CHAPTER 1

Biophilia and the Conservation Ethic

Edward O. Wilson

BIOPHILIA, IF IT exists, and I believe it exists, is the innately emotional affiliation of human beings to other living organisms. Innate means hereditary and hence part of ultimate human nature. Biophilia, like other patterns of complex behavior, is likely to be mediated by rules of prepared and counterprepared learning—the tendency to learn or to resist learning certain responses as opposed to others. From the scant evidence concerning its nature, biophilia is not a single instinct but a complex of learning rules that can be teased apart and analyzed individually. The feelings molded by the learning rules fall along several emotional spectra: from attraction to aversion, from awe to indifference, from peacefulness to fear-driven anxiety.

The biophilia hypothesis goes on to hold that the multiple strands of emotional response are woven into symbols composing a large part of culture. It suggests that when human beings remove themselves from the natural environment, the biophilic learning rules are not replaced by modern

versions equally well adapted to artifacts. Instead, they persist from generation to generation, atrophied and fitfully manifested in the artificial new environments into which technology has catapulted humanity. For the indefinite future more children and adults will continue, as they do now, to visit zoos than attend all major professional sports combined (at least this is so in the United States and Canada), the wealthy will continue to seek dwellings on prominences above water amidst parkland, and urban dwellers will go on dreaming of snakes for reasons they cannot explain.

Were there no evidence of biophilia at all, the hypothesis of its existence would still be compelled by pure evolutionary logic. The reason is that human history did not begin eight or ten thousand years ago with the invention of agriculture and villages. It began hundreds of thousands or millions of years ago with the origin of the genus *Homo*. For more than 99 percent of human history people have lived in hunter-gatherer bands totally and intimately involved with other organisms. During this period of deep history, and still farther back, into paleohominid times, they depended on an exact learned knowledge of crucial aspects of natural history. That much is true even of chimpanzees today, who use primitive tools and have a practical knowledge of plants and animals. As language and culture expanded, humans also used living organisms of diverse kinds as a principal source of metaphor and myth. In short, the brain evolved in a biocentric world, not a machine-regulated world. It would be therefore quite extraordinary to find that all learning rules related to that world have been erased in a few thousand years, even in the tiny minority of peoples who have existed for more than one or two generations in wholly urban environments.

The significance of biophilia in human biology is potentially profound, even if it exists solely as weak learning rules. It is relevant to our thinking about nature, about the landscape, the arts, and mythopoeia, and it invites us to take a new look at environmental ethics.

How could biophilia have evolved? The likely answer is biocultural evolution, during which culture was elaborated under the influence of hereditary learning propensities while the genes prescribing the propensities were spread by natural selection in a cultural context. The learning rules can be inaugurated and fine-tuned variously by an adjustment of sensory thresholds, by a quickening or blockage of learning, and by modification

of emotional responses. Charles Lumsden and I (1981, 1983, 1985) have envisioned biocultural evolution to be of a particular kind, gene-culture coevolution, which traces a spiral trajectory through time: a certain genotype makes a behavioral response more likely, the response enhances survival and reproductive fitness, the genotype consequently spreads through the population, and the behavioral response grows more frequent. Add to this the strong general tendency of human beings to translate emotional feelings into myriad dreams and narratives, and the necessary conditions are in place to cut the historical channels of art and religious belief.

Gene-culture coevolution is a plausible explanation for the origin of biophilia. The hypothesis can be made explicit by the human relation to snakes. The sequence I envision, drawn principally from elements established by the art historian and biologist Balaji Mundkur, is this:

1. Poisonous snakes cause sickness and death in primates and other mammals throughout the world.
2. Old World monkeys and apes generally combine a strong natural fear of snakes with fascination for these animals and the use of vocal communication, the latter including specialized sounds in a few species, all drawing attention of the group to the presence of snakes in the near vicinity. Thus alerted, the group follows the intruders until they leave.
3. Human beings are genetically averse to snakes. They are quick to develop fear and even full-blown phobias with very little negative reinforcement. (Other phobic elements in the natural environment include dogs, spiders, closed spaces, running water, and heights. Few modern artifacts are as effective—even those most dangerous, such as guns, knives, automobiles, and electric wires.)
4. In a manner true to their status as Old World primates, human beings too are fascinated by snakes. They pay admission to see captive specimens in zoos. They employ snakes profusely as metaphors and weave them into stories, myth, and religious symbolism. The serpent gods of cultures they have conceived all around the world are furthermore typically ambivalent. Often semihuman in form, they are poised to inflict vengeful death but also to bestow knowledge and power.

5. People in diverse cultures dream more about serpents than any other kind of animal, conjuring as they do so a rich medley of dread and magical power. When shamans and religious prophets report such images, they invest them with mystery and symbolic authority. In what seems to be a logical consequence, serpents are also prominent agents in mythology and religion in a majority of cultures.

Here then is the ophidian version of the biophilia hypothesis expressed in briefest form: constant exposure through evolutionary time to the malign influence of snakes, the repeated experience encoded by natural selection as a hereditary aversion and fascination, which in turn is manifested in the dreams and stories of evolving cultures. I would expect that other biophilic responses have originated more or less independently by the same means but under different selection pressures and with the involvement of different gene ensembles and brain circuitry.

This formulation is fair enough as a working hypothesis, of course, but we must also ask how such elements can be distinguished and how the general biophilia hypothesis might be tested. One mode of analysis, reported by Jared Diamond in this volume, is the correlative analysis of knowledge and attitude of peoples in diverse cultures, a research strategy designed to search for common denominators in the total human pattern of response. Another, advanced by Roger Ulrich and other psychologists, is also reported here: the precisely replicated measurement of human subjects to both attractive and aversive natural phenomena. This direct psychological approach can be made increasingly persuasive, whether for or against a biological bias, when two elements are added. The first is the measurement of heritability in the intensity of the responses to the psychological tests used. The second element is the tracing of cognitive development in children to identify key stimuli that evoke the responses, along with the ages of maximum sensitivity and learning propensity. The slithering motion of an elongate form appears to be the key stimulus producing snake aversion, for example, and preadolescence may be the most sensitive period for acquiring the aversion.

Given that humanity's relation to the natural environment is as much a part of deep history as social behavior itself, cognitive psychologists have

been strangely slow to address its mental consequences. Our ignorance could be regarded as just one more blank space on the map of academic science, awaiting genius and initiative, except for one important circumstance: the natural environment is disappearing. Psychologists and other scholars are obligated to consider biophilia in more urgent terms. What, they should ask, will happen to the human psyche when such a defining part of the human evolutionary experience is diminished or erased?

There is no question in my mind that the most harmful part of ongoing environmental despoliation is the loss of biodiversity. The reason is that the variety of organisms, from alleles (differing gene forms) to species, once lost, cannot be regained. If diversity is sustained in wild ecosystems, the biosphere can be recovered and used by future generations to any degree desired and with benefits literally beyond measure. To the extent it is diminished, humanity will be poorer for all generations to come. How much poorer? The following estimates give a rough idea:

- Consider first the question of the *amount* of biodiversity. The number of species of organisms on earth is unknown to the nearest order of magnitude. About 1.4 million species have been given names to date, but the actual number is likely to lie somewhere between 10 and 100 million. Among the least-known groups are the fungi, with 69,000 known species but 1.6 million thought to exist. Also poorly explored are at least 8 million and possibly tens of millions of species of arthropods in the tropical rain forests, as well as millions of invertebrate species on the vast floor of the deep sea. The true black hole of systematics, however, may be bacteria. Although roughly 4,000 species have been formally recognized, recent studies in Norway indicate the presence of 4,000 to 5,000 species among the 10 billion individual organisms found on average in each gram of forest soil, almost all new to science, and another 4,000 to 5,000 species, different from the first set and also mostly new, in an average gram of nearby marine sediments.
- Fossil records of marine invertebrates, African ungulates, and flowering plants indicate that on average each clade—a species and its descendants—lasts half a million to 10 million years under natural conditions. The longevity is measured from the time the ancestral form

splits off from its sister species to the time of the extinction of the last descendant. It varies according to the group of organisms. Mammals, for example, are shorter-lived than invertebrates.

