

CHAPT 2

# The Politics of Ecosystem Management

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## Chapter 2

# The Evolution of Ecosystem Management

The United States has historically gone through at least two distinct periods in its attitudes and approaches to resource management. The first, predominant in the eighteenth and nineteenth centuries, was marked by unfettered exploitation of the nation's resources. The second, the Progressive Era of the late 1800s and early 1900s, reflected a significant shift in attitudes and continues to influence resource management today. As we shall see, while challenges to the management philosophy established during the Progressive Era have periodically been mounted, to date none has totally replaced the patterns of politics and professional approaches that emerged out of that era.<sup>1</sup> In this chapter we explore these two major periods, the patterns of politics that emerged during each, and their effects on the political and ecological landscape. This chapter also examines the changes in social values, scientific knowledge, and professional practice that may be propelling us toward another significant shift—a shift toward ecosystem management.

### *Wild and Free*

The American ideal of a free and independent life developed early in United States history. The United States was a land of plenty, abounding in fertile grasslands, endless forests, and wild game. An eighteenth-century French naturalist reported that the most striking feature of the new American nation was "an almost universal forest," starting at the coast, "thickening and enlarging . . . to the heart of the country."<sup>2</sup> A seventeenth-century observer in New England wrote of the limitless flocks of passenger pigeons that blanketed the skies,



"that to my thinking had neither beginning nor ending, length nor breadth, and so thick that I could see no Sun." Meriwether Lewis observed much the same thing as he descended the Ohio River in 1803 at the onset of his epic journey across the American continent.<sup>3</sup> Artist and naturalist George Catlin recorded grasses so tall riders were "obliged to stand erect in our stirrups, in order to look over its waving tops."<sup>4</sup> The federal government's main concern was to allocate goods and resources to private parties, making way for individuals to seek their own fortunes and ways of life. A nation was being built, and the land played an important cultural and economic role in fostering that development.

Government policies in the nineteenth century, such as the Homestead Acts and the Desert Land Act, encouraged western settlers to take advantage of the country's resource abundance and promoted an agricultural society. These policies were largely based on Jeffersonian concepts of democracy and eulogized "yeoman farmers"—individual farmers who cultivated their own small parcels of land. Settlers were beckoned with promises of free land and unrestrained opportunities for resource development. Converting the nation's vast expanse of land into small farms would avoid, it was believed, the European model of wealthy landlords and poor tenants. Instead, yeoman farmers improving their own land would create economic development. The nation's future would rest on a propertied class in a propertied nation. The frontier epitomized individualism, self-reliance, and independence, values that are still ingrained in mythic images of the American West and American society.<sup>5</sup>

As implemented, however, the settlement laws of the nineteenth-century society were, more often than not, the focus of unscrupulous land grabs, ensuring that speculators and corporations rather than hardy yeoman farmers reaped the benefits.<sup>6</sup> To encourage western expansion, railroad companies were given large land grants, totaling some 180 million acres of the public domain. As the nation experienced a period of tremendous growth and industrialization after the Civil War, railroad owners and other industrialists became extremely wealthy and ruthlessly powerful by exploiting resources and corrupting legislators. The wealth of these "robber barons," as they came to be known, concentrated political as well as economic power in the hands of a few.

Americans reveled in the seemingly infinite wealth of nature. As one noted ecological historian concluded: "The people of plenty were a people of waste."<sup>7</sup> They fished, hunted, and cleared land with abandon. Thomas Jefferson defended the often inefficient and wasteful practices of his fellow Virginia planters by declaring that the nation had "such quantities of land to waste as we please," plentiful enough to last "to the hundredth and thousandth

generation."<sup>8</sup> As the nation grew, so did the impacts on the land. The expansion of the railroads linked the hinterlands to markets in growing urban centers eager for grain, lumber, and livestock, all of which were necessary for an expanding nation and growing economy;<sup>9</sup> the tall grass prairies of the Midwest were plowed to make way for cultivated grain; vast acreages in the Northeast and Great Lakes regions were deforested; and the Southwest became overrun with cattle and California and the Great Basin with sheep. Lands in the South were rapidly depleted by cotton and tobacco farming. Toward the end of the century, wild game hunting for commercial sale in markets became popular and wildlife populations were decimated. Buffalo hunters killed thousands of bison a day, often taking just tongues or hooves as trophies, and leaving the carcasses to rot. The passenger pigeons that once seemed limitless were killed by the millions.

