1993 Starker Lectures

Communications, Natural Resources, and Policy

College of Forestry * Oregon State University
Communications, Natural Resources, and Policy

compiled by
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DEDICATION

“The Starker Lecture Series is sponsored by the Starker family in memory of T.J. and Bruce Starker. As leaders of modern forest management, T.J. and Bruce Starker were visionaries for sustainable forestry in Oregon.”

Thurman, known to all as T.J., was born in Kansas and lived his youth in Burlington, Iowa. He moved with his family to Portland in 1907 and began working in and studying forestry, graduating in the first class of foresters at Oregon Agricultural College in 1910. He then studied two years for a M.S. degree in forestry at the University of Michigan and returned to Oregon to work for the U.S. Forest Service. Subsequent employment with the forest products industry and a variety of summer jobs while he was teaching forestry at O.A.C./O.S.C., gave T.J. broad and thorough experience in all aspects of forestry.

T.J. began purchasing second-growth Douglas-fir land in 1936, the beginnings of Starker Forests. Through his work experiences, teaching forest management, and extensive civic involvement, T.J. had a major influence on sound forestry and community development in Oregon.
Bruce Starker studied for a forestry degree from OSC in 1940 and an M.S. in Forestry in 1941. After service with the Coast Guard, Bruce joined his father, T. J., in acquiring and managing Oregon forest land, always with an eye for sound reforestation, management and conservation for multiple benefits and values. He worked with university, state, and federal forestry agencies, as well as with private industry, to advance reforestation, management and equitable taxation to encourage private forest management. Bruce continued the family tradition of active community service in many ways, including civic activities, regional forestry work, and contributing to writing the Oregon Forest Practices Act.

With advances in knowledge, technology, and public environmental issues, forestry in Starker Forests has changed, but the constant value of tending the land remains unchanged. The sound, progressive forestry and community spirit of T. J. and Bruce Starker continue today.

“We, at Oregon State University, College of Forestry, family and friends, are pleased to be honored by the family with this lecture series.”
"Wise management of natural resources requires a delicate balance between the knowledge of biophysical resources themselves and the social and political context in which they are managed and used."

This year’s Starker Lecture theme, “Communication, Natural Resources, and Policy,” emphasizes that context and the need to communicate the diverse views of resource use represented in the policy process. Our speakers come from a variety of backgrounds and offer a number of suggestions for facing today’s policy challenges.

Gail Achterman is an attorney in private practice specializing in natural resources and environmental law. Formerly Special Assistant for Natural Resources for Oregon Governor Neil Goldschmidt, she is particularly interested in how public land use regulations affect private landowners. Her presentation argues for a careful look at more flexible regulations which allow landowners to make exchanges of land uses in order to meet their specific objectives, while preserving the overall integrity of land use plans.
Ed Marston is the publisher of *High Country News*, a biweekly focusing on environmental and social issues in the rural west. A former physics professor who has lived in rural Colorado for 20 years, he is particularly interested in the conflict between “traditional” rural interests and “new” rural interests. His presentation contends that the cultural and political differences between these two groups are often more important than the biological issues they are supposedly fighting about; resolving land management issues will require communicating and addressing those differences.

John Gordon is Pinchot Professor and former Dean of Forestry and Environmental Studies at Yale University. As a scientist who has been involved in a number of land use policy assessments, he is a “front line” observer of the interaction between science and policy. His presentation argues for a more clear and overt role for scientists participating in the policy formulation process, which he thinks would result in better policy and better science.

Jack Ward Thomas is Chief of the U.S.D.A. Forest Service in Washington, D.C. His Starker Lecture was given the day after he was named Chief, his first public address in that position (the Starker Lecture Committee takes full credit for the timing of events in the Nation’s capital which led to this situation). A former Forest Service scientist who has been a central figure in developing ecosystem management as the goal for forest policy, his presentation describes the challenges faced by the agency as it moves towards this new approach.

As always, organizing this series required a major effort on the part of the Starker Lecture Committee. I thank Sandie Arbogast, John Sessions, Susan Stafford, and Jim Wilson for the dedication and creativity that turned disparate ideas into a coherent theme and a group of outstanding speakers. It is truly a joint effort that accounts for the fine tradition of the Starker Lecture Series.

Bo Shelby
Professor of Forest Resources
"Laws are the way that people translate their values into social contracts, and thus ensure that the public interest is protected and social norms are met."

Because trees and forests hold a special place and a special value in virtually all world cultures, it is inevitable that societies will adopt laws regulating how forests are managed. The major questions are (1) how the laws will work, and (2) who will do the regulating.

The challenge for forest landowners today is not whether forest management practices will be regulated, but how and by whom. In this country, over 20 states have formal statutes regulating forest practices. In those states without such statutes, other state, federal, and local laws controlling pollution and land use affect forest land management. These laws reflect public concern about the environment in general, and forests in particular.

The debate about forest practices regulation, in the United States and worldwide, has raged for centuries. Under English law dating from the Middle Ages, land designated as a forest could not be farmed—or even entered. Forests were royal wildlife reserves, subject to special forest laws. In fact, the word forest comes from the Latin word foresta, which refers to game preserves. This contrasts to the Latin word nemus, which refers to woods and woodlands generally.1 Privately owned lands were included in areas designated as

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forests, and their use was strictly regulated under the forest laws. Trees could not be cut down without the permission of special officials. Felling had to be done in the presence of an official forester. Unauthorized felling was considered to be waste. All rights to use forest land were strictly regulated, with special rights granted for grazing (agistment), rights of way (cheminage), firewood gathering (botes) and the right to dig peat (turbary).2

These special forest laws reflect society’s attitude toward forests, and were not limited to England and Europe. Social and religious attitudes have always affected forest management. In such countries as India, individual religious trees, sacred groves, temple forests and sacred landscapes are recognized by religious leaders and the general population. In the United States, similar attitudes toward trees and forests are evident in Native American sacred landscapes, and in named trees (the Treaty Oak) and groves (named redwood groves or the “Millennium Grove” on the Willamette National Forest).3

The modern debate about what we call forest practices laws began with the battle between Gifford Pinchot and William Greeley. Pinchot not only advocated public ownership of the vast federal forest lands, he also argued that all private forest lands should be regulated to stop the abuses of “cut and get out timber operators.” Pinchot once wrote:

The most urgent need of the forests of America is similar control. Voluntary cooperation as a means of ending forest devastation has broken down. Almost every civilized country has, to some extent, public control of lumbering on private forest lands. In America, we must have such public control as will stop forest devastation. This is the key to our future in forestry.4

Greeley believed that landowner education, technical assistance and aid were preferable alternatives.5 The differences between Pinchot and Greeley reflect the classic debate between those who believe that people will do the “right thing” if they only know what to do and those who believe that rules must be adopted and enforced if the “right thing” is to be done. It is analogous to the basic rule of the road — do we really need speed limits and traffic patrols, or is driver education and a basic understanding of highway safety enough? Because we obviously need both, the question is, “How much of each?”

This paper addresses how this balance

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5 For further information on the debate between Pinchot and Greeley, see S. T. Dana, Forest and Range Policy — Its Development in the United States (1971), and H. Clepper, Professional Forestry in the United States (1971). See also John D. Ayer, “Public Regulation of Private Forestry: A Survey and a Proposal,” 10 Harvard J Legislation, 407, 409-13 (1973). The major battle between Greeley and Pinchot occurred from 1920 to 1924. Greeley’s position was reflected in the Clarke-McNary Act of 1924, 43 Stat 653, as amended, 16 USC §§ 471 (b), 505, 515, 564-70. Later Earle H. Clapp, as chief of the U.S.D.A. Forest Service, also campaigned for federal regulation of private forest lands. His campaign had a role in prompting adoption of 13 state forest practices laws between 1940 and 1950. The debate raged again in the 1970s as Congress considered Senator Hatfield’s National Timber Supply Act (an incentives-based approach) and Senator Metcalf’s Forest Lands Restoration and Protection Act (federal legislation that would have regulated all operations on commercial forest lands and created federal enforcement mechanisms). See Ayer, supra at 411-16.
has been struck regarding forest management practices to date, and reflects on the challenges we now face. It begins with a report on the state of state forest practices acts today. The implications of recent decisions on regulatory takings for modern forest practices regulations are discussed briefly. The paper then addresses why forest practices regulations at the state level are imperative today, and how regulatory programs can be developed that will achieve results cost-effectively. The basic question is: what are the most efficient, equitable, and acceptable means of ensuring public resource protection?

**STATE FOREST PRACTICES ACTS: A STATUS REPORT**

**The Extent of Current Regulation**

The primary requirements of forest practices laws that have been adopted by various states are as follows:

1. **Fire Control.** The earliest forest practices laws were designed to develop cooperative systems of forest fire protection. These laws set burning seasons, regulated slash disposal, controlled fire hazards, and funded firefighting efforts. The need for fire control was obvious, and government action was required because forest fires cross private property boundaries, require massive control efforts, and threaten both property and public safety. Thus, most state forestry agencies were established with a primary mission of fire fighting.

2. **Reforestation.** The earliest statutes, known as forest practices laws, addressed future productivity of forest lands by ensuring that regeneration or reforestation occurred. Many states passed seed tree laws, which typically set minimum cutting diameters or a minimum number of seed trees to be left per acre. Seed tree laws often specify species, size, number, and distribution of trees to be left, and sometimes specify the period of time during which trees must be allowed to grow. Recently, several state statutes have been amended to strengthen stocking requirements and to ensure that the newly planted trees actually survive and grow. For example, in 1991, the Oregon Legislature imposed a new stocking and reforestation success standard.

3. **Road Layout and Timber Harvest Operations.** The impact of logging roads on water quality has long been a public and landowner concern. Forest practices laws regulate the location of roads, stream crossings, yarding systems, and landing areas in order to minimize soil erosion, especially on steep or unstable slopes. Most forest practices acts regulate these aspects of logging operations. In several states,

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forest practices regulations are recognized as the best management practices under the federal Clean Water Act. Even though silvicultural activities are exempt from permitting requirements under the Clean Water Act, they are regulated under state forest practices programs or water quality programs.8

(4) Silvicultural Methods. Clearcutting has been controversial for decades. Extensive litigation regarding clearcutting on federal forest lands resulted in passage of the National Forest Management Act in 1976. Most state forest practices acts now regulate the size of clearcut allowed and, in some states, the proximity of one clearcut to another. These restrictions are aimed primarily at controlling the impact of timber harvesting on water quality. Those who support clearcut size restrictions also justify them on the basis of aesthetics and wildlife habitat. In California, regulations require that clearcuts be irregularly shaped, in order to blend with natural patterns and features. In some states (e.g., Nevada), clearcutting is prohibited.

(5) Chemical Use. Concerns about aerial application of herbicides and fertilizer have resulted in the regulation of chemical application on forest lands. These regulations usually require buffer areas for water bodies and residences, and restrict the timing of applications and the chemicals that can be used. Forest practices regulations operate in conjunction with requirements of the Federal Insecticide, Fungicide, and Rodenticide Act, and impose additional requirements on the use of herbicides by forest landowners.

(6) Air Pollution. Smoke from slash burning creates air pollution. Many states have chosen to regulate slash burning through forest practices regulations, rather than state environmental quality regulations. Slash burning regulations are designed, not only to ensure adequate fire control, but also to minimize air pollution in populated areas by requiring that burning be done under conditions in which smoke will dissipate. Slash burning programs administered by state forest agencies are typically coordinated with state implementation of the federal Clean Air Act.

