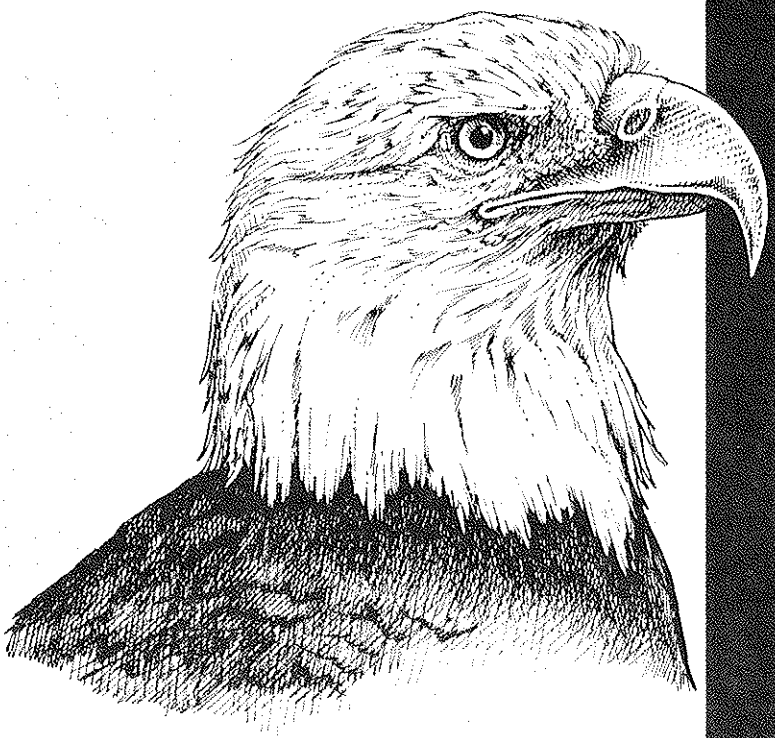
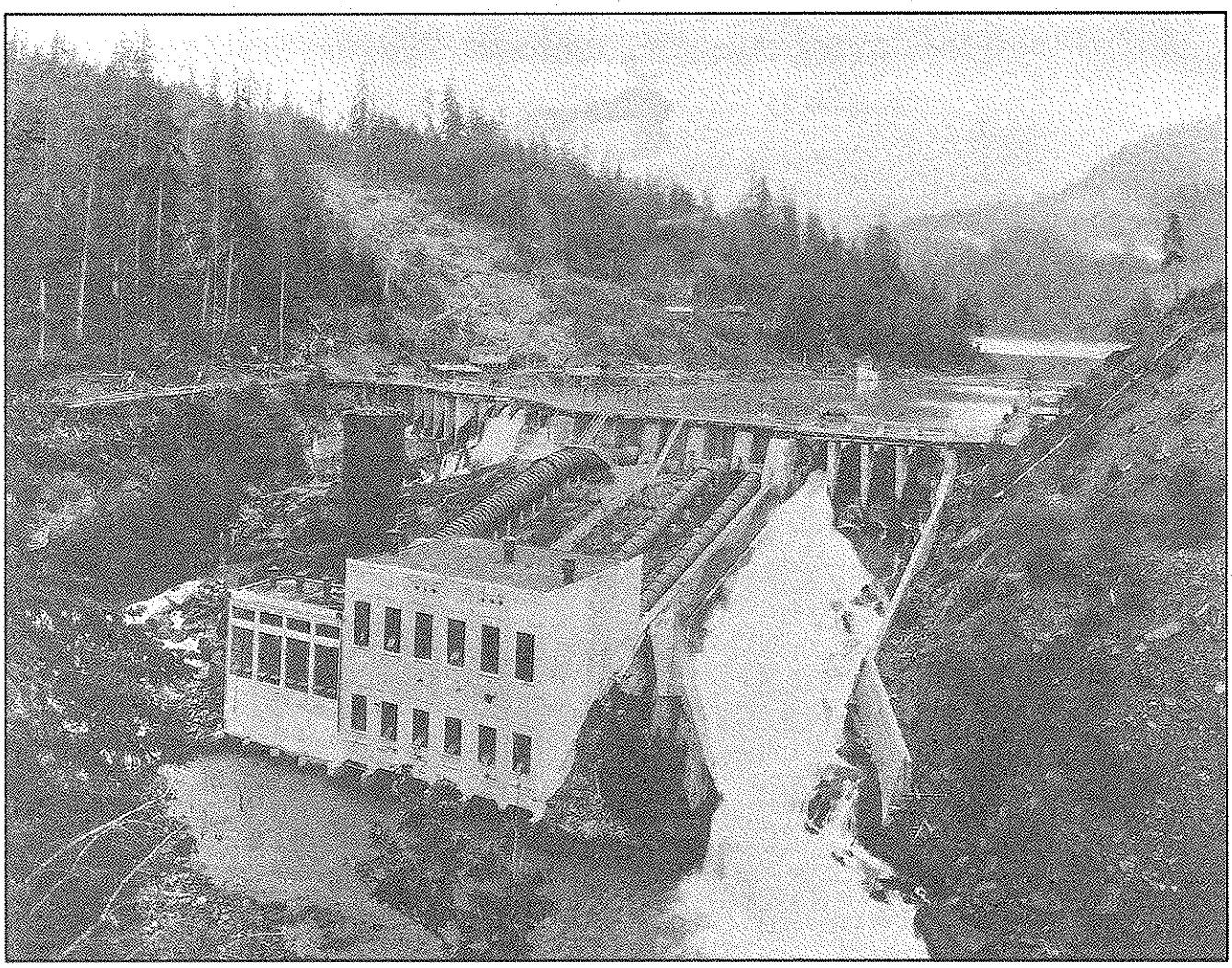
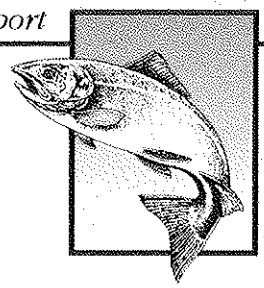
VII. Summary & Conclusions





