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ECOSYSTEMS AND THE LAW: TOWARD AN INTEGRATED APPROACH

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Abstract. American law, with its emphasis on boundary lines and property rights, does not reflect an advanced understanding of ecology. Nonetheless, on the federal public domain, the concept of ecosystem management has now been endorsed by all of the federal land-management agencies. Despite few explicit references to ecosystems or biodiversity, laws like the Endangered Species Act of 1973, National Forest Management Act of 1976, and National Environmental Policy Act of 1969 can and are being interpreted to support recent ecosystem-management initiatives. It is less clear that ecosystem-management principles can be readily transferred to private property. This shortcoming means that the law has not fully absorbed the lessons of ecology. I examine how the law promotes and hinders the movement toward an ecological management and ownership regime. I also suggest that recent ecosystem-management initiatives should provide useful lessons about how ecological principles can be further incorporated into the law.

Key words: biodiversity conservation; ecosystem management and law; ecosystem management policy; ecosystems and private property; Endangered Species Act of 1973; environmental law; National Environmental Policy Act of 1969; National Forest Management Act of 1976; natural-resources law; private property rights; property rights, legal theory of; public lands.

INTRODUCTION

Natural-resource management is undergoing profound changes. Where we traditionally have managed single resources, we are now attempting to manage entire resource systems in an integrated fashion (Society of American Foresters 1993). Where natural-resources policy ordinarily has been based upon existing political boundary lines, we are now seeking to transcend these boundaries to manage at an ecosystem or regional scale (Keiter 1994*a*). Where we historically viewed resources as plunder for the taking and valued only those things with obvious economic utility, we are now attaching value to resources and species that previously were viewed as worthless (Noss and Cooperrider 1994). Where we have ascribed rights only to individuals and corporate entities, we are now beginning to think that natural objects also might enjoy legally enforceable rights (Nash 1989). In short, ecological facts that no longer can be denied are refashioning how we perceive natural resources and inexorably moving us toward an ecosystem-based management approach (Christensen et al. 1996).

As this transition unfolds, a major challenge is to harmonize the law governing land and resources with the ecological realities confronting managers and policy makers. Yet the emerging doctrine of ecosystem management cuts profoundly against many of the assumptions undergirding the existing legal system (Bosselman and Tarlock 1994). Property rights and most natural-resource laws are based upon the notion of boundaries, which have rarely been defined in ecological terms (Keiter 1989). The very concept of legal ownership rights implies certainty and stability, but the nature of ecosystems is instability and disequilibrium (Botkin 1990), requiring a management strategy based on adaptive experimentation (Lee 1993). Moreover, the existing legal order is generally designed to ensure prompt and tangible financial returns, while ecological management often requires lengthy observation periods and managerial forbearance (Sax 1993). As a result, only a fragmentary and incomplete ecosystem-management obligation can be derived from existing law.

This paper will attempt to reconcile the current law with the concept of ecological management. It begins by defining ecosystem management and explaining its significance. Next, it explores the relationship between ecosystem management and the public domain, examining how the governing law can be interpreted to promote or hinder ecosystem management. It then addresses the difficult problems involved in extending ecosystem-management principles to privately owned lands, an essential dimension of ecological management and biodiversity conservation. It concludes with observations on how current ecosystem-management initiatives are laying the foundation for further changes integrating ecological considerations into the law.

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Ecosystem Management Principles

Existing law generally does not speak in terms of ''ecosystems,'' ''ecosystem management,'' or ''biodiversity.'' Nevertheless, the federal land- and resource-management agencies have adopted ecosystem management as an operative policy across the public domain (Congressional Research Service 1994). A similar evolution is occurring within state resource-management agencies (Wheeler 1993, Romm 1994). Some ecological principles have even been extended onto private lands, and they are beginning to reshape bedrock ownership concepts (Warburg and McElfish 1994). In the shadow of the law, therefore, the doctrine of ecosystem management is emerging as a powerful though often misunderstood policy.

