Tulsa Law Review

Volume 30
Number 4 *Mineral Law Symposium*

Volume 30 | Number 4

Summer 1995

NELPI Essay: One Step Further Towards Biodiversity Conservation

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ESSAY

ONE STEP FURTHER TOWARDS BIODIVERSITY CONSERVATION*

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I. INTRODUCTION

The Endangered Species Act of 1973[1] has been at work for more than twenty years, yet during this period hundreds of species have become extinct annually.[2] Of the 615 species listed as endangered or threatened under the Act only *four* have recovered enough to be delisted as of 1992.[3] There are still more than 4000 species waiting to be listed.[4] These facts attest to the Act's inability to thwart the ever increasing rate of species eradication by human activities.

The Endangered Species Act's failure as a tool for the conservation of listed species stems from two inherent limitations. First, it grants protection to species only after they have suffered a severe

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* Winning Essay of the Eighteenth Annual National Energy/Environmental Law & Policy Institute (NELPI) Energy, Natural Resources, and Environmental Essay Competition.

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1. 16 U.S.C. § 1531-44 (1988).

2. Jon D. Holst, *The Unforeseeability Factor: Federal Lands, Managing for Uncertainty, and the Preservation of Biological Diversity*, 13 PUB. LAND L. REV. 113, 116 (1992). During the mid-1970s about 100 species per year were becoming extinct. *Id.*; *see also* ECOSYSTEM MANAGEMENT FOR PARKS AND WILDERNESS 3-13 (James K. Agee & Darryll R. Johnson eds., 1988).

3. Holst, *supra* note 2, at 124; *see also* GEORGE CAMERON COGGINS ET AL., FEDERAL PUBLIC LAND AND RESOURCES LAW 810 (3d ed. 1992).

4. Michael E. Soulé, *Conservation: Tactics for a Constant Crisis*, 253 SCIENCE 744 (1991).

decline in population and habitat destruction or fragmentation.[5] Second, listed species do not receive the management needed to restore them to their original condition.[6]

An approach combining coordinated, efficient, and full implementation of existing environmental laws with better economic incentives, new legislation, and extensive scientific study is needed. This is a pressing need because time will only compound the costs and complexities created by the continuing ecosystem destruction and accompanying species depletion. Ultimately, it is human life that is threatened by massive ecosystem destruction.

This essay recommends various measures for achieving that approach. They include conservation easements, sharing proceeds from federal land, technology leasing from the government, tax deductions, and a center for studying the nation's biodiversity. I propose that these measures form the core of a bill entitled the Selective Ecosystem and Species Conservation Act (SESCA). The goal of SESCA is selective biodiversity conservation and not species protection in itself. The recommended measures are by no means exhaustive. However, as the core of a statutory scheme that enhances and coordinates existing environmental laws, they are capable of producing far reaching results.[7]

II. THE NEED FOR BIODIVERSITY CONSERVATION

Biodiversity is a fairly new term and has recently become the slogan in conservation.[8] In 1987 the Office of Technology Assessment

5. "The purposes of this chapter are to provide a means whereby the ecosystems upon which *endangered* species and *threatened* species depend may be conserved. . . ." 16 U.S.C. § 1531(b) (1988) (emphasis added). An endangered species is "any species which is in danger of extinction throughout all or a significant portion of its range. . . ." 16 U.S.C. § 1532(6) (1988). A threatened species is "any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range." 16 U.S.C. § 1532(20) (1988).

6. Although the Endangered Species Act requires recovery plans to be drawn and implemented for listed species, the majority of these plans rely on captive breeding and translocation programs. *See* 16 U.S.C. § 1533(f) (1988). The emphasis is not on self-recovery of the species in their natural habitats. Often these habitat areas have been largely eaten away or become too fragmented by development to support the species. Not surprisingly, most of these species will continue to need human intervention for their long term survival. Holst, *supra* note 1, at 124-25.

