



Fall 1996

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Henry B. Lacey

Recommended Citation

Henry B. Lacey, *Dancing in Place: The Clinton Administration and Aquatic Ecosystem Protection in the Pacific Northwest*, 36 NAT. RES. J. 779 (1996).

Available at: <https://digitalrepository.unm.edu/nrj/vol36/iss4/5>

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Dancing in Place: The Clinton Administration and Aquatic Ecosystem Protection in the Pacific Northwest

ABSTRACT

This article first examines conditions in aquatic ecosystems of the Pacific Northwest. The article then criticizes the Clinton Administration's plan for managing the forests on the west side of the Cascade Mountains on the basis of its likely effectiveness in restoring and protecting healthy ecological conditions in the region's watersheds. The author concludes that the Administration's "ecosystem management" plan is a laudable effort to improve public land stewardship in the Pacific Northwest. However, the Administration has failed to propose and implement measures that would be likely to assure a return to ecological health in the region's streams and rivers.

"Eventually, all things merge into one, and a river runs through it."¹

"Be watchful, and strengthen the things which remain,
that are ready to die."²

I. Introduction

Since taking office in 1993, the Clinton Administration has committed itself to "ecosystem management" as the preferred tool for regulating the uses of federal public lands.³ The shift toward this new

1. NORMAN MACLEAN, *A RIVER RUNS THROUGH IT AND OTHER STORIES* 104 (1976).

2. Revelation 3:2.

3. See William K. Stevens, Interior Secretary is Pushing A New Way to Save Species, *N.Y. TIMES*, Feb. 17, 1993, at A1. Since 1992, all four major federal land management agencies—the U.S. Forest Service, Bureau of Land Management, National Park Service, and Fish and Wildlife Service—have independently announced their commitment to manage lands on an ecosystem basis. U.S. GENERAL ACCOUNTING OFFICE, *ECOSYSTEM MANAGEMENT: ADDITIONAL ACTIONS NEEDED TO TEST A PROMISING APPROACH* 4 (1994)[hereinafter *ECOSYSTEM MANAGEMENT*]. In 1993 the Clinton Administration established an Interagency Ecosystem Management Task Force, comprised of Assistant Secretaries from 12 departments and agencies and representatives of the Office of Management and Budget and the White

paradigm in natural resources policy has been principally driven by litigation aimed at preserving the northern spotted owl.⁴ However, another significant impetus is the environmental crisis affecting the Pacific Northwest's native fish.⁵ Many stocks of Pacific salmon, as well

House Office of Science and Technology Policy to coordinate budget, legal, and information issues related to and oversee implementation of an ecosystem management approach to natural resources management. INTERAGENCY ECOSYSTEM MANAGEMENT TASK FORCE, ECOSYSTEM MANAGEMENT INITIATIVE OVERVIEW, *reprinted in id.* at 70-73. See also VICE PRESIDENT ALBERT GORE ET AL., FROM RED TAPE TO RESULTS-CREATING A GOVERNMENT THAT WORKS BETTER AND COSTS LESS: REINVENTING ENVIRONMENTAL MANAGEMENT (Accompanying Report of the National Performance Review) (1993); WAYNE A. MORRISON ET AL., CONGRESSIONAL RESEARCH SERVICE, ECOSYSTEM MANAGEMENT: FEDERAL AGENCY ACTIVITIES (1994) (discussing efforts by federal agencies to implement ecosystem management). Interestingly, the Forest Service and the BLM appear to have already committed themselves to ecosystem management before society has reached a consensus on the meaning of the phrase. See *infra* notes 321-343 and accompanying text. Nevertheless, ecosystem management may involve changes in the agencies' traditional commitment to commodity production. Accordingly, Senator Mark O. Hatfield (R.-Or.) has introduced S.93, the Ecosystem Management Act of 1995, 104th Cong., 2nd Sess. (1995). 141 CONG. REC. S321 (daily ed. Jan. 5, 1995). The Ecosystem Management Act would codify ecosystem management as a governing principle of public land management and mandate a study to define the meaning and practical consequences of the concept. The Hatfield bill faces an uncertain future, as many members of Congress are apparently hostile to the ecosystem management trend. See John H. Cushman, Jr., Timber! A New Idea is Crashing, N.Y. TIMES, Jan. 22, 1995, at E5.

4. See *Seattle Audubon Soc'y v. Moseley*, 798 F. Supp. 1473 (W.D. Wash. 1992) (finding Forest Service in violation of NEPA for failing to prepare adequate environmental impact statement before logging in northern spotted owl habitat), *aff'd sub nom.*, *Seattle Audubon Soc'y v. Espy*, 998 F.2d 699 (9th Cir. 1993); *Portland Audubon Soc'y v. Lujan*, 795 F. Supp. 1489 (D. Or. 1992) (finding BLM in violation of NEPA for failing to prepare supplemental environmental impact statement before logging in northern spotted owl habitat and issuing preliminary injunction), *aff'd sub nom.*, *Portland Audubon Soc'y v. Babbitt*, 998 F.2d 705 (9th Cir. 1993).

5. Similar crises exist elsewhere in the United States, particularly in the Great Lakes, upper Colorado River Basin, and Chesapeake Bay. See EXECUTIVE OFFICE OF THE PRESIDENT OF THE UNITED STATES, ENVIRONMENTAL QUALITY: THE TWENTY-FOURTH ANNUAL REPORT OF THE COUNCIL ON ENVIRONMENTAL QUALITY 222 (1994) [hereinafter CEQ REPORT]. Nationwide, one-third of all plant and animal species listed under the Endangered Species Act of 1973 (ESA), 16 U.S.C. § 1531 et seq. (1994), rely on aquatic ecosystems for habitat. CEQ REPORT at 238. Of approximately 1,033 known species of freshwater fish native to America's lakes, rivers, and streams, 74-103 are endangered, 85-114 are vulnerable to extinction, 101-147 are rare or are the subject of general concern, and 27 are thought to be extinct. *Id.* at 222. See also Gordon H. Reeves & James R. Sedell, An Ecosystem Approach to the Conservation and Management of Freshwater Habitat for Anadromous Salmonids in the Pacific Northwest, in TRANSACTIONS OF THE 57TH NORTH AMERICAN WILDLIFE & NATURAL RESOURCES CONFERENCE 408 (1992) (noting that 364 North American fish species and subspecies "are in need of special management considerations because of low numbers") (hereinafter Ecosystem Approach to Conservation).

as numerous resident (non-anadromous) fish species including bull trout, trout, kokanee, sturgeon, lamprey, and chub, are disappearing.⁶ The reasons for the ecological crisis in the region's watersheds are numerous. Over fishing, excessive reliance on hatchery production, and the impacts of the region's extensive hydroelectric power system are significant contributors to the fisheries' decline.⁷ But land use practices also bear substantial responsibility for the threat to the Pacific Northwest's native fish species' continued survival. In fact, destruction of watershed ecosystems and river and stream habitat may be the most important cause of the region's fishery crisis.⁸ Coastal and high mountain streams that provide spawning grounds for Pacific salmon and resident fish, and larger streams and rivers needed by Pacific salmon for migration to and from the sea, have suffered severe degradation as a

6. FOREST SERVICE ET AL., U.S. DEPT OF AGRICULTURE, FOREST ECOSYSTEM MANAGEMENT: AN ECOLOGICAL, ECONOMIC, AND SOCIAL ASSESSMENT (Report of the Forest Ecosystem Management Assessment Team) V.7-V.11 (1993) [hereinafter FEMAT REPORT].

7. FEMAT REPORT, *supra* note 6, at V.10-V.11; Willa Nehlsen et al., Pacific Salmon at the Crossroads: Stocks at Risk from California, Oregon, Idaho and Washington, FISHERIES, Mar.-Apr. 1991, at 4 [hereinafter Pacific Salmon at the Crossroads].

8. Christopher A. Frissell, A New Strategy for Watershed Restoration and Recovery of Pacific Salmon in the Pacific Northwest 4-5 (Sept. 1993) (unpublished report for Pacific Rivers Council, Eugene, OR) (copy on file with author) [hereinafter New Strategy for Watershed Restoration]; Watershed and Fish Habitat Degradation: Oversight Hearing Before the Subcomm. on National Parks, Forests, and Public Lands of the Committee on Natural Resources, House of Representatives, on Watershed and Fish Habitat Degradation on Public Lands and National Forests in the Pacific Northwest (No. 103-10) 103rd Cong., 1st Sess. 87 (Mar. 11, 1993) (Testimony of Dr. Bob Doppelt, Executive Director, The Pacific Rivers Council) [hereinafter Watershed Oversight Hearing]. Nationwide, aquatic ecosystems are being altered or destroyed at a faster rate than any previous time in history. NATIONAL RESEARCH COUNCIL, RESTORATION OF AQUATIC ECOSYSTEMS: SCIENCE, TECHNOLOGY, AND PUBLIC POLICY 14 (1992) [hereinafter RESTORATION OF AQUATIC ECOSYSTEMS]; ROBERT W. ADLER ET AL., THE CLEAN WATER ACT 20 YEARS LATER 58-85 (1993) [hereinafter CLEAN WATER ACT 20 YEARS LATER]. At least one-half of the more than 221 million acres of wetlands in the coterminous United States at the time of European discovery and settlement have been lost. Robert W. Adler, Addressing Barriers to Watershed Protection, 25 ENV'T'L. L. 973, 989 (1995) (citing THOMAS E. DAHL & CRAIG E. JOHNSON, FISH AND WILDLIFE SERVICE, U.S. DEPT OF THE INTERIOR, STATUS AND TRENDS OF WETLANDS IN THE COTERMINOUS UNITED STATES (1991)) [hereinafter Addressing Barriers to Watershed Protection]. The nation has also lost more than one-half of its riparian habitat. CLEAN WATER ACT 20 YEARS LATER, *supra*, at 80-82 (citing FEDERAL INTERAGENCY FLOODPLAIN MANAGEMENT TASK FORCE, 1 FLOODPLAIN MANAGEMENT IN THE UNITED STATES: AN ASSESSMENT REPORT (SUMMARY) (National Hazards Research & Applications Information Center, 1992)). And only a very small percentage of U.S. surface waters are in anything approaching "natural" condition. See Arthur C. Benke, A Perspective on America's Vanishing Streams, 9 J. NO. AMER. BENTHOLOGICAL SOCIETY 77-88 (1991). An estimated 89% of inland surface waters are manipulated for human needs. RESTORATION OF AQUATIC ECOSYSTEMS, *supra*, at 22.

consequence of timber production, livestock grazing and mining.⁹ Those activities, which dominate the uses of the region's federal lands, have a very significant impact on the survival prospects of native fish because most of the habitat necessary to preserve the region's Pacific salmon stocks and resident fish species exists on federal land.¹⁰

Much of that habitat is seriously degraded, and commodity production is a significant contributor to the problem.¹¹ Timber harvesting causes increased sedimentation of rivers and streams and deprives aquatic ecosystems of natural flood control and sources of nutrients, microhabitat, and shade.¹² Livestock grazing causes the loss of riparian vegetation that provides habitat, stabilizes streambanks and maintains water temperatures.¹³ Mining causes chemical pollution of rivers and streams, increases sedimentation, and alters stream structure and flow.¹⁴ These environmental consequences have severely harmed

9. FOREST SERVICE, U.S. DEP'T OF AGRICULTURE, INLAND NATIVE FISH STRATEGY: ENVIRONMENTAL ASSESSMENT III-13 (1995) [hereinafter INFISH EA]; Charles F. Wilkinson & Daniel K. Conner, *The Law of the Pacific Salmon Fishery: Conservation and Allocation of Transboundary Common Property Resource*, 32 U. KAN. L. REV. 17, 35 (1983); ANTHONY NETBOY, *THE COLUMBIA RIVER SALMON AND STEELHEAD TROUT: THEIR FIGHT FOR SURVIVAL* 55-71 (1980). Such commodity production often involves discharge of pollutants through "nonpoint sources." See *Oregon Natural Resources Council v. Lyng*, 882 F.2d 1417, 1424 n.8 (9th Cir. 1989) ("A nonpoint source is any source of pollutants not associated with a discrete conveyance. It includes runoff from fields, forests, mining, and construction activity.") (citing WILLIAM H. RODGERS, JR., *ENVIRONMENTAL LAW* 375 (1977)). For an excellent overview of the environmental harm caused by such "non-point source" dischargers of pollutants, see PAUL THOMPSON ET AL., *POISON RUNOFF: A GUIDE TO STATE AND LOCAL CONTROL OF NONPOINT SOURCE WATER POLLUTION* (Natural Resources Defense Council ed., 1989); *CLEAN WATER ACT 20 YEARS LATER*, *supra* note 8, at 171-83; *RESTORATION OF AQUATIC ECOSYSTEMS*, *supra* note 8, at 33, 192-94.

10. THE WILDERNESS SOCIETY, BOLLE CENTER FOR FOREST ECOSYSTEM MANAGEMENT, 2 *THE LIVING LANDSCAPE: PACIFIC SALMON AND FEDERAL LANDS* xiii (1993) (noting that approximately 38% of Pacific salmon spawning and rearing habitat in the Pacific Northwest exists on federal lands) [hereinafter *PACIFIC SALMON AND FEDERAL LANDS*].

11. Thomas W. Chamberlain et al., *Timber Harvesting, Silviculture, and Watershed Processes*, in *INFLUENCES OF FOREST AND RANGELAND MANAGEMENT ON SALMONID FISHES AND THEIR HABITATS* 181, 184-203 (William R. Meehan ed., 1991) [hereinafter *INFLUENCES OF FOREST AND RANGELAND MANAGEMENT*]; BOB DOPPELT ET AL., *ENTERING THE WATERSHED: A NEW APPROACH TO SAVE AMERICA'S RIVER ECOSYSTEMS* 17 (1993) [hereinafter *ENTERING THE WATERSHED*].

12. *ENTERING THE WATERSHED*, *supra* note 11, at 18.

13. *Id.* at 19; William S. Platts, *Livestock Grazing*, in *INFLUENCES OF FOREST AND RANGELAND MANAGEMENT*, *supra* note 11, at 389, 393-99.

14. Gerald J. Niemi et al., *Overview of Case Studies on Recovery of Aquatic Ecosystems from Disturbance*, 14 *ENV'TL MANAGEMENT* 571, 572 (1990); Rodger L. Nelson et al., *Mining*, in *INFLUENCES OF FOREST AND RANGELAND MANAGEMENT*, *supra* note 11, at 425, 429-49. See also REED F. NOSS & ALLAN Y. COOPERRIDER, *SAVING NATURE'S LEGACY: PROTECTING AND RESTORING BIODIVERSITY* 277-78 (1994) [hereinafter *SAVING NATURE'S LEGACY*] ("[T]he greatest impact of mining is probably on water resources. . . . Mining requires bringing large

many species that require healthy riparian corridors and aquatic ecosystems, including Pacific salmon and resident fish. Because Pacific salmon and resident fish are indicator species, the success or failure of any program designed to improve the ecological condition of the region's watersheds can be measured by how well it prevents and reverses degradation of their habitat.¹⁵

This paper first provides an overview of the condition of freshwater fish habitat in the Pacific Northwest.¹⁶ Included in this section is a discussion of the habitat requirements of Pacific salmon and resident fish. The paper next describes the Clinton Administration's plan for managing federal forests within the range of the northern spotted owl, west of the Cascade Mountains in Washington, Oregon, and northern California.¹⁷ The Westside Plan contains an aquatic conservation

amounts of underground material to the Earth's surface where it is exposed to rain. This material or ore usually includes high concentrations of carbon and sulfur (coal) or high concentrations of metal ions. When exposed to rainwater, these materials form runoff that is highly acidic or has high concentrations of metal ions. Both are toxic to aquatic organisms. Furthermore, processing this ore may require washing with water or smelting. Ore processing leaves highly toxic water that must go somewhere. . . .").

15. Classification of Pacific salmon and resident fish as "indicator species" is a legal issue. See 36 C.F.R. § 219.19(a)(1)(1995) (requiring Forest Service to determine whether a species is an "indicator" of forest ecosystem health). However, it is also a matter of biology, since declines in populations of native fish stocks reflect deterioration of habitat or other adverse impacts on the continued viability of the species. See *INFISH EA*, *supra* note 9, at B.5 (defining "indicator" species as species that are "adapted to a particular kind of environment [and] which reflect ecological changes caused by land management activities"). Pacific salmon are also considered "keystone" species in the aquatic ecosystems that they inhabit. See Mary F. Willson & Karl C. Halupka, *Anadromous Fish as Keystone Species in Vertebrate Communities*, 9 *CONSERVATION BIOLOGY* 489 (1995) [hereinafter *Anadromous Fish as Keystone Species*]. A "keystone species" is one that plays a "pivotal role in [its] ecosystem and upon which a large part of the community depends." See *SAVING NATURE'S LEGACY*, *supra* note 14, at 7. Removal of a keystone species from an ecological community causes other species to decline, sometimes to extinction, or to rise above numbers sustainable within the ecosystem. EDWARD O. WILSON, *THE DIVERSITY OF LIFE* 164 (1992). Thus, "declines of keystone species are more important ecologically than the loss of the last few individuals of rare species that play minor roles in their communities." *SAVING NATURE'S LEGACY*, *supra* note 14, at 7-8. In any event, the declining state of the region's wild salmon stocks and resident fish species are indicators of serious ecological problems in the region's watersheds even if native fish are not keystone species. See generally Brian H. Walker, *Biodiversity and Ecological Redundancy*, 6 *CONSERVATION BIOLOGY* 18 (1992). For example, salmon directly affect ecological processes in rivers, streams, riparian corridors, and upland areas by contributing energy and nutrients to the food chain after death. See *Anadromous Fish as Keystone Species*, *supra*, at 490.

16. See *infra* notes 22-116 and accompanying text.

17. See *infra* notes 117-234 and accompanying text. Although several other ecosystem management initiatives are underway in the region, the Westside Plan is permanent in nature, fully developed, and has reached a higher degree of implementation than the other programs. The Forest Service and the Bureau of Land Management (BLM) chartered the

strategy (ACS) aimed at protecting the health of riparian and aquatic ecosystems within federal forests. The third section of the paper assesses the measures for watershed protection and restoration contained in the Westside Plan and briefly discusses some of the ambiguities and challenges inherent in the ecosystem management concept.¹⁸ This paper contains four basic criticisms of the ACS: (1) the Westside Plan fails to require forest managers to focus on aquatic species populations as an indicator of ecosystem health; (2) the Westside Plan unwisely assumes that biologically healthy riverine habitats exist on non-federal lands; (3) the ACS does not include adequate restrictions on land use activities in riparian corridors, floodplains, and upland areas that cause harm to riparian and aquatic habitats; and (4) the ACS' reliance on watershed analysis as a device to prevent future ecological damage to riverine-riparian ecosystems is undercut by a failure to clearly specify the information that should be considered in the watershed analysis process and a lack of specific restraints on forest managers' discretion to allow destructive commodity extraction activities.¹⁹

The Westside Plan is a laudable and worthwhile effort to manage federal forests on an ecosystem basis. The Forest Service and the BLM deserve commendation for honestly discussing the environmental

Eastside Ecosystem Management Project, which would apply ecosystem management to federal lands east of the Cascade Mountains in Oregon and Washington, in January 1994. FOREST SERVICE, U.S. DEP'T OF AGRICULTURE & BUREAU OF LAND MANAGEMENT, U.S. DEP'T OF THE INTERIOR, CHARTER: INTERIOR COLUMBIA RIVER BASIN ECOSYSTEM MANAGEMENT FRAMEWORK AND SCIENTIFIC ASSESSMENT AND EASTSIDE OREGON AND WASHINGTON ENVIRONMENTAL IMPACT STATEMENT (1994). By July 1994, the project was expanded to cover federal forests throughout the upper Columbia River Basin, including those in Idaho, western Montana, northwest Nevada, northern Utah, and northwest Wyoming. The draft environmental impact statements for the Eastside and Upper Columbia River Basin ecosystem management programs were expected to be issued in late fall, 1995. In October 1993, Secretary of the Interior Bruce Babbitt announced that the Clinton Administration would issue a plan to "manage public rangelands in a manner . . . compatible with principles of ecosystem management" and "accelerate the restoration and improvement of public rangelands." BUREAU OF LAND MANAGEMENT, U.S. DEP'T OF THE INTERIOR, RANGELAND REFORM '94: DRAFT ENVIRONMENTAL IMPACT STATEMENT 6 (1993) [hereinafter RANGELAND REFORM DRAFT EIS]. In addition, a temporary ecosystem management-based program for salmon-producing watersheds east of the Cascade Mountains is in effect until the Eastside and Upper Columbia River Basin plans are in effect. FOREST SERVICE, U.S. DEP'T OF AGRICULTURE & BUREAU OF LAND MANAGEMENT, U.S. DEP'T OF THE INTERIOR, ENVIRONMENTAL ASSESSMENT FOR THE IMPLEMENTATION OF INTERIM STRATEGIES FOR MANAGING ANADROMOUS FISH-PRODUCING WATERSHEDS IN EASTERN OREGON, WASHINGTON, IDAHO, AND PORTIONS OF CALIFORNIA (1994) (hereinafter PACFISH EA).

18. See *infra* notes 319-343 and accompanying text.

19. Similar criteria have been previously proposed by The Pacific Rivers Council, an organization whose mission is to develop public policies aimed at restoring the ecological integrity of river systems. ENTERING THE WATERSHED, *supra* note 11, at 33-34, 45-65.

conditions on federal forests within the Pacific Northwest, recognizing the ecological importance of healthy watersheds to forest ecosystems, and prioritizing efforts aimed at protecting the watersheds that provide the best available remaining aquatic and riparian habitats. Nevertheless, the ACS fails to acknowledge the condition of riverine-riparian ecosystems outside the federal domain or emphasize the central importance of aquatic species populations in assessing whether the plan is likely to achieve its goals. Moreover, the ACS does not include measures sufficiently protective of the region's watersheds to assure protection of riverine-riparian ecosystems and the viability of the species that depend on them.²⁰ In addition, the public has achieved neither a clear understanding of ecosystem management nor consensus regarding its implications for public land stewardship. In fact, a commitment to ecosystem management does not guarantee bureaucratic behavior that is consistently beneficial to the ecology of the region's rivers and streams. Accordingly, the Westside Plan is unlikely to achieve its goals of preserving the Pacific Northwest's endangered aquatic and riparian species, reducing degradation of riverine habitats, and restoring the Pacific Northwest's riverine-riparian ecosystems to a biologically healthy condition.²¹

20. The riverine ecosystem describes "the entire river network, including tributaries, side channels, sloughs, [and] intermittent streams." The term is used to denote the ecological complexity of rivers and their tributaries, and can be distinguished from the "aquatic ecosystem" because it encompasses more than the flowing water of a river or stream but not lakes, ponds, or other non-flowing freshwater bodies. ENTERING THE WATERSHED, *supra* note 11, at xix. The "riverine-riparian ecosystem" includes the "processes and elements that interact in the riparian and flowing water areas throughout the entire riverine system," including the 100-year floodplain, while the riparian area, or corridor, is the "transition zone between the flowing water and terrestrial ecosystems." *Id.*

21. See *infra* notes 275-343 and accompanying text. This paper does not refer to "watersheds" when discussing biological or ecological effects or needs. A "watershed" is "[t]he entire surface area that contributes water to a lake or river." RESTORATION OF AQUATIC ECOSYSTEMS, *supra* note 8, at 524. See also, GEOLOGICAL SURVEY, U.S. DEPT OF THE INTERIOR, NATIONAL WATER SUMMARY 1990-91: HYDROLOGIC EVENTS AND STREAM WATER QUALITY 579 (1993) ("drainage basin" is the "land area drained by a river"). A watershed is therefore a geographic term that does not primarily focus on ecological function. One consequence of that ambiguity is that views of "watershed management" or "watershed protection" vary depending on the perspective of the person who uses the term. Addressing Barriers to Watershed Protection, *supra* note 8. Thus, use of the term "watershed management" is not advisable when discussing sustainable management of riverine-riparian ecosystems. See William Goldfarb, Watershed Management: Slogan or Solution, 21 B.C. ENV'T'L AFF. L. REV. 483 (1994). Nevertheless, many reports by government agencies and interest groups have advocated holistic management of watersheds. See, e.g., WATER QUALITY 2000, A NATIONAL WATER QUALITY AGENDA FOR THE 21ST CENTURY: PHASE III REPORT (Water Environment Federation ed., 1992); AMERICA'S WATERS: A NEW ERA OF SUSTAINABILITY (Report of the Long's Peak Working Group on National Water Policy), reprinted in 24 ENV'T'L L. 125 (1994);

II. Aquatic Ecosystems in the Pacific Northwest

The Pacific Northwest is experiencing a severe ecological crisis. Altogether, over 700 of the more than 1100 fish stocks and 104 other species native to the western side of the Cascade Mountains and dependent on riparian corridors are at risk of extinction.²² These include 3 bird species, 4 mammals, 12 amphibians, 45 mollusks, and 34 arthropods.²³ In addition, mammals including bats, cougars, bobcats, deer, antelope, wolverines, and beaver are dependent on healthy riparian corridors for food and are therefore imperiled by those areas' continued degradation.²⁴

The region's most visible environmental problem involves the increasing threat to wild salmon stocks. Although Pacific salmon once thrived in rivers and streams from the Mexican border to the Canadian border and from the North American Pacific coast to eastern Idaho,²⁵

U.S. ENVIRONMENTAL PROTECTION AGENCY, THE WATERSHED PROTECTION APPROACH: ANNUAL REPORT 1992 (1993).

22. U.S. DEP'T OF THE INTERIOR, RECOVERY PLAN FOR THE NORTHERN SPOTTED OWL - DRAFT 369, 371 (1992) [hereinafter DRAFT NORTHERN SPOTTED OWL RECOVERY PLAN].

23. *Id.* The loss of these species is not occurring only on the west side of the Columbia River Basin. East of the Cascade Mountains and in the upper Columbia River Basin, imperiled bird species include several grouse, the bald eagle, willow flycatcher, yellow warbler, calliope hummingbird, northern oriole, and short-eared owl. These species depend on healthy riparian areas for breeding, food, and migration corridors. Several frog and salamander species, and at least one turtle species, are also approaching extinction. Historically, North American river systems "harbored an exceedingly high diversity of river snails . . . and mussels and clams." J. David Allan & Alexander S. Flecker, Biodiversity Conservation in Running Waters, 43 BIOSCIENCE 32, 35 (1993) (Biodiversity Conservation in Running Waters). Today, however, aquatic ecosystems all over the nation are experiencing catastrophic losses of invertebrates. One especially noteworthy example of this ecological disaster is the fate of America's freshwater mussels. Once numbering 297 species and subspecies, these invertebrates traditionally served as a staple food source for Native Americans and supported a significant commercial harvest. There are now about 60 such species and subspecies listed as endangered or threatened, about 70 considered candidates for listing under the Endangered Species Act, and 20 that are already extinct. See John H. Cushman, Jr., Freshwater Mussels Facing Mass Extinction, N.Y. TIMES, Oct. 3, 1995, at B5. The most significant cause of mussel extinctions are fragmentation of stream habitat, mining, siltation, and pollution. *Id.* The situation is not much better for amphibians. For a good discussion of the causes of amphibian losses and the state of those species native to the Pacific Northwest, see Paul Stephen Corn & R. Bruce Bury, Logging in Western Oregon: Responses of Headwater Habitat and Stream Amphibians, 29 FOREST ECOLOGY & MGT. 39 (1989); A.R. Blaustein & D.B. Wake, Declining Amphibian Populations: A Global Phenomena, 5 TRENDS IN ECOLOGICAL EVALUATIONS 203 (1990).

24. FEMAT REPORT, *supra* note 6, at V.25.

25. PACIFIC SALMON AND FEDERAL LANDS, *supra* note 10, at 13-41.

they are rapidly disappearing.²⁶ Today, salmon are only twenty percent as abundant in the Pacific Northwest as they once were.²⁷ Salmon are now extinct in 38% of that range and imperiled in an additional 56%.²⁸ More than 100 stocks are extinct and hundreds of other stocks face the imminent threat of the same fate.²⁹ Scientists estimate that 314 stocks

26. In 1994, less than one million salmon returned to the Columbia River Basin to spawn. Lorraine Bodi, *The History and Legislative Background of the Northwest Power Act*, 25 ENV'T L. L. 365, 366 (1995). Among the runs that spawn within the range of the northern spotted owl, widespread decline is common. Coho are considered threatened or endangered in 33% of their range, especially in coastal areas of northern California, Oregon, and Washington. PACIFIC SALMON AND FEDERAL LANDS, *supra* note 10, at 24. Similarly, chum are now extinct in 37% of their historic range along the Washington, Oregon, and northern California coasts and are threatened or endangered in an additional 30%. *Id.* at 25. Sea-run cutthroat trout are extinct or endangered in only 10% of their range in coastal areas from northern California to the Canadian border, but are threatened in 61% of its range and are considered to be in decline throughout their entire range. *Id.* at 31. Winter-run steelhead once were found in western Washington, the lower Columbia River tributaries, Oregon coastal streams, and coastal streams throughout California. Today, they are extinct in about 29% of that historic range and threatened or endangered in an additional 29%. *Id.* at 33. Similarly, summer-run steelhead formerly occurred in the Klamath, Rogue, Umpqua, and Skagit River basins and along the coast and in some Puget Sound-area rivers. They are extinct in 45% of their former range and threatened or endangered in an additional 10%. *Id.* at 36. Pink salmon are extinct in their former range in northern California, including a small northern California coastal region, but are not generally considered to be declining in the remaining portion of their range - northwest Washington. *Id.* at 29.

