On the Preservation of Species

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I. INTRODUCTION

In 1973, Congress set as a national priority the protection and the conservation of endangered species of fish, wildlife, and plants. Congress, in earlier years, had adopted legislation to protect endangered species.[1] The Endangered Species Act of 1973 ("Act"),[2] however, is much stronger than, and supersedes, earlier legislation. Unlike the prior acts, which simply *encouraged* federal departments and agencies to take the needs of endangered species into account, the Act *requires* them to do so—to "utilize their authorities in furtherance of the purposes of this (Act)."[3] In addition, the 1973 law requires all agencies and departments of the federal government to "insure that actions authorized, funded, or carried out by them do not jeopardize the continued existence of such endangered species . . . ."[4]

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1. Endangered Species Preservation Act of 1966, Pub. L. No. 89-669, 80 Stat. 926 (1966) (repealed 1973). Endangered Species Conservation Act of 1969, Pub. L. No. 91-135, 83 Stat. 275 (1969) (repealed 1973). For a history of federal legislation to protect animals, *see* Comment, *Endangered Species Protection: A History of Congressional Action*, 4 ENVT'L AFF. 255 (1975). The 1966 and 1969 statutes are discussed in Comment, *Vanishing Wildlife and Federal Protective Efforts*, 1 ECOLOGY L. Q. 520 (1971). For the history of preservation efforts from the perspective of ecology, *see* Smith, *Ecological Genesis of Endangered Species: The Philosophy of Preservation*, 7 ANN. REV. ECOLOGY SYS. 33 (1976).

2. 16 U.S.C. §§ 1531-1543 (1976 & Supp. I 1977 & Supp. II 1978 & Supp. III 1979). *See generally* Simmons, *The Endangered Species Act of 1973*, 23 S.D. L. REV. 302 (1978); Lachenmeier, *Endangered Species Act of 1973: Preservation of Pandemonium?* 5 ENVT'L L. 29 (1974) [hereinafter cited as Lachenmeier].

3. 16 U.S.C. § 1536 (1976 & Supp. II 1978 & Supp. III 1979). The 1973 Act also differs from the prior laws in its inclusion of plants among endangered species (earlier laws had addressed only animals). MacBryde, *Notice of Review*, GARDEN, Nov./Dec. 1980, at 2.

4. 16 U.S.C. § 1536 (1976 & Supp. II 1978 & Supp. III 1979).

This is strong language. It is intended to arrest growing rates of extinction among plants and animals. Earlier laws had not done this. They had failed, as former President Nixon said, to "provide the kind of management tools needed to act early enough to save a vanishing species."[5] The 1973 Act begins with this admission, in the congressional findings and declaration that

> various species of fish, wildlife, and plants in the United States have been rendered extinct as a consequence of economic growth and development untempered by adequate concern and conservation [;][6]

that

> other species of fish, wildlife, and plants have been so depleted in numbers that they are in danger of or threatened with extinction [;][7]

and that

> these species of fish, wildlife, and plants are of esthetic, ecological, educational, historical, recreational, and scientific value to the Nation and its people.[8]

Since the Act was passed, federal agencies and the courts have grappled with the problem of properly applying it.[9] It is not enough, on the one hand, to protect a species only when the economic and other benefits of doing so are equal to or greater than the benefits of building a dam, refinery, or other such project. This "cost-benefit" approach might have been consistent with earlier legislation, but not with the stronger prohibition of 1973.[10]

It is impossible, or at least highly impractical, on the other hand,

5. President's 1972 Environmental Program, 8 WEEKLY COMP. OF PRES. DOC. 218, 223-24 (Feb. 8, 1972). *See also* Exec. Order No. 11,911, 41 Fed. Reg. 15,683 (1976).

6. 16 U.S.C. § 1531(a)(1) (1976).

7. *Id.*

8. *Id.* at 1531(a)(3).

9. *See Hearing to Amend the Endangered Species Act of 1973 Before the Subcomm. on Environment of the Seante Comm. on Commerce, Science and Transportation*, 94th Cong., 2nd Sess. (1976) (Committee Serial No. 94-82). *See also* Travis, *The Endangered Species Act of 1973*, 1 HARV. ENVT'L L. REV. 129 (1976).