In the absence of a concrete legal definition of ''ecosystem management,'' several alternative definitions have been proposed. A federal Interagency Ecosystem Management Task Force (1995*a*:3) has defined ecosystem management as:

> *. . . a method for sustaining or restoring natural systems and their functions and values. It is goal driven, and it is based on a collaboratively developed vision of desired future conditions that integrates ecological, economic and social factors. It is applied within a geographic framework defined primarily by ecological boundaries.*

The Ecological Society of America has suggested a somewhat different definition (Christensen et al. 1996: 668–669):

> *Ecosystem management is management driven by explicit goals, executed by policies, protocols, and practices, and made adaptable by monitoring and research based on our best understanding of the ecological interactions and processes necessary to sustain ecosystem composition, structure, and function.*

Other definitions, each emphasizing different dimensions of ecological management policy, have also surfaced (e.g., Society of American Foresters 1993, Keystone Center 1996, Lackey, *in press*). Given the complexities involved in just comprehending ecological processes, the proposed definitions are understandably quite general and rather abstract.

As a result, the concept of ecosystem management is being further defined in terms of general principles during this transitional period (Grumbine 1994, Moote et al. 1994, Interagency Ecosystem Management Task Force 1995*a*). For the most part, these defining principles reflect the dynamic nature of ecosystems and are designed to sustain biological resources into the future. Yet because natural-resource management policy cannot rest entirely on science, these principles also acknowledge the human role in ecosystems and therefore incorporate social values into managerial priorities and processes (Moote et al. 1994, Interagency Ecosystem Management Task Force 1995*a*, Lackey, *in press*). In other words, ecosystem management contemplates natural-resource policies that are framed at appropriate spatial and temporal scales to meet human needs without impairing the integrity of underlying systems and processes.

Despite minor differences, most observers concur in the basic content of the principles governing ecosystem management. First, ecosystem-management goals must be socially defined through a shared vision process that incorporates ecological, economic, and social considerations (Cortner et al. 1994, Moote et al. 1994). Second, given that most ecosystems transcend conventional political boundaries, ecosystem management requires coordination among federal, state, tribal, and local entities as well as collaboration with other interested parties, including private-property owners (Shannon 1993, GAO 1994). Third, ecosystem management is based upon integrated and comprehensive scientific information that addresses multiple rather than single resources (Grumbine 1994, Moote et al. 1994). Fourth, ecosystem management seeks to maintain and restore biodiversity and sustainable ecosystems (Grumbine 1994, Keiter 1994*a*, Christensen et al. 1996). Fifth, ecosystem management involves management at large spatial and temporal scales to accommodate the dynamic and sometimes unpredictable nature of natural processes (Cortner 1994, Keiter 1994*a*). Sixth, because of its experimental nature, ecosystem management requires an adaptive management approach, which includes establishing baseline conditions, monitoring, reevaluation, and adjustment (Lee 1993, Interagency Ecosystem Management Task Force 1995*a*).

Drawing upon these general ecosystem-management principles, the federal land-management agencies have each adopted their own approaches to ecosystem management. The National Park Service defines its ecosystem-management strategy as a collaborative approach to accomplish sustainable ecological, cultural, and socioeconomic systems (National Park Service, *unpublished discussion draft* [Ecosystem Management in the National Park Service; 1994]), and has restructured its regional office system using large-scale ecological criteria (National Park Service 1994). The U.S. Fish and Wildlife Service defines its approach to ecosystem management as ''protecting or restoring the functions, structures, and species composition of an ecosystem, recognizing that all components are interrelated,'' and it is using watersheds as its basic ecological unit for management (Congressional Research Service 1994:3). The Forest Service is likewise committed to ecosystem management; in proposed regulations, it defined ecosystem management as ''a concept of natural resources management wherein National Forest activities are considered within the context of economic, ecological, and social interactions within a defined area over both short- and long-terms'' (USDA Forest Service 1995:

18920; U.S. Forest Service, *unpublished memorandum* [4 June 1992] from D. Robertson, U.S. Forest Service Chief, to Regional Foresters). The Bureau of Land Management (BLM) has also embraced ecosystem management, which it defines as ''the integration of ecological, economic, and social principles to manage biological and physical systems in a manner that safeguards the long-term ecological sustainability, natural diversity, and productivity of the landscape'' (USDI-BLM 1994:1–2).

Law and Ecosystem Management on the Public Domain

Translating these definitional principles into a coherent and workable ecosystem-management policy is not easy, especially under the prevailing legal regime. The absence of an express legal mandate endorsing ecosystem management on the public domain means that the land-management agencies must derive authority to pursue ecosystem management from their governing organic mandates as well as other related laws. While these mandates plainly provide land managers with sufficient discretionary authority to pursue ecosystem-based policies (Keiter 1994*a*, Interagency Ecosystem Management Task Force 1995*b*), the resulting initiatives cannot violate defined statutory missions (GAO 1994). Moreover, these same initiatives cannot overlook other legal requirements that give priority to commodity production or impose species-level preservation obligations. In short, while the law can be used to support federal ecosystem-management initiatives, it does not consistently compel this approach to land management.

