita personal income

Peak load: The maximum electrical demand in a stated period of time. It may be maximum instantaneous load or the maximum average load within a designated period of time.

PGE: Portland General Electric

Phytoplankton: The plant portion of floating or weakly swimming organisms, often microscopic in size, in a body of water.

PL: Public Law

PMOA: Programmatic Memorandum of Agreement

PNCA: Pacific Northwest Coordinating Agreement; see definition above.

PNRBC: Pacific Northwest River Basins Commission

PNUCC: Pacific Northwest Utilities Conference Committee

Pool: Reservoir; a body of water impounded by a dam.

P_R: Pool elevation range

Project outflow: The volume of water per unit of time discharged from a project.

Proportional draft: A condition in which all reservoirs are drafted in the same proportion to meet firm loads.

PSC: Pacific Salmon Commission

PUD: Public utility district

Reclamation: U.S. Bureau of Reclamation

Record of Decision: ROD, a document notifying the public of a decision taken, together with the reasons for making that decision. Records of Decision are published in the *Federal Register*.

Recreation day: A unit of recreational use consisting of one person engaging in one recreational activity for any portion of a day.

Redds: Salmon spawning nests in gravel.

Refill: The point at which the hydro system is considered "full" from the seasonal snowmelt runoff. Also refers to the annual process of filling a reservoir.

Relative change in survival: The difference in survival between two alternatives divided by the base case survival value. The change in survival in relation to the base case survival.

Reliability: For a power system, a measure of the degree of certainty that the system will continue to meet load for a specified period of time.

Reregulation: Storing erratic discharges of water from an upstream hydroelectric plant and releasing them uniformly from a downstream storage plant.

Reservoir draft rate: The rate at which water, released from storage behind a dam, reduces the elevation of the reservoir.

Reservoir elevations: The levels of the water stored behind dams.

Reservoir storage: The volume of water in a reservoir at a given time.

Resident fish: Fish species that reside in fresh water throughout their lives.

Residualism: A condition in which migrating juvenile salmonid smolts lose their urge to migrate, physiologically revert to their freshwater life form, and remain in fresh water rather than migrate to sea.

Riprap: Broken rock, cobbles, or boulders placed on the bank of a stream or river for protection against the erosive action of water.

RM: River mile

RNA: Research Natural Areas

ROD: Record of Decision

ROSE: River Operation Simulation Experts (an SOR work group)

Rule curves: Water levels, represented graphically as curves, that guide reservoir operations.

Run-of-river dams: Hydroelectric generating plants that operate based only on available streamflow and some short-term storage (hourly, daily, or weekly).

Run-of-river reservoirs: The pools or impoundments formed behind run-of-river dams.

Salmonids: Fish of the family Salmonidae, such as salmon, trout (including steelhead), char, and whitefish.

SAM: System Analysis Model; a mathematical model developed and operated by BPA to simulate the operation of the integrated Northwest hydroelectric system.

Scoping: The process of defining the scope of a study, primarily with respect to the issues, geographic area, and alternatives to be considered. The term is typically used in association with environmental documents prepared under the National Environmental Policy Act.

SCS: System Configuration Study; a long-term evaluation being conducted by the Corps under the Columbia River Salmon Mitigation analysis.

SDWA: Safe Drinking Water Act

Secondary energy: Hydroelectric energy in excess of firm energy, often used to displace thermal resources. Sometimes called nonfirm energy.

Sedimentation: The settling of material (such as dust or other particles) into water and eventual deposition on the bottoms of streams and rivers.

Shaping: The scheduling and operating of generating resources to meet changing load levels. Load shaping on a hydro system usually involves the adjustment of reservoir releases so that generation and load are continuously in balance.

Shifting: In planning, moving surplus or deficit FELCC from one year of the critical period to another to increase the FELCC's value.

SHPO: State Historic Preservation Office

Simulation: The representation of an actual system by analogous characteristics of a device that is easier to construct, modify, or understand; or by mathematical equations.

SIPs: State implementation plans

SLCM: Stochastic Life Cycle Model

Smolt: A juvenile salmon or steelhead migrating to the ocean and undergoing physiological changes to adapt its body from a freshwater to a saltwater environment.

SOR: (Columbia River) System Operation Review

SOS: System Operating Strategy

Spawning: The releasing and fertilizing of eggs by fish.

Spill: Water passed over a spillway without going through turbines to produce electricity. Spill can be forced, when there is no storage capability and flows exceed turbine capacity, or planned, for example, when water is spilled to enhance juvenile fish passage.

Spillway: Overflow structure of a dam.

STFA: State and Tribal Fisheries Agencies

Stochastic: Involving chance or probability.

Storage reservoirs: Reservoirs that have space for retaining water from springtime snowmelts. Retained water is released as necessary for multiple uses—power production, fish passage, irrigation, and navigation.

Streamflow: The rate at which water passes a given point in a stream, usually expressed in cubic feet per second (cfs).

Subyearlings: Juvenile fish less than 1 year old.