27. PACIFIC SALMON AND FEDERAL LANDS, *supra* note 10, at x. See also Kai N. Lee, *Salmon, Science, and Law in the Columbia Basin*, 21 ENV'T L. L. 745, 751 (1991) (Columbia River Basin's fish population is about one-sixth the size it was two centuries ago). Before European settlement of the region, there were an estimated 10-16 million wild salmon swimming in its rivers and streams. NORTHWEST POWER PLANNING COUNCIL, 1987 COLUMBIA RIVER BASIN FISH AND WILDLIFE PROGRAM § 203, at 35 (1987). Records created during the mid-nineteenth century describe the Pacific Northwest's waterways as being "almost choked with salmon." MURRAY MORGAN, *THE LAST WILDERNESS* 36 (1955). Frequently the region's streams "were so full of migrating salmon that they raised the water level." TIMOTHY EGAN, *THE GOOD RAIN: ACROSS TIME AND TERRAIN IN THE PACIFIC NORTHWEST* (1990). Today, the salmon population has declined to approximately 2.5 million fish. Bodi, *supra* note 26, at 365. Most of these remaining salmon are hatchery-bred, as wild stocks have declined to approximately two percent of their historic size. Michael C. Blumm & Andy Simrin, *The Unraveling of the Parity Promise: Hydropower, Salmon, and Endangered Species in the Columbia Basin*, 21 ENV'T L. L. 657, 717-18 (1991) (citing OREGON TROUT, *THE LISTING POST* 1 (May 30, 1990)).

28. PACIFIC SALMON AND FEDERAL LANDS, *supra* note 10, at xiii.

29. Pacific Salmon at the Crossroads, *supra* note 7, at 10-16; Jack E. Williams et al., *Declining Salmon and Steelhead Populations: Endangered Species Concerns for the West*, 9 ENDANGERED SPECIES UPDATE 1 (1992). Some studies, including one by the federal government, indicate that many more stocks than those identified in Pacific Salmon at the Crossroads are at risk of extinction. See DRAFT NORTHERN SPOTTED OWL RECOVERY PLAN, *supra* note 22, at 371, cited in Plaintiff's Memorandum in Support of Motion for Summary Judgment, Seattle Audubon Society et al. v. Lyons, No. C92-479WD (W.D. Wash.) 18 (Sept. 28, 1994).

within the northern spotted owl's range alone are at moderate or high risk of extinction.³⁰

The magnitude of the crisis is equally severe for resident fish.³¹ The bull trout was once found in most of the region's major river systems, including as far south as the McCloud River in California, in the headwaters of the Yukon River, and as far east as the northern Rocky Mountains of Idaho and western Montana and in some Utah and Nevada rivers.³² The bull trout is now extinct in California and threatened in Washington, Oregon, Montana, and Idaho,³³ even in river systems that continue to provide the most viable remaining habitat.³⁴ In addition to

30. FEMAT REPORT, *supra* note 6, at V.2. A regional pattern of population-by-population extinction is well underway. Declaration of Christopher A. Frissell in Support of Plaintiff's Motion for Summary Judgment, Seattle Audubon Society et al. v. Lyons, No. C92-479WD (W.D. Wash.) ¶ 7 (Sept. 27, 1994) [hereinafter Frissell Declaration]. See also FEMAT REPORT, *supra* note 6, at V.10 & Appendix V-C (classifying majority of at-risk stocks as being at "high" or "moderate" risk of extinction). Several Pacific salmon stocks are listed as endangered or threatened under the Endangered Species Act of 1973, 16 U.S.C. §§ 1531-1544 (1988). These include Snake River spring, summer, and fall chinook and Snake River sockeye. See 50 C.F.R. § 17.11 (1995)(table of listed species). The National Marine Fisheries Service (NMFS) has initiated a status review of all steelhead, pink, chum, sockeye, chinook, and sea-run cutthroat trout runs native to the Pacific coast, 59 Fed. Reg. 46,808 (1994), and recently proposed to list as threatened species certain steelhead runs native to southwestern Oregon and northern California. 60 Fed. Reg. 14,253 (1995). NMFS has also announced that it will consider listing several "evolutionary significant units" (ESUs) of coho native to Oregon and California. 60 Fed. Reg. 38,011 (1995). NMFS developed the ESU concept as a way of determining whether a particular Pacific salmon stock is a "distinct population segment" eligible for protection under the ESA. See 56 Fed. Reg. 58,612, 58,618 (1991); Karl Gleaves et al., The Meaning of "Species" Under the Endangered Species Act, 13 PUB. LAND L. REV. 25 (1992). For a criticism of the ESU approach to classifying fish and wildlife as distinct species eligible for the protection of the ESA, see Daniel J. Rohlf, There's Something Fishy Going On Here: A Critique of the National Marine Fisheries Service's Definition of Species Under the Endangered Species Act, 24 ENV'T L. 617 (1994).

31. FEMAT REPORT, *supra* note 6, at V.11.

32. Alliance for the Wild Rockies et al., Petition for a Rule to List the Bull Trout (*Salvelinus confluentus*) as Endangered 8 (Oct. 27, 1992) [hereinafter Bull Trout Petition] (copy on file with author).

33. *Id.* at 17-32.

34. Once commonplace in the Columbia River Basin, including west of the Cascades, in the Puget Sound area, and as far south as California's McCloud River, the distribution of bull trout (*Salvelinus confluentus*) has been severely decreased throughout its former range. Memorandum From Regional Director, U.S. Fish and Wildlife Service, Portland, OR to Director, U.S. Fish and Wildlife Service (June 8, 1994), at 8-14 (copy on file with author) [hereinafter Fish and Wildlife Service Memorandum]. Most remaining populations exist in isolation, and the U.S. Fish and Wildlife Service considers bull trout to be at "extreme risk of extinction." *Id.* at 3. The species is considered a "Species of Special Concern" by the American Fisheries Society and the states of Idaho and Montana and as a "Sensitive Species" by the U.S. Forest Service and the state of Oregon. INFISH EA, *supra* note 9, at I-1. Nevertheless, the U.S. Fish and Wildlife Service has declined to list the bull trout under the ESA. See 59 Fed. Reg. 30,254 (1994) (finding that listing is "warranted but precluded due to

the bull trout, several other resident fish species within the northern spotted owl's range are at risk of extinction.³⁵

The imminent extinction of many of the region's wild salmon stocks, resident fish, and other species dependent on healthy aquatic and riparian ecosystems is a symptom of large-scale ecological problems in the Pacific Northwest's riverine ecosystems. Their rapid disappearance has occurred within the past fifty years and has resulted from massive habitat destruction.³⁶ Entire rivers have been deprived of flow, channels have been widened and simplified, wetlands have been filled, non-native species have been introduced, fish have been overharvested, and

other higher priority listing actions). That decision is the subject of litigation. *Friends of the Wild Swan et al. v. U.S. Fish & Wildlife Serv.*, No. 94-1318-50, 1996 WL 663143 (D. Or. Nov. 13, 1996). Nevertheless, the Forest Service recognizes that deterioration of aquatic habitat has caused significant declines in bull trout populations and has accordingly proposed a plan to limit land use activities in riparian areas until a more extensive, ecosystem-management based program for federal forests east of the Cascades and in the upper Columbia River Basin can be implemented. See generally PACFISH EA, *supra* note 17.

35. Resident fish species at risk of extinction include the Klamath shortnose sucker, Lost River sucker, Oregon chub, Olympic mudminnow, Jenny Creek sucker, McCloud River redband trout, and Salish sucker. FEMAT REPORT, *supra* note 6, at V.11. Declines of resident fish in addition to the bull trout are also common east of the Cascades. For example, the Westslope cutthroat trout, once found in almost every major subbasin of the upper Columbia River system, is now extirpated or seriously depressed throughout its historic range. PACIFIC RIVERS COUNCIL, NORTHERN ROCKIES FORESTS AND ENDANGERED NATIVE FISH: THE URGENT NEED FOR WATERSHED AND NATIVE FISH PROTECTION IN IDAHO, MONTANA, AND NORTHWEST WYOMING 2 (1995) [hereinafter NORTHERN ROCKIES FORESTS AND NATIVE FISH PROTECTION]. The Yellowstone cutthroat trout has been extirpated from 90% of its range, and the Snake River fine-spotted cutthroat trout and Bonneville cutthroat trout, native to southern Idaho and Wyoming, are candidates for listing under the ESA. *Id.* Other at-risk resident fish species in the Pacific Northwest include white sturgeon, Arctic grayling, redband rainbow trout, and three species of sculpin. *Id.* at 2, 23.

36. See Frissell Declaration, *supra* note 30, ¶ 3 (noting that local extinctions have accelerated in recent decades); INFISH EA, *supra* note 9, at III.12. See also KAI N. LEE, COMPASS AND GYROSCOPE: INTEGRATING SCIENCE AND POLITICS FOR THE ENVIRONMENT 22-40 (1993) (describing decline in Columbia River Basin salmon runs since era of rapid development on Columbia River and its tributaries began); Michael C. Blumm, The Northwest's Hydroelectric Heritage: Prologue to the Pacific Northwest Electric Power Planning and Conservation Act, 58 WASH. L. REV. 175, 234 (1983) (noting "precipitous declines" in Columbia River Basin salmon runs in recent decades). Aquatic habitat destruction in the Pacific Northwest has created "riverine ecosystems . . . [that] are tattered, fragmented remnants of their former selves." Christopher A. Frissell et al., An Integrated, Biophysical Strategy for Ecological Restoration of Large Watersheds, in CHANGING ROLES IN WATER RESOURCES MANAGEMENT AND POLICY 449, 450 (Donald F. Potts ed., Am. Water Resources Ass'n, June 1993) [hereinafter An Integrated Biophysical Strategy for Ecological Restoration of Large Watersheds]. This habitat destruction, resulting from grazing, logging, and other land use activities, has been a major factor in the loss of native biodiversity. *Id.*

waterways have been polluted.³⁷ The resulting loss of biological diversity has caused riverine ecosystems to lose much of their natural ability to repair themselves after disturbance and become less capable of performing ecological functions.³⁸ Such ecological simplification has in turn adversely impacted the capacity of the region's rivers and streams to provide the complexity that facilitated the evolution and supports the continued viability of native fish and wildlife.³⁹

While dams and withdrawals of water from rivers, lakes, and streams are significantly responsible for the region's poor aquatic and riparian habitat quality,⁴⁰ timber, livestock, and mineral production has contributed heavily to the problem.⁴¹ The impacts of logging, grazing

37. RESTORATION OF AQUATIC ECOSYSTEMS, *supra* note 8, at 166; SAVING NATURE'S LEGACY, *supra* note 14, at 271-82.

38. See Federal Land Management and the Future of Salmon and Aquatic Biodiversity in the Pacific Northwest (Testimony of Dr. Christopher A. Frissell), in Watershed Oversight Hearing, *supra* note 8, at 106-7.

39. INFISH EA, *supra* note 9, at III.13 ("Generally, the percent of pool habitat and quality, and large woody debris recruitment in riverine systems has declined; migratory corridors blocked; and riparian vegetation disturbed greater than what is acceptable. As a result, the fish habitat carrying capacity of [the region's] streams has been diminished and a declining trend in the security of native fish populations observed."). The condition of particular physical characteristics of aquatic habitat is useful in assessing the likelihood that the species that depend on such habitat will remain viable and are therefore discussed in this article as an indicator of the health of riverine-riparian ecosystems on federal forests in the Pacific Northwest. However, such data should not be the focus of policymakers. Repair of habitat, such as by assuring additional woody debris or deep pools or lowering water temperature, will not necessarily restore viable populations of aquatic species to riverine-riparian ecosystems. See James R. Karr, Restoring Wild Salmon: We Must Do Better, 10 ILLAHEE 316, 317 (1994).

40. Aquatic habitat degradation is caused by such withdrawals of water from lakes, streams, and rivers because industrial, agricultural, and municipal uses are often huge and inefficient. See RESTORATION OF AQUATIC ECOSYSTEMS, *supra* note 8, at 166. This problem is rendered especially difficult to solve by federal and state water pollution laws, which do not regulate water use or generally require instream flows adequate to preserve aquatic and riparian habitats. See Deborah Moore & Zach Willey, Water in the American West: Institutional Evolution and Environmental Restoration in the 21st Century, 62 U. COLO. L. REV. 775 (1991); Charles F. Wilkinson, Aldo Leopold and Western Water Law: Thinking Perpendicular to the Prior Appropriation Doctrine, 24 LAND & WATER L. REV. 1 (1989). But cf. Public Utility Dist. No. 1 of Jefferson County v. Washington Dep't of Ecology, 114 S.Ct. 1900, 1908-14 (1994) (Under Clean Water Act § 401, 33 U.S.C. § 1341(a) (1994), state may require hydroelectric project developer granted Federal Power Act license to assure minimum streamflows in the stream or river to be dammed).

41. FEMAT REPORT, *supra* note 6, at V.2 (identifying roadbuilding and logging as primary threats to fish); INFISH EA, *supra* note 9, at I.2; Frissell Declaration, *supra* note 30, ¶ 6. It is generally considered difficult, if not impossible, to ascribe responsibility for a portion of aquatic ecosystem degradation in the region to one or other of these causes. See Ecosystem Approach to Conservation, *supra* note 5, at 408; Statement of Gary Edwards, Assistant Director for Fisheries, U.S. Fish and Wildlife Service, in Watershed Oversight

and mining are magnified by the heavy use of federal lands for such activities. The federal lands are vital as refugia for remaining stocks of Pacific salmon.⁴² Within the Columbia River Basin land under the control of the U.S. Forest Service and Bureau of Land Management (BLM) provides 60% of existing and potential Pacific salmon habitat.⁴³ Resident fish are also heavily dependent on federal lands.⁴⁴ Accordingly, the success or failure of the Clinton Administration's ecosystem management program for the spotted owl forests can be measured by how well it prevents and reverses degradation of aquatic and riparian ecosystems.⁴⁵

Hearing, *supra* note 8, at 59-60. But "various transformations of the landscape probably are the most widespread and potent threats to the well-being of [aquatic] ecosystems." Biodiversity Conservation in Running Waters, *supra* note 23, at 37. Nor have federal and state water pollution regulations halted deterioration in the quality of America's waters. See CLEAN WATER ACT 20 YEARS LATER, *supra* note 8, at 14-69. The Clean Water Act's controls on point source dischargers has significantly reduced pollution of waterways by municipal sewage and industrial facilities. *Id.* at 14-29. The restraints of federal law have not solved the problem, however. Large amounts of a wide variety of chemicals and other pollutants are still discharged into surface waters all over the nation, including in the Pacific Northwest. *Id.* at 30-37. The result has been a rapid and unchecked decline in the health of aquatic and other species dependent on high quality water and degradation of aquatic ecosystems. *Id.* at 58-69; Robert M. Hughes & Reed F. Noss, Biological Diversity and Biological Integrity: Current Concerns for Lakes and Streams, FISHERIES, May-June 1992, at 11.

42. FEMAT REPORT, *supra* note 6, at V.2.

43. PACIFIC SALMON AND FEDERAL LANDS, *supra* note 10, at 53 (also noting that approximately 15,000 miles of Pacific salmon habitat is located on national forests within the Columbia River Basin, with another 1,800 miles of such habitat found on Bureau of Land Management lands within the Basin).

44. The overwhelming majority of bull trout habitat exists on national forest land. Frissell Declaration, *supra* note 30, ¶ 10. The condition of the region's bull trout populations are especially influenced by management decisions on the national forests. Approximately 80% of all known populations of the species are threatened by habitat degradation related to timber production. PACIFIC RIVERS COUNCIL, A CALL FOR A COMPREHENSIVE WATERSHED AND WILD FISH CONSERVATION PROGRAM IN EASTERN OREGON AND WASHINGTON 3 (2d ed. 1995) [hereinafter CALL FOR CONSERVATION PROGRAM].

45. This is not to say that protection of habitat on federal lands is enough to prevent additional losses of biological diversity. See *supra* notes 42-44, *infra* notes 64-67 and accompanying text. Nevertheless, the success of ecosystem management may appropriately be measured by how well it protects ecosystems on federal lands, since the national forests and the BLM lands are the most significant remaining storehouses of America's biological diversity. National forests include a majority of the 261 major terrestrial ecosystem types that are found in the continental United States (including Alaska) and most of the nation's native plant and animal species. DYAN ZASLOWSKI & T.H. WATKINS, THESE AMERICAN LANDS: PARKS, WILDERNESS, AND THE PUBLIC LANDS 102 (1994) [hereinafter THESE AMERICAN LANDS]. Nationwide, the national forests provide habitat for 150 endangered or threatened species and 1,300 species that are candidates for listing under the Endangered Species Act. *Id.* BLM lands, officially labeled "national resource lands," constitute approximately 236 million acres in the continental United States (including Alaska). *Id.* at 105. The vast majority of that acreage - more than 174 million acres - is in the 11 western states (except Alaska). *Id.*

There is little hope that habitat loss that has so dramatically contributed to the decline and imminent disappearance of numerous wild salmon stocks, resident fish, and other aquatic and riparian-dependent species can be reversed unless the federal land managers overseeing these activities ensure that they do not undermine riverine ecosystems' biological functions.

A. Habitat Requirements for Pacific Salmon and Resident Fish

The ecological conditions needed to sustain thriving native fish are tied to the specific influences under which anadromous and resident fish evolved in the Pacific Northwest. Those factors are associated with the unique environments that provide habitat for the region's native fish, including river mainstems, estuaries, high elevation streams and lakes, and riparian zones that connect aquatic and terrestrial ecosystems. This paper focuses on the likely effects of the Clinton Administration's plan for managing the old growth forests that provide habitat for the endangered northern spotted owl. Accordingly, the discussion in this section is generally limited to aquatic and riparian ecosystems west of the Cascade Mountains in northern California, Oregon, and Washington.⁴⁶

Pacific salmon and resident fish require the same essential habitat characteristics to survive.⁴⁷ The stream substrate must contain particles of a variety of sizes, ranging from silt to boulders, and the water must be cool and of high quality in order to accommodate spawning and to

at 106. The national resource lands include 7.9 million acres of forest, 35 million acres of wetlands, and 85,935 miles of fishable streams. *Id.*

46. Upland activities may also adversely impact aquatic biodiversity. Riverine-riparian ecosystems are parts of larger watersheds, and land uses within drainage basins can have a huge impact on the ecology of stream communities, particularly if the activities increase pollution or sediment delivery or alter flood regimes. See *RESTORATION OF AQUATIC ECOSYSTEMS*, *supra* note 8, at 188-204. However, a successful plan for protecting aquatic ecosystems must protect the ecological health of riparian corridors, because land use activities have the greatest potential for adverse impact when they occur in the riparian zone. As the National Research Council observed in its recent report, "the influence [of the terrestrial environment] diminish[es] with distance from the stream. Restoration and management of the riparian area are usually more cost effective in improving water quality and fish habitat than practices applied farther from the watercourse." *Id.* at 161.

47. Although their habitat needs are similar, each salmonid species exhibits a distinctive set of life history characteristics, including the age structure of the spawning population, length of juvenile fish residence in freshwater, spawning distribution within a basin, and migration season. See William R. Meehan & Theodore C. Bjornn, *Salmonid Distributions and Life Histories*, in *INFLUENCES OF FOREST AND RANGELAND MANAGEMENT*, *supra* note 11, at 47, 52-82 [hereinafter *Salmonid Distributions and Life Histories*]. Moreover, each local population, or stock, is uniquely adapted to its spawning stream and therefore may display characteristics especially suited to that environment. See *Pacific Salmon at the Crossroads*, *supra* note 7, at 5-6.

facilitate migration.⁴⁸ Reproduction, as well as the maintenance of adequate aquatic insect populations, is impaired if the water in the stream is not well-oxygenated and free of excessive sediments.⁴⁹ Sufficient water flows are necessary to maintain appropriate water temperatures and oxygen levels and to transport anadromous fish to and from spawning grounds.⁵⁰

The food chain of an aquatic ecosystem is built upon the exchange of organic material and nutrients from surrounding terrestrial habitats, and these stream inputs must be stored and processed by aquatic insects and other consumers, which in turn are consumed by salmon and other fish species, amphibians, and birds.⁵¹ Nutrients, and

48. The frequency and distribution of suitable spawning habitats influences the reproductive success of salmon stocks, and therefore degradation of such areas will adversely affect the stability of salmon populations. The suitability of a stream for spawning and egg incubation is determined by a variety of physical, chemical, and biological factors. In general, spawning salmon select sites with gravel of appropriate size, permeability, and stability. Water circulating through the nests, or redds, delivers dissolved oxygen to and removes waste products from the developing embryos. Adequate oxygenation is essential during incubation, and oxygen levels in the water vary inversely with temperature and are affected by water velocity. Increased sediment deposition reduces embryo survival, not only by decreasing the rate of water exchange between the stream and the redd but also by interfering with the movements of the developing larval salmonids, or alevins. Streambed stability also affects salmonid survival, as the gravel must be able to withstand movement of streambed materials during high flow events. Theodore C. Bjornn & Dudley W. Reiser, *Habitat Requirements of Salmonids in Streams*, in *INFLUENCES OF FOREST AND RANGELAND MANAGEMENT*, *supra* note 11, at 83, 89-108 [hereinafter *Habitat Requirements of Salmonids in Streams*]. Alevins emerge from the redds after 1-3 months but remain in the gravel for an additional 1-5 months. Upon emerging from the gravel, the juvenile fish remain in the stream for a period ranging from a few days to four years, depending on the species and the spawning location. Prior to ocean migration, juvenile salmonids undergo a physiological transformation into smolts, a process that enables the fish to tolerate salt water. Depending on the species and stock, salmon remain in the ocean for 1-4 years before returning to natal streams to reproduce. Upstream migration corridors used by adult salmon to return to their breeding grounds must allow passage for the adults to complete the life cycle. *Salmonid Distributions and Life Histories*, *supra* note 47, at 48-50.

49. Bull trout are also especially susceptible to stream sedimentation. Fish and Wildlife Service Memorandum, *supra* note 34, at 16. To reproduce, these fish require beds of gravel uncovered by even fine sediments, as well as cold, clean water and areas characterized by reduced water velocity including side channels, stream margins, and pools. *Id.*

50. Diversions of water and impoundments that alter the flow regime of streams have a direct and immediate adverse impact on fish habitat. They reduce the stream's ability to transport sediment and woody debris, maintain its structural integrity and form, and prevent growth of riparian vegetation. Those characteristics in turn are less able to provide the cover, temperature, and spawning conditions and nutrition sources needed by fish. *INFISH EA*, *supra* note 9, at III.6.

51. John G. Williams & Graham Matthews, *Willow Ecophysiology: Implications for Riparian Restoration*, in *ENVIRONMENTAL RESTORATION: SCIENCE AND STRATEGIES FOR RESTORING THE EARTH* 196, 201 (John J. Berger ed., 1990); Stanley V. Gregory et al., *An*

therefore the consumers that are a significant food supply for fish, will not cycle through the ecosystem and cannot be stored unless the stream channel itself contains a broad diversity of features.⁵² Thus, it is essential that the stream contain a sufficient quantity of pools, riffles, glides, and side channels. In combination with other sources of cover such as boulders, large woody debris, overhanging vegetation, undercut banks, deep water, and surface turbulence, such areas are essential for protection from predators and adverse flow and climate conditions.⁵³

Riparian vegetation is also a vital guarantor of nutrient flow and habitat complexity.⁵⁴ In an undisturbed ecosystem, the riparian zone

Ecosystem Perspective of Riparian Zones, 41 BIOSCIENCE 540, 548 (1991)[hereinafter Ecosystem Perspective of Riparian Zones]; Robert J. Naiman et al., Fundamental Elements of Ecologically Healthy Watersheds in the Pacific Northwest Coastal Region (hereinafter Elements of Ecologically Healthy Watersheds), in WATERSHED MANAGEMENT: BALANCING SUSTAINABILITY AND ENVIRONMENTAL CHANGE 127, 170-71 (Robert J. Naiman ed., 1992) (hereinafter WATERSHED MANAGEMENT). Terrestrial processes are not the exclusive sources of the energy and nutrients that sustain riverine-riparian biodiversity in the Pacific Northwest. Salmon, which die after migrating to freshwater breeding grounds and spawning, provide a substantial portion of such energy and nutrients. Personal Correspondence from James R. Karr (July 28, 1995). See generally Anadromous Fish as Keystone Species, *supra* note 15.

52. Ecosystem Perspective of Riparian Zones, *supra* note 51, at 549.

53. Salmonid fry emerging from redds are weak swimmers that require protection from high flows and predators, as well as access to drifting food items. Adequate habitat occurs in areas with slow-moving water, such as along channel margins, in backwaters or secondary channels, and near boulders, large woody debris, or other instream structures. Elements of Ecologically Healthy Watersheds, *supra* note 51, at 127, 164-65. As the fry grow stronger, generally during late spring and summer, they move away from channel margins, probably to obtain more and larger food items. The juvenile salmonids still require structurally complex habitats, however. For example, juveniles may establish territories in areas of calm water adjacent to more rapid currents that provide a constant supply of drifting food items. The habitat must also provide refuge from high summer and low winter temperatures, as salmonids do not thrive, and may die, when water temperatures reach the upper or lower ends of their tolerance range, and predators. Suitable cover is especially important during winter when salmonids switch from food-gathering activities to hiding and schooling behavior. Winter habitat requirements include the slower, deeper water and abundance of cover characteristic of deep pools, undercuts, and debris jams. Habitat Requirements of Salmonids in Streams, *supra* note 48, at 108-136.

54. Jerry F. Franklin, Scientific Basis For New Perspectives in Forests and Streams, in WATERSHED MANAGEMENT, *supra* note 51, at 25, 27 [hereinafter Scientific Basis for New Perspectives] ("Riparian portions of . . . northwestern forest landscapes provide numerous ecological links between the forest and aquatic ecosystem [and] control [] much of the environmental regime of stream ecosystems"). As explained by the National Research Council,

The values of riverine and riparian ecosystems are interdependent. Both riverine and riparian ecosystems are essential elements of fish and wildlife habitat; the riparian ecosystem serves to store and desynchronize peak flow conveyed by the riverine ecosystem; the food chain and nutrient cycling of both ecosystems are intertwined; the cultural and heritage values of riverine and riparian ecosystems are intimately linked. Riverine and riparian

generally contains large conifers and hardwood trees, as well as shrubs and other small woody plants, which contribute litterfall and organic material to the stream.⁵⁵ Riparian plants provide shelter from high temperatures and sunshine by shading the stream and therefore play a central role in the maintenance of optimal water temperatures and oxygenation.⁵⁶ The root systems of riparian plants also stabilize stream banks, allow undercut banks to be formed and maintained, and protect stream banks during high flow events.⁵⁷

These ecosystem functions are also assured by connectivity between floodplains, surface water, and groundwater.⁵⁸ Pacific salmon and resident fish depend on connections between areas essential for cover, nutrients, or spawning, and numerous other species require pathways between refugia⁵⁹ unobstructed by physical or chemical

ecosystems also function in an integrated fashion. Impoundment, channelization, and diversion in the riverine system can influence the riparian ecosystem. Similarly, impacts to the riparian ecosystem... can cause erosion of streambanks and enlargement of channels, thus influencing the functional qualities of the riverine system. Since the values and function are interdependent, the approach for restoration of riverine and riparian ecosystems must be integrated.

RESTORATION OF AQUATIC ECOSYSTEMS, *supra* note 8, at 186 (quoting S.E. Jensen & W.S. Platts, Restoration of Degraded Riverine/Riparian Habitat in the Great Basin and Snake River Regions, in U.S. ENVIRONMENTAL PROTECTION AGENCY, 1 WETLAND CREATION AND RESTORATION: THE STATUS OF THE SCIENCE 377, 378 (Jon A. Kusler & Mary E. Kentula eds., 1989)).

55. Elements of Ecologically Healthy Watersheds, *supra* note 51, at 159. This is not generally true in the more arid portions of the region. Thus, in areas of Oregon and Washington east of the Cascades forested riparian zones are rare. Personal Correspondence from James R. Karr (July 28, 1995).

