

Principles of Conservation Biology
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Conservation Values and Ethics

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It is inconceivable to me that an ethical relation to land can exist without love, respect, and admiration for land, and a high regard for its value. By value, I of course mean something far broader than mere economic value; I mean value in the philosophical sense.

Aldo Leopold, 1949

The Value of Biodiversity

Conservation biologists often treat the value of biodiversity as a given. To many laypeople, however, the value of biodiversity may not be so obvious. Because conservation efforts require broad public support, the conservation biologist should be able to articulate fully the value of biodiversity. Why should we care about—that is, value—biodiversity?

Environmental philosophers customarily divide value into two main types, expressed by alternative pairs of terms: **instrumental** or **utilitarian** as opposed to **intrinsic** or **inherent**. Instrumental or utilitarian value is the value that something has as a means to another's ends. Intrinsic or inherent value is the value that something has as an end in itself. The intrinsic value of human beings is rarely contested. The intrinsic value of nonhuman natural entities and nature as a whole has been the subject of much controversy. Perhaps because the suggestion that nonhuman natural entities and nature may also have intrinsic value is so new and controversial, some prominent conservationists (e.g., Myers 1983) have preferred to provide a purely utilitarian rationale for conserving biodiversity. The view that biodiversity has value only as a means to human ends is called **anthropocentric** (human-centered). On the other hand, the view that biodiversity is valuable simply because it exists, independently of its use to human beings, is called **biocentric**.

Instrumental Value

The anthropocentric instrumental (or utilitarian) value of biodiversity may be divided into three basic categories—goods, services, and information. The

Table 2.1
Four Categories of the Instrumental Value
of Biodiversity

Category	Examples
Goods	Food, fuel, fiber, medicine
Services	Pollination, recycling, nitrogen fixation, homeostatic regulation
Information	Genetic engineering, applied biology, pure science
Psycho-spiritual	Aesthetic beauty, religious awe, scientific knowledge

psycho-spiritual value of biodiversity is possibly a fourth kind of anthropocentric utilitarian value (Table 2.1).

First, goods. Human beings eat, heat with, build with, and otherwise consume many other living beings. But only a small fraction of all life-forms have been investigated for their utility as food, fuel, fiber, and other commodities. Many potential food plants and animals may await discovery. And many of these might be grown on a horticultural or agricultural scale, as well as harvested in the wild, adding variety at least to the human diet, and possibly even saving us from starvation if conventional crops fail due to incurable plant diseases or uncontrollable pests (Vietmeyer 1986a, b). Fast-growing trees—useful for fuelwood or making charcoal, or useful for pulp or timber—may still be undiscovered in tropical forests. New organic pesticides may be manufactured from yet to be screened or discovered plants (Plotkin 1988). The medicinal potential of hitherto undiscovered and/or unassayed plants and animals seems to be the most popular and persuasive rationale of this type for preserving biodiversity. Vincristine, extracted from the Madagascar periwinkle, is the drug of choice for the treatment of childhood leukemia (Farnsworth 1988). Discovered in the late 1950s, it is the most often cited example of a recent and dramatic cure for cancer manufactured from a species found in a place where the native biota is now threatened with wholesale destruction. Doubtless many other hitherto unscreened, perhaps even undiscovered, species might turn out to have equally important medical uses—if we can save them.

The degree to which conservationists rely on the argument that potential medicines may be lost if we allow species extinction to grind on is revealing. It reflects the reverence and esteem with which medicines are held in contemporary Western culture—a culture, it would seem, of hypochondriacs. Spare no expense or inconvenience to save them, if unexplored ecosystems may harbor undiscovered cures for our diseases! According to Meadows (1990), “some ecologists are so tired of this line of reasoning that they refer wearily to the ‘Madagascar periwinkle argument.’ . . . [Those] ecologists hate the argument because it is both arrogant and trivial. It assumes that the Earth’s millions of species are here to serve the economic purposes of just one species. And even if you buy that idea, it misses the larger and more valuable ways that nature serves us.”

Which brings us to the second point, services. Often overlooked by people who identify themselves first and foremost as “consumers” are the services performed by other species working diligently in the complexly orchestrated economy of nature (Meadows 1990). Green plants replenish the oxygen in the

atmosphere and remove carbon dioxide. Certain kinds of insects, birds, and bats pollinate flowering plants, including many agricultural species, and are being lost at a frightening rate (Buchmann and Nabhan 1996). Fungal and microbial life-forms in the soil decompose dead organic material and play a key role in recycling plant nutrients. Rhizobial bacteria turn atmospheric nitrogen into usable nitrate fertilizer for plants. If the **Gaia hypothesis** (Lovelock 1988) is correct, the Earth's temperature and the salinity of its oceans are organically regulated. The human economy is no more than a small subsystem of the economy of nature and would abruptly collapse if major environmental service sectors of the larger natural economy were to be disrupted.

Third, information. The mindless destruction of species "uncared for and unknown"—in the words of Darwin's contemporary and codiscoverer of evolution by natural selection, Alfred Russel Wallace (1863)—has been compared to setting fire to sections of a vast library and burning books that no one has read. Each is a storehouse of information. Desirable characteristics encoded in isolatable genes and transferable, by means of gene splicing, to edible or medical resources, may be "burned up" with the "volume" in which they could once be found. Genetic information, in other words, is a potential economic good. Such information also has another utility, more difficult to express. Meadows (1990), however, captures it nicely:

Biodiversity contains the accumulated wisdom of nature and the key to its future. If you ever wanted to destroy a society, you would burn its libraries and kill its intellectuals. You would destroy its knowledge. Nature's knowledge is contained in the DNA within living cells. The variety of genetic information is the driving engine of evolution, the immune system for life, the source of adaptability.