Early conservation writers did warn of the dangers of resource waste, but they had little political impact at the time. Nonetheless, many of the themes of conservation that would later become policy in the Progressive Era are evident in nineteenth-century writings. In novels such as *The Pioneers*, *The Prairie*, and *The Deerslayer*, James Fenimore Cooper described the moral, spiritual, and aesthetic value of wilderness and deplored its thoughtless destruction. His frontier hero, Leatherstocking, condemns the exploiters with these words: "They scourge the very earth with their axes. Such hills and hunting grounds have I seen stripped of the gifts of the Lord, without remorse or shame!"<sup>10</sup> In 1832 George Catlin wrote of the overgrazing, overcutting, and general land misuse in the United States and proposed that some lands be removed from the public domain and be reserved as national parks. The writings of the Transcendentalists Ralph Waldo Emerson and Henry David Thoreau fostered a new appreciation by Americans of the unique heritage and benefits of forests and wilderness. Perhaps most significantly, in 1864 George Perkins Marsh published *Man and Nature*, which claimed humans were subverting the balance of nature to their own detriment.<sup>11</sup> So significant is the publication of his book, that Marsh, rather than later Progressive leaders, is considered the father of the modern conservation movement. Despite these early warnings, however, government policy did little to stand in the way of building a mighty industrial empire; "great waste [was] permitted for great accomplishment."<sup>12</sup>

### ***Conservation and the Progressive Era***

At the close of the nineteenth century, attitudes and policies toward natural resource use changed dramatically. Americans began to express their disgust with the robber barons and the widespread destruction of natural resources



and implemented laws intended to restore democracy and conserve resources. At the turn of the century the Progressive Era was born, and with it the conservation movement. The nation began to deal with a variety of issues on a scale that had not been seen before. A changing economy, increased immigration, the growth of cities, labor-capital conflict, and the sociocultural tensions of a complex pluralistic polity led to increased demands for regulation.<sup>13</sup> The Progressives sought to curb the power of monopolies by regulating corporate practices and reducing control by party machines.<sup>14</sup> They supported women's suffrage, direct election of senators, primary elections, and other innovations in direct voter participation, such as the initiative, referendum, and recall. Whereas Madison and the other framers of the Constitution had believed that "liberty could best be preserved by distancing the people from the immediate operations of government, the Progressives saw no conflict between republican liberty and participatory democracy."<sup>15</sup>

The turn of the century conservationists epitomized the Progressive ideal. Along with many other policy areas, resource policy moved from fostering private entrepreneurship to supporting greater governmental regulation, establishing a collective rather than private purpose. Gifford Pinchot, a leader of the new conservationists and the first chief of the Forest Service, declared that the goal of resource management was to produce "the greatest good of the greatest number in the long run."<sup>16</sup>

The conservation movement spawned by the Progressive Era yielded impressive results throughout the twentieth century. Professional resource agencies were established to manage forest reserves, national parks, and public domain lands. The reclamation program that developed the water resources of the semi-arid and arid West made possible rich agricultural areas and great metropolitan areas. Controls were put on the harvesting of wildlife and fish resources and the grazing of livestock on public lands. Forests were regenerated. Schools were established to educate a cadre of professional resource managers and research scientists.

The approach to resource management Pinchot and the other leading conservationists took reflects an utilitarian philosophy. Resources are first and foremost to be used. Wrote Pinchot, "the first great fact about conservation is that it stands for development," and "the first duty of the human race on the material side is to control the use of the earth and all that therein is."<sup>17</sup> Nature was viewed as subservient to human wants and needs. Moreover, the duty to develop and use resources extended first to present generations. Under the utilitarian philosophy, neglecting the use and development of resources is considered as wasteful as their destruction. The interests of future generations would be served because in using resources to the fullest, the current generation did so without waste.<sup>18</sup>

A second view of nature, which became known as preservationism, also grew in popularity during the Progressive Era. John Muir, who worshiped nature as sacred and divine, is often identified as its major proponent.<sup>19</sup> According to preservationism, development is not the first and foremost use of resources, wilderness has an innate right to exist, and aesthetics are considered as important as human use. The disagreements between Muir and Pinchot over the grazing of sheep in the national forests and a dam in Yosemite's Hetch-Hetchy Valley have often been used as a convenient marker to distinguish the split in the early conservation movement between utilitarian and preservationist schools of thought.

Over the years, efforts to preserve wildlands from development resulted in the establishment and expansion of the nation's wilderness system, and the continued elevation of the importance of aesthetic and recreational uses.<sup>20</sup> Despite the gains made by the preservationists, however, the dominant philosophy and approaches guiding resource management for most of the twentieth century remained those of the utilitarian conservationists.<sup>21</sup> They institutionalized a set of values and fostered a set of political relationships that, while innovative for their time, may not be either ecologically or politically sustainable from today's vantage point. The legacy of the last 100 years of resource management is a politics of expertise, of maximum sustained yield, and of interest.

### The Politics of Expertise

The Progressive conservationists were concerned about the waste, destruction, and inefficiency they saw in the use of natural resources. Using the latest scientific research, they sought to eliminate wasteful use by efficiently managing resources. Conflicts between competing claimants to resources were to be resolved by experts through the "scientific calculation of material benefits rather than through political struggle."<sup>22</sup> Rational, neutral, fact-based science was advanced as the appropriate basis for agency administration, as well as a way to solve social problems. This coincided with the promotion of positivistic thought throughout the sciences, in which empirical measurements were the mark of "good science." The Progressives assumed that their commitment to efficiency in conservation would spill over into other areas of social life, guaranteeing American advantage in the commercial struggle among nations and ensuring a more democratic society.<sup>23</sup> So central was the Progressive's belief in the salutary effects of efficiency that one leading commentator has termed this commitment the "gospel of efficiency." Conservationists "envisaged . . . a political system guided by the ideal of efficiency and dominated by technicians who could best determine how to achieve it."<sup>24</sup>