- Bacteria contain on the order of a million nucleotide pairs in their genetic code, and more complex (eukaryotic) organisms from algae to flowering plants and mammals contain 1 to 10 billion nucleotide pairs. None has yet been completely decoded.
- Because of their great age and genetic complexity, species are exquisitely adapted to the ecosystems in which they live.
- The number of species on earth is being reduced by a rate 1,000 to 10,000 times higher than existed in prehuman times. The current removal rate of tropical rain forest, about 1.8 percent of cover each year, translates to approximately 0.5 percent of the species extirpated immediately or at least doomed to much earlier extinction than would otherwise have been the case. Most systematists with global experience believe that more than half the species of organisms on earth live in the tropical rain forests. If there are 10 million species in these habitats, a conservative estimate, the rate of loss may exceed 50,000 a year, 137 a day, 6 an hour. This rate, while horrendous, is actually the minimal estimate, based on the species / area relation alone. It does not take into account extinction due to pollution, disturbance short of clear-cutting, and the introduction of exotic species.

Other species-rich habitats, including coral reefs, river systems, lakes, and Mediterranean-type heathland, are under similar assault. When the final remnants of such habitats are destroyed in a region—the last of the ridges on a mountainside cleared, for example, or the last riffles flooded by a downstream dam—species are wiped out en masse. The first 90 percent reduction in area of a habitat lowers the species number by one-half. The final 10 percent eliminates the second half.

It is a guess, subjective but very defensible, that if the current rate of habitat alteration continues unchecked, 20 percent or more of the earth's species will disappear or be consigned to early extinction during the next thirty years. From prehistory to the present time humanity has probably already eliminated 10 or even 20 percent of the species. The number of bird species, for example, is down by an estimated 25 percent, from 12,000 to 9,000, with

a disproportionate share of the losses occurring on islands. Most of the megafaunas—the largest mammals and birds—appear to have been destroyed in more remote parts of the world by the first wave of hunter-gatherers and agriculturists centuries ago. The diminution of plants and invertebrates is likely to have been much less, but studies of archaeological and other subfossil deposits are too few to make even a crude estimate. The human impact, from prehistory to the present time and projected into the next several decades, threatens to be the greatest extinction spasm since the end of the Mesozoic era 65 million years ago.

Assume, for the sake of argument, that 10 percent of the world's species that existed just before the advent of humanity are already gone and that another 20 percent are destined to vanish quickly unless drastic action is taken. The fraction lost—and it will be a great deal no matter what action is taken—cannot be replaced by evolution in any period that has meaning for the human mind. The five previous major spasms of the past 550 million years, including the end-Mesozoic, each required about 10 million years of natural evolution to restore. What humanity is doing now in a single lifetime will impoverish our descendants for all time to come. Yet critics often respond, "So what? If only half the species survive, that is still a lot of biodiversity—is it not?"

The answer most frequently urged right now by conservationists, I among them, is that the vast material wealth offered by biodiversity is at risk. Wild species are an untapped source of new pharmaceuticals, crops, fibers, pulp, petroleum substitutes, and agents for the restoration of soil and water. This argument is demonstrably true—and it certainly tends to stop anticonservation libertarians in their tracks—but it contains a dangerous practical flaw when relied upon exclusively. If species are to be judged by their potential material value, they can be priced, traded off against other sources of wealth, and—when the price is right—discarded. Yet who can judge the *ultimate* value of any particular species to humanity? Whether the species offers immediate advantage or not, no means exist to measure what benefits it will offer during future centuries of study, what scientific knowledge, or what service to the human spirit.

At last I have come to the word so hard to express: spirit. With reference to the spirit we arrive at the connection between biophilia and the environ-

mental ethic. The great philosophical divide in moral reasoning about the remainder of life is whether or not other species have an innate right to exist. That decision rests in turn on the most fundamental question of all: whether moral values exist apart from humanity, in the same manner as mathematical laws, or whether they are idiosyncratic constructs that evolved in the human mind through natural selection. Had a species other than humans attained high intelligence and culture, it would likely have fashioned different moral values. Civilized termites, for example, would support cannibalism of the sick and injured, eschew personal reproduction, and make a sacrament of the exchange and consumption of feces. The termite spirit, in short, would have been immensely different from the human spirit—horrifying to us in fact. The constructs of moral reasoning, in this evolutionary view, are the learning rules, the propensities to acquire or to resist certain emotions and kinds of knowledge. They have evolved genetically because they confer survival and reproduction on human beings.

The first of the two alternative propositions—that species have universal and independent rights regardless of how else human beings feel about the matter—may be true. To the extent the proposition is accepted, it will certainly steel the determination of environmentalists to preserve the remainder of life. But the species-right argument alone, like the materialistic argument alone, is a dangerous play of the cards on which to risk biodiversity. The independent-rights argument, for all its directness and power, remains intuitive, aprioristic, and lacking in objective evidence. Who but humanity, it can be immediately asked, gives such rights? Where is the enabling canon written? And such rights, even if granted, are always subject to rank-ordering and relaxation. A simplistic adjuration for the right of a species to live can be answered by a simplistic call for the right of people to live. If a last section of forest needs to be cut to continue the survival of a local economy, the rights of the myriad species in the forest may be cheerfully recognized but given a lower and fatal priority.

Without attempting to resolve the issue of the innate rights of species, I will argue the necessity of a robust and richly textured anthropocentric ethic apart from the issue of rights—one based on the hereditary needs of our own species. In addition to the well-documented utilitarian potential of wild species, the diversity of life has immense aesthetic and spiritual

value. The terms now to be listed will be familiar, yet the evolutionary logic is still relatively new and poorly explored. And therein lies the challenge to scientists and other scholars.

Biodiversity is the Creation. Ten million or more species are still alive, defined totally by some 10^{17} nucleotide pairs and an even more astronomical number of possible genetic recombinants, which creates the field on which evolution continues to play. Despite the fact that living organisms compose a mere ten-billionth part of the mass of earth, biodiversity is the most information-rich part of the known universe. More organization and complexity exist in a handful of soil than on the surfaces of all the other planets combined. If humanity is to have a satisfying creation myth consistent with scientific knowledge—a myth that itself seems to be an essential part of the human spirit—the narrative will draw to its conclusion in the origin of the diversity of life.

Other species are our kin. This perception is literally true in evolutionary time. All higher eukaryotic organisms, from flowering plants to insects and humanity itself, are thought to have descended from a single ancestral population that lived about 1.8 billion years ago. Single-celled eukaryotes and bacteria are linked by still more remote ancestors. All this distant kinship is stamped by a common genetic code and elementary features of cell structure. Humanity did not soft-land into the teeming biosphere like an alien from another planet. We arose from other organisms already here, whose great diversity, conducting experiment upon experiment in the production of new life-forms, eventually hit upon the human species.

The biodiversity of a country is part of its national heritage. Each country in turn possesses its own unique assemblages of plants and animals including, in almost all cases, species and races found nowhere else. These assemblages are the product of the deep history of the national territory, extending back long before the coming of man.