Agencies responsible for managing preserved federal lands, such as national parks, national wildlife refuges, and wilderness areas, can derive direct support for an ecosystem-management approach from the existing law. In the case of the National Park Service, the National Parks Organic Act of 1916 provides that the parks are to be managed to conserve scenery, natural and historic objects, and wildlife, and to provide for public enjoyment, while ensuring that the parks are left ''unimpaired for the enjoyment of future generations'' (16 U.S.C. §1).[1] This nonimpairment requirement constitutes a clear, substantive standard that gives priority to protecting the ecological health of national parks over other considerations in the event of conflict (Keiter 1994*a*). In addition, the so-called ''Redwood Amendment'' admonishes Park Service officials to protect park resources from threatening activities, which essentially requires that park management responsibilities be viewed at an ecosystem scale (Lockhart 1988, Keiter 1994*a*). In the case of the U.S. Fish and Wildlife Service, the legislation governing the national wildlife refuge system provides for management compatible with the primary purpose of the refuge designation (16 U.S.C. §668dd(d) (1) (A)), which usually means managing to preserve critical wildlife habitat (Fink 1994). In the case of wilderness lands, the Wilderness Act of 1964 generally provides for strict preservation (16 U.S.C. §§1131(a), 1133(b)), a standard that is consistent with protecting natural ecological processes (Rohlf and Honnold 1988, Keiter 1994*a*). Thus, to the extent that ecosystem management contemplates minimal human intervention in naturally functioning ecosystems, the national parks, national wildlife refuges, and designated wilderness areas can be legally managed as ecological reserves.

The multiple-use management agencies—namely the Forest Service and BLM—also have sufficient statutory latitude to pursue ecosystem-management policies. In the case of the Forest Service, the National Forest Management Act of 1976 (NFMA) has superimposed interdisciplinary planning and interjurisdictional coordination obligations on its basic multiple-use management responsibilities (16 U.S.C. §§1604(a), (b)). The NFMA also contains a biodiversity conservation provision (16 U.S.C. §1604(g) (3) (B)), one of a few federal statutory references to this important ecological concept (Keiter 1994*a*). In addition, the NFMA places explicit limitations on timber harvesting, including riparian-zone protections as well as clearcutting and steep-slope restrictions (16 U.S.C. §1604(g) (3) (E), (F)). These provisions virtually require forest officials to view national forests as diverse ecological entities rather than simply monocultural tree farms (Wilkinson and Anderson 1985). In the case of the BLM, the Federal Land Policy Management Act of 1976 (FLPMA) recognizes that public lands contain ecological and environmental values (43 U.S.C. §1701(a) (8)), and it defines multiple-use management to include consideration of the ''long-term needs of future generations'' and to prohibit ''permanent impairment of the land and the environment'' (43 U.S.C. §1702(c)). It also provides for interdisciplinary planning and interjurisdictional coordination (43 U.S.C. §§1712(c) (2), (7), (9), 1732(a)), as well as designation of ''areas of critical environmental concern'' to protect biological resources and processes (43 U.S.C. §1702(a)).

Other laws also support ecosystem management on the public domain. The Endangered Species Act of 1973 (16 U.S.C. §§1531–1544), with its unambiguous commitment to protecting species against extinction, obligates the federal land-management agencies to give species preservation priority over other considerations (*Tennessee Valley Authority v. Hill* 1978). Because the courts have enforced the Act's jeopardy review and takings mandates (16 U.S.C. §§15336(a) (2), 1538(a)), biological considerations have been elevated on agency agendas whenever a listed species is present (*Thomas*

[1] U.S.C. = United States Code, the official compilation of all federal laws.