Despite their overall political support for more participatory democracy,



the Progressives advocated a civil service independent of political control or influence, free to determine the most efficient means to implement policy decisions. "Administration," wrote Woodrow Wilson, "lies outside the proper sphere of politics. . . . Administrative questions are not political questions. . . . Politics is thus the special province of the statesman, administration of the technical official."<sup>25</sup> Wilson and other Progressives criticized the Constitution for weakening the executive branch and allowing special interests to prevail in the legislative branch. They sought to reestablish the Constitution on a more scientific basis, one in which administrators would be neutral conduits for executive leadership. It followed then that "since natural resource matters were basically technical in nature . . . technicians, rather than legislators, should deal with them."<sup>26</sup> Professionalism became epitomized by the neutral expert who based decisions solely on empirical measurements and methods and who was in no way tainted by political ideology. The belief that fundamental allocation decisions regarding resource use should be entrusted to experts (i.e., to themselves) permeated agencies and professional schools, and still does to this day.

The reliance on expert opinion has come to have profound consequences for the role of the public in political matters. Experts render judgment, eclipsing the role of the citizen. Under the claim of professionalism and objectivity, experts convey an image that they are not involved in politics or decisions involving values, all the while making decisions reflecting their own professional values and definitions of the public interest.<sup>27</sup> The public has become an object to be studied, managed, and converted to the experts' position. As a result, experts often discount public opinion, assuming that

public opinion is of good quality when it agrees with their own views and of poor quality when it does not. The logic is this: they, the experts, are well informed; the public is poorly informed. Give the public more information, and it will agree with them. But what if even after being better informed, the public still does not agree? Rarely do the experts conclude that the public has a different point of view equally worthy of consideration.<sup>28</sup>

Ironically, the Progressive proponents of greater participatory politics created a governance structure that discourages public input to decision making.<sup>29</sup>

### **The Politics of Maximum Sustained Yield**

The primary goal of resource management—sustained yield—evolved from the utilitarian values of the Progressive Era. Intuitively, sustained yield is a log-



ical and laudable goal: no more is taken than can be replenished. As it has come to be implemented, however, the concept of sustained yield has been modified to mean taking the maximum supply a system can withstand (i.e., the furthest point to which production can be pushed without impairment of the resource's ability to reproduce).<sup>30</sup> One of our colleagues calls this "managing at the edge of harm."

As practiced, *sustained yield* means providing a continuous supply of market-oriented goods: in forest management the timber cut; in range management the stocking rate; in water management the acre-foot. In the late 1930s and early 1940s, sustained-yield forestry also came to embrace the goal of community stability, that is, harvesting timber at a rate that would sustain mill operations and thus provide economic stability for timber dependent communities.<sup>31</sup>

The sustained-yield approach became incorporated into the statutes of agencies. The statutory mandates of both the Forest Service (the Multiple-Use-Sustained-Yield Act and the National Forest Management Act) and the Bureau of Land Management (the Federal Land Policy and Management Act), for example, specifically direct these agencies to employ a multiple-use-sustained-yield approach to resource management. More often than not, however, these agencies adjusted the multiple-use concept to correspond to their primary resource production objective: timber in the case of the Forest Service and grazing in terms of the Bureau of Land Management. Although sustained yield is not specifically mentioned in the legislative mandate of agencies such as the National Park Service or the Bureau of Reclamation, they too have traditionally managed for maximum sustained yield of a single resource: visitor use in the case of the parks, and water supply in the case of water resources.<sup>32</sup>

With the advent of the environmental movement in the late 1960s and 1970s, resource management agencies and legislation started to respond to changing social values concerning the environment. In the 1970s, agencies began to give amenity resources more consideration. Nevertheless, public demands for habitat protection, recreation, and pollution control continued to be mainly viewed as constraints to output maximization rather than the goal of natural resource management. While analytical tools became more sophisticated, allowing trade-offs between development and environment to be more visibly displayed, these tools still reflected a bias toward maximum sustained yield. Linear programming models developed to balance multiple uses were unable to maximize more than one use at a time, and so maximized a single use while treating all other uses as constraints to management for that use. They also ignored or "guesstimated" values for uses that could not be quantified in monetary terms.<sup>33</sup> Furthermore, the models could only

accommodate a limited number of "multiple uses." An eminent forest ecologist recalls that

we did not even consider biological diversity—only game fish and wildlife. . . . Furthermore—and, perhaps, most important—*multiple use* emphasized outputs of goods and services as the objective of management rather than the stewardship of the ecosystem. It was output oriented rather than sustainability oriented.<sup>34</sup>

Another forestry analyst notes that at best, the agencies achieved "multiple use by adjacency: in a given forest, timber was harvested in one place, recreation services provided somewhere else, and 'multiple use' was claimed overall."<sup>35</sup> Almost four decades after the Multiple-Use-Sustained-Yield Act was passed, the concept of multiple-use-sustained-yield "still awaits becoming a definable system of land management."<sup>36</sup>

### The Politics of Interest

Over the years, the resource agencies that formed during and following the Progressive Era developed close political connections with the beneficiaries of their programs. Scholars and journalists wrote of agencies "captured" by vested interests. Grazers, for example, dominated the Bureau of Land Management, timber companies and loggers the Forest Service, and local water users the Bureau of Reclamation and Army Corps of Engineers.<sup>37</sup> The larger public interest was subjugated by a politics of interest that concentrated power in economic beneficiaries who sought the maximum yield of specific resource outputs and dollars.