56. Elements of Ecologically Healthy Watersheds, *supra* note 51, at 156-59. Resident fish including kokanee salmon, mountain whitefish, pygmy whitefish, golden trout, bull trout, brook trout, cutthroat trout, brown trout, lake trout, rainbow trout, and Arctic grayling also do not thrive unless the rivers and streams which they inhabit contain cold, well-oxygenated water. FOREST SERVICE, U.S. DEP'T OF AGRICULTURE, 1 MANAGEMENT OF WILDLIFE AND FISH HABITATS IN FORESTS OF WESTERN OREGON AND WASHINGTON 205-13 (1985). In the case of bull trout, survival is dramatically reduced if water temperatures exceed sixty-four degrees Fahrenheit. EASTSIDE FORESTS SCIENTIFIC SOCIETY PANEL, INTERIM PROTECTION FOR LATE SUCCESSIONAL FORESTS, FISHERIES AND WATERSHEDS: NATIONAL FORESTS EAST OF THE CASCADE CREST, OREGON AND WASHINGTON 134 (1994) [hereinafter EASTSIDE SCIENTIFIC SOCIETY REPORT].

57. Ecosystem Perspective of Riparian Zones, *supra* note 51, at 545; Biodiversity Conservation in Running Waters, *supra* note 23, at 37.

58. FEMAT REPORT, *supra* note 6, at V.34. See also CALL FOR CONSERVATION PROGRAM, *supra* note 44, at 9 ("Nature can slowly restore watershed health if the remaining healthier habitats are expanded and reconnected, riparian areas restored, and streams are permitted to reconnect with their floodplains.").

59. Refugia are "areas with relatively undisturbed, healthier habitat and processes that serve as refuges for biodiversity." ENTERING THE WATERSHED, *supra* note 11, at xx.

barriers.⁶⁰ Failure to ensure conditions that permit such movement also impedes ecosystem function.⁶¹ Maintenance of favorable water quality and quantity conditions, as well as the deposition of rocks, sediment, and large woody debris and the cycling of nutrients through the aquatic ecosystem, requires a stable natural disturbance regime and spatial and temporal connectivity between watersheds.⁶²

B. The Current General Condition of Aquatic Ecosystems in the Pacific Northwest

The Pacific Northwest has few remaining ecologically healthy watersheds.⁶³ Few refugia for aquatic species can be found at lower elevations because such lowland areas, which in the past provided highly productive habitats, have generally been severely degraded by human activity.⁶⁴ Those that support healthy aquatic ecosystems generally remain only in lightly-impacted mid-basin and headwater areas, high in watersheds.⁶⁵ Most of the mid-basin and headwater watersheds in the region are on public lands.⁶⁶ Thus, the remaining healthy watersheds on national forests and national resource lands are disproportionately vital to the continued survival of the region's aquatic species, including Pacific salmon and other resident fish.⁶⁷

60. CALL FOR CONSERVATION PROGRAM, *supra* note 44, at 18-19 ("Intact riparian-floodplain systems provide connecting corridors among habitats, stream networks and watersheds by regulating stream temperatures, stream flows, habitat structure and nutrient sources. This type of connected landscape is required to maintain the diverse life histories of native fish. The restoration of . . . riparian systems will in most cases require the reestablishment of late-seral riparian vegetation . . . [and] . . . man-made obstacles to interaction between stream channels and adjacent floodplains.").

61. See SAVING NATURE'S LEGACY, *supra* note 14, at 283 ("[R]iver systems can be thought of as islands, with large river systems having high species richness and small systems having low species richness. This idea suggests that fragmentation of drainage basins will lead to extinctions."); ENTERING THE WATERSHED, *supra* note 11, at 7.

62. ENTERING THE WATERSHED, *supra* note 11, at 8. Natural "disasters," such as landslides and floods, and linkages between headwater tributaries and downstream channels allow water, sediment and other features of stream complexity, and nutrients to be transported. FEMAT REPORT, *supra* note 6, at V.13.

63. ENTERING THE WATERSHED, *supra* note 11, at xxxv.

64. See New Strategy for Watershed Restoration, *supra* note 8, at 11.

65. *Id.*; 59 Fed. Reg. 30,254 (1994) (noting that majority of remaining bull trout habitat exists in headwater streams). Such areas are often referred to as "biological hot spots," which include "smaller intact riverine habitat patches that provide critical functions for the stream or biodiversity." ENTERING THE WATERSHED, *supra* note 11, at xx.

66. PACIFIC SALMON AND FEDERAL LANDS, *supra* note 10, at xiv.

67. ENTERING THE WATERSHED, *supra* note 11, at 11; Frissell Declaration, *supra* note 30, ¶ 10.

Streams west of the Cascades have lost most of their productivity for native fish.⁶⁸ In western Oregon, nearly sixty percent of streams on the national forests provide poor habitat conditions for fish; in western Washington, nearly one-quarter of the watersheds on national forest land are in unacceptable condition.⁶⁹ Conditions vary in every watershed, but an overview of the health of the region's aquatic ecosystems can be obtained by considering several key elements of an aquatic ecosystem: riparian corridor characteristics, the incidence of large woody debris in streams, water quality, and in-channel habitat complexity.⁷⁰

68. ELLIOTT A. NORSE, ANCIENT FORESTS OF THE PACIFIC NORTHWEST 104-09 (1990). Similarly, aquatic habitats in the upper Columbia River Basin and east of the Cascades have a reduced capacity to support healthy fisheries. Commodity production activities, including livestock grazing, timber harvesting, mining and road construction, have degraded stream and riparian ecosystems. PACFISH EA, *supra* note 17, at 2-3. Aquatic habitat alterations include fewer large, deep pools, losses of riparian vegetation and large woody debris in stream channels, increased water temperatures and sediment deposition, and altered streamflow regimes. ROBERT C. WISSMAR ET AL., ECOLOGICAL HEALTH OF RIVER BASINS IN FORESTED REGIONS OF EASTERN WASHINGTON AND OREGON (U.S. Dep't of Agriculture, Forest Service, Gen. Tech. Rep. No. PNW-GTR-326) (1994)[hereinafter ECOLOGICAL HEALTH OF RIVER BASINS IN FORESTED REGIONS OF EASTERN OREGON AND WASHINGTON].

69. See FEMAT REPORT, *supra* note 6, at App. V.D & table V.D.2. Aquatic ecosystems in northern California have also suffered extensive biotic alteration. DEBORAH B. JENSEN ET AL., A STRATEGY FOR CONSERVING CALIFORNIA'S BIOLOGICAL DIVERSITY 78 (1993). Land use activities have caused the rapid demise of riparian habitat, *id.* at 15, and 72% of the state's native freshwater fish species are either listed as endangered or threatened under the ESA or are candidates for such listing. *Id.* at 79.

70. These factors are evaluated because this paper aims to assess the ACS on the basis of its likely effectiveness in protecting the biological integrity, as opposed to the biological diversity, of the streams and rivers within the range of the northern spotted owl. There are two ways to conceive of "biological integrity." One way is to think of it as the "wholeness" of the aquatic/riparian ecosystem, including all of the naturally-occurring elements and processes associated with it. Paul L. Angermeier & James R. Karr, Biological Integrity versus Biological Diversity as Policy Directives, 44 BIOSCIENCE 690, 692 (1994). The other way is to consider it a measure of a given ecosystem to provide and maintain, relative to a naturally functioning ecosystem, its native biotic processes and biological diversity. See James R. Karr, Biological Integrity and the Goal of Environmental Legislation: Lessons From Conservation Biology, 4 CONSERVATION BIOLOGY 244, 245 (1990) (biological integrity is "[t]he capability of supporting and maintaining a balanced, integrated, and adaptive community of organisms having a species composition and functional organization comparable to that of natural habitat of the region."). An ecosystem achieves such a state of "ecological health" when its "inherent potential is realized, its condition is [relatively] stable, its capacity for self-repair when perturbed is preserved, and minimal external support for management is needed." *Id.* Biological diversity, on the other hand, is "the variety and variability among living organisms and the ecological complexes in which they occur." UNITED STATES CONGRESS, OFFICE OF TECHNOLOGY ASSESSMENT, TECHNOLOGIES TO MAINTAIN BIOLOGICAL DIVERSITY 3 (1987). Thus, biological integrity is a measure of an ecosystem's condition absent significant human-induced disturbance and biological diversity is a measure of the "number of kinds of items" in the ecosystem. Angermeier & Karr, *supra* at 692. A focus on biological integrity is more likely to lead to a policy choice that prevents continued habitat degradation and

1. Riparian Corridor Characteristics

Riparian corridors throughout the region are highly degraded.⁷¹ On the westside of the Cascades, logging in riparian corridors has significantly reduced the number of trees popular as lumber sources.⁷² In general, riparian areas in the northern spotted owl's range have few trees with diameters larger than ten inches and which grow within 100-

which facilitates management emphasis on ecosystem function. *Id.* To protect the biological integrity of aquatic ecosystems, biological criteria to measure ecosystem health should be adopted. See Addressing Barriers to Watershed Protection, *supra* note 8. Moreover, the Clean Water Act requires policymakers to protect the biological integrity of the nation's waterways. See 33 U.S.C. § 1251(a) (1994) (requiring federal government to "restore and maintain the chemical, physical, and biological integrity of the Nation's waters"). Unfortunately, the Clean Water Act and other laws regulating water pollution have failed to protect aquatic and riparian habitats from the adverse effects of human land use activities. The Clean Water Act and state water pollution laws focus generally on chemical contamination of waterways and mandate technology-based solutions to water quality problems. Thus, degradation of the biological aspects of waterways caused by many factors other than chemical pollution, including habitat loss and fragmentation, invasions of exotic species, excessive water withdrawals, and overharvest of fish and other aquatic life, are generally not effectively addressed by the nation's framework for regulating water quality. See generally James R. Karr, Protecting Aquatic Ecosystems: Clean Water is Not Enough, in BIOLOGICAL ASSESSMENT AND CRITERIA: TOOLS FOR WATER RESOURCE PLANNING AND DECISIONMAKING 7 (Wayne S. Davis & Thomas P. Simon eds., 1995) [hereinafter Clean Water is Not Enough]. Nor has the nation made rapid progress toward adoption of a biocriteria approach to water quality regulation. Addressing Barriers to Watershed Protection, *supra* note 8. Nevertheless, the Forest Service and BLM must consider impacts on the biological integrity of riverine-riparian ecosystems when determining how to manage the lands under their jurisdiction. The National Forest Management Act (NFMA) commands preservation of diverse and viable populations of native species on lands managed by the Forest Service. See 16 U.S.C. § 1604(g)(3)(B) (1994). NFMA also forbids "irreversible damage" to "soil, slope, or other watershed conditions," and mandates protection of "streams, streambanks, shorelines, lakes, wetlands, and other bodies of water from detrimental changes in water temperatures, blockages of water courses, and deposits of sediment" if the commodity production activities that cause such effects would "seriously and adversely affect water conditions or fish habitat." 16 U.S.C. § 1604(g)(3)(E). The Endangered Species Act (ESA) compels federal agencies to avoid jeopardizing listed species and ultimately to reverse existing trends toward extinction. 16 U.S.C. § 1531(c)(1); Carson-Truckee Water Conservancy Dist. v. Clark, 741 F.2d 257, 262 (9th Cir. 1984) (quoting Tennessee Valley Auth. v. Hill, 437 U.S. 153, 184 (1978)), cert. denied, 470 U.S. 1083 (1985). See also Seattle Audubon Society v. Lyons, 871 F. Supp. 1291, 1316 (W.D. Wash. 1994) (Federal Land Policy and Management Act requires BLM to preserve diversity and viability of native species on its lands).

71. FEMAT REPORT, *supra* note 6, at V.25. This problem is not unique to the Pacific Northwest. Throughout the western United States riparian conditions are thought to be the worst in history. See ED CHANEY ET AL., LIVESTOCK GRAZING ON WESTERN RIPARIAN AREAS 5 (1990).

72. FEMAT REPORT, *supra* note 6, at V.25. Of course, logging outside of riparian areas has also contributed to this problem.

200 feet of streams.⁷³ Much of the destruction of riparian areas is the result of roadbuilding.⁷⁴ The federal forests within the range of the northern spotted owl contain approximately 110,000 miles of roads and an estimated 250,000 stream crossings.⁷⁵ Thus, the continued shrinkage of the region's roadless areas has a magnified effect on aquatic ecosystems. Throughout the region, road densities are high, reaching nearly 12 miles per square mile of forest in some watersheds.⁷⁶ On the western side of the Cascade Mountains, federal lands contain well over 100,000 miles of roads, many of which constitute current or potential threats to aquatic and riparian ecosystems.⁷⁷

Timber harvesting and cattle grazing have also caused severe harm to riparian corridors.⁷⁸ These activities undermine soil stability, alter the structure of stream banks, and interfere with the reproduction of native plant and wildlife populations.⁷⁹ The resulting loss of conifers and understory plants reduces organic nutrient delivery to streams, eliminates the source of streambank stability, and impedes the maintenance of streamside microclimates, which are often characterized by somewhat cooler ambient air temperatures and the presence of turbulent surface water.⁸⁰ Destruction of riparian woody plants also eliminates sources of shade, which are necessary to maintain water temperatures at a level cool enough to sustain temperature-sensitive fish

73. *Id.* at V.25-V.26. Damage to riparian areas is even more extensive in the upper Columbia River Basin. More than one-half of the riparian corridors in some river basins east of the Cascades, including the Deschutes, Umatilla, Grande Ronde, and John Day, require riparian restoration. Logging and grazing have eliminated woody vegetation altogether from many Eastside streams, resulting in the loss of shade for stream channels. Many eastside rivers and streams are also characterized by incised channels and lowered water tables, and overgrazing and logging-induced soil erosion do not affect only the current health of riparian ecosystems. In some areas, scientists have determined that no new cottonwood, alder, or willow-dominated riparian communities have reestablished themselves during the last 50-100 years. EASTSIDE SCIENTIFIC SOCIETY REPORT, *supra* note 56, at 121-25.

74. FEMAT REPORT, *supra* note 6, at V.25.

75. FEMAT REPORT, *supra* note 6, at V.16. Nationwide, the national forests contain approximately 350,000 miles of roads. THESE AMERICAN LANDS, *supra* note 45, at 83 (1994). This is a huge amount of road miles. In fact, the national forest road system is so large that it could reach the moon and back, and then go halfway to the moon again, or circle the earth 14 times. *Id.* at 91, 101. National forest roads are also extremely expensive. Taxpayers spend \$120 - \$150 million each year just to construct new ones, and millions more to mitigate the erosion, sediment loading, and habitat destruction they cause. *Id.* at 101.

76. EASTSIDE SCIENTIFIC SOCIETY REPORT, *supra* note 56, at 110.

77. FEMAT REPORT, *supra* note 6, at V.16.

78. ENTERING THE WATERSHED, *supra* note 6, at 18.

79. *Id.*; Thomas L. Fleischer, Ecological Costs of Livestock Grazing in Western North America, 8 CONSERVATION BIOLOGY 629, 631-36 (1994)[hereinafter Ecological Costs of Livestock Grazing].

80. Ecological Costs of Livestock Grazing, *supra* note 79, at 636-37.

and amphibian species.⁸¹ Harvest of dead trees lying on the ground in the riparian area deprives a variety of terrestrial species of vital habitat.⁸²

The adverse erosion and temperature impacts of timber harvesting are compounded when salvage logging occurs. Removal of dead trees from riparian corridors, rivers, and streams causes stream velocity to increase and reduces the natural tendency of a stream or river channel to meander.⁸³ Such activity within riparian areas often requires the construction of additional roads, and after trees are removed and especially where associated understory vegetation is burned or otherwise damaged, cattle may find the cutover area ideal for browsing. Livestock grazing in riparian areas trample and eat native vegetation, which inhibits regeneration of plant communities and increases sedimentation rates.⁸⁴

2. Large Woody Debris

Biologists now realize that large woody debris makes an essential contribution to stream habitat complexity.⁸⁵ In addition to influencing stream channel morphology, downed logs and other organic material increase stream habitat complexity by causing pools, backwaters,

81. Elements of Ecologically Healthy Watersheds, *supra* note 51, at 159; SAVING NATURE'S LEGACY, *supra* note 14, at 233.

82. Elements of Ecologically Healthy Watersheds, *supra* note 51, at 168-69.

83. ENTERING THE WATERSHED, *supra* note 11, at 18.

84. Ecological Costs of Livestock Grazing, *supra* note 79, at 635; ENTERING THE WATERSHED, *supra* note 11, at 19. Recent political pressure to dramatically increase the amount of salvage logging on federal forests indicates that the threats to the region's riparian corridors are likely to increase in the near future. Congress recently passed a bill rescinding fiscal year 1995 appropriations that requires the Forest Service to cut six billion board feet of "dead, dying, and associated" timber nationwide in a two year period ending in 1996. Pub. L. No. 104-19, 109 Stat. 194 (1995). The bill strictly limits the judicial review that may be applied to these salvage harvests from judicial review and provides that they are to be deemed consistent with all applicable federal environmental laws. *Id.*, § 2001(f), (i). President Clinton signed the bill into law on July 27, 1995, promising that he would require the Forest Service to abide by all environmental laws and his plan for the westside forests before permitting salvage logging. Rob Eure, Clinton OKs Salvage Logging Bill, THE OREGONIAN, July 28, 1995, at C1; Memorandum to Cabinet Secretaries From President William J. Clinton (Aug. 1, 1995) (copy on file with author). For a trenchant criticism of Congress' recent pattern of exempting commodity production on federal forests from environmental laws, see Victor M. Sher & Carol Sue Hunting, Eroding the Landscape, Eroding the Laws: Congressional Exemptions from Judicial Review of Environmental Laws, 15 HARV. ENVTL. L. REV. 435 (1991).

85. FEMAT REPORT, *supra* note 6, at V.13; Bill Dietrich, An Industry in Transition: Timber Firms are Starting to Tend the Ecosystem as Well as the Trees, SEATTLE TIMES, Mar. 30, 1995, at A13.

secondary channels, and eddies to form.⁸⁶ Such additions to the aquatic ecosystem from surrounding land also provide an important source of nutrients for aquatic species and microhabitat for a variety of insects, salamanders, and microscopic organisms.⁸⁷ As the stream's ability to perform these functions diminishes, the effects are felt by the dominant species in the food chain.⁸⁸

The quantity of large woody debris in streams throughout the region has been dramatically reduced as a result of timber harvesting within riparian corridors, salvage logging, slashburning, and debris flows or floods caused by upslope timber harvesting.⁸⁹ In earlier years, particularly in the nineteenth century and the early years of this century, splash-damming was used to transport logs.⁹⁰ The resulting torrents often pushed all downed logs downstream with the felled timber.⁹¹ Clearcutting on upslope lands likewise contributes to landsliding and loss of the watershed's natural flood control system.⁹² Another contributor has historically been a policy that deemed large woody debris an unnecessary impediment to fish migration.⁹³ During the two decades from the 1950s to the 1970s, fish and wildlife agencies in the region routinely removed downed logs from streams.⁹⁴

3. Water Quality

Species dependent on aquatic ecosystems require high water quality to survive. Water temperatures within the range that corresponds to the emergence, development, and migration patterns of fish and other

86. See Peter A. Bisson et al., Large Woody Debris in Forested Streams in the Pacific Northwest: Past, Present, and Future, in *STREAMSIDE MANAGEMENT: FORESTRY AND FISHERY INTERACTIONS* 143, 146-50 (Ernest O. Salo & Terrance W. Cundy eds., 1987) [hereinafter *STREAMSIDE MANAGEMENT*].

87. See generally CHRIS MASER & JAMES R. SEDELL, *FROM THE FOREST TO THE SEA: THE ECOLOGY OF WOOD IN STREAMS, RIVERS, ESTUARIES, AND OCEANS* 26-44 (1994) [hereinafter *ECOLOGY OF WOOD*].

88. *Elements of Ecologically Healthy Watersheds*, *supra* note 51, at 170-73.

89. *ECOLOGY OF WOOD*, *supra* note 87, at 140-41; FEMAT REPORT, *supra* note 6, at V.13.

90. *ECOLOGY OF WOOD*, *supra* note 87, at 138; FEMAT REPORT, *supra* note 6, at V.14.

91. *ECOLOGY OF WOOD*, *supra* note 87, at 138; FEMAT REPORT, *supra* note 6, at V.14.

92. EASTSIDE SCIENTIFIC SOCIETY REPORT, *supra* note 56, at 138, 141; *Scientific Basis for New Perspectives*, *supra* note 54, at 38-40. Some studies have shown that clearcutting can increase the frequency of debris torrents by as much as 8.8 times. DANIEL L. BOTTOM ET AL., *THE EFFECTS OF STREAM ALTERATIONS ON SALMON AND TROUT HABITAT IN OREGON* 42 (1985).

93. FEMAT REPORT, *supra* note 6, at V.14.

94. *Id.*

aquatic organisms are especially important,⁹⁵ as is an abundance of oxygen and an absence of excessive sediment.⁹⁶ Timber harvesting, live-stock grazing, and mining have significant adverse affects on water quality.⁹⁷ Road-related landsliding, surface erosion, and stream channel diversions often cause very large quantities of sediment to be delivered into streams.⁹⁸ In addition, sediment delivery to streams increases as stream banks are eroded, riparian and upland vegetation is lost, and the natural flood control systems provided by root systems, wetlands, and healthy floodplains are eliminated.⁹⁹ Riparian corridor destruction, sedimentation, and chemical pollution cause water temperatures to rise.¹⁰⁰

Recent research indicates that most streams within the northern spotted owl's range are moderately or severely impaired.¹⁰¹ Overall, most of the watersheds on federal lands throughout the Pacific Northwest fail to meet applicable water quality criteria.¹⁰² Some studies indicate

95. OREGON DEP'T OF ENVIRONMENTAL QUALITY, WATER QUALITY DIV., DRAFT ISSUE PAPER ON THE WATER QUALITY STANDARD FOR TEMPERATURE 26-40 (1994)[hereinafter DRAFT ISSUE PAPER ON THE WATER QUALITY STANDARD FOR TEMPERATURE].

96. Kathleen Sullivan et al., Stream Channels: The Link Between Forests and Fish, in STREAMSIDE MANAGEMENT, *supra* note 86, at 39.

97. FEMAT REPORT, *supra* note 6, at V.14.

98. See Leslie M. Reid & Thomas Dunne, Sediment Production from Forest Road Surfaces, 20 WATER RESOURCES RESEARCH 1753 (1984); Douglas N. Swanston & Frederick J. Swanson, Timber Harvesting, Mass Erosion, and Steepland Forest Geomorphology in the Pacific Northwest, in GEOMORPHOLOGY AND ENGINEERING 199 (Donald R. Coates ed., 1976). It is important to keep in mind that distinct land use activities, such as agriculture, mining, and logging, can cause similar environmental impacts, including increased sediment delivery to streams. See generally Isaac J. Schlosser, Stream Fish Ecology: A Landscape Perspective, 41 BIOSCIENCE 704 (1991). Thus, determining a precise estimate of the relative contribution of each such activity to increased sedimentation is likewise difficult. Fred H. Everest et al., Fine Sediment and Salmonid Production: A Paradox, in STREAMSIDE MANAGEMENT, *supra* note 86, at 98, 101 [hereinafter Fine Sediment and Salmonid Production: A Paradox].

99. SAVING NATURE'S LEGACY, *supra* note 14, at 270.

100. *Id.* at 233.

101. FOREST SERVICE, U.S. DEP'T OF AGRICULTURE & BUREAU OF LAND MANAGEMENT, U.S. DEP'T OF THE INTERIOR, 1 FINAL SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT ON MANAGEMENT OF HABITAT FOR LATE SUCCESSIONAL AND OLD-GROWTH FOREST RELATED SPECIES WITHIN THE RANGE OF THE NORTHERN SPOTTED OWL 3&4.59 (1994) [hereinafter WESTSIDE FINAL EIS]. "Impaired" is defined as pollution that has adversely affected beneficial uses of the waterway, including fish habitat. *Id.* at 3&4.53.

102. Personal Correspondence with Jonathan J. Rhodes, Hydrologist, Columbia River Inter-Tribal Fish Commission, Portland, OR (Sept. 6, 1995). See, e.g., OREGON DEP'T OF ENVIRONMENTAL QUALITY, 1992-94 WATER QUALITY STANDARD REVIEW 1.6-1.7 (1995) (data indicating most streams in western Oregon violate temperature standards). It is important to note that compliance with water quality standards is based on achieving discharge limits on the chemical contamination of waterways. If biological criteria for determining water quality are considered, the proportion of the region's waterways in violation of applicable standards would probably double. Personal Correspondence from James R. Karr (July 28, 1995). See generally Clean Water is Not Enough, *supra* note 70, at 12-13.

that sediment levels in the Pacific Northwest's streams have more than doubled in the past 50-60 years.¹⁰³ Moreover, maximum stream temperatures commonly exceed the warmest estimated naturally occurring temperature or are in the upper portion of the range of natural conditions in most of the region's river basins.¹⁰⁴ Pollution from cattle waste and metals production and other toxic pollutants related to mining activity and logging equipment have increasingly contaminated the region's streams.¹⁰⁵

The consequences for fish have been extreme. Elevated water temperatures have caused many streams in the region to lose the capacity to support fish dependent on cold water.¹⁰⁶ Many species cannot survive when water temperatures exceed the high-sixty degree Fahrenheit level,¹⁰⁷ and elevated temperatures may adversely affect the reproductive and migratory behavior and growth of other fish species.¹⁰⁸ Increased sediment delivery to streams destroys fish spawning areas, smothers eggs and increases the mortality of juvenile fish

103. FEMAT REPORT, *supra* note 6, at V.16.

104. *Id.* Measurements of water temperature in streams east of the Cascade Mountains indicate that the problem is even more pervasive in that area of the region. The summer water temperature range required by Pacific salmon and resident fish, especially the bull trout, is commonly exceeded in streams in the lower elevations of national forests east of the Cascades by as much as ten to fifteen degrees. EASTSIDE SCIENTIFIC SOCIETY REPORT, *supra* note 56, at 123.

105. See ECOLOGICAL HEALTH OF RIVER BASINS IN FORESTED REGIONS OF EASTERN OREGON AND WASHINGTON, *supra* note 68, at 15-16.

106. DRAFT ISSUE PAPER ON THE WATER QUALITY STANDARD FOR TEMPERATURE, *supra* note 95, at 19. The effects have been especially severe east of the Cascades, where the temperature in some streams has reached 80 degrees Fahrenheit during the summer, far above the low-sixty degree range necessary for fish survival. EASTSIDE SCIENTIFIC SOCIETY REPORT, *supra* note 56, at 123.

107. Bull trout prefer temperatures in the 48-56 degree range and are not found in waters characterized by temperatures above 64 degrees. EASTSIDE SCIENTIFIC SOCIETY REPORT, *supra* note 56, at 134. Freshwater trout species also disappear when water temperatures exceed 68 degrees Fahrenheit. Gordon H. Reeves et al., Interactions Between the Redside Shiner (*Richardsonius balteatus*) and the Steelhead Trout (*Salmo gairdneri*) in Western Oregon: The Influence of Water Temperature, 44 CANADIAN JOURNAL OF FISHERIES AND AQUATIC SCIENCES 1603 (1987).

108. For example, the fecundity of spring chinook salmon and the viability of their eggs are decreased by elevated water temperatures. C. Berman & T.P. Quinn, Behavioral Thermoregulation and Homing by Spring Chinook Salmon, *Oncorhynchus tshawytscha* (Walbaum), in the Yakima River, 39 JOURNAL OF FISH BIOLOGY 301 (1991). Other studies have found that increased water temperatures cause juvenile coho salmon to grow faster and to migrate earlier, which in turn reduces the ability of the juvenile to survive into adulthood because it enters the ocean too quickly. L. Blair Holtby, Effects of Logging on Stream Temperatures in Carnation Creek, British Columbia, and Associated Impacts on Coho Salmon (*Oncorhynchus kisutch*), 45 CANADIAN JOURNAL OF FISHERIES AND AQUATIC SCIENCES 502 (1988).

by decreasing the oxygen level in the stream¹⁰⁹ and reducing the quantity of available food.¹¹⁰

4. *In-Channel Habitat Complexity*

The loss of riparian vegetation and large woody debris, as well as roadbuilding near and across streams and increased sedimentation, has vastly altered the physical complexity of the region's stream systems.¹¹¹ Loss of riparian vegetation has caused the loss of potential physical barriers creating riffles, side channels, and pools, and increased sediment delivery and erosion caused by extensive logging and livestock grazing and widespread road construction has filled most of the deep pools that existed sixty years ago.¹¹²

Many of the region's streams flow at a higher velocity than they once did and have lost a portion of their natural tendency to meander.¹¹³ Loss of leaves and large woody debris from streams is responsible for this alteration.¹¹⁴ In addition, road construction along stream banks has restricted the capacity of many streams to move laterally.¹¹⁵ The consequence of this change in stream morphology has been undeflected flows that channelize streambeds, with resulting adverse effects on water storage capacity, water tables, and flood patterns.¹¹⁶

III. Ecosystem Management in the Pacific Northwest

Since 1993, three major programs designed to integrate concern for the ecological integrity of forest and rangeland ecosystems into the

109. Fine Sediment and Salmonid Production: A Paradox, *supra* note 98, at 113-15, 117-18.

110. Denby S. Lloyd et al., Effects of Turbidity in Fresh Waters of Alaska, 7 NORTH AMERICAN JOURNAL OF FISHERIES MANAGEMENT 18 (1987).

