CHAPTER 1

The Many Roads to Conservation

1.1 Introduction

It is customary to start a book about conservation with a doom-laden outline of the impending biological and ecological crises that face the planet. In fact, most readers will have more than a passing awareness of the gravity of the current situation. A few images that depict the skeletal white hand of logging roads etched into an Amazonian satellite view, the scarred red earth of Madagascar blowing in the dust, or an immense lump of fallen rhino with the horn hacked away are enough to focus attention on biodiversity loss. At one level, the problem posed by the erosion of biodiversity is simple—it is happening and it needs to be slowed, better, stopped. But once you start examining proposed conservation strategies, or more specifically exploring the disciplines where such strategies are being crafted, only more questions arise. What is biodiversity? Why does it need conserving? What are the goals of biodiversity conservation? Who is involved in the practice of conservation, and what are their objectives? Such questions must be faced directly, since they frame any so-called solutions to the biodiversity crisis. Inevitably people will give wildly divergent answers to these kinds of questions, depending on when and where they live, their social, economic, and political circumstances, their personal experiences, and (at least among academics) their intellectual training or disciplinary affiliation. Yet answers to these questions take us a long way toward understanding changes in conservation thinking through time and help unravel the unique problems associated with the contemporary challenges discussed in this book.

In this chapter we look at some of these questions. Philosophers, artists, naturalists, ecologists, and activists have all written on these matters, and we cannot claim to offer anything other than a coarse overview of their positions. We start out with a summary of the principal threats to biodiversity (1.2) and an intellectual map of the reasons biodiversity should be saved (1.3 and 1.4). The core of the chapter lies in an examination of the historical evolution of conservation thinking. By focusing on this story in the United States, we demonstrate how tightly interwoven changing social and environmental philosophies are with conservation practice, in particular, protectionism (1.5), management (1.6), and multiple use (1.7). We also draw on a wider range of related issues from other parts of the world in the boxes. With this background we conclude by showing how, at the dawn of the modern conservation era, purely utilitarian objectives had largely succumbed to the highly preservationist goal of comprehensive biodiversity protection. We also point to the importance of distinguishing conservation goals and means, and to the fact that conservation is always about choices based on ethical values (1.8).

1.2 Principal Threats to Biodiversity

Biodiversity refers broadly to the full set of species, genetic variation within species, the variety of ecosystems that contain the species, and the natural abundance in which these items occur (OTA, 1987); in other words, it is an umbrella term for all of nature's variety (McNeely, 1990). Leaving historical (chapter 2), ecological (chapter 3), political (chapter 7), and global (chapter 9) aspects of the concept of biodiversity for later consideration, we consider here its major threats.

It barely needs repeating, the world is a very different place from what it was 10,000 years ago, and even 100 years ago. The changes of the last century radically restructured humankind's economic activities, political relations, and social and demographic profile. One prominent feature of this change is the accelerating scale of human impact on the Earth's natural biophysical systems—climate, stratospheric ozone, terrestrial and marine ecosystems, and the great cycles of water, nitrogen, and sulfur, all of which sustain the conditions on which life depends (McMichael et al., 1999; Vitousek et al., 1997). Clearly, the world our children inherit will be far more crowded, more polluted, and less habitable than the one we occupy today (Meffe and Carroll, 1997).

Closely associated with these broad changes in the global environment is the erosion of biodiversity, in particular, the loss of species, populations, and their habitats. The intricate relationships between levels of biodiversity, productivity, ecological complexity, stability, and environmental health are not well understood (May, 1999), but a pop rivet analogy nicely captures many biologists' thinking about loss of this diversity, given all the uncertainties. How many rivets can a financially strapped airline operator remove from its aircraft without impairing safety in flight? As with the removal of species and habitats from our planet, no one really wants to do the critical test. In the absence of precise details on the tolerance of human welfare to the current wave of extinctions, there is nevertheless increasing recognition that biological diversity is a key environmental asset under threat. In part, this is because of the evidence that certain ecosystems, such as speciose forests and highly productive marshes, play essential roles in maintaining a healthy, functioning ecosystem, and in part because many people hold strong ethical beliefs that nature deserves respect, often for purely intrinsic reasons (see below). The erosion of biodiversity is reflected in extinction rates (Wilson, 1988). Though extinction is a natural evolutionary process, its rate over the last century ranged from 100 to 10,000 species per year (Pimm et al., 1995) compared to a one to ten species a year background rate, based on paleontologists' estimates. This has been called variously an "extinction crisis" (Soulé, 1986) or an "extinction spasm" (Myers, 1987).

Mass extinctions have occurred before; there have been five, at the end of the Ordovician, Devonian, Permian, Triassic, and Cretaceous, spanning geologic time from 430 mya to 65 mya, when the dinosaurs met their end. These were all "natural events," and usually occurred over many hundreds or thousands of years. The present extinction spasm is considered to be unnatural (and unique) insofar as it is driven by a single species—humans. In contrast to other extinctions, which were probably driven by large-scale climatic changes that affected many or all species, our current crisis affects species in a more systematic way: large-bodied, economically significant, and habitat-sensitive species are being extirpated and replaced by smaller, generalist species that thrive in human-dominated places. The current situation is notable also for its extreme rapidity, and the fact that between one-third and two-thirds of all species on earth will disappear within the foreseeable future if the present trend continues unchecked (Pimm et al., 1995; Wilson, 1992). With species loss goes the eradication of locally adapted populations, habitats, and the evolutionary

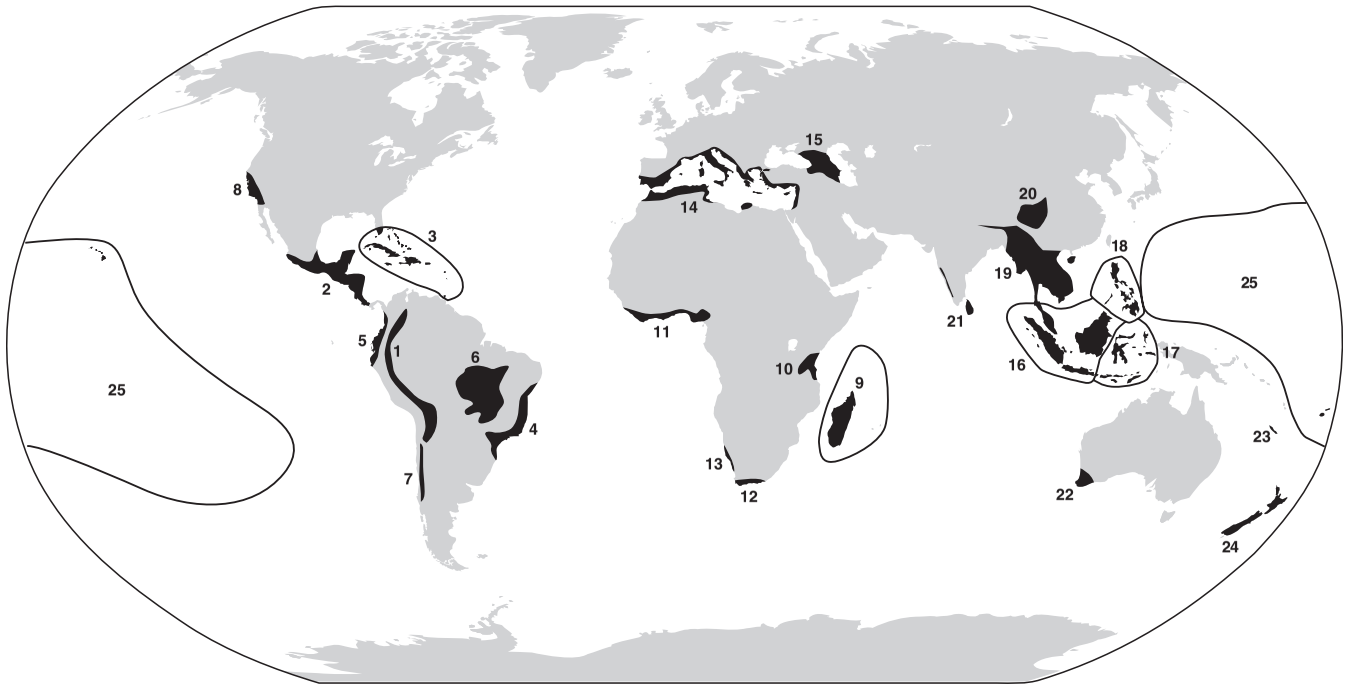
and ecological processes whereby these species coevolve and coexist.