(7) Fish and Wildlife. Recently, the need to protect fish and wildlife from the impacts of forest practices has grown in importance. Many states have already adopted laws and regulations to protect riparian zones and areas around lakes. Although these requirements incidentally protect wildlife habitat, they were primarily aimed at fishery and aesthetic protection. As early as the 1930s, Minnesota restricted timber harvest from buffers along lakes and streams. Nevada forbids felling trees within 200-foot riparian buffer zones. Recent regulations focus more directly on wildlife requirements, even in upland areas away from rivers and streams. These requirements include leaving so-called “wildlife” trees and

retaining snags to protect cavity-nesting birds. Wildlife protection measures have increased dramatically since the adoption of state and federal endangered species legislation. Oregon, Washington, and California have all adopted new rules under their forest practices laws to protect northern spotted owl habitat. These states also have adopted forest practices rules to protect other species, including some e.g., herons, that are neither threatened nor endangered. State fish and wildlife agencies and the public continue to urge even more extensive protection of wildlife habitat on private forest lands. New rules proposed by the U.S. Fish and Wildlife Service under section 4(d) of the Endangered Species Act would also regulate forest practices to protect wildlife habitat.

(8) Visual Quality. In addition to the river and lake buffers discussed above, many state forest practices laws require scenic road buffers. In New Hampshire, no more than 50 percent of the trees within 150 feet of any public highway may be cut or felled. In Virginia, scenic highways and by-ways are protected by restrictions on private forest lands. Oregon recently adopted a state statute protecting scenic buffers along certain critical state scenic routes. In California's Marin County, selective harvest is required and other visual protection measures must be taken to screen exposed soil from view from any public road, trail, or residence within a one-quarter mile. Elsewhere in California, special viewsheds have been designated where additional restrictions are imposed.

(9) Land Conversion. Many forest practices acts exempt lands from reforestation requirements when forest lands are converted to other uses. In some states, e.g., Oregon, land use laws restrict the conversion of commercial forest land to such other uses as residential areas. The major causes of forest land conversion are urbanization, crop land expansion, construction of highways, recreation areas, and second-home sites. The proportionate impact of these activities varies greatly by region. Conversion of forest lands in the northeastern United States to second-home sites recently has been a subject of major controversy. Even where forest lands are not actually converted to home sites, carrying out forest practices in areas adjacent to urbanized areas becomes difficult and controversial.

Other protection mechanisms to control forest conversion include California's timber land preserve zones ("TPZ"), designated as part of the forest taxation program. Cities and counties must zone timber land into TPZs, a classification that lasts for 10 years and restricts subdivision of land within the zone. Maine has similar restrictions on forest land conversion.

(10) Cumulative Impact Analysis. In states

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(e.g., California) that have state environmental policy acts (SEPA), the SEPA requires cumulative impact analysis to be performed before actions significantly affecting the quality of the human environment are taken. These requirements have been applied to timber harvesting. For example, in Libeu v. Johnson, 195 Cal App 3d 517, 240 Cal Rptr 776 (1987), a California court concluded that timber harvest plans approved by the California Department of Forestry failed to satisfy the requirements of the California Environmental Quality Act, because the state forester had not adequately responded to public concern about the cumulative impact of past, present, and future logging. The logging would have occurred by shelterwood methods in second-growth redwood and Douglas-fir stands located in a watershed containing spawning and rearing habitat for steelhead and salmon.

The California Department of Forestry had drawn up a lengthy checklist of various factors to be considered in the assessment of cumulative impacts, and the state forester concluded that mitigation measures were sufficient to minimize erosion. Yet the court concluded that the assessment was inadequate because it took a “serial, one-plan-at-a-time” approach. The logging would have occurred by shelterwood methods in second-growth redwood and Douglas-fir stands located in a watershed containing spawning and rearing habitat for steelhead and salmon.

(11) Timber Harvest Scheduling. Closely related to cumulative impact analysis requirements are efforts to regulate timing of timber harvest. The liquidation of old-growth forest on private forest lands in northern California's redwood region in large part prompted these efforts. The California Legislature actively considered requiring private forest lands to be managed on a nondeclining, even-flow (NDEF) basis. This requirement already applies to national forests. Although NDEF requirements were not imposed in California, many states regulate the age or the size at which trees can be harvested. For example, under New York law, high-quality hardwoods under 16” dbh and softwoods less than 12” dbh cannot be cut.

(12) Sensitive Watershed Designations. With the move to watershed-based management, some states have designated sensitive watersheds where special harvest restrictions apply. In these watersheds, additional emphasis is placed on cumulative impacts.

(13) Wetland Protection. Oregon and many other states regulate impacts on wetlands of forest harvest operations. Some states have assumed state lead responsibility under section 404 of the Clean Water Act, in part to gain control over timber harvesting activities in wetland areas. The impact of wetland regulation on timber management is pervasive in the southeastern United States where valuable timber is located in swamplands.

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Procedural Systems

Forest practices regulations generally are designed according to a "command and control" approach, in which landowners must follow set rules in timber harvest operations. Command and control systems have been criticized recently in part because they require expensive administration and enforcement.12 Virtually all federal environmental protection laws, including the Clean Water Act and the Clean Air Act, are designed according to a command and control model. Under such systems, procedural methods vary significantly. The procedural issues that typically arise under state forest practices statutes are briefly summarized as follows:

(1) Who Regulates? One of the most important procedural considerations is who does the regulating. Should forest land management be controlled by local zoning and planning organizations, environmental quality agencies, or forestry departments? Do we want the state forestry agency, through a Forest Practices Act, to address Clean Water Act requirements and Endangered Species Act requirements, or should separate systems be developed? If such wildlife agencies as the U.S. Fish and Wildlife Service adopt extensive rules governing allowable habitat modification under the Endangered Species Act, the regulations could result in precisely the system advocated by Gifford Pinchot — federal regulation of private forest land practices. Yet the regulation would be done by fish and wildlife biologists rather than by foresters. Would this situation produce appropriate public policy?

The question of who should regulate forest practices is not easily addressed. Most state legislators have not yet integrated either environmental or endangered species protection statutes with forest practices acts.

(2) Notice or Permits? Another procedural issue is whether to adopt a notice or a permit system. Does a landowner who wants to cut trees on his or her land need to get a permit from the state forester, or to simply notify the state forester of the plans? Washington and California have permit systems. Oregon has a notice system. Although comparative cost studies have not been done, a permit system seems costlier to administer.

(3) Enforcement. A third procedural issue regarding forest practices regulation involves enforcement. A command and control system will not work well without effective enforcement, which is time-consuming and expensive. Who will make sure that the established rules are enforced, and through what enforcement mechanisms? Early forest practices laws relied on criminal sanctions. The state forester had to go to the county district attorney to enforce the rules, and district attorneys were not particularly interested in prosecuting these cases. Some states allow state foresters to put liens on private land to recover remediation costs.

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costs. More recently, states have adopted civil penalty systems that allow administrative enforcement and collection of fines. Some states authorize state foresters to issue stop work orders, and grant them broad inspection powers. Other states advocate allowing citizens' suits to enforce the rules.

Takings

Forest practices regulation is now pervasive. In fact, many forest landowners are concerned that government regulations impose so many burdens that they can no longer use their property. The Fifth Amendment of the U.S. Constitution says "nor shall private property be taken for public use, without just compensation." The test of whether or not government regulation constitutes a taking is two-pronged. A takings exists (1) if the government regulation does not substantially advance a state or public interest or (2) if the regulation denies a landowner's economically viable use of the land.

General consensus exists that air and water pollution control, fire control, erosion control, and other regulations aimed at controlling off-site environmental impacts advance legitimate state interests. Scenic and riparian buffers also have been held by various courts to advance a legitimate public interest. However, regulations requiring habitat protection for wildlife are more problematic. Case law regarding this issue is sparse, and no cases have considered whether or not harvest scheduling regulations advance the public interest. Overall, most forest practices regulations will pass the "public interest" test, particularly given their origin in the common law of nuisance.

The more difficult question is whether or not a landowner has been denied economically viable use of land. In making this determination, courts look to the value of the property before and after the regulation, as well as to whether or not the landowner had a reasonable investment-backed expectation to use the land free of the particular regulation. If a landowner bought 160 acres with trees on it, planted additional trees, thinned them, took care of them, and then could not harvest them, then there clearly would be an investment-backed expectation that was thwarted. The situation would be different if someone inherited the 160 acres, and then, without investing in the timber, used it only for recreation.

To date, the courts have upheld forest practices regulations against takings challenges. In 1949, the Washington Supreme Court upheld the Washington Forest Practices Act. As early as 1908, the Maine Supreme Court issued an advisory opinion that the state legislature could regulate timber cutting and require reforestation. The justices said that, although forest practices laws might restrict the owner of wild and uncultivated lands, might delay harvest, and even might cause some loss of profit, such laws would nevertheless leave the landowner his or her lands "with the product and increase untouched, and without diminution of title, estate or quantity."

Even though most forest practices regulations will not constitute a taking that requires the landowner to be compensated, specific factual situations involving forest practices regulations could result in compensable takings of private property. These situations will depend on a specific
landowner's property configuration, past investments, and the particular resource being protected.

**ALTERNATIVE APPROACHES**

The critical question is whether or not the expansion of command and control regulation forest practices acts is really the most effective way to protect public resources and environmental values. Running a command and control regulatory system is expensive. It requires government employees to be in the field telling people what the rules mean and making sure they follow them. What alternatives could or should be considered?

**Federal Forest Practices Regulation**

One alternative would be to adopt Pinchot's approach and pass a federal forest practices act. Although many doubt that Congress would ever adopt comprehensive forest practices regulations, Congress has adopted the Surface Mining Control and Reclamation Act, which comprehensively regulates surface mining practices. If a mine operator wants to move a road culvert or otherwise impact the land, a plan amendment must be filed with the Office of Surface Mining. Such federal legislation would simply expand the command and control approach. If the objective is to get practical decisions on the ground and carry them out cost-effectively, the history of the surface mining program suggests that a federal forest practices act is not the way to go.

**Land Use Regulation**

The state of California already has mandated timber land preserve zoning. If private land happens to be in a timber land preserve zone, the landowner is required to follow the forest practices act in all activities, including those which are nonforestry-related, on that land. This approach is another variation on the command and control system, simply administered by local land use officials. Oregon rejected this approach in 1987 when it barred local governments, except in limited circumstances, from forest practices regulations. Definite problems could arise from the many different rules that might apply in a single state. In addition, most local planning agencies lack forestry expertise.

**Special Districts**

Weed control districts and soil and water conservation districts in which neighbors develop coordinated resource management plans have existed for years. Under the soil and water conservation district statutes, districts have the authority to adopt command and control regulations, but few have done so. Accordingly, special forest districts could be set up on a watershed basis. The districts, rather than a state or federal agency, would represent the landowners in the area and address cross-ownership impacts. Regulations thus could be built on community consensus at the local level. Communications among neighbors might yield better results than rules imposed by the state forest practices officer. In the event that such voluntary efforts failed, local rules could be imposed.

**Technical Assistance, Exhortation and Subsidies**

Tax incentives, federal tax credits, federal capital gains tax provisions, cost-sharing programs, various stewardship programs, and other educational and technical assistance programs provide another
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alternative to command and control approaches. These programs are all valuable; they have a part to play. However, they have not changed landowner behavior enough that anyone is ready to eliminate forest practices regulations. Given the federal deficit and the difficult financial condition of state governments, more money for incentive, subsidy, and education programs is not likely to become available.

Conservation Easements

Another alternative might be to acquire scenic easements. But easements cost money. Many nonprofit organizations such as Trust for Public Lands and The Nature Conservancy are achieving some success in obtaining donations of conservation easements; however, public funds are not likely to become available.

