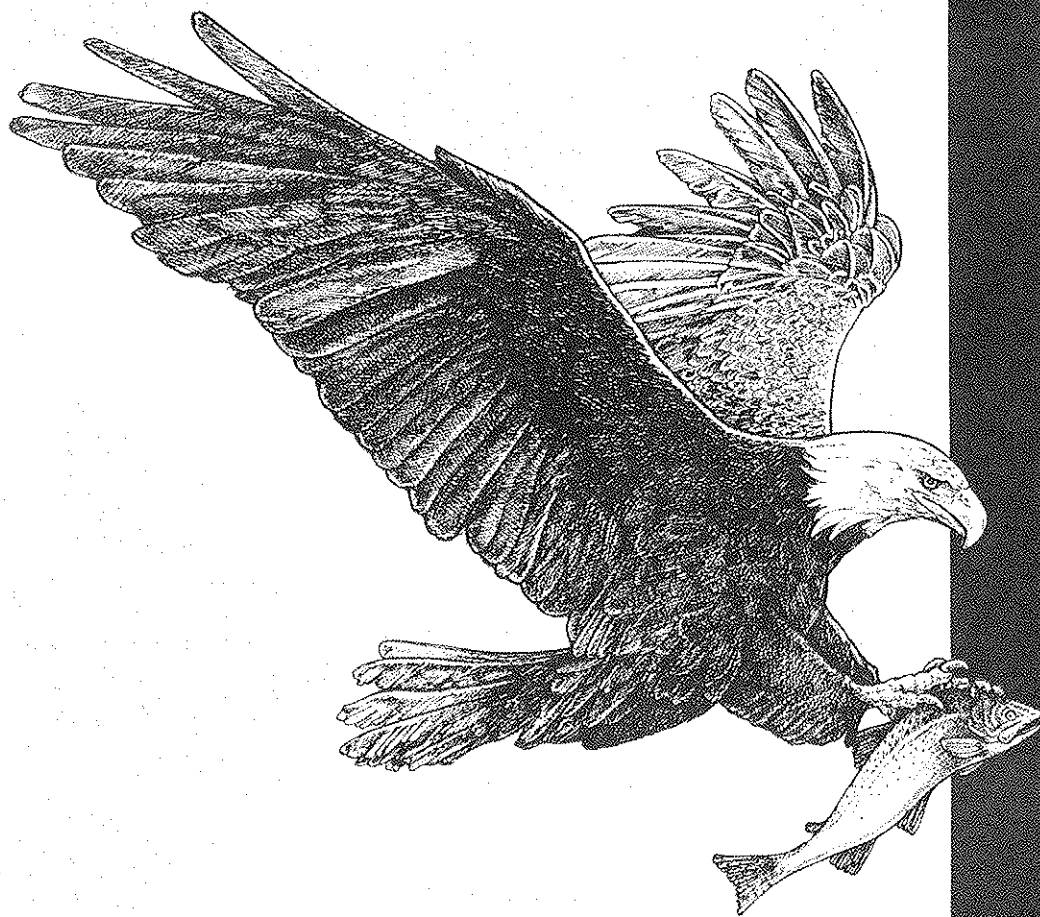
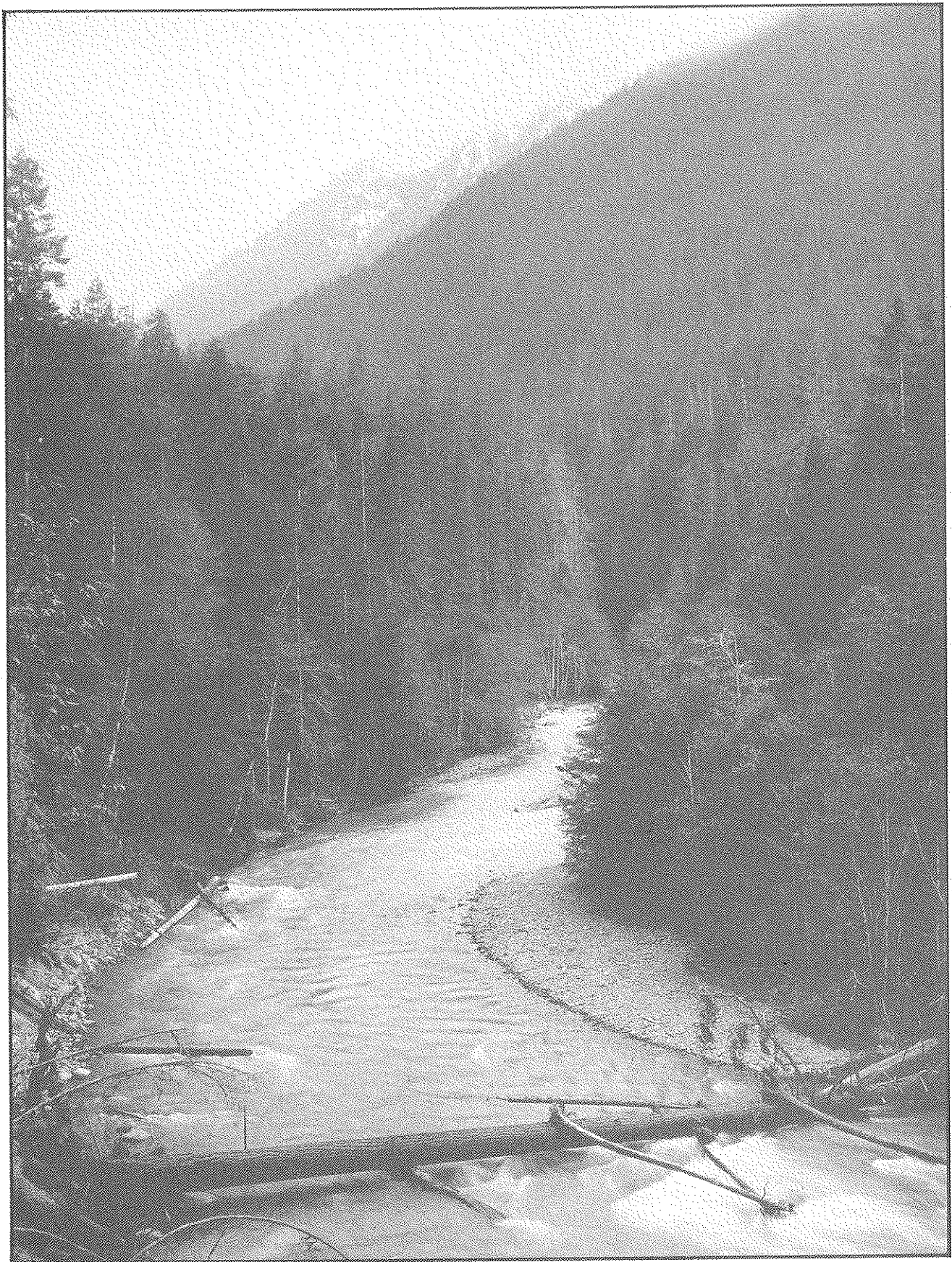
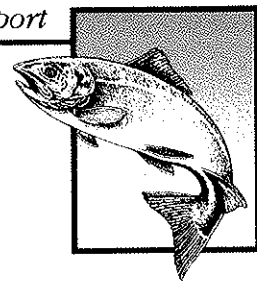


