Clean Water or Multiple Use? Best Management Practices for Water Quality Control in the National Forests

by

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During the 1940's, the forestry profession turned sharply away from a multiple-resource orientation in which watershed protection held an important place, embracing instead a kind of "timber fundamentalism." — Robert Coats[1]

Coats accuses foresters of "timber fundamentalism." We see an opposing "earth-first fundamentalism," which is reluctant to accept any environmental degradation in order to acquire the benefits of forest products. Until these two fundamentalisms are reconciled . . . we see little hope of resolution of the current controversy. — Raymond Rice and Neil Berg[2]

INTRODUCTION

The United States Forest Service is subject to several mandates in its management of the national forests. Through the Multiple-Use Sustained-Yield Act (MUSY) Congress requires that the Forest Service manage the national forests for long-term public benefit by balancing competing resources.[3] At the same time, the Clean Water Act (CWA) requires all federal agencies, including the Forest Service, to meet water quality standards with the goal of making the nation's waters both fishable and swimmable by 1983.[4]

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1. Coats, *Cumulative Watershed Effects: A Historical Perspective,* 1987 PROC. OF THE CALIFORNIA WATERSHED MGMT. CONF. 107, 110 [hereinafter PROCEEDINGS].

2. Rice & Berg, *Summary and Synthesis: Cumulative Impacts,* PROCEEDINGS, *supra* note 1, at 150.

3. Multiple-Use Sustained-Yield Act of 1960 (MUSY), 16 U.S.C. §§ 528-531 (1982 & Supp. IV 1986). The statutory definition of multiple use is at *id.* § 531(a).

4. In the Federal Water Pollution Control Act, commonly referred to as the Clean Water Act (CWA), 33 U.S.C. §§ 1251-1387 (1982 & Supp. V 1987), Congress directed that the national forests be managed to protect water quality. The pertinent provision in CWA is sec-

Because most water quality problems in the national forests can be traced to the effects of timber harvesting and related activities, there is a tension between these two mandates. To the Forest Service, however, they are not fundamentally incompatible. Rather, the agency takes the position that Congress intended to control water quality problems in the national forests only to "the extent feasible."[5] This intent is met through the planning processes the Forest Service uses under MUSY and the National Forest Management Act of 1976 (NFMA)[6] to balance demands for timber, grazing, mining, fisheries and wildlife, recreation, and other forest uses. Furthermore, by imposing management prescriptions known as Best Management Practices (BMP's) on environmentally threatening land uses, the Forest Service believes that it can meet water quality goals even as it increases the yield of timber, mineral, and other resources from the national forests.

Most water quality problems in the national forests can be traced to one of two endemic short comings of BMP's. First, in some physical settings even the most stringent BMP's will not protect streams; these situations must be handled by land use planning rather than management prescriptions.[7] Second, BMP's are not always properly or fully implemented, usually due to a lack of institutional commitment to the idea that clean water is a legitimate overriding constraint on other resource uses.[8] These regulatory shortcomings are cause for concern, particularly in California and the Pacific Northwest where national forest lands encompass much of the watershed,[9] including high quality waters essential to fish habitats and municipal water supplies.

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tion 313, which provides that:

> (a) [e]ach department, agency, or instrumentality of the . . . Federal Government (1) having jurisdiction over any property or facility, or (2) engaged in any activity resulting, or which may result, in the discharge or runoff of pollutants, . . . shall be subject to, and comply with, all Federal, State, interstate, and local requirements, administrative authority, and process and sanctions respecting the control and abatement of water pollution in the same manner, and to the same extent as any nongovernmental entity.

33 U.S.C. § 1323(a) (1982).

Although the Congressional commitment to water quality appears unequivocal, it is at odds with the multiple use directive of MUSY. "It is the policy of the Congress that the national forests are established and shall be administered for outdoor recreation, range, timber, watershed, and wildlife and fish purposes." 16 U.S.C. § 528 (1982).

5. CWA § 208(b)(2)(F), 33 U.S.C. § 1288(b)(2)(F) (1982).

6. Pub. L. No. 94-588, 90 Stat. 2949 (codified as amended in scattered sections of 16 U.S.C.).

7. *See, e.g., infra* notes 289-98 and accompanying text.

8. *See infra* notes 314-32 and accompanying text.

9. More than 60% of the average annual water yield in 11 western states is from federal reservations. The percentage varies from 56% in the Columbia-North Pacific water resource region to 96% in the Upper Colorado region. C. WHEATLEY, C. CORKER, T. STETSON & D. REED, STUDY OF THE DEVELOPMENT, MANAGEMENT, AND USE OF WATER RESOURCES ON THE PUBLIC LANDS 402-06, table 4 (1969).

Although BMP's have their limitations, other regulatory alternatives, such as the traditional permit-based approach used to control discharges of manufacturers, are not readily adaptable to the forestry context. In a setting where the sources of pollution are diffuse and not closely related in time to their eventual effects, enforcement of specific pollutant levels is neither practical nor effective.[10] Furthermore, once a watershed is damaged by logging-induced erosion, mitigation is extremely expensive, if not technologically impossible. The advantage of the management and planning prescriptions used by the Forest Service is that they are proactive. Where they are properly used, BMP's can provide some assurance that serious and unavoidable water quality problems will not materialize twenty years later—long after the harvester has left the scene.

Previous articles have analyzed the legal constraints on timber management in the national forests under the Clean Water Act,[11] the National Environmental Policy Act (NEPA),[12] the National Forest Management Act (NFMA),[13] and the Wild and Scenic Rivers Act.[14] Reflecting the fact that much of the battle over water quality has been a battle over land use planning, these articles have focused on how the statutes constrain forest planning, rather than how environmental values are protected on the ground. After summarizing the nature and extent of the environmental problem, which is essentially a conflict between forest land uses and fisheries, this Comment draws together these earlier works to show how the interplay between state and federal laws, including CWA, NEPA, and NFMA, protects water quality through forest planning.

Following this synthesis, the Comment assesses the success of BMP's in protecting water quality. It explains why BMP's are not always implemented even when they are prescribed and identifies those physical settings where, even if fully implemented, BMP's fail. The concluding section proposes some limited administrative and institutional reforms designed to correct these shortcomings.

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10. *See infra* text accompanying notes 351-54.

11. Anderson, *Water Quality Planning for the National Forests,* 17 ENVTL. L. 591 (1987).

12. Craig, *National Forest Planning and Anadromous Fish Protection*: A Trilogy of NEPA Cases, 2 J. ENVTL. L. & LITIG. 255 (1987).

13. C. WILKINSON & M. ANDERSON, LAND AND RESOURCE PLANNING IN THE NATIONAL FORESTS 222-25 (1985).

14. Gray, *No Holier Temples: Protecting the National Parks Through Wild and Scenic River Designation,* 58 U. COLO. L. REV. 551, 567-68 (1988).

I
THE ENVIRONMENTAL PROBLEM

Most of the water quality problems in the national forests result from "nonpoint sources"[15] of pollution, including timber harvesting, road building, and reforestation. The direct effects of these forestry-related activities, including sedimentation and increased water temperature, result from complex interactions of natural conditions and human disturbance. These effects lead, in turn, to indirect effects such as damaged fish habitat, reservoir siltation, and damaged water supplies. This section sets a context for the more legalistic and institutional analyses that follow by summarizing the nature and extent of forestry-related water quality impacts and some of the management techniques used to minimize them.

A. The Effects of Forestry-Related Water Pollution

In the winter of 1965, following fifteen years of intensive logging and road building in the Payette National Forest, heavy rains fell on the South Fork of the Salmon River in Idaho and triggered a series of landslides so destructive that all "[a]long 25 miles of the South Fork, the soil seemed to dissolve and run like wet concrete. The forest opened to reveal swatches of naked bedrock as dislodged trees flowed away."[16] By the time the South Fork's slopes stabilized, the river was virtually destroyed as a spawning ground; more than half the salmon population of the entire Columbia River system was effectively eliminated.[17]

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15. There is no statutory definition of nonpoint sources in the context of water pollution. Greenfield, *Controlling Nonpoint Sources of Pollution—The Federal Legal Framework and the Alternative of Nonfederal Action,* in OFFICE OF WATER REGULATIONS & STANDARDS, U.S. ENVIRONMENTAL PROTECTION AGENCY, PERSPECTIVES ON NONPOINT SOURCE POLLUTION 63 (1985) (EPA 440/5-85-001) [hereinafter PERSPECTIVES]. The term is generally defined by reference to the definition of point sources in CWA section 502(14) which states that " 'point source' means any discernible, confined and discrete conveyance, including but not limited to any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, . . . from which pollutants are or may be discharged." 33 U.S.C. § 1362(14) (1982 & Supp. V 1987).

In common usage, nonpoint source pollution is "disparate runoff caused primarily by rainfall around activities that employ or cause pollutants." United States v. Earth Sciences, 599 F.2d 368, 373 (10th Cir. 1979). *See also* Greenfield, *supra.*

16. Wann, *Timber and Tourists: Idaho Confronts Logging Issues,* EPA JOURNAL, Dec. 1987, at 20; *see also* Jahn & Burns, *Sediment/Fish Modeling in the South Fork Salmon River,* 2 PROC. OF THE FOURTH FED. INTERAGENCY SEDIMENTATION CONF. 7-41 (1986). According to this report, "[m]ajor logging efforts began in 1950 and lasted until 1965. During this time, more than 800 additional miles of road were constructed within the drainage, most of which were built on steep slopes with highly erodible soils." *Id.* at 7-45 (citation omitted).

17. Wann, *supra* note 16, at 20. The South Fork disaster was only one of several widely publicized watershed blowouts resulting from the severe winter storms of 1964 and 1965. For example, the Trinity River in California had natural spawning escapements in the 1950's of approximately 90,000 chinook salmon and 50,000 steelhead trout. Following logging on national forest lands, severe storms in 1964 led to a "tremendous pulse of sediment [that] filled in

Twenty years after the Salmon River Disaster, silviculture is still an important contributor to nonpoint source water pollution in over twenty states, including California, Oregon, Washington, and Idaho.[18] One recent report in Oregon identified over twenty-eight percent of the waters surveyed as moderately or severely affected by forestry activities.[19] Methods to limit sedimentation and other water quality impacts of timber management are better understood today,[20] but some effects remain unavoidable.[21] The two main uses of forest streams, fisheries and drinking water supplies, are still vulnerable to the effects of forest uses.

Because the most effective technique for protecting water quality in forested lands is to prohibit activities such as logging that disturb soils and lead to sedimentation, much of the conflict between multiple use and water quality can be boiled down to a disagreement over the relative economic values of forestry and fisheries. The streams and rivers of the national forests in Washington, Idaho, Oregon, California, and Alaska are home to significant salmon and trout fisheries (anadromous salmonids).[22]

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pools and destroyed riparian vegetation." THE WILDERNESS SOCIETY, A CRITIQUE OF THE SHASTA-TRINITY NATIONAL FORESTS PLAN 50 (1987) (citation omitted) [hereinafter THE WILDERNESS SOCIETY]. Even twenty years later, in 1983, the population of chinook salmon was 88% below the level of the 1950's (10,900), while steelhead fell 61% to 19,400 during the same period. *Id.*

18. WATER PLANNING DIVISION, OFFICE OF WATER PROGRAM OPERATIONS, U.S. ENVIRONMENTAL PROTECTION AGENCY, REPORT TO CONGRESS: NONPOINT SOURCE POLLUTION IN THE U.S. 1-5 (1984) [hereinafter EPA, REPORT TO CONGRESS].

19. OREGON DEPARTMENT OF ENVIRONMENTAL QUALITY, 1988 OREGON STATEWIDE ASSESSMENT OF NONPOINT SOURCES OF WATER POLLUTION, *cited in* OREGON DEPARTMENT OF ENVIRONMENTAL QUALITY, DRAFT NONPOINT SOURCE STATEWIDE MANAGEMENT PLAN FOR OREGON at 70 (1988). According to the report, "forestry activities were identified as, or suspected to be, the cause of moderate or severe impacts on one or more beneficial uses of water in approximately 8,000 out of 27,700 waterbody miles assessed." *Id.*

20. *See, e.g.*, McGreer, *The Forest Industry's Perspective of 208*, in PERSPECTIVES, *supra* note 15, at 330-31. McGreer describes the Salmon River blowout, while asserting that it could not happen again:

> The Salmon River in Idaho provides an interesting example of abusive practices resulting in damage to water and fish followed by control and responsible management. Incredibly, roads occupied 25 percent of the total ground area of highly erodible land in areas of the Middle Fork of the Salmon River watershed. Landslides streaked the mountainsides. People still use the Salmon as an example of how terrible silviculture is, but those activities in the Salmon ended over 25 years ago. This sad experience alerted the public, and may have contributed to developing [CWA Section] 208 and Idaho's Forest Practices Act. Today it is inconceivable that similar practices could be applied. Tremendous progress has been made in responsibly managing similar lands.

Id. at 330.

21. *See infra* notes 82-85 and accompanying text.

22. PACIFIC NORTHWEST FOREST AND RANGE EXPERIMENT STATION, U.S. FOREST SERVICE, INFLUENCE OF FOREST AND RANGELAND MANAGEMENT ON ANADROMOUS FISH HABITAT IN WESTERN NORTH AMERICA: SILVICULTURAL TREATMENTS 2 (1982) (General Technical Report PNW-134). Small streams, characteristic of high-elevation national forest lands, are particularly important as spawning and rearing habitat. *Id.* at 4. Eight species of anadromous salmonids spawn in the waters of California, the Pacific Northwest, Western Canada, and Alaska, including five species of salmon, two species of trout, and one species of

Anadromous salmonid populations are now far below levels recorded at the turn of the century.[23] Although forestry's effects on fisheries *habitat* are well known, scientists are still unsure to what extent historically low populations of salmon and trout are due to habitat and water quality degradation as opposed to overfishing.[24] It does appear that when habitat damage is combined with overfishing, the pressure on fisheries is particularly severe. By simultaneously reducing the population in a given watershed and eliminating habitat necessary for regeneration, fisheries populations may be driven below levels where recovery occurs naturally.[25]

Studies generally show that the direct annual value of logging is greater than that of fisheries. In the late 1970's, fisheries (both commercial and sport) employed 22,000 workers in California, Oregon, and Washington and had a value estimated at $120 million.[26] By comparison, the value of timber in Oregon and Washington alone during the same period was about $8.5 billion, and the industry employed about 28,000 people in 1978.[27] However, these studies are misleading for several reasons. First, comparisons of resource values on an annual basis do not reflect the true long-term costs to fisheries, because damaged habitat usually takes many years to recover.[28] Second, resource comparisons that measure the loss of revenue to logging from water quality regulation against the gain to fisheries improperly exclude other resource benefits from regulation.

The main incidental benefit of water quality regulation is that controls geared towards sedimentation also increase soil retention, thereby improving the long-term productivity of forest lands.[29] In addition, clean water benefits both public water supplies and water-contact recre-

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charr. *Id.* at 1.

23. *See* Grobey, *Politics Versus Bioeconomics: Salmon Fishery and Forestry Values in Conflict,* in FORESTLANDS 169, 175-84 (R. Deacon & M. Johnson eds. 1985).

24. *Id.*

25. *See generally* Cederholm, *Habitat Requirements and Life History of Wild Salmon and Trout,* 1983 PROC. OF THE WILD SALMON AND TROUT CONF. 88 (discussing delicate habitat critical to maximum survival of fisheries populations).

26. PACIFIC NORTHWEST FOREST AND RANGE EXPERIMENT STATION, U.S. FOREST SERVICE, *supra* note 22, at 3-4.

27. PACIFIC NORTHWEST FOREST AND RANGE EXPERIMENT STATION, U.S. FOREST SERVICE, INFLUENCE OF FOREST AND RANGELAND MANAGEMENT ON ANADROMOUS FISH HABITAT IN WESTERN NORTH AMERICA: ECONOMIC CONSIDERATIONS 3-4 (1985) (General Technical Report PNW-181).

28. Although the water quality impacts of timber management are short lived, peaking with the first significant storms following the activity, habitat impacts are long lived. *See, e.g.,* CALIFORNIA TROUT, CALIFORNIA DEPARTMENT OF FISH AND GAME, AND REGION 5, U.S. FOREST SERVICE, MODEL STEELHEAD STREAM DEMONSTRATION PROJECT PLAN FINAL REPORT 102 (1985) (unpublished report stating that much of the sediment delivered to the Trinity River in the 1964 storm remained in the basin in 1985).

29. Babcock, *Compelling On-the-Ground Implementation of Measures to Control Nonpoint Source Pollution,* in PERSPECTIVES, *supra* note 15, at 60.

ation.[30] Sedimentation necessitates the filtration of drinking water and lowers the amenity values of recreation. Sediment can also reduce the storage capacity of downstream reservoirs.[31]

The fundamental thrust of economic critiques—that we need to evaluate the costs of water quality regulation in the national forests more carefully—is undoubtedly correct. Such an approach will eventually lead to more efficient water quality regulation. In the meantime, however, the true costs and benefits of regulation are unknown and continue to be difficult to estimate, particularly where indirect costs and benefits are concerned.[32] For now, Congress has made quite clear its normative choice of how to balance water quality and other resources in the national forests: logging and other revenue-generating uses must be managed to protect fisheries, and to protect them fully.[33]

B. The Causes of Forestry-Related Water Pollution

Timber harvesting, reforestation, and forest road construction are the primary sources of water pollution in the national forests.[34] Each activity presents a different array of water quality concerns, but collec-

30. C. WILKINSON & M. ANDERSON, *supra* note 13, at 201.

> The headwaters of most rivers in the western states are located in national forests, with the result that more than half of the annual runoff in the American West originates on Forest Service lands. . . . [D]ownstream users, including many western municipalities, rely on the national forest watersheds for a dependable flow of clean water from streams originating on federal lands. . . . Wildlife and fish, including trout and anadromous salmon and steelhead, require clean, cool water in quantities sufficient for their habitat needs.

Id. (footnote omitted). *See also* CALIFORNIA WATER RESOURCES CONTROL BOARD, NONPOINT SOURCE ASSESSMENT REPORT app. I. (Designated Beneficial Uses for California Water Bodies) (1988).

31. *See* C. WILKINSON & M. ANDERSON, *supra* note 13, at 206 n.1063; *see also* EPA, REPORT TO CONGRESS, *supra* note 18, at 1-4 (silvicultural activities can degrade the high quality waters that flow through forested areas and that are used to supply drinking water). Siltation of reservoirs downstream from logged lands has been one of the more unexpected and problematic water quality impacts of forestry in Northern California. Interview with William Reichmuth, North Coast Regional Water Quality Control Board, in Santa Rosa, California (Nov. 7, 1988).

32. *See, e.g.*, Grobey, *supra* note 23, at 169-72 (detailing some of the uncertainties in the valuation of water quality regulation).

33. *See* National Forest Management Act, 16 U.S.C. § 1604(g)(3)(E)(iii) (1982) (stating that the regulations required under MUSY shall insure that timber will be harvested only if there is protection "where harvests are likely to seriously and adversely affect water conditions or fish habitat").