Lake Aldwell and Elwha Dam soon after dam construction. (Asahel Curtis photo, Olympic National Park)



VII. Summary and Conclusions

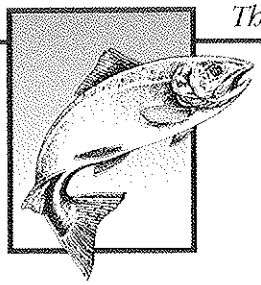
The removal of the Elwha and Glines Canyon dams is the only alternative that would result in the "full restoration of the Elwha River ecosystem and native anadromous fisheries" (P.L. 102-495, Section 3(c)). Retention of either or both dams, even with the provision of fish passage facilities and other measures, would not allow for the full restoration of native anadromous fisheries such as chinook, pink, and chum salmon, among others. In addition, retention of either or both dams would prevent the restoration of natural sediment transport processes resulting in the continued degradation of the middle and lower river, estuary, and near coastal areas. Retention of either or both reservoirs would prevent the restoration of important bottom land wildlife habitat and riverine habitat for anadromous fish, as well as prevent full nutrient transport downstream impacting freshwater ecology and the organisms that are dependent thereon. The ecosystem cannot be restored with the retention of either or both dams.

The removal of the Elwha and Glines Canyon dams, while providing for ecosystem and fisheries restoration and the protection of water users, is feasible. Several options are available for the demolition of the structures. Three general removal approaches are also available for managing the sediments that have accumulated in each reservoir: (1) the mechanical *Removal* of the sediments to a terrestrial location or marine disposal site; (2) the *Erosion* of the material downstream; or (3) the *Retention* and stabilization of the material within the confines of the existing reservoirs. Numerous scenarios are available within each approach and in the combination of approaches. Although higher cost options are available (e.g., the total removal of all sediments), significant cost savings are available for other approaches and justify further investigation. If one of these approaches is coupled with the least expensive approach to dam removal, the cost range for both activities is $66.7 to $80.0 million (in 1992 dollars).