111. Peter A. Bisson et al., Best Management Practices, Cumulative Effects, and Long-Term Trends in Fish Abundance in Pacific Northwest River Systems, in WATERSHED MANAGEMENT, *supra* note 51, at 189, 209-10.

112. EASTSIDE SCIENTIFIC SOCIETY REPORT, *supra* note 56, at 124, 126. Studies indicate that as much as 80% of large, deep pools have disappeared in coastal Oregon, with a 58% reduction in such pools in the national forests within the range of the northern spotted owl and in Washington. FEMAT REPORT, *supra* note 6, at V.22.

113. This is often a result of road construction or other development alongside streams. Such activities can constrict the channel and interfere with the interaction of the stream with its floodplain and the riparian corridor. EASTSIDE SCIENTIFIC SOCIETY REPORT, *supra* note 56, at 142. Grazing can also cause channelization and altered stream morphology. *Id.* at 144.

114. ENTERING THE WATERSHED, *supra* note 11, at 18.

115. EASTSIDE SCIENTIFIC SOCIETY REPORT, *supra* note 56, at 142.

116. Scientific Basis for New Perspectives, *supra* note 54, at 40.

management of the region's federal lands have emerged.¹¹⁷ Only one of these, the Administration's plan for managing federal forests within the range of the northern spotted owl,¹¹⁸ is currently being implemented.¹¹⁹ Accordingly, this paper limits its discussion to President Clinton's ecosystem management initiative for westside forests.

A. Background of the Westside Forests Plan

Between 1987-92, management of federal forests in the Pacific Northwest became entangled in a series of lawsuits challenging the government's failure to abide by several environmental laws, including the Endangered Species Act (ESA), National Environmental Policy Act (NEPA), Federal Land Policy and Management Act (FLPMA), and

117. Because ICBEMP and Rangeland Reform are in early stages of development or implementation, it is premature to evaluate the likelihood that they will achieve the objectives established by federal land managers. The public has not yet been informed of the measures to be adopted for forests east of the Cascades and in the upper Columbia River Basin, and the national rangeland reform program will not take effect until the Clinton Administration issues a record of decision and state BLM offices adopt local management standards and guidelines. Two other programs, PacFish and InFish, are temporary in scope. See PACFISH EA, *supra* note 17; INFISH EA, *supra* note 9. Accordingly, the Westside Plan's ACS is the only permanent ecosystem management initiative that can now be evaluated on the basis of how well it will protect aquatic ecosystems in the Pacific Northwest.

118. WESTSIDE FINAL EIS, *supra* note 101. The Secretaries of Interior and Agriculture jointly issued a Record of Decision amending Forest Service and BLM plans governing public land management within the range of the northern spotted owl in April 1994. FOREST SERVICE, U.S. DEP'T OF AGRICULTURE & BUREAU OF LAND MANAGEMENT, U.S. DEP'T OF THE INTERIOR, RECORD OF DECISION FOR AMENDMENTS TO FOREST SERVICE AND BUREAU OF LAND MANAGEMENT PLANNING DOCUMENTS WITHIN THE RANGE OF THE NORTHERN SPOTTED OWL AND STANDARDS AND GUIDELINES FOR MANAGEMENT OF HABITAT FOR LATE-SUCCESSIONAL AND OLD-GROWTH FOREST RELATED SPECIES WITHIN THE RANGE OF THE NORTHERN SPOTTED OWL (1994) [hereinafter WESTSIDE ROD]. For convenience, the text of this paper refers to these documents together as the Westside Plan.

119. The Clinton Administration has not yet issued a Record of Decision finalizing Rangeland Reform, although it became effective in August 1995. 60 Fed. Reg. 9,894 (1995)(to be codified at 43 C.F.R. §§ 1780, 4100). As proposed, Rangeland Reform would not prohibit grazing in riparian areas or on other sensitive landscapes, but would reduce the federal land agencies' management discretion and focus on the adverse impacts of grazing, including erosion, maintenance of healthy riparian corridors, retention of appropriate stream physical structures, and preservation of native biodiversity. See generally RANGELAND REFORM DRAFT EIS, *supra* note 17. Ranchers are attempting to prevent implementation of an ecosystem management program for grazing lands. See Rancher's Coalition Sues Interior Dept. Over Regs, 5 AMERICAN POLITICAL NETWORK: GREENWIRE, No. 62, Jul. 28, 1995 (available on Westlaw). In addition, bills that would prohibit implementation of Rangeland Reform and institutionalize livestock grazing as the dominant uses of BLM lands are pending before Congress. See S. 852, 104th Cong., 1st Sess. (1995); H.R. 1713, 104th Cong., 1st Sess. (1995). ICBEMP is currently in the early stages of planning and development, and therefore no directives for Eastside and upper Columbia River Basin federal forests have been issued.

National Forest Management Act (NFMA).¹²⁰ By 1992, federal courts enjoined timber harvesting from federal lands containing habitat for the northern spotted owl.¹²¹ During the 1992 Presidential campaign, then-candidate Bill Clinton promised to resolve the litigation that had paralyzed federal land management in the region.¹²² On April 2, 1993,

120. Litigation over the fate of the Pacific Northwest's old-growth forest ecosystems commenced in 1987, when citizens challenged the refusal of the U.S. Fish and Wildlife Service to list the northern spotted owl as an endangered species. See *Northern Spotted Owl v. Hodel*, 716 F. Supp. 479 (W.D. Wash. 1988). After the Fish and Wildlife Service listed the owl, legal battles over critical habitat designation, see *Northern Spotted Owl v. Lujan*, 758 F. Supp. 621 (W.D. Wash. 1991), and the adequacy of forest plan and environmental impact statement consideration of the owl's plight continued into the early 1990s. See *Portland Audubon Soc'y v. Hodel*, 18 Env't'l. L. Rep. (Env't'l. L. Inst.) 21,210 (D. Or., Apr. 20, 1988) (granting defendant's motion to dismiss for lack of jurisdiction), *aff'd in part, rev'd in part*, 866 F.2d 302 (9th Cir. 1989), on remand sub nom., *Portland Audubon Soc'y v. Lujan*, 712 F. Supp. 1456 (D. Or. 1989) (granting defendant's motion for summary judgment and vacating preliminary injunction), *aff'd in part, rev'd in part*, 884 F.2d 1233 (9th Cir. 1989) (upholding dismissal of NEPA claim but reversing as to other claims), cert. denied, 494 U.S. 1026 (1990), on remand, 21 Env't'l. L. Rep. (Env't'l. L. Inst.) 20,018 (D. Or., Dec. 21, 1989) (granting defendant's motion to dismiss on mootness grounds), *rev'd sub nom.*, *Seattle Audubon Soc'y v. Robertson*, 914 F.2d 1311 (9th Cir. 1990), *rev'd*, 503 U.S. 429 (1992), 1990 WL 169703 (D. Or., Oct. 30, 1990) (granting defendant's motion to dismiss for lack of jurisdiction), vacated and remanded, 931 F.2d 590 (9th Cir. 1991), on remand, 1991 WL 81838 (D. Or., May 8, 1991) (granting defendant's motion for summary judgment on claims under Oregon & California Lands Act and Migratory Bird Treaty Act but denying same as to claims under FLPMA), later proceeding sub nom., *Portland Audubon Soc'y v. Lujan*, 784 F. Supp. 786 (D. Or. 1992) (granting plaintiff's motion for preliminary injunction), later proceeding, 795 F. Supp. 1489 (D. Or. 1992) (granting plaintiff's motion for summary judgment and denying defendant's motion to vacate preliminary injunction), *aff'd sub nom.*, *Portland Audubon Soc'y v. Babbitt*, 998 F.2d 705 (9th Cir. 1993); *Seattle Audubon Soc'y v. Evans*, 771 F. Supp. 1081 (W.D. Wash. 1991) (granting plaintiff's request for preliminary injunction); *Seattle Audubon Soc'y v. Moseley*, 798 F. Supp. 1473 (W.D. Wash. 1992) (holding forest management plans in violation of NEPA), later proceeding, 798 F. Supp. 1484 (W.D. Wash. 1992) (granting injunction against award of timber sales within range of northern spotted owl), *aff'd sub nom.*, *Seattle Audubon Soc'y v. Espy*, 998 F.2d 699 (9th Cir. 1993). For an overview of the litigation, see Alyson C. Flournoy, *Beyond the "Spotted Owl Problem": Learning From the Old-Growth Controversy*, 17 HARV. ENV'T'L L. REV. 261, 284-300 (1993). On the northern spotted owl case and resulting listing, see Mark Bonnett & Kurt Zimmerman, *Politics and Preservation: The Endangered Species Act and the Northern Spotted Owl*, 18 ECOLOGY L.Q. 105 (1991).

121. See *Seattle Audubon Soc'y v. Moseley*, 798 F. Supp. 1473 (W.D. Wash. 1992) (finding Forest Service in violation of NEPA for failing to prepare adequate environmental impact statement before logging in northern spotted owl habitat), *aff'd sub nom.*, *Seattle Audubon Soc'y v. Espy*, 998 F.2d 699 (9th Cir. 1993); *Portland Audubon Soc'y v. Lujan*, 795 F. Supp. 1489 (D. Or. 1992) (finding BLM in violation of NEPA for failing to prepare supplemental environmental impact statement before logging in northern spotted owl habitat and issuing preliminary injunction), *aff'd sub nom.*, *Portland Audubon Soc'y v. Babbitt*, 998 F.2d 705 (9th Cir. 1993).

122. See, e.g., David Lauter & Douglas Jehl, *Bush, Clinton Clash Over Jobs, Environment*, LOS ANGELES TIMES, Sept. 15, 1992, at A1 (quoting then-candidate Clinton's promise to "figure out what is the right thing to do for a long-term sustainable forest" that maintains jobs and "preserve[s] the . . . diversity" native to those forests).

President Clinton directed the relevant agencies of the executive branch to create a "scientifically sound, ecologically credible, and legally responsible" management plan for federal forests in the Pacific Northwest.¹²³ The President also required that the plan "protect the long-term health of our forests, our wildlife, and our waterways" and "produce a predictable and sustainable level of timber sales and nontimber resources that will not degrade or destroy the environment."¹²⁴

B. Overview of the Westside Plan

In February 1994, the Forest Service and the BLM issued the federal government's plan for managing federal forests west of the Cascade Mountains.¹²⁵ The Westside Plan modifies existing management plans that govern the individual national forests and BLM ranger districts throughout the northern spotted owl's range.¹²⁶ In *Seattle Audubon Society v. Lyons*, the court found the Westside Plan consistent with the laws governing Forest Service and BLM activities.¹²⁷

The Westside Plan EIS evaluated ten options for management of the northern spotted owl forests.¹²⁸ Under each option, all lands within the national forests and BLM districts subject to the Westside Plan were allocated to seven designated management area categories. These categories were created on the basis of the likely ecological consequences of timber harvesting on land within them.¹²⁹ The management option selected by the Westside Plan EIS is built around a set of "standards and guidelines" that regulate activities within the designated management

123. FEMAT REPORT, *supra* note 6, at ii (quoting Memorandum to Forest Conference Inter-agency Working Groups from Forest Conference Executive Committee (April 1993)).

124. *Id.*

125. WESTSIDE FINAL EIS, *supra* note 101.

126. WESTSIDE ROD, *supra* note 118, at 1.

127. 871 F. Supp. 1291 (W.D. Wash. 1994), appeals docketed, Nos. 95-35052 (9th Cir., Jan. 20, 1995), 95-35214 (9th Cir., Mar. 8, 1995). Congress recently enacted, as part of an appropriations rescissions bill for fiscal year 1995, a statute declaring the Westside Plan consistent with all applicable federal environmental protection laws. Pub. L. No. 104-19, 109 Stat. 194 (1995). Accordingly, the Ninth Circuit is likely to reject all challenges to the Westside Plan. See *Robertson v. Seattle Audubon Society*, 503 U.S. 429 (1992) (rejecting arguments that similar appropriations bill amendments declaring timber sales consistent with existing laws violate separation of powers doctrine).

128. 1 WESTSIDE FINAL EIS, *supra* note 101, at 2.41-2.67.

129. *Id.* at 2.23-2.25.

areas.¹³⁰ These standards, guidelines and management areas overlay those in existing individual national forest or BLM ranger district plans, except where those existing plans are more restrictive or provide greater benefits to "late-successional forest related species."¹³¹

C. *The Aquatic Conservation Strategy*

The drafters of the Westside Plan recognized the fundamental importance of healthy aquatic and riparian ecosystems to the Pacific Northwest:

Aquatic and riparian areas are integral parts of the region's ecosystems and major factors in supporting the economy of the region. Damage to forest riparian and aquatic systems has contributed to degradation of some plant and animal communities. Of immediate concern is the loss of salmon and steelhead runs, which are major cultural and economic elements in the Pacific Northwest and northern California.¹³²

All but one proposed option, including Alternative 9,¹³³ therefore incorporated an Aquatic Conservation Strategy (ACS) aimed at protecting and restoring aquatic and riparian ecosystems.¹³⁴ Because this paper evaluates the Westside Plan in terms of how effectively it will protect and restore aquatic and riparian ecosystems, the discussion and criticism of the Westside Plan will focus on the ACS.

The ACS is intended to "restore and maintain the ecological health of watersheds and aquatic ecosystems contained within them" on

130. WESTSIDE ROD, *supra* note 118, at 1 ("The management direction consists of extensive standards and guidelines, including land allocations, that comprise a comprehensive ecosystem management strategy.").

131. WESTSIDE ROD, *supra* note 118, at C.2.

132. 2 WESTSIDE FINAL EIS, *supra* note 101, at S.6.

133. Alternative 9 was selected by the Secretaries of Agriculture and Interior as the management option for the Westside forests. See WESTSIDE ROD, *supra* note 118.

134. 1 WESTSIDE FINAL EIS, *supra* note 101, at 2.28. The ACS was not incorporated into Alternative 7, which was designed to reflect the management choices that most likely would have been chosen by the Forest Service under the various resource plans in effect before the Westside Plan was adopted. *Id.* at 2.56. Earlier comprehensive plans for managing the region's federal old growth forests also included elements intended to provide a measure of protection to fish habitat. See JACK W. THOMAS ET AL., VIABILITY ASSESSMENT AND MANAGEMENT CONSIDERATIONS FOR SPECIES ASSOCIATED WITH LATE-SUCCESSIONAL AND OLD GROWTH FORESTS OF THE PACIFIC NORTHWEST (REPORT OF THE SCIENTIFIC ANALYSIS TEAM) 439 (1993) (proposed "Conservation Strategy for Fish"); K.N. JOHNSON ET AL., ALTERNATIVES FOR THE MANAGEMENT OF LATE-SUCCESSIONAL FORESTS OF THE PACIFIC NORTHWEST 26 (1991)(report to the Agriculture Committee and the Merchant Marine and Fisheries Committee of the U.S. House of Representatives)(outlining "watershed and fish habitat emphasis" option for forest management).

federal forest lands.¹³⁵ To accomplish that goal, the ACS is designed to help forest managers protect the functions and processes of aquatic ecosystems, including the natural disturbance regimes upon which aquatic biological diversity depends.¹³⁶ Specifically, the Westside Plan requires forest managers to maintain and restore (1) watershed and landscape-scale physical features; (2) connectivity within and between watersheds; (3) biologically adequate water quality; (4) the historic sediment regime; (5) instream flows adequate to create and sustain riparian, aquatic, and wetland ecosystems, protect sediment, nutrient, and large woody debris routing patterns, and sustain historic flow timing, magnitude, duration, and spatial distribution; (6) the timing, variability, and duration of floodplain inundation and wetland and meadow water table elevation; (7) healthy species and structural composition of riparian and wetland plant communities; and (8) the habitat needed to support native species dependent on riparian corridors.¹³⁷

To accomplish these goals, the ACS requires forest managers to: (1) limit activities in unstable areas of a watershed; (2) distribute land-use activities in a manner that minimizes increases in peak streamflows; (3) protect headwater riparian areas as a means for insuring continued provision of large woody debris and boulders necessary for downstream habitat complexity and stability; (4) designate riparian areas along stream channels in order to limit streambank erosion, insure a supply of large woody debris, and provide shade, nutrients, and microclimate protection; and (5) increase protection for, and give maximum restoration priority to, watersheds containing the best remaining aquatic habitat.¹³⁸

Four basic tools are available to assist managers in performing these tasks. First, the ACS designates "key watersheds" that include refugia crucial to at-risk fish species and stocks and which provide high-quality water.¹³⁹ Second, the ACS incorporates the riparian reserves, which are governed by special land-use standards and guidelines.¹⁴⁰ Third, managers must, before authorizing certain commodity extraction activities, perform watershed analyses which must evaluate current aquatic and riparian conditions and determine the impacts of proposed

135. 2 WESTSIDE FINAL EIS, *supra* note 101, at B.81. The ACS is an experimental approach to public land management. Plaintiff's Memorandum in Support of Motion for Summary Judgment, Seattle Audubon Society et al. v. Lyons, No. C92-479WD (W.D. Wash.) (Sept. 28, 1994), at 26-27. It is to be implemented over a 100-year period. FEMAT REPORT, *supra* note 6, at V.75 & figure V.26.

136. 2 WESTSIDE FINAL EIS, *supra* note 101, at B.81.

137. *Id.* at B.82-B.83.

138. *Id.* at B.81.

139. *Id.* at B.84.

140. *Id.*

management activities on the area studied.¹⁴¹ Finally, the ACS includes a program for watershed restoration.¹⁴² In addition, the standards and guidelines applicable to late-successional reserves are also intended to benefit aquatic ecosystems within the old-growth forest.¹⁴³

1. Key Watersheds

The ACS allocates all federal land within the range of the northern spotted owl to "key watersheds" and "non-key watersheds."¹⁴⁴ The Westside Plan designates approximately one-third of the federal forests subject to its mandates, or 9.1 million acres, as key watersheds.¹⁴⁵ Key watersheds serve as fish refuges and high quality water sources.¹⁴⁶ Tier 1 key watersheds are designated on the basis of their suitability as high quality habitat, or refugia, for at-risk Pacific salmon stocks and resident fish species.¹⁴⁷ Tier 2 key watersheds are designated on the basis of their supply of high quality water.¹⁴⁸ The Westside Plan designates 143 tier 1 key watersheds, which include streams used by 176 of 257 at-risk Pacific salmon stocks.¹⁴⁹ Twenty-one tier 2 key watersheds are also designated.¹⁵⁰

Three management guidelines distinguish key watersheds. First, future road construction is prohibited in inventoried roadless areas

141. *Id.*

142. *Id.*

143. *Id.* Such standards are not themselves adequate to protect remaining ecologically significant old growth forest ecosystems in the region. The Westside Plan must also protect remaining late-successional forest stands from timber harvest. Unfortunately, the Plan fails to do this. Approximately 1.2 million acres of remaining late-successional and old growth forests and 2.2 million acres of northern spotted owl habitat are omitted from the late-successional reserves (LSRs) and riparian reserves created by the Westside Plan. In addition, the Westside Plan assumes that fire and other natural disturbances will not have a significant impact on remaining old growth forests and sanctions firefighting techniques that are likely to increase habitat fragmentation within them. See THE WILDERNESS SOCIETY ET AL., REVIEW OF THE FINAL EIS FOR THE CLINTON FOREST PLAN 4-6 (1994) (copy on file with the author) [hereinafter WILDERNESS SOCIETY COMMENTS]. Nor are the LSRs protected from substantial timber harvesting activities. The Westside Plan authorizes 100-170 million board feet of salvage cutting and thinning within LSRs. See 1 WESTSIDE FINAL EIS, *supra* note 101, at 3&4.264. Each of these flaws are likely to compromise the effectiveness of the ACS.

144. 1 WESTSIDE FINAL EIS, *supra* note 101, at 3&4.69.

145. H. MICHAEL ANDERSON, CITIZEN GUIDE TO THE NORTHWEST FOREST PLAN 31 (1994) [hereinafter CITIZEN GUIDE].

146. 2 WESTSIDE FINAL EIS, *supra* note 101, at B.91.

147. *Id.*

148. *Id.*

149. *Id.*

150. *Id.*

contained within them.¹⁵¹ Second, existing roads within key watersheds "should be reduced," which the drafters intended to mean decommissioning and not simply closed.¹⁵² Third, "[l]ong-term management within key watersheds requires watershed analysis prior to further resource management activity."¹⁵³ Thus, most commodity production activities within a key watershed must be preceded by a watershed analysis.¹⁵⁴ In addition, resources available for watershed restoration projects must first be allocated to key watersheds.¹⁵⁵

2. Riparian Reserves

While timber harvesting anywhere in a watershed affects water quality and aquatic habitat characteristics,¹⁵⁶ logging and other commodity production activities in riparian reserves have the most direct impact on aquatic ecosystems.¹⁵⁷ Accordingly, the drafters of the Westside Plan designated riparian reserves in which activities that may slow or prevent attainment of the ACS objectives are regulated or prohibited.¹⁵⁸ Riparian reserves include the portions of watersheds directly connected to streams and rivers and any area that is essential for the maintenance of the hydrologic, geomorphic, and ecological processes that affect standing and flowing water bodies.¹⁵⁹ Thus, in addition to the stream itself, streamside areas, source areas for wood and sediment, and unstable or potentially unstable portions of headwater areas and along streams are included within riparian reserves.¹⁶⁰ Option 9

151. *Id.* at B.92.

152. *Id.*

153. *Id.* This rule also applies to non-key watersheds containing inventoried roadless areas. *Id.* at B.93.

154. *Id.* This rule does not apply to any action that is categorically excluded from environmental assessment or environmental impact statement requirements pursuant to 40 C.F.R. § 1508.4. *Id.* Nor does it apply to logging in non-key watersheds, existing mining operations, or existing livestock grazing. Moreover, it is not clear that federal foresters agree that the Westside Plan prohibits management activities generally until a watershed analysis is performed. See *infra* notes 216-218 and accompanying text.

155. *Id.* at B.85 (table).

156. See *supra* notes 78-83, 92 and accompanying text.

157. 1 WESTSIDE FINAL EIS, *supra* note 101, at 3&4.68.

158. 2 WESTSIDE FINAL EIS, *supra* note 101, at B.84.

159. *Id.*

160. *Id.* at B.84 (riparian reserves are "portions of watersheds where riparian-dependent resources receive primary emphasis . . . [and] include those portions of a watershed directly coupled with streams and rivers, i.e., the portions of a watershed required for maintaining hydrologic, geomorphic, and ecologic processes that directly affect standing and flowing water bodies, such as lakes and ponds, wetlands, streams, stream processes, and fish habitats[,] . . . [as well as] primary source areas for wood and sediment, such as unstable and potentially unstable areas in headwater areas and along streams.").

allocated 2.6275 million acres of "matrix" land, or land generally committed to management activities, and all land meeting the definition within the other five land classifications, to riparian reserves.¹⁶¹

Under the Westside Plan, the principal functions of riparian reserves are to (1) maintain and restore the plant structure of riparian corridors and the functions of streams; (2) provide ecosystem benefits to species, other than fish, dependent on riparian corridors; and (3) assure greater connectivity of refugia within a watershed.¹⁶² Thus, the ACS established riparian reserves of varying interim lengths, depending on whether the associated stream is perennial and fish-bearing.¹⁶³ For fish-bearing streams, the riparian reserve encompasses the greater of (1) the distance from the edge of the stream to the top of the inner gorge; (2) the outer edges of the 100-year floodplain; (3) the distance equal to the height of two site-potential trees; or (4) 300 feet of slope distance on each side of the stream.¹⁶⁴ For permanent, non-fish bearing streams, the riparian reserve extends to the greater of (1) the area from the stream channel to the top of the inner gorge; (2) the outer edges of the 100-year floodplain; (3) the outer edges of the riparian vegetation; (4) a distance equal to the height of one site-potential tree;¹⁶⁵ or (5) 150 feet of slope distance on each side of the stream.¹⁶⁶ For non-permanent, non-fish bearing streams and wetlands less than one acre, and for unstable and potentially unstable areas, the riparian reserve must include (1) the extent of unstable and potentially unstable areas; (2) the distance between the stream channel and the top of the inner gorge; (3) the distance from the edge of the stream channel or wetland to the outer edge of the riparian vegetation; and (4) the greater of the distance equal to one site-potential tree or 100 feet of slope distance.¹⁶⁷ Similar size parameters apply to constructed ponds and reservoirs, wetlands greater than one acre, and lakes and natural ponds.¹⁶⁸

161. CITIZEN GUIDE, *supra* note 145, at 13.

162. 2 WESTSIDE FINAL EIS, *supra* note 101, at B.86.

163. *See id.* at B.86, B.88.

164. *Id.* at B.86.

165. On most federal lands in the Pacific Northwest west of the Cascades, the average potential tree height is approximately 170 feet. FEMAT REPORT, *supra* note 6, at V.35. However, exceptions to this general measurement occur in particular areas of the region. For example, the average potential tree height in the Siuslaw National Forest is 250 feet. THE WILDERNESS SOCIETY ET AL., A CRITIQUE OF THE CLINTON FOREST PLAN 11 n.6 (1993) (copy on file with author) [hereinafter WILDERNESS SOCIETY CRITIQUE].

166. 2 WESTSIDE FINAL EIS, *supra* note 101, at B.86. A slope distance is generally shorter than a horizontal distance. WILDERNESS SOCIETY CRITIQUE, *supra* note 165, at 11 n.6.

167. 2 WESTSIDE FINAL EIS, *supra* note 101, at B.88.

168. *Id.*

Forest managers may modify riparian reserve boundaries for permanently flowing streams after completing a watershed analysis if altered hydrologic, geomorphic, or ecologic processes justify such action.¹⁶⁹ The appropriate national forest or BLM district must comply with NEPA requirements before altering a riparian reserve boundary,¹⁷⁰ and no change is permitted if it would cause ACS objectives to be unfulfilled.¹⁷¹

A. Logging

Most timber harvesting activity is prohibited in riparian reserves. However, the Forest Service or BLM may allow salvage harvesting where "catastrophic events," defined as fire, flooding, volcanic eruptions, wind, or insect damage, has "degraded" riparian conditions and managers deem such harvesting necessary to achieve ACS objectives.¹⁷² Fuelwood cutting is also permitted under those circumstances.¹⁷³ Salvage trees may be removed only to the extent that the present and future supply of large woody debris to the stream is assured.¹⁷⁴ Timber managers may also "control stocking" and reestablish and "manage" stands within riparian reserves, with one objective being the acquisition of desired riparian corridor vegetation characteristics.¹⁷⁵

B. Roads

The ACS does not prohibit road construction within riparian reserves.¹⁷⁶ The Forest Service and BLM must only cooperate with other government agencies, including those of states and localities, to

169. *Id.* at B.88-B.89.

170. WESTSIDE ROD, *supra* note 118, at B.13.

171. 2 WESTSIDE FINAL EIS, *supra* note 101, at B.88.

172. *Id.* at B.123.

173. *Id.*

174. *Id.* The salvage logging rider in the Fiscal Year 1995 Appropriations Rescissions bill, Pub. L. No. 104-19, 109 Stat. 194 (1995), mandates an "emergency" harvest of "dead, dying, and associated" timber and does not include this restriction. However, President Clinton has directed the Forest Service and the BLM to conduct salvage operations in Westside forests in a manner consistent with the ACS. *See* note 84, *supra*. There is no guarantee, however, that the President's directive will assure compliance with the Westside Plan, because Congress exempted the salvage sales from all otherwise applicable requirements of law except preparation of biological assessments under the ESA and environmental assessments under NEPA. Pub. L. No. 104-19, § 2001(d), 109 Stat. 194 (1995).

175. 2 WESTSIDE FINAL EIS, *supra* note 101, at B.123. These terms are not defined by the Westside Plan.