7. By environmental laws I mean laws on pollution control, wildlife, and public land management.

8. Robert L. Fischman, *Biodiversity and Environmental Protection: Authorities to Reduce Risk*, 22 ENVTL. L. 435, 437 (1992); Lucy T. Rudbach, *A Strategy to Preserve Biological Diversity:* Marble Mountain Audubon Society v. Rice, 13 PUB. LAND L. REV. 193 (1992). However, biodiversity also refers to both the science that studies topics such as factors influencing sustainability of populations as well as social goals aimed at conserving biological resources. Fischman, *supra*, at 436.

defined biodiversity as "the variety and variability among living organisms and the ecological complexes in which they occur."[9] In short, biodiversity is another name for the multitude of life and ecosystems on earth. There are three concepts encompassed by the term biodiversity. Ecosystem diversity refers to the habitats and biological communities in a given area.[10] Genetic diversity is concerned with the richness of the gene pool present in populations of a species.[11] Species diversity is commonly understood as the number of fauna and flora in a region.[12] All three levels together comprise the biodiversity of a region.

A brief summary of the utilitarian and aesthetic justifications for biodiversity conservation is in order.[13] On the utilitarian side, humans have historically used plants and animals for food, medicine, and aesthetic needs. Research on the more than 8,000 known edible plants on earth, several hundred of which are potential food crops, would lead to more nutritious diets and eliminate starvation.[14] An estimated one third of Earth's 250,000 flowering plants may be edible.[15] Many drugs can be produced more cheaply through plant extraction than chemical synthesis.[16] Wild plants also provide genetic material used in developing food crops resistant to diseases largely immune to pesticides. Additionally, ecosystems carry the burden of cleansing and maintaining the environment. Many more uses of plant and animal wildlife and ecosystems remain to be discovered.

Aesthetically, *homo sapiens* has an inclination to be near nature and other living things as evinced by beachside residences, country

9. OFFICE OF TECHNOLOGY ASSESSMENT, U.S. CONGRESS, TECHNOLOGIES TO MAINTAIN BIOLOGICAL DIVERSITY 37 (1987).

10. Fischman, *supra* note 8, at 437; Melanie J. Rowland, *Bargaining for Life: Protecting Biodiversity through Mediated Agreements,* 22 ENVTL. L. 503, 505-06 (1992).

11. Roland, *supra* note 10, at 405.

12. Roland, *supra* note 10, at 405.

13. Many commentators have already explored the range of justifications for conserving biodiversity. *See e.g.*, PAUL R. EHRLICH & ANNE H. EHRLICH, EXTINCTION: THE CAUSES AND CONSEQUENCES OF THE DISAPPEARANCE OF SPECIES (1981). For an insightful discussion of the utilitarian, aesthetic and moral justifications for conserving biodiversity see Holly Doremus, *Patching the Ark: Improving Legal Protection of Biological Diversity*, 18 ECOLOGY L.Q. 265, 269-81 (1991).

14. *See* GENERAL ACCOUNTING OFFICE REP. NO. RCED-89-5, ENDANGERED SPECIES: MANAGEMENT IMPROVEMENTS COULD ENHANCE RECOVERY PROGRAM 10 (1988). As an example, the winged bean of New Guinea has more protein than a potato, overall nutritional value equal to a soybean, grows to fifteen feet within a few weeks and can be ground into flour. EDWARD O. WILSON, BIOPHILIA 121 (1984). This plant has already enhanced the diets of fifty tropical countries. *Id.*

15. GENERAL ACCOUNTING OFFICE, *supra* note 14, at 10.

16. EHRLICH, *supra* note 13, at 55.

homes, recreation and wildlife parks. We also assign an aesthetic value to diversity of wildlife and species that have been endowed with symbolic values. Inevitably, more species will come to possess aesthetic and symbolic value as we learn more about them.

Utilitarian and aesthetic values do not provide the only justifications for conserving biodiversity. The prospect of even more beneficial uses of species and ecosystems is incentive enough to preserve them. Recently, ninety-six members of the House of Representatives sponsored the National Biological Diversity Conservation and Environmental Research Act[17] which declared biodiversity conservation as a national goal.[18] The Act espoused an utilitarian stance on the value of biodiversity conservation.[19] While the bill was not passed, it acknowledged biodiversity conservation as the goal of national environmental laws and the need for a coordinated federal strategy in this endeavor. Congress has hinted at the direction that an overhaul of the nation's environmental laws could take.

III. Achieving Biodiversity Conservation

All of the nation's biodiversity deserve to be protected. Unfortunately, competing human interests coupled with limited funding and manpower dictate a selective conservation strategy. A statutory scheme enacting selective ecosystem and species conservation is the key to achieving the widest range of protection and has the greatest likelihood of success.[20] The core of the SESCA should consist of: 1) amendments strengthening National Environmental Policy Act and the Endangered Species Act; 2) amendments requiring the full and efficient implementation of existing pollution control laws; 3) better economic incentives for compliance with those laws; and 4) measures coordinating federal agency actions.