Some 1.5 million species have been formally named and described (see Chapter 4). Based upon the most conservative recent estimates of the total number of the planet's species—between five and ten million—that means that only 15–30%, at most, are known to science (Gaston 1991). Based upon more liberal recent estimates of the total—30 million or more—the number known to science could represent less than 5% (Erwin 1988). Imagine the loss to science if, as Raven (1988) predicts, 25% of the world's life-forms, due to the destruction of much of their moist tropical habitat, become extinct in the coming quarter-century, before they can even be scientifically named and described.

The vast majority of these threatened species are not vascular plants or vertebrate animals; they are insects (Wilson 1985b). The reason that Erwin (1988) suspects that there may be so many species of invertebrates is that so many may be endemic or host-specific. Most of these unknown insects at risk of extinction would probably prove to be useless as human food or medicine—either as whole organisms, as sources of chemical extracts, or as sources of gene fragments—nor would many be likely to play a vital role in the functioning of regional ecosystems (Ehrenfeld 1988). Though it may be difficult to so callously view such a tragedy, we may account their loss, nevertheless, in purely utilitarian terms—as a significant loss of a potential nonmaterial human good, namely, pure human knowledge of the biota.

Fourth, psycho-spiritual resources. Aldo Leopold (1953) hoped that, through science, people would acquire "a refined taste in natural objects." A beetle, however tiny and ordinary as beetles go, is as potentially beautiful as any work of fine art. And natural variety—a rich and diverse biota—is something Soulé (1985) thinks nearly everyone prefers to monotony. Wilson (1984) finds a special wonder, awe, and mystery in nature—which he calls "biophilia," and which for him seems almost to lie at the foundations of a religion of natural history. To be

moved by the beauty of organisms and whole, healthy ecosystems, to experience a sense of wonder and awe in the face of nature's inexhaustible marvels is to become a better person, according to Norton (1987).

If from the point of view of the value of information—genetic and otherwise—the mindless destruction of biodiversity is like book burning, then from the point of view of natural aesthetics and religion, it is like vandalizing an art gallery or desecrating a church. There has been little doubt expressed that the value of pure scientific knowledge is anthropocentric, and the aesthetic and spiritual value of nature is often understood to be a highfalutin kind of utilitarian value. Ehrenfeld (1976) thinks that aesthetic and spiritual rationales for the conservation of biodiversity are “still rooted in the homocentric, humanistic worldview that is responsible for bringing the natural world, including us, to its present condition.” Nevertheless, the beauty and sanctity of nature has sometimes been accounted an intrinsic, not an instrumental, value. According to Sagoff (1980), for example, “we enjoy an object because it is valuable; we do not value it merely because we enjoy it. . . . Esthetic experience is a perception, as it were, of a certain kind of worth.”

Intrinsic Value

Unlike instrumental value, intrinsic value is not divisible into categories. Discussion of intrinsic value has focused on two other issues: the sorts of things that may possess intrinsic value, and whether intrinsic value exists objectively or is subjectively conferred.

In response to mounting concern about human destruction of nonhuman life, some contemporary philosophers have broken with Western religious and philosophical tradition and attributed intrinsic value, by whatever name, to the following: robustly conscious animals (Regan 1983); **sentient** animals (Warnock 1971); all living things (Taylor 1986); species (Callicott 1986; Rolston 1988; Johnson 1991); biotic communities (Callicott 1989); ecosystems (Rolston 1988; Johnson 1991); and evolutionary processes (Rolston 1988). Leopold (1949, 1953) attributed “value in the philosophical sense”—by which he could mean only what philosophers call “intrinsic value”—to “land,” defined as “all of the things on, over, or in the earth” (Callicott 1987a). Soulé (1985) categorically asserts that “biotic diversity has intrinsic value”, and Ehrenfeld (1988) categorically asserts that “value is an intrinsic part of diversity.”

Environmental philosophers who claim that intrinsic value exists objectively in human beings and other organisms reason as follows. In contrast to a machine, such as a car or a vacuum cleaner, an organism is “autopoietic”—self-organizing and self-directed (Fox 1990). A car is manufactured; in other words, it does not grow up, orchestrated by its own DNA. And a car's purposes—to transport people and to confer status on its owner—are imposed on it from a source outside itself. Machines do not have their own goals or purposes, as organisms do—neither consciously chosen goals nor genetically determined goals. What are an organism's self-set goals? They may be many and complex. For us human beings they may include anything from winning an Olympic gold medal to watching as much television as possible. All organisms, however, strive (usually unconsciously and in an evolutionary sense) to achieve certain basic predetermined goals—to grow, to reach maturity, to reproduce (Taylor 1986).

Thus, interests may be intelligibly attributed to organisms, but not to machines. Having ample sunlight, water, and rich soil is in an oak tree's interest, though the oak tree may not be actively interested in these things, just as eating fresh vegetables may be in a child's interest, though the child may be

actively interested only in junk food. One may counter that, by parity of reasoning, getting regular oil changes is in a car's interest, but because a car's ends or purposes are not its own, being well-maintained is not in its own interest, but in the interest of its user, whose purposes it serves exclusively. Another way of saying that ever striving and often thriving organisms have interests is to say that they have a good of their own. But *good* is just an older, simpler word meaning pretty much the same thing as *value*. Hence to acknowledge that organisms have interests—have goods of their own—is to acknowledge that they have what philosophers call *intrinsic value*.