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."

The sediment management approach ultimately selected would influence the approaches and costs associated with fisheries and habitat restoration and water quality protection. Nevertheless, it is estimated that fisheries restoration would include capital and operational costs of $9.7 million for an estimated 18-year restoration planning period. Since it is assumed that wildlife populations would recover on their own, no costs have been identified for wildlife restoration. Restoration of the habitat currently inundated by Lake Mills and Lake Aldwell is estimated to cost $5.9 million. Water quality protection activities need additional investigation, but they are estimated to range from $13.6 to $15 million, not including increased annual operation and maintenance costs. Additional costs are associated with the following: modifications to the Army Corps of Engineers constructed levee on the Lower Elwha Reservation to maintain the existing level of flood protection would cost $2.1 million; costs for documentation of historic and cultural sites (up to $350,000); interpretation activities and facilities (options ranging from $0.6 to $7 million); and costs for the acquisition of the Projects ($29.5 million and no more). If the cleanup of hazardous materials (e.g., PCBs) is identified as a need, another $1.5 million, more or less, could be required.

Decommissioning the powerplants could occur upon acquisition by the Federal Government or delayed until removal of the dams is imminent. Regardless, the dams would have to be operated and maintained during an interim period. The cost of



decommissioning the powerplants is estimated to be $500,000, although some of this cost could be recovered by selling the equipment. Operation and maintenance (O&M) costs would be $500,000 to $600,000 per year if the powerplants are decommissioned upon acquisition. O&M costs are estimated at $1.2 to $1.4 million annually if power is produced. The marketing of the power could offset those costs.

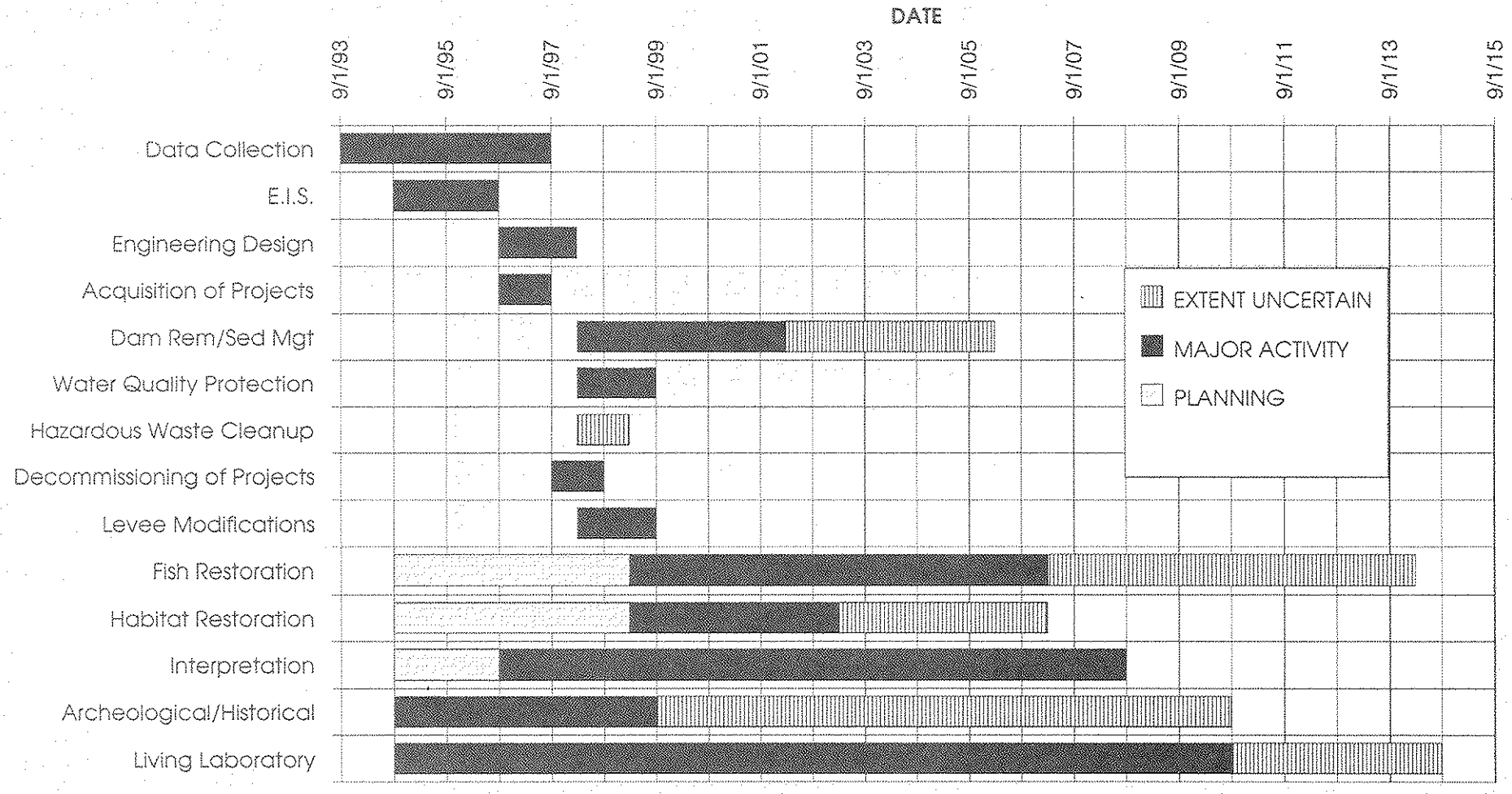
The removal of dams of this scale with benefits of this magnitude have not occurred before. Consequently, removal of the dams would attract considerable national and international interest. It would be beneficial to document the ecosystem and fisheries resources pre- and post-dams to learn as much as possible about such a restoration effort. Preliminary estimates indicate Federal costs would be about $400,000 to $500,000 per year for approximately 10 years, though cost-shares for much of the research may be possible. Such a research program would be expected to lead to greater efficiencies in restoration efforts throughout the Pacific Northwest.