# *Executive Summary*





*Elwha River at Island Camp,  
May 27, 1907. (Asabel Curtis  
photo, Washington State  
Historical Society)*



# ***Executive Summary***

## ***Background***

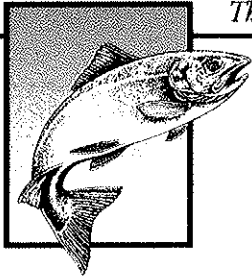
The Elwha and Glines Canyon dams were constructed on the Elwha River. Elwha Dam was constructed from 1910 to 1913 without fish passage facilities and does not have a Federal license to operate. The Glines Canyon Project was constructed from 1925 to 1927, was licensed by the Federal Power Commission for a period of 50 years in 1926, and has received annual licenses since 1976. The privately-owned projects' combined average annual generation of 18.7 megawatts of energy serves Daishowa America's Pulp and Paper Mill in Port Angeles, Washington supplying about 38% of the mill's power needs. The contemporary Federal licensing process began when the Crown Zellerbach Corporation (previous owner) submitted license applications to the Federal Power Commission (precursor to the Federal Energy Regulatory Commission (FERC)) for the Elwha Project in 1968 and the Glines Canyon Project in 1973 (Projects).

Since 1911, the Elwha and Glines Canyon dams have blocked anadromous fish passage to more than 70 miles of the Elwha River and its tributaries, limiting anadromous salmon and trout production to the lower 4.9 miles of the river below Elwha Dam. As a result, all 10 native Elwha River anadromous fish runs (i.e., spring and summer/fall chinook, coho, pink, chum, and sockeye salmon, winter and summer runs of steelhead, sea-run cutthroat trout, and native char) have been severely diminished and the ecosystem disrupted, especially within a large portion (19%) of Olympic National Park. Numerous wildlife populations within the basin are suspected to have declined.

During the 1980's, the FERC licensing process became extremely contentious and drawn out, due primarily to national policy implications of licensing a project within a National Park, the inability to design fish and wildlife mitigation measures capable of meeting Federal, State, and Indian Tribe resource goals, and legal challenges by conservation groups (i.e., Seattle Audubon Society, Sierra Club, Friends of the Earth, and Olympic Park Associates). Continued attempts to resolve FERC licensing issues were certain to result in protracted litigation, and considerable delay and expense for all parties, including the Federal Government. Failure to reach consensus would lead to the courts deciding vital issues without the opportunity for rational compromise. Verdicts would be narrowly defined by the issues taken before the courts, resulting in a piecemeal approach to the problem when a comprehensive solution is needed.

To resolve these conflicts, Congress enacted a legislative settlement of the issue. The Elwha River Ecosystem and Fisheries Restoration Act was signed into law as Public Law 102-495 by President Bush on October 24, 1992. P.L. 102-495 represents a negotiated solution that provides an avenue to negate lengthy and costly litigation, protect 300 jobs at the Daishowa America Mill, contribute to numerous jobs throughout the region through restoration activities and increased commercial and recreational fishing and tourism, support economic development for the Lower Elwha S'Klallam Tribe, restore a national park ecosystem, contribute to the understanding and improvement of restoration techniques, and assure the protection of

***Since 1911, the Elwha and Glines Canyon dams have blocked anadromous fish passage to more than 70 miles of the Elwha River and its tributaries . . .***



***The goal of the Elwha River Ecosystem and Fisheries Restoration Act is the "full restoration of the Elwha River ecosystem and native anadromous fisheries."***

municipal and industrial water supplies. Removal of the dams and restoration of the ecosystem and native anadromous fisheries would also promote tribal fisheries and the Federal trust responsibility to affected Indian Tribes.

### ***Public Law 102-495***

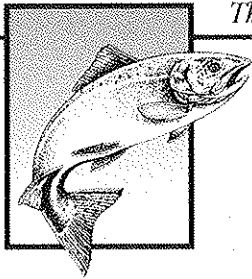
The goal of the Elwha River Ecosystem and Fisheries Restoration Act is the "full restoration of the Elwha River ecosystem and native anadromous fisheries" (Section 3(c)). The Act authorized the Secretary of the Interior to acquire the Projects and remove the dams if he determined that their removal was necessary to meet this goal. The Secretary was to develop a report documenting his conclusion and provide it to the Congress no later than January 31, 1994. Additionally, the Secretary was directed to include in the report information on dam retention alternatives that would provide less than full restoration.