The environmental laws enacted during the 1970s began to break down the power the traditional interests exerted on resource policy. These laws required the explicit consideration of environmental values during decision making and placed greater emphasis on citizen review and involvement. The elaborate administrative frameworks and publicly-open planning and environmental assessment processes established by these laws made it more difficult for development interests to influence management. The preponderance of federal legislative activity tended to centralize decision making in Washington, assuring the primacy of "national interests" defined by national interest groups. Washington-based agency leadership and Washington-based interest groups took center stage. Decisions with local impacts often became separated from local interests, history, and culture.<sup>38</sup>

The great majority of environmental groups adjusted to the dominance of expertise and interest group-driven politics by joining rather than attempting to change the political process.<sup>39</sup> They hired their own scientific experts and



established themselves as legitimate participants in scientific debate at the national level. Although environmental groups secured a place at the negotiating table and are now powerful organizations, critics note "the interest group identity for mainstream environmentalism seems more entrenched than ever."<sup>40</sup> Through lobbying, lawsuits, and appeals, these groups have strengthened the role of environmental values in governmental decision making, but they have done little to build a sense of public responsibility in public affairs.

Furthermore, resource agencies often promote divisiveness and polarization of interests by asserting authority rather than sharing power.<sup>41</sup> Rather than eliciting public participation from as representative a sample of the public as possible, traditional agency procedures tend to foster participation by organized interest groups while limiting participation by the general public.<sup>42</sup> Participation is narrowed into a set of techniques designed to secure administrative compliance with statutory and regulatory requirements. Citizens are encouraged to use formal means of communicating with the agency, even though they consistently prefer methods that involve two-way communication and shared decision making.<sup>43</sup> Methods such as formal hearing periods do not address effectively public concerns because they do not provide an adequate forum for representing public interests; they exclude the general public in favor of polarized interest groups; and they do not allow for constructive information exchange between the public and agency professionals.<sup>44</sup> When the public is viewed only as a set of interest-holding individuals, public participation becomes merely a means to gather data for an information base. Individuals and interest groups are not encouraged to interact with the agency or with one another in forums where they can learn about themselves and about one another. Rather than leading to public learning, current participation techniques often lead to political alienation.<sup>45</sup> This lack of dialogue increases controversy over resource management decisions, because it forces interested parties to take extreme stands in order to be heard.<sup>46</sup> Citizens also become more likely to use other forums, such as the courtroom, to affect agency decisions and policies. In such venues, issues are cast in narrow legal terms and decisions declare winners and losers, further polarizing the interests. Rather than realizing the harmonious balancing of factional concerns envisioned by Madison, the emergence of competing groups has created an often dysfunctional system of interest group acrimony and gridlock.<sup>47</sup>

### ***The Roots of Ecosystem Management***

By the late 1980s, the focus of resource management had begun to shift from sustained yield to sustainability. Whereas sustained yield focuses on outputs and views resource conditions as constraints on maximum production, sus-

tainability makes resource conditions the goal and a precondition for meeting human needs over time. Outputs, then, are interest on the resource capital.<sup>48</sup> Leading resource management professionals began to ask whether the multiple-use-sustained-yield concept, *as implemented*, had outlived its usefulness. Three increasingly integrated themes began to emerge: a concern for the health of ecosystems; a preference for both landscape-scale and decentralized management; and a new kind of public participation integrating civic discourse into decision making.

By the early 1990s, these refrains had melded into the philosophy of ecosystem management. Reports by the National Research Council, the Ecological Society of America, and the Society of American Foresters all called for applying new ecological approaches to the study and management of resources.<sup>49</sup> By 1994, eighteen federal agencies had adopted some form of ecosystem management as a guiding policy.<sup>50</sup> State and local resource agencies began implementing ecosystem management projects and landscape level studies as well.<sup>51</sup>

Ecosystem management, however, is not just a product of the 1990s. Its roots go back to changes in social values, scientific knowledge, and professional and administrative practice that have occurred in spite of the dominance of Progressive Era ideas, laws, institutions, and political relationships that are the legacy of the past 100 years. Just as the seeds for the Progressive conservation movement can be found in ideas advanced by the conservation writers of the nineteenth century, the precursors of ecosystem management can be traced to ideas and events that developed in an earlier time.

### Changing Societal Values

In the United States, conservation leaders from George Perkins Marsh to John Muir and Aldo Leopold were early proponents of many of the themes that characterize ecosystem management today. During the 1930s, for example, Aldo Leopold championed ecological integrity and a changed human relationship to land and nature, elaborating both a land ethic and a Golden Rule of Ecology. His famous land ethic calls for enlarging the

boundaries of the community to include soils, waters, plants, and animals, or collectively: the land. . . . In short, a land ethic changes the role of *Homo sapiens* from conqueror of the land-community to plain member and citizen of it.