Additional analyses are necessary to identify a preferred sediment management option. The option ultimately selected would influence other activities associated with the restoration effort, and some cost savings could be identified. However, additional water users needing protection, although not specifically listed in P.L. 102-495, could be identified requiring additional protection measures. Other costs might also be uncovered. If Congress chooses to fully implement the Elwha River Ecosystem and Fisheries Restoration Act, the selection of a preferred sediment management option would occur during development of an Environmental Impact Statement (EIS)/advanced planning report, following submission of the Elwha Report to the Congress.

The total cost of removing the Elwha and Glines Canyon dams is most influenced by the sediment management option selected. Options 1, 5, and 7 provide a realistic cost range for sediment management activities. If all related restoration costs are included with each of these options, total costs would range from $147.59 to $203.28 million (Tables 13, 15, and 16) for the 20 year restoration period (Figures 7 to 9). For comparison purposes, total costs associated with sediment management option 2 (total removal of all accumulated sediments) would be $307.36 million (Table 14). Although option 2 is not recommended at this time, it would be evaluated, along all other sediment management options, in the EIS/advanced planning report.

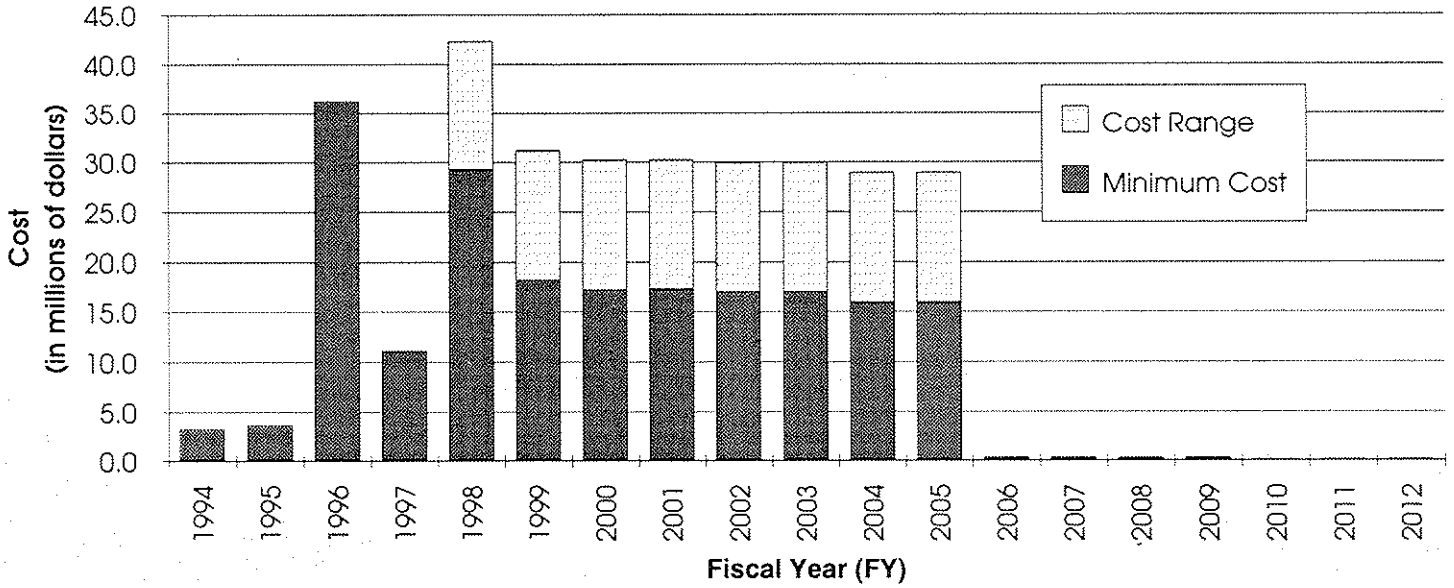
The costs to fully restore the Elwha River ecosystem and native anadromous fisheries are generally on a par with salmon restoration activities elsewhere in the region. However, it is important to note that restoration of the Elwha River would be essentially complete following removal of the Elwha and 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. Removal of the dams and 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.

Figure 7
ELWHA RIVER RESTORATION
Project Schedule



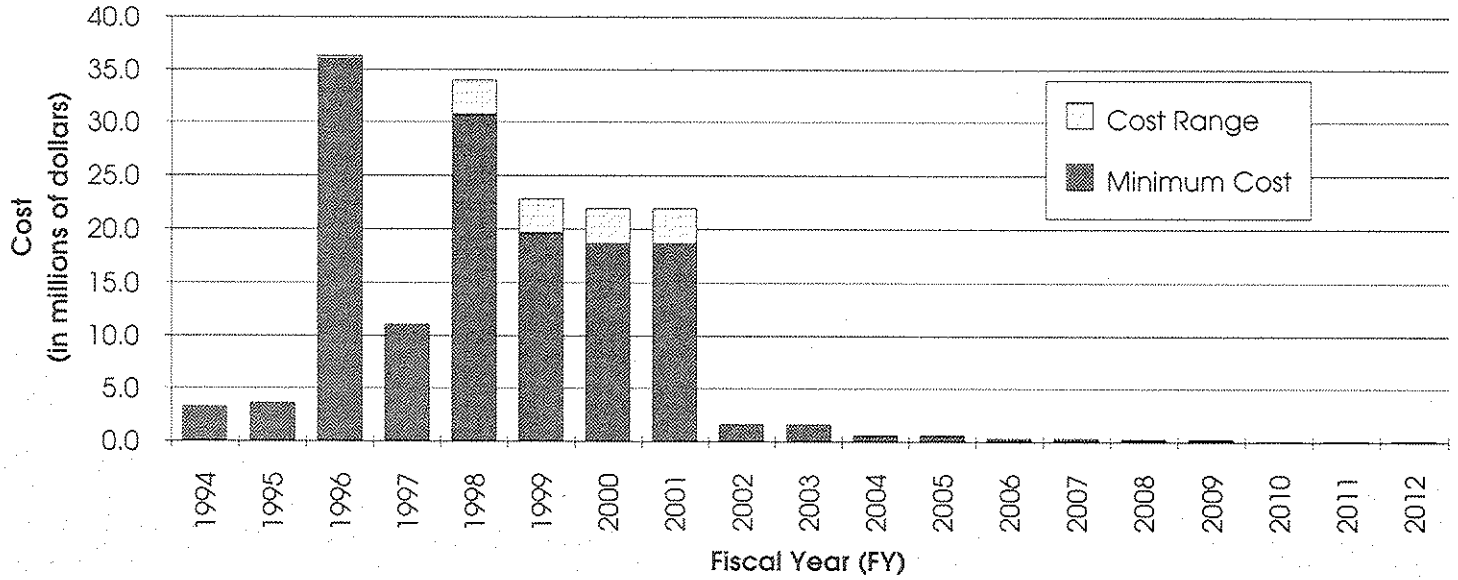
Extent of uncertain activities will be defined in EIS/advanced planning process.