17. H.R. 585, 102nd Cong., 1st Sess. (1991).

18. H.R. Rep. No. 259, 102nd Cong., 1st Sess. (1991). The bill was first introduced on January 18, 1991 sponsored by Rep. James H. Scheuer (D-NY) and co-sponsored by 82 Democrats and 13 Republicans. H.R. 585, 102nd Cong., 1st Sess. (1991).

19. H.R. Rep. No. 259, *supra* note 18, at 2.

20. Holly Doremus argues for a similar approach, representative ecosystem protection, as one of four alternatives to the existing scheme for conserving biodiversity. Doremus, *supra* note 13, at 318-24. The other alternatives she suggests are: amending National Environmental Policy Act to require consideration of impacts on biological diversity, prioritization of species under Endangered Species Act and expanding the use of the public trust doctrine. Doremus, *supra* note 13 at 324-28. SESCA differs from representative ecosystem protection in its structure and application, the variety of market incentives it employs, its stress on interagency coordination, and full and efficient implementation of pollution control laws in support of the Endangered Species Act.

A new federal agency, the Ecosystem Management Service, should be created and charged with implementing SESCA. SESCA is based on a ranking of ecosystems and species present in a given ecosystem. Each ecosystem is assigned a priority based on the damage to which it has or will be subjected, the number of species it supports, and its abundance. Species within an ecosystem are ranked according to their roles in maintaining the ecosystem and abundance within similar types of ecosystems.

Sustaining species, which perform an essential function in an ecosystem chain, deserve the highest protection. An example of a sustaining species is the wasp in tropical forest ecosystems. Without the wasp there would be no figs and in turn no bats, monkeys, birds, or mammals. These animals either feed on the figs or are dependent on other animals that do.[21] Studies have already shown how depletion of sustaining species in aquatic ecosystems reduces the populations of commercially harvested fish.[22] In one experiment scientists discovered that a loss of ten species in a lake led to increased starvation among trout.[23] Birds are also not immune to the cascading destruction of species caused by a diminishing number of sustaining species.[24]

SESCA will apply to developments that have any degree of negative impact on an ecosystem selected for protection. Initially, a determination would be made whether the impact will destroy or alter the affected ecosystem by decreasing the viability of sustaining and other species. The likelihood that an affected species will regain its normal viability and the abundance of similar affected ecosystems within the country are major factors. Detrimental effects which are invisible in themselves but accumulate in small increments to produce a substantial impact at a future time must also be carefully considered.[25] The

21. Melanie J. Rowland, *Bargaining for Life: Protecting Biodiversity through Mediated Agreements*, 22 ENVTL. L. 503, 506 n.12 (1992).

22. *See* D.W. Schindler, *Biotic Impoverishment at Home and Abroad*, 39 BIOSCIENCE 426 (1989); D.W. Schindler et al., *Long-Term Ecosystem Stress: The Effects of Years of Experimental Acidification on a Small Lake*, 228 SCIENCE 1395 (1985); D.W. Schindler, *Effects of Acid Rain on Freshwater Ecosystems*, 239 SCIENCE 149 (1988).

23. D.W. Schindler et al., *Long-Term Ecosystem Stress: The Effects of Years of Experimental Acidification on a Small Lake*, 228 SCIENCE 1395 (1985).

24. Jon R. Luoma, *Black Duck Decline: An Acid Rain Link*, AUDUBON, May 1987, at 19, 22.

25. Jon D. Holst contends that environmental impact statements required by the Endangered Species Act are inadequate because most impacts on biodiversity are not reasonably foreseeable or measurable at the time development begins. Jon D. Holst, *The Unforeseeability Factor: Federal Lands, Managing for Uncertainty, and the Preservation of Biological Diversity*, 13 PUB. LAND L. REV. 113, 128 (1992).

amount of protection to be given will depend on a balancing of societal interests in the development against the adequacy of economic incentives offered by SESCA and biodiversity concerns. If development is banned and SESCA's economic incentives cannot provide sufficient compensation, the government should compensate as needed to avoid a takings claim.