v. Peterson 1985; *Sierra Club v. Yeutter* 1991). Moreover, the Act applies across boundary lines; its jurisdictional reach follows habitat rather than political boundaries (Cheever 1991). The National Environmental Policy Act of 1969 (NEPA) (42 U.S.C. §§4321–4370(a)), although primarily a procedural law (*Robertson v. Methow Valley Citizens Council* 1989), has likewise profoundly influenced the behavior of federal land managers. NEPA requires that federal agencies prepare an environmental impact statement whenever a major federal action will significantly affect the human environment (42 U.S.C. §4332(2) (c)). The courts have aggressively enforced this requirement (Keiter 1990). In fact, several courts have ruled that meaningful environmental analysis requires examination of the true ecological impacts of a proposed action, including its cumulative impact in spatial and temporal terms (e.g., *Conner v. Burford* 1988; *Marble Mountain Audubon Society v. Rice* 1990; *Resources Ltd. v. Robertson* 1993). In addition, laws like the Federal Water Pollution Control Act of 1972 (33 U.S.A. §§1251–1387), the Clean Air Act of 1990 (42 U.S.C. §§7401–7671(q)), and Migratory Bird Treaty Act of 1918 (16 U.S.C. §§703–712) contain regulatory provisions that protect important ecological components, and can therefore be invoked to support current ecosystem-management initiatives.

The collective impact of these laws provides even more powerful legal support for ecosystem management than can be extracted from any single statute (Keiter 1994*a*). In *Seattle Audubon Society v. Lyons* (1994), the court cited four different laws—NEPA, NFMA, FLPMA, and the Endangered Species Act—to endorse the ecosystem-management policy adopted in the U.S. President's plan to address the Pacific Northwest's timber-harvesting controversy. The White House Interagency Ecosystem Management Task Force (1995*b*) similarly cited a plethora of laws to establish a legal foundation for current federal ecosystem-management approaches. Moreover, the courts, in an apparent effort to encourage comprehensive ecological assessments, have extracted complex planning and consultation obligations from the overlapping environmental statutes that govern public land managers (*Pacific Rivers Council v. Thomas* 1994; *Silver v. Babbitt* 1995). In *Pacific Rivers Council v. Thomas* (1994), for example, the Ninth Circuit Court of Appeals ruled that the Forest Service must reconsult with the U.S. Fish and Wildlife Service before implementing a forest plan when a new species is subsequently listed under the Endangered Species Act. To enforce its ruling, the court enjoined all forest-plan activities pending the reconsultation outcome. The decision suggests that endangered-species consultation obligations are important to ensure that a plan's full ecological consequences are assessed before implementation decisions are made piecemeal (Bada 1995).

Not all federal law, however, can be interpreted to support ecosystem management on the public domain. Older laws like the Taylor Grazing Act of 1934 (43 U.S.C. §§315–315r) and the General Mining Law of 1872 (30 U.S.C. §§21–42)—often referred to as the ''Lords of Yesterday''—are oriented toward commodity production on public lands with little regard for environmental consequences (Wilkinson 1992), and they grant important rights to ranchers and miners that can be invoked to challenge ecological initiatives. Similarly, federal land-management agencies traditionally have relied upon the multiple-use concept to give priority to commodity production; the annual congressional appropriation process has reinforced this tendency, with Congress regularly tying agency budgets to resource production targets (O'Toole 1988, Blumm 1994). The U.S. Supreme Court's revitalized constitutional takings doctrine provides federal lease holders with a potential legal weapon against ecologically based restrictions (Thompson 1996). The Federal Advisory Committee Act of 1972 (Public Law Number 92-463, 86 Statutes 770, 5 U.S.C. appendix at 1175), until it was amended recently, made interjurisdictional partnership arrangements among federal, state, and local governmental entities quite difficult to organize and convene (McHarg 1995, Lynch 1996). In addition, ''wise-use movement'' proponents have sought to argue, unsuccessfully under constitutional Supremacy Clause principles, that interjurisdictional planning requirements obligate federal land managers to give priority to county land-use plans advocating resource development over environmental considerations (*United States v. Nye County, Nevada* 1996; Reed 1993–1994). Moreover, several members of the 104th Congress promoted amendments to several key laws, including the Endangered Species Act, Taylor Grazing Act, and National Forest Management Act, that would have undercut current ecosystem-management initiatives.