Intrinsic and instrumental value are not mutually exclusive; many things may be valued both for their utility and for themselves. Employers, for example, may value their employees in both ways. Similarly, intrinsically valuing biodiversity does not preclude appreciating the various ways in which it is instrumentally valuable.

Norton (1991) argues that some environmental philosophers and conservation biologists, by claiming that biodiversity has intrinsic value (or is intrinsically valuable), have actually done more harm than good for the cause of conservation. Why? Because the intrinsic value issue divides conservationists into two mutually suspicious factions—anthropocentrists and biocentrists. The latter dismiss the former as “shallow resourcists;” and the former think that the latter have gone off the deep end (Norton 1991). If biodiversity is valuable because it ensures the continuation of ecological services, represents a pool of potential resources, satisfies us aesthetically, inspires us religiously, and makes better people out of us, the practical upshot is the same as if we attribute intrinsic value to it: we should conserve it. Instrumentally valuing biodiversity and intrinsically valuing it “converge” on identical conservation policies, in Norton's view (Figure 2.1); thus, we don't really need to appeal to the intrinsic value of biodiversity to ground conservation policy. Hence, Norton argues, the controversial and divisive proposition that biodiversity has intrinsic value should be abandoned. A wide and long anthropocentrism, he thinks, is an adequate value package for conservation biology.

Attributing intrinsic value to biodiversity, however, makes a practical difference in one fundamental way that Norton seems not to have considered. If biodiversity's intrinsic value were as widely recognized as is the intrinsic value of human beings, would it make much difference? All forms of natural resource exploitation that might put it at risk would not be absolutely prohibited, as intrinsic value easily can be ignored. After all, recognizing the intrinsic value of human beings does not absolutely prohibit putting people at risk when the benefits to the general welfare (or “aggregate utility”) of doing so are sufficiently great. For example, in 1990, soldiers from the United States and other industrial nations were sent into combat, and some were killed or wounded, not to protect themselves and their fellow citizens from imminent annihilation, but to secure supplies of Middle Eastern petroleum and to achieve geopolitical goals.

Rather, if the intrinsic value of biodiversity were widely recognized, then sufficient justification would have to be offered for putting it at risk—just as we demand sufficient justification for putting soldiers at risk by sending them

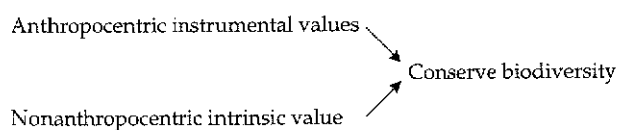
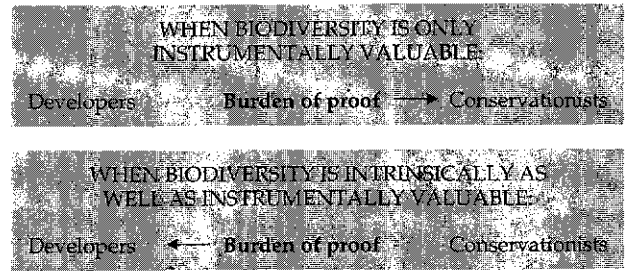


Figure 2.1 Norton's convergence hypothesis.

Figure 2.2 Burden of proof according to instrumental and intrinsic value systems.



to war. The practical difference that attributing intrinsic value to biodiversity makes is to shift the burden of proof from conservationists who are trying to protect it to those whose actions might jeopardize it (Figure 2.2). Fox (1993) puts this point clearly and forcefully:

Recognizing the intrinsic value of the nonhuman world has a dramatic effect upon the framework of environmental debate and decision-making. If the nonhuman world is only considered to be instrumentally valuable then people are permitted to use and otherwise interfere with any aspect of it for whatever reasons they wish. If anyone objects to such interference then, within this framework of reference, the onus is clearly on the person who objects to justify why it is more useful to humans to leave that aspect of the world alone. If, however, the nonhuman world is considered to be intrinsically valuable then the onus shifts to the person who wants to interfere with it to justify why they should be allowed to do so.

Monetizing the Value of Biodiversity

Monetizing the value of biodiversity is a technical task for economists. Here we discuss only the basic ways of putting a dollar value on biodiversity and the philosophical issues raised by the prospect of doing so. It might seem that only the instrumental value of biodiversity is subject to expression in monetary terms. Some environmental economists, accordingly, explicitly endorse a strict anthropocentrism (Randall 1986). However, as we shall see, even the intrinsic value of biodiversity can be taken into account in an economic assessment of conservation goals.

Some endangered species have a market price: notoriously, elephants for their tusks; rhinoceroses for their horns; baleen whales for their meat, bone, and oil; and Bengal tigers for their pelts. In some cases—the blue and sperm whales, for example—their monetary value is the only reason the species are threatened with extinction. In other cases—the Bengal tiger and the mountain gorilla, for example—habitat destruction is also a factor in their endangerment. Myers (1981), however, suggests that taking advantage of their monetary value may be the key to conserving many species. An alternative perspective is provided by Holmes Rolston in Essay 2A.