34. The principal nonpoint sources of water pollution on national forest lands are timber management, mining, and grazing. While small and abandoned mining operations and grazing continue to be difficult to control, relatively little land is allocated to them, and their effects are far less pervasive than those from logging. For a general discussion of some of the problems with mining and grazing in Region 5 of the Forest Service (California), see PACIFIC SOUTHWEST REGION [REGION 5], FOREST SERVICE, U.S. DEPARTMENT OF AGRICULTURE, REGIONAL SURVEY REPORT AND ACTION PLAN, BEST MANAGEMENT PRACTICE IMPLEMENTATION, PHASE II-FIELD REVIEW apps. D (mining), G (grazing) (1986) [hereinafter REGION 5 BMP SURVEY].

tively the primary problems are erosion and sedimentation, less severe effects include changes in natural water temperature and the addition of organic nutrients and silvicultural chemicals.[35] The table below, and the material following it, summarize how forest management affects water quality.[36]

TABLE 1: FOREST MANAGEMENT AND WATER QUALITY

Management Activity	Environmental Effects			
	Sedimentation	Organic Nutrients	Water Temperature	Chemicals
Forest Protection				
Fertilizers				X
Herbicides				X
Fire Suppression	X	X	X	X
Thinning	X	X		
Timber Harvesting				
Cutting		X	X	
Yarding	X			
Log Storing/Handling		X		
Reforestation				
Site Preparation	X	X	X	X
Planting/Seeding	X			
Forest Roads	X			

1. Forest Protection

Forest protection involves both suppressing threats from fire and insects and improving productivity by fertilizing and thinning. The greatest water quality effects of these activities stem from forest fires and the chemicals used to fight them.[37] Regular use of pesticides, herbicides, and

35. *See* G. BROWN, FORESTRY AND WATER QUALITY (1972); Megahan, *Nonpoint Source Pollution from Forestry Activities in the Western United States: Results of Recent Research and Research Needs*, in U.S. FORESTRY AND WATER QUALITY: WHAT COURSE IN THE 80's? at 92 (1980) (proceedings of a conference sponsored by the Water Pollution Control Federation).

36. The information presented in this table is drawn from G. BROWN, *supra* note 35; REGION X, U.S. ENVIRONMENTAL PROTECTION AGENCY, FOREST HARVEST, RESIDUE TREATMENT, REFORESTATION AND PROTECTION OF WATER QUALITY (1976) (EPA Document No. 910/9-76-020) [hereinafter EPA, REGION X]; and Pardo, *What is Forestry's Contribution to Nonpoint Source Pollution?*, in U.S. FORESTRY AND WATER QUALITY: WHAT COURSE IN THE 80's? at 31 (1980).

37. In 1977, a year when there were many fires in the West, the Forest Service used 14.5 million gallons of fire retardants. Maximum concentrations can run as high as 0.07 gallons per square foot. Most fire retardants are composed primarily of an ammonia base, with the potential for nitrogen pollution of streams. At least one study, covering a 15-month period following a simulated retardant drop, showed no measurable effects on fish. Megahan, *supra* note 35, at 130-31.

fertilizers is not widespread, and some national forests have banned their use.[38] Precommercial thinning, which is performed in some forests to improve growth rates by limiting competition among trees, has only minimal impacts on water quality.[39] Commercial thinning, on the other hand, uses regular timber harvesting methods to remove the cut trees and can have many of the same types of impacts as final harvesting.[40]

2. *Timber Harvesting*

Harvesting involves two decisions that have particularly significant water quality implications: what portion of the forest stand to cut, and how to move (or "yard") the trees from where they are cut to a central point where they are gathered for transport. Clearcutting is by far the most common form of stand management in the Northwest,[41] primarily because of lower costs.[42] As for yarding, the most common, and most damaging, method is tractor skidding.[43] Whatever the form of management, harvesting leads to several types of water pollution, including sedimentation, increased water temperature, and nutrient loading.

Sedimentation. Because it directly affects fish and fish habitat, sedimentation is the most damaging pollutant generated by harvesting.[44] Sedimentation occurs as the result of detachment (when soil particles are dislodged from the soil surface or aggregate) and transport (the movement of sediment by water, wind, or gravity).[45] These processes occur in two ways: by surface erosion, which occurs when water that normally filters into the ground instead flows over the surface and dislodges soil, and by mass soil movement, which happens when large volumes of soil and rock are detached and moved downslope by gravity.[46]

The major cause of surface erosion on forest lands in the Pacific Northwest is rain falling on soils that are normally protected by plant cover. Over time, direct rainfall on soil reduces infiltration and increases

38. Brown, *Controlling Nonpoint Source Pollution from Silvicultural Operations*, in PERSPECTIVES, *supra* note 15, at 332.

39. At this stage of thinning, the trees cut are too small to recover commercially and site disturbance is minimal. EPA, REGION X, *supra* note 36, at 43-44, 50-51.

40. *Id.* at 44-46, 51.

41. *Id.* at 109. The silvicultural systems for final harvest are: 1) shelterwood (selective removal of trees in a series of cuts, leaving some to serve as shelter for new growth), 2) seed tree (a few wind-resistant trees are left to provide a natural source of regeneration), 3) clearcutting (complete removal of trees in one harvest), and 4) selection (the removal of individual trees, or trees in small groups, leading to an uneven-aged stand). *Id.* at 46-50.

42. *See* G. COGGINS & C. WILKINSON, FEDERAL PUBLIC LAND AND RESOURCES LAW 619-20 (1987).

43. EPA, REGION X, *supra* note 36, at 59-79.

44. *See id.* at 10.

45. *Id.* at 91; G. BROWN, *supra* note 35, at 4. Aggregate is rock composed of various mineral fragments that can be broken apart. EPA, REGION X, *supra* note 36, at 93.

46. G. BROWN, *supra* note 35, at 4. Detachment and transport are also caused by stream channel scour—erosion of stream beds and channel banks by water or debris. *Id.* at 10.

the flow of water over the surface, which in turn leads to erosion.[47] Although clearcutting may leave some ground cover, when it is combined with controlled burns (used in most national forests to prepare for replanting),[48] the resulting exposed soils are primed for erosion.

Soil exposure is not the only cause of runoff and erosion. Most harvesting methods also disturb and compact soils by using heavy equipment to move logs off their stumps, clear areas for yarding, cut roads and trails, and clear ground for replanting.[49] Disturbed soils have more surface area exposed to the rain and wind, and this exposure in combination with a loss of binding capacity increases the potential for erosion.[50] Compacted soils, such as those in road beds, have less capacity to absorb rainfall.[51] The resulting surface runoff and channeling often create or enlarge gullies, detaching additional sediment and transporting it to streams.[52] When these man-induced causes of erosion combine with natural variables including slope, the amount of rainfall, and surface aggregate stability, the amount of sedimentation increases.[53]

Another major cause of sedimentation in the forests of the Pacific Northwest is mass soil movement, which occurs when large volumes of soil and rock slide or "slump."[54] Here, the primary factor is a natural one, the degree of slope.[55] Proper planning and siting to avoid disturbing steep areas altogether are thus more useful than management techniques in preventing slides. In borderline areas, where the risk of slides is substantial but some disturbance is still allowed, the exact siting of roads and the timber cut become critical in preventing slides.[56] The fact that mass soil movement is the most difficult source of sedimentation to predict[57] makes regulation particularly difficult.

Temperature. Although sedimentation is the most pervasive pollutant caused by logging operations, harvesting also affects water temperature by removing streamside shading.[58] This problem is easily controlled by leaving buffer strips of vegetation on the south side of east-west-oriented streams and on both sides of north-south-oriented streams.[59]

47. *Id.* at 4-5.

48. *See infra* text accompanying notes 65-68.

49. Site preparation is described *infra* at text accompanying notes 65-71. The effects of road building are discussed *infra* at text accompanying notes 72-75, 82-85.

50. EPA, REGION X, *supra* note 36, at 93-94.

51. G. BROWN, *supra* note 35, at 5.

52. *Id.* at 6-7.

53. *See generally id.* at 4-10.

54. EPA, REGION X, *supra* note 36, at 111-12.

55. *See* G. BROWN, *supra* note 35, at 7-9.

56. *Id.* Road construction will often result in more extensive disturbance of soils than the logging itself. For further discussion of the problems of road construction and maintenance, see *infra* notes 72-75, 82-85 and accompanying text.

57. *See infra* notes 76-78 and accompanying text.

58. EPA, REGION X, *supra* note 36, at 144-54.

59. *Id.* at 146-47.

Water quality problems occur when these buffer zones are cut.[60] In watersheds where multiple tracts are logged over a period of a several years, temperature increases can be cumulative and require long-term planning for the watershed as a whole.[61]

Nutrients. Finally, timber harvesting may introduce organic materials into streams and rivers.[62] When these materials decay in small streams that have little summer flow, they consume dissolved oxygen, release organic compounds that interfere with aquatic life, and may violate drinking water standards.[63] The primary means of controlling organic materials is to prevent logging debris from entering streams in the first place. Again, riparian buffer zones are an effective control.[64]

3. *Reforestation*

The effects of reforestation stem from both clearing the land and site disturbance during replanting. For reforestation to be effective, most of the remaining vegetation in logged areas must be cleared to limit competing growth and maximize the seedlings' chance of survival.[65] Most national forests in California and the Pacific Northwest use controlled burns to clear lands.[66] If an area is burned when vegetation is dry, the fire may be so hot that *all* plant cover and slash (bark and branches left from logging operations) is burned, rather than just competing growth. This leaves the soil unprotected and prone to erosion.[67] Furthermore, fires may jump into areas that were not meant to be logged, such as streamside buffer zones.[68]

Once the land has been cleared, replanting may further increase the potential for erosion.[69] Heavy equipment is often used to prepare and plant sites, leading to both soil compaction and disturbance.[70] On steep,

60. *See, e.g.,* REGION 6, FOREST SERVICE, U.S. DEPARTMENT OF AGRICULTURE, SISKIYOU NATIONAL FOREST, FINAL ENVIRONMENTAL IMPACT STATEMENT FOR THE SILVER FIRE RECOVERY PROJECT, at IV-81-129 (discussion of temperature impacts is scattered throughout these pages). In at least one case, a stream's mean temperature maxima increased by 14 degrees over the summer months, and its annual maximum increased by 28 degrees. G. BROWN, *supra* note 35, at 26.

61. G. BROWN, *supra* note 35, at 30-33.

62. EPA, REGION X, *supra* note 36, at 124-32.

63. *Id.* at 125. Several studies have shown that nutrient levels, following clearcutting, exceeded both federal drinking water and state water quality standards. *Id.* at 136-37; G. BROWN, *supra* note 35, at 39-41.

64. EPA, REGION X, *supra* note 36, at 126.

65. *See id.* at 56-57.

66. *See id.* at 82.

67. *Id.* at 58.

68. *See* REGION 5 BMP SURVEY, *supra* note 34, at 8a-10a.

69. EPA, REGION X, *supra* note 36, at 55-56.

70. *Id.*

erosive slopes the amount of sediment delivered to streams through reforestation may be even greater than that due to harvesting.[71]

4. *Forest Roads*

Forest roads compact soil in the roadbed and disturb soil in adjacent rights-of-way.[72] In addition, most roads are drained by ditches that can overflow and cut new gullies if not properly designed and maintained. On steep lands, drainage ditches and the cut of the road itself may weaken slopes to the point of causing slumps and, in more serious circumstances, landslides.[73] Where landslides run directly into streams, the resulting debris can scour stream channels to the bedrock, removing gravel that is essential to salmonid spawning and rearing.[74] Some studies show that over forty percent of the sediment delivered to streams results from landslides and other mass soil movements induced by forest roads.[75]

C. *Controlling the Effects of Forestry-Related Water Pollution*

Like other forms of nonpoint source pollution such as agricultural and urban runoff, forestry-related pollutants become a water quality concern when they are transported into a body of water by rainfall and snowmelt.[76] Unlike agricultural and urban runoff, the sediment generated by silviculture is unpredictable because the volume of sediment depends primarily on catastrophic events, such as landslides, which are difficult to model. In some watersheds the full water quality effects of forest roads and timber harvesting may take up to twenty-five years to develop.[77] If a stream supplies a reservoir, it can take even longer for the sediment to move downstream into the reservoir; consequently, siltation and filtration problems may not arise until decades after roads are built and trees are cut. These time lags and uncertainties make all but the most flexible environmental regulations unworkable and put a premium on good planning and supervision rather than remediation.[78]

Like any other regulatory mechanism, the management techniques used to control nonpoint source pollution in the national forests are limited by their expense.[79] In areas prone to erosion or landslides, for exam-

71. *Id.* at 58-59.

72. G. BROWN, *supra* note 35, at 18.

73. *Id. See also* EPA, REGION X, *supra* note 36, at 111-12, 118-19.

74. G. BROWN, *supra* note 35, at 16; EPA, REGION X, *supra* note 36, at 126.

75. *See, e.g.*, McCashion & Rice, *Erosion on Logging Roads in Northwestern California: How Much Is Avoidable?* 81 J. FORESTRY, Jan. 1983, at 23.

76. EPA, REPORT TO CONGRESS, *supra* note 18, at 1-1.

77. *See id.* at 2-14.

78. For a general discussion on planning and management, see EPA, REGION X, *supra* note 36, at 155-222.

79. EPA, REPORT TO CONGRESS, *supra* note 18, at 1-18.

ple, the Forest Service could use helicopters and cables to yard logs and avoid soil disturbance and compaction altogether.[80] However, because these techniques add significantly to logging costs, at least some national forests use them only where the value of the timber sale is sufficiently high to outweigh the expense.[81]

In some natural settings, no set of management practices can completely prevent nonpoint source pollution. A major example is the sedimentation caused by logging roads. When the area being logged includes steep terrain, engineering techniques are extremely expensive and of limited effectiveness.[82] A leading study of mass soil movement caused by logging roads in the Six Rivers National Forest in northwestern California found that "[a]t most, about 24 percent of the erosion measured on the logging roads could have been prevented by conventional engineering methods."[83] This study also found that erosion yields from road rights-of-way were seventeen times the average erosion from timber harvest areas.[84] The implication is that planning what lands will be cut, where roads will go, and how much area will be roaded has much more to do with controlling sedimentation than engineering methods.[85]

In sum, the primary water quality problem in forest streams in California and the Pacific Northwest is damage to fisheries and fish habitat. The major cause of this problem is sedimentation caused by logging roads, harvesting, and reforestation. The water quality effects of most forest activities can be minimized through well-established management prescriptions. However, the costs of some techniques are prohibitive[86] and, as will be seen, idealized prescriptions do not always translate into on-the-ground solutions. In settings where the management prescriptions are ineffective or infeasible, timber and clean water come into sharp

80. EPA, REGION X, *supra* note 36, at 62-74. Some techniques for moving logs that are less disruptive of soils are skyline, balloon, and helicopter systems. *See id.* at 96. The effects of mechanical treatments also can be avoided by management practices such as manual replanting or aerial seeding. *Id.* at 53-54, 106.

81. Grobey, *supra* note 23, at 170, estimates that compliance with California's Forest Practice Act, which is generally viewed as less restrictive than Forest Service practices, costs operators $55 million annually.

82. *See generally* McCashion & Rice, *supra* note 75, at 23.

83. *Id.* Unavoidable road-related erosion was defined as erosion that "could not have been prevented by normal engineering practices *or by relocation of the right-of-way within the 1-mile road segment.*" *Id.* (emphasis added). The implication is that even with good planning to identify unstable slopes, road-related erosion is often inevitable. For further discussion of the problems inherent in planning to protect areas that are water quality sensitive, see *infra* notes 289-313 and accompanying text.

84. McCashion & Rice, *supra* note 75, at 26.

85. Controlling burns used to prepare areas for replanting is another management technique that has sedimentation side-effects, particularly in steep watersheds where burning debris often rolls or slides into areas that were supposed to be protected. Telephone interview with Tom Stokley, Trinity County Planning Department (Feb. 21, 1989).

86. For further discussion of how the Forest Service treats the cost of BMP's in deciding what prescriptions to follow, see *infra* notes 247-53 and accompanying text.

conflict. In these areas the combination of natural influences on forestry-related pollution and the limited effectiveness of management prescriptions reveals the need to protect water quality in the forests through better planning.

II
THE BATTLE OF THE PLANS

The well-publicized wholesale destruction of several watersheds,[87] the continuing inability of managers to restore fisheries to historic levels,[88] and the efforts to increase the proportion of lands allocated to wilderness and other preservationist uses,[89] have combined to exert substantial political and legal pressure against logging on national forest lands.[90] These pressures make it difficult for the Forest Service to perform its multiple use mandate.

This section has two purposes. First, it analyzes how federal statutes control the interplay between overarching but vague multiple use objectives and more specific Congressional objectives such as fishable/swimmable water. Second, this section describes how water quality considerations are incorporated into the forest-planning process. Because water quality problems are unavoidable in some physical settings, the first step in maintaining water quality is to ensure that the planning processes identify environmentally sensitive areas and proscribe land-disturbing uses within them.

A. Water Quality Planning Under the Clean Water Act

The Clean Water Act[91] is the primary statutory mechanism for protecting and improving the quality of the nation's waters. In the national forests, however, it is only one of several federal and state laws that can be used to protect streams and their beneficial uses.[92] Historically, the

87. *See* Coats, *Cumulative Watershed Effects: A Historical Perspective,* PROCEEDINGS, *supra* note 1, at 107.

88. *See* Craig, *supra* note 12, at 255.

89. *See* Wann, *supra* note 16, at 20.

90. *See, e.g.,* Anderson, *New Directions for National Forest Water Quality Planning,* FOREST WATCH, Mar. 1988, at 22.

91. 33 U.S.C. §§ 1251-1387 (1982 & Supp. V 1987).

92. Among the federal statutes are the National Forest Management Act of 1976 (NFMA), Pub. L. No. 94-588, 90 Stat. 2949 (codified as amended in scattered sections of 16 U.S.C.), the Multiple-Use Sustained-Yield Act of 1960, 16 U.S.C. §§ 528-531 (1982 & Supp. IV 1986), the National Environmental Policy Act of 1969 (NEPA), 42 U.S.C. §§ 4321-4370a (1982 & Supp. V 1987), and the Wild and Scenic Rivers Act, 16 U.S.C. §§ 1271-1287 (1982 & Supp. V 1987). For a case raising many of these statutory claims, see National Wildlife Fed'n v. United States Forest Serv., 592 F. Supp. 931 (D. Or. 1984), *judgment amended,* 643 F. Supp. 653 (1984). State laws controlling water quality in forest lands include those set up under the federal Clean Water Act, such as the Porter-Cologne Water Quality Control Act, CAL. WATER CODE §§ 13000-13806 (West 1971 & Supp. 1989), and state forest practice acts, such as the Oregon Forest Practices Act, OR. REV. STAT. ANN. §§ 527.610-.730, .990(1)

lines between these statutes have been drawn on institutional grounds: EPA and the states are responsible for implementing CWA, with its singleminded focus on water quality, and the Forest Service is responsible for NFMA, NEPA, and MUSY, with their balancing, multiple use orientation. As a result, the history of water quality management in the national forests is one of a continuing effort to accommodate often conflicting objectives.[93] Many controversies can be traced to the lack of involvement of one party with the other's efforts to plan and implement its statutory responsibilities.[94]

The Clean Water Act charges EPA and the states with identifying point and nonpoint sources of pollution. Point sources are controlled through a permit-based regime and nonpoint sources through a management strategy. Just as land use planning decisions made by the Forest Service have important consequences for water quality, CWA planning and standards-setting processes also limit the Forest Service's discretion to allow particular land uses in environmentally sensitive areas.

1. The CWA Section 208/303(e) Planning Process

In an idealized characterization,[95] state water quality planning under CWA can be broken into four steps.[96] The first step is to identify the

(1988).

