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Reconstructing Conservation

Finding Common Ground

Edited by

BEN A. MINTEER

and

ROBERT E. MANNING

ISLAND PRESS

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This book is dedicated to Laurance S. Rockefeller in appreciation for his interest in and support for this project, and in respect for his lifelong and productive engagement in conservation thought and practice.



The Woodstock Foundation was very pleased to join with our colleagues and friends at the University of Vermont, the National Park Service, and The Trust for Public Land in sponsorship of a seminar on the history, values, and practice of conservation.

In their task of "reconstructing conservation" for the new century, the participating scholars addressed a wide range of questions of ethics and practice and found common ground in the essential humanity of conservation. Conservation, both as an idea and a practice, must be concerned with the total relationship between humans, culture, and the natural environment. It has roots in theory, science, ethics, aesthetics, and in the real places where people live and work, whether urban, suburban, rural, or wild. The time is upon us and the opportunity is great—not just for conservation of the land but also for renewal of the human spirit.

This fundamental connection between land and the human spirit was essential to the philosophies of George Perkins Marsh and Aldo Leopold, and it is basic to my own conservation philosophy. It was especially fitting that part of the seminar took place in Woodstock, Vermont, where my wife Mary and I focused much of our conservation interest for many years. There, working in partnership, the Woodstock Foundation's Billings Farm & Museum and the Marsh-Billings-Rockefeller National Historical Park preserve and interpret a cradle of American conservation—the boyhood home of Marsh and a place that has known the hand of thoughtful stewardship over two centuries.

From the conserved farm and forest of Woodstock, from the verdant rural countryside of Vermont, and from the probing ideas of the scholars whose work is represented here, we take renewed hope, rooted in our legacy of conservationism and poised to address the challenges before us. As it did in the time of Marsh, once again the message and vision of conservation will go forth across the nation from the hills of Vermont.

—LAURANCE S. ROCKEFELLER, Chairman Emeritus,
The Woodstock Foundation, Inc.

May 1, 2003

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Chapter 14

Reconstructing Conservation in an Age of Limits: An Ecological Economics Perspective

DAVID N. BENGSTON AND DAVID C. IVERSON

Throughout most of the twentieth century, natural resource management and economics shared a common moral philosophy (utilitarianism) and philosophy of science (positivism). The "gospel of efficiency"¹ that was so deeply rooted in natural resource management agencies, educational institutions, and management paradigms fit well with the gospel of economic efficiency preached by economists. As a result, economic thinking has had a significant influence on conservation thought and practice, much as economic rationality has colonized many other spheres of social life.² Driven by the goal of providing the greatest good to the greatest number over the long run, natural resource managers and policy makers have been strongly influenced by the reductionist theory of value and the optimization techniques of economics, often attempting to reduce multiple-use management to a mathematical problem.³

The influence of economic thought once served the natural resource management community well. Utilitarian rationality reflected the nation's prevailing cultural climate and belief system, and economic analyses have lent credibility to and helped justify natural resource management plans and policies in the eyes of high-level policy makers and politicians. But the emergence of global environmental problems, growing concern about the sustainability and environmental effects of economic growth, and major shifts in environmental attitudes and values in recent decades have raised serious questions about the relevance and sufficiency of mainstream economic approaches to dealing with conservation issues. The traditional economic paradigm is inadequate to inform conservation thought and practice

in the face of the changed social and ecological contexts of the twenty-first century. Some observers go much further, arguing that environmental policies based on traditional economic analysis and social organization based on economic specialization and exchange are in fact among the main forces driving global environmental degradation today.⁴ An ecologically informed approach to conceiving the value of nature and the relationship between economic and ecological systems is needed, based on a broader and pluralist theory of value.

This chapter traces the evolution of thinking about natural resources and the environment in economics, including the classical school, the neo-classical school, and the emergence of environmental and natural resource economics as subdisciplines within the neoclassical school. The changed social and ecological contexts for conservation are then described, as well as the search for sustainability prompted by the changed contexts. Important milestones in the search for sustainability include the emerging paradigms of ecosystem management and ecological economics. These alternative management and economic paradigms provide guidance for reconstructing conservation in an age of limits.