Even some of the most environmentally protective laws are not entirely consistent with ecosystem-management principles. The Endangered Species Act requires preservation of single species, not entire ecosystems (Doremus 1991, Grumbine 1992); it has not been administered very aggressively (Houck 1993); and it is often only invoked after significant environmental harm has been done to important ecosystems (Kunich 1994). The National Forest Management Act's biodiversity-conservation requirement, according to one court, does not require the Forest Service to incorporate conservation-biology principles into its forest-planning processes (*Sierra Club v. Marita* 1995). The National Park Service, acutely conscious of its Organic Act obligation to meet park visitor needs, has often given visitor comfort priority over biological considerations, as in the case of Yellowstone's Fishing Bridge campground-closure controversy (*National Wildlife Federation v. National Park Service* 1987;

Runte 1987). Although the Wilderness Act provides a vehicle for protecting large blocks of wildlife habitat from development, the Act's wilderness-designation language speaks primarily in recreational rather than ecological terms, and Congress has rarely been moved by ecosystem-based arguments in making wilderness designation decisions (Nash 1982, Keiter 1994*b*).

Beyond the law, the federal land-management agencies have themselves erected bureaucratic barriers to ecosystem management on the public domain. Long committed to maintaining managerial discretion, federal land managers have been reluctant to relinquish any authority over resource priorities or decisions through collaborative processes or interagency agreements (Sax and Keiter 1987, Shannon 1994). As a result, many ecosystem-management initiatives consist of general commitments to coordination processes, rather than a clear statement of priorities giving ecological considerations primacy in making resource decisions (Keiter 1989). Haunted by long-standing agency rivalries, some federal land-management officials continue to suspect the motives of sister agencies promoting cooperative management initiatives. And long accustomed to meeting the commodity needs of local Western communities, some agency employees harbor the suspicion (shared by many local residents) that ecosystem-management proposals will ignore local economic concerns. Agency employees are also often ill prepared to address the complex scientific considerations that are part of an ecological management approach. Thus, besides resting on an incomplete legal foundation, federal ecosystem-management initiatives also must surmount agency traditions that are not entirely receptive to this new concept.

Law and Ecosystem Management on Private Lands

Because the nation's biological resources do not respect conventional political boundary lines, private lands are a critical dimension of most ecosystem-based management efforts. Outside the American West, most land is in private ownership. Extensive forest lands in northern New England and southern Appalachia are privately owned yet contain important ecological resources (Gilbert 1988, Trombulak 1995). Even in the West, private land holdings are interspersed with public lands, especially in those areas where the railroad-era checkerboard land-ownership pattern still prevails (Gates 1968). Reflecting early settlement patterns, low-elevation riparian lands are often privately held, and these lands provide critically important wildlife habitat, particularly during the harsh winter months. Human-sensitive species, like the grizzly bear, regularly encounter serious problems on or near private lands, where mortality rates are quite high (U.S. Fish and Wildlife Service 1993). However, a powerful, property-rights-based backlash has surfaced and appears intent on derailing recent ecosystem-management initiatives.

State and local law generally governs private property and land use. Unlike the uniform federal regulatory standards that prevail across the public domain, private lands are governed by quite diverse legal standards and policies. Most states have adopted zoning and local land-use planning laws, and the Supreme Court has sustained this exercise of governmental power against constitutional attack (*Village of Euclid v. Ambler Realty Co.* 1926; *Agins v. City of Tiburon* 1980). State land-use planning laws, however, are often discretionary rather than mandatory, and usually contain waiver provisions. Although some progressive states, such as Vermont, Oregon, and Washington, have included ecological-protection provisions in their planning laws, most states do not require consideration of ecological concerns (Tarlock 1993, Warburg and McElfish 1994). In fact, the dominant theme pervading state property law is that landowners possess an autonomous right to decide how to use or develop their property, subject only to minimal zoning constraints as well as judicially created nuisance limitations (McElfish 1994).

This prevailing view of land as a fungible commodity is now being challenged by the view that land performs critical and unique ecological functions, which merit legal recognition and protection (Sax 1993). Property is gradually coming to be seen as a vital ecological resource that confers important communal benefits (Freyfogle 1993, Sax 1993). As part of an interconnected ecological web, individual pieces of property play an important role within the larger ecosystem. When property is viewed from this perspective, property owners may no longer be entitled to proceed autonomously; owners may be required to take account of whether the parcel performs critical riparian, habitat, or other ecological functions (Humbach 1989). When this is the case, owners may owe an ecologically based legal obligation to the community to protect these functions, which may require modification or relinquishment of development plans (Karp 1993).