Market Mechanisms

Economists have long suggested that market-based systems are more efficient than are command and control systems. Emissions trading systems have been adopted under the federal Clean Air Act. Under this approach, facilities that can reduce pollution cheaply will do so and sell their extra emission allowances to those that cannot. The Chicago Board of Trade has set up a trading market for sulfur dioxide emission allowances. This approach holds promise, particularly where pollution sources collectively harm a regional environment.13

Along these lines, a system of tradable harvest rights might be developed to address cumulative impacts and timber harvest scheduling. Harvest rights could be allocated to all landowners. If one landowner does not care whether his trees are cut now or 100 years from now, another could buy the right to cut now. Perhaps a market could also be developed for habitat conservation units, a measure often used in determining wildlife habitat mitigation requirements.

Mitigation Banking

Another approach might be to follow the wetlands model, which allows mitigation banking. With mitigation banking, a landowner who wants to fill a part of one wetland can do so, as long as mitigation is provided somewhere else.

Pooling and Unitization

To some extent, the most challenging problems confronting forest land managers relate to common property resources, such as fish, wildlife, and water, that cross property ownership boundaries. To the extent that one landowner impacts these resources, the ability of his or her neighbor to impact them further may be restricted or prohibited. As economists would say, when each owner has the right to act in a way that benefits himself or herself (for example, by cutting suitable owl habitat on his or her land), while imposing costs on another (by placing the burden of habitat retention on a neighbor), that landowner imposes external costs on his or her neighbor.

The problem posed by external costs associated with common property resources was evident early in the oil and gas industry. Unregulated development and common law rules encouraged each landowner to drill wells as fast as possible and produce as much as possible before the common oil and gas reservoir was exhausted. This resulted in

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enormous economic and physical waste. Even after the problem was recognized, debate raged about how to solve it. Some of the debate centered around whether producers should be left to correct the problem voluntarily, or state or federal regulations should be imposed.

Some producers realized that by controlling production from a common pool, they could significantly improve total recovery. This encouraged landowners to develop cooperative conservation agreements. Still, some landowners would not participate, and state conservation laws were adopted. These laws seek to prevent waste of resources, promote national development, and allow each landowner to get his or her fair share of the resource that is present. They do this by regulating the spacing of wells and production. Small tracts or fractional interests can be brought together through “pooling,” and entire leasehold interests can be joined through “unitization.”

Trees are not pooled resources in the same sense as oil and gas. The resources are analogous in that we now need ecosystem management on a landscape level to address fish and wildlife resources and cumulative impacts. How can forest resources be conserved on the watershed basis? Could private landowners enter into agreements similar to unitization agreements? An allocation system could be developed to ensure that every landowner is paid fairly over time while wildlife is protected and riparian resources are restored. For example, if riparian restoration is needed in a sub-basin in which the landowner does not want to harvest the trees, and an industrial landowner in the next sub-basin wants to cut, the landowners could reach an agreement that would ensure that riparian restoration occurred in the best place, while harvest occurred elsewhere.

The pooling and unitization has worked in oil and gas. People are regulating themselves for their own benefit and that of their neighbors, rather than having the state impose regulations. Unit operating agreements address many of the issues private forest landowners now face: the basis for prorating revenue, management control, decision-making, and conflict resolution. They provide a framework for similar forest land management agreements. Joint ventures among neighboring landowners to protect the environment, preserve important public values, and still allow private landowners a return on their reasonable investment in forest lands may be possible.

In conclusion, we need technical assistance, we need incentives, and we need education if we are going to successfully manage forest lands while responding to the legitimate value that the public places on our forests. By themselves, however, these programs will not do the job. At the local watershed level we need to think about new forms of organization that neighbors can develop themselves to allow collective cooperation and action. We should build on this foundation of voluntary action, rather than continue to think that more and more complex command and control regulations can be developed and imposed.
"This talk assumes that you have been kicked by the same mule as me and are fascinated by the West."

I publish a newspaper for 30,000 or so Americans and foreigners who also share this fascination. *High Country News* is produced by a small staff based in a coal-mining and fruit-growing town — Paonia — in western Colorado. The HCN staff coordinates a freelance network of several hundred writers, photographers, and artists spread around the West. My role as publisher is to seek some larger meaning — an overview — in the articles submitted to us each day.

Without an overview, our jobs would be impossible. At 16 tabloid pages every other week, *High Country News* is smaller than the West's several thousand small-town weeklies, let alone the urban dailies. How, then, do we compete against so many newspapers with so many more pages?

The key is the staff's and writers' vision of the West. Stories are chosen for intrinsic interest, and because they are typical of events throughout the region. When we write about Livingston, Montana's population boom, or the fight in Sedona, Arizona, over a Forest Service land exchange, or the drying up of a Nevada ranch by groundwater pumping, those stories stand in proxy for hundreds of similar stories. If the paper knows what it is doing, readers say to themselves: "That's happening here, too."
Holistic treatment of a 10-state, 1-million-square mile region is possible because the West is bound together by a fantastic landscape, a small human population, federal or Indian ownership of half of the land, and a distinct culture. *High Country News* West has flexible boundaries. We exclude California and Texas because they have too many people, and because their cultures are so strong they overwhelm their westernness. Our core states are Idaho, Montana, Wyoming, Utah, and Colorado, but over time we’ve added New Mexico, Arizona, Nevada, Washington, and Oregon. We also make forays into North Dakota, South Dakota, and Nebraska.

The generalities I will make about this rough, roughly defined region are intended to describe how the West is evolving. They are based on journalism, which means they are anecdotal. Although I was trained as a physicist, there is no science here — no systematizing or data collection. It is all speculation. But I hope this speculation may prove useful to those who do more specialized work.

Let me start by telling why I called for the dissolution of the U.S. Forest Service in an editorial in the September 20, 1993, issue of *HCN*. The editorial was written, in my head, on two visits to the neighboring West Elk Wilderness area in Colorado’s Gunnison National Forest. I wrote some of it while threading my way over and past and under the enormous amount of deadfall that blocks trails into that wonderful land. I wrote more of it when I realized that the deadfall was creating a patchwork of new trails — four, five, six trails in parallel — as hikers and those on horseback cut new paths around the fallen trees, and created new sources of erosion.

The final, angriest chunk got written when I came upon a 3-mile-long, 20-foot-wide, eroding linear clearcut the Forest Service had allowed local ranchers to carve over a ridge so they could push their cows back and forth between two grazing areas. Needless to say, that “trail” was well maintained: there was no deadfall across it.

I had lived near the Gunnison National Forest for 20 years, and been a vacation home permittee as a summer visitor for years before that. But for some reason, those eight days in the wilderness crystallized my view of the agency.

It recalled for me the admiration I had felt during the 1960s for the various district rangers I’d dealt with as a summer home dweller. They all struck me as spare, short-spoken, competent, authoritative, and deserving of respect.

My next contact with the Gunnison National Forest came in the early 1980s, when I was a reporter covering the attempt by AMAX mining company to build a large molybdenum mine near Crested Butte, Colorado. As part of the process, the staff of the Gunnison National Forest wrote an environmental impact statement. That EIS didn’t tell me much about the proposed mine, but it told me a lot about the U.S. Forest Service.

Among the issues the mine proposal raised was AMAX’s desire to dump 155 million tons of tailings in a valley with some archaeological sites. The Forest Service’s EIS said no harm would be done to the sites. To the contrary, the agency said, the tailings would bury and preserve the sites for future investigators.

AMAX wanted to build a large powerline down a winding and attractive forest road. That was OK, said the Forest Service. Sooner or later that corridor would be developed, so why not now. (I nicknamed
that piece reasoning "pre-emptive impacting."

The price of molybdenum was deep in the cellar, and the mine was not financially feasible. That should have posed a problem because the 1972 Mining Law requires that a mining operation be financially feasible before the federal government is allowed to grant a firm a land patent. But the low molybdenum price didn't matter, said the Forest Service. Sooner or later, the metal's price would come back. (It has been 11 years, and the price still hasn't come back. And the mine hasn't been built.)

At every point, the Forest Service analysis paid mocking lip service to the laws Congress had charged it with implementing. Those laws were suborned to the 1872 Mining Law, and then even the 1972 Mining Law was suborned to the mining industry.

When I made fun of the AMAX environmental impact statement in print, the Forest Supervisor said it didn't matter to him that he'd caught guff "out-service" (a new term to me) because he'd gotten a lot of praise "in-service."

At the time, I blamed the EIS on that supervisor. But he was followed by a supervisor who tried to hand the forest over to the Louisiana-Pacific timber company, and was only stopped by a regional revolution by some very conservative counties and towns.

As I hiked throughout the West Elk into Soap Basin, over Castle Pass, under the Castles — I reviewed my 25-year history with the agency. I recalled that, while I thought my Paonia district was blessed with some fine district rangers, I also thought that the regional forester had it in for the Gunnison National Forest when it came to choosing a supervisor.

But thanks to High Country News, I now realize there is nothing unique about the Gunnison National Forest. Judge Dwyer stopped logging in the Northwest because he found that the Forest Service was picking and choosing among the nation's laws and the agency's regulations. A scientific panel charged with investigating the so-called East Side, or dry side, forests in the Northwest recently found that the circles on maps showing late-successional old-growth stands are just that: circles on maps. In a majority of cases, when the scientists examined the ground, they did not find the old-growth forests the agency's planners claimed were there. A forest economist from Oregon — Randall O'Toole — made a career in the mid-1980's of proving that the various forests were hardwiring the FORPLAN forest planning computer program. That is, they were using that program as a ventriloquist's dummy in order to extract from it the number of board feet they wanted to cut, or had been ordered to cut.

It is important to look beyond this betrayal of law and mission to see the code the Forest Service has been following. Because of its strong top-down, hierarchical setup, it has been relatively immune to the new values influencing society. The agency basically follows the teachings of economist Thomas Malthus, and believes that all-out production of commodities is essential if America is to stay ahead of population growth. In that sense, the Forest Service is very much like the West's traditional rural communities.

I admit that some day we may look back from our caves, where we are subsisting on roots and berries, and say: "We should have listened to the Forest Service. We should have concentrated on commodities."
But for better or worse, the nation has taken a different turn. The nation has changed its values from an almost exclusive concentration on economic development and production to an interest in, an appreciation of, and a fear of the natural world. This new set of values is made up of such things as a desire for and love of wild lands and wild rivers and wild creatures, a fear of the ozone hole and of too much carbon dioxide in the atmosphere, and a recognition — related to such events as the Midwestern floods and the Florida hurricanes — of the limits of our ability to control nature.

Unlike the Forest Service, most of us are no longer Malthusians. We no longer believe we will run out of food, or lumber, or oil, or electricity. We have faith in markets to move commodities around geographically, and in technology to substitute for a commodity when it runs short. As a result, it is not as easy as in the past for utilities, or lumber companies, or farmers, or oil companies to stampede us into opening a mine or drilling a well or chopping down a forest by predicting shortages.

There have also been startling changes in the West, where we no longer have a cowboy-and-Indian view of the settling of the West. Today, many westerners believe that the West was plundered rather than civilized, and that whatever we gained from the settling must be balanced against the damage that native peoples and nature suffered.

Such a shift in view has a profound effect on how the public views the management of natural resources. That shift was especially striking during the 12 years of the Reagan-Bush era, when such men as James Watt, Donald Hodel, and Manuel Lujan were secretaries of Interior, and the federal administration and the U.S. Senate were hostile to most of the western environmental agenda.

Despite that anti-environmental line up, great progress was made — progress that Clinton-Babbitt will be hard pressed to match. Here is a partial list:

(1) The nuclear bomb-making network in the West collapsed, including the Hanford Arsenal in the state of Washington and Rocky Flats in Colorado. In addition, allegations of criminal charges were brought. The bringing of these charges would have been impossible under the old values, which placed national security and production of bombs and missiles ahead of everything else.