The Evolution of Conservation Thought in Economics

From the beginnings of economics as a field of scholarly inquiry, a minority of economists have focused on the central role played by natural resources in economic activities and the linkages between economic systems and ecological systems.⁵ The first school of economic theorists was the Physiocrats, a group of French social philosophers writing in the mid-eighteenth century. Named for their belief that the universal laws of physics extend their rule to social systems, the Physiocrats emphasized the productive power of agriculture and land. As characterized in 1901 by economist Hannah Robie Sewall, "The fundamental economic postulate of the Physiocrats was that the cultivation of the soil is the sole source of new wealth."⁶ Their land-based—or, more broadly, natural resource-based—economic theory identified the environment as the foundation of the economy and the ultimate source of national wealth.

Other classical economists were concerned with the earth's carrying capacity and long-term limits to economic growth. Best known of the

classical economists were cleric-turned-economist Thomas Malthus (1766–1834) and businessman-turned-economist David Ricardo (1772–1823). The limits to carrying capacity suggested in Malthus' model and the limits to economic growth implied by the lower quality of the next available resources in Ricardo's model were in contrast to the widespread belief in progress in the nineteenth century. Long-term prospects for economic growth were not sanguine, according to the early practitioners of the dismal science. Ecological economist Herman Daly noted, "Classical economists thought that, over the long run, population growth and diminishing returns would unavoidably channel the entire economic surplus into rent, thus reducing profit to zero and terminating economic growth."⁷ John Stuart Mill, who helped move economic theory away from the classical model and into the neoclassical era, was nevertheless influenced by classical economic thinking and wrote of the "impossibility of ultimately avoiding the stationary state" in his 1848 essay "Of the Stationary State." In the same essay, Mill also wrote eloquently of the undesirability of endless economic growth if it meant the obliteration of natural systems and natural beauty.

Subsequent economic thinkers downplayed the importance of population growth and resource constraints as driving forces as they developed the neoclassical, or marginalist, approach to economics. British economist Alfred Marshall (1842–1924) is often described as the father of neoclassical economics, although he was one of several economists who made key contributions in the late nineteenth century, including Carl von Menger and Léon Walras. The core concept of neoclassical economics is the role of the market system in optimally allocating scarce resources to their "highest-value" uses. The fact that markets and hence prices do not exist for most life-supporting environmental services undoubtedly contributed to the lack of attention to environmental issues in neoclassical economics. In addition, the world was relatively sparsely populated when much of the neoclassical theory was developed; it was a world in which the scale of the economy was small relative to the scale of ecological systems. Most economic textbooks throughout the twentieth century scarcely acknowledged the existence of the environment and said nothing about its role as the foundation of all economic activity. Instead, economists focused on the theory of utility-maximizing consumers, profit-maximizing producers, the process of market exchange and price formation, and, at the macro level, growth in national economies.

Another reason for the economists' lack of attention to environmental

and conservation concerns relates to broader developments in the scientific community. The late nineteenth century witnessed a trend of increasing specialization in science, and by the early years of the twentieth century the economics profession was rapidly gaining ground as a distinct discipline and separate department within the structure of universities.⁸ The separation and professionalization of economics quickly led to less interaction and communication with colleagues in other disciplines and incentive systems that rewarded only work within the field of economics. The result was isolation from the natural sciences and continued weakening of the link between natural resources and the economy in economic theory.

In light of these developments, the first half of the twentieth century is often regarded as a period in which economists showed little or no interest in conservation or environmental issues. But a small group of economists wrote about natural resource problems as conservation issues during this time. Some of these economists critiqued mainstream thinking and exposed its flaws, as in L. C. Gray's 1914 contribution to the theory of nonrenewable resources in which he explicitly recognized—in contrast to mainstream economic thought—that the intergenerational allocation of resources was an ethical issue rather than an efficiency issue.⁹ These and other early contributions were largely ignored, however, by mainstream economics, which neglected the role of natural resources while focusing on refinements to its model of how the price system allocates scarce resources. Boundless faith in the price system, technological progress, and the substitutability of manufactured capital for natural capital led most economists to believe that the market could easily deal with any scarcity of natural resources.