Leopold's Golden Rule of Ecology asserts that "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."<sup>52</sup>



During the decades that followed Leopold's writings, several scholars wrote texts and articles that attempted to bring ecosystem concepts into natural resource management,<sup>53</sup> but it was not until more recently that such concepts began to take firmer root in national policy, finding fertile ground prepared by the burgeoning environmental movement. In what one environmental historian has called "the gospel of ecology,"<sup>54</sup> environmentalists utilized the term *ecosystem* as an emblem of their earth-connectedness and holism.<sup>55</sup> To a large extent, ecosystem management may rightfully be viewed as rooted in environmentalism and the evolving socio-political values captured by that movement.<sup>56</sup>

Some observers consider Rachel Carson the mother of the environmental movement. Her 1962 book on the dangers of pesticides, *Silent Spring*, was the first to raise significantly public consciousness about the damages that indiscriminate use of human technologies inflicted on natural environments.<sup>57</sup> Heightened public concerns about pesticides and pollution of air and water were made graphic by images of the burning Cuyahoga River, oil-soaked birds on the beaches of Santa Barbara, and smog-filled air in Birmingham, Alabama. These and similar catastrophes eroded the American devotion to technology and growth, which began to be usurped by a belief that there were environmental limits to growth.<sup>58</sup> On April 22, 1970, the first Earth Day was held, drawing an estimated 20 million Americans to public celebrations and demonstrations and firmly establishing environmental quality as a national concern. Support for environmental values would continue to grow. Studies of public attitudes would consistently identify a shift from traditional values embracing materialism, efficiency, wealth, and hierarchical power to environmental values emphasizing living in harmony with nature, quality of life, and limits to economic growth.<sup>59</sup> Today, most Americans strongly support environmental values and consider themselves environmentalists.<sup>60</sup>

A flurry of federal environmental and natural resource management legislation in the late 1960s and throughout the 1970s institutionalized the public's embrace of environmental values. Public desire to protect the nation's natural resource heritage was reflected in new laws, including, for example, the Wilderness Act of 1964, the Wild and Scenic Rivers Act of 1968, the National Environmental Policy Act of 1969, the Clean Air Act of 1970, the Federal Water Pollution Control Act Amendments of 1972 (Clean Water Act), and the Endangered Species Act of 1973. Much of this federal legislation was enacted in response to complaints by the general public—and particularly national environmental groups—that agencies were more amenable to commodity than environmental values and oblivious to the popular "limits to growth" and "balance of nature" concepts.

Public support for environmental programs and values remained high in

the 1980s during the conservative administrations of Presidents Ronald Reagan and George Bush.<sup>61</sup> A major goal of both the Reagan and Bush administrations was to reduce the size and scope of the federal government, and this was reflected in their environmental and natural resource management policies. Although for the most part the Reagan and Bush policies did not support environmentalist values, some of the policy initiatives of the 1980s, such as improved accounting procedures to weed out below-cost timber sales and the inclusion of cost-sharing requirements for financing federal water projects, utilized concerns about the size of the federal budget to reduce environmental impacts and achieve environmental goals.<sup>62</sup> An emphasis on market approaches to resource conservation and privatization married environmental protection to the need for financial economy and political decentralization.<sup>63</sup> It became increasingly recognized that to conserve financial resources, the nation must manage its land and water resources with extensive cooperation among public agencies and, to the extent possible, with private individuals and organizations. Reliance on decentralized decision making and collaborative partnerships began to be woven into the philosophy of resource management.<sup>64</sup>

By the late 1980s, the Reagan-Bush administrations' critique of big Washington government and the need to decentralize decision making to those communities closest to the resource also began to resonate more broadly: with local economies and communities hit hard by federal laws and decisions that favored resource protection over extraction; with scientists who saw the need to better link human wants and needs to an understanding of the dynamics of ecosystem processes; and with agency visionaries who realized that the problems they experienced in fulfilling their mandated public involvement requirements could never be corrected unless they dispersed and shared power. The result was a shift in public sentiment; rather than favoring centralized protection of environmental quality and natural resources, support grew for decentralized approaches that assumed local communities could in some ways be better equipped to steward natural resources. Collaborative ventures began emerging among industry, environmental interests, agencies, and local citizens to address natural resource and environmental issues. Increasingly, these efforts focused on integrated planning and management of ecosystems or watersheds.<sup>65</sup>

### **Growing Scientific Knowledge**

Ecosystem science, with its emphasis on holistic understanding of the interconnections among all components of nature, is a second root of ecosystem management. The ecosystem concept developed out of the science of ecolo-



gy, but ecosystem science has since broadened to include several other sciences, including the social sciences.