Biodiversity is strongly patterned. Its greatest storehouse lies in areas that are warm and humid, especially tropical rainforests which, although they occupy less than an estimated 7 percent of the Earth's surface, are thought to contain at least 50 percent of the world's species (Wilson, 1988). Although species diversity is also associated with altitude, area size, successional stage, and other factors (considered in chapter 3), the latitudinal effect is strong. For example, of the twenty-five biodiversity hotspots, areas highlighted for the prioritization of global conservation efforts, sixteen lie in the tropics (Figure 1.1). This means that remaining biodiversity is found largely in developing countries, where conservation resources are scarcest, where habitat conversion is most rapid (Dobson et al., 1997), and where the threat to biodiversity is greatest. Notably, too, species richness is concentrated in areas of high human density, both at a global scale (Cincotta et al., 2000; see chapter 8) and within continents (at least as shown for Africa; Balmford et al., 2001), even when latitudinal differences are controlled. Given that the population projections for 2050 are highest for many of the world's poorest countries (Bongaarts and Bulatao, 2000), the challenge for conservationists is all the more acute. None of this means that blame is to be laid at the door of developing rather than developed nations. In fact, almost the converse: a good proportion of the extraction of natural resources supports businesses owned by Westerners or Westernized national elites (chapter 7). With so much of the Western and developed world already environmentally degraded, a guilty focus necessarily settles on areas of remaining diversity (chapter 9).

The direct and indirect causes of biodiversity declines are extremely complex, and rarely if ever exclusively local. Virtually everything we do affects species diversity. Sometimes these outcomes are positive: for instance, there are activities that potentially enhance species diversity and habitat protection, such as programs that establish wildlife reserves, mount species survival programs, or manage botanical and zoological parks, as well as many traditional natural resource management practices that may be quite effective (chapters 4 and 5). However, the majority of human activities, particularly in recent years, are detrimental to diversity. The broad anthropogenic processes of deforestation, desertification, pollution, agricultural expansion, and urban sprawl drive species extinction, spearheaded by an "evil quartet" of mechanisms (habitat loss, overexploitation, introduced species, and pollution; e.g., Purvis et al., 2000). Furthermore, though the 6.5 billion (and growing) world population is a key ingredient of biodiversity loss, equally important factors are where these people live and the inequities in what they consume. In the developing world many people are forced to live in fragile areas not well suited to human habitation, whereas in industrial countries (and among elites in the developing world) the wealthy consume a disproportionate share of nature's products, whether this be water, wood, or wilderness experience (Figure 1.2). In fact, standing back from the local sites of biodiversity erosion, it becomes clear that the most distal causes of biodiversity decline are probably the most important: the steady narrowing of traded products from agriculture, forestry, and fisheries, promoting monoculture and genetic loss; deficiencies in knowledge and its applications; and legal and institutional systems that promote unsustainable exploitation (WRI, 1992). These global processes are examined further in chapters 7 and 9.

1.3 Why Conserve Nature? Instrumental Values

Why is there a need to conserve biodiversity? The reasons are neither obvious nor widely agreed upon (Norton, 2000). Envi-



1 Tropical Andes
2 Mesoamerica
3 Caribbean
4 Atlantic Forest Region
5 Choco / Darien / Western Ecuador
6 Brazilian Cerrado
7 Central Chile
8 California Floristic Province
9 Madagascar and Indian Ocean Islands
10 Eastern Arc Mountains and Coastal Forests
11 Guinean Forests of West Africa
12 Cape Floristic Province of South Africa
13 Succulent Karoo
14 Mediterranean Basin
15 Caucasus
16 Sundaland
17 Wallacea
18 Philippines
19 Indo-Burma
20 Mountains of South-Central China
21 Western Ghats / Sri Lanka
22 Southwestern Australia
23 New Caledonia
24 New Zealand
25 Polynesia / Micronesia

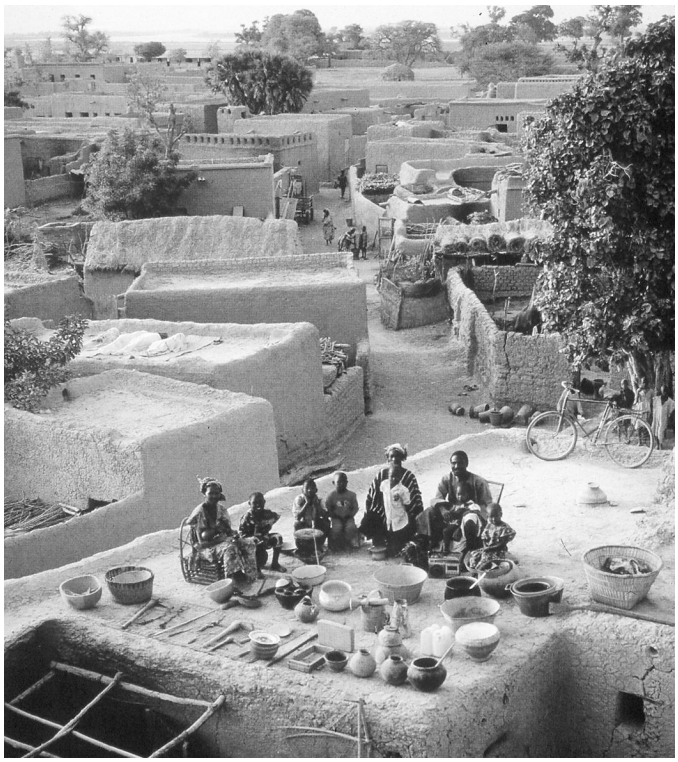
Figure 1.1. Biodiversity Hotspots.

Map shows twenty-five areas (shaded dark gray) containing biodiversity hotspots; hotspots comprise 3 to 30 percent of each shaded area. Hotspots are defined by two criteria: species endemism and degree of threat. To qualify as a hotspot an area must contain at least 0.5 percent of the world's 300,000 plant species, and have lost more than 70 percent of its primary vegetation (Myers et al., 2000). These hotspots (an aggregate expanse of 800,767 km^2) contain the sole remaining habitats of 44 percent of the Earth's plant species and 35 percent of its vertebrate species; 38 percent of this area is currently protected, legally if not effectively, in parks or reserves. Reprinted by permission from *Nature* 403, 853–858 (2000) Macmillan Publishers Ltd.

ronmental philosophers identify two very different sets of arguments, based on the utilitarian (or instrumental) versus the intrinsic (or inherent) value of nature. The utilitarian value of nature refers to the product or function that nature can provide, whereas intrinsic value inheres in the natural object or system itself, irrespective of whether it has any use. Arguments for conserving biodiversity that are based on the utilitarian value are often labeled anthropocentric (human-centered), whereas the arguments predicated on intrinsic value are often called biocentric (or ecocentric) since the value exists independent of its use to human beings. Though philosophers are somewhat troubled by the tautology entailed in the anthropocentric position, pointing out that enjoyment or use of an object is ultimately based on some inherent value (Sagoff, 1988), the intrinsic/utilitarian distinction remains enormously helpful for thinking about the arguments for conserving biodiversity.

The utilitarian value of biodiversity may be divided into four basic categories: goods, services, information, and spiritualism (Table 1.1). As regards nature's *goods*, people need food fuel, fiber, and medicine, items they can obtain both through collection in the wild and through cultivation. The utility of the vast majority of species is still unknown, with respect to both undiscovered medicinal properties (see chapter 8) and genetic diversity. As regards the latter, although more than 20,000 edible plants are known, and perhaps 3,000 have been used by humankind throughout history, the world's food supply is dominated by many fewer (Prescott-Allen and Prescott-Allen, 1990) and according to some analyses a mere handful of crops (Vietmeyer, 1986). The genetic diversity that lies in the wild ancestors of wheat, oats, and barley that still occur in the arid hills of Galilee could, for example, save conventional food resources from incurable disease or uncontrollable pests. Nature's *services* (often referred to as ecosystem services) are a product of such a vast, invisible natural economy that they were, until quite recently, overlooked! For example, green plants replenish oxygen and remove carbon dioxide from the atmosphere, fungal and microbial organisms decompose dead organic material and recycle plant nutrients, and rhizobial bacteria turn atmospheric nitrogen into usable nitrate fertilizer for plants. Fear about the stress to which ecosystems can safely be subjected when several of their component species go extinct was popularized by Commoner (1971), and this question has become central to the field of conservation biology (see chapter 3). The *information* value of nature lies not only in the estimated 5 to 15 million species that exist, most of which are still unknown to science (May, 1999), but in the evolutionary and ecological processes that allow these species to coexist. As Ehrenfeld (1976) argues, the study of intact functioning ecosystems provides blueprints for habitat reconstruction, design principles for new ecosystems, environmental baselines for monitoring threatened systems, and a wonderful teaching laboratory for the ecologists of the future. Finally, as regards *psycho-spiritual* value, nature offers rich meaning to human existence, for some an emotional touchstone, for others a sense of spiritual or intellectual purpose. This derives not only from the exquisite excitement of scientific discovery, but also from the beauty and more diffuse sense of awe and mystery that can be found in nature. This complex value E. O. Wilson (1984) calls "biophilia," invoking the strong bonds humans can feel with nature. A clear example of how conservation can be rationalized on utilitarian grounds, combining nature's goods, services, information, and spiritual value, is found in the Biodiversity Support Program's (BSP) emphasis on the links between health and conservation (Box 1.1).

Utilitarian approaches to the value of biodiversity find their purest expression in



a

b

c

d

Figure 1.2A–D. Material Lifestyles around the World.
Thirty statistically average families from thirty countries shared their lives by opening their houses to photographers who lived with them for a week. At the end of that period, the collaboration produced unique portraits of our material world at the end of the twentieth century. Each family was photographed with all their possessions outside their homes. a. Mali, b. Poland, c. Tibet, and d. United States (From Menzel, 1994). Photos copyright of Peter Menzel and Sierra Club Books.

