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Preserving Biological Diversity in the United States: The Case for Moving to an Ecosystems Approach to Protect the Nation's Biological Wealth

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**Preserving Biological Diversity in the
United States: The Case for Moving to
an Ecosystems Approach to Protect the
Nation's Biological Wealth**

Julie B. Bloch*

Protecting the biodiversity of the planet from human impact is essential to maintaining the existing balance found throughout nature. This paper provides a general discussion of the reasons why biological diversity must be preserved. In addition to the need to ensure the survival of the planet, reasons for biodiversity protection are based on economic, spiritual, and moral concerns. The author describes the current level of biodiversity destruction, and examines the shortcomings of current laws focusing on the protection of endangered species and their habitats. In light of those shortcomings, the author then analyzes and contrasts four methods which could be used to protect biodiversity in the United States. These four models are 1) a "living museums" approach, 2) the Biological Diversity Conservation Act, introduced

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in the 102d Congress, 3) a rezoning of the public lands of the United States, and 4) an ecosystems protection act. The author concludes that the best way to preserve biological diversity in the United States would be to implement an ecosystems protection act, a legal model which is sound from both biological and political standpoints.

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If the Biota, in the course of aeons, has built something we like but do not understand, then who but a fool would discard seemingly useless parts? To keep every cog and wheel is the first precaution of intelligent tinkering.

- Aldo Leopold¹

I. Introduction

After spending years on the back burner, the struggle to preserve the world's biological diversity has finally come to the forefront, spurred on by the relentless efforts of biologists and environmentalists in the United States and abroad. The problem of mass extinctions is neither new nor unexpected. For decades, scientists have been warning of the possibly catastrophic results of a drastic decrease in the Earth's biological diversity.² Despite legal efforts to protect vast areas of land and species in critical danger, the number of extinctions in the United States and abroad is increasing at an alarming rate.³ In the United States, it is now estimated that the number of extinctions each year exceeds the number of species that are listed as endangered or threatened pursuant to the Endangered Species Act ("ESA") during that year.⁴

Some biological diversity has been preserved as a result of

1. A SAND COUNTY ALMANAC 177 (1966).

2. See, e.g., NORMAN MYERS, *THE SINKING ARK: A NEW LOOK AT THE PROBLEM OF DISAPPEARING SPECIES* (1979).

3. For several estimates of the extent of biological diversity loss, see RICHARD TOBIN, *THE EXPENDABLE FUTURE: U.S. POLITICS AND THE PROTECTION OF BIOLOGICAL DIVERSITY* 2-4 (1990). Tobin notes that estimates of extinctions in the U.S. range from conservative estimates of 100 species per year to predictions that all species except humans and their domesticated animals could become extinct in the future. There are also different estimates of the number of species in danger of extinction. Six hundred species are listed as endangered by the Fish and Wildlife Service ("FWS"), while the Nature Conservancy, a public interest organization, estimates that the number of endangered species is about two thousand. *Id.* at 4.

On the international front, the number of extinctions is said to exceed 17,500 per year. See Edward O. Wilson, *The Current State of Biodiversity*, in *BIODIVERSITY* 13 (Edward O. Wilson ed., 1988).

4. TOBIN, *supra* note 3, at 61-64.

the environmental protection statutes passed in the 1960's and 1970's. But despite the efforts of the environmental movement over the last twenty years, habitat loss is one of the most serious environmental threats facing the country. For the first time, however, some lawmakers are beginning to examine the issue of biodiversity from the perspective of the scientist, focussing on the health of ecosystems⁵ as a whole rather than on individual species.⁶ Unfortunately, this initiative comes at a time of increasing political backlash against an environmental movement that is perceived to favor plants and animals over people.⁷ While this new effort to preserve biodiversity will receive criticism from many different corners of society, it is nonetheless one of the most important environmental protection undertakings thus far.

This paper provides a general discussion of the importance of biodiversity, examines the shortcomings of current laws, and proposes a legal model to protect biological diversity that is sound from both a biological and a political standpoint. Section II defines biological diversity and discusses several justifications for its preservation, some of which relate to the economic benefits humans derive from biological resources. Other justifications include the recreational, aesthetic, and spiritual significance of diverse species and ecosystems. The section concludes with a description of the extent of the loss of biological diversity in the United States and the current state of several of the nation's ecosystems.

Section III discusses some of the reasons why current species protection laws and laws regulating the public domain fail to preserve biological diversity. It argues that management of

5. An ecosystem is defined as: "[t]he organisms living in a particular environment, such as a lake or forest (or in increasing scale, an ocean or the whole planet), and the physical part of the environment that impinges upon them." EDWARD O. WILSON, *THE DIVERSITY OF LIFE* 396 (1992); see also JEFFREY A. MCNEELY ET AL., *CONSERVING THE WORLD'S BIOLOGICAL DIVERSITY* 84 (1990).

6. For arguments in favor of a shift from a species protection approach to an ecosystems protection approach, see generally BRYAN NORTON, *WHY PRESERVE NATURAL VARIETY?* (1986); WILSON, *supra* note 5.

7. See Keith Schneider, *When the Bad Guy Is Seen as the One in the Green Hat*, N.Y. TIMES, Feb. 16, 1992, at Sec. 4, 3; See *infra* note 102 and accompanying text.

biodiversity must be based on ecosystems rather than individual species. It then discusses the biological diversity bill of the 102d Congress,⁸ which is a first step toward managing biodiversity based on a holistic and scientific approach to ecosystems.

Section IV examines and contrasts four legal models for preserving biodiversity. The hypothetical passage of the Biological Diversity bill is used as a starting point from which possible scenarios are projected. The first, and most limited, scenario would be to turn small areas of the country into reserves, so-called "living museums," and open the rest of the land for development. The second scenario would essentially follow the approach taken by the bill on its face. This would include an extensive commitment to biological research, some additional considerations in the processes under The National Environmental Policy Act ("NEPA"), and informal inter-agency cooperation. The third scenario would involve a reexamination and rezoning of the public lands for the purpose of protecting biodiversity. This would require agencies to both reexamine their individual management mandates and to enter into inter-agency cooperative agreements. The fourth and most far reaching scenario would be to enact an "Ecosystems Protection Act," designed to inventory the nation's biological resources and to protect entire ecosystems. The procedural and substantive standards that could be imposed by an ecosystems protection act, as envisaged by this scenario, are outlined. The section goes on to discuss the political constraints on such an act and ways in which biodiversity protection and economic development could be fairly balanced. The article concludes that even in the face of political and economic constraints, the fourth scenario is both attainable and well worth achieving.

8. H.R. 585, 102d Cong., 1st Sess. (1991).

II. What is Biological Diversity? A Definition and Discussion of the Current State of Biodiversity in the United States

What would the world be, once bereft
Of wet and of wildness? Let them be left,
O let them be left, wildness and wet;
Long live the weeds and the wilderness yet.
—Inversnaid⁹

A. Biological Diversity — a Definition

Before embarking on a discussion of the importance of preserving biological diversity, it is first necessary to have a functional definition of the term. Depending on one's profession, biological diversity is either a simple or an extremely difficult term to define. For a biologist, cataloguing biological diversity constitutes the essence of her profession. The biologist discovers and identifies individual organisms and their interactions and places them into categories of species¹⁰ and ecosystems. She may spend years studying the complex interactions of one or more species within an ecosystem and never quite understand how the system functions as a whole. Unfortunately, actions must be taken in the absence of full knowledge and scientific certainty in order to protect the diverse array of species that are essential to the health of the planet.

For the purposes of a lawyer or lawmaker, biological diversity can be explained in general terms which allow for im-

9. GERARD MANLEY HOPKINS, *POEMS OF GERARD MANLEY HOPKINS* 95 (3d ed. 1948).

10. A *species* can be defined as follows:

[A] population or series of populations within which free gene flow occurs under natural conditions. This means that all normal, physiologically competent individuals at a given time are capable of breeding with all other individuals of the opposite sex belonging to the same species or at least that they are capable of being linked genetically to them through chains of other breeding individuals. By definition they do not breed freely with members of other species.

Wilson, *supra* note 3, at 5-6.

mediate and efficacious actions, while permitting variation with the advent of new scientific knowledge. The term biological diversity refers to "the full range of variety and variability within and among living organisms and the ecological complexes in which they occur."¹¹ Biodiversity includes genetic diversity, species diversity, and ecosystem diversity.¹² Although these three types of diversity are mutually dependent,¹³ each is important for different reasons.

Genetic diversity refers to the range of genetic material within and among populations of species.¹⁴ Diversity in a species' gene pool helps it to adapt to changing environmental conditions resulting from climatic changes or natural or man-made disasters. Genetic diversity becomes especially critical when one considers the potential effects of global warming on the Earth's climate.¹⁵ Scientists predict that even slight climatic changes could cause mass extinctions of plants and animals.¹⁶ The greater the diversity of the gene pool, the more likely it is that a species will survive. If gene pools are severely diminished, the effects of global warming could be even more catastrophic. Genetic diversity is also important to humans because it provides the raw materials used to develop new types of agricultural crops, pharmaceuticals, fibers, and other products.¹⁷

11. H.R. 585, 102d Cong., 1st Sess. § 3(1) (1991). This definition is also used in the United Nations Convention on Biodiversity. Convention on Biological Diversity, Article 2, June 5, 1992, 31 I.L.M. 818. The Convention was signed in June 1992, at the United Nations Conference on Environment and Development. As of the date of print, the United States has not signed the treaty.

12. H.R. REP. NO. 259, 102d Cong., 1st Sess., pt. 1, at 7, n.2 (1991).

13. *Id.*

14. *Id.*

15. See Robert L. Peters II, *The Effect of Global Climatic Change on Natural Communities*, in BIODIVERSITY 450-61 (Edward O. Wilson ed., 1988); Thomas E. Lovejoy, *Looking to the Next Millennium*, NATIONAL PARKS, Jan.-Feb. 1992, at 41, 44; John C. Ryan, *When Nature Loses Its Cool*, WORLD WATCH, Sept.-Oct. 1992, at 10; WILSON, *supra* note 5, at 271-72.

16. See Peters, *supra* note 15, at 450-51.

17. The economic importance of biological diversity was illustrated by President Bush's refusal to sign the Biological Diversity Convention due to opposition from the patent bar during the United Nations Conference on Environment and Development. See Victoria Slind-Flor, *Patent Bar Lobbied Bush for Rio Stance*, NAT'L L.J., June 29, 1992, at 19; compare Wilson, *supra* note 3, at 15.

In addition to genetic diversity, another important aspect of biodiversity is species diversity. Species diversity refers to the richness and variety of species at a particular locale.¹⁸ Species are "the building blocks of ecosystems and are often the most obvious indicators of an ecosystem's health."¹⁹ Each species in an ecosystem fills a specialized niche; thus, the destruction of one part of the system affects all others.²⁰ Scientists have estimated that for every known species that becomes extinct, tens of others may also disappear because of the complex web of relationships between species.²¹

Finally, ecosystems diversity is "the distinctive assemblages of species and ecological processes (such as food chains) that occur in different physical settings such as wetlands or tropical rainforests."²² Some ecosystems, such as tropical rainforests, contain a great variety of species, while others, such as the arctic tundra, contain relatively few. A single mountain may be an ecosystem in and of itself;²³ or an ecosystem may exist over a vast area of land.²⁴ All ecosystems, however, are sustained by the complex interaction of species with their physical environment.

18. Peters, *supra*, note 15, at 450-51.

19. McNEELY ET AL., *supra* note 5, at 56.

20. *Id.* at 56-57.

21. U.S. GENERAL ACCOUNTING OFFICE, ENDANGERED SPECIES MANAGEMENT IMPROVEMENTS COULD ENHANCE RECOVERY PROGRAM 10 (1989).

22. H.R. REP. NO. 259, at 7, n.2. Some critics of using an ecosystems approach assert that there is no operational definition of ecosystem which could be used. Telephone Interview with Don Knowles, Associate Deputy Secretary, Department of the Interior (February 28, 1992).

23. This is the case with Mt. Graham in Arizona. The mountain contains a variety of unique species which move up and down the mountain throughout the year rather than migrating to different areas. See, e.g., *Mount Graham Red Squirrel v. Madigan*, 954 F.2d 1441 (9th Cir. 1992); Jean Eisenhower, *Tucson Businessmen Attack Apache - Again: Another History of Mt. Graham*, EARTH FIRST! J., Samhain (1992), at 8.