176. The Westside Plan prohibits new road construction only in inventoried roadless areas contained within key watersheds. *See infra* notes 282-285 and accompanying text.

achieve consistent road design, operation, and maintenance.¹⁷⁷ In general, roads must be minimized in riparian reserves.¹⁷⁸ Nevertheless, new roads may be built if (1) a watershed analysis is performed; (2) design, operation, and maintenance criteria are established and followed; (3) disruption of natural hydrologic flow paths, including streamflow diversions and interception of surface and subsurface flow, is minimized; (4) sidecasting is restricted to the extent necessary to prevent sediment introduction to streams; and (5) wetland disturbance is avoided.¹⁷⁹ Moreover, the ACS calls on forest managers to meet its objectives by reconstructing roads and drainage features that adversely affect aquatic and riparian ecosystems,¹⁸⁰ although the ACS also permits the closure, obliteration, and stabilization of roads if such actions are consistent with ACS objectives and transportation needs.¹⁸¹

The ACS does not prohibit new stream crossings or mandate the removal of existing culverts, bridges or other devices for stream passage. Such facilities must be improved or built in a manner sufficient to accommodate the effects of a 100-year flood, with priority to be given to those that would affect the highest value ecosystem resources to the greatest degree.¹⁸² Stream crossings must not permit diversion of the stream's flow out of its channel or onto or down the road in the event of a crossing structure failure.¹⁸³ To minimize sediment delivery to streams, the ACS recommends - but does not command - outslipping of roadway surfaces unless that method of mitigation would increase sedimentation or is unfeasible or unsafe.¹⁸⁴ Forest managers must also route road drainages away from unstable channels, fills, and slopes.¹⁸⁵ Finally, fish passage must be assured and maintained in all fish-bearing and potentially fish-bearing streams.¹⁸⁶

C. Grazing

The ACS does not include any specific constraints limiting livestock grazing in riparian reserves. However, such grazing must be halted if it will cause further ecological harm to aquatic or riparian

177. 2 WESTSIDE FINAL EIS, *supra* note 101, at B.123.

178. *Id.* at B.123-B.124.

179. *Id.* at B.124.

180. *Id.*

181. *Id.*

182. *Id.*

183. *Id.*

184. *Id.*

185. *Id.*

186. *Id.*

ecosystems.¹⁸⁷ Livestock trailing, bedding, watering, loading, and other handling activities may continue in riparian reserves, although the ACS recommends that they be timed and located to avoid adverse impacts on streamchannel physical features, instream flows, riparian corridors, and species distribution and frequency and achieve sediment regime goals.¹⁸⁸ Managers may not allow placement of new livestock management facilities within riparian reserves and must relocate existing facilities that contribute to a failure to meet ACS objectives if they cannot be appropriately modified.¹⁸⁹

D. Mining

The ACS likewise places few restrictions on mining activities. Most mining may continue in riparian reserves.¹⁹⁰ Existing mining operations may be allowed to continue without prior watershed analysis, regard to existing resource conditions, or consistency with ACS objectives. New mining operations can be authorized after watershed analysis is performed, regardless of any impact on aquatic or riparian resources. The Westside Plan requires only that miners submit a reclamation plan, operations plan, and reclamation bond that addresses (1) facility, equipment, and material removal costs; (2) recontouring of disturbed areas; (3) isolation and neutralization of toxic or potentially toxic materials; (4) salvage and replacement of topsoil; and (5) seedbed preparation and revegetation to the extent forest managers consider necessary to achieve ACS objectives.¹⁹¹

187. *Id.*

188. *Id.* at B.125.

189. *Id.*

190. The exception is sand and gravel mining, if extraction of such resources would impair ACS objectives. *Id.* at B.126.

191. *Id.* at B.125. The Forest Service has been reluctant to enforce even this lenient requirement. Numerous mining claims within riparian reserves are actively worked, yet unmonitored by forest managers. Moreover, the Forest Service recently argued that the General Mining Law of 1872, 17 Stat. 91, codified as amended in scattered sections of 30 U.S.C. (1994), prohibited managers from following these ACS requirements. This position is not supported by the language of NFMA. The Forest Service must require a plan of operations from a miner if the operation is "likely [to] cause a significant disturbance of surface resources." *Clouser v. Espy*, 42 F.3d 1522, 1532 (9th Cir. 1994), cert. denied sub nom., *Clouser v. Glickman*, 115 S.Ct. 2577 (1995). The Forest Service's regulations implementing the General Mining Law of 1872 specify only the information that an operations plan must include and do not preclude requiring such a plan when mining occurs in riparian areas. 36 C.F.R. §§ 228.4, 228.4(f), 228.8 (1995). Perhaps recognizing that the Westside Plan does not conflict with Congress' command that hardrock mining generally be allowed in national forests, the government recently agreed to a consent decree requiring forest managers to implement the Westside Plan's mining reclamation, operations planning, and bond

Mining structures, support facilities, and roads must generally be located outside riparian reserves, but if the miner has no alternative they can be placed in such areas if forest managers determine that ACS objectives will not be compromised.¹⁹² The same rules generally apply to solid and sanitary waste facilities associated with mining activities, although technology adequate to prevent discharge of acid or toxic materials within riparian reserves must be employed and the chemical and physical stability of all wastes must be assured.¹⁹³ Roads for the support of mining activity may be built, even in riparian reserves. However, they must be closed, obliterated, and stabilized when no longer needed.¹⁹⁴ The Forest Service and BLM must prohibit new surface occupancy for oil, gas, and geothermal exploration within riparian reserves and correct the impacts of those activities where they already occur as necessary to achieve ACS objectives.¹⁹⁵ The Westside Plan also directs forest managers to develop and follow appropriate inspection and monitoring requirements.¹⁹⁶

E. Fire Suppression

Fire suppression activities are generally permitted within riparian reserves, subject to the requirement that they be consistent with ACS objectives.¹⁹⁷ Support facilities for firefighting activities are generally to be kept out of riparian reserves and the introduction of firefighting chemical compounds to surface waters is to be minimized.¹⁹⁸

F. Hydroelectric Facility Development

Hydroelectric facility development is not prohibited in riparian reserves, even in tier 1 key watersheds.¹⁹⁹ The ACS directs forest managers to request the Federal Energy Regulatory Commission (FERC) to include in the applicable license conditions that protect riparian resources and channel stability.²⁰⁰ In addition, the ACS requires

provisions. *National Wildlife Federation et al. v. Agpaoa*, No. 95-3005-CO (D. Or., filed Jan. 23, 1995).

192. 2 WESTSIDE FINAL EIS, *supra* note 101, at B.125.

193. *Id.*

194. *Id.*

195. *Id.* at B.126.

196. *Id.*

197. *Id.*

198. *Id.*

199. *Id.*

200. *Id.* Under the Federal Power Act (FPA), 16 U.S.C. §§ 791-823 (1994), FERC must apply "today's values," including those relating to protection of the environment, when

developers to assure instream flows and habitat conditions as necessary to allow the restoration of riparian corridors, favorable instream habitat

licensing or re-licensing a hydroelectric project. See Michael C. Blumm, *Federalism, Hydroelectric Licensing and the Future of Minimum Streamflows After California v. Federal Energy Regulatory Commission*, 21 ENV'T L. 113, 115 (1991) (quoting H.R. REP. No. 934, 99th Cong., 2d Sess. at 22 (1986), reprinted in 1986 U.S.C.A.N. 2537, 2538 (Conference Committee Report on the Electric Consumers Protection Act of 1986)). In particular, FERC has the authority to require streamflows adequate to protect fish and wildlife if such requirements are "economically feasible." *California v. Federal Energy Regulatory Comm'n*, 495 U.S. 490, 499 (1990). In general, FERC is not obligated to require licensees to guarantee minimum stream flows established by state water laws. *Id.* at 498; *Federal Power Comm'n v. Oregon*, 349 U.S. 435, 449-50 (1955); *First Iowa Hydroelectric Cooperative v. Federal Power Comm'n*, 328 U.S. 152, 167-68 (1946). However, the ESA may prevent issuance of a license. See 16 U.S.C. §§ 1536(b)(3)(A), (c), (g)-(h) (if species listed as endangered or threatened are present in area of proposed hydroelectric project, FERC must prepare biological assessment to determine if project would affect species; if so, FERC must consult with NMFS or U.S. Fish and Wildlife Service, which must suggest "reasonable and prudent alternatives" if species would be jeopardized by project; if no such alternatives exist, FERC cannot license the project unless the Endangered Species Committee grants an appropriate exemption from ESA requirements). Moreover, the Wild and Scenic Rivers Act of 1968 prohibits issuance of FPA licenses to projects "on or directly affecting" designated rivers. 16 U.S.C. § 1278(a) (1994). Where a developer proposes to construct a project on a wild and scenic river corridor on federal land, the federal land agency responsible for the river corridor may veto issuance of the license if the project would have a "direct effect" on the waterway. *Swanson Mining Co. v. Federal Energy Regulatory Comm'n*, 790 F.2d 96, 103-05 (D.C. Cir. 1986). But see 16 U.S.C. § 1278(a) (allowing FERC to issue license to projects above or below rivers designated as wild and scenic or on tributaries of such rivers if project would not invade designated area or "unreasonably diminish" the values for which the river was classified as wild and scenic). Moreover, FERC must give "equal consideration" to fish and wildlife values, relative to the other purposes of the proposed project, and cannot grant licenses for projects that would be inconsistent with the purposes of federally reserved lands. 16 U.S.C. §§ 661, 797(e), 796(2) (1994). Federal land agencies, as well as NMFS and the Fish and Wildlife Service, may demand that conditions designed to protect fish and wildlife values be included in an FPA license for a project within the boundaries of a federal reservation. 16 U.S.C. §§ 797(e), 811; see *Escondido Mutual Water Co. v. LaJolla Band of Mission Indians*, 466 U.S. 765, 772, 776-79 (1984) (FERC must impose license conditions requested by federal land agencies). But see 16 U.S.C. § 818 (1994) (BLM may not demand license conditions for projects not to be constructed within boundaries of lands not considered wilderness study areas, but may require licensee to obtain right-of-way permit). The Fish and Wildlife Coordination Act obligates FERC to include in FPA licenses conditions that will "adequately and equitably protect, mitigate damages to, and enhance" fish and wildlife habitat affected by hydroelectric projects. 16 U.S.C. § 803(j) (1994); see *National Wildlife Fed'n v. Federal Energy Regulatory Comm'n*, 912 F.2d 1471, 1479 (D.C. Cir. 1990). States may invoke the certification process of section 401 of the Clean Water Act, 33 U.S.C. § 1341, and require that hydroelectric facility licenses be granted only on condition that state water quality objectives, including adequate fish habitat, be achieved. See *Public Utility Dist. No. 1 of Jefferson County v. Washington Dep't of Ecology*, 114 S.Ct. 1900 (1994). For a good overview of FERC's hydroelectric facility licensing process and how other federal agencies and the public may participate in it, see JOHN ECHEVERRIA ET AL., *RIVERS AT RISK: THE CONCERNED CITIZEN'S GUIDE TO HYDROPOWER* (1989).

conditions, and fish passage.²⁰¹ Although support facilities for new hydroelectric projects must be located outside riparian reserves, necessary roads or other access routes can be built in riparian reserves. Such leases, permits, rights-of-way, or easements are to be designed or modified so as to avoid effects that would slow or prevent achievement of ACS objectives.²⁰²

G. Instream Flows

The ACS does not limit withdrawals from streams or other surface waterbodies or compel the acquisition of instream flows adequate to achieve desired aquatic or riparian conditions.²⁰³ Forest managers

201. 2 WESTSIDE FINAL EIS, *supra* note 101, at B.126.

202. *Id.* at B.127.

203. See WESTSIDE ROD, *supra* note 118, at C.36 (requiring forest managers to "identify instream flows needed to maintain riparian resource, channel conditions, and fish passage"). Adequate instream flows are necessary to support many aquatic organisms, including fish. The natural timing, magnitude, duration, and spatial distribution of water flow is vital to the creation and sustenance of riverine habitat and to the maintenance of sediment, nutrient, and woody debris routing patterns. FEMAT REPORT, *supra* note 6, at V.19. Moreover, some aquatic organisms, especially fish, are adapted to natural variations in flow and are adversely affected when disturbances alter natural flow patterns. See Bernhard Statzner et al., Hydraulic Stream Ecology: Observed Patterns and Potential Applications, 7 J. NORTH AMER. BENTHOLOGICAL SOC'Y 307 (1988). Assuring such flows has not always been possible under the water laws of the western United States. Under the prior appropriation doctrine of water law which prevails in Washington, Oregon, and (in combination with the riparian rights doctrine) California, a diverter of water from a stream who applies the water to a "beneficial use" is granted priority for his uses in times of shortage over other appropriators who made later diversions. Historically, retention of water in streams to provide flows adequate to support recreational uses or fisheries was not considered such a "beneficial use." See generally JOSEPH L. SAX ET AL., LEGAL CONTROL OF WATER RESOURCES 149 (2d ed. 1991) [hereinafter LEGAL CONTROL OF WATER RESOURCES]; Charles F. Wilkinson, Western Water Law in Transition, 56 U. COLO. L. REV. 317, 319 (1985). Today, however, most western states, including the states affected by the Westside Plan, recognize instream uses of water. See OR. REV. STAT. §§ 536.310(7), .325, .410, 537.332-.360 (1988 & 1994 Supp.); WASH. REV. CODE §§ 90.03.005, .247, .345, 90.22.010, 90.54.040 (1992 & 1996 Cum.); CAL. WATER CODE § 1707 (1996 Cum.) (allowing water rights to be changed to a use for "preserving or enhancing wetlands habitat, fish and wildlife resources, or recreation in, or on, the water" under certain circumstances); CAL. FISH & GAME CODE § 5937 (1984 & 1996 Cum.) (requiring dam operators to "keep in good condition any fish that may be planted or exist below the dam"). In California, the State Water Resources Control Board may also protect instream flows through the public trust doctrine. See National Audubon Soc'y v. Superior Court, 658 P.2d 709 (Cal.), cert. denied, 464 U.S. 977 (1983); United States v. State Water Resources Control Board, 227 Cal. Rptr. 161, 200 n.40 (Cal. App. 1986). California law also allows protection of instream flows pursuant to the riparian rights doctrine. See *In re Water of Hallett Creek Stream System*, 749 P.2d 324, 325 (Cal. 1988), cert. denied, 488 U.S. 824 (1989) (recognizing riparian rights on federal reservation adjacent to surface water body). Given their importance to aquatic ecosystems, preservation of instream flows in the Pacific Northwest is critical. It is also difficult, because water diverters have claimed rights to more water than is available in many rivers and streams of Oregon and Washington. Interview with Karen Russell, Assistant Director, Waterwatch of Oregon (Sept. 6, 1995).

may, however, attempt to acquire the water necessary to provide such flows.²⁰⁴ The ACS does not provide forest managers any guidance as to how and from whom to acquire the necessary water rights.²⁰⁵

H. Other Characteristics of Riparian Reserves

Trees within a riparian reserve that are a "safety risk" may be cut down,²⁰⁶ and herbicide, insecticide, and other toxic chemicals used for

204. 2 WESTSIDE FINAL EIS, *supra* note 101, at B.127 (authorizing forest managers to use "land acquisition, exchange, and conservation easements to meet Aquatic Conservation Strategy objectives and facilitate restoration of fish stocks and other species at risk of extinction"). The federal government has "reserved rights" to the water needed to fulfill the statutory objectives of the national forest system. GEORGE C. COGGINS, 3 PUBLIC NATURAL RESOURCES LAW § 21.04(2), at 21.33 (1990). See *Cappaert v. United States*, 426 U.S. 128, 138 (1976). A right to the water is established pursuant to federal law as of the date on which the public land is withdrawn from the public domain. LEGAL CONTROL OF WATER RESOURCES, *supra* note 203, at 805-06. Reserved rights have been characterized as "a wild card that may be played at any time" and as a "first mortgage of undetermined and undeterminable magnitude which hangs like a Sword of Damocles over every title to water rights on every stream which touches a federal reservation." Janice L. Weis, *Federal Reserved Water Rights in Wilderness Areas: A Progress Report on a Western Water Fight*, 15 HASTINGS CONST. L.Q. 125 (1987) (quoting sources). The federal government's authority to reserve water rights under federal law is actually somewhat limited. The Supreme Court has made clear that the classification of public land into non-public domain categories, such as national forests, reserves only so much water as is necessary to fulfill the purpose of the reservation. *United States v. New Mexico*, 438 U.S. 696 (1978). Thus, the New Mexico Court held that reservation of the national forests did not also ensure adequate water for wildlife conservation in them, because such a purpose is not subsumed under Congress' mandate in the Organic Act of 1897 that the national forests be managed for timber production. The New Mexico Court did not, however, rule on the scope and meaning of the Organic Act's other expressed command - to protect the "favorable conditions of water flows" on the national forests. Thus, in *United States v. Jesse*, 744 P.2d 491 (Colo. 1987), the court found that the national forests are entitled to such water as is necessary to provide the instream flows required to preserve channel stability and certain other purposes. Such a reservation water may inure to the benefit of aquatic and riparian ecosystem-dependent species. By contrast, the federal government does not have any reserved right to water for BLM lands, unless the land is designated as wilderness. COGGINS, *supra*, § 21.04(2), at 21.33; *Sierra Club v. Watt*, 659 F.2d 203, 206 (D.C. Cir. 1981). Nor is it clear whether the BLM can assert "non-reserved" water rights in state court to provide for fish and wildlife protection on those public lands. COGGINS, *supra*, § 21.04(3), at 21.35. See John Shurts, *FLPMA, Fish and Wildlife, and Federal Water Rights*, 15 ENV'T L. 115, 115-23 (1984), for a good discussion of the on-again, off-again history of federal "non-reserved" water rights.

205. 2 WESTSIDE FINAL EIS, *supra* note 101, at B.127. Federal land managers have not traditionally asserted and defended reserved water rights on a consistent basis. See generally Jason Marks, Comment, *The Duty of Agencies to Assert Reserved Water Rights in Wilderness Areas*, 14 ECOLOGY L.Q. 639 (1987); Robert H. Abrams, *Water in the Western Wilderness: The Duty to Assert Reserved Water Rights*, 1986 U. ILL. L. REV. 387. As for non-reserved rights, federal managers must follow the law of the relevant state in applying for appropriate recognition and enforcement of such rights. *Sierra Club v. Watt*, 659 F.2d 203, 204 (D.C. Cir. 1981).

206. WESTSIDE ROD, *supra* note 118, at C.37.

pest suppression may be applied if forest managers decide that such activity will not compromise ACS objectives.²⁰⁷ Although the ACS does not specifically limit livestock grazing in riparian reserves,²⁰⁸ forest managers must also cooperate with wildlife management officials to eliminate adverse wild ungulate impacts on riparian reserves.²⁰⁹

3. Watershed Analysis

The ACS generally requires a watershed analysis to be performed before proposed land use activities in key watersheds, non-key watersheds containing inventoried roadless areas, or riparian reserves can occur.²¹⁰ The goals of a watershed analysis are to (1) determine the ecological processes in a specific watershed; (2) learn how such processes are physically and temporally distributed; (3) evaluate current upland and riparian conditions in a watershed; and (4) ascertain how such conditions affect riparian habitat and uses of the resources within the watershed.²¹¹ A watershed analysis must be conducted by a team that includes federal scientists from a variety of fields, including geomorphologists, hydrologists, soil scientists, and biologists.²¹²

Factors to be examined in a watershed analysis must include all influences on the ecosystems within the watershed, including landslides, surface erosion, peak and low streamflows, stream temperatures, the effects of roads, the dynamics of large woody debris, channel processes, and fire.²¹³ Examples of information to be covered include a description of local commodity needs, resource capabilities, ranges of natural variability, and other information that will facilitate the preparation of an environmental impact statement or environmental assessment on a specific local project or at the forest- or resource area-wide planning level.²¹⁴ The watershed analysis must also discuss the ecological processes and functions operating within the watershed and identify potentially conflicting approaches and objectives.²¹⁵

A watershed analysis does not require forest managers to make any particular decision.²¹⁶ Watershed analysis is to provide the "basis

207. 2 WESTSIDE FINAL EIS, *supra* note 101, at B.127.

208. See *infra* note 287 and accompanying text.

209. 2 WESTSIDE FINAL EIS, *supra* note 101, at B.127.

210. *Id.* at B.93.

211. *Id.* at B.94.

212. *Id.*

213. *Id.*

214. *Id.* at B.93.

215. *Id.*

216. *Id.* ("The focus of watershed analysis will be on collection and compilation of information about the watershed that is essential for making sound management decisions.

for developing project-specific proposals, and defin[e] monitoring and restoration needs for a watershed. . . . The information from the watershed analyses will contribute to decision-making at all levels."²¹⁷ Thus, the principal purpose of watershed analysis is information-gathering. However, the functions of watershed analysis are not limited to support for project planning. The Westside Plan contemplates that the information gained from a watershed analysis will be used to determine funding priorities and to develop monitoring strategies and objectives.²¹⁸ The ACS also specifies that watershed analysis should support decisions to establish and refine the boundaries of riparian and other reserves, assist in the development of restoration strategies and priorities, and reveal the most useful indicators for monitoring environmental changes.²¹⁹

4. Watershed Restoration

The ACS incorporates a watershed ecosystem restoration program based on two fundamental principles: first, restoration should focus on areas where the ecological benefits of restoration are likely to exceed the long-term economic costs of undertaking restoration activities; and second, the process should aim to return the watershed to ecological health over the long term.²²⁰ Watershed restoration should (1) control and prevent runoff and sediment production caused by roads; (2) rehabilitate riparian corridors; and (3) reconstruct in-stream habitat complexity.²²¹

A. Roads

The ACS gives the Forest Service and BLM the discretion to remedy environmental problems caused by roads through a variety of means. These range from closure and stabilization to measures designed to reduce their adverse effects, including soil removal from landslide-prone areas, modification of drainage systems to reduce integration of roads into stream networks, and reconstruction of stream crossings to reduce the risk of road failure.²²² The ACS does not, however, dictate

It will be an analytical process, not a decisionmaking process with a proposed action requiring NEPA documentation.").

217. *Id.*

218. *Id.*

219. *Id.*

220. *Id.* at B.121.

221. *Id.* at B.121-B.122.

222. *Id.* at B.121.

when managers should choose a particular remedy.²²³ Nor does the ACS require any existing road to be removed or command forest managers to apply specific ecological health-based parameters when making such decisions.²²⁴ Instead, forest managers must select a remedy for road-caused ecosystem damage on the basis of the "value and sensitivity of downstream uses," transportation needs, "social expectations," costs, and the likelihood that the remedy chosen will mitigate environmental harm.²²⁵

B. Riparian Corridors

The ACS sanctions substantial opportunities for continued logging in riparian reserves. Forest managers may re-plant conifers in riparian reserves and in landslide areas along streams and on flood terraces,²²⁶ thin dense, young stands to facilitate the growth of large conifers,²²⁷ and reforest shrub- and hardwood-dominated stands with conifers.²²⁸ The Westside Plan's preference for active efforts to maximize conifer growth is also indicated by the ACS' failure to prohibit timber harvesting even where riparian vegetation restoration is ongoing.²²⁹

C. Instream Physical Habitat Features

The ACS gives priority to the protection of watershed areas containing high quality aquatic habitat.²³⁰ The ACS also requires forest managers to correct ecological deficiencies on upslope areas and in riparian areas to assure the long-term presence of necessary instream features, such as adequate large woody debris.²³¹ However, the Westside Plan contains no specific and quantitative objectives that would provide forest managers a benchmark for such indicators of ecosystem

223. See WESTSIDE ROD, *supra* note 118, at C.32-C.33.

224. See *id.* (requiring only that decisions be likely to achieve ACS objectives). The Westside Plan recommends, but does not mandate, that road densities in national forests and on National Resource Lands within the range of the northern spotted owl be reduced. See *supra* notes 151-152 and accompanying text.

225. 2 WESTSIDE FINAL EIS, *supra* note 101, at B.121.

226. *Id.*

227. The drafters of the Westside Plan consider this necessary to "releas[e] young conifers from overtopping hardwoods." *Id.*

228. *Id.*

229. *Id.*

230. *Id.* at B.122.

231. *Id.*

health.²³² Nor does the Westside Plan prohibit artificial aquatic habitat stabilization. The ACS only discourages installation of structures in streams as a method for mitigating land use activities that degrade existing habitat, substituting for habitat protection, or justifying management decisions that may harm aquatic ecosystems over the long term.²³³ Moreover, the ACS sanctions the use of introduced structures to improve physical habitat features during the short term.²³⁴

IV. Will it Work?

Evaluating Aquatic Ecosystem Management under the Westside Plan

The task facing the Clinton Administration as it attempts to resolve the contentious battle over the future of federal forests in the Pacific Northwest is daunting. The ESA requires the federal government to prevent the extinction of threatened or endangered species,²³⁵ while NFMA and FLPMA mandate that the Forest Service and BLM assure diverse and viable native wildlife and fish populations.²³⁶ But simply

232. See *infra* notes 314-315 and accompanying text.

233. 2 WESTSIDE FINAL EIS, *supra* note 101, at B.122.

234. *Id.*

235. Under the ESA, federal agencies must "insure" that "any action" which they "authorize[, fund[, or carr[y] out . . . is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of [critical] habitat of such species. . . ." 16 U.S.C. § 1536(a)(2). In addition, federal agencies are prohibited from "taking" a listed species. 16 U.S.C. § 1538(a)(1)(B). Destruction of habitat can constitute such a taking. See *Babbitt v. Sweet Home Chapter of Communities for a Great Oregon*, 115 S.Ct. 2407, 2412-18 (1995).

236. See 16 U.S.C. § 1604(g)(3)(E) (prohibiting timber harvests where "serious[] and adverse[] [e]ffect [on] water condition or fish habitat" would occur); 36 C.F.R. § 219.27(g) (1995) (requiring, "where appropriate and to the extent practicable," the Forest Service to "preserve and enhance the diversity of plant and animal species" at a level "at least as great" as in a "natural forest"); 43 U.S.C. § 1712(c) (requiring BLM to "use and observe the principles of multiple use and sustained yield," and to "give priority to the designation and protection of areas of critical environmental concern (defined at 43 U.S.C. § 1702(a))." 43 U.S.C. § 1702(c) defines multiple use as the "management of the public lands . . . so that they are utilized in the combination that will best meet the present and future needs of the American people; making the most judicious use of the land for some or all of these resources . . ." and using some land for less than all of the resources, where appropriate". Notwithstanding the clear language of the NFMA regulation quoted above, the federal courts have determined that neither NFMA nor its implementing regulations require the Forest Service to preserve all of the biological diversity native to a particular national forest. See *Sierra Club v. Robertson*, 810 F. Supp. 1021, 1028 (W.D. Ark. 1992) (rejecting claim that forest plan did not adequately protect biological diversity because plaintiff demonstrated "mere disagreement with agency over methodology" and "failed to show that [the Forest Service's] methodology or choices are irrational"), *aff'd* on merits but vacated for lack of standing, 28 F.3d 753 (8th Cir. 1994); *Sierra Club v. Robertson*, 845 F. Supp. 485, 502 (S.D. Ohio 1994) ("Diversity is not the controlling principle in forest planning, although it is an

avoiding extinction cannot be the measure of success, at least with regard to the region's salmon runs and resident fish species. Treaties signed by the government and the region's Native American tribes more than a century ago compel federal foresters to assure that harvestable fish stocks will be restored to the Pacific Northwest.²³⁷ Moreover, many of the region's native species may go extinct regardless of changes in land use practices on federal forests.²³⁸

important goal to be pursued in the context of overall multiple-use objectives"); *Kirchbaum v. Kelly*, 844 F. Supp. 1107, 1114 (W.D. Va. 1994) (rejecting claim that Forest Service failed to adequately protect native biodiversity as "dispute with the [agency] over the meaning of diversity" and holding that planning for "diversity of appearance," as opposed to the "whole range of plant and animal life," did not violate NFMA). And on the lands commonly referred to as the "Oregon and California Act Lands," after the Oregon and California Sustained Yield Act, 43 U.S.C. § 1181a et seq. (1994), it is not clear whether the BLM may even consider impacts on fish and wildlife and their habitats when determining how to manage commodity production on them. See *Headwaters, Inc. v. Bureau of Land Management*, 914 F.2d 1174, 1184 (9th Cir. 1990) (noting that O&C Act "envisions timber production as a dominant use" of the O&C Lands and stating that preservation of wildlife habitat and old growth forests are not "goal[s] on a par with timber production, or indeed . . . of the O&C Act at all."). Contra *Seattle Audubon Society v. Lyons*, 871 F. Supp. 1291, 1314 (W.D. Wash. 1994) ("Management under the [O&C Act] must look not only to annual timber production but also to protecting watersheds, contributing to economic stability, and providing recreational facilities.") (citing *Portland Audubon Soc'y v. Lujan*, 795 F. Supp. 1489, 1500-02 (D. Or. 1992) (O&C Act does not override or limit agency conservation obligations under NEPA or ESA), *aff'd sub nom.*, *Portland Audubon Soc'y v. Babbitt*, 998 F.2d 705 (9th Cir. 1993)).