93. *See* Leven, Rector & Doty, *Water Quality Protection on National Forest Lands in California,* PROCEEDINGS, *supra* note 1, at 27.

94. In 1974, EPA proposed a model forest practice act based on existing acts in California, Oregon, and Washington. EPA initially intended that all states adopt some form of the act to control nonpoint source pollution from silviculture. The model act was greeted with immediate and fierce opposition by the timber industry, and EPA quickly backtracked. In subsequent guidance, and in a series of workshops around the country, EPA made it clear that it was leaving the choice of whether to use educational or regulatory programs to the states, so long as they could demonstrate that the section 208 program would address the states' water quality objectives. *See* S. DANA & S. FAIRFAX, FOREST AND RANGE POLICY 249 (1980). Dana and Fairfax characterize this series of events as "the beginning of a long and ultimately successful dialogue between EPA and the forestry community." *Id.*

95. To this day, there is no agreement on what is required of the different plans [required by CWA] and how they are supposed to fit together. *See, e.g.,* W. RODGERS, HANDBOOK ON ENVIRONMENTAL LAW (1977).

96. Most water quality impacts of timber management are defined as nonpoint sources and are regulated through section 208 of the Act. CWA § 208, 33 U.S.C. § 1288 (1982 & Supp. V 1987). Section 208 does several things. Initially, it requires the state to designate planning agencies on an areawide basis. *Id.* § 208(a). These agencies identify bodies of water where water quality objectives are not being met. *Id.* § 208(a)(2). Where objectives are not being met due to nonpoint source pollution, the planning agency is to devise a strategy of either voluntary educational programs or regulation (based on state law) to control the pollution. *Id.* § 208(b)(4). These strategies define best management practices for particular land uses. *Id.* § 208(b)(4)(B). These practices may be either voluntary or mandatory, but the agency and the state must demonstrate to EPA that the practices will be adopted to a degree that is sufficient to meet state water quality objectives. *Id.* § 208(b)(4). Finally, the state is to designate an entity to implement the program. *Id.* § 208(c).

Given the amount of work involved in this effort, an obvious question is why a state would enter into the planning process. Section 208 requires states to tell powerful constituen-

beneficial uses for each body of water. Common forest stream uses include fishing, recreation, and drinking water. The next step is to set water quality standards that protect these uses. Many states set standards by referring to specific EPA guidelines that are based on existing scientific research.[97] Once standards are set, the state then identifies both those bodies of water where standards are being violated and the sources of problem pollutants.[98] In the final stage, states allocate among each point and nonpoint source the total load of each pollutant that can be introduced into the body of water without exceeding standards.[99] This "waste load allocation"[100] is accomplished by writing permits for point sources and prescribing "best management practices" for nonpoint sources.[101] Because of the technical complexity involved in determining

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cies, including agricultural and timber companies, how to run their operations by prescribing management practices that may carry substantial costs.

EPA has two primary points of leverage in encouraging states to adopt effective 208 plans. First, under section 303(e), EPA can revoke state authority to issue National Pollutant Discharge Elimination System (NPDES) (addressing point source) permits if the state fails to prepare an acceptable 208 plan. Second, and perhaps more realistically, EPA could withhold federal funding for wastewater treatment facilities from states that do not submit or implement 208 plans. *See* CWA § 208(f). During the late 1970's, when there was substantial funding for such facilities, this latter threat carried substantial weight.

97. CWA § 303(a), (c), 33 U.S.C. § 1313(a), (c) (1982 & Supp. V 1987).

98. CWA § 303(d), 33 U.S.C. § 1313(d) (1982 & Supp. V 1987). Pollutants may include naturally occurring elements or conditions such as sediment and temperature. *See* CWA § 502(6), 33 U.S.C. § 1362(6) (1982).

99. EPA is now focusing the water quality management planning process and funding on priority water quality issues and geographic areas. This process contains the following steps: a) developing total maximum daily loads (TMDL's), EPA's term for the amount of pollution that can be allowed consistent with meeting water quality standards; b) updating and maintaining Water Quality Management (WQM) plans; and c) establishing and assuring the adequate implementation of new or revised water quality standards. 40 C.F.R. § 130.5 (1988).

The WQM plans consist of the initial 208/303(e) plans, updated every three years to reflect water quality problems identified in the states' 305(b) reports (annual). *Id.* § 130.6. These plans are used to identify priority point and nonpoint water quality problems, consider alternative solutions, and recommend control measures. *Id.* § 130.6(b). For nonpoint sources, the WQM plans are intended to describe the regulatory and nonregulatory programs, activities, and BMP's that the agency has selected to control nonpoint source pollution in order to protect designated uses. *Id.* § 130.6(c)(4). Economic, institutional, and technical factors shall be considered, and BMP's are to be evaluated and modified as necessary to achieve water quality goals. *Id.* Regulatory programs are required where they are determined necessary to attain or maintain a designated use, or where nonregulatory approaches are inappropriate. *Id.* § 130.6(c)(4)(ii). BMP's must be identified for silvicultural sources. *Id.* § 130.6(c)(4)(iii). Where other federal statutes contain provisions to protect water quality, states are allowed to implement management plans through agreements or Memoranda of Understanding with the appropriate federal agencies. *Id.* § 130.6(c)(4)(iv). For a general discussion by EPA on controlling nonpoint source pollution, see OFFICE OF WATER REGULATIONS AND STANDARDS, U.S. ENVIRONMENTAL PROTECTION AGENCY, NONPOINT SOURCE GUIDANCE (Dec. 1987) [hereinafter EPA, NONPOINT SOURCE GUIDANCE].

100. OFFICE OF WATER REGULATIONS AND STANDARDS, U.S. ENVIRONMENTAL PROTECTION AGENCY, QUESTIONS & ANSWERS ON: ANTIDEGRADATION 8 (Aug. 1987) [hereinafter EPA, QUESTIONS & ANSWERS].

101. CWA §§ 208(b)(2), 303(d), (e)(3), 33 U.S.C. §§ 1288(b)(2), 1313(d), (e)(3) (1982 & Supp. V 1987).

the quantity of a given pollutant discharged from a particular source or land area, few states have performed these allocations, particularly in the context of nonpoint sources.[102]

On national forest lands, where most water pollution is traced to nonpoint sources, the primary system of control under CWA is the imposition of best management practices.[103] These practices are designed to protect beneficial uses and, in some cases, to achieve numeric water quality standards.[104]

Water quality standards play a subtle role in the context of nonpoint sources, but they can have important consequences for forest land uses. Perhaps the clearest characterization of this role vis-a-vis forestry is that standards set objectives that the state is committed to attain.[105] Land owners and forest project operators cannot be prosecuted under CWA for violating state water quality standards.[106] Nevertheless, if the standards are exceeded, EPA (or environmental interests) can require the state to take corrective actions such as tightening the management prescriptions contained in BMP's or, in serious cases, writing specific discharge limitations in permit form.[107]

As a result, beneficial use designations and the standards selected to protect them may represent de facto decisions about how forest land will be allocated, even though a land owner cannot be directly compelled to comply. If a stream is used as a municipal water supply, for example, the standards may be so strict that no logging of adjacent lands will be permitted, particularly where state regulations require preproject environmental review.[108]

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102. The problem is not so much a lack of coordination between land use and water quality planning as a pervasive lack of resources and capacity to carry out the monitoring and analysis needed to determine where standards are being violated and who is responsible for the violations. *See generally* Anderson, *supra* note 90, at 23. Only a few planning agencies have begun the extensive information gathering needed to identify total maximum daily loads. Waste load allocations by planning agencies are even less common.

In California, the only region that has even started this process is the San Francisco Bay Region. *See* SAN FRANCISCO BAY REGION, CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD, WATER QUALITY CONTROL PLAN, SAN FRANCISCO BAY BASIN (Vol. 2) at 4-4 (1987) (establishing a toxicity control program for the Bay).

Thus, although they could be used as a substantive constraint on nonpoint source pollution from timber harvesting, waste load allocations have generally been confined to water bodies where the primary problems stem from point source dischargers whose pollutants are easier to measure, and thus easier to allocate.

103. EPA, NONPOINT SOURCE GUIDANCE, *supra* note 99, at 2-3.

104. *Id.* at 4.

105. *Id.* at 2.

106. *Id.* at 2-3.

107. EPA, QUESTIONS & ANSWERS, *supra* note 100, at 11.

108. An example where this has occurred is the Bull Run Special Management Area in the Mount Hood National Forest, which is the main water supply for the city of Portland. The Forest Service not only tightly controls land uses in this area, but it also refuses to allow public entry. *See* OR. ADMIN. R. 340-41-026 (1984).

Water quality standards may also constrain land uses where state statutes provide independent enforcement authority against nonpoint sources. With a few significant exceptions, however, most western states do not authorize the enforcement of water quality standards against nonpoint sources. Instead, most states set numeric standards for forested areas, but grant forest users exemptions if they follow BMP's.[109] As a result, the Forest Service has been able to maintain much of its land use discretion, even in particularly sensitive areas, by giving assurances to the states that water quality standards will be met through the imposition of BMP's.[110]

There are indications from several different sources that the relatively loose reign given states to control or not control nonpoint source water pollution from forestry in general, and from forestry in the national forests in particular, will soon be limited. In 1985, for example, EPA notified Idaho that it would not approve its water quality standards.[111] Idaho had exempted (largely at the urging of the Forest Service and the timber industry) a broad range of timber management activities from the application of its antidegradation policy—one part of the state's water quality standards.[112] Under EPA's regulations interpreting CWA, high quality waters, which meet or exceed standards, cannot be degraded.[113]

It is not clear whether EPA will extend its oversight beyond exemptions to examine whether BMP's actually achieve water quality standards. In Idaho, EPA took the position that standards *must* be met by a state and that exemptions are justified only when the state demonstrates that standards will be met by BMP's.[114] This stance indicates that EPA expects more than a state's unexamined acceptance that a landowner's BMP's will meet water quality standards.

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109. Knopp, Smith, Barnes, Roath & Furniss, *Monitoring Effectiveness of Best Management Practices on National Forest Lands,* PROCEEDINGS, *supra* note 1, at 48.

110. *See* Curry, *Water Quality Protection in Forest Management: Are Best Management Practices Working?,* PROCEEDINGS, *supra* note 1, at 55.

111. Complaint at 10, Idaho Conservation League v. Russell, No. 87-1326 (D. Idaho filed Nov. 5, 1987) (ELR Pend. Lit. 65982).

112. *See* Anderson, *supra* note 90, at 26-28. A coalition of environmental organizations recently filed suit alleging that EPA had failed to fulfill its nondiscretionary duty under CWA to promulgate an antidegradation policy for Idaho following the agency's rejection of the state's submittal. Complaint, Idaho Conservation League v. Russell, No. 87-1326 (D. Idaho filed Nov. 5, 1987) (ELR Pend. Lit. 65982).

113. For a detailed discussion of EPA's antidegradation regulations, see Anderson, *supra* note 11, at 613-24. The EPA regulations regarding antidegradation are at 40 C.F.R. § 131.12 (1988). There is no explicit antidegradation requirement in CWA; however, the requirement fits within the purposes of the Act, particularly the clause "*maintain* . . . the integrity of the Nation's waters." CWA § 101(a), 33 U.S.C. § 1251(a) (1982) (emphasis added). Moreover, section 303(a) made water quality standard requirements under prior law the starting point for CWA water quality requirements. *See* EPA, QUESTIONS & ANSWERS, *supra* note 100, at 1.

114. *See generally* Anderson, *supra* note 11, at 624-32.

A serious effort by EPA to ensure that BMP's are effective could severely disrupt Forest Service operations for two reasons. First, in environmentally fragile areas where no BMP can prevent serious water quality effects, standards can be met only by removing the lands from management activities. Second, in areas where BMP's are feasible but expensive, the profitability of timber sales might be affected if the Forest Service is forced to use control measures it would not normally adopt.[115]

Forest Service practices are also threatened by a recent decision in the Ninth Circuit Court of Appeals in which the court held that under *federal* law the Forest Service must consider state water quality standards in its environmental analyses and demonstrate how projects on national forest lands will comply with these standards.[116] While this decision does not change the fact that there is no federal statutory authority to enforce water quality standards for nonpoint sources, it does subject such sources on federal lands to at least limited preproject scrutiny.

In response to these challenges from EPA and the courts, the Forest Service has taken the position that compliance with BMP's demonstrates *per se* that state water quality standards are being met, regardless of whether forest users are already exempted under state law.[117] This argument is based on language in section 208 of CWA that requires states to adopt BMP's that will control nonpoint source pollution from forestry "to the extent feasible."[118] Although the Department of Agriculture (the parent agency of the Forest Service) has lobbied EPA to accept this position, the two agencies are still not entirely reconciled.[119]

EPA's position consists of two propositions. First, the agency agrees with the Forest Service that although CWA requires states to adopt ambient water quality standards, the Act does not make violation of these standards by nonpoint sources unlawful.[120] According to EPA,

115. *Id.; see also* Bauers, *Evaluation of Nonpoint Source Impacts on Water Quality from Forest Practices in Idaho: Relation to Water Quality Standards,* in PERSPECTIVES, *supra* note 15, at 455.

116. Northwest Indian Cemetery Protective Ass'n v. Peterson, 795 F.2d 688, 696 (9th Cir. 1986), *rev'd on other grounds sub nom.* Lyng v. Northwest Indian Protective Ass'n, 108 S. Ct. 1319 (1988).

117. *See* C. WILKINSON & M. ANDERSON, *supra* note 13, at 377 (discussing the Forest Service's 1985 petition for rehearing of the *Northwest Indian* case).

118. CWA § 208(b)(2)(F)(ii), 33 U.S.C. § 1288(b)(2)(F)(ii) (1982).

119. Following the *Northwest Indian* decision, the Department of Agriculture lobbied EPA to issue new guidance that would clarify that state standards are not enforceable against nonpoint sources, at least not under the authority of CWA. Anderson, *supra* note 11, at 65-66; *see also* Beasley & Harper, *U.S. Department of Agriculture's Perspective on Silvicultural Nonpoint Source Water Quality,* in PERSPECTIVES, *supra* note 15, at 321.

120. OFFICE OF WATER, U.S. ENVIRONMENTAL PROTECTION AGENCY, NONPOINT SOURCE CONTROLS AND WATER QUALITY STANDARDS 2-3 (Aug. 19, 1987) (guidance designated as Chapter 2, General Program Guidance, of the Water Quality Standards Handbook) [hereinafter EPA GUIDANCE ON NPS CONTROLS AND WQS].

however, where water quality standards are not being met, the states must control nonpoint sources under state law, either through regulation or educational programs.[121]

Second, where states have already decided to enforce standards against nonpoint sources, EPA's position is that although the use of BMP's *should* mean that water quality standards are being met, a *per se* rule is inappropriate.[122] Rather, EPA guidance characterizes the relation between standards and BMP's as an "iterative process" where states continually monitor the efficacy of BMP's and adjust them whenever water quality standards are not met.[123] Furthermore, EPA guidance implies that states exempting forestry uses may be required to end this practice if beneficial uses are not protected. This guidance also appears to reject the Forest Service position that nonpoint sources be controlled only to the extent feasible:

> If water quality cannot be assured, where there have been persistent and continued violations, and/or where NPS [nonpoint source] controls are found to be infeasible, the State may have to impose its regulatory sanctions, including the issuance of orders for cleanup and abatement or, if necessary, orders to cease the activities causing the violations.[124]

EPA also supports those states that do not exempt federal agencies and their permittees from state water quality standards based solely on the agreement to use BMP's.[125] At least two states have chosen not to exempt forestry activities in certain situations. In California, two re-

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121. *Id.* at 2. States may also choose to develop direct enforcement measures for the control of nonpoint sources. "The Act provides no means for enforcement of Section 208 plans against non-point sources, although states are free to develop such mechanisms pursuant to authority preserved under Section 510 of the Act." Anderson, *supra* note 11, at 603 n.60 (quoting letter from EPA to the Forest Service).

Another basis for regulating federal sources is that although water quality standards are not enforceable against all nonpoint sources, section 313's requirements that federal facilities "comply with all Federal, State, interstate, and local requirements, administrative authority, and process and sanctions respecting the control and abatement of water pollution" means that state water quality standards must be met by all federal activities, whether resulting in point or nonpoint source pollution. CWA § 313(a), 33 U.S.C. § 1323(a) (1982).

122. *See* C. WILKINSON & M. ANDERSON, *supra* note 13, at 377.

123. EPA GUIDANCE ON NPS CONTROLS AND WQS, *supra* note 120, at 3. This guidance states that:

> If subsequent evaluation indicated that approved and properly installed BMP's are not achieving water quality standards, the State should take steps to: 1) revise the BMP's, [and] 2) evaluate and, if appropriate, revise water quality standards (designated beneficial uses and water quality criteria) or both. If BMP's are revised, the landowner or manager is expected to begin implementing such BMP's. Through the iterative process of monitoring and adjustment of BMP's and/or water quality standards, it is anticipated and expected that BMP's will lead to achievement of water quality standards.

Id.

124. Covington, *Best Management Practices for Water Pollution Control: A National Perspective,* PROCEEDINGS, *supra* note 1, at 19, 21 (1987) (discussing the EPA guidance).

125. EPA explicitly recognizes and accepts the possibility of independent state authority. EPA GUIDANCE ON NPS CONTROLS AND WQS, *supra* note 120, at 3.

gional Water Quality Control Boards apply numeric standards and discharge prohibitions to forest users.[126] In Oregon, forest users may violate state standards only if the violations are temporary and the state makes a finding that the activity is in the public interest.[127] As a result, state agencies and environmental organizations in parts of California and Oregon have been able to block or limit several controversial projects such as timber salvage sales in previously unlogged areas.[128]

Even without federal authority to directly enforce water quality standards against nonpoint sources, the fact remains that states and their designated management agencies (including the Forest Service) are required to attain the standards.[129] The difference between states that exempt forest users and those that do not is one of remedies. In states that exempt forest users, the remedy for a violation of standards is indirect: BMP's are tightened until standards are attained. In states that do not exempt forest users, state agencies have discretion to either tighten BMP's or bring direct enforcement actions under state laws.[130] In either setting, states that fail to act when standards are violated consistently take the risk that EPA will withhold funding or revoke permit authority,[131] or that citizens will bring suit to force such action.[132]

2. *Nonpoint Source Control Under CWA Section 319*

In 1987, after recognizing that nonpoint source pollution had gone largely unregulated, Congress included a new program in its revisions to the Clean Water Act.[133] From a planning standpoint, section 319 adds little to existing statutory requirements. It calls on the states to prepare an assessment report that identifies waters that cannot reasonably be expected to achieve water quality standards without the adoption of

126. The two are the North Coast and the Lohantan Regional Water Quality Control Boards. *See, e.g.*, NORTH COAST REGIONAL WATER QUALITY CONTROL BOARD, WATER QUALITY CONTROL PLAN FOR THE NORTH COAST REGION IV-29 (1988).

127. OR. ADMIN. R. § 340-41-026 (1984).

128. *See, e.g.*, Sierra Club v. United States Forest Serv., 843 F.2d 1190 (9th Cir. 1988); Order, Wilderness Soc'y v. Tyrell, No. S-88-1322 (E.D. Cal. Nov. 21, 1988).

129. *See* EPA GUIDANCE ON NPS CONTROLS AND WQS, *supra* note 120, at 3.