Surplus energy: Energy generated that is beyond the immediate needs of the producing system. This energy may be sold on an interruptible basis or as firm power.

System flood control: Flood protection for the Portland, Oregon-Vancouver, Washington metropolitan area that is coordinated among all of the storage reservoirs in the Columbia River system.

Tailrace: The canal or channel that carries water away from a dam.

Tailwater: The water surface immediately downstream from a dam or hydroelectric powerplant.

TBR: Transport benefit ratio

TCR: Transport control ratio

Thermal powerplant: Generating plant that converts heat energy into electrical energy. Coal, oil, and gas-fired powerplants and nuclear powerplants are common thermal resources.

Threatened: Legal status afforded to plant or animal species that are likely to become endangered within the foreseeable future throughout all or a significant portion of their range, as determined by the U.S. Fish and Wildlife Service or the National Marine Fisheries Service.

TIR: Transport/In-river ratio

TRG: Transportation Review Group

Tules: The name commonly applied to fall chinook salmon originating on the lower Columbia River.

Turbidity: A measure of the optical clarity of water, which depends on the light scattering and absorption characteristics of suspended and dissolved material in the water.

Turbine: Machinery that converts kinetic energy of a moving fluid, such as falling water, to mechanical or electrical power.

UCUT: Upper Columbia United Tribes

$\mu\text{g/l}$: micrograms per liter

$\mu\text{g/m}^3$: micrograms per cubic meter

Upper rule curve (URC): The flood control rule curve for a storage reservoir which typically is the uppermost of the family of rule curves used to guide reservoir operations.

Upriver brights: The name commonly applied to fall chinook salmon originating on the middle Columbia River, primarily in the area below Priest Rapids Dam.

UPRR: Union Pacific Railroad

URC: Upper rule curve, see definition above.

Usable storage: Water occupying active storage capacity of a reservoir.

Usable storage capacity: The portion of the reservoir storage capacity in which water normally is stored or from which water is withdrawn for beneficial uses, in compliance with operating agreements.

USFS: U.S. Forest Service

USFWS: U.S. Fish and Wildlife Service

USGS: U.S. Geological Survey

Variable energy content curve (VECC): The January through July portion of the energy content curve. The VECC is based on the expected amount of spring runoff.

Velocity: Speed; the rate of linear motion in a given direction.

VECC: Variable energy content curve; see definition above.

Water Budget: A part of the Northwest Power Planning Council's Fish and Wildlife Program calling for a volume of water to be reserved and released during the spring, if needed, to assist in the downstream migration of juvenile salmon and steelhead.

Water conditions: The overall supply of water to operate the Pacific Northwest hydroelectric generating system at any given time, taking into account reservoir levels, snowpack, needs to provide water or retain water to meet various operating constraints (such as the Water Budget, flood control, flow constraints, etc.), weather conditions, and other factors.

Water particle travel time: The theoretical time that a water particle would take to travel through a given reservoir or river reach. It is calculated by dividing the flow (volume of water per unit time) by the cross-sectional area of the channel.

Water retention time: The length of time that a particle of water is resident in a lake or reservoir, based on rates of inflow, outflow, and circulation within the water body.

Water rights: Priority claims to water. In western states, water rights are based on the principle "first in time, first in right," meaning older claims take precedence over newer ones.

WDF: Washington Department of Fisheries

WDFW: Washington Department of Fish and Wildlife

WDW: Washington Department of Wildlife

WKP&L: West Kootenay Power & Light

WNHP: Washington National Heritage Program

WSDOT: Washington State Department of Transportation

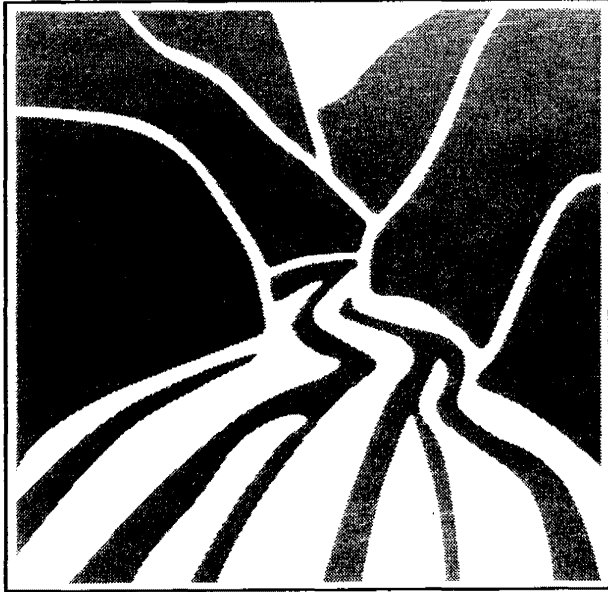
WRDA: Water Resources Development Act

Xerophytic: Plants that are structurally adapted for life and growth with a limited water supply.

Yearlings: One-year-old juvenile salmon and steelhead.

Zooplankton: Aquatic animals that cannot actively swim against the current and cannot make their own food by photosynthesis.





Chapter 15

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