(2) Underground nuclear testing ended. I remember the excitement that surrounded the end of above-ground nuclear testing in President John F. Kennedy's administration. So the quiet, almost whimpering end of underground nuclear testing indicates that issue is largely settled despite the efforts of a large work force and bureaucracy in the U.S. nuclear establishment to keep the bombs blasting.

(3) If water defines the west, then the death throes of conventional water development indicates how much the region has changed. During the allegedly prodevelopment Reagan-Bush years, we saw the following:

Reform of California's Central Valley Project.

Defeat of Denver's Two Forks Dam and Reservoir after preparation of a $35 million environmental impact statement.
Reform of the Central Utah Project and the removal of that project from control by the Bureau of Reclamation.

The ongoing financial agony of the Central Arizona Project.

The continuing inability of proponents of a central Rockies water project — Animas-LaPlata — to turn the first shovel.

The damping down of water releases from Glen Canyon Dam to reduce damage to land and wildlife in the Grand Canyon.

Several attempts to manage upper basin Colorado River dams so as to mimic natural flows.

In addition to dramatic action on the West's mainstream rivers, there has been quieter progress on the tributaries, where the restoration of riparian habitat is becoming a major movement.

Finally, there has been a shift in the assumptions underlying water development. Governor Cecil Andrus of Idaho is calling on the Army Corps of Engineers to drain the Snake River reservoirs for part of each year so as to recreate the river that those reservoirs flooded. His goal is to help salmon make it to the ocean. There is also the prospect that two dams in Olympic National Park will be torn down to turn the Elwha back into a river.

These changes came about despite intense resistance from the bloc of 20 or so western senators and the federal administration. Over the next few decades, the change in the values which govern the West will become an irresistible force, and those who oppose it to the death — like the Forest Service and the Bureau of Reclamation — will find their own deaths.

The paradigm has shifted abruptly, and western institutions and culture are lagging the change. The West's institutions are showing the kind of inertial lag that destroys rigid buildings in earthquakes.

Because I love the West, and because I am not entirely enamored of the kind of society and life this new paradigm is bringing, I spend a lot of time thinking about how the West might adapt without being destroyed.

I believe that the West most of us care about is going, going, and almost gone. While the miners fight reform of the 1872 Mining Law, and the ranchers fight an increase in grazing fees, and the environmentalists fight to reintroduce wolves and to smooth out the water flows of the Colorado River, and the land grant universities study different ways to increase a calf's weaning weight, the West is losing its natural resource economies and its land base.

As a result of these last two losses, the region is becoming more and more a servant economy. High Country News has reported on the effects of this servant economy: small town residents who commute hours on icy roads over Teton Pass into Jackson, Wyoming of up Highway 82 into Aspen, Colorado, or elsewhere to work in ski towns. We have written about people who camp on the forests around Jackson for five months of the year because they don't earn enough to rent a place. And we have described ski area workers who live all winter in tents in the Telluride, Colorado, town park. We have also written about how the Hispanic town of Santa Fe is becoming a town of well-to-do Anglos, and about numerous ranching towns that have become summer-home meccas for the rich and the famous.
This anecdotal evidence about an emerging Third World mix of rich and poor is reinforced by grim electoral results. Oregon and Colorado have passed tax limitation amendments that make it hard to provide basic services. Both states have been involved in referendum feuds over gay rights, even though it is, at best, a peripheral issue. In Montana, a very reasonable tax reform proposal was beaten two-to-one, despite endorsement by almost all elected officials in both parties.

I believe these are signs that the West is becoming ungovernable, in part because of the shift in the region's economic base and in its guiding paradigm.

In Colorado, the anti-gay amendment got enough votes in rural areas to overcome its Denver-Boulder deficit. My interpretation is that the referendum's backers were helped by a desire by people to cast a protest vote against change.

Some of the change is driven by the ease with which urban people can buy into rural areas. Today's economic equation in the West is: a person sells a ranch house in southern California and buys a ranch in Montana. That person then puts too big a house on the ranch, and maybe adds a guest house and swimming pool, and you now have a piece of property that can never again be used as a working ranch. It has become an expensive toy.

Rural people who believe that the world and their dignity are based on hard work and productivity are offended at having land that had been worked for generations turned into playgrounds. It is hard for me to imagine that kind of pain, just as it is hard for me to imagine the anger loggers must feel at being told they must not cut trees because the forests are wanted for their beauty.

So it is easy to understand the emotions, even for the publisher of an environmentalist newspaper. But it is also important to look beyond the anger. If I were John Steinbeck, for example, *Grapes of Wrath* would have had an extra wrinkle. It seems to me the Okies got rough justice in California, considering how they had abused their arid Oklahoma land and helped create the dust bowl.

And I think that migrating Californians — perhaps Californians are God's instrument when it comes to punishing those who don't treat land right — are giving us westerners a sort of rough justice. I don't know how you handle your old cars once they stop running, but I put mine up on blocks in my yard and advertise that I am selling, let's say, a 1976 Pinto station wagon for parts. Then people come and haul off a water pump or a fender or whatever they need to keep their old heaps going for another few months.

That is what we are doing with the West: selling it off for parts. Land that is gullied, or whose big trees have been replaced by a dog-hair forest, or whose streams have bitten so far into the ground that the water table has been lost, or whose grasslands have been covered by a pinion-juniper forest is being sold off for parts. Newcomers to the West are willing to buy this unproductive land because it looks good to people looking for a place to live on rather than a place to live off.

The land they are buying doesn't have to produce. It just has to be pretty, or look out on an attractive landscape, or be close to one of our neighborly western communities, or have clean air. The West, after 150 years or so of having been run into the ground, is now being sold off to people who, to their eventual dismay, will
create a 500,000-square-mile subdivision.

If the West is to continue to be a place where nature, rather than lawns, reign, there must be three large changes. First, that shopworn rule — "You can't tell a person what to do with their land" — has to change. If we can't come together to plan how the West is to be developed, then we can't have the West.

In place of coming together, we choose to grouse about Californians and their money. That complaining is dishonest. We westerners have chosen not to tell individuals and developers where houses should be built, and how big they can be. Since we haven't taken responsibility for how this region is to be developed, we have no right to complain when people do as they damn please.

For the most part, it is chaos out there. The few islands of order — places like Aspen and Boulder, Colorado — are especially over-run because people want to live in planned communities with open space and other amenities. They are suffering because the rest of us haven't created orderly communities that can compete with an Aspen and a Boulder. So anyone who can afford to, tries to squeeze into those communities.

It is an open question whether other western places will try to control their destinies. There are some encouraging examples. The Flathead Basin, downstream of Glacier National Park, is attempting to do comprehensive, basin-wide planning. Summit County, Utah, home of Park City, taxes second homes much more highly than permanent residences to make it possible for the nonrich to live in a place that is attracting a lot of outside money. Crested Butte, Colorado has an ordinance that limits the size of new houses to 2,500 square feet in an attempt to keep the town affordable. There are a few other examples. But very few.

I blame some of this on land grant universities — institutions whose job it is to strengthen the fabric of rural life. Helping rural communities to do land use planning should be a top priority for land grants, and especially for their schools of agriculture. But none of them have developed an expertise in techniques — such as land trusts and the trading of development rights — of keeping rural areas rural and productive. The Flathead Basin is paying lots of money to an Aspen planner to do its planning, and Summit County hired a Chicago outfit.

In addition to our need to find ways to keep rural land rural, we face the related challenge of the servant economy. Western mining, lumber, and oil and gas interests are fond of saying that they pay their employees well, while tourism pays poorly. That, they say, proves the need for more mining, logging, and drilling.

Those natural resource jobs pay higher because they have a century-long tradition of labor strife and unions. If the West is to avoid dividing into a rich man-poor man Third World region, the people who work in ski areas, in resorts, at construction, and in shops need to organize for decent wages. It's a point the natural resource industries generally forget to make.

So far as I am concerned, better pay is an environmental position. There can not be a healthy environment in a region wracked by social injustice.

After land use planning and decent wages, we need to restore the land's ability to produce. To have restoration, ranching, forestry, and mining have to buy into the restoration ethic.
Restoration cannot be imposed from without. It cannot be imposed by a centralized government in Washington, D.C. The land can be brought back to life only if westerns push for healthy ecosystems with as much vigor and enthusiasm as we have pushed in the past for dams, clearcuts, fire suppression, and nuclear bomb factories.

It is not just ranchers, miners, and loggers that have to change. The environmental community must recognize that we — the environmentalists — do not earn our living from the land and that we do not have all the answers. Rather, we are the vanguard of an urban population that, after abandoning the land for several generations, is beginning to take an interest in rural areas.

We returnees have much to learn. To take one example, so-called green economies — tourism and the like — are yet to demonstrate that they can create stable, desirable, affordable communities.

Environmentalists must also be willing to give up dependence on Washington, D.C., as the place where decisions are made. Ultimately, we must work things out locally, with our neighbors, and according to existing conditions. And so, of course, must the ranchers, miners, and loggers.

Let me tell you a story about centralization, and how the West is micromanaged out of Washington. A forest near me, the Grand Mesa, put together a travel task force to decide on road closures. The committee of 11 — an outfitter, environmentalist, rancher, off-road-vehicle person, et al. — reached consensus, except for the ORVer. The Forest Service was ready to act on the majority's recommendation. But the ORV representative called his organization back in D.C., and that organization told the National Cattle Association that it would withdraw its support for a grazing fee rollback unless things changed in this tiny county in western Colorado. So the calls were made, and the rancher on the travel task force had his legs cut out from under him in the interests of this national coalition. The Forest Service went back to the drawing board.

Let me tell you another story. Environmentalists and ranchers in Gunnison County, whose livestock consumes a very large 10 percent of the federal grass in Colorado, reached agreement on a new plan for public grazing: double the livestock fee but keep the money in the local forest and out of D.C. compulsory school for grazing permittees, and decentralization of decision-making (that was the tough one for the environmentalists). When Colorado's governor came to visit the city of Gunnison, the Colorado Cattle Association did everything it could to keep him from meeting with these renegade ranchers. They were renegades because they had sat down with their neighbors instead of working through the state and national hierarchies.

Despite these two examples, I'm not arguing that only ranchers are addicted to centralized control and sabotage of local control. I could also tell you about an environmental newspaper that was urged not to print an article about mining reform because the ideas in the article would hurt within-the-beltway maneuvering. The disease is endemic to the West. We are a typical colonial people, forever running to the distant seat of government because we can't get along at home.
THE WEST IS GOING, GOING, ...

On the brighter side, the very fact that I have these stories to tell is encouraging. A few years ago, I'd have had none of these examples of traditional enemies trying to come together. Some of the cooperation is quite amazing.

In part, we are separated by our cultures. Ranchers and loggers and miners and the urban people who tend to belong to environmental groups eat from different food groups, wear different clothes, listen to different music, and go to different churches. Those are differences that can only be overcome by our humanity — by our sense that under the different hats and outfits we are all the same.

We are also kept apart because we lack three important institutions. We lack a communications medium — whether newspaper or TV or radio station — to help us trade ideas and information back and forth across this vast region.

We lack a broad-based citizen reform movement, analogous to the reformers in the cities at the turn of the last century, who fought against child labor, fought for indoor plumbing, and in general civilized the cities. And we lack a university of the West. Overall, that means we don't have the basic things we need to understand our situation and act to change it.

In closing, I want to tell you about my K through 12 education. I came out of high school in 1957 believing that George Washington had established the nation, Abraham Lincoln had freed the slaves and cemented the union, and everything that followed was details. I had been taught, implicitly, that my job in life was to keep my nose clean, mow my lawn once a week, commute to work on an interstate highway, and vote every other year.