The subdisciplines of natural resource economics and environmental economics began to emerge following World War II. Natural resource economists concentrated on renewable and nonrenewable natural resources as factors of production (forestry, fisheries, mining, energy, and land use) and regarded the environment as a source of materials that required special management because of their distinguishing characteristics. The rise of natural resource economics was stimulated in part by the booming postwar economy and the rapidly growing demand for raw materials, as well as concerns about dependence on foreign sources of nonrenewable resources. Along with this rapid and dramatic increase in the extraction of natural resources came the need for efficiency in production

and utilization: both technical efficiency, which concerns natural resource managers, and efficiency in exchange, which is the purview of economists.

Environmental economics developed a bit later than natural resource economics, and it came to be recognized as a subdiscipline in the 1960s and 1970s. Growing concern about pollution and the rise of the modern environmental movement stimulated the development of environmental economics, which focused on problems of air and water pollution control and on the environment as a source of nonmarket amenities. The pioneering work of Siegfried V. Ciriacy-Wantrup inspired many who worked to establish environmental economics as a subdiscipline.¹⁰ The establishment of the Association of Environmental and Resource Economists and launching of its *Journal of Environmental Economics and Management* in the 1970s were milestones in the institutionalization of environmental and natural resource economics.

As these subdisciplines grew and matured, environmental and resource economists pointed out the problems caused by the neglect of the natural resource base and environmental concerns in economic models. But, as part of the neoclassical mainstream, they generally insisted that environmental problems could be solved by means of market corrections, such as internalizing environmental externalities, ensuring that the “true value” of environmental goods and services are reflected in prices, and determining “optimal” pollution levels and depletion rates. Attempting to take account of the shifting and expanding set of environmental values in society during the 1960s and 1970s, environmental economists added concepts such as existence value, bequest value, and option value. But these nonuse values of the environment, as conceived by economists, are still narrowly instrumental in nature, based on aggregations of individual preferences measured in monetary terms.

Environmental economists' tinkering with the neoclassical model to deal with its environmental shortcomings has been likened to the work of Ptolemaic astronomers who added epicycles to their earth-centered model of the universe in an attempt to shore up a fundamentally flawed model.¹¹ The central flaw in neoclassical economics is its view of the economy as a closed system of production and consumption, symbolized by the circular flow model of the economy contained in most economic textbooks. Environmental and natural resource economists added to this conceptualization in limited ways by including the environment as a separate system that provides inputs into production processes (natural resources), a sink for

wastes of economic processes (pollution), and a source of nonmarket environmental amenities (e.g., scenic beauty). But the vision of the economy as somehow separate from and largely independent of its biophysical foundations has had a powerful influence even on environmental and resource economists, as revealed by the opening sentence in an early review of environmental economics: "Man has probably always worried about his environment because he was once totally dependent on it."¹² Humans were once totally dependent on the environment, but, according to mainstream economic thinking, this dependence has been broken. This view of the relationship between economic and ecological systems stands in sharp contrast to the perspective of the Physiocrats and other classical economists, who saw natural resources as the foundation of economic activity.

In recent years, many mainstream environmental and resource economists have been bewildered by the declining influence of their recommendations in policy circles. For example, economist Paul Portney asked, "Will environmental law evolve to include a more prominent role for economic considerations?" He continued: "Writing from the vantage point of 1989, the answer would appear to be no. If anything, the more recent environmental laws . . . move somewhat away from allowing economic considerations in standard-setting."¹³ The main reason Portney gave for the declining influence of economic recommendations on environmental policy is that economists haven't done a convincing job of explaining to policy makers why the monetized cost-benefit approach to environmental policy is advantageous. Neoclassical environmental and natural resource economists seldom, if ever, ponder the possibility that waning interest from policy makers may be due to flaws and limitations of the economic paradigm from which their policy recommendations flow. Nor do they consider that the growing irrelevance of neoclassical prescriptions may be due to the changed context for conservation that we find ourselves in today. But the social and ecological contexts and the nature of environmental problems—now global in scale—have shifted dramatically, as discussed in the following section.