24. At some point, the concept is not very useful from a political standpoint. Arguably, the United States could be considered a large ecosystem; however, it would be politically and practically impossible to attempt to preserve biodiversity on that scale.

B. Causes of the Decline in Biological Diversity

Although illegal hunting has contributed to the extinction of some plants and animals, by far the most important cause of species extinctions is the loss of habitat. Habitat loss is a direct result of human population growth and per capita consumption levels.²⁵ As society develops, demands for natural resources (i.e., land, wood, and minerals) increase, causing conflict between humans and other species dependent upon those resources. Specific causes of habitat loss include overharvesting of forests, development of wetlands, rural to urban conversion, pollution, overgrazing, and overfishing.²⁶ The fact that extinctions are the natural result of the development of human society makes the problem very difficult to solve for both political and practical reasons. Since its initial strengthening amendments in 1973, the Endangered Species Act ("ESA")²⁷ has been challenged by industries and agencies concerned with natural resource extraction.²⁸ Sometime during the 103d Congress, the ESA will be brought before Congress for reauthorization. Confronted by economic recession and ever increasing resource conflicts, many people argue that it is unreasonable to protect endangered species at the expense of human development.²⁹ This backlash, however, is a result of a fundamental misunderstanding of the interconnectedness of humans and other species. Until and unless people realize that the loss of biodiversity will eventually be detrimental to their own progress and development, widespread extinctions will continue.

C. Why Preserve Biological Diversity?

Even in the face of scientific data that clearly establishes

25. Paul R. Erlich, *The Loss of Diversity: Causes and Consequences*, in BIODIVERSITY 21 (Edward O. Wilson ed., 1988); see also McNEELY ET AL., *supra* note 5, at 11-12.

26. McNEELY ET AL., *supra* note 5, at 12.

27. 16 U.S.C. §§ 1531-44 (1988).

28. See, e.g., Virginia S. Albrecht and Thomas C. Jackson, *Battle Heats Up as Congress Begins Review of Endangered Species Act*, NAT'L L.J., May 18, 1992, at S1.

29. *Id.* at S3.

that biological diversity in the United States faces serious threats, scientists, environmental lawyers, and policy-makers must still justify the expenditure of valuable public resources to preserve biodiversity. The reasons for preserving biological diversity have been discussed in no small measure by others and will only be briefly summarized here. It is important to note that the justifications for preserving biodiversity are more exhaustive than the justifications for preserving endangered species.

This author chooses to place arguments for the preservation of biodiversity into two broad categories: consumptive and non-consumptive justifications, both of which are utilitarian justifications. Consumptive justifications are those tangible benefits that humans derive from biological diversity. Non-consumptive justifications are the intangible benefits to humans that result from a diversity of species. It is sometimes argued that species and other natural objects have intrinsic value apart from any benefits that they provide to humans.³⁰ However, since only humans participate in the world's political systems, all policies must stand or fall on their merit as perceived by humans. Therefore, it is more useful to focus on the values humans place on the spiritual or mystical quality of the natural world when one is attempting to persuade others of the values of protecting biological diversity. Using this approach, these values on biological diversity, however intangible in the utilitarian analysis, are placed on the same playing field with values such as economic development.³¹ That gives

30. See NORTON, *supra* note 6, at 169-82; Christopher Stone, *Should Trees Have Standing? Toward Legal Rights for Natural Objects*, 45 S. CAL. L. REV. 450 (1972); see also *Sierra Club v. Morton*, 405 U.S. 727, 741-55 (1972) (Douglas, J., dissenting).

31. Quantification of these intangibles may or may not be necessary in the political debate over species protection. People may have an innate sense of what is right or fair in a given situation and can therefore influence their representatives accordingly.

For example, take the case in which there is a conflict between a mining company and a local community over the use of a park. The mine might bring a great deal of wealth to the community, but would destroy the beauty of the town and quality of life of its residents. The residents may decide to prevent development even in the absence of a quantification of its preferences for natural beauty. Should quantification be necessary, economists have developed valuation methods to quantify human

equal weight to all human preferences in the political arena. This chapter provides a general discussion of both consumptive and non-consumptive arguments for preserving biological diversity.

1. Consumptive Justifications

Humans derive enormous physical and economic benefits from the Earth's biological resources. The most basic benefit, of course, is life itself; people could not survive without the plants and animals that provide them with food and oxygen and that also support the Earth's natural processes.³² There are other tangible benefits from biological diversity. If managed sustainably, the forests, prairies, and estuaries in this country could provide countless goods and services to society. Since most of the species on Earth have not yet been identified or studied,³³ scientists are just beginning to understand the potential uses of plants and animals in industries such as pharmaceuticals, agriculture, and textile manufacturing.³⁴ Currently, about 25% of prescription drugs sold in the United States are derived from plant extracts.³⁵ A few years ago, scientists discovered that the bark of the Pacific yew tree contains a compound that can be used to treat ovarian and breast cancer. It is highly likely that research in this field will yield an increasing number of possible cures and means of preventing human diseases, since scientists have tested less than 5% of the species on Earth for food or medicinal potential.³⁶ How-

preferences for aesthetics, option values, existence values, etc. See generally JOHN A. DIXON & PAUL B. SHERMAN, *THE ECONOMICS OF PROTECTED AREAS* 24-49 (1990).

32. Apocalyptic predictions are not uncommon. According to Myers, opportunistic species such as rats and cockroaches are more adaptable than most other species. With the elimination of many of their natural predators, these species could become pests. MYERS, *supra* note 2, at 53-54. Lovejoy fears that the failure to halt the mass extinctions could result in an ecological holocaust. Lovejoy, *supra* note 15, at 44. The dwindling populations of large land and sea mammals are an indication of what may be in store for humans. See Marlise Simons, *Dead Mediterranean Dolphins Give Nations Pause*, N.Y. TIMES, Feb. 2, 1992, at 12.

33. See generally Wilson, *supra* note 3, at 10.

34. *Id.* at 15.

35. H.R. REP. NO. 259, at 14.

36. *Id.* (citing testimony of James McChesney, Institute of Pharmaceutical Sci-

ever, many species are becoming extinct before scientists can even identify them, let alone test them. Even though its value is known, the Pacific yew is in danger of becoming extinct along with countless other animals and plants that live in the ancient temperate forests of Oregon and Washington.³⁷ In a hearing before the U.S. House of Representatives, a spokesperson for the American Pharmaceuticals Association testified that: "[I]t is alarming to consider that years ago, there might have existed a plant or microorganism that could have cured AIDS or other diseases, but that through inaction, that species became extinct."³⁸ Indeed, the AIDS pandemic is likely to cause great suffering and loss of life on the African continent and elsewhere in the world. In addition, other illnesses such as heart disease, cancer, diabetes, and antibiotic resistant infections still claim the lives and health of many Americans.³⁹ Without a diverse gene pool from which to develop medicines, humans may be faced with plagues or epidemics that they will have no means to combat. This is a frightening vision of the society the next generation will inherit.

In addition to their medicinal value, the biological resources of this country are used to improve agricultural productivity and to control pests without the use of dangerous

ences). Wilson states that less than 1% of species have been tested. Wilson, *supra* note 3, at 15. Increasingly, however, pharmaceutical companies are looking to nature for compounds to fight diseases that affect humans. See Andrew Pollack, *Drug Industry Going Back to Nature*, N.Y. TIMES, Mar. 5, 1992, at D1.

37. See Timothy Egan, *Trees That Yield Cancer Drug Are Being Wasted*, N.Y. TIMES, Jan. 29, 1992, at A1. The article states, "Nearly a year after the Government recognized the Pacific yew as the most valuable tree in American forests because it yields a rare cancer-fighting drug, the precious bark is still being burned as scrap and discarded to rot on the forest floor in wasteful logging operations in the Northwest." *Id.* The article cites dozens of complaints from people who found piles of yew bark lying in heaps on the ground. Clear-cutting results in the wastage of 75% of the bark from yew trees. *Id.*

38. H.R. REP. No. 259, at 14 (quoting *The National Biological Diversity Conservation and Environmental Act: Hearings on H.R. 4335 Before The Subcomm. on Natural Resources, Agriculture Research and Environment of the House Comm. on Science, Space and Technology*, 100th Cong., 2d Sess. 342, at 351 (1988) (testimony of the American Pharmaceutical Association)).

39. *National Biodiversity Conservation, H.R. 585 and H.R. 2082: Hearing Before the Subcomm. on Environment of the House Comm. on Science, Space, and Technology*, 102d Cong., 1st Sess. 94 (1991) [hereinafter 1991 Hearing].

chemicals and pesticides. One scientist has stated that, "[a]n adequate food supply is, and always has been, humankind's most outstanding need. More than one billion people, that is one world citizen out of every four, are undernourished or starving."⁴⁰ A diverse gene pool is absolutely essential to the development of new strains of crops to feed the domestic population and to export to foreign countries. Biotechnology is a rapidly growing field, but it depends upon a wide variety of genetic resources. In addition, a diverse gene pool is an essential barrier against pests and diseases that destroy crops. Today, most of the world's population is fed by approximately twenty crops.⁴¹ Monoculture (single crop agriculture) is extremely susceptible to catastrophic failures caused by pests, disease, and natural disasters.⁴² These twenty plants are "the bulwark between mankind and starvation."⁴³ On the eve of the twenty-first century, many humans still lack the most basic of needs; yet the reckless destruction of the Earth's biological resources continues.

In addition to the products that are derived from diverse biological resources, indispensable services are also provided to humans by species and ecosystems. Nutrient cycling and decomposition of wastes are performed by various microorganisms in the soil. Trees serve the valuable function of turning carbon dioxide into oxygen and maintaining a stable climate. These ecological processes are not direct economic benefits, but they are nonetheless essential to productivity and, ultimately, human survival.

Finally, recreation can be viewed as a consumptive justification for preserving biodiversity because it has achieved a significant degree of quantification and because recreation adds economic value to society. Often, the value of recreation to humans can be approximated by accounting for time, travel costs, entrance fees, and the amount of money spent during a

40. *Id.* at 96.

41. *Id.*

42. H.R. REP. NO. 259, at 14. The report cites the example of a fungal blight that destroyed over 10% of the U.S. corn crop in 1970. Fortunately, a disease resistant strain of corn was imported from Mexico, preventing total disaster.

43. 1991 *Hearing*, *supra* note 39, at 96.

vacation in a national park. However, using this data alone as a measure of value is problematic since environmental economists generally agree that the amount people pay to enter a forest is different from the amount they would pay to keep it from being destroyed.⁴⁴ Presumably, people would be willing to pay greater amounts to keep the area intact, thus entrance fees are not an accurate reflection of the true value humans place on recreation in natural areas.

2. Non-Consumptive Justifications

Humans also place great value on the aesthetic, cultural, social, religious, and spiritual values provided by a diversity of species and ecosystems. Although economists have attempted to quantify many of these values, for the most part, they are not subject to valuation the way direct consumptive values are. One non-consumptive justification for preserving biodiversity stems from the connection between the diversity of America's wildlands and American cultural identity. Many writers have pointed out the connection between American culture and the wilderness that gave birth to that culture.⁴⁵ For example, in his writings, Frederick Jackson Turner argues that the American frontier was the most influential force on the character of American society.⁴⁶ Wallace Stegner points

44. DIXON & SHERMAN, *supra* note 31, at 36.

45. The disappearance of the frontier was a significant event in American history. It spurred people like John Muir and Bob Marshall to fight to preserve some pieces of wild America, so that even if we could not literally homestead on the federal lands, we could return to the freedom and idealism of the pioneers when we experienced wilderness. As the U.S. nears the turn of the century, there is no open space to acquire, no free land to homestead; the frontier exists only in our collective conscience and in our history books. As Aldo Leopold remarked, "the rich diversity of the world's cultures reflects a corresponding diversity in the wilds that gave them birth." LEOPOLD, *supra* note 1, at 242. Without the wild lands and open spaces, the danger and mystery of nature, American culture risks losing much of its dynamism, its ingenuity, and its diversity.