TABLE 1.1
Four Categories of the Instrumental or Utilitarian Value of Biodiversity[a]

Category	*Examples*
Goods	Food, fuel, fiber, medicine[b]
Services	Pollination, recycling, nitrogen fixation, homeostatic regulation, carbon storage
Information	Genetic engineering, applied biology, pure science
Psychospiritual	Aesthetic beauty, religious awe, scientific knowledge, recreation, tourism

[a] Unsurprisingly, there are many other ways of classifying and labeling the values of nature. Barbier's (1992) terminology, splitting nature into "use" and "nonuse" categories, is often encountered. Nonuse values consist exclusively of "existence values" (including biodiversity, cultural and spiritual heritage). Use values include direct-use values (harvesting, recreation and tourism, genetic use, and education), indirect-use values (ecological services), and option values (future uses of direct- and indirect-use values). Another continuum often stressed is that between consumptive and nonconsumptive uses, for example, between hunting and variously consumptive tourism, education, and science. There is, however, considerable terminological slippage among authors; for instance, occasionally one sees nonconsumptive use employed interchangeably with nonuse value (IIED, 1994).

[b] Some goods in this category can be calculated as option values. For example, the value of plants used for medicinal purposes by local communities can be calculated on the basis of their possible future value on the global market (see chapter 8 for bioprospecting).

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ecological economics, a field that addresses the relationship between ecological and economic systems, focusing on environmental policy and sustainable development (Costanza, 1989; see chapter 9). Though global environmental-social modeling had been pioneered in the Club of Rome's doomsday forecasts of the late 1960s (Meadows et al., 1972; see also Hardin, 1968), ecological economics took the approach much further, essentially arguing that nature's monetary value is the key to its conservation. Ecological economists calculate the true costs of extinction, pollution, and environmental degradation by putting a dollar value on biodiversity, its goods, services, information, and aesthetic values (for an early provocative example, see Box 1.2). Particularly challenging has been the monetary evaluation of nature's diffuse roles in providing climate control, organic waste disposal, soil formation, nitrogen fixation, biological pest control, plant pollination, pharmaceuticals, and recreation. Considering the job of bees, Meadows poignantly asked over a decade ago, "How would you like the job of pollinating trillions of apple blossoms some sunny afternoon in May?" (cited in Meffe and Carroll, 1997, 37). In recent years, ecological economists, in conjunction with environmental economists (who deal with nature as a commons) and resource economists (who focus on the harvest of renewable resources), have made important progress in quantifying the kinds of benefits that biological diversity provides (e.g., Barbier, 1992; Edwards and Abivardi, 1998; Fromm, 2000). For example, the answer to Meadow's question is US$1.6–5.7 billion annually, a range determined by estimating the gains to consumers through lower prices for crops pollinated by honey bees (Southwick and Southwick, 1992). More broadly, by quantifying the environmental benefits of such services worldwide, ecological economists have estimated the annual value of biodiversity at between $2.9 trillion (Pimentel et al., 1997) and $33 trillion (Costanza et al., 1997). Sometimes economists must devise imaginative methods for evaluating nature's goods and services, especially when these are not traded on conventional mar-

Box 1.1. The Links between Health and Conservation

Awareness of the links between the global environment and human health is not new. We tend, however, to think of the more negative associations, such as between industrial air pollution and respiratory disease, between dirty water and gastrointestinal illness, and between holes in the ozone layer and skin cancer. The Biodiversity Support Program (2001) encourages linking human well-being to the conservation of biodiversity, pointing out that there are many known benefits to biodiversity on a global scale.

Health: Biodiversity provides the raw material for the production of pharmaceuticals. Based on figures from 1993, 57 percent of the 150 most frequently sold prescription drugs in the United States had at least one major active compound derived from (or patterned after) plants and animals (Grifo et al., 1997), and sales of such drugs amounted to $15 billion worth of annual business in 1990, up from $4.5 billion in 1980 (Reid, 1997). For Europe, Japan, Australia, Canada, and the United States combined, the market value for both prescription and over-the-counter drugs based on plants in 1985 was estimated to be $43 billion. Though there are many problems with the calculation of such estimates (Principe, 1996), the magnitude of pharmaceutical benefits from plants is potentially large but hard to capture (see chapter 8).

Nutrition: All of the world's major food crops, including wheat, corn, and sorghum, depend on new genetic material from the wild to remain productive. Seventy-five percent of the world's staple crops, and even 15 percent of U.S. food crops, rely on wild animal species for pollination. Biodiversity in the world's oceans also has potential as a key food source; in 1995, alone 97 million tons of fish were commercially harvested for food and other products (UNEP, 1999).

Climate regulation: The Earth's oceans and standing forests serve as carbon sinks, fixing atmospheric carbon that would otherwise contribute to global climate change.

Moving from the global to the local scale, the links between health and biodiversity conservation are even more apparent. Many of the world's richest biological areas are inhabited by populations who rely on the conservation of biodiversity to ensure their health and survival in several ways:

Traditional medicines: Local cures, based on plant and animal materials, are the basis of health care for about 80 percent of people living in developing countries (Farnsworth et al., 1985; Grifo and Rosenthal, 1997; Shanley and Luz, 2003). For example, more than 5,000 species of plants and animals are used in China.

Food: Much of the world's rural populations rely on hunting and fishing for food, particularly for protein sources (WRI, 1992).

Ecosystem services: Intact ecological systems that protect biodiversity provide crucial services upon which local populations depend, such as clean drinking water, soil formation, and pollinators.

Box 1.2. Much More Than Stocks of Wood

In a pioneering study, Peters, Gentry, and Mendelsohn (1989) compared the economics of timber and nontimber forest products (NTFPs). Working on the Rio Nanay near Iquitos, Peru, and surveying only trees greater than >10.0 cm DBH (diameter at breast height) within a 1 ha plot, they found 842 trees representing 275 species. Of these, 72 (26 percent) species and 350 (42 percent) individuals yielded products with market value in Iquitos, including timber, fiber, latex, and fruit. Using estimates or observation of density, productivity of each species, and records of market prices over a year, they calculated the total commercial value (in US$) of a hectare of forest. Then, subtracting labor costs in collection and the cost of transport of products to appropriate markets, they calculated the net dollar value of 1 ha forest. Given that both fruit and latex can be collected every year, the total financial value of these resources was considerably greater than the current market value of one year's harvest. To calculate the net present value (NPV) of $6,330, they used a fifty-year time horizon, assumed that 25 percent of the crop was left in the forest for regeneration each year, and put in a 5 percent discount rate.

Table 1.2 Box
Value of One Hectare of Forest on the Rio Nanay, Peru (in US$)

Product	*Total Value*	*Net Value*	*Net Present Value*
Fruits	650	400	6,330 (fruit and latex together)
Latex	50	22	
Timber (clear-cut)	—	1,000	1,000
Timber	—	310	490

The same kind of calculation was done for timber. If liquidated in one cutting, saw timber would generate a revenue of $1,000 on delivery to the mill. Since the trees are all gone there is no additional future value, and incidentally no value from fruit and latex trees that are destroyed in clear cutting. So NPV stays at $1,000. Under gentler logging practices (periodic selective cutting) the NPV of $490 is still far short of that resulting from fruit and latex collection. The authors concluded that fruit and latex ($6,330) represented 90 percent of the total forest value today (a combined NPV = $6,820). Note that this does not even include medicinal plants, small palms, and lianas.

Economic evaluations like this are of course shot through with potentially problematic assumptions and methods (see chapter 9). This study and others like it have been criticized for the assumption that plants are not damaged through harvest and for using high discount rates. More recent studies have found much lower values for Central American forests (Godoy et al., 2000), and a review of twenty-four such tropical forest studies worldwide established a median yearly NTFP of only $50 (range $1–$166 per hectare; Godoy et al., 1993). The high value for the Rio Nanay site no doubt reflects its unusually high fruit tree density and its proximity to market.

Peters et al.'s study nevertheless pioneered the idea of using not just ecological services and scientific value but market benefits to justify conservation (see also Myers, 1988), and as such lays the basis for extractive reserves (see chapter 10). Despite its flaws this and other early work were extremely important in stimulating ecological economics, a field that encompasses environmental valuation studies that put a dollar value on everything from a primitive relative of modern maize found in Mexico to a lion in Kenya (see chapter 9).

kets, as discussed further in chapter 9. Finally, in some instances economists can design markets for ecological services, for example, in carbon shares or debt-for-nature swaps (Box 9.4).