The Changed Context for Conservation

The social landscape of today would be unrecognizable to conservationists of a few generations ago, as a result of a wide range of social changes. Globally, most important is the fact that the earth's human population recently

surpassed 6 billion and, according to projections from the United Nations Population Division, is headed toward 8 billion to 11 billion by the year 2050. In the United States—the most rapidly growing developed country—population has doubled since the 1960s and is projected to increase by another 50 percent by the year 2050. Economic growth and rapid urbanization have accompanied population growth, resulting in an increase in the demand for natural resources and increased strain on the ecological systems that produce these resources. Urban growth and sprawling development patterns have been identified as the most significant factor affecting forest ecosystems in the southern United States, and urbanization is the leading cause of habitat loss and species endangerment in the mainland United States.¹⁴

Other demographic changes include an increasingly multicultural and multi-ethnic society and a shift in place of residence from rural to urban areas, with more than 80 percent of Americans now living in metropolitan areas and more than 50 percent living in suburbs.¹⁵ Both of these trends imply shifts in environmental attitudes and values, and social scientists have found strong evidence of fundamental change in environmental values in recent years. Environmental values have shifted, expanded, and gone mainstream since the beginnings of the modern environmental movement in the 1960s. Social scientists have found remarkable agreement on core environmental values among diverse social groups and have concluded that current environmental beliefs, values, and cultural models represent a major change in the way we conceive of our relationship with nature. As wilderness and undeveloped natural areas have become increasingly scarce, the ecological, moral, and aesthetic values of the environment have become increasingly important and economic or utilitarian values have become relatively less important.¹⁶ Polling data indicate that environmental health and quality had been transformed from an issue of limited concern in the late 1960s and early 1970s to a settled issue of universal concern by the 1990s: "Large majorities of Americans across all classes and social groups are deeply committed to a safe and healthful environment."¹⁷ Countless additional demographic, economic, cultural, political, and technological changes could be listed. But these few examples illustrate the nature of the changing social context for conservation and the magnitude of these changes.

Even more striking is the ecological context for conservation, which has been transformed by the growing influence of economic activities. Humans have extensively altered the natural landscape locally and regionally

throughout history, sometimes unsustainably and with disastrous effects.¹⁸ But the explosive growth in population and economic activity and the increased power of technology have greatly magnified our effects on natural systems, including consequences at the global scale. Some examples of the effects of economic activities on the global ecosystem make this point abundantly clear:¹⁹

- Logging and conversion of forests have shrunk the world's forest cover by about one-half, and remaining forests are being fragmented by roads, farms, residences, and urban growth.
- We are currently in an era of species extinctions that is unprecedented in human history.
- An estimated 75 percent of the world's major marine fish stocks either are depleted from overfishing or are being fished at their biological limit.
- Humans now use an estimated 54 percent of accessible surface freshwater; it is estimated that the rate of pumping of groundwater by the world's farmers exceeds natural recharge rates by at least 209 billion cubic yards each year.
- Sixty-five percent of the approximately 3.7 billion acres of cropland worldwide have experienced some degree of soil degradation.
- Between one-third and one-half of the earth's land surface has been transformed by human economic activity.
- Humans appropriate about 25 percent of potential total global net primary productivity and 40 percent of terrestrial net primary productivity.
- The concentration of carbon dioxide in the atmosphere has increased by about 30 percent since the industrial revolution, with almost half of that increase coming since 1959.
- Humans move more earth each year than all the traditional forces of nature—rivers, winds, and oceans—combined, and the rate is increasing.
- More than half of the original wetlands of the lower forty-eight states of the United States have been lost. The rate of loss is slowing, but loss of wetlands continues.

The list of momentous anthropogenic effects on the earth could go on and on: stratospheric ozone depletion, growing evidence of global climate change, and the like. But it is clear that the magnitude of human-induced environmental change is enormous.