46. FREDERICK JACKSON TURNER, *THE FRONTIER IN AMERICAN HISTORY* (1920). Turner discusses the connection between the conquest and development of the frontier and the development of democracy in America. Stegner argues that the preservation of wilderness can be justified "even if we can never do more than drive to its edges and look in. For it can be a means of reassuring ourselves of our sanity as creatures, a part of the geography of hope." Wallace Stegner, *The Wilderness Idea*,

out the profound influence of wilderness on American literature: "It seems to me significant that the distinct downturn in our literature from hope to bitterness took place almost at the precise time when the frontier officially came to an end, in 1890" ⁴⁷

Other non-consumptive justifications for preserving species and ecosystems include the values humans place upon solitude, education and scientific study, and upon the mere existence of biodiversity. Clearly, the diversity of species provides stimulation for children and adults interested in the interconnectedness of life as a vocation or a hobby. In addition, biodiversity can be said to have "existence value" if people value the fact that it exists, even if no direct use can be foreseen.⁴⁸ Presumably, if humans value the existence of biological diversity, they would be willing to allow a prohibition on the use of an endangered ecosystem for the indefinite future and would continue to allocate tax dollars to protect it.

In addition to these values, many philosophers and naturalists have offered moral justifications for the preservation of diverse species. David Ehrenfeld argues that morality mandates the preservation of all species without regard to their conventional value or their importance in terms of overall biodiversity. Since most of the world's species predate human beings, they have a type of adverse possession of their niches on Earth. Ehrenfeld writes, "[a]s in law, long-established existence confers a powerful right of continued existence."⁴⁹ Albert Schweitzer believed that the right to exist is based on the "will-to-live" that every living being possesses.⁵⁰ According to Schweitzer, the ethical person "shatters no ice crystal that sparkles in the sun, tears no leaf from its tree, breaks off no flower, and is careful not to crush any insect as he walks."⁵¹

in *WILDERNESS: AMERICA'S LIVING HERITAGE* 99-100 (David Brower ed., 1961).

47. *Id.* at 102.

48. DIXON & SHERMAN, *supra* note 31, at 32. The author notes that wilderness is referred to by the word "it." *Id.*

49. David Ehrenfeld, *Why Put a Value on Biodiversity?*, in *BIODIVERSITY* 215 (Edward O. Wilson ed., 1988).

50. RODERICK NASH, *THE RIGHTS OF NATURE* 61 (1989).

51. *Id.* at 61 (quoting ALBERT SCHWEITZER, *PHILOSOPHY OF CIVILIZATION: Civiliza-*

Finally, Peter Singer argues that humans have a moral obligation to all creatures which can feel pain.⁵² Of course, to the extent that species have an intrinsic value independent of human morality, such value has no place in the utilitarian analysis. However, the satisfaction humans gain from a moral existence must be given some utilitarian weight.

Similarly, because humans value religion, it too must be included in the utilitarian calculus. Many religions teach respect for the creation of the divine being.⁵³ In the Judeo-Christian tradition, the clearest example of this mandate appears in the story of Noah's Ark. Although many theologians have stressed the verses from the Creation Story which give man dominion over all other creatures, the Book of Genesis also contains some implications for the preservation of biological diversity.⁵⁴ Before destroying the Earth, G-d tells Noah to build an ark and to take with him two of every kind of animal "to keep their kind alive on the face of the earth."⁵⁵ After the flood, Noah is instructed: "Bring forth with you every living thing that is with you . . . birds and animals, and every creeping thing that creeps upon the Earth that they may breed

tion and Ethics 254 (John Naish trans., 1923)).

52. See PETER SINGER, *ANIMAL LIBERATION* 17 (1990).

53. In a recent Gallup poll, 96% of Americans said that they believe in G-d. See Richard Higgins, *Some Question the Depth of Americans' Claim to Faith*, THE BOSTON GLOBE, Apr. 21, 1991, at 12. Therefore, discussing the religious foundations of the preservation of biodiversity may be a powerful way to persuade people to act. Throughout his book, Vice-President Gore stresses the importance of a spiritual shift in the way humans perceive their relationship with nature. ALBERT GORE, *EARTH IN THE BALANCE: ECOLOGY AND THE HUMAN SPIRIT* 238-55 (1992). According to Edith Brown Weiss:

Philosophers from diverse cultural traditions have recognized that we are trustees or stewards of the natural environment. The fundamental thesis that we have obligations to conserve the planet for future generations and rights to have access to its benefits is deeply rooted in the diverse legal traditions of the international community. There are roots in the common and the civil law traditions, in Islamic law, in African customary law, and in Asian nontheistic traditions.

EDITH BROWN WEISS, IN *FAIRNESS TO FUTURE GENERATIONS* 18 (1989). See generally SEYYED HOSSEIN NASR, *MAN AND NATURE: THE SPIRITUAL CRISIS IN MODERN MAN* (1990).

54. Vice-President Gore states that the verses from Genesis could be read as a commandment: "Thou shalt protect biological diversity." *Id.* at 244-45.

55. *Genesis* 7:1-3.

abundantly on the earth and be fruitful and multiply on the earth."⁵⁶ Most strikingly, when G-d vows never to destroy the Earth again, He makes this promise not only to Noah and his family, but to the rest of His creation as well: "Behold, I establish my covenant with you and your descendants, and with every living creature that is with you, the birds, the cattle, and every beast of earth with you, as many as came out of the ark, every beast of the earth."⁵⁷ For the Christian or Jew, "[t]o wipe out unnecessarily whole species of those creatures over whom we exercise stewardship is to betray that stewardship and to impoverish the experience of God. It is a crime against our Creator."⁵⁸

Other religious traditions also emphasize the preservation of all species on Earth. In Buddhism, there is belief in a cycle of rebirths, both earthly and spiritual.⁵⁹ Like humans, animals are seen as having the potential for attaining enlightenment.⁶⁰ Thus, all forms of life are revered because all are seen as interconnected parts of nature as a whole.⁶¹ Devout Buddhists are strict vegetarians, and, although plants are consumed, followers are instructed not to interfere with the growth of any plant.⁶² Also, the personal relationship of Gotama, the historical Buddha, to the Earth is represented in the tale of his

56. *Genesis* 8:17.

57. *Genesis* 9:9-10.

58. John B. Cobb, Jr., *A Christian View of Biodiversity*, in *BIODIVERSITY* 485 (Edward O. Wilson ed., 1988).

59. PETER HARVEY, *AN INTRODUCTION TO BUDDHISM: TEACHINGS, HISTORY AND PRACTICES* 32-36 (1990). See also Michael E. Soulé, *Mind in the Biosphere: Mind of the Biosphere*, in *BIODIVERSITY* 469 (Edward O. Wilson ed., 1988).

60. CHATSUMARN KABILSINGH, *How Buddhism Can Help Protect Nature*, in *TREE OF LIFE: BUDDHISM AND PROTECTION OF NATURE* 7, 11 (Shann Davies ed., 1987); HARVEY, *supra* note 59, at 33.

61. See H.H. Dalai Lama, *Introduction to DHARMA GAIA: A HARVEST OF ESSAYS IN BUDDHISM AND ECOLOGY V* (Allan H. Badiner ed., 1990); Joan Halifax, *The Third Body: Buddhism, Shamanism, and Deep Ecology*, in *DHARMA GAIA* 20, 25-32 (Allan H. Badiner ed., 1990). The interrelationship of all beings is represented by the symbolism of Indra's net. The net has an expanse that sweeps across the cosmos. At each juncture of the net there is a multifaceted jewel, and in each facet one can see reflected the entirety of the net. Thus, the net of Indra can be seen as a metaphor for the interrelationship of species within an ecosystem. See Bruce A. Byers, *Toward an Ecocentric Community*, *TURNING WHEEL*, Spring 1992, at 39.

62. Kabil Singh, *supra* note 60, at 11.

temptation by Mara. When tempted and taunted by Mara, no person was present to bear witness to his good deeds; but when Gotama touched the ground, a resounding chorus rang out attesting to his merit.⁶³

In many Native American traditions, the Earth is seen as the Mother of all things, and many species of animals have great significance in Native American religions. Native Americans "saw in virgin nature, in forests, trees, streams, and the sky, in birds and buffaloes, direct symbols of the spiritual world."⁶⁴ For Native Americans, the Earth itself is sacred — a living creature with whom they have an unbreakable bond.⁶⁵ Native Americans believe that creation is an on-going process "in which they are morally and religiously obligated to participate."⁶⁶ Failure to fulfill these duties will cause great harm to the Earth and those who depend on it.⁶⁷ The Native American does not objectify nature; rather, nature is an element within which he exists. He is a part of the environment, not apart from it. Therefore, nature should not be harmed because causing injury to the environment disrupts the perfect alignment of the Native American within the natural world.⁶⁸

In Islam, the Quran teaches that the bond between man and nature is inseparable. Man's transcendence to a higher

63. HARVEY, *supra* note 59, at 21. The moving of the "earth-witness" is frequently portrayed in Buddhist iconography where the Buddha is shown seated cross-legged in meditation with his right hand touching the earth. *Id.*

64. NASR, *supra* note 53, at 98.

65. *Lyng v. Northwest Indian Cemetery Protective Ass'n*, 485 U.S. 439, 460 (1988) (Brennan, J., dissenting).

66. *Id.* (citing U.S. Federal Agencies Task Force, American Indian Religious Freedom Act Report 11 (1979)). Each piece of land has a unique spiritual identity; "therefore, land is not fungible." *Id.* at 461. *Wilson v. Block*, 708 F.2d 735 (9th Cir. 1983); *Sequoyah v. TVA*, 620 F.2d 1159 (6th Cir.), *cert. denied*, 449 U.S. 953 (1980); *Badoni v. Higginson*, 638 F.2d 172 (10th Cir. 1980), *cert. denied*, 452 U.S. 954 (1981); *Crow v. Guliet*, 541 F. Supp. 785 (D.S.D. 1982); *Inupiat Community of Arctic Slope v. United States*, 548 F. Supp. 182 (D. Alaska 1982). See also Dean B. Suagee, *American Indian Religious Freedom and Cultural Resources Management: Protecting Mother Earth's Caretakers*, 10 AM. INDIAN L. REV. 1, 9-17 (1982). Native American resistance to European hegemony has been a struggle for sanctuary as well as living space. NASR, *supra* note 53, at 98.

67. 485 U.S. at 460-61 (Brennan, J., dissenting).

68. N. Scott Momaday, *Native American Attitudes to the Environment*, in *SEEING WITH A NATIVE EYE* 79, 84 (Walter Holden Capps ed., 1976).

state is dependent on his contemplation and understanding of the natural world.⁶⁹ He is at the center of the Cosmos, and is thus both master and custodian of nature.⁷⁰ Edith Brown Weiss notes that under Islam "[e]ach generation is entitled to use the resources but must care for them and pass them to future generations."⁷¹ There is an intimate connection between the inner state of man and the external, natural world.⁷² For example, Mystical Islam, or Sufism, abounds with animal imagery, emphasizing a commonality between man and nature.⁷³ Spiritually, Islam, in its many forms, requires that man examine and understand his inner state in order to come to terms with the full extent of nature in the real sense; nature must not be seen as something to manipulate or dominate, but rather, as something with which to harmonize.⁷⁴

Preserving biological diversity, then, is justifiable on many grounds, both consumptive and non-consumptive. All of the justifications for preserving individual endangered species or natural areas are also applicable to the preservation of biodiversity. In addition, the preservation of biodiversity can be justified on scientific grounds whereas the preservation of individual endangered species outside of the ecological context is, for the most part, justifiable only on aesthetic or moral grounds. An ecosystem that loses a species will come to a new equilibrium, though it may be much poorer for the loss. The

69. NASR, *supra* note 53, at 94-97.

70. 485 U.S. at 460-61 (Brennan, J., dissenting).

71. WEISS, *supra* note 53, at 18.

72. *Id.*

73. ANNEMARIE SCHIMMEL, *MYSTICAL DIMENSIONS OF ISLAM* 305-08 (1975). The image of soul as bird was popular as a primitive motif and can still be found today. *Id.* at 306. In Turkey, when someone has died, they say, "the soul has flown away." *Id.* at 306-07. Another popular theme in Persian poetry is the nightingale who yearns for the rose, which represents the soul longing for eternal beauty. *Id.* at 307. Other common nature symbols include the duck as human being, "half bound to the earth, half living in the ocean of God." *Id.* at 308. The crow represents the "ugly winter landscape of this human existence," the camel, the faithful person. *Id.* And the unclean dog represents the Sufi who longs to be purified. *Id.* "Every flower in the garden becomes . . . a tongue to praise God: every leaf and petal is a book in which God's wisdom can be read, if man will only look. God has put signs on the horizons and in man's soul (Sura 41:53); man has only to look at them." *Id.* at 308.