It all seemed cut, dry, and dull. I was relieved to discover that Washington and Lincoln hadn't done it all. They had simply dealt with their era's challenges. They had left me and my fellow westerners an enormous amount to do in our era.

While the task that faces us westerners is immense, it is not more immense than those in Revolutionary times or Civil War times. Like the people of those eras, we have been given the opportunity to do heroic deeds and to hand down an inspiring legacy to our descendants. The next couple of decades will tell — in Wallace Stegner's words — whether we are up to establishing a society to match the scenery.
"Forestry is changing rapidly and radically."

A "paradigm shift" with many of the characteristics described by Thomas Kuhn (1970) in his book, *The Structure of Scientific Revolutions*, is underway. Kuhn characterizes a paradigm shift in science by ever-more-frantic attempts to make the old paradigm work, that is, to solve problems and explain anomalies. As the "revolution" occurs and a new paradigm arises, a period of confusion begins and contending schools of thought develop. I believe that we are in such a period now, and that the outline of the new paradigm is at least dimly in view.

Acceptance of a new forestry paradigm signals changes in our basic world-view, changes in the techniques that we employ in forest research and management, changes in what constitutes effective leadership, and changes in how we see and make forest policy.

Briefly, I think that some of these changes are or will be:

**World-view:**

Sustained yield of wood probably won't survive as the principal criterion of good forest stewardship. We are now expected to see whole forests rather than to construe forests as a collection of goods and attributes centered on tree stems.

**Techniques:**

We are now expected to know as much about wildlife and water, for example, as
we do about wood. We are expected to apply our technical skills in ways that are complementary and reinforcing. Further, we are expected to be able to do integrated, or coordinated, management of large areas, often across fee-ownership boundaries and in the face of fierce counterpressures.

Leadership:

We are now expected to practice inclusive, participatory leadership of the kind that solves long-term, complex problems based on systems about which we lack much important information. Further, we are expected increasingly to lead through “thinking and cooperation,” rather than by boldness and fiat.

Forest Policy:

We will be expected to facilitate the emergence of a coherent national policy on forests, to replace the confusing and sometimes contradictory avalanche of laws we now have. This will be better achieved in the light of a clearer national vision for our aggregate desires for and from forests. Foresters need to foster development of that vision, and provide mechanisms for constructing a concomitant national forest policy. Similar exercises have recently been concluded with apparent success in Sweden, New Zealand, and Tasmania. Thus, it should be possible here in our much larger and more diverse country.

In this lecture, I focus on one of the available mechanisms for constructing science-based forest policy, because I think it is the most important aspect of the paradigm change. The rewards will be great if we get it right. In particular, I examine an emerging role for scientists of all kinds in the construction of “science-based assessments.” These assumptions are attempts to use science-derived information and techniques to answer, or to help answer, questions formulated by politicians and other “policy-makers.”

Three of the assessments in which I have participated—the National Acid Precipitation Assessment Program (NAPAP), the Society of American Foresters’ (SAF) Task Force on Scheduling the Harvest of Old-Growth Timber, and the Scientific Panel on Late-Successional Forest Ecosystems—are mature enough to assess.

Other, more recent assessments (the Forest Ecosystem Management Assessment Team, Eastern Oregon Forest Health, and the Sierra Ecosystem Study) may provide additional opportunities for future analysis and improvement.

A Priori Rules for Assessment?

Acceptance of the notion that “assessments” are legitimate policy tools has developed slowly, along with acceptance of the uneasy (but almost wholly dependent) relationship between science and government. In a previous paper (Gordon 1992), I said:

“The idea that science should be the basis for resolution of public resource policy issues and conflicts over the application of technology to the management of natural resources is relatively new (last 150 years). For most of that time the science base has been

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1 This is documented in the National Research Council Report, “Forestry Research: A Mandate for Change.”
2 As described by H.H. Webster (1993) in Environmental Leadership: Developing Effective Skills and Styles.
inadequate to the tasks presented it, so its role has not been large.

"However, attempts were made in the last century to resolve scientifically a policy debate about natural resources in the West (Herrick 1991-92). Although official policy had it that settlement of the arid West would improve rainfall, John Wesley Powell knew otherwise, and presented compelling, science-based arguments that western settlement was 'piling up a heritage of conflict and litigation over water rights.' However, Powell lost the policy argument, and as Herrick says, 'As Powell learned a century ago, ... such information is critical but not sufficient to determining how a nation might respond to risk.' A century later, the translation of scientific information to policy and management processes still falls far short of being an exact science ... However, issues are now generally acknowledged to be complex enough so that a scientific basis for decisions would be desirable, but the notions of how to go about this are not well-developed."

Brewer (1984) presented the following tentative rules (i.e., questions to be asked at the outset or during review of a given project) for carrying out assessments:

(1) Was the policy question or issue carefully posed, specified, and well understood by both researcher and policy maker?

(2) Did the policy question "translate" reliably into researchable terms and, if not, what compromises were made and whose preferences were favored [and why]?

(3) Were sufficient resources, in terms of time, money, and talent, allocated to carry out the work?

(4) Was the research keyed to the realities of the policy-maker's world, i.e., did it reflect the resources over which the user exercises control and incorporate the political constraints within which the user operates?

(5) Were [are...to be] results communicated in an intelligible fashion? To whom, and via which media?

(6) Was the knowledge created in the work misused, abused, or not used, and why in each case?

The NAPAP, SAF Task Force, and Scientific Panel assessments were chosen for a variety of reasons. First, I was personally involved in all of them, and thus infer license to be particularly critical. Second, they all involve issues related to forest management. Third, they differ widely in scale and effect, although all were completed recently enough that their effects are both not fully known and still debated. Although some of Brewer's questions were handled well in each of the assessments evaluated, all three could have benefited from more rigorous examination at the outset.

SELECTED EXPERIENCE

The National Acid Precipitation Assessment Program and the Oversight Review Board

Perhaps the largest and most striking attempt to use science-based assessment in making forestry and environmental policy involves the Congressional use of the findings of the National Acid Precipitation Assessment Program in developing the Clean Air Act reauthorization of 1990. In 1980, public concern for the effects of so-called "acid rain" on forests and lakes promoted the enactment of the Acid Precipitation Assessment Act. This
legislation provided for the establishment of an interagency, interdisciplinary group to fully research the effects of acidic deposition, including acid rain, on a range of resources and materials, including water bodies and forests. Unlike the assessments of the SAF Task Force and the Scientific Panel, NAPAP requested, and got, primary research funding — 600 million dollars worth.

The National Acid Precipitation Assessment Program was established to conduct the funded research. Working under the auspices of an interagency committee and at the President's Council on Environmental Quality, NAPAP developed a framework for a broad-based, multi-year research program to investigate how acid precipitation might be impacting human health and the environment, including forests and trees. The program involved leading scientists from the United States, as well as visiting scholars from abroad. Research related to the effects of acid precipitation on forests was coordinated by the U.S.D.A. Forest Service. Although the initial focus of this research was the relationship between acid precipitation and forest health, the research program was soon expanded to include an assessment of a broader range of air pollutants.

Studies by NAPAP indicated that the relationship between acid rain and damage to lakes and forests was, at best, unclear. However, research on the effects of other air pollutants on forests confirmed existing evidence of the previously hypothesized link between high ozone levels and forest damage.

The NAPAP research program was a 10-year effort that yielded information relatively slowly by Congressional standards. However, by the end of the 10-year period, NAPAP offered relatively strong and convincing scientific evidence (at least to some) that the link between acid precipitation and forest damage was not strong. Other air pollutants, particularly ozone, were considered to be of much greater concern.

The NAPAP research effort was nearly completed when Congressional debate over reauthorization of the Clean Air Act began in earnest. Despite the lack of certainty regarding the impact of acid rain on forests and other natural resources, this link continued to serve as one rationale for advocating strong measures to curb the emissions of acid rain precursors. These measures eventually became a cornerstone of the reauthorized Clean Air Act.

During the last two years of the NAPAP program, an Oversight Review Board of scientists was created to evaluate the assessment and ensure that the process had followed its scientific mandate. The Board published “The Experience and Legacy of NAPAP” in April 1991. Its “lessons learned” section bears striking resemblance to the questions posed by Brewer. Hindsight seemed to make clear that:

1. Initial formulation of the policy questions to be answered is all-important, and too little time was spent on this at the outset,

2. The timing and form of communication of results is critical, because policy will be made with or without complete science when the political time is right; the Clean Air Act was reauthorized before the final NAPAP document was available.

3. Assessment must be given primacy; that
is, the people in charge of the scientific effort must stay focused on answering with the best science available, the carefully selected policy questions agreed upon at the outset.

(4) Political commitment to the process must be obtained and maintained for the duration of the assessment effort.

If NAPAP exemplifies an overall lesson for the generic assessment process, that lesson is timeliness. The final report missed the Congressional boat by some months, even though the sailing time had been known fairly precisely for ten years. This lapse was disastrous, in my view. Knowledgeable people do not dispute the quality of most of the science that NAPAP produced. Nor do they deny that the findings of NAPAP had a strong influence on the final version of the reauthorization. However, the process and its conclusions lost credibility because they were late, and there is now no way to remedy this. A frequently expressed view (to which I do not wholly subscribe) is that this failing indicates that scientists regarded NAPAP as simply another funding mechanism, and did not take seriously their charge to support policy. This residual cynicism will make it more difficult to do large-scale, forward-looking assessments in the future. It already has affected research on global warming.

The Society of American Foresters Task Force on Scheduling the Harvest of Old-Growth Timber

It was clear as early as the 1970s that the fate of remaining old-growth forests in the Pacific Northwest was to become a subject of considerable political debate. The Society of American Foresters thus established a Task Force and produced both a report and a “position” statement on old-growth forest issues. The members of the Task Force included three of the four scientists who were principal participants in the Scientific Panel on Late-Successional Forest Ecosystems. The conclusions of the SAF Task Force were (1) that old-growth needed to be more precisely described and better inventoried; (2) that there were sound reasons, including but not limited to the protection of the northern spotted owl and other potentially endangered species, for establishing a system of old-growth reserves; and (3) that harvest scheduling of the kind then done on public forests needed to be changed to accommodate the realities of forests in transition from old-growth to second-growth. It seems fair to say, in hindsight, that these were sound recommendations. It is also fair to say that the report and position had little impact. We learned the following things:

(1) Policy-makers were not involved in the creation of the SAF Task Force, or in setting the specific questions for it; thus, the Task Force produced an answer to a question that no one (outside SAF) had specifically asked.

(2) Some of the scientists who produced the report and endorsed the final version publicly repudiated the report soon after its publication. This severely damaged the credibility of the report.

(3) There was no planned or sustained effort to make the content of the report known to those who might use it. Although the report was published, it was not distributed effectively.

The one overriding generic assessment lesson to be learned from the SAF Task Force is the need for
implementation. Implementation begins with initial communication between those who do policy and those who do science, and requires careful framing of the questions to be answered. This step was omitted. Further, those who produce the report must be committed to a planned, funded program of transmission and explanation of the product, and to product, and to supporting the document with additions and revisions as knowledge and questions change over time. This commitment is essential if the assessment is to be used.

The Scientific Panel on Late-Successional Forest Ecosystems

The Scientific Panel on Late-Successional Forest Ecosystems received the benefit of several previous assessments, most notably the "Thomas Report" (Johnson et al. 1991). In addition, the Scientific Panel had what, in hindsight at least, seemed to be several advantages:

(1) The questions to be answered were discussed fairly thoroughly by policy-makers and researchers, and written down clearly in a letter.

(2) No ponderous organizations or protocols separated the scientists involved from the policy-makers. Scientists worked directly with Congress and agencies.

(3) Agreement was reached at the outset that the output would be information arrayed in a series of choices and their probable consequences, not a single "recommended solution."