SESCA is possible only if there is information on the number and types of ecosystems within the country. Hence, an Ecosystem Research Center must be established to study and gather data on the nation's ecosystems. The center should be a division within Ecosystem Management Service and modeled in size, function, and structure after the one proposed in the National Biological Diversity Conservation and Environmental Research Act.[26] The center should be staffed by scientists from federal and state agencies, nonprofit research institutions, and universities. The center's decision making body, the Project Section, should be comprised of nine scientists, appointed by the President upon recommendation by the National Academy of Sciences, serving staggered terms of seven years each.

One of the center's main tasks would be to prepare a primary map showing the type and geographic contours of each ecosystem within the country including an appendix containing data on the number and variety of native species in each ecosystem in statistical format. Special attention should also be given to preparing a second map of ecosystems especially rich in the number of native species.[27] Both maps will provide the data for a third map showing ecosystems deserving protection and a list containing information about these ecosystems useful for conservation planning and management.[28] A period of three or four years should be allotted to data gathering. All three maps should be updated every year. The maps should be available to the public, although they will have no input on the drawing. Allowing public comment would disrupt the purely scientific basis of the map.[29]

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26. *See* H.R. 585, 102nd Cong., 1st Sess. § 9 (1991).

27. *See id.*

28. *See id.* § 9(b) (containing a useful outline of what information the list should contain). For example, the ownership status of and applicable laws affecting land supporting ecosystems sought to be protected.

29. The public tends to equate sentimental affection for animals appealing to the human senses with environmental preservation; often leading to irrational considerations in management plans and detrimental effects on biodiversity. *See* S. Schechtman, *The "Bambi Syndrome:" How NEPA's Public Participation in Wildlife Management is Hurting the Environment*, 8 ENVTL. L. 611 (1978).

The center's other primary functions include developing a plan for the establishment of an information clearinghouse on the nation's ecosystems and guiding federal agencies in studying impacts on biological diversity.[30] Additionally, a fourth map showing ecosystems in critical states, those verging on extinction, should also be prepared.[31] The center will also be responsible for enhancing our understanding of biodiversity and developing a plan to fill any gaps in knowledge. This could be done by publishing treatises, atlases, and articles on the practical use of biological information.[32]

To carry out its information gathering and mapping functions the center would use existing state and federal databases on wildlife and conduct research to fill in any gaps.[33] Where appropriate, it will decide which federal, state or private agencies will be assigned research projects.[34] In return it will share information with state and federal agencies, coordinate and provide technical assistance for their research projects.[35] The center should also train federal and state personnel as needed.[36]

As a statutory scheme SESCA functions through the following core components:

A. *Coordination of Agency Actions*

To prevent unnecessary spending and waste of human resources, an interagency committee will approve and coordinate conservation projects.[37] The committee will be the main decision making body of the Ecosystem Management Service. While the project section of the center is primarily responsible for selecting and coordinating research projects, it will consult with the committee beforehand. The committee will also decide which ecosystems and species within selected ecosystems will be conserved after consultation with the center.

Structurally, the interagency committee should consist of seventeen representatives from various federal environmental agencies and

30. *See* H.R. 585, 102nd Cong., 1st Sess. (1991).
31. *See id.* § 9(b)(3).
32. *See id.*
33. *See id.* § 9.
34. *See id.*
35. *See id.*
36. *See id.*
37. By "environmental agencies" I mean any agency involved in the use, management, and conservation of the country's natural and energy resources.

nonprofit research institutions or universities, chaired by a representative from the Council on Environmental Quality.[38] Members of the project section of the center may also serve on the committee. Decisions should be made by majority vote with the chairperson casting the tie-breaking vote. Each representative will have a staff of assistants drawn from their respective agencies or organizations.

B. *Amendments Strengthening National Environmental Policy Act and the Endangered Species Act*

The National Environmental Policy Act suffered a serious blow when the Supreme Court declared that it imposed only essentially procedural duties on federal agencies.[39] The broad language of the Act leaves ample room for a contrary reading:

> [I]t is the continuing *responsibility* of the Federal Government to use *all* practicable means . . . to the end that the Nation may fulfill the responsibilities of each generation as *trustee* of the environment for succeeding generations . . . preserve . . . and maintain, wherever possible, an environment which supports *diversity* . . . and enhance the quality of *renewable* resources.[40]