237. The federal government obtained land from the region's Native American tribes during the mid-nineteenth century in return for numerous treaties that included a guaranteed right of access to "accustomed grounds and stations" for tribal fishing. See, e.g., *Treaty of Medicine Creek*, Dec. 26, 1854, 10 Stat. 1132, 1133. See generally Jack L. Landau, Comment, *Empty Victories: Indian Treaty Fishing Rights in the Pacific Northwest*, 10 ENV'T L. L. 413, 416-17 (1980), for a discussion of these so-called Stevens Treaties. The Stevens Treaties require federal land agencies to impose "environmental restraints" on activities that may adversely affect the tribes' fishing rights. *United States v. Washington*, 694 F.2d 1374, 1375, 1381-82, 1389 (9th Cir. 1982), vacated on rehearing en banc, 759 F.2d 1353 (9th Cir.), cert. denied, 474 U.S. 994 (1985). This requirement is a corollary of the Stevens Treaties' guarantee to many of the Pacific Northwest's tribes of "absolute right[s]" to the maintenance of their historic fisheries within the Columbia River Basin and an entitlement to a "fair share" of the fish currently existing in the region's rivers. See *Sohappy v. Smith*, 302 F. Supp. 899 (D. Or. 1969), *aff'd as modified sub nom.*, *United States v. Oregon*, 529 F.2d 570 (9th Cir. 1976); *United States v. Washington*, 384 F. Supp. 312 (W.D. Wash. 1974), *aff'd*, 520 F.2d 676 (9th Cir. 1975), cert. denied sub nom., *Northwest Steelheaders Council v. United States*, 423 U.S. 1086 (1976). Unless purchased from the tribes or extinguished in a "just war," the tribes' treaty fishing rights must be left undiminished by the United States government. See FELIX S. COHEN, *HANDBOOK OF FEDERAL INDIAN LAW* 50-58 (1982). The Forest Service or BLM may also infringe tribal treaty fishing rights if Congress explicitly authorizes such action. *Washington v. Washington State Commercial Passenger Fishing Vessel Ass'n*, 443 U.S. 658 (1979).

238. See FEMAT REPORT, *supra* note 6, at V.2 ("It should be noted that the forest ecosystem management options developed in this exercise cannot resolve all issues contributing to the

To forestall and reverse the ecological collapse of aquatic and riparian ecosystems on the western side of the Cascade Mountains, any plan for managing the northern spotted owl forests must fundamentally re-order management priorities in the national forests and on the National Resource Lands of the Pacific Northwest. Continued emphasis on commodity production at the expense of severe ecological damage to watersheds is inconsistent with Congress' mandate to protect the region's native fish and wildlife and with the government's trust responsibilities to the treaty tribes. The Clinton Administration deserves credit for recognizing the government's legal obligations and the sad state of affairs in westside federal forests. After years of denial by previous administrations that the westside old growth forest ecosystems are on the verge of disappearance, the President and his advisors acknowledged the poor ecological conditions prevailing on them.²³⁹ The Administration also deserves applause for basing the Westside Plan on a comprehensive, accessible and easily understood guide to the environmental conditions on the national forests and BLM lands of the Pacific Northwest. The Forest Service and the BLM generally considered recent scientific knowledge about old growth ecosystems and did not, as had previous administrations, ignore the opinions and conclusions of the government's own scientists.²⁴⁰

decline of anadromous salmonids, such as artificial propagation practices and excess harvest in sport and commercial fisheries."). Such extinctions indicate that society must consider changing land use practices on non-federal lands as well. Extinctions are a symptom of "pervasive impoverishment of living systems" caused by the "systematic reduction in the earth's ability to support life," which has been brought about by deterioration and disturbance of the planet's biological processes. James R. Karr, *The Issue is Larger Than Biodiversity*, CASCADE CREST (Sierra Club, Cascade Chapter), Nov.-Dec. 1993, at 11, 13 (copy on file with author). To reverse this "biotic impoverishment," policymakers must focus on restoration of biological integrity on a landscape-wide basis, not simply in designated reserves such as national forests, national resource lands, and wilderness areas. *Id.* See also the sources cited in note 70, *supra*.

239. FEMAT REPORT, *supra* note 6, at II.63 ("Not all is well in the forests . . . of the Pacific Northwest"); *id.* at II.38 (noting that "[s]tream and riparian systems have been significantly degraded by past management actions. . .").

240. See 1 WESTSIDE FINAL EIS, *supra* note 101, at S.3 (noting that FEMAT Report was used to craft management options discussed in Westside Plan). The Clinton Administration's predecessor was criticized for failing to make any serious effort to comply with NFMA and other laws aimed at protecting wildlife and fish on the public lands. See *Seattle Audubon Soc'y v. Evans*, 771 F. Supp. 1081, 1090 (W.D. Wash. 1991) ("More is involved here than a simple failure by an agency to comply with its governing footnote. The most recent violation of NMFA exemplifies a deliberate and systematic refusal by the Forest Service and the [Fish and Wildlife Service] to comply with the laws protecting wildlife. This is not the doing of the scientists, rangers, and others at the working levels of these agencies. It reflects decisions made by higher authorities in the executive branch of government."). Nevertheless, the drafters of the Westside Plan committed a number of serious methodological errors in

There is also much good in the Westside Plan itself. The Westside Plan correctly identifies the watershed as the most logical, and consequently the most effective, unit for ecosystem-based management.²⁴¹ No federal land agency has ever before committed itself to such a management approach, since such agencies are responsible for lands with boundaries not often related to natural processes.²⁴²

preparing the EIS. These included (1) a failure to evaluate the ten proposed alternatives in terms of impact on population viability of native species, including wild salmon stocks and resident fish; (2) an assumption that habitat conditions on non-federal lands could be assumed to have no effect on the viability of aquatic species; and (3) refusal to acknowledge the highly uncertain outcome of the Westside Plan's experiment with the ACS, including especially watershed analysis, which as proposed can be used to justify virtually any management activity. See *infra* notes 292-318 and accompanying text. Although these are serious flaws in the Westside Plan, the court rejected arguments that they violate NFMA and NEPA in *Seattle Audubon Society v. Lyons*, 871 F. Supp. 1291 (W.D. Wash. 1994). Since Congress has passed, and the President has indicated that he will sign, a bill that declares the Westside Plan consistent with all applicable laws, the Ninth Circuit will not have the opportunity to determine whether Judge Dwyer's conclusion in that regard is correct. See note 127, *supra*.

241. ENTERING THE WATERSHED, *supra* note 11, at 7-8. See also SAVING NATURE'S LEGACY, *supra* note 14, at 288 ("The proper unit for management is the watershed, and because watersheds are hierarchically ordered, for watersheds within watersheds."). Traditionally, "[m]anagement [of aquatic ecosystems] has often focused on small portions of a watershed such as a single lake or a stream segment of a few miles, with no overall plan for the watershed." *Id.* at 284. Some scientists disagree that the hydrologic watershed is the best geographic boundary for efforts to protect and improve aquatic ecosystem health. See, e.g., Robert M. Hughes et al., A Regional Framework for Establishing Recovery Criteria, 14 ENV'T'L. MANAGEMENT 673, 675 (1990) ("[W]aterbodies, especially streams, reflect the landscapes they drain. This characteristic of rivers that drain both mountains and plains make river basins too heterogeneous for establishing regional expectations or for reporting regional condition."). The alternative unit recommended by these skeptics is the "ecoregion," which can be defined as "a region of relative homogeneity in ecological systems or in relationships between organisms and their environments." Alisa L. Gallant et al., U.S. ENVIRONMENTAL PROTECTION AGENCY, REGIONALIZATION AS A TOOL FOR MANAGING ENVIRONMENTAL RESOURCES 1 (1989). Ecoregions are based on similarities of soil, land use, land surface form, potential natural vegetation, and similarity of water quality. RESTORATION OF AQUATIC ECOSYSTEMS, *supra* note 8, at 98. Thus, "ecoregions that distinguish among areas using multiple variables in land and water characteristics better represent differences in ecological variability." Addressing Barriers to Watershed Protection, *supra* note 8. Geographers divide the United States into 76 ecoregions, including 11 in the Pacific Northwest. See James M. Omernik, Aquatic Ecoregions of the Conterminous United States, 77 ANNALS OF THE ASS'N OF AMERICAN GEOGRAPHERS 118, map (1987). The distinction between watersheds and ecoregions as measuring boundaries may be academic, however, because land use disturbances in a watershed have an impact on downstream and lower elevation aquatic ecosystems. Addressing Barriers to Watershed Protection, *supra* note 8. Nor does the ecoregion concept imply that watershed boundaries are unhelpful in assessing threats to aquatic ecosystems. See James R. Karr, Biological Integrity: A Long-Neglected Aspect of Water Resources Management, 1 ECOLOGICAL APPLICATIONS 66, 70 (1991).

242. Robert B. Keiter, Taking Account of the Ecosystem on the Public Domain: Law and Ecology in the Greater Yellowstone Ecosystem, in ENVIRONMENTAL POLICY AND BIODIVERSITY

Similarly, the ACS recognizes that activities undertaken at the headwaters or on terrestrial uplands have powerful effects downstream or downslope.²⁴³

The ACS also correctly prioritizes restoration efforts. Because the remaining aquatic habitat in good condition is scarce, it is vital that such refugia be secured first. The environmental conditions on the region's federal forests no longer resemble a series of degraded islands in a sea of untouched wilderness. Today, forest ecosystems are more accurately characterized as islands of healthy habitat surrounded by severe ecological distress.²⁴⁴ Aside from its biological merits, a refugia-first approach is especially wise in an era where budgets are unlikely to grow. Land managers can more efficiently allocate scarce dollars if they recognize that it is better to prevent downstream degradation than to attempt mitigation after it occurs. The Forest Service and BLM also deserve credit for establishing "key watersheds," since such areas are essential if remaining healthy aquatic habitats are to be protected.²⁴⁵

Laudable progress notwithstanding, the Westside Plan contains several methodological flaws that reduce its effectiveness in restoring the region's numerous imperiled aquatic species to stable population levels.

111-12 (R. Edward Grumbine ed., 1994); RODERICK NASH, *WILDERNESS AND THE AMERICAN MIND* 34 (3d ed. 1982). The Forest Service recently committed itself to managing all of its lands on a watershed basis. CEQ REPORT, *supra* note 5, at 216. However, prior efforts to institutionalize watershed management have generally failed. The best known example was an outgrowth of the Water Resources Policy Act of 1965, which created river basin commissions to assist in water resource planning. See 42 U.S.C. § 1962a(2) (1994). However, the river basin commissions never attempted to plan for the protection of aquatic ecosystems. TIM PALMER, *LIFELINES: THE CASE FOR RIVER CONSERVATION* 193 (1994). President Reagan terminated the river basin commissions in 1981, although the statutory authority for them remains on the books. Charles H.W. Foster & Peter P. Rogers, *Federal Water Policy: Toward an Agenda for Action* (Unpublished discussion paper, Harvard University Energy and Environmental Policy Center) 33 (Aug. 1988) (copy on file with author).

243. See *SAVING NATURE'S LEGACY*, *supra* note 14, at 282-83 ("[Aquatic] systems are linear and branched, so that the flow of water forms a continuum from headwater to sea. . . . Thus, upstream events such as pulses of pollution can have effects far downstream. . . . [And] since aquatic systems are inherently connected, it is difficult to establish downstream reserves or refugia that are reasonably protected or buffered from both upstream and downstream influences. . . .").

244. See *ENTERING THE WATERSHED*, *supra* note 11, at 43 ("Instead of the ideal matrix of high quality habitat with patches of disturbed habitat, we find we have created a matrix of disturbed, degraded and sterile habitats surrounding a few tattered remnants of high quality habitat that still support locally abundant and diverse assemblages of native species.").

245. See *New Strategy for Watershed Restoration*, *supra* note 8, at 20-23 (discussing need to classify areas within watershed on basis of functional significance as habitat for aquatic and riparian-dependent species and urging that first preservation and restoration priority should be assigned to "focal habitats," or areas supporting a "mosaic of high-quality habitats that sustain a diverse or unusually productive complement of native species").

The ACS is also tainted by problems associated with each of its elements. Finally, implementation of ecosystem management is also likely to encounter disagreements over definitions, values, and priorities. This section first criticizes several assumptions made by FEMAT scientists in the course of preparing the species viability assessments that are the foundation of the Westside Plan. The Forest Service and the BLM instructed the FEMAT scientists to assume that habitat conditions on non-federal lands are biologically acceptable and that restoration of habitat on federal lands will suffice to restore viable populations of aquatic and riparian species. The article then discusses the flaws associated with each ACS element and concludes with a brief discussion of the political, policy, and legal challenges inherent in an ecosystem management scheme.

A. The Viability Analysis Underlying the Westside Plan is Inaccurate and the Plan's Standard for Assuring Viability is Insufficiently Protective

To comply with their obligations under NFMA and FLPMA, the Forest Service and the BLM were required to develop a plan for managing the federal forests west of the Cascades that would insure the maintenance of viable populations of all species native to those forests.²⁴⁶ Thus, FEMAT assigned a panel of scientists to evaluate the likelihood of maintaining viable populations of old-growth related species, including numerous fish stocks and species, for 100 years under each of the ten management alternatives they considered.²⁴⁷ FEMAT then ranked the viability of each species or species group based on four potential outcomes: (A) viable and well-distributed populations; (B) viable populations, but with gaps in their distribution; (C) populations restricted

246. See 36 C.F.R. § 219.19 (1995); *Seattle Audubon Society v. Lyons*, 871 F. Supp. 1291, 1316 (W.D. Wash. 1994) (FLPMA requires BLM to preserve diversity and viability of native species on its lands). A "viable population" is "one which has the estimated numbers and distribution of reproductive individuals to insure its continued existence is well-distributed in the planning area." 36 C.F.R. § 219.19.

247. FEMAT screened 54 proposed alternatives for management of the westside federal forests against certain ecological criteria, then selected 35 for more detailed review. After additional study, 10 management options were chosen for intensive evaluation. *Seattle Audubon Society v. Lyons*, 871 F. Supp. 1291, 1303 (W.D. Wash. 1994). In addition to 259 stocks and species of fish, 1 WESTSIDE FINAL EIS, *supra* note 101, at 3&4.197, FEMAT performed viability assessments on 527 fungi, 164 lichens, 106 bryophytes (e.g., mosses), 128 vascular plants, 108 mollusks, 18 amphibians, 38 birds, 15 mammals, 11 bats, and 11 groups of arthropods. *Id.* at 3&4.132, .146, .150-.154, .161, .166-.169, .179-.180, .184, .188. In addition, FEMAT separately considered the impacts of the ten alternatives under consideration on the northern spotted owl and the marbled murrelet. *Id.* at 3&4.243.

to refugia; and (D) extirpation.²⁴⁸ Each proposed management alternative was evaluated on the basis of whether it achieved an 80% or greater likelihood of achieving outcome a—viable, well-distributed populations.²⁴⁹

Unfortunately, the viability assessments prepared by the FEMAT scientists are undermined by several methodological errors. These include an assumption that habitat conditions on non-federal lands are biologically acceptable²⁵⁰ and a failure to incorporate into the analysis contained in the Plan population sizes of aquatic and riparian species occurring within the region's federal forests.²⁵¹ Moreover, FEMAT recommended, and the agencies adopted, a management alternative that is only 80% likely to preserve well-distributed, viable populations of many aquatic and riparian species over a period of time too short to assure long-term survival of those species.²⁵² Taken together, the errors committed by the FEMAT scientists and the Westside Plan's acknowledgement that the ACS may fail to preserve all aquatic and riparian species native to the Westside forests prevent the Plan from guaranteeing the continued viability of aquatic and riparian species native to the westside forests.

248. See 1 WESTSIDE FINAL EIS, *supra* note 101, at 3&4.118. FEMAT limited the scientists on the panel assigned to perform the viability assessments to 100 "likelihood points" that could be assigned to any of the four designated viability outcome possibilities. The FEMAT scientists were therefore permitted to account for uncertainty by spreading the 100 points across more than one of the viability outcomes. *Id.*

249. FEMAT REPORT, *supra* note 6, at II.28. The FEMAT scientists concluded that, out of 1,079 species evaluated, 840 would have less than an 80% chance of achieving well-distributed, viable populations. WILDERNESS SOCIETY CRITIQUE, *supra* note 165, at 36. However, under the most protective management option considered by FEMAT - Alternative 1 - 437 old-growth related species would fail to achieve viable, well-distributed populations despite preservation of essentially all remaining old growth forests on federal lands west of the Cascades. Thus, under the draft Westside Plan 403 species would have had less than an 80% likelihood of achieving outcome A under the recommended management option - alternative 9 - that would have had at least an 80% chance of achieving outcome A under alternative 1. *Id.* The Forest Service and the BLM modified Alternative 9 under the final Westside Plan to incorporate some measures nearly as protective as those included in Alternative 1. WILDERNESS SOCIETY COMMENTS, *supra* note 143, at 15. Such changes resulted in improved viability results for almost all assessed species, especially bryophytes, lichens, mollusks, and amphibians. See 1 WESTSIDE FINAL EIS, *supra* note 101, at 3&4.140, .145, .165, .175. In addition, the agencies concluded that the modifications grafted onto Alternative 9 insured that no vertebrate species, including salmon, would have less than an 80% chance of achieving viable, well-distributed populations. WILDERNESS SOCIETY COMMENTS, *supra* note 143, at 14-15.

250. See *infra* notes 253-258 and accompanying text.

251. See *infra* notes 259-270 and accompanying text.

252. See *infra* notes 271-274 and accompanying text.

FEMAT excluded from consideration in the viability assessment procedure all impacts associated with land uses and environmental conditions on non-federal lands. The scientists on the panel assigned to perform the viability assessments were instructed to assume that "conditions other than habitat on federal lands are adequate to provide for well-distributed, stabilized populations" of all native species.²⁵³ The agencies justified this assumption on the grounds that it was necessary to encourage the FEMAT scientists to focus on habitat conditions on federal lands:

The intent of this direction was not to ignore possible problems resulting from cumulative effects, or to make the assumption that viable populations of species could be supported by nonfederal lands alone. Rather, it was designed to cause panelists to initially think, to the extent practicable, only about the degree to which federal habitat itself could be expected to support stable, well-distributed populations on federal lands. Thus, except as otherwise explicitly noted, this assumption had the practical effect of marginalizing or rendering essentially immaterial the degree and nature of a contribution of nonfederal lands to panel ratings. If the assessment ratings instead had been designed to evaluate habitat on all lands regardless of ownership, it would have been difficult, if not impossible, to determine the benefit expected to accrue to some species or species group from habitat provided on federal lands under each of the alternatives.²⁵⁴

This explanation, however, is illogical.²⁵⁵ First, although the

253. 2 WESTSIDE FINAL EIS, *supra* note 101, at App. J3-1 (quoting instructions given to FEMAT panels) (Appendix J3 is available as a separate document; it was not included in the published FEMAT Report). Specifically, the FEMAT scientists were instructed to assume that "environmental conditions other than habitat condition (e.g., ocean pollution); habitat conditions on non-federal land; land ownership patterns; and the amount of overlap between the species range and the range of the northern spotted owl" are adequate to provide for well-distributed and stable populations. *Id.* Although the instruction does not specifically say so, there is no doubt that its effect was to preclude consideration of population sizes.

254. 2 WESTSIDE FINAL EIS, *supra* note 101, at App. J3.1.

255. The drafters of the Westside Plan admitted that this assumption did not reflect reality. "Habitat conditions on state and private lands are inadequate to provide well-distributed, stabilized populations." 2 WESTSIDE FINAL EIS, *supra* note 101, at App. J2.430. See also DRAFT NORTHERN SPOTTED OWL RECOVERY PLAN, *supra* note 22, at 372 ("Management of fish habitat, and therefore fish populations, requires consideration of the habitat within the watershed to accommodate stream and terrestrial processes that work in concert throughout the basin."). One possible explanation for the Forest Service's and the BLM's desire to foreclose consideration of population sizes may be an unwillingness to explain the risks to aquatic and riparian species inherent in alternative 9. The agencies acknowledged that Alternative 9 would provide only a low to medium probability of

management options under consideration would have their most direct impact on habitat, there was not as a consequence justification to ignore other factors presenting a risk to the viability of assessed species. Nor was it necessary to separate biological factors from legal and policy judgments in this manner. Such isolation of biological risk factors could be done as effectively on a population basis as on a habitat basis.²⁵⁶ Moreover, it is impossible to accurately evaluate the viability prospects of species that range across federal and non-federal lands by isolating federal habitat conditions in the assessment, since the population sizes of such species are affected by numerous factors on and off federal lands.²⁵⁷ The effect of the FEMAT scientists' assumption that habitat and other environmental conditions on non-federal lands are adequate to preserve viable, well-distributed populations of aquatic and riparian species is to ignore such cumulative effects.²⁵⁸

providing for viable populations of late-successional forest associated wildlife species if the Westside Plan did not allow "restorative silvicultural treatments." 2 WESTSIDE FINAL EIS, *supra* note 101, at F.12. This indicates that fish and wildlife populations on federal forests west of the Cascades may not be sustainable at the expected levels of timber production under by the Plan. This potential consequence should be explained in greater detail. NEPA requires the agencies to explain the magnitude of the risk that a "major consequence" of the Westside Plan may be "jeopardy to other species that live in the old growth forests." Seattle Audubon Society v. Moseley, 798 F. Supp. 1473, 1483 (W.D. Wash. 1991).

256. See Declaration of Russell Lande in Support of Plaintiff's Motion for Summary Judgment, Seattle Audubon Society et al. v. Lyons, No. C92-479WD, ¶ 9, at 10 (Sept. 26, 1994) [hereinafter Lande Declaration]. Nor is separation of biological factors from policy judgments necessarily justified on the grounds that policy choices on federal lands are more complex than on state, local, or private lands. *Id.*

257. Frissell Declaration, *supra* note 30, ¶ 14, at 10-11. For example, salmon stocks migrate through a variety of ownerships on their way to and from upstream spawning beds.

258. The Forest Service and the BLM did not cure this analytical error by including a short discussion of cumulative effects in the final EIS for the Westside Plan. The agencies' discussion amounts only to a brief acknowledgment that activities on non-federal lands will have an impact on aquatic and riparian species. The agencies did not analyze the impact on aquatic and riparian species of non-federal land use activities nor explain how such impacts, in combination with disturbances caused by activities on federal lands, will contribute to the continuing pattern of decline in the populations of many native fish species and stocks. The Forest Service and the BLM also omitted discussion of the cumulative impacts of activities on federal lands. See, e.g., 2 WESTSIDE FINAL EIS, *supra* note 101, at App. J2.432 (explanation for coho salmon) ("Habitat conditions on state and private land are inadequate to provide well distributed, stabilized populations of coho salmon. As a result, two classes of cumulative effects are possible from activities off federal land: those nonfederal actions that impact federal habitat, and those occurring during migratory or oceanic life history phases. The first class of activities occurs infrequently since federal lands tend to occur higher in a watershed than non-federal land. The second class of activities include physical (i.e., dams) or chemical (i.e., poor water quality) [barriers to migration]. Migratory barriers may hinder movement of coho salmon between freshwater habitat on federal lands and the ocean. Commercial and sport harvest may also impact the number of adults returning to spawn on federal lands."). Not only is this "explanation" inadequate, it may fall short of

The FEMAT scientists' assumption also renders the Westside Plan's viability assessments practically impossible to verify, since the assumption precluded public release of population data for species affected by the Westside Plan. Scientific convention dictates that planners articulate the basis for their judgments of species population viability under the management alternative chosen.²⁵⁹ But failure to disclose the basis of the viability assessments is not the only factor precluding independent verification of the results. The FEMAT scientists' failure to even consider population sizes renders the entire prediction of species viability suspect.²⁶⁰ A viability assessment is, at bottom, a prediction of the likelihood that a population of a particular plant or animal species will survive for some specified period of time. To be accurate, the prediction must rest on a fundamental biological truism: all else equal, the likelihood of a species becoming extinct rises as the population of the species declines.²⁶¹ Conservation planners cannot reasonably measure

compliance with the law. NEPA requires the government to avoid such conclusory statements or explain why further analysis of such cumulative effects are either unnecessary or infeasible. *See, e.g., Seattle Audubon Society v. Espy*, 998 F.2d 699, 704 (9th Cir. 1993). Thus, in *Natural Resources Defense Council, Inc. v. Hodel*, 865 F.2d 288 (D.C. Cir. 1988), the court rejected an EIS where the agency inserted "boilerplate" language into the document and failed to address cumulative impacts.

259. Such information can be obtained in two ways: planners can either (1) collect data on the life history (e.g., birth and death rates and dispersal behavior) of the species in question and then model the persistence of the population under varying habitat conditions, or (2) examine actual data on the persistence times of populations isolated by natural or man-made factors. There is little doubt that this information was available to the FEMAT scientists, especially with regard to Pacific salmon stocks and species. Lande Declaration, *supra* note 256, ¶ 13, at 14.

260. It may also violate NEPA. An EIS must contain at least a reasonably complete discussion of the "significant aspects of the probable environmental consequences." *Idaho Conservation League v. Mumma*, 956 F.2d 1508, 1519 (9th Cir. 1992). Courts ordinarily will not find compliance with this obligation unless, based on a "pragmatic judgment," the content of the EIS "foster[s] . . . informed decision-making." *California v. Block*, 690 F.2d 753, 761 (9th Cir. 1982). This standard does not appear to have been met in the preparation of the Westside Plan, since the agencies failure to use a methodology amenable to independent verification cannot amount to a reasoned analysis of the species viability data utilized by FEMAT. *See Defenders of Wildlife v. Endangered Species Scientific Authority*, 659 F.2d 168, 178 (D.C. Cir. 1981) (overturning agency determination that export of endangered bobcats would not adversely affect survival of species where agency did not consider status of bobcat population and number of bobcats that would be affected by the action).

261. *See Frissell Declaration, supra* note 30, ¶¶ 10, 12, at 8, 10. The explanation of the assumption provided by the drafters of the Westside Plan is inconsistent with this principle ignores the fact that continued shrinkage of species populations increases the relative importance of protecting remaining habitat on federal lands. WILDERNESS SOCIETY CRITIQUE, *supra* note 165, at 38.

the viability of native plants and wildlife without considering the number of individuals of each species assessed.²⁶²

But FEMAT's failure to consider population data does not only complicate objective evaluation of the Westside Plan's species viability impacts. It may also have precluded comparison of the proposed management alternatives in terms of the likelihood that they would prevent extinctions of aquatic and riparian species.²⁶³ The cost of this omission could be high for the region's fish species and stocks. The agencies' failure to produce a species viability assessment that allows this comparison creates the risk that species populations already close to extinction, which are especially sensitive to incremental habitat loss, will be lost.²⁶⁴

This is particularly troubling in light of the ease with which such a comparison could have been performed. Numerous studies assessing the risks to salmonid populations under different population and habitat scenarios have been published.²⁶⁵ But such information was also

262. WILDERNESS SOCIETY CRITIQUE, *supra* note 165, at 38 ("[N]umbers must be linked to habitat, lest the whole endeavor become a sterile and meaningless exercise."). Some FEMAT scientists independently considered the population impacts of the ten proposed alternatives, although their conclusions were not publicly released by the Forest Service and the BLM. The viability assessment results obtained by these scientists cast serious doubt on the likelihood that Alternative 9 will achieve viable, well-distributed populations of all native aquatic and riparian species. For example, a calculation for coho salmon made by one FEMAT scientists panel concluded that, on average, coho had a 13% chance to achieve a viable, well-distributed population and that chinook salmon had only a 27% likelihood of achieving a viable, well-distributed population under Alternative 9. See Declaration of Michael Axline in Support of Plaintiff's Motion for Summary Judgment, *Seattle Audubon Society v. Lyons*, No. C92-479WD, at Exhibit G (Sept. 27, 1994), cited in Plaintiff's Memorandum in Support of Motion for Summary Judgment, *Seattle Audubon Society et al. v. Lyons*, No. C92-479WD, at 26 (Sept. 28, 1994). Compare 1 WESTSIDE FINAL EIS, *supra* note 101, at Table 3&4.34 (noting that, under Alternative 9, average likelihood of coho achieving viable, well-distributed population, considering only federal land habitat, was 65%, and that chinook, considering only federal land habitat, would have 65% likelihood of achieving well-distributed population).

263. Frissell Declaration, *supra* note 30, ¶ 14, at 11.

264. Reply Declaration of Christopher Frissell in Support of Plaintiff's Motion for Summary Judgment, *Seattle Audubon Society et al. v. Lyons*, No. C92-479WD (W.D. Wash.), ¶¶ 11-14, at 5-7 [hereinafter Frissell Reply Declaration]. This point is well-illustrated by considering the conclusions that the Forest Service and the BLM may have reached had they instructed the FEMAT scientists to make the reverse assumption. If FEMAT scientists had assumed that habitat conditions on non-federal lands were not suitable to sustain aquatic and riparian species populations on non-federal lands, it is likely that the agencies would have had greater reason to conclude that remaining high quality habitat on federal lands must be immediately restored or maintained. Such a conclusion would follow from the extreme sensitivity of imperiled fish stocks and species to further deterioration of their habitat. See *id.*, ¶¶ 24-25, at 11-12.