Biodiversity is the frontier of the future. Humanity needs a vision of an expanding and unending future. This spiritual craving cannot be satisfied by the colonization of space. The other planets are inhospitable and immensely expensive to reach. The nearest stars are so far away that voyagers would need thousands of years just to report back. The true frontier for humanity is life on earth—its exploration and the transport of knowledge

about it into science, art, and practical affairs. Again, the qualities of life that validate the proposition are: 90 percent or more of the species of plants, animals, and microorganisms lack even so much as a scientific name; each of the species is immensely old by human standards and has been wonderfully molded to its environment; life around us exceeds in complexity and beauty anything else humanity is ever likely to encounter.

The manifold ways by which human beings are tied to the remainder of life are very poorly understood, crying for new scientific inquiry and a boldness of aesthetic interpretation. The portmanteau expressions "biophilia" and "biophilia hypothesis" will serve well if they do no more than call attention to psychological phenomena that rose from deep human history, that stemmed from interaction with the natural environment, and that are now quite likely resident in the genes themselves. The search is rendered more urgent by the rapid disappearance of the living part of that environment, creating a need not only for a better understanding of human nature but for a more powerful and intellectually convincing environmental ethic based upon it.

REFERENCES

I first used the expression "biophilia" in 1984 in a book entitled by the name (*Biophilia*, Harvard University Press). In that extended essay I attempted to apply ideas of sociobiology to the environmental ethic.

The mechanism of gene-culture coevolution was proposed by Charles J. Lumsden and myself in *Genes, Mind, and Culture* (Harvard University Press, 1981), *Promethean Fire* (Harvard University Press, 1983), and "The Relation Between Biological and Cultural Evolution," *Journal of Social and Biological Structure* 8(4) (October 1985):343–359. It represents an extension of theoretical population genetics in an effort to include the principles of cognition and social psychology.

Balaji Mundkur traced the role of snakes and mythic serpents in *The Cult of the Serpent: An Interdisciplinary Survey of Its Manifestations and Origins* (State University of New York Press, 1983).

Jared Diamond's study of Melanesian attitudes toward other forms of life and Roger S. Ulrich's review of psychological research on biophilia are presented elsewhere in this volume.

I have reviewed the measures of global biodiversity and extinction rates in greater detail in *The Diversity of Life* (Harvard University Press, 1992).

In evaluating the environmental ethic I have been aided greatly by the writings of several philosophers, including most notably Bryan Norton (*Why Preserve Natural Diversity?*, Princeton University Press, 1987), Max Oelschlaeger (*The Idea of Wilderness: From Prehistory to the Age of Ecology*, Yale University Press, 1991), Holmes Rolston III (*Environmental Ethics: Duties to and Values in the Natural World*, Temple University Press, 1988), and Peter Singer (*The Expanding Circle: Ethics and Sociobiology*, Farrar, Straus & Giroux, 1981).

CHAPTER 2

The Biological Basis for Human Values of Nature

Stephen R. Kellert

THE BIOPHILIA HYPOTHESIS boldly asserts the existence of a biologically based, inherent human need to affiliate with life and lifelike processes (Wilson 1984). This proposition suggests that human identity and personal fulfillment somehow depend on our relationship to nature. The human need for nature is linked not just to the material exploitation of the environment but also to the influence of the natural world on our emotional, cognitive, aesthetic, and even spiritual development. Even the tendency to avoid, reject, and, at times, destroy elements of the natural world can be viewed as an extension of an innate need to relate deeply and intimately with the vast spectrum of life about us.

The hypothesis suggests that the widest valuational affiliation with life and lifelike processes (ecological functions and structures, for example) has conferred distinctive advantages in the human evolutionary struggle to adapt, persist, and thrive as individuals and as a species. Conversely, this notion intimates that the degradation of this human dependence on nature

brings the increased likelihood of a deprived and diminished existence—again, not just materially, but also in a wide variety of affective, cognitive, and evaluative respects. The biophilia notion, therefore, powerfully asserts that much of the human search for a coherent and fulfilling existence is intimately dependent upon our relationship to nature. This hypothesized link between personal identity and nature is reminiscent of Aldo Leopold's alteration (1966:240) of Descartes's dictum of selfhood from "I think, therefore I am" (an anthropocentric conception of human identity) to "as a land-user thinketh, so is he" (a biocentric view of selfhood, recognizing Leopold's concept of land as a metaphor for ecological process).

This chapter explores the biophilia notion by examining nine fundamental aspects of our species' presumably biological basis for valuing and affiliating with the natural world. These hypothesized expressions of the biophilia tendency (regarded not as an instinct but as a cluster of learning rules) are referred to as the utilitarian, naturalistic, ecologistic-scientific, aesthetic, symbolic, humanistic, moralistic, dominionistic, and negativistic valuations of nature.

Before commencing the description of these basic values, it might be worth explaining briefly how these hypothesized categories of the basic human relationship to nature evolved in my work. This digression proceeds less from any personal indulgence than from a desire to indicate how the dimensions of the biophilia tendency became apparent as possibly universal expressions of the human dependence on nature.

A limited version of the typology of nine perspectives of nature was developed in the late 1970s as a way of describing basic perceptions of animals (Kellert 1976). This typology was employed in a study of nearly 4,000 randomly distributed Americans residing in the forty-eight contiguous states and Alaska (Kellert 1979, 1980, 1981). Expanded versions of the typology were subsequently used in researching human perceptions of varying taxa including wolves (Kellert 1986d, 1991a), marine mammals (Kellert 1986b, 1991b), diverse endangered species (Kellert 1986c), invertebrates (Kellert 1986a, 1992), and bears (Kellert 1993a); in analyzing the nature-related perspectives of diverse human groups such as hunters (Kellert 1978), birders (Kellert 1985b), farmers (Kellert 1984a) and the general public distinguished by age (Kellert 1985a), gender (Kellert 1987), socioeconomic status (Kellert 1983), and place of residence (Kellert 1981, 1984b); in exploring

cross-cultural perspectives of nature and animals in Japan (Kellert 1991c), Germany (Schulz 1986; Kellert 1993b), and Botswana (Mordi 1991); and in examining historical shifts in perceptions of animals in Western society (Kellert 1985c).

The point of this digression is to note that in each study the value dimensions were revealed although they might vary, often greatly, in content and intensity. What began as merely the objective of describing variations in people's perceptions of animals gradually emerged as the possibility of universal expressions of basic human affinities for the natural world. The typology may be simply a convenient shorthand for describing varying perspectives of nature. Its occurrence, however, in a wide variety of taxonomic, behavioral, demographic, historic, and cultural contexts suggests the distinct possibility that these categories might very well be reflections of universal and functional expressions of our species' dependence on the natural world.

Classification of Values

The task of this chapter is to describe each of these categories as indicative of the human evolutionary dependence on nature as a basis for survival and personal fulfillment. As suggested, nine hypothesized dimensions of the biophilia tendency—the utilitarian, naturalistic, ecologistic-scientific, aesthetic, symbolic, humanistic, moralistic, dominionistic, and negativistic—are described here. This description is followed by a discussion of how this deep dependence on nature may constitute the basis for a meaningful and fulfilling human existence—that is, how the pursuit of self-interest may constitute the most compelling argument for a powerful conservation ethic.

Utilitarian

The utilitarian dependence on nature is both something of a misnomer and at the same time manifest. The possible inappropriateness of the term stems from the presumption that *all* the biophilia tendencies possess utilitarian value in the sense of conferring a measure of evolutionary advantage. The use of the utilitarian term here is restricted to the conventional

notion of material value: the physical benefits derived from nature as a fundamental basis for human sustenance, protection, and security.