74. WEISS, *supra* note 53, at 18.

wide range of human values placed on biological diversity, then, would seem to warrant strong legal protection for the nation's flora and fauna.

D. The Current State of Biological Diversity

If one accepts that stopping the loss of biodiversity is an important goal, the next step is to assess the magnitude of the problem. It is difficult to calculate the total number of species that have been lost because scientists do not know how many species originally existed on Earth.⁷⁵ However, in the last 200 years, species extinction is proceeding at an alarming rate.⁷⁶ Because tropical forests contain more than 50% of the world's biological diversity,⁷⁷ it is not surprising that most of the United States government's efforts at biodiversity preservation have centered on providing aid to third world countries with tropical ecosystems.⁷⁸ Scientists have predicted that the destruction of the rainforests could result in the loss of 25% of all of the species on Earth within the next 30-40 years.⁷⁹ Indeed, the 1990's may be the last decade in which constructive, preventive measures rather than emergency measures can be taken.⁸⁰ If action is not taken now to stem the tide of extinctions, future generations will inherit "a biologically impoverished world, with potential social, health and economic consequences."⁸¹ In light of this overwhelming evidence, international and national efforts to preserve the rainforests in tropical countries like Brazil and Indonesia have gained tremendous momentum over the past decade. These efforts culminated in the International Convention on Biodiversity which was signed at the United Nations Conference on Envi-

75. Wilson, *supra* note 3, at 10.

76. *Id.*; see also McNEELY ET AL., *supra* note 5, at 11.

77. H.R. REP. NO. 259, at 8-9.

78. In 1989, the U.S. spent over \$23 million to fund biodiversity conservation activities abroad. H.R. REP. NO. 259, at 22-23.

79. Peter H. Raven, *Our Diminishing Tropical Forests*, in BIODIVERSITY 119, 121 (Edward O. Wilson ed., 1988); Paul R. Erlich & Edward O. Wilson, BIODIVERSITY STUDIES: SCIENCE AND POLICY, SCI., Aug. 16, 1991, at 760.

80. McNEELY ET AL., *supra* note 5, at 15.

81. H.R. REP. NO. 259, at 13.

ronment and Development in June, 1992.⁸²

While it is true that tropical forests contain a greater variety of organisms⁸³ and are therefore losing larger numbers of species, each year many ecosystems and species within United States territories are also seriously threatened with extinction.⁸⁴ Despite the successes of the Endangered Species Act and other environmental laws protecting species and ecosystems, the rate of extinctions in the United States is accelerating. In 1991, the Scientific Advisory Council of the Environmental Protection Agency ranked habitat destruction and the loss of biodiversity as two of the four major threats to the global environment.⁸⁵ The United States contains 8% of the world's species of plants and animals but is losing species at rates that are faster than those of many developing countries.⁸⁶ It is estimated that within the next ten years, the United States will lose over 600 species of plants as well as numerous kinds of butterflies, migratory birds, frogs, and freshwater fish.⁸⁷

A few specific examples will serve as useful illustrations of the seriousness of the problem in the United States. More than 70% of recorded extinctions in the United States have occurred in Hawaii.⁸⁸ Hawaii, which contains 25% of the species in the United States, has already lost numerous species of

82. Convention on Biological Diversity, June 5, 1992, 31 I.L.M. 818.

83. The vast majority of organisms in the rainforest are insects. It is not at all clear whether preservation priorities should be based solely on the numbers of species in a particular area. We need to protect all kinds of ecosystems and habitats. See Daniel H. Janzen, *Tropical Dry Forests: The Most Endangered Major Tropical Ecosystems*, in BIODIVERSITY, *supra* note 3, at 132-33 (Edward O. Wilson ed., 1988).

84. H.R. REP. NO. 259, at 10. It should be noted that a number of U.S. territories contain tropical rainforests. Guam, American Samoa, the Virgin Islands, and Puerto Rico all contain tropical ecosystems. *Id.* at 9.

85. SCIENTIFIC ADVISORY BOARD, ENVIRONMENTAL PROTECTION AGENCY, REDUCING RISK: SETTING PRIORITIES AND STRATEGIES FOR ENVIRONMENTAL PROTECTION 13 (1991).

86. H.R. REP. NO. 259, at 10. The rate of deforestation in Florida is roughly 25 times the rate in Brazil. *Id.* In addition, the ancient forests in the Pacific Northwest are more severely fragmented than the tropical rainforests of Brazil. Timothy Egan, *Citing Space Photos, Scientists Say Forests in the Northwest are in Danger*, N.Y. TIMES, June 11, 1992, at A13.

87. 1991 Hearing, *supra* note 39, at 27.

88. H.R. REP. NO. 259, at 10.

birds, and many of its rare and unique plants are also threatened with extinction.⁸⁹ This is a loss to both the United States and the rest of the world since 90% of the species on the Hawaiian Islands are not found anywhere else on Earth.⁹⁰ In California, 91% of original wetlands have been lost,⁹¹ and over 600 species of plants are in danger.⁹² Florida's unique Everglades ecosystem is on the verge of irreparable harm due to overwhelming human demands on the waters that give life to the system.⁹³ Nearly one-third of the flora and fauna of Texas are at risk.⁹⁴ In addition, logging in the ancient forests of the Pacific Northwest has resulted in the fragmentation of the habitat of the northern spotted owl.⁹⁵ Finally, national parks, forests, and wildlife refuges throughout the United States are suffering from both overuse by visitors and encroachment by neighboring human communities and the pollution they create.⁹⁶ A 1986 study of the North American national parks demonstrated the loss of many large animal species.⁹⁷ Since the parks' wildlife is largely protected from hunters, this decrease in species can be attributed to habitat loss.⁹⁸ Because a decrease in habitat size increases the risk of species extinctions,⁹⁹ the smallest parks experienced the larg-

89. TOBIN, *supra* note 3, at 4-5.

90. H.R. REP. NO. 259, at 10.

91. *Id.* at 12.

92. *Id.*

93. COUNCIL ON ENVIRONMENTAL QUALITY ("CEQ"), U.S. NATIONAL REPORT PREPARED FOR SUBMISSION TO THE UNITED NATIONS CONFERENCE ON ENVIRONMENT AND DEVELOPMENT 296 (1992) [hereinafter *U.S. National Report*].

94. *Id.*

95. See, e.g., *Seattle Audubon Soc'y v. Evans*, 771 F. Supp. 1081 (W.D. Wash.), *aff'd*, 952 F.2d 297 (9th Cir. 1991); Designation of Critical Habitat for the Northern Spotted Owl, 57 Fed. Reg. 1796 (1992); Management for the Northern Spotted Owl: National Forests in Washington, Oregon, and California, 57 Fed. Reg. 8621 (1992).

96. Barry Meier, *Refuges Feel Strain as Wildlife and Commerce Collide*, N.Y. TIMES, Dec. 1, 1991, at 38.

97. LESTER R. BROWN ET AL., STATE OF THE WORLD 104 (1988) (Discussing a study by William D. Newmark, *A Land Bridge Island Perspective on Mammalian Extinction in Western North American Parks*, NATURE, Jan. 29, 1987); see also Lovejoy, *supra* note 15, at 43.

98. BROWN ET AL., *supra* note 97, at 103.

99. When an area becomes separated from other similar areas, the number of original species which existed in the area when it was not isolated declines to the

est percentage of species loss.¹⁰⁰ However, even very large national parks such as Rocky Mountain and Yosemite have lost between one-fourth and one-third of their native mammals.¹⁰¹

Despite all of the scientific evidence that the nation's biological diversity is in danger, many government and industry officials still claim that there should be more development, less emphasis on animals, and more concern for human jobs and quality of life.¹⁰² There is a growing trend toward increasing the power of private property owners to obtain compensation for takings pursuant to statutes protecting the environment.¹⁰³ Most particularly, former Secretary of the Interior Manuel Lujan, who was legally responsible for the preservation of endangered species, called for a weakening of the act to better account for economic interests.¹⁰⁴ Perhaps the most striking example of the threat to biodiversity is the debate over opening the Arctic National Wildlife Refuge to oil drill-

number it would be able to support as an island. For some species, this decline is so large that it leads to extinction. This theory is known as the equilibrium theory of island biogeography. The reduction in the size of a type of habitat leads to a decline in the value of the remaining habitat. For example, if 90% of the original area is lost, then only about half of the original species will survive in the remaining area. See MYERS, *supra* note 2, at 222-25; WILSON, *supra* note 5, at 220-28. See also Marla Cone, *Massive Wave of Extinction Perils County Wildlife; Ecology: Biologists Find Isolated Islands of Open Space Can't Sustain Animals. Mountain Lions May Be Among the First to Go*, L.A. TIMES, San Diego County ed., Jan. 1, 1991, at B1.

100. BROWN ET AL., *supra* note 97, at 103, 104.

101. *Id.* at 104 (citing Newmark, *supra* note 97).

102. See, e.g., Charles C. Mann & Mark L. Plummer, *The Butterfly Problem*, THE ATLANTIC MONTHLY, Jan. 1992, 47-70; Thomas Palmer, *The Case for Human Beings*, THE ATLANTIC MONTHLY, Jan. 1992, at 83-88. The "wise-use movement" is a new political coalition which is being forged between groups ranging from small individual inholders in national parks to large mining companies, all of whom feel threatened by the environmental movement. Keith Schneider, *Environment Laws Are Eased by Bush as Election Nears*, N.Y. TIMES, May 20, 1992, at A1, A18; Jon Krakauer, *Brownfellas*, OUTSIDE, Dec. 1991, at 68. See also Maura Dolan, *Bush Woos West by Trying to Ease Land Restrictions*, L.A. TIMES, Aug. 4, 1992, at A1.

103. See Keith Schneider, *Environment Laws Face A Stiff Test From Landowners*, N.Y. TIMES, Jan. 20, 1992, at A1; Marcia Coyle, *Property Revival: Economic Rights Gurus Look to High Court*, NAT'L L.J., Jan. 27, 1992, at 42. However, the Supreme Court decision in *Lucas v. South Carolina Coastal Commission* indicates that the Court is not prepared to abandon its takings law precedents. 112 S. Ct. 2886 (1992).

104. *Lujan: Change Endangered Species Act*, UPI (May 11, 1990) (LEXIS, Nexis Library, Current File) [hereinafter *Lujan*].

ing.¹⁰⁵ Another example of this conflict is occurring in Southern California where after six years of drought, the water has finally run out. Recently, the government decided to cut off the water supply to farmers in the area, citing the ESA among other reasons.¹⁰⁶ Conflicts of this type are arising all around the country; thus, in the immediate term, it is likely that several species will be sacrificed in political battles. But each time a group of loggers or farmers or businessmen argues that "just this once" a species must be sacrificed for the greater good of the human community, the risk that future generations will live in a world lacking in biodiversity increases. All of these trends place the future of biological diversity in a very precarious position.

III. Past, Present, and Future Efforts to Preserve Biodiversity

A. The Failure of Current Approaches to Biodiversity Preservation

Despite the efforts of the government and environmentalists over the past twenty years to halt the loss of species, it has become increasingly clear that a new approach to biodiversity preservation is needed.¹⁰⁷ Certainly, the numerous laws designed to protect the natural environment have helped preserve some species and ecosystems;¹⁰⁸ however, many of the nation's wild lands are still in imminent danger. Biologists

105. Jessica Matthews, *A Lethargic Energy Bill*, WASH. POST, Oct. 12, 1992, at A23. The provision for drilling in the Arctic National Wildlife Refuge was dropped from the final version of the Comprehensive National Energy Policy Act. See H.R. 776, 102d Cong., 1st Sess. (1992).

106. Robert Reinhold, *U.S. Cuts Off California Farmers' Water Supply*, N.Y. TIMES, Feb. 15, 1992, at Sec. 1, 1. Several species of fish require a certain water temperature level to survive, yet the human demands on reservoirs are reducing the amount of water, thereby increasing the temperature. *Id.* at 7. The farmers believe the fish should be sacrificed to save their crops. The environmentalists and the fishermen are fighting to preserve the fish.

107. For a thorough discussion of the failures of past and present environmental laws and some suggestions on how to improve the legal protection of biodiversity in the U.S., see Holly Doremus, *Patching the Ark: Improving Legal Protection of Biological Diversity*, 18 ECOLOGY L.Q. 265 (1991).