Practical means for conserving the nation's biodiversity do exist since most of the damage it suffers from human activity is largely avoidable or unintended.[41] The National Environmental Policy Act's mandate can be achieved only if it imposes a substantive duty on federal agencies.[42] Congress should, therefore, amend the Act to unequivocally state its true purpose. Agencies would then have an

38. The committee is modeled after the one established by the National Biological Diversity Conservation and Environmental Research Act. H.R. 585, 102nd Cong., 1st Sess. (1991). It should consist of one representative each from the Fish and Wildlife Service, National Oceanic and Atmospheric Administration, National Park Service, Department of Energy, National Science Foundation, Agricultural Research Service, Environmental Protection Agency, Forest Service, Bureau of Land Management, Army Corps of Engineers, Council on Environmental Quality and the ecosystem research center. The remaining members should be leading scientists from nonprofit research institutions or universities appointed by the President upon recommendation by the National Academy of Sciences. *See id.*

39. Vermont Yankee Nuclear Power Corp. v. NRDC, 435 U.S. 519 (1978).

40. 42 U.S.C. § 4331(b) (1988) (emphasis added).

41. "[M]ost losses of biological diversity caused by human activity are unintended and largely avoidable. . . ." H.R. Rep. No. 259, 102nd Cong., 1st Sess., at 2 (1991).

42. Prior to *Vermont Yankee* several appellate courts had opined that the National Environmental Policy Act did, in fact, impose a substantive duty on federal agencies. *See e.g.*, Calvert Cliffs' Coord. Comm'n v. United States Atomic Energy Comm'n, 449 F.2d 1109 (D.C. Cir. 1971); Karlen v. Harris, 590 F.2d 39, 43 (2d Cir. 1978). The Supreme Court's interpretation of the act has been criticized as "crabbed." *See* Lynton Caldwell, *NEPA Revisited: A Call for a Constitutional Amendment*, ENVTL. FORUM, Nov.-Dec. 1989, at 18.

affirmative duty to act in conformance with the findings of the environmental impact statement. Such an amendment would also relieve agencies from relying on the Supreme Court's deference to their interpretations of ambiguous statutes.[43]

This invigorated National Environmental Policy Act would require agencies to make findings on the feasibility of alternatives and mitigation measures and prioritize them accordingly in the environmental impact statement. Currently, they are not required to do so. Environmental impact statements should also cover any adverse impact on all three levels of biodiversity in the effected region, not just listed species.[44] In particular, agencies must use suitable tools to study the cause and effect of attenuated impacts which are not reasonably foreseeable nor measurable at the time development is commenced.

Agencies should also be required to approve only proposals which minimize impacts. Authorizing citizen suits would further check agency indiscretions in determining the timing and scope of an environmental impact statement and studying alternatives and mitigation measures. These amendments will help prevent agencies from making unwise albeit informed decisions.

Under SESCA, the Endangered Species Act's role would be reduced but simultaneously strengthened. The amended Endangered Species Act would cover species incapable of long term survival without human intervention in addition to endangered and threatened species. Species protected by the new act will remain protected until maps of the nation's ecosystems are prepared. The interagency committee would then decide whether the species' status should be preserved. If so, the amended Endangered Species Act requires the Fish and Wildlife Service to acquire and/or restore sufficient land for use as habitats to enable the species to survive naturally. Otherwise, the species would be delisted but given the same protection as listed species for four years after delisting. At the end of those four years the species would receive the same protection as non-listed species.

43. *See generally* Chevron, U.S.A. v. NRDC, 467 U.S. 837 (1984) (holding an agency charged with interpreting an ambiguous statute is implicitly authorized to fill in the gaps: regulations implementing the statute are given controlling weight if based on a permissible construction of the statute).

44. *See* Holly Doremus, *Patching the Ark: Improving Legal Protection of Biological Diversity*, 18 ECOLOGY L.Q. 265, 326 (1991).

C. *Full Implementation of Existing Pollution Control Laws*

In its present form, the Endangered Species Act directs the Secretary of the Interior and federal agencies not under his control to utilize their programs in pursuit of the Act's purposes.[45] Literally, this command envisions concerted action by federal agencies to make and implement regulations protecting both wildlife and human welfare.