According to modern economic theory, what is necessary for transforming a species' market price from a conservation liability into a conservation asset is to take it out of a condition that economists call a "commons" and "enclose" it. *Enclosing* here does not mean literally building a fence around a species population; it means, rather, assigning rights to cull it. A wild species that has a market value is subject to overharvesting when property rights to it cannot be legitimately asserted and enforced. This leads to the **tragedy of the commons** (Hardin 1968), discussed in Chapter 19. If a resource can be owned (either privately or publicly) and property rights to it can be enforced, then the species

ESSAY 2A

Our Duties to Endangered Species

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Few persons doubt that we have obligations concerning endangered species, because persons are helped or hurt by the condition of their environment, which includes a wealth of wild species, currently under alarming threat of extinction. Whether humans have duties directly to endangered species is a deeper question, important in both ethics and conservation biology, in both practice and theory. Many believe that we do. The U.N. *World Charter for Nature* states, "Every form of life is unique, warranting respect regardless of its worth to man." The *Biodiversity Convention* affirms "the intrinsic value of biological diversity." Both documents are signed by well over a hundred nations. A rationale that centers on species' worth to persons is anthropocentric; a rationale that includes their intrinsic and ecosystem values is naturalistic.

Many endangered species have no resource value, nor are they particularly important for the usual humanistic reasons: scientific study, recreation, ecosystem stability, and so on. Is there any reason to save such "worthless" species? A well-developed environmental ethics argues that species are good in their own right, whether or not they are "good for" anything. The duties-to-persons-only line of argument leaves deeper reasons untouched; such justification is not fully moral and is fundamentally exploitive and self-serving on the part of humans, even if subtly so. Ethics has never been very convincing when pleaded as enlightened self-interest (that one ought always to do what is in one's intelligent self-interest).

An account of duties to species makes claims at two levels: one is about facts (a scientific issue, about species); the other is about values (an ethical issue, involving duties). Sometimes, species can seem simply made up, since taxonomists regularly revise species designations and routinely put after a species the name of the "author" who, they say, "erected" the taxon. If a species is only a category or class, boundary lines may be arbitrarily drawn, and the species is nothing more than a convenient grouping of its members, an artifact of taxonomists. No one proposes

duties to genera, families, orders, or phyla; biologists concede that these do not exist in nature.

On a more realistic account, a biological species is a living historical form, propagated in individual organisms, that flows dynamically over generations. A species is a coherent, ongoing, dynamic lineage expressed in organisms, encoded in gene flow. In this sense, species are objectively there—found, not made, by taxonomists. Species are real historical entities, interbreeding populations. By contrast, families, orders, and genera are not levels at which biological reproduction takes place. Far from being arbitrary, species are the real survival units.

This claim—that there are specific forms of life historically maintained over time—does not seem fictional, but rather is as certain as anything else we believe about the empirical world, even though at times scientists revise the theories and taxa with which they map these forms. Species are not so much like lines of latitude and longitude as like mountains and rivers, phenomena objectively there to be mapped. The edges of such natural kinds will sometimes be fuzzy, and to some extent discretionary (see Chapter 3). One species will slide into another over evolutionary time. But it does not follow from the fact that speciation is sometimes in progress that species are merely made up, rather than found as evolutionary lines.

At the level of values and duties, an environmental ethics finds that such species are good kinds, and that humans ought not, without overriding justification, to cause their extinction. A consideration of species offers a biologically based counterexample to the focus on individuals typically sentient and usually persons—so characteristic of Western ethics. In an evolutionary ecosystem, it is not mere individuality that counts. The individual represents, or re-presents anew, a species in each subsequent generation. It is a token of an entity, and the entity is more important than the token. Though species are not moral agents, a biological identity—a kind of value—is here defended. The dignity resides in the dynamic form; the individual inherits this, exemplifies it,

and passes it on. The possession of a biological identity reasserted genetically over time is as characteristic of the species as of the individual. Respecting that identity generates duties to species.

The species is a bigger event than the individual, although species are always exemplified in individuals. Biological conservation goes on at this level too, and, really, this level is the more appropriate one for moral concern, a more comprehensive survival unit than the organism. When an individual dies, another one replaces it. Tracking its environment over time, the species is conserved and modified. With extinction, this stops. Extinction shuts down the generative processes in a kind of superkilling. It kills forms (species) beyond individuals. It kills collectively, not just distributively. To kill a particular plant is to stop a life of a few years or decades, while other lives of such kind continue unabated; to eliminate a particular species is to shut down a story of many millennia, and leave no future possibilities.

Because a species lacks moral agency, reflective self-awareness, sentience, or organic individuality, some hold that species-level processes cannot count morally. But each ongoing species represents a form of life, and these forms are, on the whole, good kinds. Such speciation has achieved all the planetary richness of life. All ethicists say that in *Homo sapiens* one species has appeared that not only exists but ought to exist. A naturalistic ethic refuses to say this exclusively of one late-coming, highly developed form, but extends this duty more broadly to the other species—though not with equal intensity over them all, in view of varied levels of development.

The wrong that humans are doing, or allowing to happen through carelessness, is stopping the historical gene flow in which the vitality of life lies. A shut-down of the life stream is the most destructive event possible. Humans ought not to play the role of murderers. The duty to species can be overridden, for example, with pests or disease organisms. But a *prima facie* duty stands nevertheless. What is wrong with human-caused extinction is not just the loss of

human resources, but the loss of biotic sources. The question is not: What is this rare plant or animal good for? But: What good is here? Not: Is this species good for my kind, *Homo sapiens*? But: Is *Rhododendron chapmanii* a good of its kind, a good kind? To care about a plant or animal species is to be quite nonanthropocentric and objective about botanical and zoological processes that take place independently of human preferences.