Figure 8
TOTAL PROJECT COST*
Sediment Management 'Removal' Option
Summary of Annual Capital, Operating, and Maintenance Costs
FY 1994 - FY 2012



*Total project cost includes cost for activities shown in Tables 13 and 14.

Figure 9
TOTAL PROJECT COST*
Sediment Management 'Retention' Option
Summary of Annual Capital, Operating, and Maintenance Costs
FY 1994 - FY 2012



*Total project cost includes cost for activities shown in Tables 15 and 16.

Table 13
TOTAL PROJECT COST SUMMARY
for
Sediment Management Option #1

Activity	FY 1994	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	Totals
Data Collection	0.47	0.51	0.40	0.40																1.78
E.I.S. *	2.10	1.94																		4.04
Engineering Design			3.20	1.80																5.00
Acquisition of Projects			29.50																	29.50
Dam Rem/Sed Mgt					15.27	15.27	15.27	15.27	15.27	15.26	15.26	15.26								122.13
Water Quality Protection				7.15	7.15	0.57	0.57	0.57	0.57	0.57										17.15
Hazardous Waste Cleanup					1.50															1.50
Decommissioning of Projects					1.00															1.00
Levee Modifications					2.10															2.10
Fish Restoration	0.39	0.35	1.94	0.22	0.23	0.36	0.36	0.38	0.38	0.38	0.38	0.37	0.20	0.17	0.11	0.10	0.10	0.10	0.08	6.60
Habitat Restoration	0.06	0.11	0.76	0.96	0.96	0.96	0.37	0.37	0.12	0.12	0.12	0.12								5.03
Interpretation					0.50	0.50	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14				2.40
Archeological/Historical	0.08	0.13		0.10	0.10	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.69
Restoration/Scientific Studies	0.18	0.60	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45										4.38
ANNUAL TOTAL, ALL ACTIVITIES	**3.27**	**3.63**	**36.25**	**11.08**	**29.26**	**18.13**	**17.18**	**17.20**	**16.95**	**16.94**	**15.92**	**15.91**	**0.36**	**0.33**	**0.27**	**0.26**	**0.12**	**0.12**	**0.10**	**203.28**

***All 1994 and 1995 activities are necessary for EIS/advanced planning.**

Table 14
TOTAL PROJECT COST SUMMARY
for
Sediment Management Option #2

Activity	FY 1994	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	Totals
Data Collection	0.47	0.51	0.40	0.40																1.78
E.I.S. *	2.10	1.94																		4.04
Engineering Design			3.20	1.80																5.00
Acquisition of Projects			29.50																	29.50
Dam Rem/Sed Mgt					28.28	28.28	28.28	28.28	28.28	28.27	28.27	28.27								226.21
Water Quality Protection				7.15	7.15	0.57	0.57	0.57	0.57	0.57										17.15
Hazardous Waste Cleanup					1.50															1.50
Decommissioning of Projects					1.00															1.00
Levee Modifications					2.10															2.10
Fish Restoration	0.39	0.35	1.94	0.22	0.23	0.36	0.36	0.38	0.38	0.38	0.38	0.37	0.20	0.17	0.11	0.10	0.10	0.10	0.08	6.60
Habitat Restoration	0.06	0.11	0.76	0.96	0.96	0.96	0.37	0.37	0.12	0.12	0.12	0.12								5.03
Interpretation					0.50	0.50	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14				2.40
Archeological/Historical	0.08	0.13		0.10	0.10	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.69
Restoration/Scientific Studies	0.18	0.60	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45										4.38
ANNUAL TOTAL, ALL ACTIVITIES	3.27	3.63	36.25	11.08	42.27	31.14	30.19	30.21	29.96	29.95	28.93	28.92	0.36	0.33	0.27	0.26	0.12	0.12	0.10	307.36