### ***The Secretary's Determination***

Objectives of Elwha River restoration will be to emulate a natural functioning, self-regulating ecosystem. To evaluate ways to meet these objectives, Department of the Interior bureaus (including the National Park Service, Fish and Wildlife Service, Bureau of Reclamation, and Bureau of Indian Affairs) and cooperating entities, including the Lower Elwha S'Klallam Tribe and the Department of Commerce's National Marine Fisheries Service, developed additional information on dam removal, water quality protection, and fisheries and habitat restoration. As a result of these investigations, the Secretary has determined that removal of both the Elwha and Glines Canyon dams is the only alternative that would achieve the goal of full restoration of the Elwha River ecosystem and native anadromous fisheries. Although some anadromous fish stocks are extinct (sockeye salmon) or are only present in very small numbers (spring chinook and pink salmon), other stocks of fish that are physically and/or genetically close to Elwha River fish could be substituted.

The Secretary has also determined that removal of the Elwha and Glines Canyon dams, while providing for ecosystem and fisheries restoration and the protection of water users, is feasible. Therefore, this report also contains details regarding acquisition of the Projects including an analysis of responsibilities and liabilities, alternatives for dam removal and sediment management, plans for fish and habitat restoration and the protection of existing municipal and industrial water supplies, analyses of impacts to historic properties and the regional power supply, and a discussion of alternatives for disposition of project property.

Public Law 102-495 directed the Secretary to include in his report a "definite plan" for removal of the Elwha and Glines Canyon dams. Removal of the dams would constitute a major Federal action, thereby requiring compliance with the National Environmental Policy Act (NEPA). The Secretary's report demonstrates that dam removal is feasible and is necessary for full restoration of the ecosystem and native anadromous fisheries. The report describes plans consisting of four options for removal of the dams, nine scenarios for managing the accumulated sediments, and



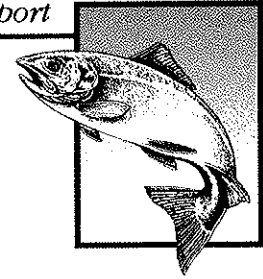
methods of fish and habitat restoration. The preliminary cost estimate for removal of the projects is \$66.7 to \$80.0 million (in 1992 dollars). However, additional costs for water user protection, fish and habitat restoration, flood control measures, and the acquisition of the projects (\$29.5 million) increase the total cost to \$147.59 to \$203.28 million, to be incurred over the 20 year restoration period. If all accumulated sediments were completely removed, the total cost would be \$307.36 million. Although this option is not recommended at this time, it would be included with an analysis of all sediment management options in the EIS/advanced planning report.

A restoration schedule is depicted in Figure 7. Illustrations of project costs associated with the retention or removal of the accumulated sediments within the reservoirs are contained in Figures 8 and 9. Project cost summaries for four sediment management options can be found in Tables 13 to 16.

## Conclusions

The removal of the Elwha and Glines Canyon dams is the only alternative that would result in the "full restoration of the Elwha River ecosystem and native anadromous fisheries" as prescribed by the Elwha River Ecosystem and Fisheries Restoration Act (Section 3(c)). A synopsis of the consequences of each restoration alternative is provided in Table 3. Retention of either or both dams, even with the provision of fish passage facilities and other measures, would not allow for the full restoration of native anadromous fisheries, in particular chinook, pink, and chum salmon. Additionally, retention of either or both dams would prevent the restoration of natural sediment transport processes, resulting in continued degradation of the river below the dams, the estuary, and near coastal areas. Retention of either or both reservoirs would prevent the restoration of important bottom land and riverine habitat for wildlife and anadromous fish, as well as prevent full nutrient transport, thus impacting freshwater organisms.