It has long been apparent that a biological advantage exists for humans in exploiting nature's vast cornucopia of food, medicines, clothing, tools, and other material benefits. What may constitute a major conservation development in recent years is the increasing recognition and detailed delineation of the potential and often unrealized material value of various genetic, biochemical, and physical properties of diverse plant and animal species (Myers 1978; Prescott-Allen 1986). Of particular significance has been the expanding realization of the "hidden" material value in nature represented by obscure species and unimpaired ecosystems, such as undiscovered organisms of the tropical rain forests, as potential repositories of material benefit as human knowledge expands to exploit the earth's vast genetic resource base (Eisner 1991).

Naturalistic

The naturalistic tendency may simplistically be regarded as the satisfaction derived from direct contact with nature. At a more complex and profound level, the naturalistic value encompasses a sense of fascination, wonder, and awe derived from an intimate experience of nature's diversity and complexity. The mental and physical appreciation associated with this heightened awareness and contact with nature may be among the most ancient motive forces in the human relationship to the natural world, although its recreational importance appears to have increased significantly in modern industrial society.

The naturalistic tendency involves an intense curiosity and urge for exploration of the natural world. This interest in direct experience of living diversity, and its possible evolutionary roots, is suggested by Wilson (1984:10, 76):

> Because species diversity was created prior to humanity, and because we evolved within it, we have never fathomed its limits. . . . The living world is the natural domain of the more restless and paradoxical part of the human spirit. Our sense of wonder grows exponentially; the greater the knowledge, the deeper the mystery and the more we seek knowledge

to create new mystery. . . . Our intrinsic emotions drive us to search for new habitats, to cross unexplored terrain, but we still crave this sense of a mysterious world stretching infinitely beyond.

Discovery and exploration of living diversity undoubtedly facilitated the acquisition of increased knowledge and understanding of the natural world, and such information almost certainly conferred distinctive advantages in the course of human evolution. As Seielstad has remarked (1989:285): "The surest way to enrich the knowledge pool that will keep the flywheel of cultural evolution turning is to nourish the human spirit of curiosity." A genetic basis for this naturalistic tendency is suggested by Iltis (1980:3): "Involvement with nature . . . may be in part genetically determined; human needs for natural diversity . . . must be inherent. Man's love for natural colors, patterns and harmonies . . . must be the result . . . of . . . natural selection through eons of mammalian and anthropoid evolution."

The naturalistic tendency has been cited as providing an important basis for physical fitness and the acquisition of various "outdoor skills" such as climbing, hiking, tracking, and orienteering. The possession of these skills and associated states of mental and physical well-being have been empirically described for a variety of contemporary outdoor activities with a strong emphasis on the naturalistic experience (Driver and Brown 1983; Kaplan 1992). The mental benefits of these activities have been related to tension release, relaxation, peace of mind, and enhanced creativity derived from the observation of diversity in nature. The psychological value of the outdoor recreational experience is noted by Ulrich et al. (1991:203) in a review of the scientific literature: "A consistent finding in well over 100 studies of recreation experiences in wilderness and urban nature areas has been that stress mitigation is one of the most important verbally expressed perceived benefits." Kaplan (1983:155), drawing on extensive research of the naturalistic experience, concluded in a rather more subjective vein: "Nature matters to people. Big trees and small trees, glistening water, chirping birds, budding bushes, colorful flowers—these are important ingredients in a good life."

Ecologistic-Scientific

While important differences distinguish the scientific from the ecologistic relationship to nature, both perspectives similarly reflect the motivational

urge for precise study and systematic inquiry of the natural world and the related belief that nature can be understood through empirical study. The ecologistic experience may be regarded as more integrative and less reductionist than the scientific, involving an emphasis on interconnection and interdependence in nature as well as a related stress on integral connections between biotic and abiotic elements manifest in the flow of energy and materials within a system.

The concept of ecology is, of course, a modern scientific formulation: Leopold (1966:176) proclaimed it "the outstanding scientific discovery of the twentieth century." Still, the notion of ecology encompasses far more than the conventional and narrow expression of scientific inquiry. Leopold, despite the previous assertion, recognized this possibility and remarked (1966:266): "Let no man jump to the conclusion that Babbitt must take his Ph.D. in ecology before he can 'see' his country. On the contrary, the Ph.D. may become as callous as an undertaker to the mysteries at which he officiates."

Still, the ecologistic experience of nature often involves a recognition of organizational structure and complexity barely discernible to the average person. This difficulty of perspective reflects the fact that most important ecological processes are prominently manifest at the bottom of biological food chains and energy pyramids often associated with the activities of invertebrate and microbial organisms. As invertebrates represent more than 90 percent of the planet's biological diversity, they perform most of the critical ecological functions of pollination, seed dispersal, parasitism, predation, decomposition, energy and nutrient transfer, the provision of edible materials for adjacent trophic levels, and the maintenance of biotic communities through mutualism, host-restricted food webs, and a variety of other functions and processes. Most people hardly recognize these ecological tendencies, let alone the species integral to their performance, preferring to direct their emotional and conscious awareness of nature to larger vertebrates and prominent natural features.

The human understanding of ecological function is thus at its initial stages of articulation and recognition through systematic inquiry and careful investigation. Nonetheless, the broad realization of ecological process has probably always been intuitively and empirically apparent to the astute human observer. An understanding of organismic and habitat inter-

dependence has likely been the mark of certain figures throughout human history. Moreover, this ecological insight has probably conferred distinctive advantages in the meeting and mastering of life's physical and mental requirements—including increased knowledge, the honing of observational and recording skills, and the recognition of potential material uses of nature through direct exploitation and mimicry. The sense of nature's functional and structural interconnectedness may have further instilled in the prudent observer a cautious respect for nature likely to temper tendencies toward overexploitation and abuse of natural processes and species.

The scientific experience of nature, in contrast to the ecologistic, involves a greater emphasis on the physical and mechanical functioning of biophysical entities as well as a related stress on issues of morphology, taxonomy, and physiological process. The scientific perspective, as previously suggested, tends to be reductionistic: it focuses on constituent elements of nature often independent of the understanding of entire organisms or their relations to other species and natural habitats. Despite this restricted emphasis, often divorced from direct experiential contact with nature, the scientific outlook shares with the ecologistic an intense curiosity and fascination with the systematic study of life and lifelike processes. The depth and intensity of this pursuit of knowledge can often lead to a profound appreciation of nature's wonder and complexity. A sense of this wonder can be discerned in Scott McVay's description of such scientists as Wilson, Vishniac, and von Frisch (1987:5–6):

> I start with wonder, awe and amazement of the profusion of life. . . . E. O. Wilson . . . wrote that a genetic description of a mouse would fill every page of the Encyclopedia Britannica in every edition starting with the first printing in the 1750s to the present day. . . . Roman Vishniac [found] more wonder in a drop of pond water than in traveling to the most remote places on the planet. . . . Karl von Frisch . . . said that there was miracle enough in a single species to provide a life's work.

Such reflections suggest a derivative satisfaction from experiencing the complexity of natural process quite apart from its apparent utility or evolutionary advantage. Yet the actual and potential benefits of such awareness are also quite evident. One can imagine the value of vastly enhanced knowledge and understanding of nature conferred upon those who developed the capacities for precise observation, analysis, and detailed study of even a fraction of life's extraordinary diversity.