Collectively, these unprecedented ecological and social changes imply a new relationship between humans and nature and a new context for conservation. The scale of human economic activity has increased dramatically relative to the scale of the earth's life support systems. We have rapidly made the transition from a relatively "empty world" in terms of humans and the human footprint on the landscape to a "full world" in which the consequences of economic activities are dominant.²⁰ This represents a watershed in the development of economic systems. Throughout human history, manufactured capital and labor have been the scarcest, or limiting, factors in economic growth. We have now entered an era in which increasingly scarce natural capital—the stock that yields the flow of natural resources and ecological services—is the limiting factor. But this turning point has gone largely unnoticed for a variety of reasons that allow us to ignore a wide range of social and environmental costs of economic activities, including the failure to account for depletion of natural capital in national income accounting.²¹ As a result, the ecological systems on which all economic activity—and life itself—depends are undergoing rapid changes that threaten social and economic well-being and sustainability.

There are, therefore, limits to the growth of economic activity on a finite planet: the classical economists had it right. A point is reached at which economic growth becomes uneconomic—that is, the costs of aggregate economic activity outweigh the benefits. In 1992, the Union of Concerned Scientists issued its *World Scientists' Warning to Humanity*, signed by about 1,700 of the world's most prominent scientists, including the majority of Nobel laureates in the sciences. This declaration is a clear and forceful statement of the need to recognize environmental limits and the need for a changed relationship between society and nature:

The earth is finite. Its ability to absorb wastes and destructive effluent is finite. Its ability to provide food and energy is finite. Its ability to provide for growing numbers of people is finite. And we are fast approaching many of the earth's limits. Current economic practices which damage the environment, in both developed and underdeveloped nations, cannot be continued without the risk that vital global systems will be damaged beyond repair.²²

What is less clear is the *nature* of the limits to economic growth. As we approach limits to material and energy resources, waste absorption capacity, and so on, are we likely to experience catastrophic ecological collapse,

as some have warned? Or are the limits to economic growth and related environmental degradation more likely to be continuous and gradual?²³ Certainly, there are many examples of localized ecological collapse, such as the collapse of a fishery, and the possibility exists of catastrophic thresholds at larger spatial scales. An example is the possibility of global warming bringing about abrupt, large-scale changes in ocean circulation patterns, which in turn could cause significant and rapid changes in world climate. But in general, most environmental degradation is more like a gradual fraying of the web of life, a slow but inexorable reduction of our options and erosion of possibilities for future generations. Yet more immediate than the biophysical limits to growth may be the social limits as people are forced to confront the extent of loss of beauty, degradation of sacred space, and erosion of quality of life they are willing to withstand.

The Search for Sustainability in an Age of Limits

The changed context for conservation has prompted a worldwide search for policies, institutions, and ways of thinking that will move us toward sustainability. This search is manifested in many ways and at all spatial scales, including global efforts such as the Earth Summit (United Nations Conference on Environment and Development, or UNCED), held in Rio de Janeiro in 1992, and the “Rio+10” World Summit on Sustainable Development, held in Johannesburg in 2002; national efforts such as the President’s Council on Sustainable Development in the United States; and thousands of local efforts around the world, such as the sustainable cities and communities movement. In natural resource management, concerns about sustainability have been central from the earliest days of modern resource management. But the meaning of sustainability has evolved considerably over time. Many notions of sustainability have been suggested, ranging from dominant product sustainability (reflecting a strongly anthropocentric perspective) to ecosystem benefit sustainability (reflecting a strongly biocentric perspective).²⁴ Economists have tended to favor an anthropocentric approach to sustainability that focuses on nondecreasing human welfare over time, and they often adopt a “weak sustainability” concept that assumes the loss of natural capital can be compensated by the substitution of manufactured or human capital.²⁵ But notions of “strong sustainability” that assume limits to the extent to which natural capital can be substituted

for other forms of capital and that emphasize the interdependencies between ecological and economic systems have gained favor in recent years.²⁶ This section discusses ecosystem management and ecological economics, both of which reflect the shift toward strong and ecologically informed approaches to sustainability.