These economic approaches are useful. Not only do they offer powerful tools in advocacy, but they expose the pressures that work against conservation (Edwards and Abivardi, 1998). They are also rather controversial. Here we look only at the philosophical issues entailed, with the realpolitik getting closer scrutiny in chapter 9. In an early but extremely forward-looking attack on the idea of turning nature into a commodity, Ehrenfeld (1976) put his finger on possible dangers with utilitarianism. Most species and natural processes are probably not very useful. As such, option values are small and economic arguments for conservation weak. He also questioned how a utilitarian ethic can conserve species that are economic liabilities, species that are dangerous, or species whose medicinal products can now be fabricated synthetically. Furthermore, what if it really does make economic sense to drain a marshland for development, rather than leave it to provide ecosystem services or tourism? It is tempting but ultimately dangerous for a utilitarianist faced with such a dilemma to exaggerate a threatened species' (or resource's) economic significance, and try sneaking conservation in through a fabricated utilitarian rationale (Bell, 1987). Finally, there is the issue of the morality of pricing (Ehrenfeld, 1976; Sagoff, 1988). We generally try to protect an object's dignity by removing it from the market. Thus slavery was banned in respect of human life, and prostitution was outlawed to protect women. So, too, should nature be removed from the market, the argument goes. All in all, if we are to enlist the market in the cause of conservation this must be done very carefully, and on a case-by-case basis (Meffe and Carroll, 1997); utilitarian arguments are probably never sufficient, and science alone cannot protect biodiversity (Wilson, 1984).

1.4 Intrinsic Values

Intrinsic value is a much more subjective matter. While most people take the intrinsic value of humans for granted, the view that "Nature" (often personalized in this sense) has inherent rights and is as such subject to the same moral, ethical, and legal protection afforded humans is more controversial (Nash, 1989). Trying to put an anthropocentric spin on their case, advocates of intrinsic worth compare the immorality of the destruction of nature to the tossing of rocks at the windows of the Louvre, to the quarrying of stone from the pyramids of Egypt, to the burning down of a great library, or, in extreme manifestations, to genocide. But to what level of biodiversity does intrinsic value adhere—every single living being, only sentient beings, species, biotic communities, or evolutionary processes? And how can we judge this? Looking just at two writers whose contributions to the conservation movement are so prominent, Leopold attributes intrinsic value to all things "to include the soils, waters, plants, and animals or collectively: the land" (Leopold, 1970, 239), whereas Soulé (1985) claims that it is diversity itself that has intrinsic value, not its entities. The variety of modern natural rights (or eco-) philosophies that blossomed in the 1960s and 1970s predicated on intrinsic value differ on this dimension (Box 1.3). They also differ in the extent to which they view modern environmental problems as emanating directly from Western science and civilization, and to which they romanticize our preindustrial past, as incidentally do various strains of ecofeminism (Box 7.1).

Long prior to the emergence of these recent philosophically based movements, ancient traditions and scriptures guided recognition of moral and ideological (though not legal) rights of nature. As Callicott (1994) shows, most of the world's religions (including major faiths such as Islam, Hinduism, Jainism, Buddhism, Taoism, and Confucianism) furnish powerful worldviews that sanction spiritual interconnectedness among

Box 1.3. Ecophilosophies

Deep ecology. Inspired by Hindu metaphysics, Arne Næss launched deep ecology in 1973, calling for the liberation of land and nonhuman life from ownership and abuse. The central tenet of deep ecology is that all beings are manifestations of one Supreme Being (Næss and Rothenberg, 1989). Accordingly, the suffering of one creature is the suffering of all, guaranteeing a fundamentally biocentric worldview in which all organisms and entities in the ecosphere are equal in intrinsic worth (Sessions and Devall, 1990, 312). Deep ecologists define themselves in opposition to mainstream conservation policies or other "shallow, anthropocentric" approaches to environmentalism, that in their eyes amount to shuffling deckchairs on the *Titanic*. Indeed, deep ecologists argue that the only way to achieve meaningful and long-lasting conservation is through a fundamental change in human consciousness. Deep ecologists are deeply antagonistic to human society, a sentiment of intense alienation that fires some of their activist groups, such as Earth First! (Taylor, 1991). Note that "ecology" in this label derives not from the discipline introduced in chapter 3, but from religious and philosophical notions, and as such is more akin to environmentalism (Nash, 1989). Also, insofar as deep ecologists attribute moral worth to nonbiotic entities, such as rivers and mountains, their ecophilosophy goes beyond the postulates of Leopold (Meine, 1988; see also Soulé, 1985) and most contemporary conservation biologists (Meffe and Carroll, 1997). Deep ecology has also provoked intense criticism from non-Western radicals (Guha, 1989b).

Bioregionalism. Like deep ecology, bioregionalism calls for a substantial reorganization of human consciousness. Bioregionalists, however, see as the fundamental problem the separation between people and the land from which they both derive their subsistence and dispose of their wastes. Because most people in the developed world buy food produced far from where they live, use power produced elsewhere, and send their trash to still another area, they are insulated from their environment and oblivious to environmental impacts of their lifestyle. Bioregionalists advocate "living in place" (McGinnis, 1999). In this way people will become more attuned to what their local environment can produce, and adopt a lifestyle better suited to their surroundings.

Biophilia. Biophilia is a term coined by E. O. Wilson (1984; see also Kellert and Wilson, 1993) in his book of the same name. It is based on two related ideas: first, that humans have an innate interest in and attraction to all things living, and second, that understanding other organisms and the natural world fosters greater appreciation of their value. Through exploration and understanding, emotional bonds with the natural world are strengthened and a more meaningful conservation ethic is possible. Like the other ecophilosophies sketched above, biophilia calls for deep social change; in contrast, however, biophilia relies heavily on science rather than moral transformation to achieve these ends. Furthermore, it is concerned not with the intrinsic value of each and every biological specimen but rather with that of genes, species, ecosystems, and evolutionary processes.

Gaia. Gaia, the Greek word for Earth, was used by biologist James Lovelock (1979) to capture the idea that Earth is not a large rock with disparate biological and geological processes, but a single organismic entity with a unitary system of

(continued)

(Box 1.3 continued)

feedbacks and interrelationships, of which life is the most important. Gaia advocates view the Earth as a giant organism that has withstood the abuses of the last 4.6 billion years and may well be resistant to whatever humans can do to it. It is this deterministic element in the Gaia hypothesis that disturbs some environmentalists (Bennett, 1993). Gaia has also inspired a revival of utopian writing (e.g., Callenbach, 1977).

Spiritual ecology. Perhaps best thought of as a component of all of the above, spiritual ecology is defined as a mystical attitude toward nature, emphasizing a deep unity with land and animals (Nollman, 1990). It is often fueled by romantic readings of anthropology and religion that promote the attractive idea that while industrial society has lost touch with nature, tribal and indigenous peoples have not (see chapter 4). This spiritual component of all ecophilosophy spurs the formation of new cults as well as feeding the fanaticism of radical environmental groups.

all living beings and obligations of stewardship (see also Holm, 1994). For example, deep empathy with nature derived in part from Hinduism inspired an extraordinarily successful people's movement (Chipko) to halt the commercial exploitation of India's Himalayan forests (Guha, 1989a; see Box 8.1). Even the Judeo-Christian tradition, so commonly blamed for the current environmental crisis (e.g., White, 1967), can be read to embody a conservation ethic, with environmentally concerned Christians and Jews now challenging the conventional reading of Genesis as legitimating humankind's dominion over all living creatures. They champion biblical passages showing that God intended his creation to be teeming with life (as in the story of Noah's Ark, Figure 1.3), and the notion that humans were put in the world to act as stewards of nature (as in the story of the Garden of Eden). From these arguments has developed a Judeo-Christian Stewardship Conservation Ethic (Callicott, 1994). All in all, even though intrinsic belief in the value of nature is difficult to quantify, it is widespread, resilient, and quite easily disinterred from texts that may at first look as if they bear no conservation ethic.

Along these distinct rationales for conserving biodiversity based on instrumental and intrinsic value, conservationists often split into two mutually suspicious factions, anthropocentricists and biocentricists. The latter dismiss the former as shallow materialists who carve their case according to the demands of political expediency, and whose view of man as the measure of all things betrays the "arrogance of humanism," the very title of Ehrenfeld's (1978) book. The former eye the latter as unrealistic, unscientific, and sometimes too radical in their methods. Such a divide can be politically counterproductive, as when delegates to the 1992 Earth Summit in Rio de Janeiro became distracted with arguments over whether to emphasize nature's utilitarian or intrinsic value (Norton, 2000). Steps toward a more inclusive ethic could be taken. First, most conservation biologists would probably agree that neither utilitarian nor intrinsic arguments are sufficient alone, since different people and interest groups will respond to distinct kinds of reasoning (Caro et al., 2003). Second, there is an inescapable logic to the argument that intrinsic approaches are essential, not because they automatically confer protection (they do not), but rather because they place the burden of proof on the interest group planning to destroy biodiversity (Meffe and Carroll,