265. The FEMAT Report itself relied on several studies that discuss current extinction risks for populations of salmonids. See FEMAT REPORT, *supra* note 6, Table V.C.3; Frissell Reply Declaration, *supra* note 264, ¶¶ 11-14, at 5-7.

developed by the FEMAT scientists themselves. The FEMAT panel assigned to assess the viability of fish stocks and species native to the westside forests prepared a comparative analysis of the extinction risks to those stocks and species.²⁶⁶ Nevertheless, the government justified its failure to consider the differential risk of extinction among the ten proposed alternatives on the grounds that such information would be unreliable and too "speculative."²⁶⁷ However, projecting the degree of extinction risk that would exist under the ten management options considered would not have been difficult. At the most basic level, the agencies could simply have informed the public that greater risks of extinction of aquatic and riparian species would accompany higher levels of timber cutting and road building and vice-versa.

Nor can the Forest Service and the BLM reasonably defend this omission on the highly questionable grounds that a complete quantitative population viability analysis would be necessary to compare the alternatives in terms of extinction risks.²⁶⁸ This technical approach to the problem was unnecessary, and in any event the speculative nature of data on aquatic species extinctions is not a reason to ignore it.²⁶⁹ The agencies' obligations under NEPA should also have compelled the Forest Service and the BLM to undertake at least a rudimentary comparison of extinction risks among the various proposed management alternatives.²⁷⁰

266. Plaintiff's Memorandum in Support of Motion for Summary Judgment, *Seattle Audubon Society et al. v. Lyons*, No. C92-479WD (W.D. Wash.) 26, 49-52 (Sept. 28, 1994) [hereinafter S.A.S. Memorandum].

267. Memorandum of Federal Defendants in Opposition to Plaintiff's Motion for Summary Judgment, *Seattle Audubon Society et al. v. Lyons*, No. C92-479WD (W.D. Wash.), 35 & n.10, 38 (Oct. 17, 1994) [hereinafter Government Opposition Memorandum].

268. See Frissell Reply Declaration, *supra* note 264, ¶ 27, at 13 ("The premise is that only a formal, fully quantitative population viability analysis would be useful in comparing differential risks. To put it another way, the explanation assumes an artificially difficult goal, and then uses the difficulty of achieving that goal to rationalize doing nothing.").

269. See Reply Declaration of James R. Karr in Support of Plaintiff's Motion for Summary Judgment, *Seattle Audubon Society et al. v. Lyons*, No. C92-479WD (W.D. Wash.) ¶ 7, at 4 (Nov. 14, 1994). The Forest Service and the BLM are inconsistent in their opposition to the use of "speculative" data. The government defended the Westside Plan's lack of detail regarding commodity production under the ten proposed management alternatives by asserting that "predictive data utilized at [the] programmatic level is inherently speculative and uncertain." Government Opposition Memorandum, *supra* note 267, at 14. Thus, the agencies appear to have subjected the measurement of extinction risks to a double standard. Moreover, the agencies candidly acknowledged that "judgments," based on subjective evaluations of conditions on federal forests, were used to create viability ratings for remaining federal land habitat. See *id.* at 22-24.

270. See, e.g., *Seattle Audubon Soc'y v. Moseley*, 798 F. Supp. 1473, 1483 (W.D. Wash. 1992) (requiring Forest Service to analyze impacts of alternatives analyzed in prior plan for westside forests on old growth-related species); *Friends of the Earth v. Hall*, 693 F. Supp.

In any event, however, the results of FEMAT's species viability assessments indicate that the plan falls short of fulfilling the agencies' obligations to preserve viable populations of the westside forests' aquatic and riparian species. Alternative 9, as modified in the Final EIS on the Westside Plan, is predicted to assure at least an 80% likelihood that such species will achieve viable and well-distributed populations for 100 years. However, that probability figure is insufficiently protective. In general, scientists do not consider a species to be viable unless there is at least a 95% chance that it will persist for several centuries.²⁷¹ The assessment time period employed by FEMAT is also inadequate. A one-century assessment frame is too short because many habitats and populations will not be stabilized within that amount of time.²⁷² This is because the woody debris in stream channels deteriorates slowly and therefore the full effect of woody debris through timber harvesting will not be felt for decades.²⁷³ Replacement of the structural foundations of aquatic habitat can take more than 100 years as well. Some slow-growing conifers such as western red cedar can thrive for more than 200 years before providing

904, 934, 937 (W.D. Wash. 1988) (EIS must explain magnitude of risks involved in proposed project).

271. Michael E. Soule, *Where Do We Go From Here?*, in *Viable Populations for Conservation* 175 (Michael E. Soule ed., 1987). See also FEMAT REPORT, *supra* note 6, at IV.43 (noting that some FEMAT scientists "preferred 200 years or longer as an assessment [time] frame"). It is not clear that the agencies were required the agencies to select a 95% probability threshold. The Forest Service's viability regulation defines a "viable population" as one "which has the estimated numbers and distribution of reproductive individuals to insure its continued existence is well distributed in the planning area." 36 C.F.R. § 219.19 (emphasis added). The FEMAT scientists' rating system is based on subjective estimates and required probability estimates to be assigned to four distinct potential outcomes, including extirpation. Thus, one cannot reasonably conclude that an 80% likelihood of achieving viable, well-distributed populations means that there is a 20% chance the species will go extinct. If, on the other hand, the FEMAT scientists' estimate is accurate, the question is whether an 80% likelihood of achieving outcome A is enough to comply with the viability mandate. Congress did not command that a minimum numeric measurement of certainty be utilized. See Charles F. Wilkinson & Michael A. Anderson, *Land and Resource Planning in the National Forests*, 64 OR. L. REV. 1, 296 (1985). Cf., e.g., *Sierra Club v. Espy*, 38 F.3d 792, 800 (5th Cir. 1994) (characterizing NFMA's diversity requirement and the viability regulation as "just the type of policy-oriented decision Congress . . . left to the discretion of the experts - here, the Forest Service"). Thus, the agencies are well within their discretion to conclude that a proposed management alternative 80% likely to achieve viable, well-distributed populations and somewhat less likely to achieve viable populations that are characterized by gaps in distribution complies with the regulation. See, e.g., *Thomas Jefferson University v. Shalala*, 114 S.Ct. 2381, 2386 (1994) (courts must give substantial deference to reasonable agency interpretations of own regulations).

272. FEMAT REPORT, *supra* note 6, at V.68 ("[D]egraded aquatic ecosystems will not be fully functional in 100 years.").

273. WILDERNESS SOCIETY CRITIQUE, *supra* note 165, at 40.

replacement woody debris to streams.²⁷⁴

B. The Aquatic Conservation Strategy is Unlikely to Protect and Restore Riverine-Riparian Ecosystems

Aside from the viability analysis that undergirds the Westside Plan, there are flaws associated with each of the major components of the ACS. This subsection discusses each of those components in turn.

1. Key Watersheds

The key watersheds designated by the Westside Plan do not include all remaining refugia for aquatic species. Some remaining high quality habitat exists on private lands, which are not affected by the Westside Plan,²⁷⁵ and a substantial amount of salmon habitat remains outside the boundaries of key watersheds.²⁷⁶ Moreover, the ACS does not afford any automatic protection to the refugia that are designated.²⁷⁷ Instead, a watershed analysis must be performed before any "management activit[y]" may be undertaken,²⁷⁸ and the Westside Plan defines a management activity as, among other things, "an activity undertaken for the purpose of . . . protecting [or] . . . replenishing . . .

274. FEMAT REPORT, *supra* note 6, at IV.71.

275. 1 WESTSIDE FINAL EIS, *supra* note 101, at 3&4.5. The Clinton Administration has also proposed a "4(d) rule" under the Endangered Species Act that allows private parties to incidentally take northern spotted owls on non-federal lands outside six "special emphasis areas." 60 Fed. Reg. 9,484, 9,485 (1995). Accordingly, the protection of aquatic habitat on non-federal forests provided by the Westside Plan, which is already weak, has been further weakened.

276. Approximately 2.7 million acres of salmon habitat are excluded from the various reserves created or recognized by the Westside Plan. WILDERNESS SOCIETY COMMENTS, *supra* note 143, at 10. This includes 1.9 million acres that are not protected by key watershed designation. *Id.* This flaw in the Westside Plan leaves 82 of 257 salmon stocks at risk of extinction unprotected by the ACS. 2 WESTSIDE FINAL EIS, *supra* note 101, at B.91. The Westside Plan also failed to adopt several measures designed to protect key watersheds that were recommended by federal fisheries biologists. These included (1) removal of all tier 1 key watersheds from programmed timber harvest; (2) a ban on all new road construction in key watersheds; and (3) removal of all inventoried roadless areas from programmed timber harvest. *See* 1 WESTSIDE FINAL EIS, *supra* note 101, at 3&4.123-125, 129, App. J2. These measures, had they been adopted, would have provided protection to an additional 1.5 million acres of aquatic habitat outside designated reserves. WILDERNESS SOCIETY COMMENTS, *supra* note 143, at 11-13. Moreover, adoption of these recommended measures also would help prevent disturbances likely to cause catastrophic loss of aquatic habitat from occurring on an additional 717,000 acres of steep slopes. *Id.* at 13. The drafters of the Westside Plan did not explain the reasons why these measures were not adopted.

277. 1 WESTSIDE FINAL EIS, *supra* note 101, at 2.30.

278. *Id.*

resources.²⁷⁹ Thus, the ACS itself imposes no actual restraints on management activities within key watersheds.²⁸⁰ Since watershed analysis reports are not decision documents,²⁸¹ presumably a forest manager could decide to undertake timber harvesting activity even if the information obtained discloses that it would harm downstream aquatic conditions, so long as other restrictions imposed by the riparian reserve or key watershed provisions of the ACS are not violated or do not apply.

The protections afforded roadless areas within key watersheds do not extend to any such area that is not already subject to protection by law and which has not been inventoried.²⁸² Thus, any roadless area not identified in the second Roadless Area Review and Evaluation (RARE II) process will not be preserved by the ACS.²⁸³ That is an unfortunate

279. FEMAT REPORT, *supra* note 6, at IX.19.

280. See S.A.S. Memorandum, *supra* note 266, at 28 (ACS is "no better or worse than the watershed analysis that is applied to it. The entire plan. . . relies on watershed analysis to achieve the results it claims.").

281. See *infra* notes 294-296 and accompanying text.

282. WESTSIDE ROD, *supra* note 118, at B.19.

283. The Westside Plan's reference to "inventoried roadless areas" refers to lands inventoried for possible wilderness designation under the Wilderness Act of 1964, 16 U.S.C. §§ 1131 et seq. (1994). The Secretary of Agriculture must recommend to Congress "primitive" areas that should be added to the nation's Wilderness system. 16 U.S.C. § 1132. Accordingly, the Forest Service has conducted several inventories of roadless areas on the national forests which might be eligible for wilderness designation. The first such inventory, dubbed "Roadless Areas Review and Evaluation" (RARE I), began in 1972 but ended when the Forest Service was enjoined from completing it before preparing an environmental impact statement. See *Wyoming Outdoor Coordinating Council v. Butz*, 484 F.2d 1244 (10th Cir. 1973); *West Virginia Highlands Conservancy v. Island Creek Coal Co.*, 441 F.2d 232 (4th Cir. 1971). In 1977, the Forest Service launched a second inventory of national forest roadless lands, and in 1979 classified approximately 60 million acres into wilderness, "further planning," and non-wilderness categories. See FOREST SERVICE, U.S. DEP'T OF AGRICULTURE, RARE II FINAL ENVIRONMENTAL IMPACT STATEMENT: ROADLESS AREA REVIEW AND EVALUATION 37 (1979); JAN G. LAITOS, NATURAL RESOURCES LAW: CASES AND MATERIALS 354 (1985). However, the RARE II inventory process was also halted for failure to prepare an adequate environmental impact statement. See *California v. Block*, 690 F.2d 753 (9th Cir. 1982). The Forest Service subsequently commenced a third roadless area inventory in 1983. LAITOS, *supra*, at 358 n.4. However, the injunction issued by the Block court prevented the Forest Service from allowing commercial activities, including road construction, in any area inventoried during the RARE II process. See *Earth First v. Block*, 569 F. Supp. 415 (D. Or. 1983). In 1984, the Forest Service agreed to reconsider whether roadless areas should be designated as wilderness every 10-15 years, but environmentalists also agreed to allow the Forest Service the discretion to manage such roadless areas in the manner it thinks best. LAITOS, *supra*, at 358 n.5. Since 1984, Congress has designated numerous Forest Service lands listed in the RARE II inventory as wilderness. Such bills have also generally decided the fate of remaining non-wilderness lands in the affected state. COGGINS, *supra* note 204, § 14B.02[3][a], at 14B.8-10. FLPMA obligates BLM to similarly study roadless areas on its lands for wilderness designation. See 43 U.S.C. § 1782(a). BLM has completed its inventory, including identification of 24 of 174 million acres of roadless lands throughout the western

oversight. First, the RARE II process identified only those roadless areas in portions of national forests under consideration for wilderness status.²⁸⁴ RARE II did not inventory all roadless areas. Second, the FEMAT Report clearly emphasized the central importance of roadless areas in the assessment of available aquatic resources. The authors warned that "[m]anagement activities in roadless areas will increase the risk to aquatic and riparian habitat, potentially impair the capacity of [k]ey [w]atersheds to function as intended, and limit the potential to achieve [ACS] objectives."²⁸⁵ It makes little sense to reduce the likelihood of achieving ambitious aquatic restoration goals by failing to accord protection equally needed by both inventoried and non-inventoried roadless areas.

Nor does the ACS adequately safeguard aquatic ecosystems against construction of new roads. Even in key watersheds, roadbuilding may continue, and although the ACS mandates that such construction must be "offset," the Westside Plan considers "decommissioning," or closure and stabilization without obliteration, sufficient to meet that requirement.²⁸⁶ The result of this lenient provision will inevitably be more erosion, more sedimentation, and more aquatic habitat destruction, not less. Sediment loading as a result of slumping, slope instability induced by roadbuilding, and landsliding, as well as road collapses and decreased soil permeability as a result of compaction, can be assuredly decreased only by removing unnecessary roads and by preventing the construction of additional roads.

2. Riparian Reserves

The most significant problem with riparian reserves is their continued broad availability for resource extraction. Neither timber harvesting, livestock grazing, nor mining are prohibited, even in key

United States as "wilderness study areas." 47 Fed. Reg. 29,788, 29,789 (1982). FLPMA requires that these wilderness study areas be managed "in a manner so as not to impair the suitability of such areas for preservation as wilderness, subject [generally] to the continuation of existing mining and grazing uses and mineral leasing in the manner and degree in which the same was being conducted on October 21, 1976." 43 U.S.C. § 1782(c). The courts have prevented the BLM from deleting roadless lands from its list of wilderness study areas. See *Colorado Environmental Coalition v. Lujan*, 803 F. Supp. 364 (D. Colo. 1992); *Sierra Club v. Watt*, 608 F. Supp. 305 (E.D. Cal. 1985). Congress has likewise designated some of the BLM wilderness study areas as wilderness. *COGGINS, supra*, at § 14B.02[4] at 14.25.

284. See Wilderness Act of 1964, 16 U.S.C. § 1132 (requiring Forest Service to recommend to Congress for statutory protection as wilderness "primitive" areas relatively undisturbed by human activities).

285. FEMAT REPORT, *supra* note 6, at V.51.

286. WESTSIDE ROD, *supra* note 118, at B.19.

watersheds.²⁸⁷ Considering the magnified adverse effects on streams of road construction, loss of conifer-created streambank stability and erosion prevention, and altered microclimates and nutrient loading schemes, the continuation of such activities within riparian reserves seems unlikely to advance the Westside Plan's goal of restored aquatic ecosystems.

The boundaries of riparian reserves are not definite. Although the appropriate width of a riparian reserve depends on topographical factors unique to the particular watershed of which the stream is a part,²⁸⁸ the ACS fails to provide clear standards that would limit the degree to which boundaries can be altered.²⁸⁹ Once forest managers complete a watershed analysis, the boundaries of even permanent and fish-bearing stream riparian reserves can be changed.²⁹⁰ Boundary alteration increases the likelihood of edge effects for species inhabiting riparian and aquatic habitats.²⁹¹ Managers should be required to limit boundary changes only to those dictated by unique geographical considerations and avoid any alteration that could adversely affect the biological integrity of riparian corridors or instream habitat conditions.²⁹²

287. *Id.* at C.31-C.35.

288. *Id.* at B.13.

289. *Id.*

290. The boundaries for intermittent stream and wetland riparian reserves appear subject to more extensive alteration. *See id.* at B.14.

291. *See* Peter B. Moyle & Georgina M. Sato, On The Design of Preserves to Protect Native Fishes, in *BATTLE AGAINST EXTINCTION: NATIVE FISH MANAGEMENT IN THE AMERICAN WEST* 155, 158-59 (W.L. Minckley & James E. Deacon eds., 1991). Edge effects are phenomena originating outside the boundaries of a specific habitat area which influence the fate of biota occupying the habitat. WILLIAM S. ALVERSON ET AL., *WILD FORESTS: CONSERVATION BIOLOGY AND PUBLIC POLICY* 64 (1994). In biological terminology, an "edge" is the "interface between two different types of habitat." *Id.* Conservation biology teaches that edge effects are likely to be detrimental to species adapted to unique habitat microconditions. *Id.* at 65-71. In riverine ecosystems, edge effects can damage aquatic habitats far downstream from the point at which the event creating the edge effect occurred. This is a result of the inherent "coupling" that links upstream and downstream riverine habitats. Scientists label such transmission of aquatic edge effects "hyperfragmentation." When disturbances related to commodity production occur in headwaters, the hyperfragmentation process expands exponentially. *Integrated Biophysical Strategy for Restoration of Large Watersheds, supra* note 36, at 450-51.

292. The existing boundaries of riparian reserves may not be consistently inviolate in any event. Harvesting of timber for salvage purposes or to "enhance the old-growth ecosystem" is permitted in riparian reserves. Several recent timber sales on one Oregon national forest and three Oregon BLM districts indicate that forest managers may be taking advantage of these exceptions to allow inappropriate harvesting activities within riparian reserves. *See* Mark Hubbard, Riparian Reserves and Option 9: Say It's Saved, Then Log It, *WILD FOREST REVIEW*, Nov. 1994, at 25 (criticizing proposed Cat Tracks timber sale in Eugene BLM district, Partnership One timber sale in Rogue River National Forest, and Harry's Road Thin and Rock Creek Thin timber sales in Coos Bay BLM district as allowing harvests within

3. Watershed Analysis

The Westside Plan does not adequately define the role of watershed analysis in implementing the ACS. Consequently, the most fundamental problem with the watershed analysis process now underway in westside forests is the lack of a comprehensive implementation strategy for restoration and other management projects. Without such a focus, there is no way to hold forest managers accountable for the progress of ecosystem management without such an overall direction. Without a formal management strategy for a particular watershed, forest managers could continue to allow prior land use practices without being aware of their impacts on watershed-level ecological processes. Moreover, if the scope of a watershed analysis is limited only to evaluation of site-specific goals and monitoring, managers will not be able to determine whether watershed- and region-level ecosystem objectives will be achieved.

The Westside Plan also fails to adequately clarify the role of watershed analysis in the forest planning process. The FEMAT Report proposed watershed analysis as a tool for understanding watershed-scale ecological processes and biodiversity, with the aim of assisting managers to make decisions likely to result in protected and restored ecosystems.²⁹³ But the final environmental impact statement for the Westside Plan rejected institutionalizing watershed analysis as a first tier of a reformed planning process.²⁹⁴ Presumably the Westside Plan's drafters desired to avoid the procedural delays associated with the statutory requirements associated with forest planning.²⁹⁵ But

designated riparian reserve boundaries).

293. FEMAT REPORT, *supra* note 6, at V.53-V.57.

294. 2 WESTSIDE FINAL EIS, *supra* note 101, at B.93.

295. Watershed analysis documents completed thus far have been made publicly available, but the Forest Service and BLM apparently do not consider the watershed analysis process to be subject to the National Environmental Policy Act (NEPA), 42 U.S.C. §§ 4321-4370d (1994). Although the draft environmental impact statement for the Westside Plan proposed that watershed analysis be considered the first step in the forest planning process, and therefore subject to NEPA, the final environmental impact statement omitted this feature of the watershed analysis program. See Memorandum from Regional Inter-agency Executive Committee to Regional Ecosystem Office & Watershed Analysis Coordination Team 1 (Jan. 10, 1995) ("Watershed analysis is not a decisionmaking process, nor is a watershed analysis report a decision document, a planning document requiring NEPA review, or a regulatory prescription document.") (copy on file with author). But the Westside Plan's silence on the question whether a watershed analysis is a public document is not conclusive. The Westside Plan does not expressly state that watershed analysis is not subject to NEPA, and in any event the drafters of the Westside Plan could not exempt watershed analysis from environmental impact requirements if they are applicable because the National Forest Management Act does not supersede NEPA.

watershed analysis should be subject to public participation and scrutiny. While watershed analysis documents are not themselves notices of any land use decision, and the information obtained in a watershed analysis does not require forest managers to make any particular decision, watershed analysis is intended to guide forest managers in making resource allocation decisions.²⁹⁶ Watershed analysis therefore fulfills a function similar to environmental assessments and environmental impact statements under NEPA, even if it does not itself amount to an irretrievable commitment of resources, and accordingly should be subjected to the public scrutiny that accompanies an environmental impact review process.

Considering the extensive confusion within and outside the Forest Service and the BLM over the appropriate scope and methodology of watershed analysis,²⁹⁷ adherence to NEPA, or other similar environmental impact review requirements, would be likely to assist forest managers in refining the watershed analysis process. Opportunity for public participation in watershed analysis is also likely to advance effective ecosystem management. Since the ACS gives forest managers the authority to permit timber harvesting even in key watersheds or alter riparian reserve boundaries once a watershed analysis is completed,²⁹⁸ and therefore creates the possibility that progress toward restored aquatic ecosystems may be undermined, the watershed analysis process should facilitate public input that might help avoid that consequence. Moreover, watershed analysis is a prerequisite to implementation of restoration programs.²⁹⁹ Since the ACS does not include any specific guidelines or criteria for watershed analysis, compliance with the specific mandates of NEPA, as refined during twenty years of experience with that planning law, may facilitate more efficient and effective restoration measures.

Public participation in the watershed analysis program could also facilitate a more coherent planning process. Forest managers also have not adopted clear and uniform guidance for the scope and contents of a watershed analysis.³⁰⁰ To be adequate, a watershed analysis should: (1)

296. See *supra* notes 217-219 and accompanying text.

297. Interview with Jonathan J. Rhodes, Hydrologist, Columbia River Inter-tribal Fish Commission, Portland, OR (Sept. 16, 1995).

298. See *supra* notes 169-171, 172-175 and accompanying text.

299. 2 WESTSIDE FINAL EIS, *supra* note 101, at B.92. But see 1 WESTSIDE FINAL EIS, *supra* note 101, at 2.31 (noting that watershed analysis is required only before construction of roads in existing roadless areas).

300. A draft guidance document for watershed analysis was issued in March 1995 by the Regional Ecosystem Office, which represents the Forest Service, BLM, Fish & Wildlife Service, Bureau of Indian Affairs, National Park Service, NMFS, and the Environmental Protection Agency (EPA). See FOREST SERVICE, U.S. DEP'T OF AGRICULTURE, ECOSYSTEM ANALYSIS AT THE WATERSHED SCALE: THE REVISED FEDERAL AGENCY GUIDE FOR WATERSHED

provide information and specific recommendations to support restoration planning, management projects, and overall ecosystem management; (2) identify critical aquatic and terrestrial diversity areas, or "hot spots," that should be included in riparian reserves or otherwise protected through appropriate management decisions; (3) identify riparian reserves on a watershed level; (4) describe the role of the watershed in meeting regional protection and restoration objectives; (5) determine the current level of biodiversity in key watersheds and the watershed condition needed to maintain or achieve biodiversity at the desired level; and (6) determine the condition of ecosystem components, including water quality, needed to maintain ecological health outside of key water-sheds.³⁰¹

These goals cannot be met unless a watershed analysis examines the major ecosystem processes operating within the watershed and evaluates the biological integrity of the contained ecosystems.³⁰² Managers should therefore assess past and present geomorphologic landforms,³⁰³ hydrologic patterns,³⁰⁴ stream channel morphologic types and trends,³⁰⁵

ANALYSIS (Review Draft, Version 2.1, March 1995) [hereinafter ECOSYSTEM ANALYSIS]. EPA has also issued a guide for watershed analysis. See U.S. ENVIRONMENTAL PROTECTION AGENCY, REGION X, A WATERSHED ASSESSMENT PRIMER (1994) [hereinafter WATERSHED ASSESSMENT PRIMER].

301. See Letter from Bob Doppelt, Executive Director, The Pacific Rivers Council, Eugene, OR, to John Lowe, Chair, Regional Interagency Executive Committee, Portland, OR (Jan. 6, 1995), at 1 (copy on file with author) [hereinafter Doppelt Letter].

302. See *id.* at 6; Personal Correspondence from James R. Karr (July 28, 1995). Watershed analysis should not focus too much on the physical characteristics of watersheds. The point of the analysis should be to prevent land use activities that could damage the biological diversity within a watershed. Therefore, all data should be collected and analyzed with that goal in mind. See Declaration of James R. Karr in Support of Plaintiff's Motion for Summary Judgment, Seattle Audubon Society et al. v. Lyons, No. C92-479WD (W.D. Wash.) ¶¶ 16-17, at 8 (Sept. 27, 1994) [hereinafter Karr Declaration].

303. A watershed analysis should identify potentially unstable and erodible slopes, as well as general watershed landforms. ECOSYSTEM ANALYSIS, *supra* note 300, at 9.

304. The watershed analysis should at least include an examination of average annual flow, low flows, and floods, as well as rain-on-snow potential and rain and snow accumulations. According to the chairman of the Regional Inter-agency Executive Committee responsible for overseeing implementation of the Westside Plan, "basic standards" for data related to vegetation, hydrology and fish were to be issued by April 1995. Letter from John E. Lowe, Chair, Regional Inter-agency Executive Committee, to Bob Doppelt, Executive Director, The Pacific Rivers Council 3 (Feb. 3, 1995) (copy on file with author) [hereinafter Lowe Letter].

305. A watershed analysis should survey streams and valleys in order to classify stream channels into reaches with similar morphological and biological characteristics. ECOSYSTEM ANALYSIS, *supra* note 300, at 23. In addition, the past and current condition of and linkages between valley types can indicate how streams will respond to changes in sediment delivery, hydrology, and large woody debris deposit and therefore provide information helpful in determining the potential of streams for aquatic and riparian habitat. *Id.*

disturbance cycles, biological diversity,³⁰⁶ vegetation,³⁰⁷ and climate and land use patterns.³⁰⁸ In addition, a watershed analysis should specify areas of the watershed that are characterized by high biological productivity and clearly delineate areas critical to ecosystem function such as wetlands, unconstrained valley bottoms, and tributary junctions.³⁰⁹ A watershed analysis document should also identify risks to critical ecosystem areas and recommend management actions likely to reduce such hazards.³¹⁰

The effectiveness of watershed analysis can also be improved by reducing the geographic scale of the data-gathering process. Although the purpose of watershed analysis is to assist forest managers in deciding how to allocate resources within a watershed, some analysis areas cover nearly 500 square miles.³¹¹ Ecosystem study on such a broad scale is not likely to be an efficient allocation of limited resources. An area of such size and complexity will require substantial staff time and expense, but may be unlikely to produce a document specific enough to assist a manager in deciding what activities to allow in a particular riparian corridor. A watershed analysis should be focus on local ecological conditions and not amount to a general tome on aquatic and riparian ecology and watershed processes.³¹²

Similarly, the experience of agency personnel thus far indicates that consistency in watershed analysis will be difficult to achieve. The documents completed to date reflect variations in data coverage, data use,

306. In general, a watershed analysis should evaluate the processes that generate and maintain genetic, species, and biological community diversity. Karr Declaration, *supra* note 302, ¶ 16, at 8. Thus, an evaluation of a watershed's biodiversity should include data regarding species distribution and population sizes. WATERSHED ASSESSMENT PRIMER, *supra* note 300, at 59-62. For fish, a watershed analysis should provide stocking records, hatchery records, migration routes, and species competition data. *Id.*

307. The condition of both terrestrial and riparian vegetation should be assessed since both affect habitat conditions for aquatic and riparian species. WATERSHED ASSESSMENT PRIMER, *supra* note 300, at 58-62.

308. A watershed analysis should include an assessment of all roads and trails that are active, closed, or restored, including their condition, maintenance, use levels, stability, potential and actual tendency to deliver sediment to streams, and the location and condition of culverts, bridges, and other stream crossings. ECOSYSTEM ANALYSIS, *supra* note 300, at 59.

309. Doppelt Letter, *supra* note 301, at 7.

310. *Id.*

311. *Id.* at 3.