The Scientific Panel, however, had severe limitations. One limitation was that old-growth had not been effectively mapped on all federal lands. In addition, time was extremely short and did not allow all sources of existing information to be fully accessed. Most importantly, although research on old-growth and related species had been accelerated a few years earlier, the Scientific Panel still had a woefully inadequate information base, particularly regarding species (other than the spotted owl), related to old-growth forests and the effects of various silvicultural practices on wildlife populations. Specifically, we learned:

(1) Scientific knowledge that is plentiful and well-agreed-upon before policy questions arise is probably easier to use in policy-making. In this instance both emerged together.

(2) "Interest group" science, done in the heat of policy battles, does not seem to contribute to resolution.

(3) Despite honest and energetic attempts, effective communication does not yet seem to have been achieved between the scientists and the policy-making community.

Several attempts have been made to do science-based assessment of old-growth forests in the Pacific Northwest. Some research base exists, but no widely agreed-upon response had been made to well-defined policy questions. Further, the science base was not mature when the general policy questions matured. The much larger and more expensive Forest Ecosystem Management Assessment launched in the wake of President Clinton's Forest Conference is too recent to evaluate; however, there is some reason to speculate
that it sets a new standard for assessments, at least in terms of scientific scope.

**GENERALIZATIONS**

*A Clearer Role for Science in Policy-Making*

Many views of the role of science in policy-making are evident in current conflicts. Perhaps progress has been slow in part because inappropriate models are frequently pursued. Two of the most frequently used (although seldom stated) approaches are:

(a) Science will decide what is right, then we will legislate that.

(b) For any policy position, there exists a set of scientists willing to support it. All scientists are equal. Therefore, science-into-policy is simply a matter of finding the right scientists.

Typically, scientists take the former approach, and policy-makers the latter. Good reasons exist for both approaches, however. Often, issues arise, at least in part, because of scientific advance. For example, controversies over old-growth timber allocation have been triggered in part by research that indicates that many old-growth forests persist longer and function differently than was previously thought. The technology to detect and assess the consequences of acid rain played a large role in bringing that issue to national policy attention. In both instances, the triggering scientific advances were the subject of heated debate within the scientific community, as are most new scientific findings. This debate, however, tends to reinforce the non-scientists' view (approach B). The scientific community often does little to clarify the nature of internal debates, which usually revolve more around the question “What is happening?” than around “What can be done about it?” This internal agenda thus tends to isolate scientists from policy-making processes. In addition, science does not move smoothly to a “consensus” view. Science advances jerkily, and is usually incapable of producing results, let alone consensus, on demand.

Scientists and policy-makers are products of quite different educational and organizational cultures, and respond to very different reward systems. This “two cultures” dichotomy often presents a barrier to communication. Functionally, the scientific process involves testing hypotheses, and thus proving things wrong. In contrast, the policy-making process entails choosing that which is right, and rendering it into law or regulation. Thus, at their most fundamental levels, the processes involved in doing science and making policy are incongruent.

**Research Access for Politicians**

Research access consists of the capability to answer policy and management questions by finding or generating appropriate science-based information. Currently, politicians have no standard means through which to access scientific research in a timely way (Carnegie Commission, 1991). Adequate research access enables an organization or policy-making body to work toward its goals. At the minimum, research access consists of using data bases, computer literature searches, and professional contacts that arise during the usual course of business. Sophisticated research access comprises detailed knowledge of the policy and technical questions, in priority order, that are most critical to achieving objectives, and similarly detailed knowledge of research sources. Thus, policy-making bodies, especially Congress, need better research access than they now have.
Both Brewer (1984) and Russell (1992) indicate the primacy of framing questions in a way that allows sophisticated research access and assessment effort to continuously forecast issues and frame additional questions. This might happen as follows: questions, derived from conversations with decision- and policy-makers, are framed formally, according to the "client model" (Stoltenberg et al. 1968). This approach defines researchable problems by five elements: (1) an identified decision-maker or class of decision-makers that are "real" (i.e., nameable) individuals; (2) a decision-maker's objective; (3) a set of alternative paths for achieving the objective; (4) doubt as to which, if any, path is efficient and effective; and (5) the context or environment of the problem in its geographic, organizational, technical, and human dimensions. The research access organization, with the guidance of the "client," i.e., Congress or another policy-making body, prioritizes the problems and searches the scientific community for specific information and individuals that can help solve them. Particular attention and skill must be focused on the durability of problems; thus, those problems that are likely to remain unresolved for long periods of time allow a more leisurely pursuit of answers. More commonly, time pressure will be acute, and a long solution equivalent to no solution. Thus, the ability to forecast future problems and to act quickly to produce competent assessments are central to successful research access.

A research access organization, if there were to be one, must be staffed with people who are capable of gaining the attention and respect of policy-makers, managers, and scientists. Most of the staff should have considerable credentials in science, because of the insular nature of science language and institutions.

Several approximate models of this kind of organization now serve Congress. Although each has a considerable record of positive achievement, all are unacceptably imperfect when specifically addressing forest policy issues and assessments. Procedures and processes through which scientists can provide effective advice on specific pieces of environmental legislation often have been inadequate. The record of Congress in developing science-based policies on forest and environmental issues, therefore, is particularly mixed.

The National Academy of Sciences, through its action arm, the National Research Council, provides formal advice to the federal government on a wide array of science-related questions, many of which are "environmental" (but, at least until recently, few of them "forestry"). Usually these advisories are issued as the report of a committee, and these reports tend to have high credibility and considerable visibility. However, environmental and natural resources scientists are not numerically prominent in the Academy, and Academy attempts to target these areas of science are not always successful. Also, National Research Council reports are rarely produced rapidly enough to respond to questions that arise during the genesis of specific pieces of legislation. The hearing process, although it produces copious quantities of testimony, seems poorly suited, in both the brevity of its presentation and its ephemeral capture of scientific information, to the task of marshalling strong and continuing scientific expertise. Thus, when confronted with contentious, science-based environmental issues, Congress usually has sought other mechanisms for scientific
input. The Congressional Research Service and the Office of Technology Assessment are the standing organizations available to Congress that best approximate the theoretical research access organization described by Stoltenberg et al. (1968). Although they provide specialized information for legislative purposes, neither organization is closely tuned to the business of producing assessments from primary sources in real time.

Successful science assessment can be defined as a marshalling of results and people to give science-based answers to carefully defined policy questions. The requirements for a higher probability of success include the following:

(1) Questions should be formulated before assessment is done.

(2) Ideally assessment will use existing, peer-reviewed science.

(3) All involved, particularly the scientists, need to recognize that a range of policy options and consequences must be considered and effectively communicated.

(4) Effective (clear and timely) communication is as important as is good science.

(5) Those involved need to understand that “magic” options are rarely uncovered, no matter how carefully the assessment is done. “Technofix” options for resolving policy questions are rare, and scientific agreement is almost never universal.

The time and trouble needed to do an adequate assessment can only be justified if a policy forum exists to accept it.

Acceptance is much more likely if the sequence of events is: questions, assessment, formulation of options, choice, rather than: questions, formulation of options, assessment, choice. The first sequence is preferred because politically formed options posed at the outset unnecessarily restrict the assessment, and advocacy groups tend to form within the assessment team. Acceptance is rare if the sequence is: assessment, questions, formulation of options, choice.

A ROLE FOR UNIVERSITIES AND COLLEGES OF FORESTRY

Several attributes of universities with vigorous forestry schools make them appropriate places to do science-based assessments to aid the formulation of forest policy. First, these universities are the only organizations likely to contain, within themselves, the range of expertise needed to address modern forestry, environmental, and natural resources questions. Second, universities have a reputation as neutral ground dedicated to scholarly inquiry, with a record (although not a perfect one) of protecting investigators from political reprisals and “kill the messenger” behavior. Third, universities are relatively stable institutions: they persist, at the same address, over long periods of time. I believe that universities, and particularly the forestry, environmental, and natural resources colleges and departments they comprise, should make science-based assessments one of their major priorities, out of both duty to society and self-interest.

Society now has no ready place to turn for these kinds of assessments. As indicated, the United States Congress receives inadequate assistance, and this does not provide for state legislatures or other public bodies. Thus, universities could help meet
an increasingly acute societal need if they directed some of their energy to assessments. In terms of self-interest, beyond the general notion that universities have a responsibility to society, the payoff lies in integration. Universities, and even colleges within them, suffer from disciplinary isolation, and the doing of assessments could help overcome this. Assessments are done to answer questions from outside science, questions that almost never can be answered by the practitioners of a single, or even a few academic disciplines. The collaboration required almost always crosses the boundary between the natural and social sciences, because policy questions about forests almost always have social, as well as biological and physical dimensions. In this way, policy questions provide a mechanism to lure faculty from widely different areas into discussion and synthesis.

To successfully take on this role, universities will need to take several actions. First, a university or college contemplating this action should review existing experience. Most of these institutions have done assessments, or have faculty who have done them under some other aegis. Second, the institution will need to create a “question formulation” group that moves freely in both scientific and political company, and that is empowered to help policy people frame, launch, complete, and communicate assessments. Third, faculty and students will need new incentives for participating in assessments. Students can participate in the assessment process in a variety of ways, and can at the same time begin to learn increasingly important skills. Faculty may be induced to participate through pay, promotion credit, and the intellectual challenge of working across both disciplinary boundaries and the boundaries of science.

There are many potential problems: adequate review, to ensure intellectual soundness; exposure to an unprecedented level of political pressure; and time taken from more traditional activities, to name a few. If a university or college or department were to be successful, however, they would provide a powerful positive influence on the construction of better science-based forest policy. This policy we urgently need.

**References**


ASSESSMENTS I have KNOWN: TOWARD SCIENCE-BASED FOREST POLICY?

management of late-successional forests of the Pacific Northwest. A report to the Agriculture Committee and the Merchant Marine and Fisheries Committee of the U.S. House of Representatives.


"I became Chief of the U.S.D.A. Forest Service on the 1st of December, and I'm happy to deliver my first speech in that direction here at Oregon State University, where I held a faculty appointment for 20 years. A number of my colleagues, those with whom I worked during those years, are present, and that makes this occasion especially meaningful."

Today we're facing shifting values and changing paradigms; further, what American society wants from its national forests is certainly evolving. As a result, we are redefining resources, products, and services. Societal demands derive from personal nonconsumptive values that now rival traditional uses of public lands. These changing values are altering the multiple-use concept. This means that the assumption that I was taught early in my career, i.e., that what is good for forestry is good for everything else, has been rejected.

It's very clear now that the forests are more than trees, and that trees are more than timber. It's clear now that wildlife is more than animals to be hunted, and days spent in the woods are far more than recreation. It's clear now that public concern over the forest transcends economic analysis, and that the costs and
benefits of forest management decisions involve much more than dollars and cents.

Over the past decade, land use planning by the Forest Service occurred coincidentally with a rapid evolution of the concept of appropriate forest management and policy. Thus, the planning process brought the Forest Service and the nation face-to-face with new realities. During that period, the national forest management issues evolved from concerns that were local, state, and regional in scope. The expansion of public interest in national forest management and policy issues beyond the western states, which contain the vast majority of public lands, represents a continuing shift in political power as applied to public land issues.

A CHANGING CONSTITUENCY

Participation by interest groups in forest planning has proven to be very difficult to organize, to receive, to evaluate, and, certainly, to act upon. The traditional Forest Service constituencies were recruited and cultivated around the concept of multiple use. These constituencies thought of the national forests in terms of livestock grazing; wood and timber extraction; wildlife (basically hunting and fishing); recreation (camping and hiking); and water (downstream users). The agency today remains organized along these lines, and each organizational level has its own constituency and serves as the in-house caretaker of the interests of that constituency.