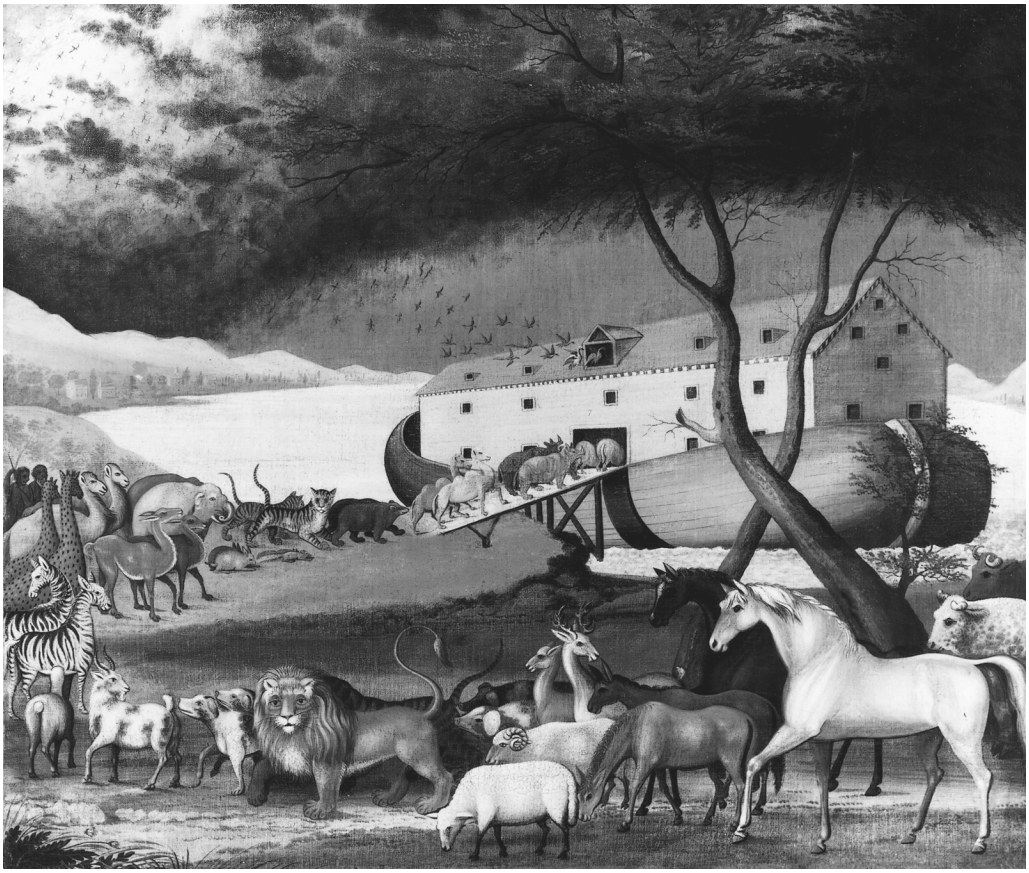


Figure 1.3. Noah's Zoo.
Ancient traditions and scriptures have upheld a moral recognition of nature throughout the ages. Even Judeo-Christianity, sometimes characterized as epitomizing man's domination over nature, has its tales of stewardship, as in the story Noah's Ark. Recently, a unique multifaith conservation initiative has emerged among Baha'is, Buddhists, Christians, Hindus, Jains, Jews, Muslims, Shintos, Sikhs, Taoists, and Zoroastrians. The Alliance of Religions and Conservation (ARC), funded in part by the WorldWide Fund for Nature (WWF), sprang from a 1986 gathering at Assisi, the Italian birthplace of the Roman Catholics' patron saint of ecology (Benthall, 1995), and is actively involved in investing up to US$30 billion religious assets in its "Sacred Gifts for a Living Planet" program, designed to use faith to combat forest and marine destruction and other environmental threats. Reproduced from Edward Hicks's *Noah's Ark* (1846). Philadelphia Museum of Art: Bequest of Lisa Norris Elkins.

1997). Third, an enormous step forward could be made if people recognized that whatever philosophical motivation (instrumental or intrinsic) lies behind their own private valuation of nature, it should not constrain the full range of strategies for conserving biodiversity that they are willing to support (e.g., Barrett and Grizzle, 1999). At the margins this could be intellectually challenging; for example, a person who values each and every individual in nature may find a conservation project that advocates game ranching difficult to countenance, but for the most part we can be more open-minded. That the goals and means of conservation should be kept separate is one of

the conclusions of this book (see below, and chapter 11).

1.5 The Changing Practice of Conservation: First, Protection

Given the very different ethical values people bring to conservation, it is not surprising that conservation, preservation, and management, words that have become household terms over the last few decades, mean distinct things to different people. In this and the next two sections we examine historically how these concepts have changed, accreting different nuances over time. As we will see later in the book, subtle differences in the meaning and interpretation of these terms can lead to very different expectations and conservation outcomes in the real world. We will trace the development of these potentially slippery terms, and in so doing provide a framework for revisiting these issues later in other more topically focused discussions. Specifically, we look at the development of the human dimensions of conservation, exploring how this history is interwoven with changing social and environmental philosophies.

For a number of reasons, not least simplicity, this survey is structured around the origin and range of strategies applied to conservation problems in the United States over the last 140 years. With its more recent European occupation and rapid environmental change, the United States' story provides an encapsulated view of the development of conservation thinking. Furthermore, the simultaneous existence of "frontier" areas and densely settled human populations forced the American conservation movement to deal with a variety of issues, many of which affect current conservation thinking around the world to this day. Not surprisingly, American conservation was strongly influenced by European perspectives, both in the metropolitan centers and in the colonies, and we allude to some of these similarities and differences in the boxes.

Many contemporary authors cite the establishment of "American-style" national parks as the beginning of the current conservation era. In 1832, after traveling through the American frontier, artist George Catlin wrote that the United States' natural heritage should be saved "by some great protecting policy of government . . . in a magnificent park . . . A nation's park, containing man and beast, in all the wild and freshness of their nature's beauty!" (Catlin, 1990, 35). And so the American national park paradigm, undeniably the most influential institution to come from the American conservation movement, was born. It is fitting that a nonprofessional conservationist is credited with the national park concept because in its early stages American conservation was heavily influenced, if not driven by, influential (and usually very wealthy) amateur conservationists. With help from these "hobby conservationists" and writers like John Muir who treasured the wilderness as an oasis in which to shelter from the evils of modern civilization, Catlin's vision slowly became a reality. In 1872 Yellowstone National Park was gazetted. Subsequently, and still with the help of wealthy, nonspecialist benefactors (Fox, 1985), Acadia, Yosemite, and Grand Teton National Parks and Muir Woods would all be established.

What made national parks different from earlier types of conserved areas such as royal forests (see chapter 2) was that they were protected simply for their intrinsic value, for the very fact they existed. They were established on the premise that all the people of a nation would collectively benefit more from their preservation than would a few from their exploitation. Today, national parks form the cornerstones of many countries' conservation programs and are still primarily predicated on intrinsic values. Many of the conservation successes and failures discussed in the remainder of the book stem directly from applying the American national park concept (even though national parks within the United States have

evolved quite significantly away from some of their original caricatures; Schelhas, 2001).

There was, however, also something very unusual about Catlin's vision. From this same passage, in this magnificent park Catlin hopes to see "for ages to come, the native Indian in his classic attire, galloping his wild horse, with sinewy bow, and shield and lance, amid the fleeting herds of elks and buffaloes" (Catlin, 1990, 35). Here we have a man who, like Muir and Henry Thoreau, was a dissenter from the deeply rooted Western ideology that holds humankind in stark separation from (and yet in command of) nature. Catlin rejected the conventional view that celebrates humankind as created in the image of God and enjoying dominion over all the creatures, a view derived from at least one interpretation of the Bible's Book of Genesis. For Catlin, humankind was part of nature, and national parks should capture this harmony.

Perhaps because of its idiosyncrasy in this respect Catlin's dream was not durable. Human occupation quickly fell from the national park paradigm. Native Americans were evicted from Yellowstone only a few years after its creation. Only with the herding of native communities into reserves beyond the borders of the park could the image of wilderness lands untouched by human presence persist. The popular perception of national parks emerged as empty, pristine areas free from human influence. The conservationists' goal was to lock up these parks legally before commercial interests could spoil them, and humankind was to retain at least for a while their biblical dominion over nature (Box 1.4). The "man and beast" part of Catlin's paradigm had been forgotten, and the approach to protected area management that entailed excluding people from protected areas came to be known as the "Yellowstone model" (Stevens, 1997a).

This protectionist tradition that sought to eliminate all human influences in national parks contrasted with the more homely conservation ideas that were developing among common farmers and fishers in the eastern states (Judd, 1997). It contrasted also with European conservation traditions at the time. Because Europe was so densely settled, it had undergone substantial anthropogenic change and pristine areas free from human influence were rare. In addition, many parts of Europe had a long history of recorded land rights. As a result, European approaches to conservation emphasized the footprints of human presence, be these in hedges, hollows, stone walls, or copses (Harmon, 1991; Evans, 1997), and British conservationists explicitly developed a vision of nature with villages as an integral component of the rural landscape. As such, national parks in Britain not only fully recognize existing land rights but also seek to maintain and protect established farming systems. Interestingly, though, once Europeans moved to the colonies, they freely adopted the preservation and protectionism of the Yellowstone model, probably because these areas were perceived (often inaccurately; see chapter 2) as empty frontiers reminiscent of the American west (Neumann, 1998).