Increasingly, we humans have a vital role in whether these stories continue. The duties that such power generates no longer attach simply to individuals or persons, but are emerging duties to specific forms of life. The species line is the more fundamental living system, the whole, of which individual organisms are the essential parts. The species too has its integrity, its individuality, and it is more important to protect this than to protect individual integrity. The appropriate survival unit is the appropriate level of moral concern.

A species is what it is, inseparable from the environmental niche into

which it fits. Particular species may not be essential in the sense that the ecosystem can survive the loss of individual species without adverse effect. But habitats are essential to species, and an endangered species typically means an endangered habitat. Integrity of the species fits into integrity of the ecosystem. Endangered species conservation must be ecosystem-oriented. It is not preservation of *species* that we wish, but the preservation of *species in the system*. It is not merely *what* they are, but *where* they are that we must value correctly.

It might seem that for humans to terminate species now and again is quite natural. Species go extinct all the time. But there are important theoretical and practical differences between natural and anthropogenic extinctions. In natural extinction, a species dies when it has become unfit in its habitat, and other species appear in its place. Such extinction is normal turnover. Though harmful to a species, extinction in nature is seldom an evil in the system. It is rather the key to tomorrow. The species is employed in, but abandoned to, the

larger historical evolution of life. By contrast, artificial extinction shuts down tomorrow because it shuts down speciation. One opens doors, the other closes them. Humans generate and regenerate nothing; they only dead-end these lines. Relevant differences make the two as morally distinct as death by natural causes is from murder.

On the scale of evolutionary time, humans appear late and suddenly. Even more lately and suddenly they increase the extinction rate dramatically. What is offensive in such conduct is not merely senseless loss of resources, but the maelstrom of killing and insensitivity to forms of life. What is required is not prudence, but principled responsibility to the biospheric earth. Only the human species contains moral agents, but conscience ought not be used to exempt every other form of life from consideration, with the resulting paradox that the sole moral species acts only in its collective self-interest toward all the rest.

will be conserved, so the theory goes, because the owner will not be tempted to "kill the goose that lays the golden egg."

Or will he, she, or it? Other factors, such as species' reproductive rates and growth rates in relationship to interest rates, discount rates, and so on, confound this simple picture. As Haneman (1988) points out, "the interest rate level, the nature of the net benefit function and its movement over time, and the dynamics of the resource's natural growth process combine to determine the optimal intertemporal path of exploitation . . . Other things being equal, the higher the interest rate at which future consequences are discounted, the more it is optimal to deplete the resource now."

The blue whale is a case in point. The International Whaling Commission effectively encloses whale populations, despite occasional poaching, by allotting species harvest quotas to whaling nations (Forcan 1979). Clark (1973) concludes, however, that it would be more profitable to hunt blue whales to complete extinction and invest the proceeds in some other industry than to wait for the species population to recover and harvest blue whales at sustainable levels indefinitely. Clark does not recommend this course of action. On the contrary, his point is that market forces alone cannot always be made to further conservation goals.

The idea of conserving economically exploitable threatened species by enclosing and sustainably harvesting them may work well enough in conserving species with relatively high reproductive and growth rates (such as ungulates), but may not work at all well in conserving species that have relatively low reproductive and growth rates (such as whales). Hence, enlisting the market in the cause of conservation must be done very carefully on a case-by-case basis.

Potential goods—new foods, fuels, medicines, and the like—have no market price, obviously, because they remain unknown or undeveloped. To destroy species willy-nilly, however, before they can be discovered and exam-

ined for their resource potential is to eliminate the chance that a desirable commodity will become available in the future. Hence, biodiversity may be assigned an "option price," defined as "the amount people would be willing to pay in advance to guarantee an option for future use" (Raven et al. 1992). The option price of any given undiscovered or unassayed species may be very small because the chance that a given species will prove to be useful is also probably very small (Ehrenfeld 1988). But added together, the option prices of the million or more species currently threatened with wholesale extinction might be quite formidable.

The market confers a dollar value on biodiversity in other ways than the price of the actual and potential goods that nature provides. People pay fees to visit national parks, for example, and to hike in wilderness areas. Such fees—no less than the price of vincristine or of wildebeest steaks—express the value of a bit of biodiversity in money. But often, because user fees are usually low, the true monetary value of the psycho-spiritual "resource" is underexpressed by those fees alone. Subsidies provided from local, state, and federal tax revenues might also be factored in when assessing the monetary value of a psycho-spiritual resource. The money people spend—for such things as gasoline, food, lodging, and camping equipment—to get to a particular spot and visit it may be credited to the resource by employing the "travel cost method" (Peterson and Randall 1984; see also Case Study 3 in Chapter 18). "Contingent valuation," in which people are polled and asked what they would be willing to pay for the opportunity to enjoy a certain experience—say, to hear wolves howling in Yellowstone National Park in the United States—is also used to calculate the dollar value of psycho-spiritual resources (Peterson and Randall 1984).