Ecosystem ecology was born in 1935, when British ecologist Arthur Tansley defined an ecosystem as "the whole *system* (in the sense of physics) including not only the organism-complex, but also the whole complex of physical factors forming what we call the environment of the biome—the habitat factors in the widest sense."<sup>66</sup> Tansley's definition was greatly influenced by the then currently popular systems theory, which looked at any system, be it sociological, chemical, or physical, as a whole made up of patterns of structure and behavior. Tansley and other early ecosystem ecologists applied the physical concept of equilibrium to the organization and maintenance of ecosystems.<sup>67</sup>

A major shift in ecosystem ecology was initiated by the Hubbard Brook studies in the 1960s and 1970s, which set several precedents in ecosystem research. Where previous ecosystem ecologists had focused on energy flow through the ecosystem, the multidisciplinary Hubbard Brook scientists focused on flow of matter, particularly water and nutrients. They also offered a means of bounding terrestrial ecosystems in terms of hydrologic watershed boundaries, which permitted applied research.<sup>68</sup> Building on background meteorologic and hydrologic data from the USDA Forest Service, this team began exploring streamwater chemistry and the details of the input–output relations of a small watershed within the Hubbard Brook Experimental Forest. Researchers, looking at the ecosystem as a unit, manipulated the whole ecosystem to study its construction, function, and responses to disturbance and stress. One of the advantages of the Hubbard Brook site was that it provided several similar watersheds, which allowed some to be used as controls for experiments conducted on adjacent watersheds. Over 150 scientists took part in studies of the Hubbard Brook ecosystem in the 1960s and 1970s, producing over 450 research articles. The Hubbard Brook studies were the basis for future ecosystem research design and provided extensive empirical data for use in resource management.<sup>69</sup>

In the 1970s, as research into ecological systems expanded, ecosystem ecologists realized they did not have the necessary expertise in disciplines like chemistry, geology, and hydrology to study fully ecosystem functions. Furthermore, they realized that population dynamics, genetics, and other sciences previously dismissed as "reductionist" provided critical information for analysis of ecosystem function. Ecosystem ecologists began collaborating with scientists from other disciplines in studies they called "ecosystem science."<sup>70</sup>

As social values and law—and therefore political interests and government funding—placed greater emphasis on ecological impacts, scientific research

began to pay more attention to the impacts of environmental change and to the societal and ecological benefits of noncommodity and amenity resources. A more diverse cadre of scientific disciplines were integrated into the evolving discipline of ecosystem science.<sup>71</sup> In 1985, an eminent ecologist wrote:

Until recently ecology was generally considered to be a subdivision of biology dealing with the relationships of organisms with the environment. Then, during the environmental awareness decade, 1968 to 1981, a school of ecosystem ecology emerged that considers ecology to be not just a subdivision of biology, but a new discipline that integrates biological, physical and social science aspects of man-in-nature interdependence.<sup>72</sup>

Other "trans-disciplinary" or "synthesis" disciplines, such as conservation biology and ecological economics, emerged in the 1980s. Both conservation biology and ecological economics are avowedly normative and committed to the goal of ecological sustainability. Conservation biologists, for example, clearly believe that preserving biological diversity should be pursued as a policy.<sup>73</sup>

Conservation biology arose because none of the traditional applied disciplines (e.g., agriculture, forestry, wildlife management, fisheries biology) could comprehensively address threats to biological diversity. "Conservation biology has two goals: first, to investigate human impacts on biological diversity and, second, to develop practical approaches to prevent the extinction of species. . . ."<sup>74</sup> It bridges the biological sciences and the more applied natural resource disciplines, providing a theoretical approach to the protection of biological diversity while also attempting to provide answers to specific questions that arise in the field. Conservation biology is more normative than most natural sciences. It also differs from traditional natural resource management "by having the long-term preservation of the entire biological community as its primary consideration, with economic factors often being only a secondary consideration."<sup>75</sup>

Ecological economics, another synthesis discipline, seeks to bridge the disciplines of ecology and economics, based on a belief that traditional ecology has tended to overlook human dimensions and that traditional economics is built on the ideal and possibilities of unrestrained economic growth.<sup>76</sup> Conventional ecology is criticized because it rarely studies humans, often focusing instead on pristine ecosystems. Conventional economics is criticized because it reduces human motivations to individual self-interest, determines value through exchange and prices, and ignores many items that cannot be cap-



tured through market exchanges (externalities): "Economics too often trivializes the most important questions in social and political life, including the intrinsic value of healthy ecosystems."<sup>77</sup> Ecological economists advocate a better understanding of human-nature interconnections and an expansion of the traditional economic emphasis on efficiency to include considerations such as intergenerational equity, communalism, and improved tools for incorporating ecological costs into economic accounting.<sup>78</sup> Unrestrained economic growth is rejected as unattainable. Accordingly, the "limiting factor in development is no longer manmade capital but remaining natural capital."<sup>79</sup>

In the 1990s, large-scale disturbances, such as those associated with the eruption of Mount St. Helens and the Yellowstone fires, provided laboratories for study of ecosystem dynamics and pointed to the role that disturbances and biological legacies play in recovery processes.<sup>80</sup> They also made dramatically clear the inadequacy of legal boundaries for delineating management districts. Many ecosystem scientists and resource managers began collaborating in cooperative ventures, studying and managing resources across a patchwork of jurisdictions and ownership patterns. Science and policy became linked in places such as the Northern Lands, the Greater Yellowstone Ecosystem, and the Great Lakes Ecosystem. Resource managers were no longer excluded from the realm of ecosystem science.<sup>81</sup>

Although there continues to be debate over the definitions of *ecosystem* and *ecosystem ecology*,<sup>82</sup> ecologists increasingly are embracing the integrated and comprehensive nature of ecosystem science as critical to ecosystem management at the landscape scale. As an eminent Hubbard Book ecologist put it, "unless we stop addressing such complex problems in a fragmented way, management actions will be piecemeal and often ineffectual."<sup>83</sup> Ecosystem science provides tools for understanding the interconnections within and between landscapes.