The emergence of ecosystem management is a manifestation of the search for sustainability in response to the changed context for conservation. Natural resource management agencies in the United States began to adopt an ecosystem approach to the management of public lands in the late 1980s and early 1990s. By the mid-1990s, ecosystem management initiatives and activities were taking place in eighteen federal agencies and had been adopted or endorsed by a growing number of state agencies as well as private firms and associations.²⁷ Ecosystem management can be seen in part as a response to new goals for environmental and natural resource management that have arisen as a result of the changed context, including maintaining ecosystem health and ecological integrity, protecting biodiversity, and ensuring sustainability. Increasingly, adaptive management practitioners are adding systems resiliency to the list.

Despite the interest in and apparent growing acceptance of ecosystem management, a single, widely accepted definition has not emerged. The lack of consensus about a definition of ecosystem management is not surprising: a single definition of multiple-use natural resource management did not emerge during the decades in which this model was formulated and implemented.²⁸ A natural resource management model is too complex and dynamic—changing with new scientific understanding, professional experience, and social values—to be codified into a single definition that satisfies all stakeholders. As social scientist Thomas More observed, ecosystem management is a fuzzy concept “that contains practices, techniques, goals, and objectives that share overlapping attributes or characteristics. It is defined through these characteristics, any one of which may or may not be present in a particular project.”²⁹ Ecosystem management is similar to the central but imprecisely defined concepts that guide other professions, such as the ideas of “health” for medicine and “justice” for law.

Several scholars have characterized the main elements in ecosystem management.³⁰ The following list is adapted from More’s summary of the most widely discussed characteristics. The first three items are frequently mentioned goals, and the next two are important perspectives of ecosystem management:

1. Maintain ecosystem health (e.g., maintain and protect ecosystem integrity and functions; restore damaged ecosystems).
2. Protect and restore biodiversity (protect native genes, species, populations, ecosystems).
3. Ensure sustainability (e.g., incorporate long time horizons; consider the needs of future generations; include ecological, social, and economic sustainability).
4. Employ a systems perspective (e.g., take a broad, holistic approach to management; manage at multiple spatial scales and consider the connections between different scales; coordinate across administrative, political, and other boundaries to define and management ecosystems at appropriate scales).
5. Include human dimensions (e.g., incorporate social values and accommodate human uses within ecological constraints; view humans as embedded in nature).³¹

To this list we would add two additional characteristics that relate to the implementation of ecosystem management:

1. Adaptive management, in which management is conducted as a “continuous experiment where incorporating the results of previous actions allows managers to remain flexible and adapt to uncertainty.”³²
2. Collaboration, in which planning and management are joint decision-making processes that involve sharing power with stakeholders.

None of these seven interrelated characteristics alone defines ecosystem management, and all of them need not be present in a given project. But overall, these characteristics in many ways reflect responsiveness to the changing social and environmental contexts, and they provide clear guidance for reconstructing conservation in an age of limits.

Another manifestation of the search for sustainability is the emergence of ecological economics as a response and alternative to the neoclassical economic model. Ecological economics has been defined as “a transdisciplinary field of study that addresses the relationships between ecosystems and economic systems in the broadest sense, in order to develop a deep understanding of the entire system of humans and nature as a basis for effective policies for sustainability.”³³ Essentially, ecological economics is an ecolog-

ically informed approach to economics. Ecological economics represents a reintegration of economics and the other sciences (biophysical and social) and a return to some of the classical roots of economics, including the view that the scale of the economy cannot increase indefinitely and must eventually reach a “stationary state,” as John Stuart Mill put it in 1848. Although its origins can be traced far back in history, the recent emergence of ecological economics as an alternative paradigm dates from the writings of seminal thinkers such as Kenneth Boulding, Herman Daly, and Nicholas Georgescu-Roegen.³⁴ The International Society for Ecological Economics (ISEE) was officially established in 1988, and the first issue of ISEE’s journal, *Ecological Economics*, appeared in 1989. Interest in ecological economics has spread rapidly, as shown by the formation of national and regional societies affiliated with ISEE, including the Australia–New Zealand, Brazil, Canada, Europe, India, Russia, and United States regional societies.