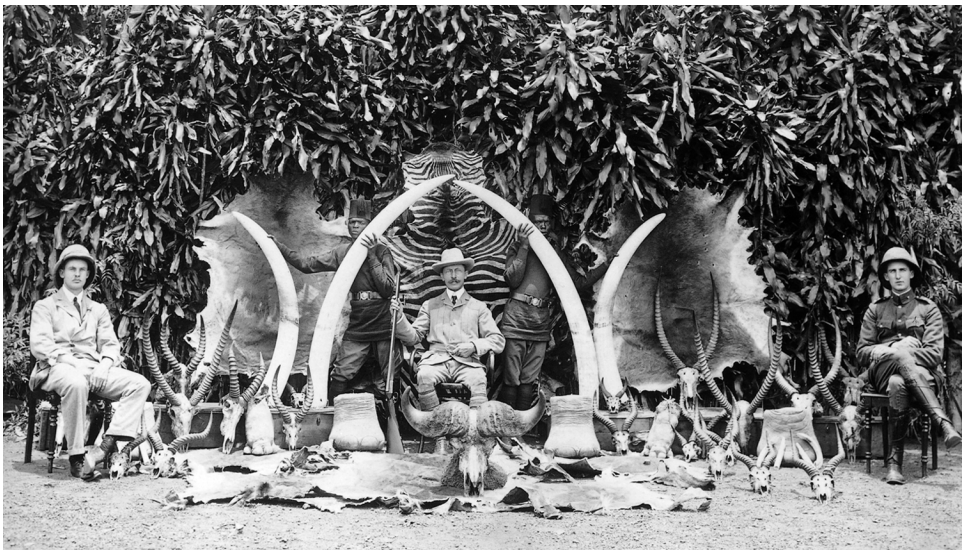
A final significant feature of early American national parks was that they were mostly established to protect spectacular scenery, not biological resources. As Stephen Mather, the National Park Service's first director (recruited to head the National Park Service from his role as a wealthy amateur conservationist), sought to expand the parks system, his instructions were to look for "scenery of supreme and distinctive quality or some natural feature so extraordinary or unique as to be of national interest" (Ise, 1961, 195). This focus on scenery and its effect on the design of parks and protected areas would also come to influence contemporary conservation strategies and is discussed in chapters 2 and 3.

1.6 Then Resource Management

Rapid industrialization and economic expansion of the late nineteenth and early

Box 1.4. Man versus Nature: From Hunters to Penitent Butchers

Man's dominion over nature, and the beginnings of his subsequent fall, is colorfully illustrated in the culture of hunting that was deeply embedded in the consciousness of European settlers and resource professionals, especially those with military backgrounds, all across the British Empire. In Africa the hunting of wild animals became a particularly important symbol of European dominance on the continent. Ritualized as "The Hunt" (MacKenzie, 1987), it served to distinguish social class within the settler society as well as to differentiate European hunters from other, obviously African hunters (MacKenzie, 1988; Neumann, 1996). In extreme cases Africans themselves became game, occasioning terminological slippage between "animal bags" and "human bags" (MacKenzie, 1988, 301).



Governor Sir Hesketh Bell with Hunting Trophies in Uganda, 1890.
Reproduced courtesy of the Royal Commonwealth Society.

"The Hunt" was hedged with rules and prescriptions: only choose males as quarry, deliver a coup de grace to injured animals, and do not "shoot from railway carriages, river steamers (except at crocodiles . . . always fair game), motor vehicles or aeroplanes" (MacKenzie, 1988, 299). Critical here was the notion of "sportsmanship." The idea of hunting "just for meat" was anathema to the ideology. African hunting practices were consequently deemed "unsportsmanlike," and their methods (traps, pits, spears, poison, etc.) inhumane, offending the sensibilities of conservationists in England, most notably the members of the Society for the Preservation of the Fauna (Neumann, 1998, 107). Through The Hunt, then, the subjugation of nature became a symbol of white dominance and a marker of manliness (MacKenzie, 1987), and through ritualized slaughter, the gruesome realities for the defeated lower orders (animal, social, and racial) were obscured.

(continued)

(Box 1.4 continued)

But this was not to last. In one of the more intriguing and tortuous twists in conservation history, from the erstwhile big-game hunters emerged ardent preservationists (Beinart, 1990), or in the terms of a Faunal Preservation Society history "penitent butchers." In some senses hunters have always liked to see themselves as conservationists and complained about the practices of others. In India and Africa a new generation of hunters decried the excessive destruction of animals that their forebears had engaged in, the scramble for museum specimens, and the whole "system of penetrating the country by feeding the natives" (W.D.M. Bell, cited by MacKenzie, 1988, 298). Later, at least in Africa, the blame for declining game resources was shifted to the natives, and legislative action was taken to destroy native hunting (chapter 2).

Subsequent shifts of public feeling in at least some Western countries have in recent years eroded the status and acceptability of hunting. This demise is illustrated by the changing relationship of the British monarchy to the chase (MacKenzie, 1988). While in 1924 the ideal honeymoon for a royal couple was a shooting safari in East Africa, the dispatching of a tiger on a trip to India and Nepal by the Duke of Edinburgh in 1961 caused worldwide outrage. And in 1986, when the Queen and Duke of Edinburgh returned to Nepal, the nearest they came to big-game shooting was to witness the tranquillizing of a rhino called "Philip" so it could be fitted with a radio device for conservation monitoring.

twentieth centuries that inspired the creation of national parks also brought concomitant increases in the consumption of natural resources. Already in other parts of the world, as global capitalism was taking hold, administrators were beginning to realize the finite limits to the productivity of the land and the need for central governments to take control of forests and zones with high economic potential. This sparked a new discipline—forestry. After depleting their own oak forests (and losing America's natural wealth after 1776), European colonialists needed to find timber—for ships and railways—to manage their empire and accordingly set up the East India Company (Guha, 1989a; Peluso, 1992). With clever language the plain exploitation of timber was hidden behind a starkly neutral label—"scientific forestry" (Gadgil and Guha, 1992). Scientific forestry was part of the newly emerging science of resource management, and developed initially in Germany. Though it aimed at the sustained production of timber, its ecological consequences were largely negative. For instance, all across the Indian Himalayas mixed forests of conifer and broad-leaved species were replaced with single-species stands of commercially valuable conifers, destruction of traditional forest management practices occurred and large areas were converted into tea, coffee, or rubber plantations (Guha, 1989a).

In the United States at this time we see the beginnings of the same processes. A continent that had once seemed to offer inexhaustible forests and herds was beginning to show signs of decimation at the hands of increasingly hungry commercial interests. Accordingly the U.S. Congress allowed its conservation focus to wander beyond national parks, and passed the Forest Reserve Act of 1891. Within two years President Benjamin Harrison set aside 13 million acres (around 52,000 km^2) of forests; his successor, Grover Cleveland, added another

5 million (Meine, 1988). But no American president had a greater impact on conservation than Theodore Roosevelt. During his first year in office, Roosevelt established 13 new forest reserves. He followed with 53 wildlife reserves, 16 national monuments, 5 national parks, and 32 other reserves, totaling over 75 million acres (Fox, 1985); by the end of his tenure he had expanded the national forest system to 195 million acres (or about 780,000 km^2; Meine, 1988). Legend has it that when a Forest Service applicant was asked "Who created the first National Forest?" he thought for a moment and responded, "The first National Forest was created by God, but it was expanded by Theodore Roosevelt" (Meine, 1988, 77). Like the earliest conservation strategies, early national forests were perhaps best characterized as territorial claims seized to prevent them from being consumed by commercial harvesting. Initially, their management simply entailed prohibition of unauthorized uses and deciding what the authorized uses should be, in other words, a weak form of protectionism. Science had little or no role in the process, and conservation meant little more than showing restraint in using what nature provided in order to make it last longer. But during the first decade of the twentieth century, that began to change.

The name most commonly associated with early scientific management of forests is Gifford Pinchot. Strongly influenced by European "scientific" practices in the colonies, Pinchot advocated manipulating forests (i.e., management) to enhance the quantity and quality of their production, rather than just making them last longer. Science played a pivotal role in this process by helping foresters identify optimal growing conditions as well as planting and cutting strategies. In this way, science was combined with simple protection to shape the way conservation was carried out. The important implication was that the practice of conservation was no longer just about preserving the forest; it now entailed enhancing or improving the forest itself. The guiding principle behind this powerful new paradigm came to be known as "highest use: the greatest good for the greatest number in the long run." By applying European-style forestry to the large and relatively pristine forests of the western United States, the U.S. Forest Service became a key player in the development of conservation thinking.

Not surprisingly, the paradigm of highest use was as controversial as it was influential. It led to one of the earliest divisions within the conservation movement, one that would define a spectrum of conservation goals that still exists (the intrinsic/instrumental debate, discussed above). Under Pinchot's principle of highest use, the "greatest good" was based on the utilitarian value of nature, or the products that could come out of a forest. A successfully conserved forest would produce the maximum amount of timber for a rapidly growing and developing society. Challenging Pinchot's "utilitarians" was a growing segment of the conservation movement with John Muir as their figurehead, who championed the intrinsic value of nature. Suspicious of Pinchot's brand of conservation and scientific management, Muir and others argued that national parks and many of the country's national forests provided much more than just timber; they were worthy of strict preservation in their natural, unmanaged state. And so a philosophical divide between those who valued nature for intrinsic or instrumental values was born.