130. *See* 40 C.F.R. § 130.6(c)(4)(ii) (1988). "*Regulatory* programs *shall* be identified where they are determined to be necessary by the State to attain or maintain an approved water use or where non-regulatory approaches are inappropriate in accomplishing that objective." *Id.* (emphasis added).

131. CWA § 208(d), 33 U.S.C. § 1288(d) (1982 & Supp. V 1987) (withholding of funding); CWA § 303(e)(2)-(3)(B), 33 U.S.C. § 1313(e)(2)-(3)(B) (1982) (NPDES permitting authority).

132. CWA § 505(a)(2), 33 U.S.C. § 1365(a)(2) (1982 & Supp. V. 1987). This has happened in Idaho. Complaint, Idaho Conservation League v. Russell, No. 87-1326 (D. Idaho filed Nov. 5, 1987) (ELR Pend. Lit. 65982); *see also* Complaint, Environmental Defense Fund v. Scherer, No. 87-K-986 (D. Colo. filed July 7, 1987) (ELR Pend. Lit. 65981).

133. CWA § 319, Pub. L. No. 100-4, 101 Stat. 52 (codified at 33 U.S.C. § 1329 (Supp. V 1987)).

nonpoint source controls.[134] These requirements essentially reaffirm the planning approach already required by EPA regulations under CWA sections 208 and 303(e).[135]

There is, however, one area where section 319 may have added some real substance to existing EPA regulations for nonpoint source water quality control planning. Section 319(b)(2)(F) authorizes a state to review federal financial assistance programs and development projects for their conformity with the state's nonpoint source control program.[136]

States were already authorized to review and comment on the water quality impacts of federal licenses and permits.[137] The new language adds to this authority in two ways. First, it substantially broadens the range of federal activities, including Forest Service actions, subject to state review and comment.[138] Second, and more importantly, the statutory language suggests that if a state finds the proposed federal action inconsistent with the state's program for controlling nonpoint source pollution, then "the Federal agency *must* make efforts to accommodate the

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134. Congress recognized that:

> [I]nformation and institutional relationships developed under the section 208 planning process will be relevant to, and consistent with, the requirements and objectives of this bill. [Congress also recognized that] [m]any States used the section 208 planning process to gather needed data about nonpoint source pollution and to promote local and regional cooperative pollution control efforts. In such cases, the State is encouraged to build upon these program elements in constructing the program required by this bill.

S. REP. NO. 50, 99th Cong., 1st Sess. 37 (1985).

In fact, the 319 Assessment Report for California merely catalogues existing reports of nonpoint source problems. While EPA is not pleased with this level of effort, given Congress' failure to appropriate funds for the management plans that are supposed to respond to problems identified in the Assessment, it is not surprising that the states are devoting little effort to section 319.

135. To see how closely section 319 tracks EPA's regulations implementing the earlier CWA sections 208, 303(e), and 305(b), compare 40 C.F.R. Part 130 with CWA section 319(a). This is also recognized in the EPA Guidance for section 319, which states that:

> States can incorporate their NPS Assessment and Management Programs into their water quality management (WQM) plan and areawide waste treatment management plan developed and updated in accordance with the provisions of section 205(j), 208, and 303 of the Act, 40 C.F.R. Part 130 (the Water Quality and Management regulation), and state requirements.

EPA GUIDANCE ON NPS CONTROLS AND WQS, *supra* note 120, at 20.

136. CWA § 319(b)(2)(F), 33 U.S.C. § 1329(b)(2)(F) (Supp. V 1987); *see also* CWA § 319(k), 33 U.S.C. § 1329(k) (Supp. V 1987) (federal departments and agencies directed to accommodate state concerns).

137. *See* Exec. Order No. 12,372, 3 C.F.R. 197-98 (1983).

138. Section 319(b)(2)(F) broadens the review to include any programs listed in the most recent Catalog of Federal Domestic Assistance. EPA's preliminary listing of federal development projects that are subject to state review includes (among others) the following relevant activities for the Forest Service: 1) Forest Plans, 2) Resource Area Analyses, 3) Integrated Resource Management Plans, 4) Timber Activities/Sales, and 5) Watershed Management. OFFICE OF WATER, U.S. ENVIRONMENTAL PROTECTION AGENCY, DRAFT FEDERAL CONSISTENCY GUIDANCE app. F.2 (Selected Federal Assistance Programs) (Aug. 1988) [hereinafter EPA, DRAFT FEDERAL CONSISTENCY GUIDANCE].

state's concerns."[139] No allowance is made for technological or economic infeasibility of such efforts.[140]

Finally, section 319 also provides states with a new avenue to challenge federal projects that threaten to violate water quality standards. The consistency determination that states perform now includes an analysis of:

> [t]he extent to which the project will comply with applicable pollution control standards . . . including: a) water quality standards, including beneficial uses, the numeric and narrative criteria established to support these uses, and the State's antidegradation policy; b) requirements for implementation of BMP's and other pollution control measures; c) any statutory, regulatory, or administrative requirements, such as permits, monitoring, or prohibition of activities under certain conditions.[141]

This provision is important because it suggests that unlike nonpoint sources generally, federal actions resulting in nonpoint source pollution might be required, based on *federal* law, to meet state water quality standards. Although states, environmental organizations, and private citizens still may not be able to bring enforcement actions if state standards exempt forest uses, this new language appears to give states that do not exempt forest users a new federal remedy for noncompliance. For state agencies that are active in national forest planning and the review of timber sales, this is potentially an important source of influence.

While section 319 does not change the basic structure of CWA regarding nonpoint source pollution, it does allow a state to raise water quality concerns in the forest-planning process, and it may force changes in projects where the state has legitimate environmental objections.[142] Because, section 319 appears to preclude consideration of economic and technical feasibilities in determining what controls to impose on nonpoint sources, federal agencies must take whatever steps are necessary to meet state water quality standards.[143] Thus, section 319's provisions reinforce the proposition that an important part of the battle over water quality in the national forests takes place at the planning stages, years before timber is harvested or roads are built.

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139. *Id.* at i (Executive Summary) (emphasis added).

140. While it is not clear how EPA will handle cases where technological infeasibility is asserted, additional language in section 319 reinforces the implication that Congress did not intend economic feasibility to be a major factor in formulating nonpoint source controls. Section 319(a)(1)(C) requires states to identify programs that will "reduce, *to the maximum extent practicable,* the level of pollution resulting from [nonpoint source categories]." 33 U.S.C. § 1329(a)(1)(C) (Supp. V 1987) (emphasis added).

141. EPA, DRAFT FEDERAL CONSISTENCY GUIDANCE, *supra* note 138, at 5.

142. *See id.* at 3.

143. *See generally id.* at 3-7.

B. Forest Planning and Water Quality: RPA, NFMA, and NEPA

The Clean Water Act and its state-developed water quality standards are not the only constraints on Forest Service discretion, nor are they the only statutory protections for clean water on national forest lands. Because nonpoint source pollution is not *directly* regulated under the Clean Water Act, one must look to other state and federal statutes[144] to find the fundamental limits on management activities in national forests. The preceding section analyzed how state standards and EPA guidance address nonpoint source pollution. This section reverses that perspective and examines the role of Forest Service planning in protecting water quality.

Historically, water quality planning and forest planning have operated independently.[145] However, because forest planning is the primary mechanism for withdrawing environmentally sensitive lands from management, planning is also the most important tool the Forest Service has to mediate between its dual mandates for resource development and water quality protection. As such, forest planning is properly seen as the primary BMP for water quality control. The primary federal statutes defining the processes for and objects of forest planning are the Resources Planning Act of 1974 (RPA),[146] the National Forest Management Act of 1976 (NFMA),[147] and the National Environmental Protection Act (NEPA).[148]

1. The RPA Program and Regional Guides

Forest planning involves two separate processes whose relationship is not well defined.[149] These processes are a top-down planning effort under RPA,[150] and a bottom-up effort under NFMA.[151] Section 8(a) of RPA requires the President to submit a Renewable Resource Assessment, Program, and Statement of Policy to Congress.[152] The RPA Pro-

144. *See supra* note 92 and accompanying text.

145. Forest planning determines what national forest lands will be allocated for what uses. *See* C. WILKINSON & M. ANDERSON, *supra* note 13, at 76. Since serious water quality impacts are unavoidable in certain physical settings, land use allocation is a critical stage in water quality planning. Reflecting this, the states and EPA have played a far more active role in forest planning than the Forest Service has in water quality planning. *See generally id.* at 76-90, 217-25.

146. Forest and Rangeland Renewable Resources Planning Act of 1974, 16 U.S.C. §§ 1601-1610 (1982 & Supp. V 1987).

147. Pub. L. No. 94-588, 90 Stat. 2949 (codified as amended in scattered sections of 16 U.S.C.).

148. 42 U.S.C. §§ 4321-4370a (1982 & Supp. V 1987). Some of the other federal statutes affecting water quality concerns are the Wild and Scenic Rivers Act and the Wilderness Act. *See supra* note 92.

149. C. WILKINSON & M. ANDERSON, *supra* note 13, at 76-90.

150. *See supra* note 146.

151. *See supra* note 147.

152. 16 U.S.C. § 1606(a) (1982).

gram is prepared by the Chief of the Forest Service and is revised every five years.[153] The RPA Program sets national objectives for timber, wildlife, range, and recreation,[154] with the purpose of facilitating long-term budgeting by the Forest Service and Congress.[155] Although the RPA Program has not met its initial objective of easing the Forest Service's budgeting problems,[156] it has been used to influence local decisions regarding the amount of land allocated to timber harvesting and, conversely, the amount set aside due to environmental concerns, including water quality.[157]

Two years after enacting RPA, Congress gave further direction to the Forest Service by passing NFMA.[158] NFMA requires the Forest Service to prepare forest plans for each national forest.[159] These forest plans are detailed land use directives, and all subsequent actions including timber harvesting, road building, recreational use, grazing, and mining must be consistent with the plans.[160] The staff of each national forest prepares its own plan,[161] and as a result, these documents often are more responsive to local issues and concerns than the national level RPA goals.

Although planning under NFMA will be treated in more detail in the following section, it is introduced here because the Forest Service implements the RPA objectives by incorporating them into the forest-planning process. The Forest Service interprets the relationship between NFMA and RPA as an iterative process, with the national goals at the top of a hierarchy.[162] RPA Program objectives are allocated to each region of the Forest Service, and each region then allocates its share to individual national forests.[163] The RPA objectives must serve as one of the alternatives that are studied in the preparation of each national forest plan and its environmental impact statement.[164]

The staff of each national forest does not have to adopt the RPA objectives as their preferred land use plan. However, when there are significant differences between the preferred alternative at the local level and the allocated RPA objectives, the regional office of the Forest Service

153. For a description of how forest planning at each level works, see generally THE CITIZENS' GUIDE TO FOREST PLANNING (S. Welborn ed. 1982).

154. *Id.* at 20.

155. C. WILKINSON & M. ANDERSON, *supra* note 13, at 37.

156. *See id.* at 40.

157. *See generally id.* at 76-85.

158. Pub. L. No. 94-588, 90 Stat. 2949 (codified as amended in scattered sections of 16 U.S.C.).

159. C. WILKINSON & M. ANDERSON, *supra* note 13, at 44.

160. *See* 36 C.F.R. §§ 219.14-.27 (1988). For a description of substantive and procedural requirements for Forest Plans, see *infra* notes 169-80 and accompanying text.

161. C. WILKINSON & M. ANDERSON, *supra* note 13, at 44.

162. *Id.* at 79-80.

163. *Id.* at 80.

164. THE CITIZENS' GUIDE TO FOREST PLANNING, *supra* note 153, at 8.

may override the local plan.[165] Recently, national objectives for timber production under RPA have been set at historically high levels.[166] As a result, in many forests, the staff faces conflicts between the environmental issues they have identified in their own analyses, the concerns of others commenting on the plans, and the economic priorities of Forest Service Headquarters.[167] For the time being, local environmental concerns have generally prevailed over the pressure for increased economic returns from Washington.[168]

2. *Forest Planning Under NFMA*

The purpose of NFMA forest planning is to maximize the long-term net public benefit from the national forest system in an environmentally sound manner.[169] Plans determine "resource management practices, levels of resource production and management, *and the availability and suitability of lands for resource management.*"[170] Because forest plans are revised only every ten to fifteen years, and all permits and contracts for the use of national forest lands must be consistent with the plans,[171] the plans represent long-term decisions and are not easily reversed. They commit some lands to relatively intensive management and unavoidable water quality effects and withdraw others from the Forest Service's revenue base.

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165. The regional forester also may request that the Forest Service Chief reduce the region's RPA objectives. C. WILKINSON & M. ANDERSON, *supra* note 13, at 80-81. In at least two national forests, however, preferred alternatives under the local Forest Plans were rejected in favor of RPA-based alternatives. *Id.* at 82-83 n.424.

166. *See, e.g.*, O'Toole, *RPA: John Crowell Makes His Presence Known,* FOREST PLANNING, Jan./Feb. 1984, at 26.

167. For a discussion of just such a conflict engendered by John Crowell, the Assistant Secretary of the Department of Agriculture, see *id.* Region 6 of the Forest Service (Oregon and Washington) resisted efforts by Crowell to increase timber yield objectives, largely by sticking to original estimates of lands unsuited to timber harvest. THE CITIZENS' GUIDE TO FOREST PLANNING, *supra* note 153, at 26.

168. *See id.*

169. 36 C.F.R. § 219.1(a) (1988) (Purpose and Principles: National Forest System Land and Resource Management Planning).

170. 36 C.F.R. § 219.1(b) (1988) (emphasis added). The details of the forest-planning process are beyond the scope of this paper. The ten basic steps in the process are: 1) to identify public issues and Forest Service opportunities and concerns (ranking them by importance and deciding which to analyze); 2) to develop quantifiable planning criteria to maximize public benefit; 3) to inventory the existing resources and collect data about potential impacts; 4) to analyze the management situation by constructing a model of the national forest's outputs, determining minimum management requirements, and making rough tradeoffs; 5) to formulate alternatives (at least four are required: no action, RPA targets, market resources emphasis, nonmarket emphasis); 6) to estimate the effects of alternatives; 7) to evaluate alternatives and choose the preferred alternative; 8) to draft the actual forest plan for the preferred alternative; 9) to draft the final forest plan reflecting any further agency or public concerns identified in the draft; and 10) to implement the plan and monitor its outputs and effects. THE CITIZENS' GUIDE TO FOREST PLANNING, *supra* note 153, at 4-12. *See also* C. WILKINSON & M. ANDERSON, *supra* note 13, at 76-77.

171. 16 U.S.C. § 1604(i) (1982 & Supp. V 1987).

In addition to defining the process for forest planning, NFMA also contains substantive guidelines, including requirements that environmental values be considered in determining permitted land uses and that sensitive lands not be disturbed. NFMA requires the Forest Service to

> ensure that timber will be harvested from National Forest System lands only where:
>
> (i) soil, slope, or other watershed conditions will not be irreversibly damaged;
>
> (ii) there is assurance that such lands can be adequately restocked within five years after harvest; [and]
>
> (iii) protection is provided for streams, streambanks, shorelines, lakes, wetlands, and other bodies of water from detrimental changes in water temperatures, blockages of water courses, and deposits of sediment, where harvests are likely to seriously and adversely affect water conditions or fish habitat.[172]

Based on these statutory provisions and their implementing regulations,[173] the Forest Service has withdrawn over thirty percent of the lands in some national forests in California from the "timber base."[174] While the Forest Service's criteria for withdrawal based on environmental sensitivity are not without controversy,[175] the impact of such withdrawals on water quality is probably greater than any other control measure the Forest Service has taken to reduce nonpoint source pollution.[176]

Most of the forest plans prepared to date assume that the primary substantive standards for water quality are those based on CWA. In an interesting development, several national forests have set their own numeric stream quality standards using authority under NFMA rather than CWA.[177] These standards were developed as an application of the

172. *Id.* § 1604(g)(3)(E)(i)-(iii).

173. The NFMA implementing regulations essentially repeat the statutory criteria for excluding lands from the timber base. For a succinct description of how suitability determinations work, see Morrison, *The National Forest Management Act and Below Cost Timber Sales: Determining the Economic Suitability of Land for Timber Production,* 17 ENVTL. L. 557, 576-78 (1987). The regulations do exclude additional lands where timber production is not cost-effective due to physical or biological conditions of the site, or transport requirements. 36 C.F.R. § 219.14(b) (1988).

174. *See* REGION 5, FOREST SERVICE, U.S. DEPARTMENT OF AGRICULTURE, DRAFT ENVIRONMENTAL IMPACT STATEMENT, SHASTA-TRINITY NATIONAL FOREST LAND AND RESOURCE MANAGEMENT PLAN II-4-5 (1986) (describing characteristics which limit the range of alternatives considered in the EIS). Approximately 31.8% of the Shasta-Trinity Forest was automatically excluded from the timber base due to productivity or environmental concerns, and to varying degrees a portion of the remaining base was also excluded under the six alternatives considered in the EIS. *Id.* at II-4-8.

175. *See infra* notes 291-98 and accompanying text.

176. *See infra* notes 335-43 and accompanying text; *see also* Stahl, *On Unstable Ground,* FOREST PLANNING, July 1984, at 9 (discussing the protection of water quality by minimizing the erosion caused by timber harvesting on the steepest forest lands).

177. *See, e.g.,* FOREST SERVICE, U.S. DEPARTMENT OF AGRICULTURE, PROPOSED LAND

Forest Service's minimum management requirements (MMR's), a set of prescriptions that incorporate the most restrictive statutory requirements applying to specific Forest Service projects.[178] In general, these prescriptions require forests to maintain viable populations of resident fish and wildlife species (which may be the more sensitive beneficial uses designated under state water quality planning).[179] In settings where Forest Service activities are exempt from state water quality standards, NFMA-based MMR's may provide an independent means to protect water-dependent uses. Region 6 of the Forest Service (Washington and Oregon), for example, will not allow a forest plan alternative that violates MMR's to be selected as the preferred plan.[180]

3. *NEPA and Forest Planning*

Although NFMA, RPA, and state water quality standards set the substantive criteria that determine whether and how a particular area may be managed, NEPA[181] governs the procedure by which these criteria are applied and by which they may be challenged by other parties. NEPA plays a critical role in mediating the water quality objectives of EPA and the states under CWA, and the multiple use focus of the Forest Service under NFMA.[182]

NEPA serves this mediating function because it requires the Forest Service, in its planning processes, to identify the individual and cumulative water quality impacts of its proposed actions[183] and to describe mitigations for these effects.[184] NEPA and NFMA have been interpreted to require a "programmatic" environmental impact statement (EIS) for

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AND RESOURCE MANAGEMENT PLAN, HURON-MANISTEE NATIONAL FOREST IV-93 (1985) (noted in C. WILKINSON & M. ANDERSON, *supra* note 13, at 224 n.1179). One limit used in this Forest Plan was to assure that there was one brook trout per 100 square meters in tributaries not used for spawning, and three trout per 100 square meters where spawning occurs. *Id.*

178. 36 C.F.R. § 219.27 (1988). For a detailed analysis of some of the shortcomings of the MMR process used by the Forest Service, see O'Riordan & Horngren, *The Minimum Management Requirements of Forest Planning,* 17 ENVTL. L. 643 (1987).

179. 36 C.F.R. § 219.19 (1988).