Even economists now recognize—and of course attempt to monetize—the "existence value" of biodiversity (Randall 1988). Some people take a modicum of satisfaction in just knowing that biodiversity is being protected even if they have no intention of consuming exotic meats or personally enjoying a wilderness experience. Existence value has a price; one way to ascertain it would be to calculate the amount of money sedentary people actually contribute to conservation organizations, such as The Nature Conservancy or the Rainforest Action Network. Further, economists now also recognize "bequest value"—the amount people would be willing to pay to assure that future generations of *Homo sapiens* will inherit a biologically diverse world (Raven et al. 1992).

Monetizing the value of the often free or underpriced recreational, aesthetic, intellectual, and spiritual utility of nature is more often attempted than monetizing the value of the services that the economy of nature provides to the human economy. In part this may simply reflect the level of ecological literacy among economists, who may be growing adept at "shadow pricing" (as contingent valuation is sometimes called) psycho-spiritual resources. As occasional ecotourists and consumers of outdoor recreation, they can readily understand these resources, but the nuances of pollination, nutrient cycling, and the like may remain a mystery to them. Their neglecting to quantify the value of the service sector of the economy of nature may also reflect the fact that so far, most vital services performed for us free of charge by other species are not scarce, and economists calculate prices only for those things that are (but see Buchmann and Nabhan 1996).

Meadows (1990) hints at one way of monetizing natural services: "How would you like the job," she asks, "of pollinating trillions of apple blossoms some sunny afternoon in May? It's conceivable maybe that you could invent a machine to do it, but inconceivable that the machine could work as elegantly and cheaply as the honey bee, much less make honey on the side." The value of nature's service economy could be monetized by calculating the cost of

replacing natural services with artificial ones. Put in terms of scarcity and options, what would be the cost of employing human labor or machines to pollinate plants, if—because of present economic practices, such as excessive use of insecticides—in the future pollinating organisms were to become vanishingly scarce?

Ehrenfeld (1988) notes, however, that, just as many species have little potential value as goods, many species are likely to have little importance in the service sector of the economy of nature: "The species whose members are the fewest in number, the rarest, the most narrowly distributed—in short, the ones most likely to become extinct—are obviously the ones least likely to be missed by the biosphere. Many of these species were never common or ecologically influential; by no stretch of the imagination can we make them out to be vital cogs in the ecological machine."

Some philosophers and conservation biologists strenuously object to the penchant of economists for reducing all value to monetary terms (Sagoff 1988; Ehrenfeld 1988). Some things have a price, others have a dignity. And, as a familiar matter of fact, we have attempted to exclude certain things from the market that we believe have a dignity—things, in other words, to which we attribute intrinsic value. Indeed, one possible motive for claiming that biodiversity has intrinsic value (or is intrinsically valuable) is to exclude it from economic valuation, and thus to put it beyond the vagaries of the market. We have, for example, attempted to take human beings off the market by outlawing slavery, and attempted to take sex off the market by outlawing prostitution. Why not take intrinsically valuable biodiversity off the market by outlawing environmentally destructive human activities?

Sagoff (1988) argues that we have two parallel and mutually incommensurable systems for determining the value of things: the market and its surrogates on the one hand, and the ballot box on the other. As private individuals, most of us would refuse to sell our parents, spouses, or children—at any price. And as citizens united into polities, we may refuse to trade biodiversity for any "benefit" projected in a benefit-cost analysis. Indeed, the United States Endangered Species Act of 1973 is a splendid example of a political decision to take biodiversity off the market.

Economists counter that we must often make hard choices between such things as the need to bring arable land into production and protecting the habitat of endangered species (Randall 1986). While we may like to believe, piously and innocently, that intrinsically valuable people are literally priceless, the value of a human life is not uncommonly monetized. The dollar value of a human life, for example, might be reflected by the amount that an automobile insurance company pays a beneficiary when a customer kills another person in an accident, or by the maximum amount that an industry is willing to pay (or is required by law to pay) to protect the health and safety of its employees. Similarly, recognizing the intrinsic value of biodiversity does not imply that it cannot be priced. The only way we can make informed choices is to express the entire spectrum of natural values, from "goods" and "services" to "existence," in comparable terms: dollars.

The Endangered Species Act was amended in 1978 to create a high-level interagency committee, the so-called "God Squad," which could allow a project that put a listed species in jeopardy of extinction to go forward if its economic benefits were deemed sufficiently great. This legislation affirms that we do indeed have two incommensurable systems of determining value—one economic and the other political. It also affirms the original political decision to exempt biodiversity from being routinely monetized and traded off for greater economic benefits. But it acknowledges that politically and economi-

cally determined values often clash in the real world. And it provides that when the opportunity cost of conserving biodiversity exceeds an unspecified threshold, the God Squad can allow economic considerations to override the general will of the citizens of the United States, democratically expressed through their Congressional representatives, that the nation's extant native species be conserved, period.

Bishop (1978) formalizes the reasoning behind the God Squad amendment to the U.S. Endangered Species Act. He advocates the safe minimum standard (SMS) approach, an alternative to the practice of aggregating everything from the market price to the shadow price of biodiversity, plugging it into a benefit-cost analysis (BCA), and choosing the economically most efficient course of action (Figure 2.3). Instead, the SMS assumes that biodiversity has incalculable value and should be conserved unless the cost of doing so is prohibitively high. As Randall (1988) explains,

Whereas the . . . BCA approach starts each case with a clean slate and painstakingly builds from the ground up a body of evidence about the benefits and costs of preservation, the SMS approach starts with a presumption that the maintenance of the SMS for any species is a positive good. The empirical economic question is, "Can we afford it?" Or, more technically, "How high are the opportunity costs of satisfying the SMS?" The SMS decision rule is to maintain the SMS unless the opportunity costs of doing so are intolerably high. In other words, the SMS approach asks, how much will we lose in other domains of human concern by achieving the safe minimum standard of biodiversity? The burden of proof is assigned to the case against maintaining the SMS.