108. *Id.* at 287-304.

and environmentalists have begun to seriously question the efficacy of focusing on a single species when the real goal is to preserve the habitats in which these species live. Indeed, it is futile for the federal government and private individuals to invest in costly single species recovery programs while ignoring the fact that habitats are disappearing. This realization has led to calls for a more systematic and preventive approach to replace the current crisis management approach of the Endangered Species Act.¹⁰⁹ This chapter discusses the reasons articulated for the failure of current laws to adequately protect biodiversity. It then discusses the biodiversity bill introduced in the 102d Congress as a first step toward a new approach to preserving biological diversity.

1. The Piecemeal Approach of Current United States Laws

A 1987 report by the Office of Technology Assessment found that federal efforts to preserve biological diversity are ineffective.¹¹⁰ The report found that the United States' efforts were too fragmented to address "the full range of concerns over the loss of biological diversity."¹¹¹ Since current laws were not designed to protect biological diversity, it is not surprising that they fail to adequately achieve that goal. Currently, there are twenty-nine federal laws protecting various parts of the natural environment.¹¹² Individual laws have been passed to protect endangered species,¹¹³ marine mammals,¹¹⁴ wild and scenic rivers,¹¹⁵ forests,¹¹⁶ fisheries,¹¹⁷ wetlands,¹¹⁸

109. Albrecht & Jackson, *supra* note 28, at S1.

110. U.S. CONGRESS, TECHNOLOGIES TO MAINTAIN BIOLOGICAL DIVERSITY, OFFICE OF TECHNOLOGY ASSESSMENT 221 (1987).

111. *Id.*

112. For a list of twenty-nine federal laws relating to biodiversity preservation, see *id.* at 223.

113. Endangered Species Act, 16 U.S.C. §§ 1531-44 (1988).

114. Marine Mammal Protection Act, 16 U.S.C. §§ 1361-1407 (1988).

115. Wild and Scenic Rivers Act, 16 U.S.C. §§ 1271-87 (1988).

116. National Forest Management Act, 16 U.S.C. §§ 1600-87 (1988).

117. Magnuson Fishery Conservation and Management Act of 1977, 16 U.S.C. §§ 1801-62 (1988).

118. Clean Water Act § 404, 33 U.S.C. § 1344 (1988).

and other species and ecosystems.¹¹⁹ In addition, there are numerous treaties, as well as state and local laws, that protect species and ecosystems. However, these statutes are administered by a variety of agencies that engage in little or no coordinated planning. The U.S. National Report states:

Many U.S. laws mandate conservation of some aspect of biological diversity, from the broad mandate of the National Forest Management Act [NFMA]¹²⁰ to the habitat conservation approach of the Endangered Species Act [ESA]¹²¹ and the specific mandates of the Migratory Bird Conservation Act.¹²² . . . Nevertheless, these programs and statutes do not form a coherent comprehensive framework for assessing or ensuring progress toward a common goal, in part because no one has heretofore articulated such a goal.¹²³

In general, three types of laws are used to protect and manage biological diversity in the United States. The first kind of law is typified by the sustainable-yield approach used in forests, fisheries, and game reserves.¹²⁴ These laws are designed to maintain a steady harvest of natural resources. The second type of law currently in effect is best exemplified by the Endangered Species Act.¹²⁵ ESA protects individual species from extinction by legally protecting them *in situ* or, as a last resort, by placing them in zoos until a viable population can be released back into the wild.¹²⁶ The third type of law focuses on habitat preservation. It provides for the purchase or acquisition of large tracts of land and for strict regulation of uses on that land. Laws creating wilderness ar-

119. See TECHNOLOGIES TO MAINTAIN BIOLOGICAL DIVERSITY, *supra* note 110, at 223.

120. 16 U.S.C. §§ 1600-87 (1988).

121. 16 U.S.C. §§ 1531-44 (1988).

122. 16 U.S.C. §§ 715-15s (1988).

123. COUNCIL ON ENVIRONMENTAL QUALITY, U.S. NATIONAL REPORT PREPARED FOR SUBMISSION TO THE U.N. CONFERENCE ON ENVIRONMENT AND DEVELOPMENT (Draft, May 1991, at 69, on file with CEQ).

124. See Multiple-Use Sustained-Yield Act, 16 U.S.C. §§ 528-31 (1988).

125. 16 U.S.C. §§ 1531-44 (1988).

126. See 16 U.S.C. § 1539(j).

eas¹²⁷ and wildlife refuges¹²⁸ are examples of this type of legal mechanism. Only this third category can effectively protect a diversity of species and ecosystems. Although protected areas in the United States were not specifically designed to preserve biodiversity, many of them are large enough to protect ecosystems containing a great diversity of species.¹²⁹ In order to effectively protect biodiversity, however, such conservation areas must be of the proper size and in the right locations.

2. Reactive Nature of the Endangered Species Act

For the most part, current United States species protection laws are not only piecemeal but also reactive in character. They were designed to be a safety net to rescue a species when its population dwindles below a certain level. The Endangered Species Act¹³⁰ is the epitome of this type of law. Words such as "endangered,"¹³¹ "threatened,"¹³² and "critical habitat"¹³³ are a telling indication of the way in which the law is designed to function. The ESA is triggered only when a species has experienced a tremendous reduction in its population, gene pool, and habitat. At that point, the federal government engages in a last ditch effort at preservation.¹³⁴ Sometimes it succeeds; often it does not. Nearly four thousand species are currently waiting to be listed for protective status.¹³⁵ The reactive approach to species preservation is both costly and ineffective.¹³⁶ It requires drastic and expensive preservation measures where an ounce of prevention might have saved more species at a lower cost.

In the past, Congress has recognized that preventing envi-

127. National Wilderness Preservation System, 16 U.S.C. §§ 1131-36 (1988).

128. Protection and Conservation of Wildlife, 16 U.S.C. §§ 661-68ee (1988).

129. F. William Burley, *Monitoring Biological Diversity for Setting Priorities in Conservation*, in BIODIVERSITY 227, 228 (Edward O. Wilson ed., 1988).

130. 16 U.S.C. §§ 1531-44 (1988).

131. 16 U.S.C. § 1532(6).

132. 16 U.S.C. § 1532(20).

133. 16 U.S.C. § 1532(5)(A).

134. David E. Blockstein, *Toward a Federal Plan for Biological Diversity*, ISSUES IN SCI. & TECH., Summer 1989, at 63, 64.

135. MANN & PLUMMER, *supra* note 102, at 52.

136. Blockstein, *supra* note 134, at 64.

ronmental degradation is easier and more cost effective than cleaning up after the problem has occurred. David Blockstein analogizes the ESA to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA).¹³⁷ Both are remedial statutes that are triggered after a disaster has occurred. By contrast, Congress established preventive measures in the area of toxic wastes when it passed the Resource Conservation and Recovery Act (RCRA)¹³⁸ and the Toxic Substances Control Act (TSCA).¹³⁹ RCRA and TSCA are designed to stop problems relating to the use and disposal of toxic wastes and toxic substances before they happen. However, no such measure has been taken with regard to stopping the loss of biological diversity. This is a gap that urgently needs to be filled.

3. Biological Shortcomings of the Endangered Species Act

Daniel Rohlf has listed several reasons for the failure of the ESA to protect biodiversity.¹⁴⁰ Rohlf's assertions, though useful in pointing out the difficulties of using the Act to protect biodiversity, can be characterized as failures resulting more from political constraints than from shortcomings of the statute itself.¹⁴¹ Rohlf first argues that the ESA protects high profile species that do not usually play an important role in overall biodiversity.¹⁴² Because listing decisions under ESA are political, the Fish and Wildlife Service (FWS) tends to list species such as birds and mammals that are more appealing to people, rather than basing decisions on the scientific impor-

137. 42 U.S.C. §§ 9601-75 (1988); Blockstein, *supra* note 134, at 63, 64.

138. 42 U.S.C. §§ 6901-92k (1988).

139. 15 U.S.C. §§ 2601-71 (1988).

140. See Daniel J. Rohlf, *Six Biological Reasons Why the Endangered Species Act Doesn't Work-And What to Do About It*, CONSERVATION BIOLOGY, Sept. 1991, at 273.

141. See Michael O'Connell, Response To: Six Biological Reasons Why the Endangered Species Act Doesn't Work and What to Do About It (1992) (unpublished manuscript, on file with the World Wildlife Fund).

142. Rohlf, *supra* note 140, at 275.

tance of a species.¹⁴³ In addition, species recovery plans do not reflect the importance of species in terms of biodiversity. Between 1982 and 1986, the FWS spent 50% of its funds on plans for twelve species, only six of which were considered highly threatened.¹⁴⁴ A better approach would protect key-stone or indicator species, meaning species that are central to the health of ecosystems as a whole or that are indicative of problems with ecosystem health.¹⁴⁵ Second, Rohlf argues, the terms "endangered" and "threatened" are not objectively definable, thus politics and economics too often enter into listing decisions.¹⁴⁶ Third, policies under the Act do not adequately protect distinct populations of species unless they are separately listed, which happens very rarely.¹⁴⁷ That means that a population of a species may be allowed to become extinct if the species exists in large enough numbers elsewhere. Fourth, many FWS decisions are made in closed-door proceedings, without the participation of outside experts.¹⁴⁸ Therefore, independent scientists with more objective views rarely influence FWS decisions. Fifth, the Act does not sufficiently protect habitat reserves in order to sustain recovered populations.¹⁴⁹ Finally, Rohlf writes, federal agencies tend to discount uncertainty in making their decisions.¹⁵⁰ All of these inconsistencies between science and law contribute to the inability of the ESA, as it is currently implemented, to adequately protect biodiversity.

Protecting endangered species of plants, animals, and other living organisms can best be done by preserving them in the habitats in which they live, reproduce, and evolve. Protecting biodiversity will require planning and coordinating the management of federal, state, and private lands which com-

143. *Id.*

144. *Id.*

145. See *Seattle Audubon Soc'y v. Evans*, 771 F. Supp. 1081, 1083 (W.D. Wash.), *aff'd*, 952 F.2d 297 (9th Cir. 1991).

146. Rohlf, *supra* note 140, at 276.

147. *Id.* at 277.

148. *Id.* at 277-78.

149. *Id.* at 278-79.

150. Rohlf, *supra* note 140, at 279.

prise ecosystems. Present environmental laws are piecemeal, reactive and often inconsistent with the science of conserving biodiversity.¹⁵¹ Indeed, if protecting biological diversity is the goal, the laws will have to be structured differently to favor advanced planning over emergency rescues, and to allow science to trump economics and politics when necessary. The biodiversity bill provides an opportunity to move in this direction.

B. The Biodiversity Bill — The First Step Toward a Coordinated Federal Approach To Protecting Biodiversity

In response to the growing threat posed by the loss of biological diversity, the United States Congress is considering a bill entitled the National Biodiversity Conservation and Environmental Research Act.¹⁵² The biodiversity bill requires the federal government to rethink the way in which current and future protected areas will be managed. The bill is the first attempt to unify the federal agencies' approaches to protecting biodiversity. United States Congressman James Scheuer (D-NY), the bill's original sponsor, described its intended purpose:

It is the purpose of this biodiversity legislation to . . . enable every element in our society to perceive the problem of biological diversity in its whole terms, in its holistic terms, looking at it not as an endangered species, but looking at the problem of how we preserve endangered ecosystems, each of them with perhaps thousands of endangered species.¹⁵³

The biodiversity bill makes conservation of biological diversity a national goal and requires the development and im-

151. See *supra* text accompanying notes 110-29.

152. H.R. 585, 102d Cong., 1st Sess. (1991). Another version of the bill (H.R. 2082) was before the House Committee on Merchant Marine and Fisheries. In addition, a substantially similar bill was before the Senate. S. 58, 102d Cong., 1st Sess. (1991). H.R. 585 was reported out of the House Committee on Science, Space And Technology in October 21, 1991. The full House took no action on the bill.