180. O'Riordan & Horngren, *supra* note 178, at 650.

181. 42 U.S.C. §§ 4321-4370a (1982 & Supp. V 1987).

182. *See* Craig, *supra* note 12, at 279-80.

183. *See* National Wildlife Fed'n v. United States Forest Serv., 592 F. Supp. 931, 942 (D. Or. 1984) (holding that the Forest Service is required under NEPA to evaluate the cumulative effects of multiple sales, including sales on lands not held by the Forest Service).

184. *See* Robertson v. Methow Valley Citizens Council, 109 S. Ct. 1835, 1843-44 (1989) (affirming the District Court holding that a "mere listing" of mitigation measures is generally inadequate under NEPA).

each forest plan,[185] as well as subsequent environmental analyses for more detailed unit plans and Forest Service actions.[186]

As a planning tool, the programmatic EIS's that accompany forest plans are too general to allow any analysis of the potential for water quality violations in a particular area.[187] Instead, these EIS's identify areas of concern that need to be tracked as the Forest Service's plans become more specific.[188] Ideally, they also ensure that the Forest Service plans include a monitoring program that will flag specific water quality issues before it is too late to avoid them. Recognizing the importance of planning under NEPA and NFMA, the states and EPA have allocated most of their staff and funding to reviewing forest plans, project proposals, and their environmental documentation rather than trying to address problems that have already occurred.[189] EPA, in particular, tried to ensure that forest plans contain a substantive monitoring program that provides enough information to evaluate the effectiveness of Forest Service BMP's. Only with this information can EPA assure that the iterative process between water quality standards and BMP's works.[190]

185. A programmatic EIS, as opposed to a project-specific EIS, analyzes the expected impacts of a series of related actions. Often these actions will occur over a long period of time. As a result, the level of detail in the analysis seldom provides more than a general picture of impacts and proposed mitigation measures. *See generally* Scientists' Inst. for Pub. Info. v. Atomic Energy Comm'n, 481 F.2d 1079, 1087-88 & n.30 (D.C. Cir. 1973) (discussing a Council on Environmental Quality (CEQ) Memorandum to Federal Agencies on Procedures for Improving EIS's (May 16, 1972)). The CEQ regulations for programmatic EIS's are at 40 C.F.R. §§ 1500.4(i), 1502.4, 1502.20, 1508.18(a) (1988).

186. Craig, *supra* note 12, at 257-59.

187. In effect, the Forest Service cut a deal with EPA that EIS's for Forest Plans would be done at a generalized level, and in return, the Service agreed to be very specific in its project-level environmental assessments, particularly regarding mitigation. In fact, it is impossible to prepare these EIS's in any other way due to the size of the areas involved—one cannot write specific BMP's or mitigation measures where land and hydrology conditions vary so extensively. In this sense, *Methow Valley,* and its holding that project-specific EIS's must contain a detailed discussion of mitigation measures, is not a problem for the Forest Service. Interview with John Rector, Region 5, U.S. Forest Service, in San Francisco, California (Jan. 1989); *see also infra* notes 239-60 and accompanying text for a discussion of environmental assessments.

188. *See supra* notes 136-43 and accompanying text (discussing intergovernmental review under CWA section 319).

189. Interview with Deborah Caldon, EPA Region IX, in San Francisco, California (Oct. 1988); interview with William Reichmuth, *supra* note 31.

190. *See, e.g.,* REGION X, U.S. ENVIRONMENTAL PROTECTION AGENCY, COMMENTS ON PROPOSED LAND AND RESOURCE MANAGEMENT PLAN AND DRAFT ENVIRONMENTAL IMPACT STATEMENT FOR THE WILLAMETTE NATIONAL FOREST, OREGON 3 (May 1988) [hereinafter REGION X, WILLAMETTE COMMENTS]. The Comments note that the EIS for the Willamette National Forest Plan does not specify that a monitoring program will be used, and that "[w]ithout a detailed monitoring plan, it will be difficult for the Forest Service to comply with the Council on Environmental Quality's NEPA regulations which require that an EIS shall contain: 'means to mitigate adverse environmental impacts (40 C.F.R. § 1502.16(h)).'" The Comments point out that "NFMA also provides the basis for a monitoring plan." *Id. See also* REGION X, U.S. ENVIRONMENTAL PROTECTION AGENCY, DETAILED COMMENTS, DRAFT ENVIRONMENTAL IMPACT STATEMENT (DEIS) AND LAND AND RESOURCE MANAGEMENT PLAN (PLAN) FOR THE UMATILLA NATIONAL FOREST 6 (Mar. 1988) (stating that

Beyond their role as a tool for evaluating BMP's, programmatic EIS's for forest plans help identify areas that should be withdrawn from the timber base, either for environmental reasons or due to a lack of productivity.[191] As discussed above, these decisions are critical in settings where water quality impacts are unavoidable.

We saw earlier that the application of state water quality standards to nonpoint source pollution generally, and to projects in the national forests in particular, has been a source of controversy.[192] A related dispute is whether the Forest Service can satisfy its environmental review obligations under NEPA by merely listing the BMP's that apply to a project, or whether some further analysis of the effectiveness of these measures in that particular setting is also required. If the Forest Service can automatically satisfy its NEPA obligation to consider mitigation by promising to use all applicable BMP's, the burden is effectively shifted to project opponents to show that a particular BMP will not work in a particular setting.

The Supreme Court recently attempted to deal with this issue in *Robertson v. Methow Valley Citizens Council,*[193] but, perhaps purposefully, it left much to the imagination. The Court held that NEPA requires a mitigation analysis "in sufficient detail to ensure that environmental consequences have been fairly evaluated."[194] At the same time, the Court also repeated the well-accepted position that NEPA itself does not mandate that a "complete mitigation plan be actually formulated and adopted."[195]

This language is laudable for its consistency with prior cases.[196] However, it does little to guide the Forest Service in its analysis of mitigation measures, BMP's for a particular project, or forest plan EIS's. It remains unclear whether the required "detail" addresses the mitigation measure itself or the effectiveness of the measure. The Forest Service can, without difficulty, write down in great detail how stream crossings will be constructed; it is more difficult, however, to analyze whether the crossings will avoid erosion on a particular stream given the type and extent of timber harvesting.

Notwithstanding the ambiguity of its phrasing, the Court's fundamental concern is that NEPA continue to force decisionmakers to con-

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the level of detail in the monitoring mechanisms was insufficient).

191. *See* REGION 5, FOREST SERVICE, U.S. DEPARTMENT OF AGRICULTURE, *supra* note 174, at II-4-8 (figure II-3).

192. *See supra* notes 95-132 and accompanying text.

193. 109 S. Ct. 1835 (1989).

194. *Id.* at 1847.

195. *Id.*

196. *See* Strycker's Bay Neighborhood Council v. Karlen, 444 U.S. 223, 227-28 (1980) (per curiam).

sider the probable environmental consequences of proposed actions.[197] To fulfill this purpose, a NEPA review of Forest Service BMP's must include some analysis of the effectiveness of the BMP's in each project setting.[198]

The extent to which NEPA requires the Forest Service to evaluate the efficacy of the required BMP's is critical. In many physical settings the efficacy of BMP's is uncertain. Consequently, site-specific review of appropriate mitigation measures would undoubtedly open the agency to more legal challenges. By introducing evidence of such uncertainty, parties challenging proposed Forest Service projects in California and Oregon have succeeded in forcing the agency to study the predicted success of BMP's and, in particular, the potential for violating water quality standards.[199] Relying on the success of these cases, many of the legal challenges to forest plans and subsequent Forest Service actions now allege violations of the agency's duty to consider mitigation under NEPA.[200]

Because the two systems for water quality and land use planning are not integrated, the Forest Service is vulnerable to legal challenge whenever it proposes specific actions in areas with stringent water quality standards.[201] These legal challenges have made the Forest Service more willing to incorporate state and EPA concerns into the forest-planning process, but such interaction is still sporadic.[202] Until the water quality and land use planning processes are integrated and some structural incentives are given to the states to participate actively in the forest-planning process for national forest lands, the level of attention given to water quality will continue to depend largely on local interest and the responsiveness of the staff in individual national forests.[203]

197. *Methow Valley,* 109 S. Ct. at 1847.

198. The Court acknowledged that mitigation may be required by other statutes, and that in these cases the agency must not only consider environmental consequences but also avoid them. *Id.* at 1847 n.14. The CWA requirements for BMP's are one such setting.

199. *See* Northwest Indian Cemetery Protective Ass'n v. Peterson, 795 F.2d 688, 696 (9th Cir. 1986), *rev'd on other grounds sub nom.* Lyng v. Northwest Indian Protective Ass'n, 108 S. Ct. 1319 (1988); Thomas v. Peterson, 753 F.2d 754 (9th Cir. 1985); National Wildlife Fed'n v. United States Forest Serv., 592 F. Supp. 931 (D. Or. 1984), *vacated in part and appeal dismissed,* 801 F.2d 360 (9th Cir. 1986). These cases are discussed in Craig, *supra* note 12.

200. *See, e.g.,* Methow Valley, 109 S. Ct. 1835 (1989) (neither NEPA nor CEQ regulations require a mitigation plan to be formulated and adopted, but the EIS must discuss mitigation in sufficient detail); Sierra Club v. United States Forest Serv., 843 F.2d 1190 (9th Cir. 1988) (preliminary injunction granted partially on showing that environmental assessments (EA's) did not discuss the impact of logging on California's water quality standards).

201. *See, e.g.,* C. WILKINSON & M. ANDERSON, *supra* note 13, at 372.

202. *See generally Methow Valley,* 109 S. Ct. 1835 (1989).

203. Some water quality standards in California, for example, have not been changed since 1972. Interview with William Reichmuth, *supra* note 31.

III
MAKING THE SYSTEM WORK: APPLYING WATER QUALITY CONTROLS ON THE GROUND

An effective water quality control strategy for the national forests requires at least two things: withdrawing sensitive watersheds from intensive land uses, and implementing management prescriptions in those areas that are selected for timber harvesting, road building, or other land-disturbing uses. As discussed in the preceding section, the former is largely a planning issue, the latter largely one of effective administration.

This section takes the broad outlines of the planning process discussed in the preceding section and focuses on the role of each actor in implementing this process. Just as there are unique roles for the states, EPA, and the Forest Service in water quality and forest planning, each plays its part in assuring that the prescriptions established at the planning stages are effectively applied.

A. The Roles of EPA and the States

The Clean Water Act contains two sections relating to the implementation of nonpoint source controls.[204] As with the planning provisions of the Act, these sections are somewhat redundant in the obligations they impose on EPA and the states. The redundancies result from Congressional attempts to address nonpoint source pollution in the 1972 amendments,[205] and again fifteen years later in the 1987 Water Quality Act.[206]

1. Section 208/303(e) Implementation: Management Agency Agreements and State Certification of Forest Service BMP's

States have certified three types of nonpoint source management programs for silviculture under CWA section 208(b): 1) educational programs stressing voluntary compliance with suggested practices,[207] 2) regulatory programs based on a state Forest Practice Act, often coupled with preproject review of timber-harvesting plans, and 3) regulatory programs based on federal agency practices and regulations. The responsibilities of the states in implementing nonpoint source control programs depend largely on the types of programs they choose to impose. In the West, most states have adopted regulatory controls, using Forest Prac-

204. CWA §§ 208, 319, 33 U.S.C. §§ 1288, 1329 (1982 & Supp. V 1987).

205. Pub. L. No. 92-500, 86 Stat. 839 (codified as amended at 33 U.S.C. § 1288 (1982)).

206. Pub. L. No. 100-4, 101 Stat. 52 (codified at 33 U.S.C. § 1329 (Supp. V 1987)).

207. Educational programs are beyond the scope of this Comment. For a summary of how different states are approaching silviculturally related pollution, see EPA, REPORT TO CONGRESS, *supra* note 18, at 3-1.

tice Acts for state and private lands, and Forest Service BMP's for national forests.[208]

To implement these nonpoint source programs, EPA requires the states to designate management agencies that will have on the ground responsibility for applying regulatory controls or managing educational programs.[209] EPA also requires the states to certify that these strategies will achieve applicable state water quality standards.[210] Most states in the Western United States have designated the Forest Service as the management agency for national forest lands and have certified Forest Service BMP's.[211] All certifications must be approved by EPA.[212]

The Forest Service BMP's that states certify are not new prescriptions, nor are they specific. Rather, they are compilations of existing broad prohibitions relating to erosion control in timber harvesting, road construction, herbicide application, and other water quality related practices already contained in the Forest Service Handbooks and Manuals.[213] These prescriptions do not have the legal force of regulations; they are not enforceable against private companies working under contract or special permit with the Forest Service. However, they are mandatory in the sense that Forest Service personnel must include applicable prescriptions in timber contracts, road building specifications, and other contracts or special use permits used to govern projects on national forest lands.

One of the primary pressures for effective nonpoint source management strategies is EPA oversight of state certification that nonpoint source programs will attain water quality standards. In the past, state certifications of BMP's were seldom scrutinized. Once in place, the management agency and the state had no real duty to examine whether their

208. *See* Thaler, *Solutions for Water Pollution in Our Forests, Plans Based on Section 208 of Clean Water Act,* FOREST PLANNING, Jan/Feb 1984, at 20, 22.

209. CWA § 208(c)(1), 33 U.S.C. § 1288(c)(1) (1982).

210. CWA § 208(b)(3)-(4), 33 U.S.C. § 1288(b)(3)-(4) (1982). *See also* 40 C.F.R. § 130.6(c)(5) (1988) (identification of management agencies as a part of the state's water quality management plan).

211. Management Agency Agreements (MAA's) have been signed between the Forest Service and at least four states: California, Oregon, Washington, and Idaho. *See, e.g.,* MANAGEMENT AGENCY AGREEMENT BETWEEN THE STATE WATER RESOURCES CONTROL BOARD, STATE OF CALIFORNIA, AND THE FOREST SERVICE, U.S. DEPARTMENT OF AGRICULTURE (1981).

212. 40 C.F.R. § 130.6 (1988). Under this regulation, states must prepare water quality management (WQM) plans, one element of which is nonpoint source management and control. This element must "describe the regulatory and non-regulatory programs, activities and Best Management Practices (BMP's) which the agency has selected as the means to control nonpoint source pollution where necessary to protect or achieve approved water uses." 40 C.F.R. § 130.6(c)(4)(i) (1988).

213. *See* Knopp, Smith, Barnes, Roath & Furniss, *Monitoring Effectiveness of Best Management Practices on National Forest Lands,* PROCEEDINGS, *supra* note 1, at 48.

nonpoint source programs were actually protecting beneficial uses, in particular, streams and other water bodies.

Recently, however, EPA has become active in its oversight of state certifications. The agency's first major foray into this area came in 1985 when it vetoed a portion of Idaho's water quality standards because the state legislature decided to grant the logging industry an exemption from one portion of the standards.[214] As a result of this controversy, EPA developed its now-familiar "three-part feedback loop system for nonpoint source management."[215]

This feedback system explicitly defines for the first time how the agency interprets the interaction between water quality standards and nonpoint source management programs under CWA.[216] The first two stages of the loop, establishing water quality standards that protect beneficial uses[217] and designing and implementing BMP's that will protect these uses, were already in place.[218] The new and critical step is the third one, monitoring water quality and, where problems are shown, modifying BMP's in order to achieve water quality standards.[219]

After the Idaho decision and several additional EPA challenges, states are taking seriously the implied threat that the agency will disapprove either the state's water quality standards or its BMP certification.[220] In at least some western states, EPA pressure has led state agencies to take a new look at whether BMP's are in fact meeting water quality standards.[221]

2. *Section 319 Management Plans*

In addition to EPA's authority over state certifications, the other source of movement in nonpoint source management and implementation is the enactment of CWA section 319(b).[222] This section requires state preparation, and EPA approval, of a program controlling pollution from nonpoint sources.[223] Under section 319(d)(2)(D), EPA may require revisions in state programs that "are not adequate to reduce the level of pollution in navigable waters in the State resulting from nonpoint sources and to improve the quality of navigable waters in the State." If a state

214. Idaho gave the logging industry a blanket exemption from its antidegradation requirements, a mandatory portion of the state water quality standards under CWA. For a detailed discussion of this decision and its implications, see Anderson, *supra* note 11, at 624-32.

215. *Id.* at 630.

216. *See generally* EPA GUIDANCE ON NPS CONTROLS AND WQS, *supra* note 120.

217. *See supra* notes 96-132 and accompanying text.

218. *See* Anderson, *supra* note 11, at 630.

219. *Id.* at 630-31.

220. Interview with Deborah Caldon, *supra* note 189.

221. Telephone interview with Nancy Lillquist, Nonpoint Source Coordinator, Oregon Department of Environmental Quality (Feb. 2, 1989).

222. 33 U.S.C. § 1329(b) (Supp. V 1987).

223. CWA § 319(b), 33 U.S.C. § 1329(b) (Supp. V 1987).

fails to submit an acceptable plan, EPA may issue its own plan for the state.[224] These review and approval standards give EPA a new statutory basis for supervising state control of nonpoint sources, even if the state's control measures are nothing more than a listing of already existing measures developed under section 208.

To date, few innovative strategies have been developed under section 319 because Congress, after authorizing over $400 million for nonpoint source control, has failed to appropriate any funds to implement the management programs.[225] As a result, many states are not preparing the program at all, or are submitting a pro forma effort.[226] Similarly, in most states, section 319 management programs have turned out to be nothing more than a compilation of existing programs with the addition of vaguely worded priorities for new nonpoint source control programs should funding become available.[227]

B. The Role of the Forest Service

In most western states the Forest Service has two independent mandates for implementing water quality controls in projects on national forest lands. First, it is the designated management agency for nonpoint source programs in California, Oregon, Washington, and Idaho.[228] As such, the Service is responsible for implementing BMP's to control water pollution on national forest lands to the maximum extent practicable.[229]

Second, NFMA and NEPA also impose substantive and procedural requirements regarding water quality on the Forest Service. The limitations on Forest Service land use discretion imposed by forest-planning criteria described above are one class of these requirements.[230]

Once the planning decision to approve a particular management action or land use is made, two additional controls govern the Service's final decision to proceed with a project. These controls are the agency's timber sale regulations and site-specific environmental assessments,[231]

224. CWA § 319(d)(3), 33 U.S.C. § 1329(d)(3) (Supp. V 1987).

225. *See* CWA § 208(f)(3), 33 U.S.C. § 1288(f)(3) (1982).

226. Interview with Deborah Caldon, *supra* note 189.

227. *Id.*

228. *See supra* notes 209-12 and accompanying text.

229. Originally, nonpoint source control was to be to "the extent feasible." CWA § 208(b)(2)(F), 33 U.S.C. § 1288(b)(2)(F) (1982). CWA § 319(a)(1)(C), 33 U.S.C. § 1329 (a)(1)(C) (Supp. V 1987) now requires control "to the maximum extent practicable." This may mean that management agencies are precluded from considering economic factors such as cost in deciding what controls to apply.

230. *See supra* notes 149-200 and accompanying text.

231. *See, e.g.*, C. WILKINSON & M. ANDERSON, *supra* note 13, at 222-25 (discussing the protection of water resources and fish habitats from timber harvesting and road construction). While all management activities have the potential to affect water quality, the following analysis focuses on timber sales.

which constitute the first steps in translating BMP's from generalized written prescriptions to specific (and enforced) management directives.