As noted earlier in this chapter, the practical effect of recognizing the intrinsic value of something is not to make it inviolable, but to shift the burden of proof, the onus of justification, onto those whose actions would adversely affect it. Because the safe minimum standard approach to monetizing the value of biodiversity shifts the burden of proof from conservationists to developers, it tacitly acknowledges, and incorporates into economic appraisal, biodiversity's intrinsic value.

Conservation Ethics

According to Leopold (1949), ethics, biologically understood, constitutes "a limitation on freedom of action." Ethics, in other words, constrains self-serving behavior in deference to some other good (Table 2.2).

Anthropocentrism

In the Western religious and philosophical tradition, only human beings are worthy of ethical consideration. All other things are regarded as mere means to human ends. Indeed, anthropocentrism seems to be set out in no uncertain terms at the beginning of the Bible. Man alone is created in the image of God, is given dominion over the earth and all the other creatures, and, finally, is

Figure 2.3 Burden of proof according to the standard BCA and the SMS approaches.

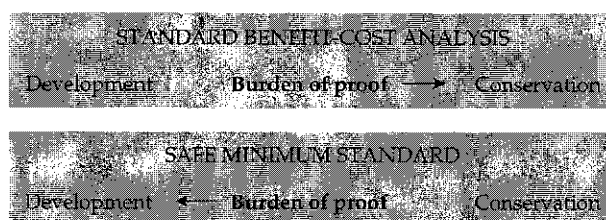


Table 2.2
A Comparison of Western Environmental Ethics

Value	Anthropocentrism	Judeo-Christian Stewardship Ethic	Biocentrism	Ecocentrism
Intrinsic value	Human beings	Species/creation as a whole	Individual organisms	Species, ecosystems, biosphere
The value of nature	Instrumental	Holistic-intrinsic	Individualistic-intrinsic	Holistic-intrinsic
"Man's" place in nature	Lord and master	Caretaker	One among equals	Plain member and citizen

commanded to subdue the whole creation. White (1967) claimed that because Jews and Christians believed, for many centuries, that it was not only their God-given right, but their positive religious duty, to dominate all other forms of life, science and an eventually aggressive, environmentally destructive technology developed uniquely in Western civilization.

As Norton (1991) has shown, an effective conservation ethic can be constructed on the basis of traditional Western anthropocentrism. Ecology has revealed a world that is far more systemically integrated than the biblical authors could have imagined, and subduing nature has untoward ecological consequences. An anthropocentric conservation ethic would require individuals, corporations, and other interest groups to fairly consider how their actions that directly affect the natural environment indirectly affect other human beings. Logging tropical forests, for example, may make fine hardwoods available to wealthy consumers, turn a handsome profit for timber companies, employ workers, and earn foreign exchange for debt-ridden countries. But it may also deprive indigenous peoples of their homes and traditional means of subsistence, and people everywhere of undiscovered resources, valuable ecosystem services, aesthetic experiences, and scientific knowledge. And, unchecked, logging may leave future generations of human beings a depauperate world (intergenerational inequity). Thus, logging and other environmentally destructive types of resource development may be judged unethical without any fundamental change in the framework of traditional Western moral thought.

The Judeo-Christian Stewardship Conservation Ethic

Stung by the allegation that the Judeo-Christian worldview was ultimately responsible for bringing about the contemporary environmental crisis, some environmentally concerned Christians and Jews challenged White's (1967) interpretation of biblical environmental attitudes and values (Barr 1972). After all, God pronounced everything that He created during the five days before He created human beings to be "good." Thus, God appears to have conferred intrinsic value on every kind of creature, not just on humanity. Indeed, the text suggests that God intended His creation to be replete and teeming with life:

And God said, Let the waters bring forth abundantly the moving creature that hath life, and fowl that may fly above the earth in the open firmament of heaven. And God created great whales, and every living creature that moveth, which the waters brought forth abundantly, after their kind, and every winged fowl after his kind: and God saw that it was good. And God blessed them, saying, Be fruitful and multiply, and fill the waters in the seas, and let fowl multiply in the earth. (Genesis 1:20-22)

Further, "dominion" is an ambiguous notion. Just what does it mean for "man" to have dominion over nature? White (1967) argues that, in the past at least, Jews and Christians took it to mean that people should exercise a despotic reign over nature. Later in Genesis, however, God put Adam (who may represent all human beings) in the Garden of Eden (which may represent all of nature) "to dress it and to keep it" (Genesis 2:15). Our "dominion," this suggests, should be that of a responsible caretaker—a *steward*—rather than a tyrant. But what about "man" alone being created in the image of God? That could be taken to confer unique responsibilities, not unique privileges, on human beings. As God cares for humanity, so we who are created in the image of God must care for the earth.