To be sure, this emerging view of property is still quite controversial and not yet widely shared. But property law has always been evolutionary: The legal principles governing property ownership rights and responsibilities have been adapted—time and again—to meet changing social conditions (Sax 1993, McElfish 1994). With some state legislatures and courts now beginning to integrate ecological concerns into the concept of ownership, that evolutionary process appears to be taking a new turn. Given the public's steadfast commitment to environmental protection, this trend can be expected to continue, though on a piecemeal basis.

Because property rights are constitutionally protected, landowners can invoke the Fifth Amendment of the U.S. Constitution to challenge government regulations designed to protect ecological resources on private prop-

erty. Under the Fifth Amendment, the government is prohibited from taking property without just compensation, and the U.S. Supreme Court has ruled that this takings limitation extends to regulatory restrictions on property use (e.g., *Dolan v. City of Tigard* 1994). Briefly stated, the Court has ruled that a compensable takings occurs if (a) the government regulation is not substantially related to legitimate government interests or (b) constitutes a deprivation of all economically viable use of the property (*Lucas v. South Carolina Coastal Council* 1992; *Nollan v. California Coastal Commission* 1987). Although it is not easy to establish a constitutional taking under these standards, the Court's takings decisions nonetheless give private landowners a powerful legal tool to contest government zoning and land-use restrictions. Even if a court eventually determines that the challenged regulation does not cross the takings threshold, the threat and expense of litigation will deter many state and local governments from utilizing their full police powers to protect biological resources on private lands. Moreover, in an effort to deter additional environmental regulations, property-rights proponents have successfully pushed regulatory takings bills through several state legislatures (Martinez 1994).

Some federal laws extend to private lands and provide protection for important ecological resources. Most notably, the Endangered Species Act's prohibition on ''taking'' listed species applies across jurisdictional boundaries and reaches private property (16 U.S.C. §1538(a)(1)). Because ''taking'' is defined as ''harm'' to protected species, the U.S. Fish and Wildlife Service has adopted regulations limiting private landowners from significantly altering habitat (50 C.F.R. §17.3).[2] The Supreme Court, in *Babbitt v. Sweet Home Chapter of Communities* (1995), recently sustained these regulations against the argument that the agency exceeded its statutory authority by extending them to private property. Relatedly, the Clean Water Act's wetlands protection provision (33 U.S.C. §1344), which safeguards this important ecological resource from exploitation, has been attacked for removing too much valuable property from productive use. The courts have sustained some takings challenges to specific wetlands-designation decisions (Blumm 1995), and the federal agencies are still undecided about how broadly to define the concept of a wetland. Thus, even though federal regulatory power can be invoked under existing law to protect ecological resources on private lands, federal involvement in these matters is unpopular and has fueled a property-rights backlash against the ecological management of natural resources (Albrecht 1994, Ruhl 1995).

As an alternative, various nonregulatory approaches to preserving biological resources on private lands have been suggested. One approach, advocated by several natural-resource economists, is to defer to free-market forces to determine appropriate land use (Anderson and Leal 1991, Huffman 1994). According to this view, if property is most valuable for biological purposes, then the market will see that it is devoted to this purpose. But the conventional market puts little value on most biological resources or on biodiversity generally (Rose 1991). And an alternative government-constructed market system is not likely to have sufficient information about biological resources to be able to structure a market around intertwined, site-specific resources (Breckenridge 1995).

Another approach, which has emerged as a preferred strategy in several locations, involves the creation of public–private partnerships to promote coordinated, ecosystem-based management of widely shared biological resources (U.S. Senate Committee on Environment and Public Works 1994, Keystone Center 1996). In California, for example, a Natural Community Conservation Planning process is based upon federal, state, and private landowners collaboratively engaging in regional planning to accomplish biodiversity-conservation goals (Manson 1994). Such partnership approaches, however, are not always easy to initiate, implement, or sustain. Absent the compulsive force of a powerful law like the Endangered Species Act, participants must surmount their own often-divergent individual interests to establish mutually forged goals that are consistent with ecosystem protection. This can require a major commitment to time-consuming and often-expensive processes. And even if private landowners want to collaborate in federally based ecosystem-management partnerships, the Federal Advisory Committee Act imposes procedural barriers to such public–private cooperative arrangements (McHarg 1995, Lynch 1996).