Removal of the Elwha and Glines Canyon dams, while protecting water users and accomplishing fish and habitat restoration, is feasible. The costs to fully restore the Elwha River ecosystem and native anadromous fisheries are generally on a par with restoration activities elsewhere in the region. However, it is important to note that restoration of the Elwha River would be essentially complete following removal of the Elwha and Glines Canyon dams and the completion of associated activities, whereas habitat impacts in other Pacific Northwest basins are likely to continue. Also, implementation of P.L. 102-495 would negate lengthy and costly litigation and provide significant benefits to an economically depressed region. Full restoration of the ecosystem and native anadromous fisheries would promote tribal fisheries and the Federal trust responsibility to affected Indian Tribes. Because it is a negotiated solution rather than a litigated decision, P.L. 102-495 provides a rare "win-win" opportunity for all affected parties.



survey and an ethnographic survey would be needed to document resources in the Project area. Following this work, the recommended course of action to protect archeological sites during and after dam removal would be to monitor the reservoir as sediments are moved. Recommended mitigation for removal of the dams is documentation of the structures according to standards set for the Historic American Engineering Record.

## ***Impacts on Regional Power Supply***

Recent economic growth, early shutdown of the Trojan nuclear plant, and reductions in the generating capability of the Columbia River hydropower system to support fisheries mitigation have produced a need to secure new electric power resources in the Northwest. Because of cost-effectiveness and environmental attributes, acquisition of conservation has been accorded the highest priority by the Northwest Power Planning Council (Council). The Council's goal for regionwide acquisition of at least 1,500 average megawatts of conservation over a 10 year period has been adopted by the Bonneville Power Administration, the state utility commissions, and the principal regional utilities. Current evidence indicates that actual rates of conservation are consistent with this goal. However, the acquisition of a mix of projects would probably be advanced to cover the small size of the Elwha and Glines Canyon projects (18.7 average megawatts).

## ***Cost-Sharing***

Restoration of the Elwha River ecosystem and native anadromous fisheries would result in benefits to a broad spectrum of public and private interests. However, certain parties (i.e., tribes) would be excluded from cost-sharing.

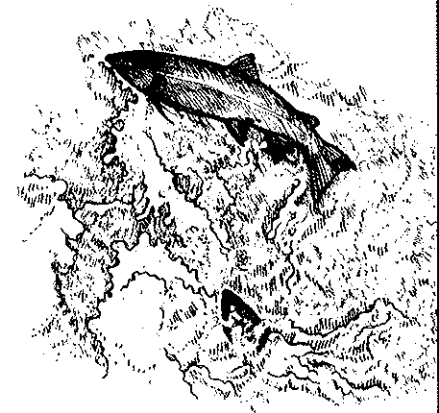
There are a number of Federal statutes -- both generic and project-specific -- that address the issue of cost-sharing for fish and wildlife mitigation, enhancement, or restoration at Federal water resources development projects of the Army Corps of Engineers, Interior's Bureau of Reclamation, and the Department of Agriculture's Soil Conservation Service.

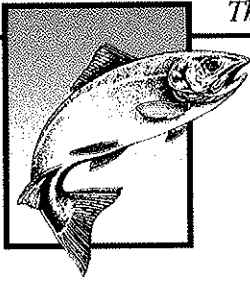
While these statutes do not apply directly to the removal of the Elwha and Glines Canyon dams, there is certainly precedent to require as much as 25 percent non-Federal cost-sharing for certain fish and wildlife resource activities.

Appropriate cost-sharing terms will be explored during development of the advanced planning report and NEPA compliance process. Based on the results of this review, a formal cost-sharing agreement would be negotiated prior to initiation of the selected alternative.

## ***Restoration Costs***

Additional investigations are necessary to identify the preferred dam removal and sediment management option. This would in turn allow the further identification of the measures that are necessary to protect existing water users and the best





restoration. Plantings of native vegetation in the area would be undertaken to mimic the pre-dam landscape while measures to control the invasion of exotic plants would be implemented. Over time, the drained reservoir areas would attain characteristics of the surrounding lands.