***All 1994 and 1995 activities are necessary for EIS/advanced planning.**

Table 15
TOTAL PROJECT COST SUMMARY
for
Sediment Management Option #5

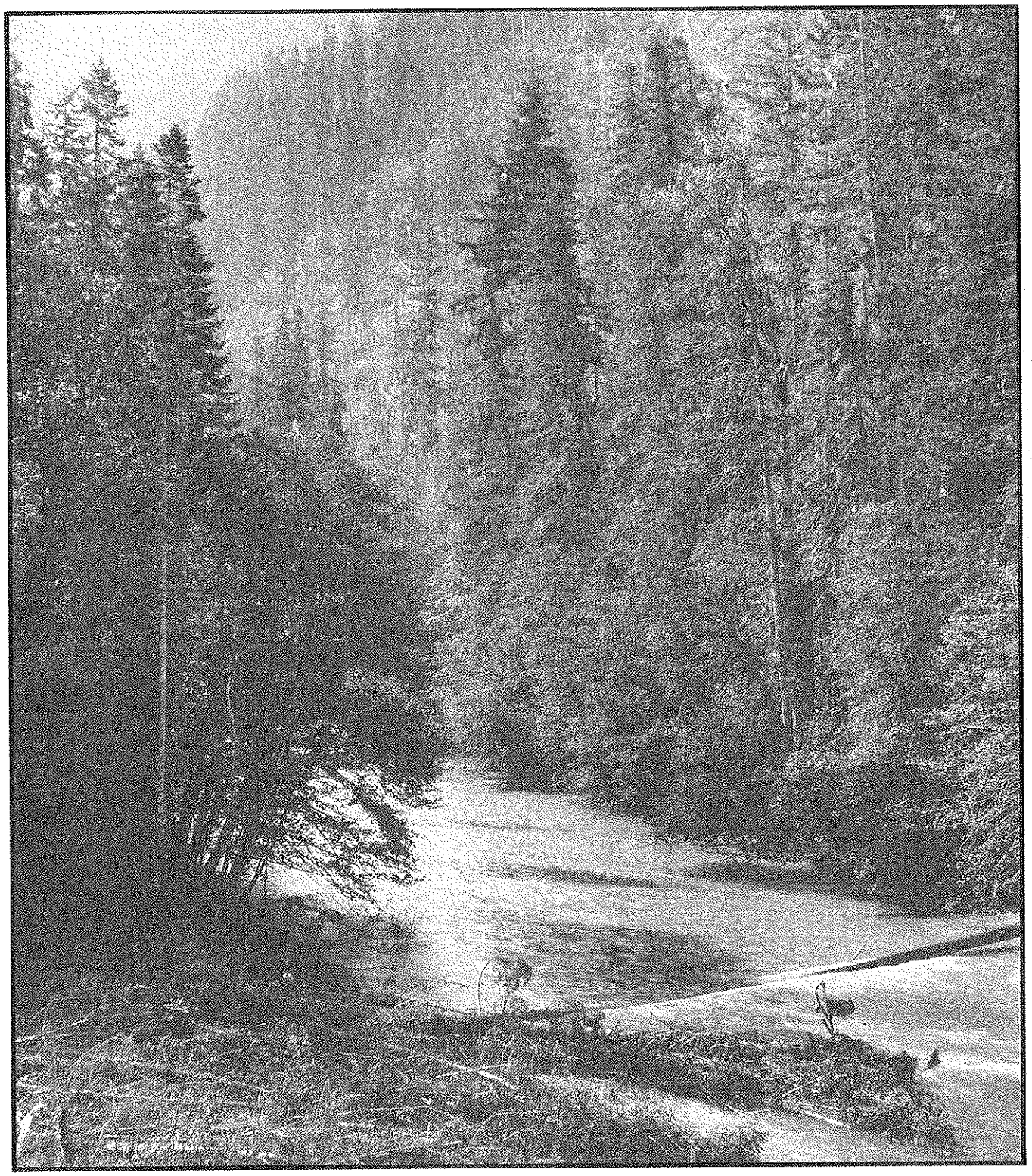
Activity	FY 1994	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	Totals
Data Collection	0.47	0.51	0.40	0.40																1.78
E.I.S. *	2.10	1.94																		4.04
Engineering Design			3.20	1.80																5.00
Acquisition of Projects			29.50																	29.50
Dam Rem/Sed Mgt					19.99	19.98	19.98	19.98												79.93
Water Quality Protection				7.15	7.15	0.57	0.57	0.57	0.57	0.57										17.15
Hazardous Waste Cleanup					1.50															1.50
Decommissioning of Projects					1.00															1.00
Levee Modifications					2.10															2.10
Fish Restoration	0.39	0.35	1.94	0.22	0.23	0.36	0.36	0.38	0.38	0.38	0.38	0.37	0.20	0.17	0.11	0.10	0.10	0.10	0.08	6.60
Habitat Restoration	0.06	0.11	0.76	0.96	0.96	0.96	0.37	0.37	0.12	0.12	0.12	0.12								5.03
Interpretation					0.50	0.50	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14				2.40
Archeological/Historical	0.08	0.13		0.10	0.10	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.69
Restoration/Scientific Studies	0.18	0.60	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45										4.38
ANNUAL TOTAL, ALL ACTIVITIES	3.27	3.63	36.25	11.08	33.98	22.84	21.89	21.91	1.68	1.68	0.66	0.65	0.36	0.33	0.27	0.26	0.12	0.12	0.10	161.08