Although they are not monolithic in their views, the newest participants in the forest planning process have been grouped together as environmentalists. As a group, however, environmentalists have a deep and strongly expressed concern about how national forests have been managed, and have demanded some changes. Working on five fronts—legislative, political, public affairs, legal, and personal involvement—they have been ever more successful in challenging the status quo. Yet, environmentalists have not been recognized or claimed as a constituency by any crew of the Forest Service staff.

Arrival of the Gladiators

Clearly the average citizen cannot or will not devote the time necessary to participate in the forest planning process effectively and over the long haul. The planning process has dragged on for over a decade, and many of the initially enthusiastic participants have dropped out, exhausted by the time required for meetings and reviews of documents that are increasingly technical, mathematical, and voluminous.

Some of the hard-core participants, those with an abiding interest, eventually formed well-organized groups. On both sides of the issue, these groups grew and became molded into organizations that had the aim of providing resources—political, technical, legal, and financial—that are necessary to ensure increased effectiveness in the forest planning process. As those involved individuals found themselves in organized advocacy groups, professional gladiators came to dominate the arenas of natural resource politics, planning, allocation, and management.

The Need for Collaboration

Until the ranks of our natural resource management agencies are filled with Renaissance men and women—and I think that's probably never—much improved collaboration among disciplines and interest groups will be required to achieve technically integrated, politically acceptable forest management. Collaboration,
unfortunately, is the antithesis of the land-use planning process that's evolved up to this point. This is because the gladiators are paid by the extreme elements in the debate, and they most commonly dominate the process. They fight hard, sometimes dirty, and always to win. Perhaps that needs to change.

THE SCIENTIST'S DILEMMA

The process of exerting influence over the management of forests on public lands has steadily become more adversarial, sophisticated, and expensive. Amateurs have faded into the background, except when they can provide resources for the gladiators.

The traditional role of scientists has been to conduct the research that provides the building blocks of knowledge and to perform the syntheses of technical information that are used to construct foundations for natural resource management. Today, however, scientists are increasingly involved in developing or evaluating criteria that serve to guide forest management activity. I believe that this change results from a desperate search for new participants in natural resource management and planning. The new participants need to have a higher level of technical and political credibility than do the more traditional players, who have been battered in a long, drawn-out, and increasingly contentious planning process.

The outcome of increased participation of scientists in evaluation and planning is unclear. When participating scientists produce results that are not in keeping with the desires of those who represent extremes in the debate, their credibility, intelligence, motivation, and objectivity will be constantly and fiercely attacked. Scientists tend not to be faceless and nameless producers of plans; thus, the attacks can be made personal.

These attacks come as a shock to the minds and souls of innocence. Scientists have not been well-prepared for the management area, i.e., did not attend gladiator school during their formative years. Those who stand in the arena with gladiators circling, looking for a weakness to attack, risk their professional reputations. Most scientists neither seek nor relish this experience. Nonetheless, scientists will find it increasingly harder to avoid the arena, and to hide from the need and demand for applicable knowledge. It's an exacting, tough, mean, and bruising process.

Any side in an intense debate over natural resource management processes and decisions can quickly turn up at least a few supportive scientists, who will suggest alternative courses of action or point out weaknesses in present information or analysis. As a result, however, many scientists are turning their backs on this dirty business of natural resource allocation. That, I think, is the nation's loss. Although scientists have much to offer in improving forest planning and management, we need to recognize that there is no panacea for conflict resolution inherent in their participation. The public should not expect too much from scientists, because science is a method in the search for truth, and not an infallible end result or a product.

FOREST PLANNING AS THE CONSTRUCTION OF SOCIAL CONTRACTS

Forest plans indicate, among many other things, the intent to produce commodities at stated levels. Harvesters, processors, and users of those commodities then rely on those projections to make economic decisions and social commitments. A powerful constituency assumes that the level
of outputs projected is promised, and this projection can be reduced in response to changing conditions at some point in the future only at great economic, political, and social cost. Thus, whether intended or not, a social contract, or at least a political contract, is formed with constituencies upon the approval of forest plans.

The projections, interpreted as firm commitments by the interest groups, exert profound influence on all present as well as future planning and resource allocation exercises. Therefore, each planning cycle begins with all of the baggage carried from the preceding plans.

Over the centuries, planners have neglected to leave a cushion, a margin for error in establishing quotas for exploiting natural resources from natural systems. Yet when we exceed the limits of biological systems, even if only rarely, we can produce resource damage that cannot be fully repaired. Planners need, therefore, to be conservative in what is promised, and users, cautious in terms of what is expected, if we are to manage natural resources on a more sustainable basis.

The Sorcerer's Apprentice

There seems to be an evolving dream in this conflict that a computer, directed by an infallible model, when fed an adequate diet of appropriately mixed and seasoned data, will then spew forth infallible answers for the planner's use. This is an illusion, and always will be. There are neither sufficiently sophisticated models nor data of adequate quantity and quality to entice the beast to foolproof answers. Nonetheless, these sophisticated tools can produce an illusion of accuracy and understanding. When the computers devour data that enable the models to deliver results that do not ring true in the light of theory, empirical data, experience, common sense, and professional opinion, caution lights should flash and alarm bells should ring. Caution is therefore advised. Models and computers are bloodless tools that do not suffer the consequences of their shortcomings or of their misuse. These consequences are reserved for the people affected, and for the forest.

The Role of Monitoring

There is a growing tendency for planners and managers to promise research and monitoring activities adequate to detect whether or not projected levels of goods and services can be derived from natural systems. As might be expected, however, the risks inherent in making or accepting such promises too readily are great. An intensive monitoring program cannot mitigate for management actions that have a high probability of adverse effect.

We need to ask several questions when we prescribe a monitoring program. Do adequate techniques exist? What would monitoring cost? Have the protocols been developed and tested? What are the critical indicators? What are the thresholds and critical values for deciding whether or not a change in management is necessary? Are the trained personnel available? Can they be acquired? Are resources to support such a monitoring effort apt to be forthcoming?

If the answer to any of these questions is no, what are the alternatives? Monitoring programs that involve data collection adequate for risk analysis and attendant decision-making are expensive, probably more expensive than can now be anticipated. Further, an appropriate monitoring program needs to consider "lag effects," i.e., adverse impacts that are more dramatic or occur sooner than can be revealed by the monitoring effort. Thus, the
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damage may be done before it is detected.

This possibility is particularly worrisome in monitoring efforts that involve cumulative effects, which are unknown or poorly understood and related to several interacting activities. Series of measurements over many years may be required to distinguish between changes that result from normal, seasonal, and annual perturbations, and those that are attributable to management activity.

Promises to monitor the impact of an activity on a natural resource or system are sometimes made to allay concerns over a risky course of action. The validity and potential for full implementation of the promised monitoring program must be assessed rigorously. Monitoring does not and will not ever substitute for wise and conservative planning for the management of natural resources.

Recognizing Complexity

Introspective natural resource managers are becoming increasingly aware that their understanding of forest ecosystems is rudimentary and inadequate. Such recognition begs caution. As the ecologist Frank Egler said, “Nature is not only more complex than we think, it’s more complex than we can think.”

The political and legal cloud that swirls around natural resource management is likewise complex. This complexity seems to increase steadily with the rapid shifting of public opinion, formulation of new laws, periodic court opinions, and surges of gladiators in the arena. Forest plans are constructed on sands that are ever shifting economically, technically, socially, politically, and legally. These quick shifts result in a quandary for natural resource managers and the public, who need stability in order to develop long-term vision.

The Changing Goal of Forest Planning

Upon superficial examination, forest planning seems to be largely “bottom-up” in nature. Each national forest develops a plan that considers the ecological, social, and economic circumstances unique to that particular administrative unit. The estimates of goods and services to be derived from each forest add up to the regional commitment, and the regional situation contributes to the national situation. The amount of commodity or products thus provided has been the focus of desired outcomes.

This is not surprising when we consider the evolved importance of the annual sale quantity of timber to regional economies and to the largely rural, sometimes isolated, natural-resource dependent communities that are located in or near national forests. The welfare of these communities is the legitimate concern of appointed and elected officials, and all politics are indeed local. Furthermore, the Forest Service has a long-standing policy of aiding in the creation and maintenance of community stability. As a result, over the decades, wood and livestock production have become foremost among the multiple uses. The other multiple uses have not been ignored. In essence, planners either view them as constraints on the production of wood or assume that they are automatically accrued by-products of appropriately modified forest practices carried out primarily to produce or harvest timber.

This bottom-up planning and top-down grading, largely focused on commodity production, may have made sense when we began the planning process over a decade ago. But times and circumstances change as experience
accumulates, and the next planning cycle will obviously need to be modified in the light of our experience. During the past decade or so, the forest planning process has proceeded apace. As plans were instituted, new societal and scientific forces and concerns had come forcibly to the fore. These concerns include threatened and endangered species, biodiversity retention, long-term productivity, and ecosystem sustainability. As a result, land-use planning and national forest management will never be the same again.

The Importance of Laws

There is a clear trend in the thrust of laws that influence national forest management in the United States toward increased consideration over what has been grouped together as environmental concerns. The Multiple Use-Sustained Yield Act of 1960, the Wilderness Act of 1964, the Wild and Scenic Rivers Act of 1968, the National Environmental Policy Act of 1969, the Clean Water Amendments of 1972, the Endangered Species Act of 1973, the Forest and Rangeland Renewable Resources Planning Act of 1974, and the National Forest Management Act of 1976 simultaneously tightened the controls on commodity production, and broadened the goals for managing national forests.

For example, the Multiple Use-Sustained Yield Act and Resources Planning Act required and directed attention to multiple uses and to multiple values, even though they allowed the major emphasis to remain on production and harvest of wood products. In addition, the Wilderness Act and the Wild and Scenic Rivers Act created new land classifications, whereas the National Environmental Policy Act, the National Forest Management Act, and the Endangered Species Act directed emphasis to environmental concerns. Each of these acts and the subsequent federal court decisions that scored the agencies' attempts to obey these laws have turned the screws tighter. The thrust of the laws and court cases is clear: national forest management will ensure attention to multiple use, to wilderness, and to wild and scenic rivers; the environmental and economic effects of all proposed management actions will be analyzed; diversity will be retained in plant-animal communities; and all forms of plant and animal life will be protected.

Over time, increasingly frequent and violent collisions have occurred in the form of legal challenges to management options resulting from attempts to comply with these acts while simultaneously maintaining past levels of commodity production. Some of those collisions have been particularly dramatic and revealing.

The Northern Spotted Owl Takes Center Stage

The listing of the northern spotted owl as threatened by the Fish and Wildlife Service in 1990 and the evolution, through the recovery plan, of President Clinton's proposed plan for federal lands in the owl region are critical elements for understanding the current forces operating on national forest management. These listings and plans exemplify the trials and tribulations of federal land management agencies, trying to respond to citizens, whose changing values are expressed in the laws, while not dramatically altering the traditional levels of commodity production. This still-unfolding drama will probably go down in conservation history as a classic example of a collision caused by the interactions of the Multiple Use-Sustained Yield Act, the Resource Planning Act, the National Forest Planning Act, the National
Environmental Policy Act, and the Endangered Species Act. It is a moment of truth, a watershed of national values.

Before the owl was listed as threatened, the Forest Service ultimately judged all of the proposed conservation strategies on the basis of their ability to satisfy the regulations issued pursuant to the National Forest Management Act “to maintain all native vertebrate species in a viable state across their ranges on the national forests.” After the owl was declared threatened, all plans were additionally evaluated as to whether or not the intent of the Endangered Species Act was satisfied, that is, “to provide the means whereby the ecosystems upon which an endangered and threatened species depends may be conserved.” These evaluations have evolved into the present state of affairs. All strategies proposed to date have been increasingly expensive in terms of opportunity cost and social impact. This was true of the Draft Recovery Plan and is true of the President’s Plan. The political distress caused by the specter of adoption of any of the strategies has been both immediate and profound at state, regional, and national levels.