1. USFS Timber Sale Regulations

NFMA was designed in part to ensure that the Forest Service is more responsive to nontimber resource concerns, and that the NFMA-implementing regulations contain controls relating to the water quality effects of timber sales.[232] The central prescription is that the officer approving a timber sale contract must

> insure that each timber sale contract, permit or other authorized form of National Forest timber disposal is consistent with applicable land and resource management plans and *environmental quality standards* and includes, as appropriate, requirements for:
>
> . . .
>
> d) Minimizing increases in soil erosion;
>
> . . .
>
> h) Minimizing adverse effects on, or providing protection for and enhancing other National Forest resources, uses and improvements.[233]

Other NFMA regulations allow the Service to use performance bonds to assure that contract terms are met,[234] to modify contracts due to environmental concerns raised during the sale,[235] and to cancel sales for serious violation of terms or the discovery of serious unavoidable environmental impacts.[236]

In addition to restrictions placed on national forest projects by the NFMA regulations, the Forest Service also requires reviewing officers to ensure that timber contracts, road specifications, and other project documents conform to the prescriptions contained in its Handbooks and Manuals.[237] While these prescriptions tend to be generalized, they do

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232. These *sale* regulations, 36 C.F.R. Part 223, are distinct from the *planning* regulations, 36 C.F.R. Part 219, discussed *supra* at notes 173-74 and accompanying text. The timber sale regulations incorporate planning decisions to remove areas from the timber base and provide for modification or cancellation of timber contracts for environmental reasons. *See* 36 C.F.R. §§ 223.14(a)(4), .40, .113, .116(a)(5) (1988); *see also* C. WILKINSON & M. ANDERSON, *supra* note 13, at 222-25.

233. 36 C.F.R. § 223.30 (1988) (emphasis added). The use of the term "environmental quality standards" is vague and may have been an attempt to avoid explicitly acceding to the Ninth Circuit's holding that the Forest Service is required to address *state* water quality standards in its environmental reviews under NEPA. *See supra* notes 116-19 and accompanying text (discussing Northwest Indian Cemetery Protective Ass'n v. Peterson, 795 F.2d 688 (9th Cir. 1986), *rev'd on other grounds sub nom.* Lyng v. Northwest Indian Protective Ass'n, 108 S. Ct. 1319 (1988)); *cf.* 36 C.F.R. § 228.8(b) (1988) (requiring mining operations to "comply with applicable Federal and *State* water quality standards" (emphasis added)).

234. 36 C.F.R. § 223.35 (1988).

235. Modifications are subject to the contractor's "valid existing rights." 36 C.F.R. § 223.113 (1988).

236. Contractors must be compensated when contracts are cancelled for environmental reasons. 36 C.F.R. § 223.116 (1988).

237. The Forest Service Manual is a wide-ranging compendium of management prescrip-

give Forest Service staff the authority to impose more specific contract-based controls.[238]

2. *NEPA Revisited: Environmental Assessments and Mitigation Measures*

The translation of generalized NFMA regulations and Forest Service Manuals and Handbooks into project and site-specific measures begins when the Service issues a notice of intent to perform a project and asks for comments in the form of "issues, concerns and opportunities" (ICO's).[239] This is the first stage in preparing an environmental assessment (EA). EA's are performed for all but the most routine Forest Service actions,[240] which are categorically excluded from NEPA review.[241]

Once ICO's are identified, the Service assembles an interdisciplinary team with expertise in each of the issue areas. The team develops a range of alternatives to the proposed project, analyzes the environmental consequences of each alternative, and, most importantly, prepares a set of mitigation measures designed to minimize, avoid, or remedy any significant impacts predicted by the analysis. The completed EA is then sent out for comment. If no significant impacts are identified, or if the mitigation measures are predicted to reduce impacts to an insignificant level, a finding of no significant impacts (FONSI) is issued and the project goes forward.[242]

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tions that all staff are required to follow. Handbooks give more specific guidance on particular areas. Forest Service Manuals and Handbooks are modified or supplemented for each Forest Service Region.

238. *See, e.g.*, U.S. FOREST SERVICE, REGION 5, FOREST SERVICE MANUAL 1950 (discussed in REGION 5 BMP SURVEY, *supra* note 34, at 7a) (requiring that the contractor, permittee, or other Forest user be held accountable for BMP implementation); U.S. FOREST SERVICE, TIMBER SALES ADMINISTRATION HANDBOOK, SERVICE-WIDE HANDBOOK 2409.15 (discussed in REGION 5 BMP SURVEY, *supra* note 34, at 7a) (using erosion hazard ratings (EHR's) to determine waterbar spacing; EHR's allow a land manager to predict what erosion will occur after particular management practices are applied).

239. These are terms of art used by the Forest Service to describe the first stage of its NEPA review process. Issues are possible negative impacts of the proposed action identified by parties outside of the Forest Service, concerns are impacts identified by Forest Service staff, and opportunities are possible beneficial impacts. Interview with John Rector, *supra* note 187.

The notice of intent is distributed in several ways: to a preexisting list of parties who have expressed an interest in that forest's projects, to appropriate staff within the Forest Service, to certain other federal agencies with an interest in Forest Service actions (such as the Fish and Wildlife Service), and to the state through the A-102 review clearinghouse.

The Forest Service stresses that environmental assessments can also document the positive environmental effects of projects as well as the negative. For instance, by clearing dense undergrowth, some timber sales may improve wildlife habitat and reduce fire danger. *Id.*

240. NEPA requires the Forest Service to examine environmental impacts before implementing any federal actions. C. WILKINSON & M. ANDERSON, *supra* note 13, at 63.

241. The Council on Environmental Quality regulations implementing NEPA define a categorical exclusion as "a category of actions which do not individually or cumulatively have a significant effect on the human environment." 40 C.F.R. § 1508.4 (1988).

242. If an EA concludes that a project will cause no significant environmental effects, a

The EA has two critical functions.[243] First, it serves as the basis for designing site-specific mitigation measures such as undisturbed areas, road location and design prescriptions, and yarding techniques and locations.[244] Often, this requires a field investigation to inventory site conditions.[245] If the sale (or other action) goes forward, the prescriptions are incorporated into contract language, sale area maps, and performance standards.[246]

In deciding what management prescriptions to apply to a project, the Forest Service does consider costs, although this is done outside of the EA process. If a mitigation measure or BMP is too expensive, based on its cost relative to the value of the timber being cut, the agency will first try to redesign the project to avoid or lessen the need for the mitigation.[247] If this project redesign is not successful, the mitigations themselves may be cut or redesigned to reduce costs.[248] In national forests where the staff are under pressure to meet regional sales targets and produce a set quantity of timber, the reviewing officer will look seriously at the specific mitigation requirements suggested by the interdisciplinary team, but only use them where they are cost-effective.[249] Where local staff want to fund watershed restoration, or other projects such as wildlife enhancement, the only source of funds is often the receipts from the planned sale.[250] As a result, there may also be significant internal pressure to go ahead with environmentally sensitive actions.[251]

FONSI must be issued explaining the reasons for that finding. 40 C.F.R. § 1508.9 (1988).

243. In addition to those two functions, the EA also serves to give the line officer (forest supervisor) who will decide whether to approve the sale a written record as a basis for making a reasoned decision that can survive judicial review. To do this, the record must also include information on the cost of management prescriptions so that the line officer can justify the sale on economic criteria as required by 36 C.F.R. § 219.14 (1988). Interview with John Rector, *supra* note 187.

244. REGION 5 BMP SURVEY, *supra* note 34, at 2c-4c.

245. Interview with John Rector, *supra* note 187.

246. Sale area maps are detailed diagrams showing where the contractor is allowed to harvest and where special prescriptions must be used. *Id.*

247. *Id.*

248. *Id.* For example, if a sale calls for construction of a class one road (two lane paved all-season), but landslide hazards require expensive rerouting, the project itself may be altered by changing the specifications to a seasonal one lane dirt road to offset the cost of a longer route. Similarly, if the ideal strategy for minimizing erosion is installing culverts in a road, but this is so expensive that the profitability of the sale is threatened, the design of the mitigation may be altered to provide for simple outsloping of the road. *Id.*

249. *Id. See also* REGION 5 BMP SURVEY, *supra* note 34, at 10a.

250. *See* Coats, *Cumulative Impacts of Development in Watersheds,* PROCEEDINGS, *supra* note 1, at 107, 110.

251. In some cases, it is local staff who propose logging sensitive watershed that would otherwise be avoided. This occurs when the sale will generate funds for watershed restoration and road reconstruction. Staff may feel that, where a watershed already is degraded due to past management activities, it is better to go ahead with logging and use the funding generated by the sale to do remedial work. Haskins, *A Management Model for Evaluating Cumulative Watershed Effects,* PROCEEDINGS, *supra* note 1, at 125, 129.

The most serious tension between timber targets and water quality occurs not in the context of BMP cost, but where management prescriptions are technically infeasible due to site conditions such as steep, highly erosive slopes.[252] Theoretically, the EA process should identify these areas, and both the NFMA regulations and state water quality standards (where the Forest Service is not exempted) should then prohibit harvesting under these circumstances. Such areas may contain valuable stands of timber, however, and the temptation to log them to meet regional or forest plan goals may be great. Not surprisingly, several Forest Service EA's have been challenged in court on these grounds.[253]

Another context where EA's should flag the infeasibility of BMP's, but where harvesting has nevertheless proceeded, is fire salvage sales.[254] In these cases the fire often has burned timber down to the stream, making the use of buffer zones impossible and raising the threat of serious temperature and sedimentation effects.[255] Because fire-damaged timber must be removed within several years for it to retain any commercial value, the Forest Service's EA process is under substantial time pressure in these situations—making it difficult to resolve complex questions of how to design effective management prescriptions.[256]

In addition to their role in translating generalized BMP's into specific prescriptions, EA's also generate baseline data that can be used to evaluate a project after it is completed. With this information, site-specific BMP's can be reviewed to determine their effectiveness in meeting water quality standards, and changes in terrain and habitat conditions can be monitored to ensure that they are kept within acceptable limits.[257] While detailed surveys of terrain and habitat conditions are not routinely performed,[258] the qualitative information gained from site visits per-

252. *See* Skaugset, *Timber Harvesting and Water Quality,* PROCEEDINGS, *supra* note 1, at 43, 44.

253. *See supra* note 132.

254. For a report on some of the problems with fire salvage sales in California, see Lawson, *Is Fire Salvage Logging Necessary?,* FOREST WATCH, Mar. 1988, at 17.

255. Although some of these effects would occur with or without salvage logging, where the sale is being done at the same time as harvesting on lands upstream or downstream of the fire, cumulative effects may push sediment and/or temperature above thresholds of concern. *See* Witness Statement of John Jackson (former Nonpoint Source Coordinator, Oregon Department of Environmental Quality) at 5, National Wildlife Fed'n v. United States Forest Serv., No. 87-752 (D. Or. filed Feb. 7, 1988); *see also* Lawson, *supra* note 254, at 19.

256. Lawson, *supra* note 254, at 20.

257. *See* Leven, Rector & Doty, *Water Quality Protection on National Forest Lands in California,* PROCEEDINGS, *supra* note 1, at 27, 29. EPA and some states see this as critical to the feedback loop relation between BMP's and water quality standards. *See supra* notes 123-24 and accompanying text.

258. Interview with John Rector, *supra* note 187. Requiring such surveys is one possible means of tightening the Forest Service's responsibilities under its Management Agency Agreements to implement nonpoint source controls under CWA.

formed in the EA scoping process at least gives local Forest Service staff some idea of whether their BMP's are working.

By establishing a context for translating generalized directives into site-specific prescriptions and generating the information to evaluate these measures after a project is completed, the environmental review process under NEPA makes the effective implementation of water quality controls possible.[259] Nevertheless, external scrutiny of the proposed Forest Service action is necessary to ensure that such information is generated on a regular basis. Moreover, input by state agencies and private organizations is essential to guarantee that the environmental review process is not compromised due to the pressure on Forest Service staff to meet timber production goals and to generate revenues to fund local projects.[260]

3. *Enforcing BMP's During the Timber Sale*

As with other forms of nonpoint source pollution, including agricultural and urban runoff, the water quality effects of forestry usually are separated from the land-disturbing activities that cause them by both space and time.[261] Conventional enforcement tools such as cease and desist orders have little relevance in these settings. As a result, in the national forests, water quality controls are "enforced" by supervising road and timber contractors to ensure that they comply with the mitigation requirements and BMP's in their contracts.

During the time the contract is performed, the Forest Service's sale administrator is responsible for enforcing mitigation measures and management prescriptions.[262] While the degree of supervision varies with the size and sensitivity of each sale, one sale administrator is usually responsible for several sales at any one time—making it impossible to visit each site every day.[263]

If unanticipated environmental issues arise after contract performance begins, the sale administrator can call on Forest Service specialists, such as engineers and watershed management staff, for technical advice on how to handle such problems.[264] At this stage, however, it is very difficult for the sale administrator to stop work because Forest Service

259. *See* Craig, *supra* note 12, at 272.

260. *See, e.g., id.* at 273 n.106 (complaint by citizen resulted in Forest Service cancelling a timber sale).

261. *See* Weaver, Hagans & Madej, *Managing Forest Roads to Control Cumulative Erosion and Sedimentation Effects,* PROCEEDINGS, *supra* note 1, at 119.

262. Interview with John Rector, *supra* note 187.

263. The performance of the sale administrator is overseen by a sale inspector who visits the site periodically to make sure contract specifications are being followed. *Id.*

264. Each forest generally has specialists in hydrology, wildlife, engineering, watershed management, range, and transportation management. *See* U.S. FOREST SERVICE, ORGANIZATIONAL DIRECTORY (1986).

regulations stipulate that the Service will reimburse the contractor for the costs of such delays.[265] The Forest Service is also generally responsible for the cost of any additional mitigation measures or management prescriptions not contemplated in the original contract.[266] As a result, where local Forest Service staff are under pressure to get contracts completed, effective controls depend on sustained oversight by state, local, or private actors.

The main technique for enforcing water quality prescriptions is on-site direction of contractors.[267] When a contractor violates a contract term and the sales administrator is aware of the violation, the administrator can try to have the violation corrected immediately.[268] Some violations lend themselves to correction, while others do not. If the violation is not easily reversed, as in the case of logging within a buffer zone, a record of the violation is made, and the administrator will determine whether mitigation is feasible.[269] Where the cost of mitigation is high in relation to the value of the sale, the Service's leverage is limited. It will try to negotiate a settlement where part of the cost is borne by the contractor and part by the Service.[270] Where mitigation is less expensive, the contractor is often told that unless the work is performed, the Service will do the remedial work itself, charging the costs to the contractor or withholding payments due for road construction or reforestation.[271] According to the Service, it may also stop harvesting if contract violations are not corrected, particularly if they are repeated.[272]

Forest Service regulations also provide two other enforcement mechanisms. Although seldom used for environmental prescriptions, the Forest Service can require performance bonds from contractors.[273] These bonds are normally used to assure that the contractor has the financial capability to complete a sale once a contract is awarded, but bonds are sometimes used in environmentally sensitive settings to enforce completion of BMP's.[274] The Forest Service can also suspend a contractor from bidding on future sales based on past noncompliance. A contractor can be barred from bidding on new jobs for a period of up to

265. Interview with John Rector, *supra* note 187. *See also* 36 C.F.R. § 223.113 (1988).

266. 36 C.F.R. § 223.113 (1988).

267. REGION 5 BMP SURVEY, *supra* note 34, at 8c.

268. Interview with John Rector, *supra* note 187.

269. *Id.*

270. *Id.* This was confirmed in a telephone interview with Brian Stone, Section Head for Sales Preparation and Evaluation, Region 5, U.S. Forest Service (Feb. 16, 1989).

271. Interview with Brian Stone, *supra* note 270.

272. Interview with John Rector, *supra* note 187; interview with Brian Stone, *supra* note 270 (this was independently confirmed by each).

273. 36 C.F.R. § 223.35 (1988). According to Brian Stone, *supra* note 270, bonds are occasionally required.

274. Interview with Brian Stone, *supra* note 270.

three years.[275] Like performance bonding, however, contractor disqualification is not widely used because the administrative procedures are cumbersome.[276]

Based on the few evaluations that have been done, and on informal comments from local environmental organizations, most national forest staff take their environmental oversight responsibilities seriously.[277] The real test of BMP design and enforcement is, however, whether they successfully protect water-dependent beneficial uses such as fisheries and drinking water quality.[278] Perhaps the major shortcoming of the current regulatory framework is the absence of a consistent and comprehensive system for monitoring watershed impacts.[279]

4. Making the Feedback Loop Work: Monitoring and Evaluation

On their face, both NFMA[280] and the Management Agency Agreements implementing the states' nonpoint source control programs on national forest lands require the Forest Service to monitor whether the agency is actually achieving water quality goals.[281] At present, however, the Forest Service does little monitoring of water quality parameters.[282] Instead, the Service uses BMP implementation as a surrogate, with the presumption that if BMP's are followed, water quality standards will be met.[283] State monitoring has been even less extensive; it has usually been in response to citizen complaints and limited to review of forest plans, EIS's/EA's, and occasional visual inspection of timber sales.[284]

Monitoring only for BMP implementation makes sense from an enforcement standpoint because, as described earlier, most timber contractors have been released from any liability by the time water quality

275. 36 C.F.R. §§ 223.130-.145 (1988).

276. Interview with Brian Stone, *supra* note 270. *See* 36 C.F.R. §§ 223.130-.145 (1988) (Suspension and Debarment of Timber Purchasers).

277. These findings are discussed in more detail *infra* at notes 314-27 and accompanying text (findings of the Region 5 BMP Survey).

278. *See generally* C. WILKINSON & M. ANDERSON, *supra* note 13, at 223.

279. *See id.*

280. For discussion of the NFMA forest plan monitoring requirements, see THE CITIZENS' GUIDE TO FOREST PLANNING, *supra* note 153, at 12. The monitoring regulations are at 36 C.F.R. § 219.12(k) (1988).

281. MANAGEMENT AGENCY AGREEMENT BETWEEN THE STATE WATER RESOURCES CONTROL BOARD, STATE OF CALIFORNIA, AND THE FOREST SERVICE, U.S. DEPARTMENT OF AGRICULTURE 2 (item 1(d)) (1981).

282. The Forest Service has monitored herbicide/pesticide application and claims it can demonstrate conclusively that there will be no violation of state standards if BMP's are followed. *See* REGION 5 BMP SURVEY, *supra* note 34, at 4b-7b.

283. Interview with John Rector, *supra* note 187.

284. Interview with William Reichmuth, *supra* note 31. California's limited role in water quality monitoring on National Forest lands was confirmed by John Rector, *supra* note 187. Oregon also limits its monitoring on National Forest lands to responding to citizen complaints; however, the state is now negotiating with the Forest Service to intensify the Service's monitoring obligations. Interview with Nancy Lillquist, *supra* note 221.

impacts are seen. However, BMP monitoring does not answer the more fundamental question of whether the current system protects water quality and water-dependent uses. For this reason, EPA is now pressing both the states and the Forest Service to adopt the "three part feedback loop" described earlier.[285]

More specifically, EPA and some states have recently begun a campaign to force the Forest Service to monitor watersheds where projects have a high potential for sedimentation and/or habitat damage.[286] EPA has done this through the intergovernmental review process for Forest Service EIS's and EA's.[287] Some states are going further by renegotiating their Management Agency Agreements with the Forest Service to include more substantive monitoring provisions.[288] As a result, over the next several years the data to evaluate definitively whether, and in what settings, BMP's are meeting water quality standards should become available.