Aesthetic

The physical beauty of nature is certainly among its most powerful appeals to the human animal. The complexity of the aesthetic response is suggested by its wide-ranging expression from the contours of a mountain landscape to the ambient colors of a setting sun to the fleeting vitality of a breaching whale. Each exerts a powerful aesthetic impact on most people, often accompanied by feelings of awe at the extraordinary physical appeal and beauty of the natural world.

The human need for an aesthetic experience of nature has been suggested by the apparent inadequacy of artificial or human-made substitutes when people are exposed to them. This preference for natural design and pattern has been revealed in a variety of studies as Ulrich has noted (1983:109): "One of the most clear-cut findings in the . . . literature . . . is the consistent tendency to prefer natural scenes over built views, especially when the latter lack vegetation or water features. Several studies have [shown] that even unspectacular or subpar natural views elicit higher aesthetic preference . . . than do all but a very small percentage of urban views." Additional research suggests that this aesthetic preference for nature may be universally expressed across human cultures (Ulrich 1983:110): "Although far from conclusive, these findings . . . cast some doubt on the position that [aesthetic] preferences vary fundamentally as a function of culture."

Living organisms often function as the centrally valued element in people's aesthetic experience of nature. Unlike the previously described ecologistic-scientific emphasis on relatively obscure organisms, the aesthetic response is typically directed at larger, charismatic megavertebrate species. The basis for this aesthetic focus on relatively large animals is elusive yet, in all likelihood, critical to the understanding of the human attraction to and dependence on nature. Leopold (1966:137, 129–130) powerfully describes this aesthetic significance in alluding to the presence and absence of wildlife in the natural landscape:

> The physics of beauty is one department of natural science still in the Dark Ages. . . . Everybody knows, for example, that the autumn landscape in the north woods is the land, plus a red maple, plus a ruffed grouse. In terms of conventional physics, the grouse represents only a millionth of either the mass or energy of an acre. Yet subtract the grouse and the whole thing is dead. An enormous amount of some kind of motive power has been lost. . . . My own conviction on this score dates from the day I saw a wolf die. . . . We reached the old wolf in time to watch a fierce green fire dying in her eyes. I realized then, and have known ever since, that there was something new to me in those eyes—something known only to her and to the mountain.

Leopold referred to this central aesthetic of animals in the landscape as its "numenon," its focus of meaning, in contrast to merely the "phenomenon" of a static and lifeless environment. This essential aesthetic is perhaps what George Schaller (1982) recognized in his reference to the Himalayas as "stones of silence" upon discovering the near extirpation of its endemic caprid fauna—in contrast to Leopold's revelation of the wolf's role in the landscape as requiring one to "think like a mountain." The animal in its contextual environment appears to confer upon its habitat vitality and animation, what Rolston (1986a) has called the essential wildlife aesthetic of "spontaneity in motion."

The biological advantage of the aesthetic experience of nature is difficult to discern, yet, as Wilson suggests (1984:104), "with aesthetics we return to the central issue of biophilia." The aesthetic response could reflect a human intuitive recognition or reaching for the ideal in nature: its harmony, symmetry, and order as a model of human experience and behavior. The adaptational value of the aesthetic experience of nature could further be associated with derivative feelings of tranquillity, peace of mind, and a related sense of psychological well-being and self-confidence. The aesthetic response to varying landscapes and species may also reflect an intuitive recognition of the greater likelihood of food, safety, and security associated with human evolutionary experience. Kaplan and Kaplan suggest, for example (1989:10): "Aesthetic reactions [to nature] . . . reflect neither a casual nor a trivial aspect of the human makeup. Rather, they appear to constitute a guide to human behavior that is both ancient and far-

reaching. Underlying such reactions is an assessment of the environment in terms of its compatibility with human needs and purposes." Iltis has further argued for a genetic component in the human aesthetic response to nature (1973:5): "Human genetic needs for natural pattern, for natural beauty, for natural harmony, [are] all the results of natural selection over the illimitable vistas of evolutionary time." A more empirical delineation of this aesthetic preference for certain landscapes and species as a possible function of human evolutionary experience, associated with the likelihood of encountering food, safety, and security, is offered by Heerwagen and Orians. (See Chapter 4 in this volume and Orians 1980.)

Symbolic

The symbolic experience of nature reflects the human use of nature as a means of facilitating communication and thought (Lévi-Strauss 1970; Shepard 1978). The use of nature as symbol is perhaps most critically reflected in the development of human language and the complexity and communication of ideas fostered by this symbolic methodology. The acquisition of language appears to be enhanced by the engendering of refined distinctions and categorizations. Nature, as a rich taxonomy of species and forms, provides a vast metaphorical tapestry for the creation of diverse and complex differentiations. As Lawrence suggests (see Chapter 10) with reference to animals, though the notion can be more broadly extended to other categories of nature, "it is remarkable to contemplate the paucity of other categories for conceptual frames of reference, so preeminent, widespread, and enduring is the habit of symbolizing in terms of animals." Shepard further emphasizes the importance of animate nature as a facilitator of human language and thought (1978:249, 2):

> Human intelligence is bound to the presence of animals. They are the means by which cognition takes its first shape and they are the instruments for imagining abstract ideas and qualities. . . . They are the code images by which language retrieves ideas . . . and traits. . . . Animals are used in the growth and development of the human person, in those most priceless qualities we lump together as "mind." . . . Animals . . . are basic to the development of speech and thought.

A limited indication of the symbolic function is reflected in the finding (Kellert 1983) that animals constitute more than 90 percent of the characters employed in language acquisition and counting in children's preschool books. Studies by Shepard (1978), Bettelheim (1977), Campbell (1973), Jung (1959), and others indicate the significance of natural symbols in myth, fairy tale, story, and legend as an important means for confronting the developmental problems of selfhood, identity, expressive thought, and abstraction.

An enduring question of modern life is the degree to which the human capacity for technological fabrication has provided an effective substitute for traditional natural symbols as the primary means of communication and thought. The unlikelihood of this possibility is suggested by the evolutionarily very short time period of modern industrial life relative to the long course of human evolution during which nature constituted the sole environment for our species' language development (Shepard 1978). More important, the dependence of the human psyche on highly varied and refined distinctions seems to be matched only by the extraordinary diversity, complexity, and vividness of the natural world as an extremely rich and textured system. Plastic trees, stuffed animals, and their fabricated kin seem but a meager substitute more likely to result in a stunted capacity for symbolic expression, metaphor, and communication.

Humanistic

The humanistic experience of nature reflects feelings of deep emotional attachment to individual elements of the natural environment. This focus, like the aesthetic, is usually directed at sentient matter, typically the larger vertebrates, although humanistic feelings can be extended to natural objects lacking the capacity for reciprocity such as trees and certain landscapes or geological forms.

The humanistic experience of strong affection for individual elements of nature can even be expressed as a feeling of "love" for nature, although this sentiment is usually directed at domesticated animals. Companion animals are especially given to the process of "humanization" of nature in the sense of achieving a relational status not unlike other humans might assume, even family members. The therapeutic mental and physical benefits

of the companion animal have been documented in various studies, at times even resulting in significant healing benefits (Katcher and Beck 1983; Rowan 1989; Anderson et al. 1984; Chapters 3 and 5 in this volume).