The Judeo-Christian Stewardship Environmental Ethic is elegant and powerful. It also exquisitely matches the ethical requirements of conservation biology (Baker 1996). The Judeo-Christian Stewardship Environmental Ethic confers objective, intrinsic value on nature in the clearest and most unambiguous of ways—by divine decree. But intrinsic value devolves upon species, not individual specimens. For it is clear that during His several acts of creation God is creating species, "kinds," not individual animals and plants—whales, in other words, not specifically the one that swallowed Jonah or the one named Moby Dick. Thus, it is species, not individual specimens, that God pronounces good. Hence, human beings may freely use other living things as long as we do not endanger their species—as long, in other words, as we do not compromise the diversity of the creation. As Ehrenfeld (1988) points out, the Judeo-Christian Stewardship Environmental Ethic makes human beings directly accountable to God for conserving biodiversity: "Diversity is God's property, and we, who bear the relationship to it of strangers and sojourners, have no right to destroy it."

Traditional Non-Western Environmental Ethics

Christianity is a world religion, but so are Islam and Buddhism. Other major religious traditions, such as Hinduism and Confucianism, while more regionally restricted, nevertheless claim millions of devotees. Ordinary people are powerfully motivated to do things that can be justified in terms of their religious beliefs. Therefore, to distill environmental ethics from the world's living religions is extremely important for global conservation. The well-documented effort of Jewish and Christian conservationists to formulate the Judeo-Christian Stewardship Environmental Ethic in biblical terms suggests an important new line of inquiry: How can effective conservation ethics be formulated in terms of other sacred texts? Callicott (1994) offers a comprehensive survey. To provide even a synopsis of that study would be impossible here; however, a few abstracts of traditional non-Western conservation ethics may be suggestive.

Muslims believe that Islam was founded, in the seventh century A.D., by Allah (God) communicating to humanity through the Arabian prophet Mohammed, who regarded himself as part of the same prophetic tradition as Moses and Jesus. Therefore, because the Hebrew Bible and the New Testament are earlier divine revelations underlying distinctly Muslim belief, the basic Islamic worldview has much in common with the basic Judeo-Christian worldview. In particular, Islam teaches that human beings have a privileged place in nature, and, going further in this regard than Judaism and Christianity, that all other natural beings were created to serve humanity. Hence, there has been a strong tendency among Muslims to take a purely instrumental approach to the human-nature relationship. As to the conservation of biodiversity, the Arabian oryx was nearly hunted to extinction by oil-rich sheikhs armed with military

assault rifles in the cradle of Islam. But callous indifference to the rest of creation is no longer sanctioned religiously in the Islamic world.

Islam does not distinguish between religious and secular law. Hence, new conservation regulations in Islamic states must be grounded in the Koran, Mohammed's book of divine revelations. In the early 1980s, a group of Saudi scholars scoured the Koran for environmentally relevant passages and drafted *The Islamic Principles for the Conservation of the Natural Environment*. While reaffirming "a relationship of utilization, development, and subjugation for man's benefit and the fulfillment of his interests," this landmark document also clearly articulates an Islamic version of stewardship: "he [man] is only a manager of the earth and not a proprietor, a beneficiary not a disposer or ordainer" (Kadr et al. 1983). The Saudi scholars also emphasize a just distribution of "natural resources," not only among members of the present generation, but among members of future generations. And, as Norton (1991) has argued, conservation goals are well served when future human beings are accorded a moral status equal to that of those currently living. The Saudi scholars have even found passages in the Koran that are vaguely ecological; for example, God "produced therein all kinds of things in due balance" (Kadr et al. 1983).

Ralph Waldo Emerson and Henry David Thoreau, thinkers at the fountainhead of North American conservation philosophy (discussed in Chapter 1), were influenced by the subtle philosophical doctrines of Hinduism, a major religion in India. Hindu thought also inspired Arne Naess's (1989) contemporary "Deep Ecology" conservation philosophy. Hindus believe that at the core of all phenomena there is one and only one Reality or Being. God, in other words, is not a supreme Being among other lesser and subordinate beings, as in the Judeo-Christian-Islamic tradition. Rather, all beings are a manifestation of the one essential Being—called *Brahman*. And all plurality, all difference, is illusory, or at best only apparent.

Such a view would not seem to be a promising point of departure for the conservation of biological diversity, because the actual existence of diversity, biological or otherwise, seems to be denied. Yet in the Hindu concept of *Brahman*, Naess (1989) finds an analogue to the way ecological relationships unite organisms into a systemic whole. However that may be, Hinduism unambiguously invites human beings to identify with other forms of life, for all life-forms share the same essence. Believing that one's own inner self, *atman*, is identical, as an expression of *Brahman*, with the selves of all other creatures leads to compassion for them. The suffering of one life-form is the suffering of all others; to harm other beings is to harm oneself. As a matter of fact, this way of thinking has inspired and helped to motivate one of the most persistent and successful conservation movements in the world, the Chipko movement, which has managed to rescue many of India's Himalayan forests from commercial exploitation (Guha 1989; Shiva 1989).

Jainism is a religion of relatively few adherents, but a religion of great influence in India. Jains believe that every living thing is inhabited by an immaterial soul, no less pure and immortal than the human soul. Bad deeds in past lives, however, have crusted these souls over with *karma*-matter. *Ahimsa* (non-injury of all living things) and asceticism (eschewing all forms of physical pleasure) are parallel paths that will eventually free the soul from future rebirth in the material realm. Hence, Jains take great care to avoid harming other forms of life and to resist the fleeting pleasure of material consumption. Extreme practitioners refuse to eat any but leftover food prepared for others, and carefully strain their water to avoid ingesting any waterborne organ-