Differences between ecological economics and neoclassical economics have been widely discussed.³⁵ The differences run deep, beginning with the preanalytic vision or basic conceptualization of the economy and running through a variety of other ontological assumptions and disparities in epistemological approaches to understanding relationships and interactions between economic and ecological systems. Given space limitations, we are unable to discuss in detail all these differences.³⁶ Instead, we focus on the key difference: the theory of value. As economic historian Joseph Schumpeter noted, the way in which the question of value is dealt with in economics holds the “pivotal position.”³⁷

At the heart of neoclassical economics (including neoclassical environmental and natural resource economics) is a reductionist and narrowly instrumental theory of value. Economists assume that the ways in which people value the environment instrumentally—as a means to an end—in their roles as individual consumers exhausts the ways they care about it.³⁸ Economic value is based on an aggregation of individual preferences and is measured in monetary terms. Value is measured as the sum of individual’s willingness to pay (WTP) for some benefit or willingness to accept (WTA) compensation for the loss of some benefit. Despite the limitations of this notion of value, economists view it as a meta-value that comprehends all others, as revealed in the following statement by an environmental economist: “Economics takes people as it finds them, and to the extent that such ethics [Leopold’s land ethic] are present, they should express themselves as economic values.”³⁹

In contrast, ecological economics embraces value pluralism, which strives to include all the diverse values people hold for the environment, as well as the worth of life-supporting environmental services and functions that people may or may not be aware of. Ecological economists have proposed a wide range of approaches to environmental values and valuation, from nonanthropocentric approaches based on embodied energy or energy cost of production⁴⁰ to anthropocentric approaches that include traditional economic value based on people's WTP or WTA. Most ecological economists would agree, however, that no single theory of value or valuation approach can capture all the values of natural systems, which include both instrumental and noninstrumental, or intrinsic, values. The instrumental values of nature arise from the fact that "nature benefits us. Nature is useful: it serves a purpose, satisfies a preference, or meets a need."⁴¹ Ecosystems are instrumentally valuable because of their utility as a means to achieve specific ends or from the realization of other values. Traditional economic value, based on human preferences, is one type of instrumental value. The economic value of an ecosystem is due to its utility in achieving human ends, where the ultimate end is maximizing preference satisfaction.

Ecological or life-support value is another broad concept of what is instrumentally good about ecosystems. Life-supporting environmental functions and services are good because human well-being depends on these functions and services. As with economic value, the basis of ecological value is certain tangible benefits that people receive. But unlike the case with economic value, people's preferences for these benefits play little or no role. Many people are unaware of the life-supporting benefits that ecosystems provide, such as atmospheric gas regulation, climate regulation, flood control, regulation of water characteristics and flows, erosion control, soil formation, nutrient recycling, waste treatment, pollination, and many others. Therefore, a simple aggregation of people's preferences or willingness to pay for life-supporting environmental services will not provide a meaningful measure of their importance. The benefits exist whether or not we are aware of the role of ecosystems in providing them. Life-supporting environmental functions and services are as essential to all economic activity and to life itself as the foundation of a building is to its structural integrity. The perception of life-support value requires an observer or valuer who understands why the foundation is essential—someone with some level of understanding of how ecosystems work and what life-supporting services they provide. Neoclassical economics cannot adequately incorporate eco-

logical values in this sense because its theory of value reduces all values to human preferences.

As mentioned earlier, the value pluralism of ecological economics also recognizes noninstrumental, or intrinsic, values—valuing nature as an end in itself rather than a means to an end. We value our children and other humans in this way, in addition to valuing them instrumentally for the benefits we receive from them. They have "a good of their own"; they are not substitutable or replaceable. The majority of people today value the environment intrinsically, in ways that go beyond its contribution to self-interested goals.⁴² A diversity of intrinsic environmental values may be distinguished, including moral, spiritual, cultural, and aesthetic values. Environmental philosopher Mark Sagoff has noted that our unwillingness to pay may be a better measure of the worth of these deeper values than willingness to pay: "It is fair to say that the worth of the things we love is better measured by our *unwillingness* to pay for them. . . . The things we are unwilling to pay for are not worthless to us. We simply think we ought not to pay for them."⁴³