Nowhere did these opposing strategies attain more national prominence than in California, where the Hetch Hetchy controversy became an enduring symbol of the divide between preservationist and utilitarian rationales for conservation. At the turn of the twentieth century, the city of San Francisco had around 400,000 inhabitants and a grossly inadequate water supply. Even though the Hetch Hetchy valley was already part of Yosemite National Park, the city proposed that the valley be dammed to provide a more reliable and cleaner water

source. What ensued was a thirteen-year battle polarizing preservationist and utilitarian perspectives. Leading the preservationists was John Muir, who had been instrumental in getting the valley included as part of Yosemite. Muir and his acolytes accused the utilitarians of purely economic shortsightedness by "trying to make everything dollarable" (Fox, 1985, 141). Leading the utilitarian infantry was the original proponent of highest use, Gifford Pinchot. In their eyes, the greatest good for the greatest number meant clean water for 400,000 San Franciscans, rather than an intact Hetch Hetchy valley for the whole nation. Muir, lamenting the precedent set by Hetch Hetchy and concerned that all national parks would meet similar fates, died a year after the final decision to build the dam. Under catchy titles ("Dam the Rivers, Damn the People"; e.g., Cummings, 1990) such battles continue to this day, often with recognition of a third stakeholder, the local community displaced or otherwise affected by the hydrological developments (e.g., Johnston, 2001; and see Box 4.6).

1.7 Leading to Game Management, Multiple Use, and Broader Conservation Goals

Until the 1920s approaches springing from utilitarian and intrinsic views remained separate, each settling for dominance in its own sphere: preservation for intrinsic value in national parks and utilization in the national forests, with notable exceptions like Hetch Hetchy, where the land of a national park was put to economic use. But with a more affluent society, greater numbers of people turned to outdoor recreation to escape the cities, and hunting became increasingly important in shaping conservation thinking. Reflecting the growing importance of sporting interests, a representative supporting a bill in the U.S. Congress to protect sport fisheries argued, "It is a notable fact that of the twelve apostles selected by Christ, four were fisherman" (Fox, 1985, 168).

At the heart of this movement linking sporting and conservation interests was a forester named Aldo Leopold. Despite being trained in the Pinchot tradition of forestry, Leopold advocated a much broader approach to the goals of utilitarian management than simply the utilization of the trees therein. He recognized the national forests as important refuges for wild game and argued that their management should be based on more than just lumber production. In contrast to the European situation, where hunters paid large fees to hunt hand-reared game on private estates, American national forests provided hunting and recreational opportunities more equitably. Leopold considered the European system undemocratic, and wanted to steer national forests away from a similarly elitist system. His vision of highest use was not limited to timber or even economic benefits; it also included game species. Notably, the importance of game came more from its aesthetic and cultural value for hunters, rather than its market value. The dangers of seeing nature as a resource with a price on its head were as alive to Leopold as they are to Ehrenfeld (1976), and it is with Leopold that additional nonconsumptive objectives of preservationism began to creep into utilitarian conservation. The recognition of cultural value and the incorporation of nongame species into management ushered in the paradigm of "multiple use," still dominant in the U.S. Forest Service today. But at this stage in his career Leopold was far from a preservationist; he supported predator eradication programs in hopes of boosting game numbers. Ironically, however, these same predator control programs would push conservation thinking forward by inspiring Leopold to develop a broader ecological community-level approach to conservation.

The program in question was on the Kaibab Plateau, in the southwestern United

States. With predator control, coyotes, mountain lions, bobcats, and wolves had all been eradicated or nearly so. In 1905 the area was incorporated into the Grand Canyon Game Preserve, so hunting and livestock grazing were prohibited and the deer population was left to grow. What ensued was "one of history's most celebrated cases of game *mis*management" (Meine, 1988, 240). After twenty years without active management or predators the deer had severely overgrazed the plateau. Over the winter of 1925–26 over 60 percent of the herd died through mass starvation or was shot after emergency reinstatement of hunting. The Kaibab experience was a watershed for Leopold, demonstrating the importance of wildlife-habitat relationships.

Until that point, management had been based on simple cause-and-effect relationships: fewer predators meant more game, less hunting meant even more game. But through the Kaibab lesson Leopold realized that these simple relationships drawn from his experiences in forestry did not necessarily hold. His goal switched to providing a scientific foundation for game management like Pinchot had done for forestry twenty years earlier, recognizing that deer and other game species were bound in a broader web of interactions. He also realized that "habitat" meant more than just the vegetation and weather where game species lived. Predators, prey, competitors, and resources would all have to be considered when managing a single population like the deer of the Kaibab. Leopold's new science, called "game management," grew out of traditional forestry, but its view of natural systems was much broader than just the species being managed. By demonstrating their ecological importance, Leopold provided a convincing argument for conserving nongame and even predatory species, even though they were not directly useful to humans (Leopold, 1997). Here we see the beginnings of Leopold's enduring "land ethic," the notion that all species are part of a biotic community that includes soil, water, plants, and animals. While the science underlying Leopold's land ethic has been largely revised by modern ecology (chapter 3), Leopold himself remains a source of inspiration to many modern biologists and conservationists.

Game management significantly expanded the scope of conservation efforts in nonscientific ways as well. First, Leopold was a strong advocate for the protection of wilderness—large, relatively untouched, and inaccessible roadless areas—and the experiences to be had there. Second, realizing that wildlife relied on private as well as public land, Leopold argued that "conservation is not merely a thing to be enshrined in outdoor museums, but a way of living on land" (quoted in Meine, 1988, 310). In this context Leopold first ventured the notion of a "conservation ethic," as an inducement for private landowners to manage their property in ways that served not only their own interests but those of the public and future generations (Carpenter and Turner, 2000). This shift marked the beginning of a second phase of importance for amateurs in American conservation. This time, however, the amateurs were not wealthy or influential benefactors. Leopold argued that it was hunters and farmers who held the key to game conservation, as successful game management could be achieved with "*creative use* of the same tools which have heretofore destroyed it—axe, plow, cow, fire and gun" (Leopold, 1933, vii). These early steps, to include game species and then nongame in the management of national forests, to recognize the importance of "wilderness" and finally private lands, form the beginning of a larger trend toward expanding the goals of conservation. And, indeed, in other parts of the world a similar broadening of horizons was underway, as, for example, with the transformation of the colonial sport hunters into conservationists (as we saw in Box 1.4).

In the years following the development

of game management, conservation found a home in mainstream culture, both in the United States and in Europe (Evans, 1997; Fox, 1985). As this happened the movement swung back toward more preservationist ends. Amazingly, even during World War II, when natural resources were needed for the war effort, preservation for intrinsic value held strong and was subsequently bolstered by the unprecedented improvements in economic well-being during the postwar era. During the 1950s and 1960s the goals of conservation expanded enormously as concern for game and charismatic species captured the popular imagination and the environmental movement arose. With the birth of environmentalism, air, water aesthetics, and human health were added to conservation awareness, drawing an even wider circle of popular concern (e.g., Carson, 1962). Also in the 1960s more nonspecialists than ever became concerned with conservation issues. With the publication of Ehrlich's (1968) *The Population Bomb* and the Club of Rome's gloomy predictions about how much longer human appetites could be supported by the planet (Meadows et al., 1972), human population and resource consumption became global issues and consequently the concern of all (see chapter 2). Just as the conservation movement sixty years earlier was confronted with the finite nature of North American resources, the 1960s generation was alarmed by the suddenly tangible limits of the planet's resources, captured in pictures of Earth as a small, fragile entity entirely alone and vulnerable in space. Yet while many think of the 1960s and 1970s as the beginning of environmentalism, there is an interesting twist to the story, illustrative of the swings and pendulums that have characterized conservation thinking since its conception. Almost 200 years previously in far-flung colonial outposts environmental health had played a key role in stimulating conservation thinking and policy (Box 1.5).

Emphasis on the global environment combined with sensitivity to human interests set the stage for sweeping changes in conservation policy throughout the 1970s and early 1980s, developments that sparked the community-based conservation movement and our present conservation predicament(see chapter 2). Notably, however, it was not until the mid 1980s that the growing list of entities deemed worthy of conservation, and the ecological systems in which they had evolved, would stimulate the emergence of a discipline of conservation biology (chapter 3).