IV
ARE BMP'S WORKING?

The two previous sections described the planning system for identifying environmentally sensitive areas of the national forests and the administrative system that EPA, the states, and the Forest Service use to implement water quality controls. This section identifies and analyzes the major shortcomings of this system, drawing from several BMP evaluations done by the Forest Service and independent parties.

Taken together, these studies reveal that effective use of BMP's as a water quality control hinges on the following three steps. First, forest planning and the NEPA review process must prohibit land-disturbing activities in areas where water quality degradation is unavoidable even with the use of BMP's. Harvesting in areas where effects are avoidable, but only at unacceptable costs, must also be precluded. Second, imple-

285. *See supra* notes 215-19 and accompanying text.

286. *See, e.g.*, REGION X, WILLAMETTE COMMENTS, *supra* note 190, at 3.

287. *See, e.g.*, REGION IX, U.S. ENVIRONMENTAL PROTECTION AGENCY, COMMENTS ON THE SOUTH FORK FIRE RECOVERY SALVAGE PROJECT, FINAL EIS, SHASTA-TRINITY NATIONAL FOREST (Sept. 1988); REGION X, U.S. ENVIRONMENTAL PROTECTION AGENCY, COMMENTS ON THE SILVER FIRE RECOVERY PROJECT (May 1988); REGION X, U.S. ENVIRONMENTAL PROTECTION AGENCY, COMMENTS ON THE PROPOSED LAND AND NATURAL RESOURCE MANAGEMENT PLAN AND DRAFT ENVIRONMENTAL IMPACT STATEMENT FOR THE WILLAMETTE NATIONAL FOREST, OREGON (May 1988); REGION X, U.S. ENVIRONMENTAL PROTECTION AGENCY, COMMENTS ON WING CREEK-TWENTY MILE AREA PLAN DRAFT EIS (Apr. 1988); and REGION X, U.S. ENVIRONMENTAL PROTECTION AGENCY, COMMENTS ON THE DRAFT EIS AND PROPOSED LAND AND NATURAL RESOURCE MANAGEMENT PLAN FOR THE UMATILLA NATIONAL FOREST (Mar. 1988).

288. Oregon appears to be taking the lead in this regard. Oregon's MAA is being renegotiated as part of the state's management strategy under CWA section 319. *See* OREGON DEPARTMENT OF ENVIRONMENTAL QUALITY, DRAFT NONPOINT SOURCE STATEWIDE MANAGEMENT PLAN FOR OREGON 45-46, 74 (Nov. 1988).

mentation of BMP's must ensure that in areas where logging does go forward, generalized practices are translated into effective and enforceable site-specific prescriptions. These prescriptions must be implemented through Forest Service oversight and enforcement during the sale. Finally, water quality must be monitored and management practices adjusted where it is shown that they do not protect water-dependent uses.

A. Excluding Sensitive Areas from Harvesting

1. Timber Suitability Analyses

The success of the Forest Service in excluding water quality sensitive lands from timber management has not been evaluated on a region-wide basis. However, the Wilderness Society has evaluated individual forest performance in its reviews of forest plans.[289] These reviews identify several serious problems with the process that some staffs use to identify lands suitable for timber harvest.[290]

One class of suitability analysis problems is illustrated in the Shasta-Trinity National Forest in northwestern California. This forest (as well as at least several others in California and the Pacific Northwest) uses a "Timber Suitability Model"[291] to determine what areas can be logged. The model works by ranking thirteen criteria relating to soil productivity, erosion and mass wasting potential, and the ease of reforestation.[292]

The first problem with this type of analysis is that it takes thirteen important objectives and tries to translate them into one figure. Inevitably, this approach suppresses the importance of individual criteria and may mask serious and unavoidable management problems—as would happen, for instance, if an area had highly productive but landslide-prone terrain.[293] A second problem with many suitability models is that they do not incorporate or reflect all of the NFMA standards applicable to timber harvesting.[294] In the Shasta-Trinity model, at least one NFMA criterion, the plan's effect on water quality and fish habitat, appears to be omitted altogether.[295]

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289. *See, e.g.*, THE WILDERNESS SOCIETY, *supra* note 17.

290. *Id.* at 26-27.

291. U.S. FOREST SERVICE, SHASTA-TRINITY NATIONAL FORESTS, PROPOSED FOREST LAND AND RESOURCE MANAGEMENT PLAN app. I, table I-1 (Timber Suitability Model) (1986) (cited in THE WILDERNESS SOCIETY, *supra* note 17, at 26).

292. *Id.*

293. THE WILDERNESS SOCIETY, *supra* note 17, at 27 (noting some problems with the Timber Suitability Model).

294. *Id.* The statutory criteria are discussed *supra* at notes 171-73 and accompanying text. They are codified at 16 U.S.C. § 1604(g)(3)(E)(i)-(iii) (1982 & Supp. V 1987).

295. THE WILDERNESS SOCIETY, *supra* note 17, at 51-52. It could be argued that slope and the other factors considered are proxies for water quality and fish habitat, but slope already appears to serve as a proxy for other NFMA criteria such as erosion and mass wasting potential. *See id.* at 27.

Other forest plans have given even less attention to the environmental suitability of potential timber lands. The draft forest plan for the Clearwater National Forest in Idaho, for example, failed to identify *any* lands as unsuitable in spite of the fact that the forest contains over 284,000 acres of lands with slopes exceeding sixty percent and has a history of widespread landslides due to past logging.[296] Because these suitability determinations are difficult to reverse, and govern harvesting for at least ten years after they are made, environmental organizations have focused much effort on scrutinizing[297] and, in some cases, challenging them.[298] The states and EPA, however, often wait to act until there are specific water quality concerns—a strategy that may need to change if further progress is to be made in controlling nonpoint source pollution in the national forests.

2. *Cumulative Effects*

The effective exclusion of environmentally sensitive lands from logging also requires consideration of the potential cumulative effects of different projects within the same watershed.[299] There are two types of cumulative effects: the *additive* effects of different projects in the same watershed, and the *synergistic* effects of multiple projects.[300] Whether a given effect is additive or synergistic may vary from watershed to watershed, making it extremely difficult to predict cumulative effects.

Largely because of the difficulty in predicting cumulative effects, the Forest Service generally takes a conservative approach to managing them. Most agency models manifest this approach by assuming that the effects of geographically related projects will be synergistic.[301]

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296. *See generally* THE WILDERNESS SOCIETY, A CRITIQUE OF THE CLEARWATER NATIONAL FOREST PROPOSED PLAN 22-29 (1985).

297. *See* THE WILDERNESS SOCIETY, *supra* note 17, at 1.

298. *See, e.g.*, The Wilderness Soc'y v. Tyrell, No. S-88-1322 (E.D. Cal. Nov. 21, 1988) (order granting preliminary injunction against the U.S. Forest Service concerning implementation of the South Fork Fire Recovery Salvage Project).

299. Cumulative effects result from two or more operations separated by either space or time (or both), where the effects of one project persist long enough so that they become cumulative with other practices. Ice, *Managing Cumulative Effects: An Industry Perspective*, PROCEEDINGS, *supra* note 1, at 131.

300. *See* Rice & Berg, *Summary and Synthesis: Cumulative Impacts*, PROCEEDINGS, *supra* note 1, at 150, 151.

301. *See id.* The model used by the Shasta-Trinity and many other national forests in California and Oregon has been criticized, however, because it is based on the assumption that so long as no more than 12% of the land area in a watershed is compacted no detrimental changes will occur. Harr, *Myths and Misconceptions About Forest Hydrologic Systems and Cumulative Effects*, PROCEEDINGS, *supra* note 1, at 137, 138-39. Harr comments that:

> A 12 percent compaction corresponds to a 32 percent increase in size of peak flow. . . . Are we ready to believe streams can accommodate a 32 percent increase in the size of an 8- to 15-year event without adverse effects on the channel? . . . Without reference to the stream channels in question, we cannot arbitrarily say nothing will happen until the mythical 12 percent figure is surpassed.

Furthermore, the Forest Service has decided to address cumulative effects by scheduling timber sales and other management activities over time rather than by using BMP's.[302] As a result, the effects of any one project are largely dissipated before another is begun.[303] In effect, project scheduling is another (temporal) form of land use planning and, given the relative certainty that it will work, should be commended as consistent with the agency's water quality responsibilities under NFMA and CWA.

Unfortunately, however, scheduling only works where there is unified control over all harvesting on a stream and its tributaries. Many national forest lands are interspersed with private holdings.[304] As a result, effective scheduling of mixed ownerships depends on either voluntary cooperation of landowners, or state-imposed scheduling under the authority of Forest Practice Acts. In California, at least, the state currently does not have authority under its act to impose scheduling on private landowners.[305]

Scheduling is also complicated by the fact that the water quality effects of timber management on private lands are often more severe than those found on federal lands. Usually this stems from relatively loose application and enforcement of Forest Practice Acts.[306] As a result, when logging is planned on both state and federal lands, and the state lands are logged first, scheduling may effectively preclude the Forest Service from acting until the effects of activities on private lands subside. In Oregon, for example, the state's proposed scheduling scheme prohibits logging more than thirty percent of a given land area in national forests during any ten-year period.[307] To account for the greater potential for water quality effects, only eleven percent of privately owned lands can be

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Id. at 139.

302. *See* THE WILDERNESS SOCIETY, *supra* note 17, app. F at 1 (critique of cumulative effects methodology).

303. This approach is criticized by some. *See, e.g.,* Rice & Berg, *Summary and Synthesis: Cumulative Impacts,* PROCEEDINGS, *supra* note 1, at 150, 151-52. However, assuming that the Forest Service is already applying BMP's to the "maximum extent practicable" as called for in section 319 of CWA, applying stricter BMP's would be nonsensical.

304. *See* Fairfax & Cowart, *Public Lands Federalism: Judicial Theory and Administrative Reality,* 15 ECOLOGY L.Q. 375, 410-12 (1988).

305. Weaver, Hagans & Madej, *Managing Forest Roads to Control Cumulative Erosion and Sedimentation Effects,* PROCEEDINGS, *supra* note 1, at 119, 123.

306. *See* THE WILDERNESS SOCIETY, *supra* note 17, at 58-59. Even in California, which is widely recognized as having the nation's strictest Forest Practice Act, it is generally accepted that the Forest Service's BMP's are more widely applied than the state rules for private lands. *Id. See also* O'Leary, *California 208 Activities: An Update,* in FORESTRY MANAGEMENT PRACTICES AND CUMULATIVE EFFECTS ON WATER QUALITY AND UTILITY 23-28 (June 1988) (National Council of the Paper Industry for Air and Stream Improvement, Inc., Tech. Bul. No. 435). This was also confirmed by Deborah Caldon of EPA Region IX, *supra* note 189.

307. Ice, *Managing Cumulative Effects: An Industry Perspective,* PROCEEDINGS, *supra* note 1, at 131, 135.

cut during a similar period.[308] Applying these restraints to a hypothetical 1,000-acre watershed—half in private lands and half in federal—if private owners harvest 100 acres before the Forest Service takes any action, only thirty acres of national forest lands could be cut during the next ten years.[309]

Because cumulative effects analysis is a required element of the NEPA review process, the question of who will get to log first on a given watershed has led to litigation or the threat of litigation to block projects on federal lands.[310] Inevitably, this pressure has created further tension between the Forest Service, the states, and private landowners over who will get what share of long-term harvesting schedules. Some national forests have responded to irresponsible practices on private lands by refusing to consider cumulative effects from non-Forest Service lands.[311] Although some pressure is being put on these forests to work with adjacent landowners, the interplay between public and private logging continues to be one of the most important unresolved water quality issues in California and Oregon.[312]

Both suitability analysis and cumulative effects planning, the two major tools the Forest Service uses to exclude environmentally sensitive lands from timber harvesting and road building, suffer from serious flaws. External pressures on local staff to increase the volume of timber being cut and internal pressures to keep projects going in order to fund other badly needed activities result in suitability analyses that mask risks to watersheds in complex formulae that purport to demonstrate no overall risk of harm.[313] Furthermore, by ignoring the water quality impacts of projects on nonfederal lands in scheduling projects on federal lands, at least some National Forests are overlooking potentially serious cumulative effects. These two shortcomings in the agency's approach to planning mean that logging and road building are permitted in areas where no BMP's can avoid significant erosion.

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308. *Id.*

309. These figures are determined as follows: Assuming the private owners harvest *first,* they would be allowed to cut up to 11% of 1,000 acres, or 110 acres in a ten-year period (looking at the watershed as a whole). Before the Forest Service cuts, therefore, the private owners have taken 100 acres of this "allocation," leaving 10 acres unused. The percentage of land area that can be cut by the Forest Service (yielding an equivalent water quality impact) is 30% or roughly three times that of a private landholder. Since there are only 10 acres available, the 10-acre surplus translates into approximately 30 acres if cut by the Service. If the Forest Service had cut first, it could have cut 300 acres.

310. *See, e.g.,* National Wildlife Fed'n v. United States Forest Serv., 592 F. Supp. 931 (D. Or. 1984); EPIC v. Johnson, 170 Cal. App. 3d 604, 216 Cal. Rptr. 502 (1985).

311. Interview with Tom Stokley, *supra* note 85; interview with William Reichmuth, *supra* note 31.

312. Interview with Nancy Lillquist, *supra* note 221. Interview with John Rector, *supra* note 187.

313. *See* THE WILDERNESS SOCIETY, *supra* note 17, at 26-30.

B. BMP Implementation

The second class of issues facing a nonpoint source water quality management regime based on the use of BMP's involves the question of how diligently these measures are applied on the ground. This includes the subsidiary issues of agency response when BMP costs exceed the capacity of the agency or the contractor to pay, line staff reaction to highly variable site conditions that can never be entirely anticipated in written prescriptions, and agency commitment to educating and, where necessary, compelling contractors to comply with environmentally oriented management practices. Because these issues are inextricably intertwined in practice, they are discussed together in this section.

The leading study of BMP implementation specific to national forest lands was done by Region 5 of the Forest Service (California).[314] During 1984 and 1985, Region 5 reviewed BMP implementation in a series of visits to seven timber sales in the Klamath National Forest and several new and reconstructed road sites in the Six Rivers and Sierra National Forests.

The reviews were generally positive and concluded that BMP's were being applied to projects in their planning, layout, and harvesting phases.[315] The study, however, did identify two areas of concern: reforestation practices and road construction.[316] According to the report, reforestation, and in particular the controlled burns used in many forests to clear lands for replanting, often interferes with a key BMP—the streamside buffer.[317] Interference occurs when burns spread to the timber and vegetation in the streamside zone, typically as a result of dry conditions and/or steep slopes. The intrusion of the burn into the buffer eliminates the buffer's capacity to filter upstream erosion and removes cover that moderates temperature increases in shallow, slow-moving streams.[318]

In addition, the study found that BMP's for road construction are not implemented in some situations, particularly where the cost of preventive measures is high or contract administration difficult.[319] According to the survey, cost considerations came into play in two ways:

314. REGION 5 BMP SURVEY, *supra* note 34. For a good survey of other BMP implementation studies that have been performed on federal, state, and private lands, see NATIONAL COUNCIL OF THE PAPER INDUSTRY FOR AIR AND STREAM IMPROVEMENT, INC., TECH. BUL. NO. 538, PROCEDURES FOR ASSESSING THE EFFECTIVENESS OF BEST MANAGEMENT PRACTICES IN PROTECTING WATER AND STREAM QUALITY ASSOCIATED WITH MANAGED FORESTS (Jan. 1988).

315. REGION 5 BMP SURVEY, *supra* note 34, at 6.

316. *Id.*

317. *See generally id.* at 8a-9a.

318. *See* Curry, *Water Quality Protection in Forest Management: Are Best Management Practices Working?*, PROCEEDINGS, supra note 1, at 55, 57 (discussing buffer strips).

319. REGION 5 BMP SURVEY, *supra* note 34, at 6. Specific problems related to costs were the use of low water crossings in streams, the failure to use specified surfacing treatments, and a lack of oversight of "pioneer" (initial road cuts into newly harvested areas) roads to insure

through general cost-saving efforts imposed by senior Forest Service staff, and through the attempts of contractors to cut their own costs where they were directly responsible for environmental protection measures.[320]

The scaling back or elimination of BMP's to cut costs is contrary to section 319 of CWA, which requires BMP's to the "maximum extent practicable."[321] Nevertheless, cost containment pressures on line staff continue to be severe, particularly where the costs of BMP's are so high that they threaten a sale's feasibility. Again, the problem can largely be traced to historically high levels of harvesting and pressure through the RPA national timber production goals to continue these levels.[322] According to the Region 5 Survey, "[a]ttainment targets, though necessary from a management viewpoint to efficiently manage such a large agency, are sometimes counter productive, putting pressure on field managers to get the job done, in spite of possible risks to water quality."[323] As the report goes on to say, "[w]ater quality can't be compromised legally in order to reduce . . . costs. This is simply not an acceptable alternative."[324]

The Forest Service's ability to react to unexpected site conditions affects BMP implementation in both timber harvesting and road construction. The Region 5 survey found that when new erosion hazards are discovered after work has already begun, Forest Service staff with the expertise to respond are not routinely available to determine exactly what remedial or precautionary steps should be taken.[325] This results from both a lack of communication between sales administrators and field specialists and, more importantly, from reductions in the level of staffing.[326]

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that BMP's are applied before winter rains. *Id.* at 5c-6c.

These findings are confirmed by a series of events in the Shasta-Trinity National Forest. Local residents, some of whom worked for the Forest Service, found that the streamside buffer zone BMP's were not being implemented and asked the North Coast Regional Water Quality Board to investigate. The Board found that the *streamside BMP's were not being followed in 40% of the sales.* As a result of the ensuing publicity, the Forest Supervisor called a forest-wide meeting and made it clear to staff, and sales administrators in particular, that they would be held responsible for any BMP violations. One staff member who later cut a streamside area was suspended without pay and eventually left the Forest Service. Interview with Tom Stokley, *supra* note 85. According to Mr. Stokley, the outcome has been that the Shasta-Trinity Forest now generally does a good job implementing BMP's. *See also* THE WILDERNESS SOCIETY, *supra* note 17, at 54 (discussing violations in implementing BMP's in the Shasta-Trinity Forest).

320. *See generally* REGION 5 BMP SURVEY, *supra* note 34, at 7c-8c.

321. CWA § 319(a)(1), 33 U.S.C. § 1329(a)(1) (Supp. V 1987).

322. C. WILKINSON & M. ANDERSON, *supra* note 13, at 379-80 (describing the RPA program).

323. REGION 5 BMP SURVEY, *supra* note 34, at 10a. *See also id.* at 5c (regarding lower quality cost-saving efforts for stream crossings), 7c (regarding the prohibitive costs of replanting timber roads).

324. *Id.* at 5c.

325. *Id.* at 7a, 12a, 3c.