The humanistic experience of nature can result in strong tendencies toward care and nurturance for individual elements of nature. From an adaptational viewpoint, the human animal as a social species, dependent on extensive cooperative and affiliational ties, may especially benefit from the interactive opportunities fostered by a humanistic experience of nature. An enhanced capacity for bonding, altruism, and sharing may be important character traits enhanced by this tendency. The use of companion animals for a variety of functional tasks, such as hunting and protection, may also contribute to evolutionary fitness through the acquisition of diverse skills and understandings of nature. This knowledge born of intimate human interaction with a nonhuman species is conveyed in Barry Lopez's description of semidomesticated wolves (1978:282):

> The wolves moved deftly and silently in the woods and in trying to imitate them I came to walk more quietly and to freeze at the sign of slight movement. At first this imitation gave me no advantage, but after several weeks I realized I was becoming far more attuned to the environment we moved through. I heard more . . . and my senses now constantly alert, I occasionally saw a deer mouse or a grouse before they did. . . . I took from them the confidence to believe I could attune myself better to the woods by behaving as they did—minutely inspecting things, seeking vantage points, always sniffing at the air. I did, and felt vigorous, charged with alertness.

Moralistic

The moralistic experience of nature encompasses strong feelings of affinity, ethical responsibility, and even reverence for the natural world. This perspective often reflects the conviction of a fundamental spiritual meaning, order, and harmony in nature. Such sentiments of ethical and spiritual connectedness have traditionally been articulated in poetry, religion, and philosophy, but today they can even be discerned in the modern discourse of scientific language, as suggested by Leopold's remarks (1966:222, 231):

> Land is not merely soil; it is a fountain of energy flowing through a circuit of soils, plants, and animals. . . . A thing is right when it tends to preserve the integrity, stability, and beauty of the biotic community. It is wrong when it tends otherwise.

The moralistic perspective has often been associated with the views of indigenous peoples (see Chapter 6 in this volume). Booth and Jacobs (1990) describe important elements in the moralistic experience of nature among indigenous North Americans prior to European acculturation. They emphasize a fundamental belief in the natural world as a living and vital being, a conviction of the continuous reciprocity between humans and nature, and the certainty of an inextricable link between human identity and the natural landscape. This outlook is powerfully reflected in the words of Luther Standing Bear (1933:45):

> We are of the soil and the soil is of us. We love the birds and beasts that grew with us on this soil. They drank the same water as we did and breathed the same air. We are all one in nature. Believing so, there was in our hearts a great peace and a willing kindness for all living, growing things.

A more Western articulation of this moralistic identification with nature, somewhat rationalized by the language of modern science, is offered by Loren Eiseley (1946:209–210):

> It is said by men . . . that the smallest living cell probably contains over a quarter of a million protein molecules engaged in the multitudinous coordinated activities which make up the phenomenon of life. At the instant of death, whether of man or microbe, that ordered, incredible spinning passes away in an almost furious haste. . . . I do not think, if someone finally twists the key successfully in the tiniest and most humble house of life, that many of these questions will be answered, or that the dark forces which create lights in the deep sea and living batteries in the waters of tropical swamps, or the dread cycles of parasites, or the most noble workings of the human brain, will be much if at all revealed. Rather, I would say that if "dead" matter has reared up this curious landscape of fiddling crickets, song sparrows, and wondering men, it must be plain even to the most devoted materialist that the matter of which he

> speaks contains amazing, if not dreadful powers, and may not impossibly be, as Hardy has suggested, "but one mask of many worn by the Great Face behind."

From the perspective of this inquiry, the vexing question is the possible biological significance of a moralistic experience of nature. It might be supposed that a moralistic outlook articulated in a group context fostered feelings of kinship, affiliation, and loyalty leading to cooperative, altruistic, and helping behavior. Strong moralistic affinities for nature may also produce the desire to protect and conserve nature imbued with spiritual significance, as Gadgil (1990) has described for the nearly 6 percent of historic India regarded as sacred groves. It may be sufficient to suggest that a biological advantage is conferred on those who experience a profound sense of psychological well-being, identity, and self-confidence produced by the conviction of an ultimate order and meaning in life. The expression of this insight and its possibly pervasive significance is eloquently expressed by John Steinbeck (1941:93):

> It seems apparent that species are only commas in a sentence, that each species is at once the point and the base of a pyramid, that all life is related. . . . And then not only the meaning but the feeling about species grows misty. One merges into another, groups melt into ecological groups until the time when what we know as life meets and enters what we think of as non-life: barnacle and rock, rock and earth, earth and tree, tree and rain and air. And the units nestle into the whole and are inseparable from it. . . . And it is a strange thing that most of the feeling we call religious, most of the mystical outcrying which is one of the most prized and used and desired reactions of our species, is really the understanding and the attempt to say that man is related to the whole thing, related inextricably to all reality, known and unknowable. This is a simple thing to say, but a profound feeling of it made a Jesus, a St. Augustine, a Roger Bacon, a Charles Darwin, an Einstein. Each of them in his own tempo and with his own voice discovered and reaffirmed with astonishment the knowledge that all things are one thing and that one thing is all things—a plankton, a shimmering phosphorescence on the sea and the spinning planets and an expanding universe, all bound together by the elastic string of time.

Dominionistic

The dominionistic experience of nature reflects the desire to master the natural world. This perspective may have been more frequently manifest during earlier periods of human evolution; its occurrence today is often associated with destructive tendencies, profligate waste, and despoliation of the natural world. Yet this view may be too narrow and associated with exaggerated dominionistic tendencies. Life, even in the modern era, may be regarded as a tenuous enterprise, with the struggle to survive necessitating some measure of the proficiency to subdue, the capacity to dominate, and the skills and physical prowess honed by an occasionally adversarial relationship to nature. Rolston's insight (1986b:88) is helpful:

> The pioneer, pilgrim, explorer, and settler loved the frontier for the challenge and discipline. . . . One reason we lament the passing of wilderness is that we do not want entirely to tame this aboriginal element. . . . Half the beauty of life comes out of it. . . . The cougar's fang sharpens the deer's sight, the deer's fleet-footedness shapes a more supple lionness. . . . None of life's heroic quality is possible without this dialectical stress.

Beyond an enhanced capacity to subjugate nature, the dominionistic experience may foster increased knowledge of the natural world. As Rolston's remarks intimate, the predator understands and even appreciates its prey to a degree no mere external observer can attain, and this perspective may be as true for the human hunter of deer or mushrooms as it is for the wolf stalking its moose or the deer its browse. While the survival value of the dominionistic experience may be less evident today than in the evolutionary past, one suspects a false arrogance in the denial of the human inclination to master nature in favor of strong emotional bonds of affection or kinship for life. The dominionistic experience of nature, like all expressions of the biophilia tendency, possesses both the capacity for functional advantage as well as exaggerated distortion and self-defeating manifestation.

Negativistic

The negativistic experience of nature is characterized by sentiments of fear, aversion, and antipathy toward various aspects of the natural world. Most

advocates of conservation regard fear and alienation from the natural world as inappropriate and often leading to unwarranted harm and destruction. The potential biological advantage of avoiding, isolating, and even occasionally harming presumably threatening aspects of nature can, however, be recognized. (See Chapter 3 in this volume.) The disposition to fear and reject threatening aspects of nature has been cited as one of the most basic motive forces in the animal world. As Öhman suggests (1986:128): "Behaviors that can be associated with fear are pervasive in the animal kingdom. Indeed, one could argue that systems for active escape and avoidance must have been among the first functional behavior systems that evolved."

The human inclination to fear and avoid threatening aspects of nature has been particularly associated with reptiles such as snakes and arthropods such as spiders and various biting and stinging invertebrates. A predisposition to fear and avoid such creatures and other harmful elements of nature may have conferred some advantage during the course of human evolution resulting in its statistically greater prevalence. This potential has been described by Ulrich et al. in a review of the scientific literature (1991:206): "Conditioning studies have shown that nature settings containing snakes or spiders can elicit pronounced autonomic responses . . . even when presented subliminally." Schneirla (1965) further notes that the occurrence of "ugly, slimy, erratic" moving animals, such as certain snakes and invertebrates, provokes withdrawal responses among vertebrate neonates in the absence of overt or obvious threat.