## ***Disposition of Project Lands***

Pursuant to the Act, the lands associated with the Glines Canyon Project would be managed in accordance with National Park Service authorities upon acquisition. The lands associated with the Elwha Project could be included in the Olympic National Park or National Wildlife Refuge System (NWRS), held in trust for the Lower Elwha S'Klallam Tribe (Tribe), or provided for use by the State, as long as such use supports the Federal investment in restoration.

The National Park Service has determined that Elwha Project lands qualify for inclusion into Olympic National Park. The U.S. Fish and Wildlife Service (FWS) has preliminarily recommended against establishing a National Fish and Wildlife Refuge administered solely by the FWS but is interested in cooperative management of the area. The Tribe has developed a land use proposal that would protect restoration while supporting needed housing and economic opportunities for the Tribe. The State of Washington has not expressed an interest in the lands. The potential for cooperative management of the Elwha Projects lands, for example the NPS, FWS, Tribe, and/or State, needs further analysis.

## ***Interpretation of Dam Removal***

Removal of the Elwha and Glines Canyon dams would be of national interest resulting in wide publicity. For many years, interest would increase visitation to Olympic National Park and Clallam County by people desiring a firsthand view and the inside story of this historic event. A range of options are available to provide an interagency/intergovernment presentation of dam removal efforts and ecosystem restoration. Such efforts would provide an important boost to the local economy and enhance regional partnerships.

*Devi Sharp, Department of Natural Resources, studies radio-tagged carcasses in Olympic National Park.  
(Janis Burger)*

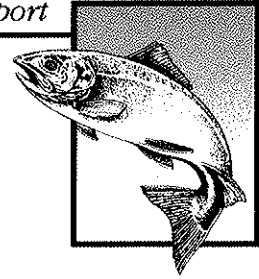


## ***Living Laboratory***

There is great interest in making use of the Elwha River basin as a "Living Laboratory." To fully explore this concept, a panel consisting of fish and wildlife biologists, ecologists, silviculturists, hydrologists, soil scientists, tribal representatives and other specialists would be convened to develop a study plan to monitor changes to the ecosystem resulting from dam removal. Federal funds may be secured to act as seed money to initiate and/or cost-share identified research investigations.

## ***Impacts to Cultural Resources***

If the dams are removed, the cultural resource that is the Elwha River can be restored, with benefits to both Indians and non-Indians. An initial archeological



anadromous fisheries. The definite plan includes a number of dam removal and sediment management options that would result in full restoration. However, additional studies in support of an EIS/advanced planning report will be required to select a preferred alternative.

## ***Water Quality Protection***

Several options (e.g., new wells, new inlet and settling basin, modification of existing systems) have been identified to protect the major Elwha River water users from the impacts of dam removal. Additional work would be required during the EIS/advanced planning stage to confirm the viability of each option, to identify any additional options, and to work with the affected entities to develop consensus regarding a preferred option for each diversion.

## ***Fish Restoration***

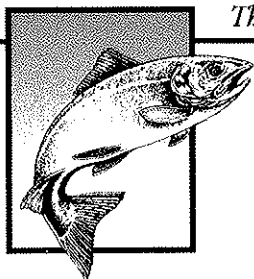
For most of the Elwha River stocks, the fish restoration plan recommends accelerating the recovery process through the outplanting of juvenile fish into the upper river. Although indigenous stocks would receive first priority in brood development and restoration, some salmon stocks are extinct or are only present in very small numbers. Other salmon stocks that are physically or genetically close to Elwha River salmon could be substituted. Sea-run cutthroat trout and native char would be allowed to recover naturally. To ensure that fish are available for outplanting when access to the upper river is restored, stock assessment and brood development has already begun. Stock status assessments will continue and will be expanded to identify the most promising sources of broodstock for restoration.

Hatchery support would be required to develop and maintain broodstock for outplanting. The two existing fish production facilities in the lower river (those of the Washington Department of Fisheries and the Lower Elwha S'Klallam Tribe) would be modified to produce juvenile fish for outplanting. Use of these facilities would reduce logistical costs and limit the possibility of future transfer restrictions due to fish disease concerns. Modifications to support this effort would include improvements to water supplies and the expansion of incubation and support capabilities. Juvenile outplanting would take place when safe downstream passage at the dam sites is assured and would occur for up to two fish generations (8 to 10 years) at levels consistent with the carrying capacity of the habitat and the ability to effectively reintroduce each stock to the upper river at its target time and size of release.