153. 1991 *Hearing*, *supra* note 39, at 2.

plementation of a coordinated federal strategy on biodiversity protection. It is designed to foster the research, planning and coordination necessary to maintain or restore "fully functioning ecosystems on federal lands and waters."¹⁵⁴ The bill also requires that biological diversity be considered specifically when federal agencies conduct environmental impact statements under the National Environmental Policy Act (NEPA).¹⁵⁵ The Council on Environmental Quality, which issues guidelines under NEPA, would develop non-binding guidance to help federal agencies make decisions concerning the preservation and management of biological diversity. The biodiversity bill also directs federal agencies to review programs for consistency with the goal of protecting biodiversity.¹⁵⁶

One of the most important parts of the bill is Section 5, which requires the Council on Environmental Quality to identify areas of common concern among agencies and to develop a coordinated federal strategy for conserving biodiversity. As mandated by Section 5, the strategy identifies a means of maintaining viable populations of native plants and animals as well as representative examples of all types of natural communities native to the United States. In addition, Section 5 requires the CEQ to identify the specific roles of various federal agencies in attaining the objectives of the federal strategy and to establish guidelines to help federal agencies make their policies, actions and programs consistent with federal strategy. The importance of the CEQ's role in this process should not be underestimated. The CEQ is responsible for defining the requirements of NEPA. In the past, the Supreme Court has accorded great deference to the CEQ's regulations and its interpretation of NEPA.¹⁵⁷ Therefore, the CEQ would influence and develop the federal plan for biodiversity protection.

154. H.R. 585 § 5.

155. H.R. 585 § 6 (1991); National Environmental Policy Act of 1969, 42 U.S.C. § 4321 (1977 & Supp. 1991).

156. H.R. 585 § 6.

157. *Robertson v. Methow Valley Citizens Council*, 490 U.S. 332, 356 (1989) (court based its decision on CEQ's reversal of its earlier position requiring a "worst-case analysis" under NEPA).

Finally, Section 7 of the bill provides for the establishment of a National Center for Biological Diversity within the Smithsonian Institution to compile new and pre-existing information. This information would be accessible to federal agencies, enabling them to effectively implement the federal strategy.¹⁵⁸ In addition, it would structure research grants and contracts so as to fill the gaps in knowledge about biological diversity.¹⁵⁹ The Center would train scientists, collect data, coordinate existing information, and provide that information to the CEQ so that it could develop a comprehensive strategy. The Center would serve as a clearinghouse for information on biodiversity collected at the federal, state, and local levels.¹⁶⁰ It would also make the information available to other agencies, resource managers and interest groups concerned with the protection of biodiversity.¹⁶¹ As a clearinghouse, the Center would establish a network of existing databases to promote better access to information. The long term goal of this network would be to protect species and ecosystems before they become threatened or endangered. But in the short run, "emergency" actions would also be taken by using existing information to revise recovery and resource management plans.

Although the biodiversity bill is a laudable first step toward biodiversity preservation, its effect will ultimately depend upon whether it is accompanied by a change in the way public (and private) lands in the United States are viewed and managed. This change will require further legal action, either through laws or administrative regulations, to establish standards for decisionmaking. The next chapter will compare four possible scenarios and their implications for biodiversity protection in the United States.

IV. Four Models for Preserving Biodiversity

The biodiversity bill provides an excellent opportunity to begin the transition from narrowly focused species protection

158. H.R. 585 § 7.

159. H.R. REP. NO. 259, 102d Cong., 1st Sess., pt. 1, at 26 (1991).

160. *Id.* at 25, n.2.

161. *Id.* at 25.

laws to a broader based ecosystems protection scheme. It also provides an occasion to look at the public lands from a different perspective and with a different purpose in mind. However, the bill itself will be only the first step in the preservation of biological diversity. This chapter discusses four scenarios that could arise subsequent to the bill's passage. The first scenario is that envisioned by those who want to weaken or eliminate altogether the Endangered Species Act and the problems it creates for industry. This proposal would set aside representative ecosystems in what might be called "living museums" and would free up the rest of the land for development. The second scenario would be to accept the bill on its face with little or no subsequent formal action. The third scenario would be to alter the way in which the public lands are managed to better protect biodiversity. This could be accomplished through legislative or administrative action which would impose more substantive requirements on agencies responsible for public lands. The final scenario would be an Ecosystems Protection Act modeled on the Endangered Species Act. It would be designed to inventory ecosystems in the United States, categorizing them according to their need for protection, and allowing for a balance of economics and environmental protection. The new act would contain both procedural and substantive standards by which decisions relating to biodiversity could be made. After comparing the four models, it will be argued that the fourth scenario best protects biodiversity and ecosystems on public and private lands.

A. The "Living Museums" Approach

In the "living museums" approach, a portion of land is set aside as protected from all development.¹⁶² There are

162. Protected areas can control human use or occupancy in a continuum from strict reserves to multiple use. Presumably, living museums fit in the category of scientific reserve/strict nature reserve which "[p]rotect nature and maintain natural processes in an undisturbed state in order to have ecologically representative examples of the natural environment available for scientific study, environmental monitoring, and education, and for the maintenance of genetic resources in a dynamic and evolutionary state." IUCN 1985, United Nations List of National Parks and Protected Areas, *quoted in* McNEELY ET AL., *supra* note 5, at 59.

many approaches for defining these areas, including identifying critical areas for habitat or critical resources (such as water).¹⁶³ Optimally a combination of these factors will result in an integrated approach.¹⁶⁴

While an ecosystems approach to preserving biodiversity has been applauded by both biologists and environmentalists, shifting to a system of living museums could be detrimental to biodiversity in the long run. For example, Former Interior Secretary Manuel Lujan, who was technically responsible for protecting endangered species, has called for a weakening of the ESA, which would accelerate the loss of biodiversity.¹⁶⁵ During recent controversies over species such as the Mt. Graham red squirrel and the northern spotted owl, Lujan publicly called for an "endangered ecosystems" act.¹⁶⁶ Although he did not specifically outline his proposal, it is likely that his ecosystems approach would have allowed the FWS to select certain representative areas for protection while opening the rest of the public domain to development. Under such an act, "protected" ecosystems would be preserved as living museums. But, such a proposal would perhaps allow species on the rest of the public domain to become extinct. Such a proposal would also allow economic development to proceed without the obstacles imposed by the Endangered Species Act. Indeed, private developers would welcome a definite determination of protected and unprotected areas. Such a decision would mean an immediate green light for the development of natural areas. Under such a program, protected areas would exist as living museums while outside the protected areas development and habitat loss would continue unabated.

The living museums approach raises biological, political, and moral concerns. First, from a biological point of view, such an approach is likely to be ineffective because it would be very fragmented. The island biogeography theory discussed

163. See, e.g., Reinhold, *supra* note 106.

164. McNEELY, ET AL., *supra* note 5 at 56-62.

165. See Lujan, *supra* note 104.

166. *Id.*

in Section II.D¹⁶⁷ indicates that when ecosystems are reduced in size, the value of the remaining area also decreases. Thus, any attempt to create a system of living museums to visit and study would ultimately prove inadequate.

Second, while the biodiversity bill will be a necessary addition to the country's plant and wildlife protection laws, the greatest danger inherent in the bill is that fewer species will actually be protected. Therefore, it is essential that the biodiversity bill be viewed as an addition to existing laws rather than a replacement for them. A living museums approach cannot take the place of actions to help species that are currently in need of protection. Ideally, a biodiversity act would diminish the need for such emergency actions under the ESA. However, many species are currently in danger and would not be helped by such an act. Furthermore, despite efforts to preserve habitats, there will always be instances in which a species will become threatened. For this reason, the Endangered Species Act remains an important mechanism for protecting individual species threatened with extinction. In its 1991 annual report, the Council on Environmental Quality stressed that even with the shift in focus to ecosystems, "a vigorous response to the decline of individual species based on the Endangered Species Act remains essential."¹⁶⁸

Finally, with the living museums approach comes the danger that the extensive research and data compiled with good intentions would be used to sanction a policy of "no net harm" to humans; that is, there would be an attempt to find the minimum level of species needed for humans to survive. Not only would this approach be scientifically infeasible, but it is a gamble which humans cannot afford to lose.

B. Implementing the Terms of the Bill on Its Face

Even without subsequent legislative or administrative action, implementing the provisions of the biodiversity bill would no doubt have some effect on the preservation of bi-

167. See *supra* text accompanying notes 88-101.

168. COUNCIL ON ENVIRONMENTAL QUALITY, TWENTY-FIRST ANNUAL REPORT 141 (1991).

odiversity in the United States. Although no drastic political or administrative changes would occur, the mere fact that an agency has some new responsibility often justifies its taking at least some actions. It is therefore worthwhile to examine what implementing the proposed bill would accomplish.

First, the bill would create a "National Center" to increase the knowledge base for managers, policy-makers, and citizens.¹⁶⁹ Increased information would certainly have a positive impact on the way federal agencies set priorities for managing biodiversity. Indeed, compiling an inventory of biodiversity in the United States must be the first step in any effort to protect biodiversity.¹⁷⁰

Second, the bill would foster informal cooperation between government agencies, most likely in the form of inter-agency task forces with weekly or monthly meetings.¹⁷¹ Such meetings might result in an inter-agency memorandum of understanding or a set of guiding principles for agency action. However, under the bill each agency would retain the discretion to manage the lands over which it has jurisdiction in any way it chooses. The political constraints on agencies such as the Departments of Agriculture and Interior may prevent those agencies from making substantive changes.

Finally, adding the specific requirement of assessing biological diversity to the NEPA requirements may be somewhat useful.¹⁷² While federal agencies are currently required to note

169. H.R. 585 § 9. Regardless of Congress' failure to pass the Biodiversity Bill, the Vice President of the Smithsonian has said that the United States will establish a Biodiversity Center to act as a coordinating body for efforts to catalog Biodiversity. *U.S. Will Create Biodiversity Center Within Year, Smithsonian Official Says*, Daily Env't Rep. (BNA) No. 217, at A-2 (Nov. 9, 1992).

170. WILSON, *supra* note 5, at 313-15.

171. H.R. 585 § 8.

172. The National Environmental Policy Act (NEPA), 42 U.S.C. §§ 4321-70b, requires the preparation of a detailed statement on the environmental impacts of the proposed action. § 4332. The CEQ position under the Bush Administration is that the bill is not necessary since NEPA already requires the inclusion of biological diversity when an action is expected to have a significant environmental impact. Telephone interview with Larry Flick, Legislative Affairs Director, Council on Environmental Quality (Feb. 28, 1992). However, the biodiversity bill explicitly required that "[i]n reviewing environmental impact statements EPA shall take into account the impact of the proposed action on biological diversity." H.R. 585 § 5(f).

any impacts on species which are listed as threatened or endangered, agencies have generally not considered the broader issues such as habitat fragmentation, a major cause of the loss of biodiversity.¹⁷³ Therefore, specifically requiring federal agencies to consider the impacts of an action on biodiversity may make it more likely that a harmful project will be defeated.¹⁷⁴ However, as the Supreme Court recently noted, "other statutes may impose substantive environmental obligations on federal agencies, but NEPA merely prohibits uninformed — rather than unwise — agency actions."¹⁷⁵ Also, the current Supreme Court is unlikely to strengthen NEPA's control over federal agency actions. In addition, CEQ's guidelines will almost certainly be non-binding standards for preserving biodiversity. Thus, specifically mandating the consideration of biodiversity in an Environmental Impact Statement ("EIS") is unlikely to change the outcome of many agency decisions.

The bill on its face is the first step in the direction of improved protection for biological diversity. However, it falls short because it does not mandate enough change to seriously affect the state of biodiversity in the United States. Merely adding the words "biological diversity" to an EIS will not be enough to preserve biodiversity if it is simply a bureaucratic formality. Preserving the nation's biological resources will require a more dramatic change, one which implements scientific principles through law.

C. Improving Management of Biodiversity on the Public Lands

This third model would allow for a fundamental rezoning of the public lands to better protect biological diversity. The ideal means of protecting the fullest range of biological resources would be a system of protected areas selected on the basis of appropriate scientific parameters. The areas would have to be large enough to protect habitats and to allow nature to evolve without human interference. At the same time,

173. H.R. REP. NO. 259, at 22.

174. See *Sierra Club v. Marita*, 769 F. Supp. 287, 291 (E.D. Wis. 1991).

175. *Robertson v. Methow Valley Citizens Council*, 490 U.S. 332, 351 (1989).

management policies should allow for the efficient use of natural resources by surrounding communities.¹⁷⁶

The United States already has a good foundation — in its parks, forests, wilderness, refuges, and other public lands — upon which to build a network of protected areas. However, fundamental changes will be required to manage those areas for the purpose of preserving biological diversity. In order to stop the massive extinctions occurring in the United States, the federal government must take three major steps. First, a fundamental “rezoning” of existing protected areas will be required. For example, national park managers must be directed to impose restrictions which allow access but limit the impact of human use. Second, in addition to the protection of federal lands, preserving biological diversity will also require the cooperation of states and private landowners with holdings in semi-natural areas which would sustain the health of the surrounding ecosystems.¹⁷⁷ Third, the federal government should work in conjunction with state and local agencies, public interest groups, and private land owners to acquire greater areas of land, particularly those areas which contain unique ecosystems and species.¹⁷⁸ Although the biodiversity bill does not specifically call for such a broad, holistic approach, it would provide for the coordination of federal efforts to preserve biodiversity.¹⁷⁹ The coordinated federal plan mandated by the biodiversity bill could provide an opportunity to revamp the way in which the nation’s protected areas are managed.