312. Managers of the westside forests apparently recognize this flaw in the watershed analysis process. According to the chairman of the Regional Interagency Executive Committee, a revised guide for watershed analysis made available to forest managers and planners will "encourage teams to stratify . . . watersheds into subwatersheds or other subunits as necessary to better characterize ecological conditions and capabilities within the watershed." Lowe Letter, *supra* note 304, at 2.

analysis, and end products.³¹³ The Forest Service and the BLM should not preclude reliance on individual experience and judgment, but monitoring, protection, and restoration effectiveness and land use activity evaluation will be more reliable if all watershed analyses measure conditions with comparable parameters. To facilitate this process, forest managers should also be required to measure compliance with specific and quantifiable aquatic and riparian habitat objectives that indicate watershed complexity, connectivity, ecosystem integrity and structure, water quality, sediment deposition and retention, hydrologic and material transfers, floodplain and wetland hydrology, composition and diversity of riparian vegetation, and abundance of habitat sufficient for well-distributed populations of riparian-dependent species.³¹⁴ The agencies should limit managers' discretion to permit timber harvesting in key watersheds or riparian reserves, road building, or other management activities based on these specific standards.³¹⁵

These improvements to the watershed analysis process should also require that completed documents be subject to appropriate peer review, since measured parameters are likely to be subject to a variety of interpretations. Thus far the peer analysis that has occurred has not been adequately facilitated by prescribed methodologies nor assisted by consistent standard measurement parameters or end product guidelines.³¹⁶ The peer review process should not be limited to scientific personnel. Management and natural resources law and policy experts should participate in order to insure an effective watershed-level program that can actually be implemented.³¹⁷

313. Rhodes Interview, *supra* note 102. See also Jonathan J. Rhodes, A Comparison and Evaluation of Existing Land Management Plans Affecting Spawning and Rearing Habitat of Snake River Salmon Species Listed Under the Endangered Species Act 16 (Sept. 1995) (paper prepared for National Marine Fisheries Service) (noting that "watershed analysis procedures have not been finalized") (copy on file with author) [hereinafter Land Management Plan Comparison].

314. See Land Management Plan Comparison, *supra* note 313, at 33 ("[L]and management should be contingent on the status of parameters set as standards so that management is consistent with meeting standards").

315. The regional inter-agency committee overseeing implementation of the Westside Plan apparently agree that data standards must be established. See Lowe Letter, *supra* note 304, at 3.

316. Land Management Plan Comparison, *supra* note 313, at 43 ("There are no explicit provisions [in the Westside Plan] for altering management when basic habitat attributes . . . are degraded."), 47 ("In cases where habitat damage does occur and is documented, specific management adjustments are not required [by the Westside Plan].") (emphasis in original).

317. This criticism has also apparently been taken to heart by the Regional Interagency Executive Committee. According to chairman John Lowe, an inter-agency research and monitoring committee will develop watershed analysis peer review guidelines. It is not clear, however, when such guidelines will be proposed or become effective. Lowe Letter, *supra* note 304, at 3.

Finally, watershed analysis is expensive.³¹⁸ Given the highly degraded conditions in watersheds throughout the region, it would make sense to spend relatively more resources on protection and restoration activities in the field rather than on further study or on additional timber sales, which lose money in most Forest Service regions. There is little doubt that past human activities have caused the poor ecological conditions throughout the Pacific Northwest's forests. Extensive commitments of personnel and other agency resources to an effort to confirm the major sources of harm to aquatic and riparian ecosystems and precisely measure the damage should be minimized.

C. Ecosystem Management is Not a Panacea

Federal land managers in the Pacific Northwest may have entered a new era of natural resources policy. Many scientists, executives of commodity extraction industries, environmentalists, and politicians recognize, to varying degrees, that public land use must begin to more carefully account for the limits of ecosystems.³¹⁹ Beyond that general agreement, however, there is reason to doubt that a commitment to manage federal forests on an ecosystem basis can be reconciled with the political considerations, traditional policy orientation, and incentives that influence the Forest Service and the BLM.³²⁰ Moreover, the region's experience

318. The Forest Service calculates that a single Watershed Assessment can cost as much as \$100,000. INFISH EA, *supra* note 9, at III.35-III.36.

319. ECOSYSTEM MANAGEMENT, *supra* note 3, at 12-13, 20. Cf. DEWITT JOHN, CIVIC ENVIRONMENTALISM: ALTERNATIVES TO REGULATION IN STATES AND COMMUNITIES 43 (1994) (noting that complexity, uncertainty, and fragmentation associated with ecosystems, and costs of controlling destructive human disturbances, means that "regulation alone is an inadequate tool to manage an endangered ecosystem and is wholly inadequate to restore one;" in addition to regulation, research and monitoring, public education, and investment in new facilities and services are also needed).

320. A recent study of the Forest Service by the University of Washington indicated that the agency often views scientists as obstacles to achieving timber production objectives. See Brian Boyle et al., Policies and Mythologies of the USDA Forest Service: A Conversation with Employees (University of Washington, College of Forest Resources, Institute for Resources in Society, unpublished paper) (1994). See also NATIONAL WILDLIFE FEDERATION, RECOMMENDATIONS OF THE NATIONAL WILDLIFE FEDERATION TO THE FOREST SERVICE REINVENTION TEAM 4 (1994) (citing poll indicating that 68% of Forest Service employee respondents believe that managers "do not want to listen to professional advice if it conflicts with what they want to do") [hereinafter NWF RECOMMENDATIONS]. The Forest Service's commitment to timber production is as old as the agency. Managers have long emphasized logging over all other uses of the national forests, in part because of a historic agency desire to avoid a "timber famine," in part due to the traditional dominance of foresters in the upper ranks of the agency hierarchy, and in part because the Forest Service budget contains powerful incentives to cut. See RANDAL O'TOOLE, REFORMING THE FOREST SERVICE 98-110, 138-69 (1988); DAVID A. CLARY, TIMBER AND THE FOREST SERVICE (1986); and HAROLD K.

with the Westside Plan thus far indicates that basic disagreement over the expected practical impact of ecosystem management may continue to hinder the pursuit of a policy focus behind which a consensus can be formed and sustained.

The first challenge in implementing an ecosystem management scheme is to define the term.³²¹ It is clear that the words "ecosystem management" mean different things to different people.³²² The term is "much in use but too little understood,"³²³ as one of the region's most influential commentators on public lands issues has noted, environmentalists hear "ecosystem" while the timber industry and federal foresters hear "management."³²⁴ But federal land managers have available a reasonably clear indication that ecosystem management should represent a break from past patterns of public land use.³²⁵ President Clinton

STEEN, *THE U.S. FOREST SERVICE: A HISTORY* 278-323 (1976) for excellent treatments of the Forest Service's unique culture and stubborn dedication to timber production.

321. Daniel B. Schlager & Wayne A. Freimund, *Institutional and Legal Barriers to Ecosystem Management* 6-7 (Nov. 1, 1994) (unpublished report to Eastside Ecosystem Management Project) (copy on file with author). Achieving consensus on such a definition will be difficult. See R. EDWARD GRUMBINE, *GHOST BEARS: EXPLORING THE BIODIVERSITY CRISIS* 183 (1992) ("It is time to untangle the scientific search for correct boundaries from inherently value-laden questions about management goals. We must recognize that the choices we make not only reflect values but also limit the direction of our hands-on work with nature. Goals and boundaries must be based on the best scientific understanding we have of the limits that come with being one more dependent species in a world of diversity.").

322. ECOSYSTEM MANAGEMENT, *supra* note 3, at 38 ("[P]eople's interpretations, and thus perceptions, of ecosystem management var[y]-sometimes significantly") (quoting KEYSTONE CENTER, NATIONAL ECOSYSTEM MANAGEMENT FORUM (1993)); M. LYNNE CORNE, CONGRESSIONAL RESEARCH SERVICE, *ECOSYSTEMS, BIOMES, AND WATERSHEDS: DEFINITIONS AND USE* 1 (1993) ("[T]here is not enough agreement on the meaning of the concept to hinder its popularity.").

323. NWF RECOMMENDATIONS, *supra* note 320, at 12 (quoting Forest Service Chief Jack Ward Thomas). See also Robert B. Keiter, *Conservation Biology and the Law: Assessing the Challenges Ahead*, 69 CHI.-KENT L. REV. 911, 928 (1994) (remarking that land managers and the public "may have only a vague idea of what ecosystem management means").

324. Andy Kerr, *Ecosystem Management Must Include the Most Human of Factors* 1 (1995) (unpublished paper) (copy on file with author). The Forest Service apparently sees "management" as the central focus of this new approach to land stewardship: "[E]cosystem management means the use of skill and care in handling integrated units of organisms and their environments. It implies that the system, or integrated ecological unit, is the context for management rather than just its individual parts." James C. Overbay, *A Bias Toward Diversity: The Meaning of Ecosystem Management on the National Forests*, *FOREST WATCH*, Sept. 1992, at 20. Thus, the Forest Service appears to view ecosystem management primarily as a device for expanding the array of factors considered in agency decisionmaking.

325. Winifred B. Kessler & Hal Salwasser, *Natural Resource Agencies: Transforming From Within*, in *A NEW CENTURY FOR NATURAL RESOURCES MANAGEMENT* 171 (Richard L. Knight & Sarah F. Bates eds., 1995) (noting that Forest Service is "caught in [a] maelstrom of cultural, ecological, and economic changes," that the "context for natural resources management has changed significantly in recent years," and therefore that Forest Service

charged the Forest Ecosystem Management Assessment Team with a goal of developing a plan that, by necessity, must meet the needs of nature and people, but within the constraint of the "long-term health" of forests, fish and wildlife, and streams, lakes, and rivers.³²⁶ Thus, the FEMAT Report appropriately recognized that

[t]he desired future condition of federal forest and riverine ecosystems of the Pacific Northwest will involve levels of biological diversity, ecological processes and functions, including habitats, that sustain viable populations of native species as well as the productive capacity of the ecosystems. . . . The concept of ecosystem management directs the attention of land managers and others to understanding ecosystems and developing appropriate site-specific management to achieve over-arching ecosystem management objectives.³²⁷

Similarly, Forest Service Chief Jack Ward Thomas has recognized that

[e]cosystem management is a holistic approach to natural resource management, moving beyond the compartmentalized approach to focusing on the individual parts of the forest. It's an approach that steps back from the forest stand and focuses on the forest landscape and its position in the larger environment in order to integrate the human, biological, and physical dimensions of natural resource management. The purpose is to achieve sustainability of all resources.³²⁸

must adopt ecosystem management approach to adapt to such "realities"). In fact, the Forest Service itself has recognized that it desires to move from its traditional focus on "multiple use," where forests are viewed as places "to produce commodities and amenities," to an "ecological vision" in which the land has "importance beyond traditional commodity and amenity values." Winifred B. Kessler, *New Perspectives for Sustainable Natural Resource Management*, 2 *ECOLOGICAL APPLICATIONS* 221, 222 (1992) (quoting FOREST SERVICE, U.S. DEP'T OF AGRICULTURE, *NEW PERSPECTIVES FOR MANAGING THE NATIONAL FOREST SYSTEM* (1989)). On the other hand, a senior Forest Service official indicated as recently as 1992 that the agency is not concerned with the protection of "intrinsic ecosystem values." Overbay, *supra* note 324, at 21. Thus, the Forest Service itself is apparently unsure of what ecosystem management will demand of it.

326. The President explained at the Forest Conference, held in Portland, Oregon in April 1993, that the land agencies must consider both environmental and economic constraints: "[A]s we craft a plan, we need to protect the long-term health of our forests, our wildlife, and our waterways. . . . [but] we must never forget the human and economic dimensions of these problems. Where sound management policies can preserve the health of forest lands, [timber] sales should go forward. . . . [T]he plan should produce a predictable and sustainable level of timber sales and nontimber resources that will not degrade or destroy the environment." Comments of President William J. Clinton, quoted in 1 *WESTSIDE EIS*, *supra* note 101, at 1.4.

327. FEMAT REPORT, *supra* note 6, at II.84.

328. NWF RECOMMENDATIONS, *supra* note 320, at 12-13 (quoting Dr. Thomas).

Nevertheless, the extent to which ecosystem management actually constrains human economic use of natural resources is unclear.³²⁹ The drafters of the Westside Plan recognized this ambiguity in the ecosystem management concept.³³⁰ Moreover, some observers believe that the Forest Service considers ecosystem management essentially a new way of articulating the agency's traditional commitment to "multiple use."³³¹ If they are right, trouble lies ahead. Because an ecosystem does not require human manipulation to function, and because public land management has traditionally meant high levels of commodity production, it is possible that the ecosystem management concept could become a shibboleth available for use by land managers to continue the government's historically poor efforts to protect functioning ecosystems on federal forests.³³² Should that

329. ECOSYSTEM MANAGEMENT: SUSTAINING THE NATION'S NATURAL RESOURCES TRUST (Majority Report of the Committee on Natural Resources, U.S. House of Representatives) 7-15 (1994). Indeed, one prominent Pacific Northwest legislator has labeled the phrase "ecosystem management" and "watershed protection" "buzzwords for a new generation of land management philosophies and techniques." Rebecca W. Thompson, *Ecosystem Management: Great Idea, But What is It, Will it Work, and Who will Pay?*, 9 NAT. RES. & ENV'T 42 (1994) (quoting Sen. Mark O. Hatfield). Moreover, the failure of the federal land management agencies to clarify this point is very likely to lead to continued severe environmental degradation. If the policy framework for ecosystem management does not adequately constrain decisions, political convenience and concern for economic impacts are likely to tempt managers to continue compromising ecological health in the interest of accommodating local interests or maintaining their discretion to choose among competing management options. Robert B. Keiter, *Taking Account of the Ecosystem on the Public Domain: Law and Ecology in the Greater Yellowstone Region*, in ENVIRONMENTAL POLICY AND BIODIVERSITY 111, 134 (R. Edward Grumbine ed., 1994).

330. "[O]ur understanding of the underpinnings (supporting science, ecological constructs, legal interpretation, and societal acceptance) of natural resource management is in rapid flux and deals with imprecise concepts such as "ecosystem management" itself and sustainable development as a means of achieving ecosystem management." FEMAT REPORT, *supra* note 6, at II.84-II.85.

331. See, e.g., *Ecosystem Management: Hearing Before the Subcommittee on Agricultural Research, Conservation, Forestry, and General Legislation of the Committee on Agriculture, Nutrition, and Forestry* (S. Hrg. No. 103-494) 36 (Nov. 9, 1993) (Prepared Testimony of Dr. Don Waller, Department of Botany, University of Wisconsin) ("Sadly, ecosystem management as practiced thus far by the Forest Service has amounted to little more than another public relations initiative aimed at deflecting public scrutiny and criticism"); Norm Peck, *Ecosystem Management: High Level Spin Control or the Real Thing?*, FOREST WATCH, Nov.-Dec. 1992, at 23, 24. ("Without changes in the status quo, ecosystem management is nothing more than a public relations ploy foisted upon the public, the bovine masses, in place of action.")

332. See Keiter, *supra* note 323, at 932 ("[E]cosystem management must offer more than just process; it must establish workable substantive principles and clear priorities"). Unfortunately, recently some evidence has surfaced which indicates that the federal land agencies do consider ecosystem management to be much more about process than outcomes. See 58 Fed. Reg. 43,208, 43,209 (1993) (to be codified at 43 C.F.R. §§ 1780, 4100) (BLM announcement of Rangeland Reform initiative) ("Ecosystem management is a process that considers the total environment."); Overbay, *supra* note 324, at 20 ("ecosystem

happen, the Forest Service and the BLM may find themselves in the midst of yet another prolonged legal battle over their obligations to protect fish and wildlife habitat.³³³ To avoid that unpleasant and unproductive outcome, the agencies should clarify the degree to which managers in the field will have the discretion to continue authorizing timber harvesting, road construction, and other commodity extraction activities within key watersheds and riparian reserves.

Of course, it is not only federal foresters who must seek better understanding of the impact of ecosystem management. Concerned citizens must also remember that an ecosystem-based approach to public land use will not magically induce managers to change the incentives that influence their decisionmaking processes, eliminate pressures to achieve goals that have little to do with healthy ecosystems, or prevent scientific mistakes.³³⁴ Ecosystem management is probably best conceived of as a process by which land use decisions will be made.³³⁵ On the spotted owl forests, application of the Westside Plan supplements the mandates of all other statutes, regulations, and internal procedures.³³⁶ Thus, ecosystem

management means the use of skill and care in handling integrated units of organisms and their environments" and "implies that the system, or integrated ecological unity, is the context for management rather than just its individual parts").

333. Keiter, *supra* note 323, at 932.

334. For a good overview of the bureaucratic pressures that can lead resource agencies to overlook biological crises on the lands under their jurisdiction, see STEVEN LEWIS YAFFEE, *THE WISDOM OF THE SPOTTED OWL: POLICY LESSONS FOR A NEW CENTURY* 256-82 (1994).

335. Thomson, *supra* note 329, at 42.

336. As a general rule, the laws governing the Forest Service and the BLM do not adopt ecosystems or protection of biological diversity as an organizing principle. Instead, the statutory charters of the Forest Service and the BLM command the agencies to adopt as a fundamental management philosophy the encouragement of "multiple use" of lands under those agencies' jurisdiction. See Multiple Use Sustained Yield Act of 1960, 16 U.S.C. §§ 528-531 (1994); National Forest Management Act of 1976, 16 U.S.C. § 1604(g)(3)(B) (1994); Federal Land Policy & Management Act of 1976, 43 U.S.C. § 1712(c) (1994). Accordingly, the National Forest Management Act requires the Forest Service to preserve the "distribution and abundance of different plant and animal communities and species," Congress also made clear that this mandate must be met "within the limit of multiple use objectives." 16 U.S.C. § 1604(g)(3)(B). See also 36 C.F.R. § 219.1(b)(3) (recognizing that national forests are "ecosystems" but also noting that their "management for goods and services" requires only an "awareness and consideration of the interrelationships among plants, animals, soil, water, air, and other environmental factors within such ecosystems"); 36 C.F.R. § 219.27(g) (requiring, "where appropriate and to the extent practicable," the Forest Service to "preserve and enhance the diversity of plant and animal species" at a level "at least as great" as in a "natural forest"). Similarly, NEPA apparently does not require the Forest Service and the BLM to consider ecosystem functions and health when making decisions. See Holly Doremus, *Patching the Ark: Improving Legal Protection of Biological Diversity*, 18 *ECOLOGY L.Q.* 265, 326-28 (1991); Jeb Boyt, *Struggling to Protect Ecosystems and Biodiversity Under NEPA and NFMA: The Ancient Forests of the Pacific Northwest and the Northern Spotted Owl*, 10 *PACE ENV'T. L. REV.* 1009, 1035-39 (1993). But cf. *Marble Mountain Audubon*

management is likely to mean that the Forest Service and BLM will consider the impact of their decisions on whole ecosystems, use concepts of conservation biology³³⁷ in evaluating the likely impacts of commodity production, and increase their focus on the preservation of biological diversity.³³⁸ Ecosystem management will not, however, guarantee the return of aquatic ecosystems to conditions that existed before European settlement of the Pacific Northwest.³³⁹ Most people are likely to agree that the national forests and national resource lands in the range of the northern spotted owl should continue to be used for production of timber,

Society v. Rice, 914 F.2d 179 (9th Cir. 1990) (holding that Forest Service violated NEPA by failing to adequately consider existence of a biological corridor used by wildlife traveling through forest).

337. The science of conservation biology hypothesizes that reserve areas large enough to withstand the most severe natural disturbances are necessary to provide the habitat essential for the maintenance of a species' genetic diversity and for population viability and that species will go extinct if they fall below certain demographic and genetic thresholds. See CONSERVATION BIOLOGY: AN EVOLUTIONARY-ECOLOGICAL PERSPECTIVE 5, 7 (Michael E. Soule & Bruce A. Wilcox eds., 1980). Thus, preserves should encompass the largest possible amount of space for native organisms, or in the alternative, the isolation of similar habitats from each other should be minimized. *Id.* at 5-6.

338. This may not happen, because the courts have not thus far agreed that federal land managers must employ concepts of conservation biology in making decisions about uses of the land. See *Sierra Club v. Marita*, 46 F.3d 606, 620 (7th Cir. 1995) ("[C]onservation biology is not a necessary element of diversity analysis [under NFMA] insofar as the regulations do not dictate that the [Forest] [S]ervice analyze diversity in any specific way"). The Seventh Circuit's decision appears to be an incorrect application of the traditional rule requiring courts to "answer to reason . . . because [their] fiat is beyond appeal." *Jewell Ridge Coal Corp. v. Local No. 6167, United Mine Workers of America*, 325 U.S. 161, 196 (1945) (Jackson, J., dissenting). See also, e.g., *Daubert v. Merrell Dow Pharmaceuticals, Inc.*, 113 S.Ct. 2794, 2796 (1993) ("[T]he [court] must determine at the outset . . . whether the expert is proposing to testify to . . . scientific knowledge. . . . This entails a preliminary assessment of whether the reasoning or methodology underlying the testimony is scientifically valid and of whether that reasoning or methodology properly can be applied to the facts in issue."). In *Marita*, the Forest Service successfully argued that it was not required to apply conservation biology in developing a management plan for several midwestern National Forests because the science is "untested." *Sierra Club v. Marita*, 843 F. Supp. 1526, 1542 (E.D. Wis. 1994), *aff'd*, 46 F.3d 606 (7th Cir. 1995). But the Forest Service's arguments against the use of conservation biology are not supported by peer review, publication, or independent verification, and therefore are not entitled to judicial deference. See Patricia Smith King, Applying *Daubert* to the "Hard Look" Requirement of NEPA: Scientific Evidence Before the Forest Service in *Sierra Club v. Marita*, 2 WISCONSIN ENVTL. L.J. 148, 163-70 (1995).

339. The Forest Service and BLM are apparently not obligated by law to return aquatic ecosystems to pre-settlement conditions. Several recent court decisions hold that the National Forest Management Act, while obligating the Forest Service to maintain a diversity of species, does not mandate preservation of all of the biota that existed in a particular forest before European settlement. See note 236, *supra*. See also ECOSYSTEM MANAGEMENT, *supra* note 3, at 25 ("Ecosystem management's emphasis on maintaining and restoring the health of ecosystems does not, however, necessarily mean returning ecosystems to any particular historic condition.").

livestock, and minerals, and therefore the real question is whether the bureaucratic and political pressures that have allowed such activities to occur to an extent and in a manner incompatible with functioning ecosystems will be changed by the Westside Plan.³⁴⁰

The answer is "no." Ecosystem management changes neither human nature nor the bureaucratic incentives that drive agency decisions. National forest rangers and local BLM managers are likely to continue to concern themselves with meeting commodity production targets so long as superiors measure performance on that basis.³⁴¹ Policymakers in command of the Forest Service and the BLM can be expected to continue to emphasize commodity production because Congress and the Administration show every indication that they will continue to expect the public lands to contribute specific levels of timber, livestock, and minerals to the nation's economy.³⁴² And the agencies, driven as are most bureaucracies by the instinct to survive, probably will continue to act in ways that are likely to maintain and enhance their budgets, staff, and influence.³⁴³

Accordingly, the success or failure of the Westside Plan's ACS must ultimately be judged on whether the public's trust in the federal land agencies improves as it is implemented and on how well it contributes to accurate knowledge, reasoned decisionmaking, and efficient allocation of scarce ecosystem restoration resources. It is too early to evaluate the ACS using those criteria. However, it is reasonable to assume that an improved watershed analysis program, carefully designed to provide clear and readily comparable data about aquatic ecosystems, will contribute to the achievement of those goals. So too would modification of the riparian reserve and key watershed components of the ACS to take account of the problems discussed above.

340. As noted by the General Accounting Office in a recent report: "Humans are a biological component of most ecosystems, and ecosystem management does not presume that ecosystems have a life and destiny independent of people and their communities. Since ecosystems include humans, human activities and uses are integral to ecosystem management." *ECOSYSTEM MANAGEMENT*, *supra* note 3, at 23.

341. Kessler & Salwasser, *supra* note 325, at 184.

342. As Rebecca Thomson noted, "[t]he substantive results of 'ecosystem management' cannot be predicted at this time. . . ." Thomson, *supra* note 329, at 42.

343. Some commentators have pointed out that budget outcomes, rather than any independent preference to produce one resource over another, drive Forest Service decisionmaking. O'TOOLE, *supra* note 320, at 98-110. Andy Kerr made this point somewhat more colorfully when he reminded us that "[t]he seven mortal sins (pride, gluttony, avarice, sloth, anger, envy and lust) have not been repealed." Kerr, *supra* note 324, at 2.

V. Conclusion

Ecosystem management may become the dominant paradigm for public land management in the twenty-first century. The Clinton Administration has committed the nation to wide application of this new philosophy, and the Pacific Northwest is already learning how it will affect the management of our public forests. The President's commitment to aquatic ecosystem restoration is commendable, as is his Administration's acknowledgement of the vital role played by aquatic and riparian ecosystems in the larger forest ecosystem. The Westside Plan correctly adopts a watershed-based approach to forest management and wisely allocates to the healthiest remaining aquatic habitats the highest restoration priority.

Nevertheless, the Westside Plan's Aquatic Conservation Strategy is unlikely to prevent continued degradation of the region's watersheds. The ACS does not address some of the most significant threats to aquatic ecosystems, such as adequate streamflows. The watershed analysis process aimed at helping forest managers decide when to permit commodity extraction activities fails to include appropriate mechanisms for public involvement and does not provide clear standards limiting managers' discretion. The ACS also unwisely allows timber harvesting in non-inventoried roadless areas and riparian reserves and does not prohibit the construction of new roads or prevent continued loss of riparian vegetation. The ACS therefore will not prevent continued excessive sedimentation, adverse temperature impacts, and loss of riparian vegetation and deep pools needed by Pacific salmon and resident fish for cover and rearing habitat.

The concept of ecosystem management itself is ambiguous and may lead land managers to continue unsustainable economic uses of federal forests. To avoid that outcome, planners should insure that implementation of the Westside Plan is consistent with President Clinton's directive that production of timber, livestock, and mining occur only to the extent they are consistent with restoring and maintaining vital ecosystem functions and viable populations of native species. If the Forest Service and the BLM follow that criterion, the conflicts that have embroiled the agencies and the region in protracted litigation and divisive public debate over the proper role of federal forests may be reduced and the public's trust in the land agencies will improve.

VI. AFTERWORD

Neither Congress nor the federal courts are likely to derail the Clinton Administration's plan for managing the Westside Forests.³⁴⁴ Nevertheless, events since Judge Dwyer's decision have undermined the Westside Plan. Most troubling is the impact of the so-called "salvage rider."³⁴⁵ This provision of federal law, which insulates salvage sales from all environmental laws, allows the Forest Service and the BLM to cut billions of board feet of old growth timber from forests in western Oregon, western Washington, and northern California regardless of the impact on streams and rivers.³⁴⁶

The removal of this old growth timber has already had significant adverse impacts on westside aquatic ecosystems.³⁴⁷ Observers report increased erosion into streams and rivers up and down the northwest Pacific coast.³⁴⁸ Moreover, the salvage rider has undermined not only the Westside Plan, but also the commitment of the Forest Service and the BLM to ecosystem management itself. Congress' decision to require timber production regardless of ecological impacts or otherwise applicable requirements of federal law signals that ecosystem management is nothing more than a "passing fancy" to be accommodated when it is not inconvenient to the timber industry.

344. The Ninth Circuit affirmed Judge Dwyer's decision upholding the Westside Plan against challenges from the environmental community and timber industry interests in early 1996. See *Seattle Audubon Society v. Moseley*, 80 F.3d 1401 (9th Cir. 1996).

345. Fiscal Year 1995 Emergency Supplemental Appropriations for Disaster Relief and Rescissions Act, Pub. L. No. 104-19, § 2001, 109 Stat. 240 (1995).

346. The salvage rider requires the Administration to release for sale all timber sales previously enjoined during litigation over the fate of the northern spotted owl and governed by § 318 of the Fiscal Year 1990 Department of the Interior and Related Agencies Appropriations Act, Pub. L. No. 101-121, 103 Stat. 745 (1989). See *Northwest Forest Resource Council v. Glickman*, No. 95-36038, No. 95-36042, 1996 U.S. App. LEXIS 13143 (9th Cir., Apr. 24, 1996) (interpreting phrase "subject to § 318" in § 2001(k) of Pub. L. No. 104-19). WESTLAW 82 F.3d 825 (1996).

347. Interview with Mary Scurlock, Pacific Rivers Council, Portland, OR (May 30, 1996).

348. Scientists warned Congress during debate on the salvage rider that removal of dead and dying trees from national forests in the Northwest could create significantly increased erosion. Tom Alkire & Sandra Grays, *Group Says Salvage Logging Will Hurt Taxpayers*, Environment, BNA ENVIRONMENTAL DAILY, Mar. 10, 1995. That risk appears to have been exacerbated by winter weather in Oregon during 1995-96.