## ***Habitat Restoration***

The primary objective of habitat restoration in the areas inundated by Lake Mills and Lake Aldwell is the restoration of the ecosystem and native anadromous fisheries. The plan includes measures to restore the biological, hydrological, and physical processes that occurred prior to construction of the Projects. Although a precise replication of past conditions is impossible, historic photographs of the reservoir areas prior to inundation and other information provide a guide for





impounds 2.8 mile long Lake Mills. Fish passage facilities also were not provided at Glines Canyon Dam.

Measures to restore anadromous fish with the retention of either or both dams would include upstream and downstream fish passage facilities and operational changes. To pass fish at Elwha Dam, the necessary facilities would include an adult fish ladder, juvenile fish screen system, and spillway improvements. To pass fish past Glines Canyon Dam, a trap-and-haul operation would be necessary for adult fish and continuous spill and a facility for screening fish away from the turbine intake would be necessary for juvenile fish.

## ***Dam Removal***

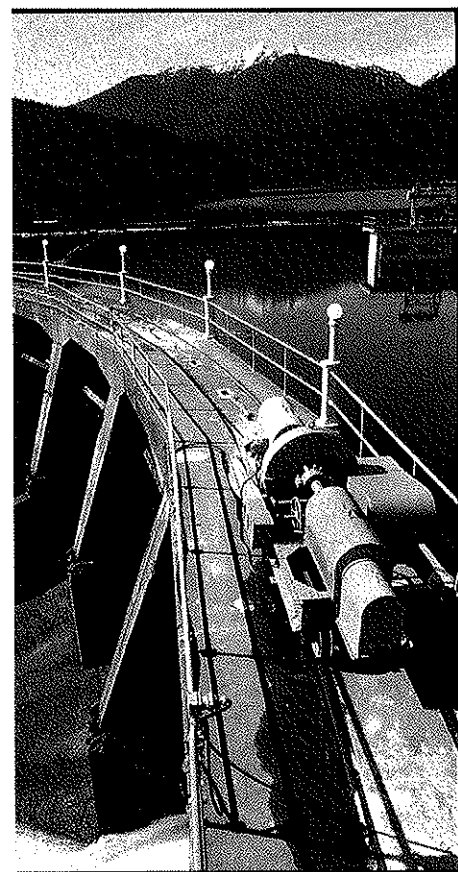
The removal of both dams would involve decommissioning the Elwha and Glines Canyon projects, removing most if not all of the existing auxiliary structures, returning the river to a free-flowing condition, and implementing habitat and fish restoration plans. The electrical energy produced by the Projects and consumed by the mill would be replaced by power provided by the Bonneville Power Administration. Measures to protect water users would be implemented.

The primary steps involved in removing the projects would include diverting the river around the dam structures, removing the structures, and managing the sediments that have accumulated in each reservoir. Four plans for diverting the river and demolishing the dam structures have been investigated, including diverting the river (1) in tunnels, (2) around the dams in a surface channel, (3) through the dam structures, and (4) over the dams by creating a notch through the structures.

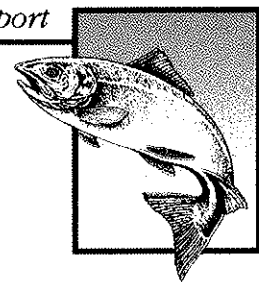
For nearly 80 years the reservoirs have acted as large settling basins, slowing the river flow and trapping material behind the dams. Most of this material has been trapped in the upstream reservoir, Lake Mills. The trapped material can be roughly divided into two categories. Coarse material ranging in size from small sand to large gravel has been deposited at the heads of the reservoirs to form deltas. Fine material consisting of smaller clay and silt sized particles is fairly evenly deposited throughout the beds of the reservoirs.