Pollutants are a major cause of ecosystem damage and the ensuing loss of biodiversity.[46] Current pollution control laws provide the Environmental Protection Agency (EPA) with many means to carry out the command of the Endangered Species Act.[47] Some of these laws contain a similar mandate. For example, the Federal Water Pollution Control Act directs the EPA to "publish criteria for water quality accurately reflecting the latest scientific knowledge on the effects of pollutants on *biological community diversity*, productivity and stability in receiving waters."[48] The EPA is also directed to "publish information on factors necessary to *restore* and maintain the chemical, physical and biological integrity of *all* navigable waters."[49]

Nevertheless, the EPA has consistently ignored the Endangered Species Act's mandate by confining its regulations to the protection of human life. The EPA, as the chief administrator of the nation's pollution control laws, must awaken to its responsibility to stop avoidable *ecosystem* damage, not just pollution harmful to human health. Accordingly, SESCA should explicitly direct the EPA to protect biological community diversity as well.

D. *Better Economic Incentives for Compliance*

Lack of appealing economic incentives has greatly hindered the effectiveness of environmental laws and is the prime reason for the

45. "The Secretary shall review other programs administered by him and utilize such programs in furtherance of the purposes of this chapter. All other Federal agencies shall, in consultation and with the assistance of the Secretary, utilize their authorities in furtherance of the purposes of this chapter by carrying out programs for the conservation of endangered species and threatened species listed. . . ." 16 U.S.C. § 1536(a) (1988).

46. Robert L. Fischman, *Biodiversity and Environmental Protection: Authorities to Reduce Risk*, 22 ENVTL. L. 435, 446 (1992)

47. For an extensive discussion of how existing pollution laws may be used by the EPA to implement biodiversity conservation see *id.* at 443-500 (analyzing the provisions of six pollution control acts to show how they may be implemented to protect ecosystems).

48. 33 U.S.C. § 1314(a)(1)(C) (1988) (emphasis added).

49. 33 U.S.C. § 1314(a)(2)(A) (1988) (emphasis added).

commercial establishment's vigorous opposition.[50] The average commercialist would agree on two things. First, it is disingenuous to insist on the environment as a luxury to be afforded when economics allows. Second, adequate compensation under SESCA would be better than none under the present system. With these tenets in mind, it is possible to structure economic incentives that compensate adequately although not completely. SESCA would offer affected parties the following incentives individually or as a package.

Conservation easements are a tool to spread the costs of ecologically sound management of natural resources.[51] These types of easements allow the holder to restrict the owner of the encumbered land from uses which would change the natural state, aesthetic, or ecological value of the land.[52] Forty-four states already use conservation easements to conserve natural resources.[53] SESCA would allow for conservation easements and permit them to be held for perpetuity or until an agreed termination date. In the event that the need for the easements no longer exist, it will expire. Although the duration of a conservation easement may impose a burden on the alienability of land or result in dead hand control, this can be offset by creating a market for conservation easements and allowing them to be traded like commodities. Any private party, organization, federal or state agency can be the easement holder or grantor since only the value of the easement would be bought or sold.[54]

Public awareness of environmental concerns will create the market force necessary to motivate businesses, along with conservation groups and private individuals, to buy conservation easements. With

50. David Roe, *An Incentive-Conscious Approach to Toxic Chemical Controls,* 13 ECON. DEV. Q. 179 (1989); Todd Woody, *Swapping Strategies*, THE RECORDER, Sept. 1992, at 34.

51. Kimberly K. Winter, *The Endangered Species Act Under Attack: Could Conservation Easements Help Save the ESA?,* 13 N. ILL. U. L. REV. 371 (1993).

52. Gerald Korngold, *Privately Held Conservation Servitudes: A Policy Analysis in the Context of in Gross Real Covenants and Easements,* 63 TEX. L. REV. 433, 435 (1984).

53. Winter, *supra* note 51, at 385 n.114.

54. Presently, the states allowing conservation easements generally require the holder to be a government agency or conservation organization engaged in "retaining or protecting natural, scenic or open-space values of real property assuring its availability for agricultural, forest, recreational, or open-space use, protecting natural resources, maintaining or enhancing air or water quality or preserving the historical, architectural, archeological or cultural aspects of real property." UNIF. CONSERVATION EASEMENT ACT, 12 U.L.A. 66 (Supp. 1992); Winter, *supra* note 51, at 385 n.114.