Social impacts are particularly difficult to evaluate. For example, consider the employment estimates made for the conservation strategy for the northern spotted owl from the Interagency Scientific Committee Report (the Thomas Report). Job losses have been estimated to range from well less than 2,000 by economists funded by environmental groups, to well over 140,000 by economists funded by the timber industry. The estimates depend on the assumptions made, and perhaps the predilections of the analyst. Nonetheless, the array and interpretation of information available is wide.

In retrospect, the Endangered Species Act was a first, rather simple and straightforward attempt to maintain biodiversity. The National Environmental Policy Act additionally required that all federal actions be evaluated as to their environmental consequences, and the regulations issued pursuant to the National Forest Management Act required that viable populations of native vertebrates be maintained, well-distributed within the national forest(s) in which they occurred.

IS PROTECTION OF THE OWL REALLY THE ISSUE?

The northern spotted owl issue has become synonymous in some minds with the debate over the future of old-growth forests of the Pacific Northwest. If we were to look simply at owls, we might be able to discern the exact attributes of owl habitat, and then perhaps to provide such habitat through innovative silviculture.

Ab-ba. So it’s simply a question of habitat for spotted owls. If we can provide for owls with appropriate silviculture, then we would no longer need to reserve mature and old-growth forests. However, other species of plants and animals have evolved with, and seem to be disproportionately associated with mature and old-growth forest states. Some of these species will almost certainly be listed as threatened, as has the marbled murrelet.

Ab-ba. The question is not only about owl habitat, but also a question about old-growth management. Further, the attributes that provide for old-growth also provide the niches that support the species that interact in yet not understood ways to make up a forest ecosystem.

Ab-ba. The question isn’t really about old-growth; rather, it’s an ecosystem question. Even so, increasing knowledge
indicates that the size, distribution, and connectivity between habitat patches may be critical variables in ensuring that a particular ecosystem retains its full, inherent complement of species and ecological processes.

*Ab-ha.* This means that the question is about ecosystems—at the landscape scale. But some of the people who are devoted to the preservation of old-growth know or care little about the biological aspects of the issue. They simply see great beauty in old-growth. Some even perceive a spiritual value in the existence of such forests.

*Ab-ha.* The question involves aesthetics and spiritual values, as well as biological attributes. The ecosystem question must be addressed at the landscape scale. What must this landscape accommodate? People are part of that landscape, as are plantations, the ancient cathedral forests, the clearcuts, the elk and the owls, and the streams and the fish. Those people have desires, differing values, and untold aspirations that demand attention. Each of us sees and wants different things from the landscape of which we too are a part. And we want our children and our grandchildren to have these same things. In the final analysis, then, we are dealing with an ecosystem sustainability question on a geographic scale, where protection of nature, the production of goods and services for people, and the lifestyle of forest users must somehow strike an enduring balance.

How are we to strike an enduring balance? The opportunity, social, and political costs of adopting any conservation strategy or any other such strategy that will be both scientifically credible and legally sufficient may be significant enough to stimulate political action.

The first option might be to weaken the Endangered Species Act, the National Forest Management Act or its regulations, the National Environmental Policy Act, or all three.

The second option might be to use the exemption provision under the Endangered Species Act, the so-called "God Squad," to exempt listed species from protection or to weaken that protection so that social and economic effects are dampened.

The third option might involve another legislative fix to restore some order and predictability to the timber supply situation in the Pacific Northwest, while also giving some protection to listed species. This option continues to be discussed. In the past, such fixes have been temporary and controversial, have failed to provide stability, and have tended to increase problems—short- or long-term. Although no one professes to prefer these short-term solutions, ongoing political, social, legal, scientific, and governmental activities may become so hopelessly entangled that the quick legislative fix, however temporary or risky in nature, might become the politically more attractive option. Short-term fixes unfortunately ease political pressure for developing and adopting long-term solutions.

The fourth option might be legislative action to create a system of late successional or old-growth reserves, and then to declare the issue resolved. That seems unlikely, at least in 1993.

The fifth option might be to fully follow the course prescribed in law and recently clarified by the federal courts. The President's Plan for Northwest forests attempts to do this. This option would require that we accept the political, social, and economic disruption that will prevail until the process is complete.
Until some option is selected and implemented, uncertainty will prevail. The gladiators certainly will not retire from the arena. Some lawmakers and natural resource managers recognize that other species await consideration for listing as threatened, and some of these species undoubtedly will be listed. The debilitating social and political turmoil that will rise in the aftermath of each species being listed is anticipated with increasing dread. Gladiators thrive on turmoil, and are in their best in mayhem. Political leaders and the people do not do well on such a free-for-all too long sustained. This is particularly true when the same kinds of lose-lose issues must be confronted over and over again, and leads to the ever more common cry, "There simply must be a better way."

**THERE MUST BE A BETTER WAY**

Addressing the preservation and recovery of one threatened and endangered species after another will ultimately become too burdensome for society and its political and legal processes to bear. That consternation leads to the consideration of yet another option. This option requires that we recognize that the scientific debate has evolved from questions about individual species and site-specific places to the larger questions regarding the survival of ecosystems and their attendant plant and animal communities in some sustainable array on the landscape.

What was not feasible even five years ago is possible now: an attempt to conserve biodiversity through ecosystem management at the landscape scale. Such an approach does not have to start from scratch. The scientific principles are established, the necessary technology exists and is improving rapidly, the political climate is changing, and most importantly, the federal lands can be accessed to form the framework.

Under current land allocation and management, prescriptions do not necessarily fit together to form an interactive, sustainable, biological entity. We need to consider land use in a context broader than a series of single-use allocations that address specific problems or pacify the most vocal constituencies. We simply cannot continue along our present path of dealing with the assured welfare of individual species as constraints and the outputs of goods and services as objectives.

The questions are larger and more complex than that. The political, economic, and social costs are mounting rapidly. We stand on shaky ground, and must either step back from the commitments of the Endangered Species Act, the National Environmental Policy Act, and the National Forest Management Act, or move on to an expanded concept of land management. This concept has to be more in keeping with both current scientific thinking and capabilities and society’s evolving demands and values.

Marion Clawson wrote a book with a question for a title: *Forests for Whom and for What?* He suggested a framework of policy analysis which included: (1) physical and biological feasibility and consequences; (2) economic efficiency; (3) economic welfare and equity; (4) social and cultural acceptability; and (5) organizational or administrative practicality. I believe that analyzing the status quo and the alternative political options described earlier by Clawson’s criteria would argue that we should seriously consider choosing the option that considers ecosystems at the landscape scale.

These unfolding circumstances are inadvertently creating new land use
classifications. The late-successional reserves in the President's Plan for federal forests in the Northwest are one example. Dedicated timber production areas called for by some groups is another.

Whether or not the establishment of such allocations by law is wise should be vigorously debated. In practical terms, the same result may be occurring as a matter of course. Before these land use classifications are put into law, it may be prudent to fully consider the ramifications of adopting a new planning and management approach as an alternative. That's under consideration now. New laws, after all, often cause more problems than they solve.

This new approach would identify forest sustainability with recognized values and uses as the foremost goal of national forest management, and use the conservation of biodiversity as a mechanism to that end. Such an approach will require consideration of the conservation of landscapes and the process of landscape management.

Aldo Leopold observed that, if tinkering with nature was to be an intelligent process with a maximum chance of long-term success, care should be taken to save all of the cogs and wheels. The Endangered Species Act was the first step. The National Forest Management Act and accompanying regulations were a second step. We now need to expand on that concept, with or without legislation, to emphasize the conservation of biodiversity and the conservation of ecosystems. Legislation in that regard may or may not be helpful. There seems to me to be no shortage of legislative instruction, only a scarcity of effective and willing compliance.

The species-by-species approach described by the Endangered Species Act will still be applicable in certain cases, but such is not adequate to move us from where the unfolding drama of forest land management and planning logically take us. We must learn to prevent the creation of threatened species, rather than attempt the heroic management feat of pulling species back from the brink of extinction once they're declared threatened.

A LAND ETHIC TO GUIDE USE

Our society at long last seems to be moving toward the implementation of a land ethic. Aldo Leopold suggested a land ethic in which "A thing is right when it tends to preserve the integrity, stability, and beauty of the biotic community. It is wrong when it tends otherwise."

The idea of a land ethic is still emerging; however, such an ethic must be developed and applied with Clawson's question, "Forests for whom and for what?" ringing in our ears. The most vexing of the problems to be faced in developing a useful ethic will be linked in all that's implied in the question of "Forests for whom and for what?" with biological capability providing a foundation for forest policy and management.

This evolving ethic, after all, is a human concept and thus must include the needs and desires of people. This implies that the provision of goods and products and services from the land has a place in the land ethic, in addition to the requirements for retention of the integrity, stability, and beauty of the biological community. Thus, Leopold's vision of what that ethic might entail must be expanded to account for conserving biodiversity and to provide for sustainable provisions of goods and services simultaneously. That constitutes a very tall order, but we're further down that trail intellectually, ethically, and technically than we ever have been before. A path not yet taken stretches ahead.
Our experience from comprehensive planning of the national forests and the sudden imposition of large-scale alterations in completed forest plans to comply with the requirements of the Endangered Species Act has taught us several lessons, which follow:

1) The national forests cannot maintain the production of commodity products at traditional levels and meet the mandates imposed by the National Forest Management Act, the National Environmental Policy Act, the Clean Water Act, the Endangered Species Act, and the Resources Planning Act.

2) The limits of these laws in the federal courts are to be tested at very high risk and with large costs in terms of dollars and credibility.

3) Addressing the conservation of biodiversity by means of the Endangered Species Act is producing high levels of political frustration, and is not adequately responding to underlying concerns to conserve biodiversity.

4) National forest management is predicated on an inappropriate scale. We now see that we need to deal with forest management in an ecosystem context and at the landscape scale if we are to adequately address the goal of conservation of biodiversity.

5) The landscape contains people, whose desires and needs must be considered and satisfied to the maximum extent possible.

6) The next round of planning must be conducted with these lessons in mind.

By moving to the broader ecosystem context at the landscape scale, we can develop more adequate plans for management, but these plans are only part of an evolving solution. Other changes, perhaps the most important, must take place within all of those involved in determining what happens to our forests.

Will the path that we have followed for 50 years take us and our forests to some desired future state? Consider the following pairs of words. The first word in each pair is where we have been and where we are; the second word is what we need to cultivate within ourselves to do a better collaborative job of stewardship. The words are: functional, interdisciplinary; competitive, cooperative; reductionist, holistic; deterministic, stochastic; use, value; linear, interdependent; training, education; simplified, diversified; short-term, long-term; site, landscape; individuals, communities; gladiators, diplomats; rigid, flexible; clever, wise; and narrow, broad.

With Weariness Comes Hope

The fighting goes on, and accelerates in frequency and intensity. The people, our sense of community, and the forests are bruised and battered in the process. Gladiators never tire of the fight. It's what they do. I detect, though, that many concerned with the forests that we collectively own have long since approached exhaustion. That may be good news; with exhaustion there may come a willingness to seek an answer to the statement made earlier—"There must be a better way."

That better way can be built on new knowledge, as well as past experiences and changes in personal and societal concepts. That better way can be embraced, because the old way has led us to a place where we simply cannot stand. Shakespeare said in Julius Caesar, "The fault, dear Brutus, is not in the stars but in ourselves." I would end by saying, if the fault lies within us, then the solution must reside within us as well.