Studies of human attitudes toward invertebrates (Kellert 1993c), as well as related research by Hardy (1988) and Hillman (1991), have discovered a variety of motivational factors in the human tendency to dislike and fear arthropods. First, many humans are alienated by the vastly different ecological survival strategies, spatially and temporally, of most invertebrates in comparison to humans. Second, the extraordinary "multiplicity" of the invertebrate world seems to threaten the human concern for individual identity and selfhood. Third, invertebrate shapes and forms appear "monstrous" to many people. Fourth, invertebrates are often associated with notions of mindlessness and an absence of feeling—the link between insects, spiders, and madness has been a common metaphor in human dis-

course and imagination. Fifth, many people appear challenged by the radical "autonomy" of invertebrates from human will and control.

These sentiments of fear and alienation from nature can foster unreasonable human tendencies and the infliction of excessive harm and even cruel behavior on animals and other elements of nature. Singer (1977) has referred to this tendency as "specicide"—reflecting the willingness to pursue the destruction of an entire species, such as Lopez (1978) has described for the wolf in North America or might exist toward certain rodent, insect, and spider species. Hillman ruefully remarked in this regard (1991): "What we call the progress of Western Civilization from the ant's eye level is but the forward stride of the great exterminator."

Negativistic tendencies toward nature, given our modern technical prowess, have often resulted in the massive destruction of elements of the natural world. Yet the extent of today's onslaught on nature should not preclude one from recognizing its possible evolutionary origin or its continued biological advantage expressed at a more modest and even "rational" level. Fear of injury or even violent death in nature will continue to be an integral part of the human repertoire of responses to the natural world, and a realistic tension with threat and danger in nature is part of the challenge of survival. It might even be suggested that some measure of fear of the natural world is essential for the human capacity to experience a sense of nature's magnificence and sublimeness. The power of pristine nature to inspire and challenge human physical and mental development in all likelihood requires considerable elements of fear and danger.

Exploration

The presentation of nine, presumably biologically based, human valuations of nature represents an exploratory effort at supporting the biophilia hypothesis. While these descriptions certainly do not constitute "proof" of the biophilia complex, the typology may provide a heuristic approach for systematically examining the evolutionary basis of each of the suggested values. Each category of the typology is thought to represent a basic human relationship and dependence on nature indicating some measure of adaptational value in the struggle to survive and, perhaps more important,

TABLE 2.1. *A Typology of Biophilia Values*

Term	Definition	Function
Utilitarian	Practical and material exploitation of nature	Physical sustenance/security
Naturalistic	Satisfaction from direct experience/contact with nature	Curiosity, outdoor skills, mental/physical development
Ecologistic-Scientific	Systematic study of structure, function, and relationship in nature	Knowledge, understanding, observational skills
Aesthetic	Physical appeal and beauty of nature	Inspiration, harmony, peace, security
Symbolic	Use of nature for metaphorical expression, language, expressive thought	Communication, mental development
Humanistic	Strong affection, emotional attachment, "love" for nature	Group bonding, sharing, cooperation, companionship
Moralistic	Strong affinity, spiritual reverence, ethical concern for nature	Order and meaning in life, kinship and affiliational ties
Dominionistic	Mastery, physical control, dominance of nature	Mechanical skills, physical prowess, ability to subdue
Negativistic	Fear, aversion, alienation from nature	Security, protection, safety

to thrive and attain individual fulfillment. A summary of the biophilia values is presented in Table 2.1.

This chapter has relied on conceptual and descriptive analysis for delineating basic elements of the biophilia hypothesis. As suggested earlier, a limited empirical corroboration of the typology has been provided by the results of various studies, conducted by the author and others, of diverse cultures and demographic groups, human perceptions of varying taxa, and historical shifts in perspectives of nature. Although methodological problems preclude the assertion of this evidence as proof, these findings offer restricted support of the typology's occurrence. And although these results

do not constitute a sufficient validation of the categories as biologically based expressions of human dependence on nature, their widespread empirical expression suggests the possibility that they may represent universal human characteristics. What appears to be relative is not the occurrence of the value types across cultures, taxa, and time but the content and intensity of this expression and its adaptational importance.

It has been argued in this chapter that each value type is indicative of our species' dependence on the natural world and represents a potential evolutionary advantage. It follows that their cumulative, interactive, and synergistic impact may contribute to the possibility of a more fulfilling personal existence. The effective expression of the biophilia need may constitute an important basis for a meaningful experience of self.

The conservation of nature is rationalized, from this perspective, not just in terms of its material and commodity benefits but, far more significantly, for the increased likelihood of fulfilling a variety of emotional, cognitive, and spiritual needs in the human animal. An ethical responsibility for conserving nature stems, therefore, from more than altruistic sympathy or compassionate concern: it is driven by a profound sense of self-interest and biological imperative. As Wilson suggests (1984:131): "We need to apply the first law of human altruism, ably put by Garrett Hardin: never ask people to do anything they consider contrary to their own best interests." Nature's diversity and healthy functioning are worthy of maintenance because they represent the best chance for people to experience a satisfying and meaningful existence. The pursuit of the "good life" is through our broadest valuational experience of nature. This deeper foundation for a conservation ethic is reflected in the words of René Dubos (1969:129):

> Conservation is based on human value systems; its deepest significance is the human situation and the human heart. . . . The cult of wilderness is not a luxury; it is a necessity for the preservation of mental health. . . . Above and beyond the economic . . . reasons for conservation, there are aesthetic and moral ones which are even more compelling. . . . We are shaped by the earth. The characteristics of the environment in which we develop condition our biological and mental being and the quality of our life. Were it only for selfish reasons, therefore, we must maintain variety and harmony in nature.

The converse of this perspective is the notion that a degraded relationship to nature increases the likelihood of a diminished material, social, and psychological existence. This chapter has intimated several possibilities in this regard, and it may be relevant to note the finding that significant abusers of nature, particularly those who inflict in childhood willful harm on animals, are far more likely in adulthood to reveal repeated patterns of violence and aggressive behavior toward other people (Kellert and Felthous 1985; Felthous and Kellert 1987). Indeed, presumably socially acceptable forms of destructive conduct toward nature may in retrospect come to be regarded as false and short-term benefits, as Leopold's lament of the last of the passenger pigeons suggests (1966:109):

> We grieve because no living man will see again the onrushing phalanx of victorious birds sweeping a path for spring across the March skies, chasing the defeated winter from all the woods and prairies. . . . Our grandfathers were less well-housed, well-fed, well-clothed than we are. The strivings by which they bettered their lot are also those which deprived us of pigeons. Perhaps we now grieve because we are not sure, in our hearts, that we have gained by the exchange. The gadgets of industry bring us more comforts than the pigeons did, but do they add as much to the glory of the spring?

A skeptical response to the assertion of the biophilia tendency as a biologically based human need to affiliate with nature is the view that this hypothesis is an expression of cultural and class bias. This view suggests that the assertions trumpeted here are but a romantic ideology of nature, paraded in the guise of biology, promoted for essentially elitist political and social reasons. Such a critique may claim that the biophilia hypothesis condemns, by implication, all those mired in poverty and trapped within urban walls to another stereotype of a less fulfilling human existence.

Abraham Maslow's (1954) notion of a hierarchy of needs may offer one response to this critique—implying the pursuit of self-realization through a broad valuational experience of nature as a higher order of human functioning. In other words, the biophilia tendency might become manifest once the basic human needs for survival, protection, and security have been realized. This argument, while superficially appealing, probably reflects a

naive assumption of human functioning. People are typically inclined to pursue concurrently a wide range of simple to complex needs if they are not overwhelmed by the sheer necessity of confronting the material basis for survival (a relatively rare condition).