### **Evolving Resource Management Experience**

Professional experience and learning based on efforts to implement new resource management programs is a third root of ecosystem management. To be sure, management perspectives evolve in response to shifts in societal values and scientific knowledge. But because they are often the ones testing new technologies and implementing complex and sometimes ambiguous legislation, managers themselves play a central role developing planning and decision-making models that take a whole systems approach to resource management.

In the 1980s, resource management agencies began managing more explicitly for ecological values. Ecological conditions prompted discussion about

deficiencies in the current system of laws and management that guided resource management and the viability of multiple-use-sustained-yield as it was currently being implemented. Foresters, for instance, began to doubt whether they could both manage trees as a crop and adequately meet other social goals, such as maintaining water quality and endangered species populations.<sup>84</sup>

In the 1980s, natural resource management agencies began changing their management priorities to reflect these ideas. The Forest Service's New Perspectives program fostered local projects that attempted to take an ecosystem approach to land management, and promoted new partnerships among managers, researchers, educators, and citizens to develop and carry out those projects. In the early 1990s, largely on the basis of its experience with New Perspectives, the agency committed itself to an ecological approach to management of national forests and grasslands.<sup>85</sup> The Bureau of Land Management made protection and acquisition of riparian areas and fish and wildlife habitats a priority.<sup>86</sup> The National Park Service reinterpreted its mandate and broadened its perspective beyond the preservation of individual scenic resources to the management of natural and historic resources as part of the entire ecosystem and social system in which they are found.<sup>87</sup> The Park Service also began to expand its system of "partnership parks" or "living landscapes" that included private lands managed by the agency. The Army Corps of Engineers and the Bureau of Reclamation increased spending on environmental restoration, mitigation, and enhancement, and became more involved in fixing environmental problems created by their own projects. The Environmental Protection Agency established a Community-Based Environmental Protection program and a new Office of Sustainable Ecosystems and Communities.

Changes in management philosophy and technology began to encourage more adaptive and collaborative resource management planning. Following the lead of corporate management,<sup>88</sup> resource professionals began examining their role as "leaders" in modern society. New leadership concepts addressed the chaotic, constantly changing, and increasingly conflictual environment in which resource managers operate by advising them to develop strong personal ethics and communication skills, embrace change by being flexible and open to new ideas, and share responsibility with others. Under the new leadership model, leaders are also "followers" or "servants" of the public interest, sharing decision making with the public. Thus, responsibility for problem solving belongs to the group and not to a single leader.<sup>89</sup> Embracing these new concepts, resource professionals began labeling the traditional leadership model as



“authoritarian” and “hierarchical,” with managers acting like “benevolent monarchs.”<sup>90</sup> Resource managers began reaching out to other disciplines and to the general populace for ideas on improving management. Leadership became increasingly linked with the need and passion for a land ethic, the reason of good science, and a connection to the evolving social values of the larger society.<sup>91</sup>

Advances and experience with information technologies, such as remote sensing and geographic information systems, as well as the explosion of personal computing capabilities and electronic communication opportunities, made it possible to gather and portray ecological data at a variety of scales and quickly simulate the results of different management options. Multiple constituencies could now participate more effectively in analysis and decision making. These information technologies made scientific information more accessible throughout and between agencies, and to the public. By increasing access to agency planning, these communication tools allow parties to learn about issues, participate in discussions about them, and collaborate in implementing and monitoring management prescriptions.

Environmental and resource management professionals also began reexamining their traditional ethics in the late 1980s and early 1990s. For example, in 1989, members of the Society of American Foresters began to debate whether they should add preservation of ecological integrity to their codes of ethics, and in 1992 added a land ethic canon.<sup>92</sup> Concern for the environmental consequences of industrial activities also swayed private sector policies. As a business strategy to attract investors and increase competitiveness, industry began to embrace “green production,” which uses a total systems concept to minimize emissions, effluent, and use of virgin materials.<sup>93</sup> One major forest products association, the American Forest and Paper Association, took a bold new step by approving a set of sustainable forestry principles and implementation guidelines to which members are expected to adhere.<sup>94</sup> Environmental labeling and third-party certification that production processes adhere to certain environmental standards emerged in several manufacturing sectors.<sup>95</sup>

### ***Specters of the Past***

History has left its mark on modern natural resource management policy and practices, often in ways that our predecessors would never have predicted. Early federal land policy envisioned a nation peopled with yeoman farmers, who would ensure a prosperous future for the nation, but instead the land dis-

positional policies of the nineteenth century facilitated unscrupulous land grabbing by large wealthy interests. Vestiges of the "wild and free" frontier mentality can still be seen in laws like the General Mining Act of 1872, which allows mining companies to obtain federal lands at a fraction of their current value. One scholar refers to the outdated laws, policies and ideas that still guide management today as the "Lords of Yesterday."<sup>96</sup>