A third approach involves the use of financial incentives to secure the cooperation of private landowners in ecosystem projects. One incentive approach, illustrated by the Nature Conservancy's property-acquisition program, involves the purchase of private lands or conservation easements to protect important ecological resources (Farrier 1995). While this approach is based upon the conventional view of private property as a transferable commodity and therefore requires no alteration in the prevailing legal system, finite resources mean that only a small portion of ecologically important lands can be protected in this manner. Another incentive approach involves the use of management fees that may be paid to private landowners to produce biodiversity on their property (Farrier 1995). The Defenders of Wildlife, for example, has established a program that compensates landowners on whose property wolves successfully breed and raise a litter of pups (Fischer 1995). However, it can be difficult to properly value these incentives or to secure government funds for such programs. Relatedly, compensation may be privately paid to landowners who suffer losses attributable to biolog-

[2] C.F.R. = Code of Federal Regulations, the official compilation of agency regulations that implement U.S. (federal) law.

ical-conservation efforts, as the Defenders of Wildlife is doing in the Northern Rockies to promote wolf recovery (Fischer 1995).

From a legal perspective, therefore, ecosystem management faces perhaps its stiffest challenge integrating private lands into an ecologically based approach to land and resource management. Centuries of tradition underlie our general conception of private property as well as the primary role that the states play in defining property rights and appropriate regulatory limitations. But just as an urbanizing nation earlier accepted zoning and other land-use controls as the price of communal living, ecological restraints may gradually be accepted as the price required to maintain critically important biological resources (Sax 1993). Because the nation's ecosystems are properly viewed as an important communal good, the public is plainly entitled to protect this increasingly valuable and diminishing resource. A few progressive states already have integrated ecological considerations into the existing legal regime governing property ownership. In other locations, public–private partnerships and the creative use of financial incentives are contributing to biological-conservation efforts. As others follow these leads, the concept of ecosystem management should gain a more secure foothold across the spectrum of property ownerships.

Toward an Integrated Approach

The challenge of integrating ecology into the law remains daunting. Successful ecosystem management involves coordinated policies addressing natural resources on both public and private lands at large spatial and temporal scales. Yet the legal standards governing these lands and resources are anything but coordinated; they represent a fragmented amalgam of federal, state, and local laws, often addressing single resources rather than the ecological complex itself. Although federal power might be invoked to impose ecological regulations across jurisdictional boundaries, the prevailing political sentiment is not likely to support extensive federal regulatory initiatives (Haeuber 1996). Any proposal calling for a national ecosystem-management law embracing both public and private lands would face considerable political opposition and could undermine the progress that is being made toward more ecologically sensitive management approaches.

Significantly, the legal differences between public and private land have not stopped the momentum toward ecosystem management. Reflecting a renewed national emphasis on site-specific solutions crafted through local democratic processes (Kemmis 1990), a variety of ecosystem-based management initiatives have surfaced across the landscape to address transboundary environmental problems. In the West, these initiatives ordinarily involve federal land managers forming partnership arrangements with state and local governments to resolve common land- and resource-management problems (U.S. Senate Committee on Environment and Public Works 1994, Keystone Center 1996). Many partnerships also include private landowners and nonprofit participants, particularly when ecologically important lands are in private ownership. In addition, the federal land-management agencies have undertaken several large-scale ecosystem-management projects, including transboundary, ecosystem-based forest planning in the Pacific Northwest (USDA Forest Service and USDI Bureau of Land Management 1994), the East-side Ecosystem Management Project in the Columbia River Basin (Haynes et al. 1996), and the collaborative federal–state Natural Community Conservation Planning process in California (Wheeler 1993, Manson 1994). Outside the West, similar partnership arrangements have surfaced in areas like the Northern Forest and Southern Appalachians as government officials, private landowners, and concerned citizens have jointly begun to examine ecosystem-scale management options (Gilbert 1988, Breckenridge 1995). The common characteristics shared by these initiatives are a recognition of the region's ecological and economic connectedness, as well as a commitment to a consensual problem-solving process (Keystone Center 1996).

These emerging and still largely experimental ecosystem-management initiatives have disparate origins. Many initiatives have been administratively created to address difficult resource-management issues that transcend traditional jurisdictional boundaries; some have been established by governmental agencies, while others represent private initiatives to break long-standing impasses. In several instances, the coercive influence of powerful legal mandates, particularly the Endangered Species Act, has prompted adjacent landowners to enter cooperative management arrangements to address cross-boundary resource problems (Wheeler 1993). In other cases, the initiatives can be traced directly to judicial decrees, most notably the integrated, ecosystem-based forest plan that resolved the Pacific Northwest's Spotted Owl–timber-harvesting litigation (USDA Forest Service and USDI Bureau of Land Management 1994). Thus, despite the lack of an explicit legal mandate, the law has played a key role in fostering the movement toward ecosystem management.