326. *See, e.g., id.* at 3c ("[s]ome forests are not staffed with a sufficient number of earth

According to one estimate, the number of field specialists in Region 5 has been cut by over thirty percent since the early 1980's.[327]

It is difficult to determine from the Forest Service's study of a few forests how pervasive BMP implementation problems are, but the study's findings as to the type of problems encountered are supported by other, independent reports. One such survey of BMP implementation in the Shasta-Trinity National Forest, performed by the California Regional Water Quality Control Board—North Coast Region, confirmed the Forest Service's finding that "[m]ost of the more substantial BMP violations dealt with ineffective streamside management zones."[328]

The Regional Board report also raised disturbing evidence that BMP violations were relatively widespread. In its inspection of forty-two timber sale units on the Hayfork Ranger District, the state found seventeen deviated from BMP's (minor technical violations were not included in this total).[329] Three units violated not only BMP's, but also the Regional Board's water quality standards.[330]

The ensuing negative publicity from this survey led to an extraordinary response by the Forest Supervisor for the Shasta-Trinity, Mr. Robert Tyrell. Mr. Tyrell called his entire staff to a meeting and let it be known that personnel would be held responsible for any future deficiencies in BMP implementation for timber sales.[331] As a result, BMP implementation is now reported to be relatively conscientious, and local environmental organizations see the Shasta-Trinity as a model of how to apply BMP's.[332]

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scientists to walk each preliminary road location.").

327. Interview with John Rector, *supra* note 187.

328. Letter from Benjamin Kor, Executive Director Regional Board, to Susanne Twight, Chairwoman Trinity County Board of Supervisors (June 18, 1986) (summarizing the results of the Board's field investigation). This report was performed in response to a formal request by Trinity County.

329. *Id.*

330. *Id.* A more positive picture of BMP implementation was produced from an evaluation done in Idaho that compared the implementation of Forest Service BMP's with the use of Forest Practice Act rules on private lands. Bauers, *Evaluation of Nonpoint Source Impacts on Water Quality from Forest Practices in Idaho: Relation to Water Quality Standards,* in PERSPECTIVES, *supra* note 15, at 455-58.

In this study 10 national forest sites were inspected. Three of the sites showed minor defects in BMP implementation. *Id.* at 456. Commenting on the Forest Service's performance, the author states that:

> Overall administration of [all aspects of] forest practices by the Forest Service helps prevent water quality impacts. . . . Extensive planning and consideration of environmental effects are major positive factors in achieving water quality protection not evident in other land ownerships. [However,] [t]he costs associated with Forest Service administration of timber sales is much higher than under State or private ownerships.

Id. at 456.

331. *See supra* note 319.

332. Interview with Tom Stokely, *supra* note 85.

C. *Do BMP's Work When They Are Implemented?*

The final test of an effective water quality control strategy based on BMP's is its success in protecting and enhancing water-dependent uses. All BMP's rest on predictions that specific management practices will work under the constraints of the project's natural setting. Monitoring and evaluation are essential to determine whether these predictions are valid and to adjust practices where they are not. As discussed above, this is still not done on a regular basis.[333] Without systematic evaluations it is difficult to generalize about the success of fully applied BMP's. The limited studies done to date do suggest that where BMP's are fully applied, they generally meet water quality standards and protect water-dependent uses.[334]

1. A Success Story

The most encouraging study of BMP efficacy resulted from litigation challenging the adequacy of the Forest Service's EA's in the Fox Creek unit of the Six Rivers National Forest in California.[335] The study showed that BMP's reduced landslides on steep, clearcut slopes by forty-nine percent.[336] Landslides from roads were reduced even further, by eighty-four percent.[337] Perhaps most importantly, the study found that fine sediments in streams (which are directly linked to salmonid emergence[338]) were held constant during the ten years of harvesting that BMP's were used.[339] In addition, the area used by steelhead for spawning (e.g., the area of suitable fish habitat) increased over the period.[340]

Part of the reason for the success of the Fox Creek BMP's may be that roads were relocated to ridge top or upper slope positions to avoid landslide hazards,[341] and that an additional twenty percent of the land area was removed from the timber base (and from road locations) prior to the study period.[342] This only reinforces the point made above that careful preproject planning and suitability analyses are an integral part of any effective BMP system.

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333. *See, e.g., supra* notes 192-200 and accompanying text.

334. *See* REGION 5 BMP SURVEY, *supra* note 34, at 14a-15a.

335. For a general discussion of the effectiveness of BMP's in the Fox Creek Unit, see Knopp, Smith, Barnes, Roath & Furniss, *Monitoring Effectiveness of Best Management Practices on National Forest Lands,* PROCEEDINGS, *supra* note 1, at 48-54.

336. *Id.* at 53.

337. *Id.*

338. *See supra* notes 22-25 and accompanying text.

339. Knopp, Smith, Barnes, Roath & Furniss, *Monitoring Effectiveness of Best Management Practices on National Forest Lands,* PROCEEDINGS, *supra* note 1, at 53.

340. *Id.* at 52-53.

341. *Id.* at 50, table 1.

342. *Id.* at 52.

The Fox Creek unit is in a highly erosive watershed that receives the highest annual precipitation of any area in California.[343] Although comparisons to other watersheds are suspect, if BMP's work in Fox Creek where conditions are generally unfavorable, they should work in other watersheds if properly applied.

2. *BMP's That Are Still in Question*

The efficacy of two (post-planning) classes of BMP's is still uncertain.[344] The first is the use of streamside buffer zones to filter or block sediment caused by upslope disturbances such as roads and timber yarding.[345] Studies by both the Forest Service and independent researchers show that buffer zones work to filter out sediment from upslope activities only where the buffer is wide and relatively level.[346] In steep, narrow watersheds, sediment is often transported through buffer zones, so the only way to control sedimentation is to limit or prohibit upslope activities.[347]

BMP efficacy is also still in question in the broader context of road construction and maintenance. Although the Fox Creek study showed an eighty-four percent reduction in landslides as a result of careful road location and engineering, another study showed that, at most, only twenty-five percent of the sedimentation from roads was avoidable through these techniques.[348]

Region 5's implementation survey also suggests that road-related BMP's, even if properly carried out, are not always effective in meeting water quality standards in the short-term. The survey states:

> The only conclusion that can be made based on the data collected to date is that the RWQCB [Regional Water Quality Control Board] Basin objectives [standards] for suspended sediment and turbidity are exceeded for a short period of time following the first rain-producing storm. Over the long-run, [however,] water quality objectives are being met by implementing BMPs.[349]

If this report's conclusion is accepted on its face, most experts presumably would agree that short-term violations of sedimentation stan-

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343. *Id.* at 49.

344. A third type of BMP that is under some attack is timber scheduling to reduce cumulative effects. For more discussion of scheduling, see *supra* notes 302-12 and accompanying text.

345. Curry, *Water Quality Protection in Forest Management: Are Best Management Practices Working?*, PROCEEDINGS, *supra* note 1, at 55, 57.

346. *See id.* at 57-59.

347. *Id.* at 60.

348. McCashion & Rice, *supra* note 75, at 23, 25. Some of the difference in these studies may be due to the fact that the latter assumed that roads would not be relocated by more than one mile out of the initial alignment and did not include the effects of reduced road area achieved by locating sales closer to existing roads (which was done in Fox Creek).

349. REGION 5 BMP SURVEY, *supra* note 34, at 10c.

dards are not a cause for concern. High levels of sedimentation occur naturally in most watersheds following peak storms. Neither fish habitat nor fish populations are seriously affected so long as large amounts of sediment are not deposited in spawning beds.[350] Road-related landslides and slumps, however, can deliver massive amounts of material into a stream bed. In these quantities, the damage to habitat can be long-lasting even if the level of sedimentation in the water rapidly decreases.[351]

Evaluations of road-related BMP's are particularly difficult because the full effects of logging roads are not felt until long after harvesting and reforestation. The time frame of the Fox Creek study may have been too short to pick up long-term effects.[352] This time lag problem is illustrated by the findings of a report on the causes of the highly publicized watershed damage and sedimentation in Redwood National Park.[353] The report concluded that failure to maintain logging roads upstream of the Park, long after harvesting was completed, was the major cause of sedimentation in the affected watershed.[354]

The Forest Service needs to take three key actions for a BMP system to protect water quality in the national forests. First, the agency's forest planning and NEPA review processes must remove environmentally sensitive lands from the timber base and preclude the development of new roads where water quality degradation is unavoidable. Next, the agency must translate idealized written management prescriptions into appropriate site-specific practices that are communicated to, and followed by, line staff and independent contractors. Finally, BMP's must be monitored in a representative sample of settings to ensure that the assumptions built into these practices are valid, and that they are adjusted as the Forest

350. A study of one watershed showed widespread violation of California's water quality standards. However, no declines in fish populations were recorded over a ten-year period and the violations of the standards only occurred over short periods following heavy storms. PACIFIC SOUTHWEST FOREST AND RANGE EXPERIMENT STATION, FOREST SERVICE, U.S. DEPARTMENT OF AGRICULTURE, A WATERSHED'S RESPONSE TO LOGGING AND ROADS, SOUTH FORK OF CASPAR CREEK, CALIFORNIA, 1967-1976 (1979).

Short-term effects, however, will violate the antidegradation component of water quality standards in most states. While recognizing these violations, the Forest Service argues that "[w]ater quality standards developed for nonpoint sources must not be used as a direct means of control, . . . antidegradation policy must be applied on a watershed basis over time, rather than requiring no change for individual points on stream segments." Beasley & Harper, *U.S. Department of Agriculture's Perspective on Silvicultural Nonpoint Source Water Quality,* in PERSPECTIVES, supra note 15, at 321, 322. In effect, the Forest Service admits that water quality standards are violated for short periods of time, but takes the position that the standards need to be modified, averaged in some manner over time, or not enforced at all. *Id.*

351. *See supra* notes 16-33 and accompanying text.

352. *See, e.g.,* Ice, *Managing Cumulative Effect: An Industry Perspective,* PROCEEDINGS, *supra* note 1, at 131 (discussing the cumulative effects of different events which are separated by either time or space).

353. Weaver, Hagans & Madej, *Managing Forest Roads to Control Cumulative Erosion and Sedimentation Effects,* PROCEEDINGS, *supra* note 1, at 119.

354. *Id.* at 123.

Service learns more about managing road and timber projects to avoid water quality problems.

Weaknesses in two of the three elements of this system persist: the Forest Service has failed to protect some areas from development where damage to watersheds is unavoidable, and some national forests lack commitment to the full application and enforcement of BMP's. These weaknesses stem from continued pressure on line staff in the Forest Service to meet national and regional timber production goals.

Production goals are not solely the result of administration interest in supporting the domestic timber industry. They also are reflected in Congressionally approved budgets that encourage timber production to maintain logging-dependent communities and in statutes that tie individual forest budgets for nontimber activities to the level of timber production.[355] While these purposes are laudable, they necessarily conflict with other Congressional mandates for clean water and multiple use.

In the absence of clear Congressional priorities, the administration has been free to encourage an agency culture that sees water quality as a constraint rather than a goal. While this culture is not uniformly shared in the Forest Service and is changing in some National Forests in response to local political and legal pressure, the tension between the "timber fundamentalists" and the "earth-first fundamentalists" remains. The struggle over best management practices reflects this tension and the need to accommodate the differing needs and priorities of individual national forests and their users. Until a more definitive resolution is made at the national level, this battle will continue under the banner of multiple use.

V

CONCLUSION: AREAS FOR REFORM

The pressures for high levels of timber harvest in the national forests of California and the Pacific Northwest are not going to change dramatically. The region's forests are too important to the regional economy to make this either likely or desirable. There are, however, some changes in the internal dynamics of the Forest Service that could be made to ensure that the agency fulfills its multiple use mandate in a more balanced fashion. In addition, there are several areas where the states could take a more constructive approach to cooperative management of timber and water quality.

355. *See, e.g.*, C. WILKINSON & M. ANDERSON, *supra* note 13, at 83-89 (discussing the RPA's relationship to the Forest Service's budget).

A. Restructuring Incentives

1. Removing Incentives That Keep Environmentally Sensitive Lands in the Timber Base

The Knutson-Vandenberg Act of 1930[356] allows the Forest Service to retain the costs of reforestation from its timber sales receipts.[357] These sums can fund watershed restoration, wildlife enhancement, and other nontimber programs. In effect, this provision encourages the Forest Service to log environmentally sensitive areas to fund the restoration of fish and wildlife habitat that has already been degraded by past projects.[358]

It makes little sense to force local staff to harvest areas that should be withdrawn from the timber base to cure past environmental damage. This system already has been criticized for leading to below-cost timber sales.[359] Congress should repeal the statute and adequately fund restoration projects. In the meantime, EPA and the states should continue to pressure the Forest Service to comply with its obligations under NFMA and CWA and to withdraw sensitive lands from harvesting.

Incentives should also be changed in the context of cumulative effects, particularly where these effects stem from projects on both federal and private lands. Currently, the Forest Service's BMP's make it theoretically possible for the agency to harvest more land than private operators, with the same environmental effects.[360] This potential benefit, however, will be captured by private landowners who, because they can respond to market forces more rapidly, cut right up to the maximum land area allowed under a cumulative effects scheduling program (including any Forest Service 'allotment'). The only way around this problem is to schedule projects on other than a first come, first serve basis. Ideally, landowners on a watershed should (at least initially) be limited to cutting a "fair share" based on their acreage and management practices.[361]

EPA and the Forest Service need to encourage states to amend their Forest Practice Acts so that the appropriate state agency has the legal authority to coordinate scheduling on streams where cumulative effects are a concern. Unified authority to schedule harvesting, combined with a system that credits operators with an increased allowable cut if they apply BMP's, would give everyone, including the Forest Service, an incen-

356. Ch. 416, 46 Stat. 527 (codified at 16 U.S.C. §§ 576-576b (1982)).

357. 16 U.S.C. § 576b (1982).

358. *See* R. Coats, *Cumulative Watershed Effects: A Historical Perspective,* PROCEEDINGS, *supra* note 1, at 110.

359. *See* C. WILKINSON & M. ANDERSON, *supra* note 13, at 162-70 (discussing uneconomical timber management practices).

360. *See supra* notes 299-313 and accompanying text.

361. *See* R. Curry, *A Critique of USDA Forest Service Application of Best Management Practices,* in THE WILDERNESS SOCIETY, *supra* note 17, at app. E (analysis of the Shasta-Trinity Plan: Fair-Share Policy).

tive to adopt and implement effective management practices. Not only would this ensure that the Forest Service considers adjacent projects in its cumulative effects analyses, it would also help move the entire forestry industry toward a higher standard of water quality control.

2. *Agency Commitment to Implementing BMP's*

The BMP implementation evaluations summarized in the preceding section, and the experience in the Shasta-Trinity National Forest in particular, demonstrate that effective implementation of BMP's depends on two critical factors. First, the Supervisor for each national forest must hold the staff accountable for BMP implementation.[362] The Region 5 study recommends making BMP implementation a part of the standard evaluation for field staff performance.[363] In serious cases, the Forest Supervisor must be willing to discipline staff who repeatedly ignore BMP's. As one leading commentator has stated: "Like it or not, . . . we are in the business of 'replacing old social and cultural patterns' in the management of nonpoint sources of pollution."[364]

Second, a forest staff's commitment to applying BMP's is largely dependent on sustained external pressure from citizens and local government, followed by inspections by state and/or regional water quality officials. The Shasta-Trinity example is not isolated. Similar responses have occurred in the Suislaw and Siskiyou National Forests following intense public scrutiny of proposed timber sales.[365] In California, where public scrutiny of timber sales and road plans is a way of life, Region 5 of the Forest Service has trained close to 1,600 staff members in the use of BMP's since 1982.[366]

What of those forests that lack active citizen and local government oversight? For now, the burden must be picked up by the states and EPA.[367] Favorable precedents in national forests where there is oversight should ease the amount of effort needed to work with more remote forests.

Finally, effective external pressure on the Forest Service depends on adequate information, and information will be developed only by ensur-

362. *See supra* notes 328-32 and accompanying text.

363. REGION 5 BMP SURVEY, *supra* note 34, at 8.

364. Covington, *Best Management Practices for Water Pollution Control: A National Perspective,* PROCEEDINGS, *supra* note 1, at 19, 22.

365. *See* Letter from Robert Burd, Director, Water Division, EPA Region X, to Ronald McCormick, Forest Supervisor, Siskiyou National Forest (regarding the Silver Fire Project).

366. Leven, Rector & Doty, *Water Quality Protection on National Forest Lands in California,* PROCEEDINGS, *supra* note 1, at 27, 30.

367. Interview with Tom Stokley, *supra* note 85. The fact that state authorities only have the capacity to respond to citizen complaints was confirmed by William Reichmuth, *supra* note 31, and by Deborah Caldon, *supra* note 189. *See also* Curry, *Water Quality Protection in Forest Management: Are BMP's Working?,* PROCEEDINGS, *supra* note 1, at 55, 61.

ing that there are minimum monitoring requirements in forest plans and the projects that implement them. EPA has worked with the Forest Service to ensure that comprehensive monitoring plans are adopted through the forest-planning process.[368] The states must complete this effort by renegotiating their Management Agency Agreements to set specific requirements for project-level water quality monitoring.[369]

Not all projects need to be monitored, nor should they be given the high cost of such efforts. States should use the information developed in the forest plans to identify watersheds where monitoring is justified based on the value of water-dependent uses and the risk of nonpoint source pollution. With the information generated by long-term monitoring of both water quality and BMP implementation, the states and the Forest Service can improve those management practices that continue to be problematic, such as road design and maintenance. The iterative relation between BMP's and water quality can only be realized through the generation of such information.

B. Restructuring State Water Quality Standards for Forestry-Related Nonpoint Source Pollution

The numeric standards California uses for sediment and turbidity were set in 1972. Oregon's standards, including its exemption for temporary activities that are in the public interest, also date to the mid-1970's. Although CWA requires states to reevaluate water quality standards every three years,[370] neither state has seriously studied whether these controls effectively protect (or overprotect) water-dependent uses.

After more than fifteen years, it is time to reassess the relation between standards and the uses they are designed to protect. The water quality needed to support a fishery varies widely between forest streams, and because numeric water quality standards are fixed, they may grossly over or underprotect water-dependent uses. Biological water quality standards, on the other hand, rely on the survival of indicator species and can be tailored to individual watersheds.[371] Although CWA authorizes biological standards, the high cost of the studies needed to document and monitor indicator species means that they will never be used on all watersheds. They may, however, be appropriate as a means of validating numeric standards for particular classes of streams. The states, with

368. *See supra* notes 187-90 and accompanying text.

369. *See supra* note 288 and accompanying text.

370. CWA § 303(c)(1), 33 U.S.C. § 1313(c)(1) (1982).

371. For a more complete discussion of how water quality standards work, see NATURAL RESOURCES DEFENSE COUNCIL, CLEAN WATER: CITIZEN'S HANDBOOK ON WATER QUALITY STANDARDS 8-10 (1987). CWA and EPA authorize states to use biological water quality standards that rely on the survival of indicator species rather than an abstract numeric figure as their control, and some states are already using these biological standards. *See* Perry, Ward & Loftus, *Survey of State Water Quality Monitoring Programs,* 8 ENVTL. MGMT. 21-26 (1984).

EPA's encouragement if necessary, should cooperate with the Forest Service to evaluate whether biological standards are more appropriate controls for forestry-related nonpoint source pollution and, if so, how they should be applied.

It has been over twenty years since the land flowed "like wet concrete"[372] on the South Fork of the Salmon River in the Payette National Forest. While the Forest Service will always face conflicting demands for timber, fisheries, and clean water that open it to charges of "timber fundamentalism," agency culture can change. By giving the Forest Service the right incentives, the states and EPA can help make this change happen. Then and only then can the struggle between the "timber fundamentalists" and the "earth-first fundamentalists" finally be put to rest.

372. *See supra* note 16 and accompanying text.