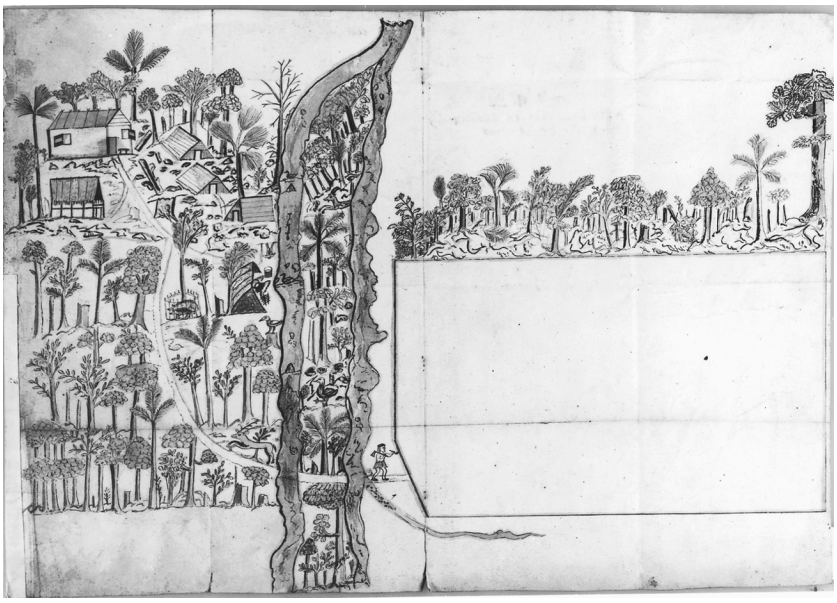
1.8 Conclusion

This history has been one of jostling values and interests, with conservation for either intrinsic or instrumental reasons taking precedence in North America at different periods or in different circles (Table 1.2). The highly preservationist ideals behind the formation of the world's first national park gave way to a period, lasting until the middle of the twentieth century, when artists, foresters, government officials, and laypersons alike wrangled over utilitarian and preservationist goals, as we saw in the history of Catlin, Pinchot, and Leopold. Then after World War II prosperity, international travel, population growth, and the media all conspired to ignite environmentalism, thereby vastly broadening the conservation agenda, lending more authority, at least in popular circles, to a preservationist mindset. By the end of the 1960s, the highly preservationist goal of comprehensive biodiversity protection (i.e., all species, and subsequently their genetic diversity, ecological interactions, and evolutionary processes) began to characterize the modern conservation era. In chapter 2 we will see how since that time yet another pendulum swing has brought the preservationist view under serious challenge, and how the old intrinsic/instrumental divide has become dressed up in development politics, ideology, and yet further ethical dilemmas.

Box 1.5. Early Environmentalists in the Colonies

Anxieties about soil erosion and deforestation have arisen at many periods in human history. As early as 450 B.C. Artaxerxes had attempted to restrict the cutting of the cedars of Lebanon in order to combat soil loss; and, as we see in chapter 4, indigenous strategies for environmental management have existed in many parts of the world since time immemorial. However, only in the mid eighteenth century did a coherent awareness of the ecological impact of the demands of emergent capitalism and colonial rule arise, as the colonial enterprise clashed with Romantic idealism in tropical lands from the Caribbean Sea to the Far East (Grove, 1995).

One such island paradise was Mauritius, evoking for Europeans the exotic south sea setting of Dante's *Divine Comedy*. By the mid seventeenth century, the Dutch, British, and French East India Companies were destroying the island's tropical ecology with agriculture, logging, mining, and hunting (Grove, 1992). Interestingly, it was scientists, often working as surgeons or curators of early botanical gardens for these trading companies, who spearheaded the burgeoning environmental concern, with the earliest developments in Mauritius. Initially Portuguese, then Dutch, it fell to French rule in 1721. Men such as Philibert Commerson, Pierre Poivre, and Jacques Henri Bernardin de St. Pierre, though charmed by the dreamy tropical allure of the island, were also sensitive to the rigorous empiricism of the French Enlightenment. In particular, they noticed the relationship between deforestation and local climate change. This led to a 1769 ordinance that limited the clearing of forests. The En-



Ebony Cutting in Progress on the East Coast of Mauritius, 1677.
One of the earliest portrayals of colonial deforestation in the tropics, with the only known illustration of the Dodo (on a tree stump) in its natural lowland ebony-forest habitat. Reproduced courtesy of the Nationaal Archief, The Hague.

(continued)

(Box 1.5 continued)

glish were quick to imitate French Mauritian policy. On the Caribbean island of Tobago a plant physiologist pioneered the study of transpiration, root pressure, and the circulation of sap, establishing, through the use of techniques pioneered by Newton, clear links between green plants and the atmosphere, and between trees and rainfall.

Tracing the story from Mauritius and Tobago to the rest of the Caribbean, India, and South Africa's Cape Colony, through public debates at the Royal Geographic Society in London and various policy initiatives in the colonies, Grove (1995) comes to the rather dismal conclusion that states will act to prevent environmental degradation only when their economic interests are threatened. Philosophical ideas and science alone are unfortunately not enough to precipitate such decisions.

One thing that becomes very clear from this story is that the question "Why conserve?" insofar as it elicits different values for conservation has historically been associated with a range of distinct conservation goals; thus for Catlin it was a dream of wilderness, and for Pinchot an orderly and productive forest. Here we should emphasize a critical but often overlooked distinction in conservation: ends and means. Means are the tools used to reach conservation goals, whereas ends are the goals themselves. Though this chapter has focused primarily on goals, history shows (see again Table 1.2) that specific means have traditionally been associated with certain ends. Later in this book (see chapter 11) we will argue how important it is to keep these concepts distinct.

The two types of means revealed most clearly in this brief history are utilization and protectionism. Utilization entails some use of the area designated for conservation; utilization is generally consumptive in some way, like hunting, timber felling, or fruit collection, and is exemplified in the policies of Pinchot. Protectionism, by contrast, seeks to exclude human consumptive uses, most classically by keeping all people (other than tourists) out. The distinction is not absolute. For example, some consider tourism to be a wholly nonconsumptive endeavor, while others point to its negative impacts and label it consumptive (see chapter 10). For this reason, protectionism and utilization are best thought of as relative attributes rather than absolutely defined categories. Protectionism versus utilization is not, however, the only point of contention among conservationists, even though so much of the literature addresses this debate. There are other extremely important axes along which conservation, both ends and means, can vary, such as the importance attributed to anthropogenic landscapes as opposed to seemingly "untouched wildernesses," the role of humans in contributing to and protecting biodiversity, the focus on single species versus ecological processes, and the identity of managers—whether they are an elite band of hobby conservationists, sportsmen, farmers making a living off the land, or professional scientists. Each of these dynamics has been alluded to in historical context in this chapter, but is developed more analytically in later chapters. Another critical axis, the degree to which conservation strategies are centralized, is a principal focus of chapter 2, where we look at the post 1970s evolution of conservation policy.

Given the quagmire of ideological debates and practical obstacles surrounding

conservation practice, how will we use the very word *conservation* in this book? Though it is impossible to strip any word of all its ethical and methodological implications, we aim to use the term in as neutral a manner as possible. For us conservation refers to an objective (goal) that is usually but not always based on the idea of nature having inherent/intrinsic value, and entails saving global representations of all unique populations, species, communities, and ecosystems within their natural context from uses that are deemed "not appropriate." It is good to be clear about this neutral definition when entering the highly interdisciplinary fray of players engaged with the modern ecological crisis, particularly given how ready different camps are to mischaracterize each other's position. Labels can become a millstone. Indeed, for some, conservation is a dirty word, evoking a stubborn will to preserve nature in some untouched and unchanging state at all costs. Modern conservation biologists have accordingly tried hard to disassociate the term from the implications of straight preservationism (see chapter 3). The latter notion was a serious casualty in the paradigm shift toward utilitarianism (chapter 2), on account of its apparent links with protectionism. Preservationism is also linked in some critics' minds with the idea of evolutionary stasis (an outmoded form of ecology; see chapter 3), and with wilderness fixation (a problematic approach given the importance of anthropogenic biodiversity discussed in chapter 7). As we use the term here conservation is neutral with respect to the means of achieving desired ends, open to the importance of anthropogenic as opposed to nonanthropogenic landscapes, and encompassing of change and dynamism. Conservation used in this sense implies neither the rationale for conserving (intrinsic/utilitarian), nor the means of so doing (protectionism, utilization, etc.).

Perhaps the clearest message of all to emerge from this brief history is that conservation is about choices, and choices are based on ethical values. The answer to the question of what kinds of biodiversity should be prioritized for conservation depends ultimately on why one thinks conservation is

Table 1.2
Changing Goals, Means, and Actors in U.S. Conservation Strategy, 1870–1969

Time Period	*Goals*	*Means*	*People Involved*
Pre-1900 (Claiming access to resources)	Utilitarian	Protectionism	Wealthy elites
1870s–Present (National parks)	Preservationist	Protectionism	Elites and professional managers
1890s–1910s (U.S. Forest Service) (Scientific management: production of a single resource)	Utilitarian	Utilization	Professional land managers
1910s–1920s (Game management: single resources and game species)	Utilitarian	Utilization	Professional land managers
1930s–1940s (Multiple use: single resources and game and nongame species)	Utilitarian and preservationist	Utilization	Landowners, land managers
1950s–1960s (All species: genetic variability)	Preservationist	Protectionism	International; nongovernmental organizations; communities

important (goals), and why one thinks conservation is important often affects how one thinks conservation should be achieved (means). All of these issues become entwined in the fates of conservation projects, the course of policy initiatives, and even in the lives of particular individuals. To deny that there are indeed many roads to conservation would merely forestall a host of options to current challenges. Debate over the means of conservation, particularly the importance of protected areas, and the implications of this for the evolution of conservation policy, draws on each of these sets of choices, and is the subject of the following chapter.