The idea of intrinsic value in this sense is alien to neoclassical economists because a fundamental principle of economics is that economic agents are motivated only by self-interest, not by broader ethical or social interests. Economists have, in effect, assumed intrinsic values—the most deeply held and meaningful of environmental values—out of existence. As it has been observed, "the purely economic man is indeed close to being a social moron."⁴⁴

Conclusion

Adapting to change has long been the greatest challenge of conservation. The history of conservation in the United States is a history of responding to changing social, economic, political, technological, and environmental conditions. The Progressive Era conservation movement, for example, was in part a response to unregulated, destructive, and unsustainable exploitation of natural resources and opposition to that exploitation by a small group of conservation leaders.⁴⁵ Another example is the spate of major environmental legislation of the 1960s and 1970s, including the 1964 Wilderness Act, the National Environmental Policy Act of 1969, the Endangered Species Act of 1973, and the National Forest Management Act o

1976. These environmental laws were responses to growing perceptions of environmental decline and changing environmental attitudes and values.

Given this history of change and adaptation, we can expect that conservation thought and practice will continue to evolve in response to the changing social and ecological contexts outlined in this chapter. Part of this adaptation must be a rejection of the narrowly utilitarian gospel of economic efficiency of neoclassical economics, which had such a strong influence on conservation throughout most of the twentieth century. The economics of sustainability is fundamentally different from the economics of growth. The traditional economic paradigm is inadequate to inform conservation thought and practice in the face of the changed social and ecological contexts of the twenty-first century because it is unable to comprehend and incorporate all the diverse values people hold for the environment, especially noninstrumental moral and spiritual values and the value of life-supporting ecological services and functions. As a result, neoclassical economic thinking has led us to systematically undervalue our dwindling natural heritage. It has also exacerbated conflict in natural resource management by ignoring or marginalizing deeply held values that people care most passionately about. The changed context for conservation demands an approach that takes limits on the scale and effects of economic activities seriously and embraces a value pluralist approach that includes the full range of environmental values.

Without a broader, pluralist understanding of all the values associated with natural systems, natural resource planners, managers, and policy makers are a bit like the proverbial drunkard who looked for his lost keys under the lamppost because "that's where the light is." In the past, natural resource managers and policy makers have often looked to traditional economic analysis for guidance about difficult public policy issues. Traditional economics casts a bright light, and it has a role to play in the making of policy choices.⁴⁶ But economics illuminates only a small part of the overall picture, and the keys may be found elsewhere. Natural resource planners, managers, and policy makers need to grasp and incorporate the full range of environmental values and learn to manage for multiple values rather than multiple uses.

The Implication of the "Shifting Paradigm" in Ecology for Paradigm Shifts in the Philosophy of Conservation

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For nearly half a century now, ecology has been shifting away from a "balance-of-nature" to a "flux-of-nature" paradigm.¹ By the mid-1970s, the latter had begun to eclipse the former in ecology, but non-ecologists remained, for the most part, clueless that such a sea change was occurring. In the early 1990s, the new, fluxy way of understanding associations of organisms and ecological processes began to dawn on the laity.² Not surprisingly, fields of endeavor that have been informed by ecology will have to take account of the paradigm shift in ecology that is now virtually complete. Here I suggest how the philosophy of conservation might be affected. I begin with a review of the dominant schools of twentieth-century thought about conservation, go on to review the shift from the balance-of-nature to the flux-of-nature paradigm in ecology, and, finally, suggest what the implications of that paradigm shift might be for an ecologically well-informed twenty-first-century philosophy of conservation.

Conservation *philosophy* has been primarily an American enterprise, precisely because the *practice* of conservation, traditional in many European and Asian societies and in pre-Columbian North American societies, was suspended after the conquest of the New World by the Old. The indigenous populations of the Western Hemisphere suffered a demographic disaster during the first century after European contact. Old World diseases such as smallpox and influenza wiped out an estimated 90 percent of the microbially inexperienced human populations of the New World.³ With a

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