The conflict surrounding appropriate use of the national parks illustrates problems faced by public lands managers. The National Park Service Act is ambiguous in terms of how human uses should be weighed against other uses such as the protection of wildlife.¹⁸⁰ One commentator who has examined

176. McNEELY ET AL., *supra* note 5, at 61.

177. Blockstein, *supra* note 134, at 65-66.

178. Bryan Norton suggests a land trading program could be used to acquire from private owners those lands containing unique ecosystems. See NORTON, *supra* note 6, at 269.

179. H.R. 585, 102d Cong., 1st Sess. §§ 5, 7 (1991).

180. Kyla Seligsohn-Bennett, *Mismanaging Endangered and “Exotic” Species in the National Parks*, 20 ENVTL. L. 415, 418 (1990).

the legislative history of the Act as well as the political climate which existed at the time of its passage has concluded that the Act is essentially preservationist in its intent.¹⁸¹

Although many scholars have accepted the multiple-use mandate as the guiding force behind the Park Service's actions, William Shutkin argues that the only uses which were intended to be allowed in the parks were those that would not disturb the wildlife.¹⁸² He concludes that the Organic Act requires the National Park Service (NPS) to give priority to wildlife preservation over human uses that may be detrimental to species which exist in the parks.¹⁸³

At the time the Act was passed, it was not expected that the most serious threats to the parks would be internal ones. In a 1980 report to Congress, the NPS found that overuse was a major threat to the viability of the parks.¹⁸⁴ Since that time, little has been done to change the way in which the NPS manages the parks. In 1990, the NPS reported over 258.7 million recreational visits to the national parks.¹⁸⁵ The increasing number of visitors leads to increased soil erosion, vehicle noise, and pollution. It is becoming clear to both environmentalists and park managers that action is required to save the parks. Park managers have the ability to make choices which protect the nation's heritage of biological diversity. First, managers can restrict various uses to lessen the detrimental impact of tourism on the parks. Visitors should be encouraged to change the way they use the parks in order to minimize the disruption of park ecosystems. This does not necessarily mean raising fees so that only a few can afford to visit the parks.¹⁸⁶ Managers of Yellowstone National Park have been faced with increasing numbers of wealthy tourists who drive bigger cars

181. William A. Shutkin, *The National Park Service Act Revisited*, 10 VA. ENVTL. L.J. 345 (1991).

182. *Id.* at 369.

183. *Id.*

184. Seligsohn-Bennett, *supra* note 180, at 416.

185. Lovejoy, *supra* note 15, at 41.

186. Preservationists have often been accused of being elitist. Raising fees so that only the rich can visit national parks is not a sound preservation policy because the parks will lose appeal for many voters and taxpayers. Providing for both low and high cost lodging is a better way to equalize access to the nation's natural heritage.

and want bigger hotels and restaurants.¹⁸⁷ Park managers could mitigate their impact by contracting with local communities to provide buses, bicycles, horses, or other innovative types of recreational vehicles which use electricity, natural gas, or solar power. This would give local residents an incentive to protect the parks as well. Park managers could also increase the number of tent camps and low impact housing instead of the luxury hotels which have more adverse impacts on the environment. Most importantly, park managers should be given authority to restrict or even completely prohibit the use of some areas if there is a specific threat to a plant or animal species. A model of scientifically planned management of biodiversity already exists in the Man and the Biosphere Program (MAB), which has been operated by the United Nations Education Scientific and Cultural Organization ("UNESCO") for over a decade.¹⁸⁸ MAB was designed to protect the natural environment while promoting regional economic development consistent with the purposes of the protected area. Since it was designed to meet the needs of both developed and developing countries, the program placed a special emphasis on involving local communities in the protection of resources.¹⁸⁹ The MAB program offers both a model of inter-agency cooperation and a technical model that could be the basis for a new network of protected ecosystems. Clearly, cooperation between various federal, state, and local institutions will be an essential part of maintaining biodiversity on

187. See John Lancaster, *Two Visions Blur Yellowstone's Future*, WASH. POST, Aug. 27, 1990, at A1.

188. See generally EDUCATION, SCIENTIFIC, AND CULTURAL ORGANIZATION (UNESCO), A PRACTICAL GUIDE TO THE MAN AND THE BIOSPHERE PROGRAMME (MAB) (1987) [hereinafter UNESCO].

189. The difficulties of balancing environmental protection and development are particularly severe in the developing world, where most of the world's biodiversity is found. In Brazil, and other countries in Latin America and Asia, international environmental organizations have joined forces with local communities and indigenous populations to protect both the rainforests and the people who depend upon them. For a discussion of this cooperative effort, see SUSANNA HECHT & ALEXANDER COCKBURN, *THE FATE OF THE FOREST: DEVELOPERS, DESTROYERS, AND DEFENDERS OF THE AMAZON* 174-76 (1989).

public lands.¹⁹⁰

Using the MAB model, public lands could be redesigned to preserve ecosystems, with agencies sharing responsibility for different areas within a single ecosystem.¹⁹¹ The MAB program emphasizes the interdependence between "the material, social, cultural and spiritual dimensions of human existence and the maintenance of the planet's biological diversity."¹⁹² Under the MAB program, a biosphere reserve is a protected area consisting of three different parts: the core area, a strictly protected zone with little or no human use; a buffer zone, which may be zoned for limited human uses consistent with the natural environment; and a transition area, in which development compatible with the protected area is permitted.¹⁹³ A wilderness area or wildlife refuge would serve as the core area of a reserve.¹⁹⁴ National forests, national parks or other public lands surrounding the wilderness areas would function as buffer zones.¹⁹⁵ By expanding the buffer and transition zones around core areas, the government would allow local communities to benefit from protected areas, giving them strong incentives to protect the areas.¹⁹⁶ Thus, wilderness ar-

190. For a thorough discussion of the existing authorities of federal agencies over biodiversity and steps which could be taken to improve cooperation between agencies with very different management objectives, see THE KEYSTONE CENTER, FINAL CONSENSUS REPORT OF THE KEYSTONE POLICY DIALOGUE ON BIOLOGICAL DIVERSITY ON FEDERAL LANDS (1991).

191. Efforts to coordinate agency actions have already begun in the Greater Yellowstone area, although no substantive changes have as yet been made. See Robert B. Keiter, *Taking Account of the Ecosystem on the Public Domain: Law and Ecology in the Greater Yellowstone Region*, 60 U. COLO. L. REV. 923, 984-90 (1989).

192. William P. Gregg, Jr., *On Wilderness, National Parks, and Biosphere Reserves*, in *FOURTH WORLD WILDERNESS CONGRESS, PROCEEDINGS OF THE SYMPOSIUM ON BIOSPHERE RESERVES* 33 (William P. Gregg, Jr. et al. eds., 1987).

193. UNESCO, *supra* note 187, at 22-24; Jane Robertson Vernhes, *Biosphere Reserves: the Beginnings, the Present, and the Future Challenges*, in *FOURTH WORLD WILDERNESS CONGRESS, PROCEEDINGS OF THE SYMPOSIUM ON BIOSPHERE RESERVES* 7, 9-11 (William P. Gregg, Jr. et al. eds., 1987).

194. Gregg, *supra* note 192, at 34-37.

195. Stanley L. Krugman, *Biosphere Reserves and the Development of Sustainable Production Systems*, in *FOURTH WORLD WILDERNESS CONGRESS, PROCEEDINGS OF THE SYMPOSIUM ON BIOSPHERE RESERVES* 49, 49-51 (William P. Gregg, Jr. et al. eds., 1987).

196. Gregg, *supra* note 192, at 37.

eas, national parks, and biosphere reserves become mutually reinforcing concepts.¹⁹⁷

The MAB concept provides a means to reconcile the debate between economic growth and environmental protection. The proponents of the reserves believe that by extending the benefits of protected areas to society, the reserves can help build new constituencies for their own protection.¹⁹⁸ Ideally, the zones of a biosphere reserve would expand outward over time, encompassing more of a region.¹⁹⁹ Because the biosphere reserve program reinforces the interdependence between humans and the natural environment, the end result would be the elimination of many of the conflicts that currently arise between humans and the environment. Rezoning the public lands in the ways discussed above, then, is both an economically and politically feasible way to improve the protection of

197. *Id.* at 35.

198. *Id.* at 37.

In biosphere reserves, a dynamic landscape of natural and managed ecosystems provides the context for meeting human *needs for information*. . . . As bioregional hubs for generating and sharing information, biosphere reserves help societies to manage ecosystems to maintain [sic] a range of spiritual, social, and material benefits. . . .

. . . . Over the years, an increase in nondestructive scientific and educational uses should provide direct benefits in terms of better information and skills for protection and management. Use of MAB as a neutral aegis for cooperation with local people can enhance local political support for protection.

Id.

199. Vernhes, *supra* note 193, at 7. The Nature Conservancy is working with federal, state and local governmental agencies as well as private landowners to promote profitable land uses that protect the health of ecosystems. A Nature Conservancy experiment in Texas is attempting to integrate human activity with natural ecosystems over a large region, focusing on the interdependence of humans and the natural environment. See William K. Stevens, *Novel Strategy Puts People at Heart of Texas Preserve*, N.Y. TIMES, Mar. 31, 1992, at C1, C8.

The strategy assumes that when conservationists can plan for an entire ecological region, preserving the most essential tracts of land, it becomes less necessary to protect every scrap of habitat. The hope is that fewer knock-down fights will develop between environmentalists and economic interests, and that fewer wild species will wind up on the endangered list.

Id. at C1. The design of the eco-region is similar to the model provided by the MAB program. It has a core area, buffer zones, and areas in which development is allowed without contest.

biodiversity in the United States.

D. An Ecosystems Protection Act

Both the biodiversity bill on its face and the proposal for redesigning the public lands would have a positive impact on the state of biodiversity in the United States. However, the protection of biodiversity could be dramatically improved if Congress were to pass an "Ecosystems Protection Act," designed for the specific purpose of protecting ecosystems in the United States.

An Ecosystems Protection Act would essentially be modeled on the Endangered Species Act, although there would be some important differences between the two acts. An Ecosystems Protection Act would first require an inventory of all ecosystems in the United States. There would be two tracks for research on biodiversity, a fast track and a long-term track.²⁰⁰ Decisionmakers can only begin to make informed choices if they understand the nature and extent of the nation's biological wealth.²⁰¹ The United States is one of the few developed countries that lacks a national biological inventory.²⁰² Although there is a great deal of knowledge dispersed in the files of biology professors and their students, federal and state agencies, and public interest groups, there is no coordinated data base to allow access to that information. In addition, many gaps in research will have to be filled in to enable federal agencies to establish conservation priorities. The Biodiversity bill would provide the impetus for an inventory of the various types of species and ecosystems within United States territory.

200. E.O. Wilson suggests both a rapid inventory and a fifty year long-term research plan which would be reconsidered and, if necessary, readjusted every ten years. WILSON, *supra* note 5, at 312-17. He also discusses the methods by which such an inventory could be taken. *Id.* See also William K. Stevens, *A Strategy to Survey the Vast Unknowns of Life on the Earth*, N.Y. TIMES, Sept. 22, 1992, at C4.

201. Wilson asserts that gaining familiarity with biodiversity is the best way to save it, since both the economic and aesthetic value of species and ecosystems grow as they are examined. WILSON, *supra* note 5, at 319-20.