Three major options for managing the sediments have been identified: (1) the material could be removed from the inundated regions and relocated to a terrestrial or saltwater site; (2) the river could be allowed to erode a new channel through the trapped material with subsequent deposition in saltwater; and (3) only the material in the path of the river would be relocated and stabilized adjacent to the new channel leaving the remaining material in place for revegetation. Nine different scenarios involving combinations of each of the sediment management options described above have been recommended for further review during the EIS/advanced planning stage.

The information developed for this report demonstrates that it is feasible to remove the dams, protect existing water users, and fully restore the ecosystem and native



*Spillway bridge, Glines Canyon Dam. (Pat O'Hara)*



a process for analysis of these alternatives consistent with full restoration of the ecosystem and native anadromous fisheries. A preferred alternative would be selected during the Environmental Impact Statement (EIS)/advanced planning stage. The EIS/advanced planning report would be initiated following submittal of The Elwha Report to the Congress.

## ***Affected Environment***

The Elwha River, 45 miles long, is located on the Olympic Peninsula in northwest Washington. With a drainage area of 321 square miles, of which 83% is located within Olympic National Park, the Elwha River is the fourth largest river by drainage area on the peninsula. The maritime climate of the area is characterized by mild, wet winters and relatively cool, dry summers. Rainfall averages 60 to 80 inches per year. The average instantaneous discharge of the Elwha River is 1,507 cfs. Water is withdrawn from the river for private, municipal, industrial, and fish propagation purposes.

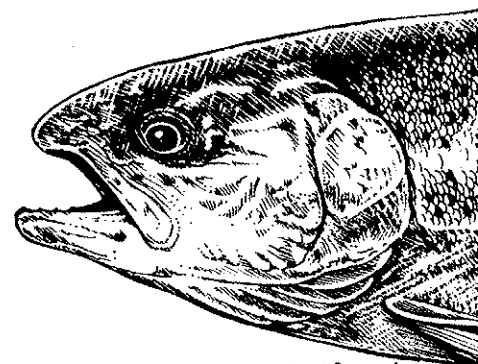
Although historical quantitative records of pre-dam run sizes of Elwha River anadromous fish are limited, the Elwha River was historically noted as one of the largest producers of salmon and steelhead on the Olympic Peninsula. Anadromous fish included stocks of spring and summer/fall run chinook, coho, pink, chum, and sockeye salmon, summer and winter runs of steelhead, sea-run cutthroat trout, and native char (Dolly Varden and bull trout). Current runs are only a small portion of their former size. At least one Elwha River salmon stock (sockeye salmon) may be extinct while two stocks (spring chinook and pink salmon) may only be present in extremely small numbers.

Because most of the valley lies within Olympic National Park, the Elwha River basin is primarily pristine. The Projects have, however, dramatically altered the landscape by inundating about 5.3 miles of river and 684 acres of lowland habitat. About 11.3 million cubic yards of sediment are trapped in Lake Mills and from 2.6 to 4 million cubic yards are trapped in Lake Aldwell. With the interception of bedload (cobble, gravel, and sand) by Lake Mills and Lake Aldwell, the spawning habitat downstream from both dams has been badly eroded such that much of the former spawning area now consists of substrate that is too large to be used by spawning fish. The trapping of bedload in the reservoirs has also contributed to the erosion of estuarine and near-shore marine habitat, including Ediz Hook at Port Angeles Harbor.

## ***Dam Retention Alternatives***

Elwha Dam is a concrete and earth-fill structure that is about 450 feet long at its crest and 105 feet high. The impoundment created by the dam, Lake Aldwell, is 2.5 miles in length. Elwha Dam was constructed without fish passage facilities.

Glines Canyon Dam is a varied radius, single arch concrete dam that is 210 feet high and varies in width from 55 feet at its base to 270 feet at its crest. The dam



*Steelhead*