the present level of public awareness it is possible to create the requisite market forces.[55] To facilitate market forces, the federal government should advertise easements for sale in suitable government and private publications. The buyer will share a percentage of the advertising costs. Normally, purchase price will be market driven since it is agreed upon by the parties. However, public auctions may also be held. Where no buyers are available, the federal government should purchase a conservation easement at a reasonable price if failure to do so would result in a regulatory taking. As a further incentive, the purchaser should receive a tax deduction of half of the easement price.[56]

Grantors of conservation easements must also allow either federal or state agencies to inspect the land regularly and set up monitoring stations. Alternatively, private organizations engaged in conserving natural resources could be approved to perform this task. SESCA should also provide contract, property, and equitable remedies to enforce conservation easement agreements. In particular, preference will be given to injunctions and specific performance as remedies.

Another economic incentive is to lease technology developed by the federal government to affected organizations or individuals capable of utilizing it for an acceptable commercial gain. Under SESCA, the Ecosystem Management Service will consult government and private experts in the industry in setting standards to determine eligible recipients and what constitutes acceptable commercial gain. This incentive has the advantage of improving the technological edge of industries with long term potential. Due to the time and costs involved in developing technology, the federal government should receive a percentage of profits derived from the leased technology. Again, market forces will determine this percentage and the lease price. Similarly, affected parties holding U.S. patents or copyrights may have the validity dates of their intellectual property extended for preserving the natural state of their lands.[57] Other parties affected by SESCA unable

55. There already exists a high level of public awareness of environmental concerns. Businesses traditionally regarded as major polluters are rushing to project a clean environment image. John Holusha, *Chemical Makers Identify A New Hazard: Their Image,* N.Y. TIMES, Aug. 12, 1991, at C1. Perhaps the best evidence of the power of consumer awareness is the chaos of green products and their equally chaotic range of labels that has been unleashed by producers and manufacturers.

56. *See generally* Rev. Rul. 64-205, 1964-2 C.B. 62 (defining charitable organizations eligible for tax deductions of easement value).

57. At present patents are valid for a term of seventeen years, copyrights for the term of the author's life and fifty years after. The life of a patent can be extended under certain circumstances. 17 U.S.C. § 302 (1988); 35 U.S.C. §§ 154-56 (1988).

to make use of any of these incentives should be granted tax deductions.

At the state government level, revenues from enterprises on federal land can be shared with state governments depending on their success in implementing the SESCA. These funds will be in addition to those which states already receive under existing environmental laws.

Ironically, SESCA would leave more land and consequently more natural resources for human use since only supporting species or representative ecosystems receive the highest priority. SESCA may also encourage better use of existing natural resources including land.

IV. CONCLUSION

Massive ecosystem destruction presents one of the most pressing and difficult problems of this century. E.O. Wilson has characterized it as a catastrophe more disastrous than totalitarian government or economic collapse because species extinction is forever.[58] Despite the dramatic increase in public awareness of the significance of ecosystems in maintaining the environment, ignorance and apathy are still the biggest enemies. Any attempts at a final solution must overcome the competition between man and nature for a meaningful existence. Providing attractive market incentives, streamlining, and increasing federal enforcement of environmental laws are only the first step. Hence, the selective ecosystem and species conservation approach as described above is a major step in the right direction. At the very least, it will advance environmental preservation beyond emergency room conservation.

Today there is hope that seeds of the future have been planted. Recently, Felicia Marcus, Regional Administrator for EPA Region 9, spoke of ecosystem management as "working with other agencies, looking at all pieces of the puzzle, trying to deal with the reality and totality of an issue and looking for long-term structural solutions."[59] There is common ground between this characterization of ecosystem management and SESCA. Yet, as human populations and global

58. Edward O. Wilson, *Toward a Lasting Conservation Ethic,* Endangered Species Act Oversight, Hearings Before the Subcomm. on Environmental Pollution of the Senate Environment and Public Works Comm'n, 97th Cong., 1st Sess. 366 (1981).

59. Felicia Marcus, Remarks at the Second Annual Environmental Law Institute (October 21-24, 1993) (edited transcript reprinted in 2 ENVTL. L. NEWS (Environmental Law Section, Calif. State Bar), Winter 1993, at 6).

trade competition increase, the gains produced by SESCA or any viable ecosystem management system will decrease proportionally. Ultimately, it is technological advancement combined with highly efficient recycling of natural resources that will be the workhorse of biodiversity conservation and save human lives.