***All 1994 and 1995 activities are necessary for EIS/advanced planning.**

Table 16
TOTAL PROJECT COST SUMMARY
for
Sediment Management Option #7

Activity	FY 1994	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	Totals
Data Collection	0.47	0.51	0.40	0.40																1.78
E.I.S. *	2.10	1.94																		4.04
Engineering Design			2.94	1.80																4.74
Acquisition of Projects			29.50																	29.50
Dam Rem/Sed Mgt					16.68	16.68	16.67	16.67												66.70
Water Quality Protection				7.15	7.15	0.57	0.57	0.57	0.57	0.57										17.15
Hazardous Waste Cleanup					1.50															1.50
Decommissioning of Projects					1.00															1.00
Levee Modifications					2.10															2.10
Fish Restoration	0.39	0.35	1.94	0.22	0.23	0.36	0.36	0.38	0.38	0.38	0.38	0.37	0.20	0.17	0.11	0.10	0.10	0.10	0.08	6.60
Habitat Restoration	0.06	0.11	0.76	0.96	0.96	0.96	0.37	0.37	0.12	0.12	0.12	0.12								5.03
Interpretation					0.50	0.50	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14				2.40
Archeological/Historical	0.08	0.13		0.10	0.10	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.69
Restoration/Scientific Studies	0.18	0.60	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45										4.38
ANNUAL TOTAL, ALL ACTIVITIES	**3.27**	**3.63**	**35.99**	**11.08**	**30.67**	**19.54**	**18.58**	**18.60**	**1.68**	**1.68**	**0.66**	**0.65**	**0.36**	**0.33**	**0.27**	**0.26**	**0.12**	**0.12**	**0.10**	**147.59**

***All 1994 and 1995 activities are necessary for EIS/advanced planning.**



Elwha River at Geyser Valley, May 27, 1907. (Asahel Curtis photo, Washington State Historical Society)