In fact, even though the law treats public and private lands quite differently, the existing legal structure has not been a major impediment to these initiatives. Federal and state law has proven sufficiently flexible to enable ecosystem-management participants to collaborate across jurisdictional boundaries and to develop common management goals. Laws like the National Environmental Policy Act (NEPA), National Forest Management Act, and Federal Land Policy Management Act explicitly provide for interjurisdictional coordination in federal planning and decision-making processes (Keiter 1994*a*), and should therefore promote federal, state, and local collaboration. NEPA procedures can—and should—be used to assess current ecological and social conditions

and to encourage public participation in ecosystem-management efforts (Keiter 1990, Interagency Ecosystem Management Task Force 1995*b*). The Endangered Species Act is being interpreted and implemented to encourage state and local participation in ecosystem planning efforts, perhaps most obviously in California's natural-community conservation-planning initiative (Wheeler 1993, Manson 1994). When federal court rulings on the Federal Advisory Committee Act (FACA) raised questions about state and local government collaboration in federal ecosystem-management initiatives, Congress amended FACA to exempt such collaborations from its rigid procedural requirements (McHarg 1995, Lynch 1996).

The law, however, also establishes important ecologically oriented constraints that should channel local debates over what ecosystem management means in a particular location. Where federal lands are involved, laws like the Endangered Species Act and NEPA require the preservation of endangered species, assessment of cumulative environmental impacts, and the use of good scientific information (Keiter 1994*a*), which means these considerations must be an important dimension of any ecosystem-management discussion. On private lands, federal laws like the Endangered Species Act and Clean Water Act protect critical ecological resources, and should therefore influence how landowners participate in new ecosystem-management arrangements. As more states and local jurisdictions incorporate ecological considerations into the responsibilities of property ownership, public–private cooperation for ecosystem-protection purposes should become even more commonplace. In short, the existing law can be invoked to ensure that ecosystem management experiments reflect a meaningful commitment to sustaining ecosystems and biological resources.

These new initiatives are providing useful insights into how ecosystem-management policies can be defined and institutionalized at the regional level. From a scientific perspective, these initiatives should help managers and citizens to: (1) better understand the ecological linkages between public and private lands; (2) acquire critical scientific data on biological resources and ecosystem processes; and (3) clarify the spatial and temporal dimensions required to ensure ecological integrity and resiliency. From a socio-economic perspective, these initiatives provide participants with an opportunity to: (1) identify long-term regional social and economic trends; (2) develop strategies to foster a stable and diversified economic base; and (3) explore alternative decision-making and dispute-resolution processes. From a legal perspective, these initiatives should help to: (1) clarify how concepts like biodiversity conservation and ecosystem integrity might be translated into a meaningful legal mandate; (2) identify effective mechanisms to promote the integrated management of public and private lands; and (3) better understand how the law can be employed to promote ecological and economic sustainability (Keiter 1994*a*).

The present challenge, therefore, is to nurture these emergent initiatives while extracting critical ecosystem-management lessons. The initiatives provide agencies and landowners with an opportunity to continue experimenting with different management approaches and to test the limits of existing law. They also provide an opportunity to educate the public that sustainable ecosystems are critical to the nation's well-being and to demonstrate what management at an ecosystem scale will entail. As the initiatives mature, the accumulated lessons should enable us to identify appropriate institutional structures and necessary legal changes required to protect the nation's ecological heritage.

Conclusion

The American legal system has generally responded to the felt necessities of the day. Confronted with new information and shifting social priorities, the law has evolved to accommodate changes in societal knowledge and values. That same process is now underway in the transition to an ecosystem-based approach to natural-resource management. Key ecological insights and understandings have been incorporated into federal law and are shaping an emerging commitment to ecosystem-based management, particularly on the public domain. These same insights are beginning to penetrate state and local law, which could reshape the fundamental principles governing property ownership. Myriad ecosystem-based initiatives have surfaced across the landscape and offer promising models of how public and private lands might be integrated for ecological-management purposes. As these lessons are absorbed and as ecological imperatives gain greater currency, further legal changes can be expected. Ultimately, the trend is toward explicit legal protection for ecosystem components and processes.

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