Any presumption of the relative unimportance of the biophilia tendency among persons of lower socioeconomic status or urban residence may, in itself, be an elitist and arrogant characterization. Nature's potential for providing a more satisfying existence may be less obvious and apparent among the poor and urban than the rich and rural, but this deprivation represents more a challenge of design and opportunity than any fundamental irrelevance of the natural world for a class of people. As Leopold noted (1966:266): "The weeds in a city lot convey the same lesson as the redwoods. . . . Perception . . . cannot be purchased with either learned degrees or dollars; it grows at home as well as abroad, and he who has a little may use it to as good advantage as he who has much." The capacity of nature to enrich and enlarge the human experience is a potential inherent in all but the most deprived and encapsulated within concrete walls. Society's obligation is not to bemoan the seeming "absence" of nature in the inner city or among the poor but to render its possibility more readily available. The presumption that only the materially advantaged and conveniently located can realize nature's value represents an arrogant characterization.

A more fundamental question is the recognition in modern society of the human need to affiliate deeply and positively with life's diversity. This is a complex issue too difficult to address here in detail. A partial response, however, may be provided by the results of the previously cited studies conducted in the United States and Japan. While these studies explore the biophilia hypothesis only indirectly, they offer circumstantial information regarding the modern relationship to the natural world among persons living in highly urban, technologically oriented, industrial societies. Insufficient space precludes all but a very brief summarization of these results, although more detailed information regarding the studies can be found elsewhere (Kellert 1979, 1981, 1983, 1991c, 1993b).

Both the United States and Japan have been described as nations with a pronounced appreciation for the natural world. Americans, for example,

are known to be especially supportive of nature conservation: nearly 10 percent of the American public is formally affiliated with at least one environmental organization (Dunlap 1978), and American environmental legislation is recognized as among the most comprehensive and protective in the world (Bean 1983). Extensive outdoor recreational activity among Americans is reflected in nearly 300 million annual visits to national parks, and three-fourths of the public participates in some form of wildlife-related outdoor recreational activity (Foresta 1984; USFWS 1990).

Japanese culture too has been characterized as encouraging a strong appreciation for nature (Higuchi 1979; Minami 1970; Murota 1986; Watanabe 1974). Often cited expressions of this interest include the practices of Shintoism, flower arranging, plant cultivation (such as bonsai), the tea ceremony, certain poetry forms, rock gardening, and various celebrations of the seasons. Higuchi (1979:19) has described a Japanese view of nature "based on a feeling of awe and respect," while Watanabe (1974:280) has remarked on a Japanese "love of nature . . . resulting in a refined appreciation of the beauty of nature." Murota (1986:105) suggests: "The Japanese nature is an all-pervasive force. . . . Nature is at once a blessing and friend to the Japanese people."

Despite these assertions of an especially refined appreciation for nature in the United States and Japan, our research has revealed only limited concern for the natural world among the general public in both countries. Citizens of the United States and Japan typically expressed strong interest in nature only in relation to a small number of species and landscapes characterized by especially prominent aesthetic, cultural, and historic features. Furthermore, most Americans and Japanese expressed strong inclinations to exploit nature for various practical purposes despite the likelihood of inflicting considerable environmental damage. Most respondents revealed, especially in Japan, indifference toward elements of the natural world lacking any aesthetic or cultural value. Very limited knowledge and understanding of nature was found, particularly in Japan.

Japanese appreciation of nature was especially marked by a restricted focus on a small number of species and natural objects—often admired in a context emphasizing control, manipulation, and contrivance. This affinity for nature was typically an idealistic rendering of valued aspects of the nat-

ural environment, usually lacking an ecological or ethical orientation. This appreciation was described by one Japanese respondent as "a love of seminature," representing a largely emotional and aesthetic interest in using "the materials of seminature to express human feelings." Other respondents described it as a perspective of nature dominated by a preference for the artificial, abstract, and symbolic rather than any realistic experience of the natural world; a motivation to "touch" nature from a controlled and safe distance; an adherence to strict rules of seeing and experiencing nature intended to express only the centrally valued aspect; a desire to isolate favored aspects of nature in order to "freeze and put walls around it." Environmental features falling outside the valued aesthetic and symbolic boundaries tended to be ignored, dismissed, or judged unappealing (Saito 1983).

American respondents revealed a somewhat more generalized interest and concern for nature, especially among highly educated and younger Americans in comparison to similar demographic groups in Japan. On the other hand, nature appreciation among most Americans was largely restricted to particularly valued species and landscapes, while other aspects of the natural world were typically subordinated to strong utilitarian concerns. The great majority of Americans revealed little appreciation of "lower" life-forms, tending to restrict their appreciation to the large vertebrates.

In conclusion, most Americans and Japanese expressed a pronounced concern for only a limited number of species and natural objects. The biophilia tendency, as described here, was broadly evident only among a small segment of the population in both countries, most prominently the better educated and the young in the United States.

A New Basis for Conservation?

A largely conceptual argument has been offered here in support of the biophilia hypothesis. It appears that a variety of basic valuations of nature are consistent with the possibility of increased evolutionary fitness at both the individual and species levels. Each expression of the biophilia tendency—the aesthetic, dominionistic, ecologistic-scientific, humanistic, moralistic, naturalistic, symbolic, utilitarian, and even negativistic—has been de-

picted as potentially enhancing the basis for a profound development of self. A range of adaptational advantages has been cited as resulting from these basic experiences of nature—enhanced physical skills and material benefits, greater awareness, increased protection and security, opportunities for emotional gratification, expanded kinship and affiliational ties, improved knowledge and cognitive capacities, greater communication and expressive skills, and others.

A conservation ethic of care, respect, and concern for nature was regarded as more likely to emanate from the conviction that in our relationship to the natural world exists the likelihood of achieving a more personally rewarding existence. As Iltis has suggested (1980:3, 5), our mental and physical well-being may represent a far more compelling basis for nature conservation than the mere rationalization of enhanced material benefit:

> Here, finally, is an argument for nature preservation free of purely [material] utilitarian considerations; not just clean air because polluted air gives cancer; not just pure water because polluted water kills the fish we might like to catch; . . . but preservation of the natural ecosystem to give body and soul a chance to function in the way they were selected to function in their original phylogenetic home. . . . Could it be that the stimuli of non-human living diversity makes the difference between sanity and madness?

Iltis's question intimates the still tenuous state of our understanding of the biophilia phenomenon. The sophistication and depth of future inquiry may prove the measure of Iltis's response to his own question (1973:7):

> We may expect that science will [someday] furnish the objective proofs of suppositions about man's needs for a living environment which we, at present, can only guess at through timid intuition; that one of these days we shall find the intricate neurological bases of why a leaf or a lovely flower affects us so very differently than a broken beer bottle.

The importance of this recognition of our basic human dependence on nature is suggested by the meager appreciation of the natural world evinced among the general public in modern Japan and the United States. The great majority of people in these two leading economic nations recognized to only a limited extent the value of nature in fostering human physical, cognitive, emotional, and spiritual development. Most Ameri-

cans and Japanese expressed an aloofness from the biological matrix of life, restricting their interest to a narrow segment of the biotic and natural community. This narrow emphasis on certain species and landscapes is clearly an insufficient basis for a fundamental shift in global consciousness—one capable of countering the contemporary drift toward massive biological impoverishment and environmental destruction.

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