202. See Peter H. Raven, *The Politics of Preserving Biodiversity*, 40 BIOSCIENCE 769, 772 (1990).

Several examples of this type of coordinated inventory and ranking system are already in place in the United States.²⁰³ The Nature Conservancy's Biological and Conservation Data System allows a developer, park manager, or concerned citizen to assess the rarity of a particular species. The program helps to identify under-represented or unrepresented ecosystems. Thus, it provides a mechanism by which managers can set priorities for preservation.²⁰⁴ Instead of protecting all endangered species, the government would expend resources only where it is necessary to protect genetic, species and ecosystem diversity. A comprehensive system of this type will ensure that those ecosystems that are unrepresented and under-represented can be targeted as top priorities for inclusion in reserves.

Once a comprehensive national inventory has been completed, ecosystems can be categorized according to their need for protection.²⁰⁵ E. O. Wilson uses the terms "hot spots" and "warm spots" in his description of ecosystems requiring protection.²⁰⁶ The categorization of ecosystems would be done by a committee, chaired by the National Center for Biodiversity. The committee would hold public hearings in order to obtain the best scientific information. One difference between this listing process and the ESA listing process would be that any ecosystem which may be endangered would receive temporary protection. Hearings could then be held to remove from the list ecosystems which are shown to be more prevalent than was originally believed. This approach to protecting ecosystems, unlike the approach taken by ESA, gives biodiversity the benefit of the doubt.

Creating categories of ecosystems, however, inevitably raises the controversial issue of setting priorities. Some people flatly refuse to value species in an economic sense in order to determine which ones should receive priority for protection.

203. *Detectives of Diversity*, NATURE CONSERVANCY, Jan.-Feb. 1992, at 23; see also WILSON *supra* note 5, at 315.

204. *Detectives of Diversity*, *supra* note 203, at 23.

205. WILSON, *supra* note 5, at 315-18.

206. *Id.* at 261, 313.

David Ehrenfeld, for example, warns of the dangers of placing values on biological diversity because that strategy prevents us from coping with the root problem.²⁰⁷ Ehrenfeld argues that by assigning values to species or ecosystems, we will inevitably lose many of them, since balancing economics and preservation merely legitimizes the process which causes extinctions in the first place. However, if the goal of preserving biodiversity is to protect the health of the greatest number of species, including humans, it seems inevitable that one must focus on key species and ecosystems to ensure their survival.

The next important step in the process would occur when a federal, state, or individual actor wished to develop an ecosystem designated for protection under the Act. The Act would contain an exemption procedure similar to the procedure provided for in section 7 of the ESA.²⁰⁸ Areas listed as "hot spots" would require a high burden of proof before development would be permitted. Areas listed as "warm spots" would require a lesser burden. Of course, a substantial amount of work would be needed to quantify the benefits of biodiversity in order to accurately compare them to other economic benefits. This can be accomplished to a sufficient degree by weighing the benefits and costs of each area and development project.²⁰⁹ This procedure would ensure that the act was not so absolutist that it would prevent necessary development projects. The criteria for granting an exemption under the ESA could be a starting point for this new legislation. Exemptions are allowed under the ESA if:

1. There are no reasonable and prudent alternatives to

207. EHRENFELD, *supra* note 49, at 214.

208. 16 U.S.C. § 1536.

209. There are two ways to balance costs and benefits. The first is a straight balancing of dollar amounts of costs and benefits in each case, the cost/benefit analysis (CBA). If the costs of protecting biodiversity outweigh the benefits of a project, the project would be permitted. The other type of cost-benefit analysis is called the Safe Minimum Standard approach (SMS). The SMS method differs from the CBA method in that there is a presumption in favor of preservation. The rule of the SMS approach is, "Avoid extinction unless the social costs of doing so are unacceptably large." It assumes that preservation is always preferable to an equally viable development project since it preserves future options. See NORTON, *supra* note 6, at 35-36.

the agency action;

2. The benefits of the action clearly outweigh the benefits of alternative courses of action consistent with conserving the species or its critical habitat, and such action is in the public interest;

3. The action is of regional or national significance; and

4. Neither the federal agency concerned nor the exemption applicant made any irreversible or irretrievable commitment of resources.²¹⁰

The exemption procedure also requires that reasonable mitigation measures be taken to preserve the species *ex situ* if necessary. Although transplanting an ecosystem is more complicated than transplanting a single species, conservation biologists are already exploring the possibility of creating synthetic flora and a physical environment suitable for housing a diversity of life.²¹¹ While mitigation cannot be a substitute for protecting existing ecosystems, it may be necessary in cases where the costs of protection would be too high.

Of all of the models discussed above, an Ecosystems Protection Act would most adequately protect biodiversity. First, it is more biologically sound than the living museums approach, which would result in fragmented habitats too small and scattered to adequately preserve biodiversity. Second, an Ecosystems Protection Act would impose more substantive changes than would the current version of the biodiversity bill. Finally, it would apply to both existing public lands and those which have not yet been designated for protection; thus, it would be more effective than the third scenario.

In addition to the clear biological advantages of this model, an ecosystems protection act has political advantages as well. It would allow environmentalists and scientists to circumvent the very difficult process of obtaining public support for preserving individual species. The environmental movement focuses on bears and owls because it is too difficult to

210. 15 U.S.C. § 1536(h)(1)(A),(B). See Jared des Rosiers, *The Exemption Process Under the Endangered Species Act: How the "God Squad" Works and Why*, 66 NOTRE DAME L. REV. 825 (1991).

211. WILSON, *supra* note 5, at 330-36.

gain support for the protection of insects and other "lower" species of plants and animals even though they are often the most important organisms in an ecosystem. Not surprisingly, public opinion polls reveal a hierarchy of attitudes toward endangered species.²¹² People empathize with seals, owls, and other aesthetically pleasing creatures, not with endangered bats and mice. Although there are endangered species of plants, there was no protection for these species until 1982, when the Endangered Species Act was amended.²¹³ The unfortunate result is that some popular species such as the California Condor receive significant amounts of money, while other species are ignored. It seems that the more photogenic a species is, the more likely it is to be "saved" regardless of its importance to overall biodiversity. Therefore, the shift to a scientifically based ecosystem approach to preserving biodiversity would make effective political action easier to achieve. Not only would it allow for a more scientific determination of which species should receive resources, but it would also enable environmental groups to pool some of their resources to preserve entire ecosystems, rather than focussing on the specific elements which comprise them.

Another political advantage of an ecosystem approach to preserving diversity is that such an approach would give greater legitimacy to the preservationist cause. Preservationists are often viewed as elitists both because recreation is expensive, and because preservationists seem to be trying to impose their values on the rest of society.²¹⁴ Rather than appealing only to the emotions of the general public, environmental groups could focus on the detrimental effects of the loss of biodiversity on human activities and human health. This focus on the utilitarian justifications for preserving bi-

212. TOBIN, *supra* note 3, at 138.

213. CYRILLE DE KLEMM, IUCN ENVIRONMENTAL POLICY AND LAW PAPER No. 24, *Wild Plant Conservation and the Law* 15-16 (1990).

214. Joseph Sax argues that preservationists are not elitist in the first sense. That is, they do not want to exclude others from natural areas. However, they do want others to value the wilderness for the same reasons they do. Thus, they seek to convert others to their system of morality. See JOSEPH SAX, *MOUNTAINS WITHOUT HANDRAILS* 14 (1980).

odiversity would respond to the criticism that environmentalists put the needs of animals over those of humans.

One might suggest that an ecosystems approach would result in the failure to protect species that do not contribute a great deal to biodiversity, but that are important to people for other reasons. While environmentalists may find fault with current national parks and forests because they were not established with biological diversity preservation in mind, many Americans would be outraged if Yellowstone Park were suddenly exchanged for a stretch of land in Hawaii with more biological diversity. However, this problem could be easily addressed. The shift to an ecosystems approach to biological diversity does not preclude the protection of individual species or protected areas with particular economic, cultural, ecological, or religious value. These species should be protected as well, but on different legal grounds. The First Amendment, the Endangered Species Act, the National Historic Preservation Act, and numerous state and local statutes could be used to justify preserving species which humans value for purposes other than their overall contribution to biodiversity.

An Ecosystems Protection Act, then, would be a biologically and politically sound way to preserve biodiversity. It would provide the impetus to inventory the nation's biological resources and categorize ecosystems based on their need for protection. While there would be a presumption against development in endangered ecosystems, economic development would be permitted if the applicable criteria were satisfied. An Ecosystems Protection Act would be preventive rather than reactive; therefore, it would be both more efficient and more successful than the current approach. Finally, in addition to preserving biodiversity, an Ecosystems Protection Act is the model which best preserves options for future generations of Americans.

V. Conclusion

For twenty years, environmentalists have been using the Endangered Species Act and other environmental protection statutes to attempt to preserve biological diversity. Although

some important battles have been fought and won, the number of extinctions in the United States continues to increase. The fight to preserve biological diversity is a particularly difficult one because the primary cause of extinctions is the current mode of human development; nevertheless, it is one of the most pressing environmental problems humans have ever faced. In his most recent work, E.O. Wilson writes that "[t]he sixth great extinction spasm of geological time is upon us Earth has at last acquired a force that can break the crucible of biodiversity."²¹⁵

It is difficult to mobilize support for the preservation of biodiversity because although species extinctions may be sad, they do not appear catastrophic to most of the American public. People are more concerned with environmental problems such as water and air pollution which have a direct and immediate effect on daily life. This leaves little time to worry about disappearing plants and animals. It is precisely the uncertain nature of the problem that warrants the establishment of a national biodiversity policy now. Scientists simply cannot know which extinctions will be catastrophic.²¹⁶

The choice to preserve large tracts of public and private land to protect biodiversity is not a choice between people and other species; it is a choice for both. The consumptive and non-consumptive uses of the nation's biological diversity are countless; the possibility that mass extinctions will be catastrophic for all leaves little doubt about the urgent need for action to preserve biodiversity. During the five years in which the biodiversity bill has been in committee, over five hundred species in the United States have disappeared.

Current environmental laws governing the protection of species and public lands have not been adequate to protect the nation's biodiversity. Since these laws were not designed for that purpose, they do not allow for comprehensive, ad-

215. WILSON, *supra* note 5, at 343.

216. TOBIN, *supra* note 3, at 19-20; *see also* PAUL EHRLICH & ANNE EHRLICH, *EXTINCTION: THE CAUSES AND CONSEQUENCES OF THE DISAPPEARANCE OF SPECIES* 96 (1981); DEPARTMENT OF STATE, *PROCEEDINGS OF THE U.S. STRATEGY CONFERENCE ON BIOLOGICAL DIVERSITY* 9 (1982).

vanced land use planning. Therefore, a new approach to the protection of biodiversity is essential. The biodiversity bill represents the first step in the shift to a scientific, holistic approach to preserving biodiversity; however, the bill would be only a beginning. Taking biodiversity seriously will mean more than simply adding words to an environmental impact statement.²¹⁷ It will mean rezoning public lands in accordance with sound conservation biology. The Man and the Biosphere program offers a promising way to address the conflict between humans and the rest of nature by emphasizing their interdependence. Finally, real progress could be made if an ecosystems protection act were enacted. Such an act would alter the focus of preservation from species to ecosystems, a more biologically and practically sound way to protect biodiversity. While the new act would not eliminate the need for the ESA, it would likely diminish the need for recovery measures over time.

The current backlash against the ESA and the environmental movement in general might lead one to believe that an Ecosystems Protection Act would not be politically feasible. It has become increasingly clear that natural ecosystems and the species that inhabit them cannot be preserved when human communities surrounding such areas are in jeopardy. However, humans cannot survive if they destroy the fundamental building blocks of life. Political battles between developers, government, environmentalists and other interest groups will continue to rage unless humans come to a new understanding of their relationship with nature. It has been suggested that a new land ethic, like the one Leopold described in his *Sand County Almanac*,²¹⁸ will be needed in order to mobilize the populace to provide for the long term stability of the world's biological diversity.²¹⁹ Indeed, it is likely that such an ethic will eventually emerge, although it may take many years and many small disasters. Perhaps, future generations will have a different conception of the interconnectedness of humans and

217. See *Sierra Club v. Marita*, 769 F. Supp. 287 (E.D. Wis. 1991).

218. LEOPOLD, *supra* note 1, at 217-41.

219. WILSON, *supra* note 5, at 312.

the natural world and will see the need to use the world's resources in a sustainable manner. Perhaps they will learn to harness the biological resources of this country for goods and services about which today's biologists can only dream. But if we are to leave those options open to future generations, we must act now to protect what remains of the nation's biological diversity.