The Progressive Era also left a strong imprint on resource management. Progressive Era initiatives left an invaluable legacy of resource conservation and political reform, but also created institutions that now appear to impede rather than further effective natural resource management. The conservation movement created professional, scientifically-based resource management disciplines dedicated to reversing the previous century's practices of resource abuse and waste, but also resulted in aloof and sometimes elitist natural resource managers and agencies. The laudable conservationist concept of sustained yield became institutionalized as a politics of maximum sustained yield. Policy and agency budgets came to stress commodity production, even as the environmental decade demanded more attention to the environmental consequences of such production. Progressive Era concepts of pluralist governance gave the public more access to government decision making, eventually becoming institutionalized in laws like the Administrative Procedure Act, the National Environmental Policy Act, the National Forest Management Act, and the Federal Land Policy and Management Act. As implemented, however, public involvement policies have resulted in a politics of interest, creating an adversarial style of public involvement in resource management dominated by national interest groups.

Increasingly, however, Americans have been challenging prevailing natural resource management policies. Hostile standoffs between the public and agencies across the country indicate that the values some people place on natural resources are in conflict with the institutions that direct resource management. People are demanding that resource management ensure ecological sustainability *and* that the needs and concerns of the citizenry be met by involving them directly in the decision-making process. As a society, Americans' vision of what forest, rangeland, and riparian ecosystems are, and ought to be, as well as how people should use them, appear to be undergoing a fundamental shift. The convergence of changing social values, growing scientific knowledge, and evolving professional and managerial experiences around concepts of integration and ecological sustainability signals a potential revolution in natural resource management. Chapter 3 describes the evolving ecosystem management concept—the presumed outcome of that revolution—and the likelihood that revolution will occur.



## NOTES

1. Klyza, *Who Controls Public Lands?*
2. C. Volney, quoted in Perlin, *A Forest Journey*, p. 324.
3. Cronon, *Changes in the Land*, p. 23; and Ambrose, *Undaunted Courage*, p. 112.
4. George Catlin quoted in Cronon, *Nature's Metropolis*, p. 213.
5. White, *It's Your Misfortune and None of My Own*, pp. 57, 138; and Hofstadter, *The American Political Tradition*. Also see Ingram and Wallace, "An 'empire of liberty.'"
6. White, *It's Your Misfortune and None of My Own*; and Dana and Fairfax, *Forest and Range Policy*.
7. Cronon, *Changes in the Land*, p. 170.
8. Jefferson as cited in Ambrose, *Undaunted Courage*, p. 33; and Jefferson in his First Inaugural Address as cited in Hofstadter, *The American Political Tradition*, p. 31.
9. See Cronon's *Nature's Metropolis* for a discussion of the impact of railroad expansion on the nation's urban development as well as on its wildland resources.
10. Cooper, quoted in Primack, *Essentials of Conservation Biology*, p. 13.
11. Catlin, "An artist proposes a national park"; and Marsh, *Man and Nature*. For a description of the contributions of Thoreau and Emerson and other early nineteenth-century writers to the development of conservation thought see Payne, *Voices in the Wilderness*.
12. Hofstadter, *The American Political Tradition*, p. 165.
13. Keller, *Parties, Congress, and Public Policy*.
14. Curbing monopolies, according to Pinchot in *Breaking New Ground*, was the third great principle of conservation. On the Progressives' administrative reform attempts see Knott and Miller, *Reforming Bureaucracy*.
15. Diggins, "Progressive constitutional thought," p. 1482.
16. This philosophy was stated in a letter sent from Secretary of Agriculture James Wilson to Gifford Pinchot upon the transfer of the forest reserves from the Department of the Interior to Agriculture via the Transfer Act of 1905. Pinchot actually drafted the letter, but credits his friend and the "scientific brains" of the conservation movement, WJ McGee, with defining the new policy. See Pinchot, *Breaking New Ground*, pp. 261, 325-326.
17. Pinchot, *The Fight for Conservation*, p. 42; and Pinchot, *Breaking New Ground*, p. 505. The fledgling Forest Service's Use Book, precursor to the modern agency manual, stated that the "prime object of the forest reserves is use." Cited in Pinchot, *Breaking New Ground*, p. 273.
18. Pinchot, *The Fight for Conservation*, pp. 42-50.
19. John Muir is often cited as the father of the wilderness movement. The outspoken supporter of preservation founded the Sierra Club in 1892. For biographies of Muir see Wolfe, *Son of the Wilderness*; and Fox, *The American Conservation Movement*.
20. The first primitive area was set aside in 1924 through the efforts of Aldo Leopold. The Wilderness Act of 1964 established the National Wilderness System. On the evolution of wilderness and aesthetic concepts in American culture and politics see Nash, *Wilderness and the American Mind*; Allin, *The Politics of Wilderness Preservation*; and Hays, *Beauty, Health, and Permanence*.
21. Klyza, *Who Controls Public Lands?*; and Wilkinson, *Crossing the Next Meridian*.