10. W. HARRINGTON, ENDANGERED SPECIES PROTECTION AND WATER RESOURCES DEVELOPMENT (Mar. 1980) (Los Alamos Scientific Laboratory Informal Report LA-8278-MS) [hereinafter cited as W. HARRINGTON]; Lachenmeier, *supra* note 2; Note, *Endangered Species Act: Constitutional Tensions and Regulatory Discord*, 4 COLUM. J. ENVT'L L. 97 (1977).

to take the congressional prohibition literally, and to defend every species, unto the last, no matter how inconsequential the benefits or how great the costs. Some "middle" course or strategy must be found so that the Act remains workable, yet does not serve merely to justify the continued destruction of species in the name of economic progress.

In 1978, in response to the issue of the snail darter and the Tellico Dam,[11] Congress addressed the possible consequences of the Act by amending it to provide for a high-level Endangered Species Committee, with power to grant exemptions.[12] This did not solve the problem. It created a complex method by which irresolvable conflicts may be appealed. However, it did not state a policy, or lay down a set of principles or a strategy to determine when exemptions should be granted.

The purpose of this article is to look critically at some of the strategies and principles which have been or may be proposed for making and for justifying policy intended to conserve or preserve endangered species. The question which motivates this discussion arises in the language of the Act. Congress had made findings that many species have become extinct "as a consequence of economic growth and development untempered by adequate concern and conservation."[13] What is "adequate concern and conservation?" To what extent should economic growth be "tempered" by it? These are questions with which courts and federal agencies must grapple over the next decade. The way they answer these question will determine whether the Act thrives or itself becomes extinct.

The article is organized in the following manner. The first part sketches the background of the Act and suggests some of the critical problems which confront those charged with its implementation. The second part describes some of the principles or strategies upon which we may base policy for protecting and conserving en-

11. *See* text accompanying notes 40-43 *infra*.

12. Endangered Species Act Amendments of 1978, Pub. L. No. 95-632, 92 Stat. 3751 (1978) [hereinafter cited as "Amendments"]. There were further amendments, P.L. 96-159, 93 Stat. 1225 (1979). These refine the endangered species review process. For discussion, *see* Note, *Endangered Species Act Amendments of 1978: A Congressional Response to Tennessee Valley Authority v. Hill*, 5 COLUM. J. ENVT'L L. 283 (1979); Liner, *Environmental Law—The Endangered Species Act Amendments of 1978: Congress Responds to Tennessee Valley Authority v. Hill*, 25 WAYNE L.R. 1327 (1979).

13. 16 U.S.C. § 1531(a)(1) (1976).

dangered species. The third part discusses some of the more difficult normative and conceptual issues central to endangered species policy. One problem considered is the difficulty not of balancing competing *interests*, but of balancing *ideology* against *interests*. We must balance the "public interest" as it is measured in economic terms against the "public interest" as it is defined by the acts of Congress.[14] The article suggests how balancing of this kind might be approached.

II. BACKGROUND

Well over ninety percent of the species which have lived on earth are extinct.[15] This is as one might expect: extinction is an inevitable part of natural history. No species is guaranteed to survive forever.[16] When extinction occurs in the course of natural selection —for example, the dinosaur—normative issues are not involved. One does not ask if extinction of that kind is good or bad, right or wrong. It is part of natural history and is to be studied as fact, not justified as policy.

What concerns us today is not extinction in itself but the astonishing increase in the rate of extinction and the knowledge that our technological society is largely responsible for it.[17] We do not believe that plants or animals succumb to natural selection when their habitats are destroyed by suburban sprawl, or when chemical pollutants diminish their ability to reproduce. We recognize our responsibility for the destruction or preservation of species.

14. One may take the "plain meaning" of an act of Congress as a criterion of "the public interest" no matter what can be said against it on economic grounds. The most extreme statement of the thesis would be that there exists no public interest other than that expressed in legislation. For discussion, *see* L. TRIBE, AMERICAN CONSTITUTIONAL LAW 450 (1978). For an introduction to the controversy between legislative versus economic or market conceptions of "the public interest," *see* PHILOSOPHY AND THE PUBLIC INTEREST (W. Leys and C. Perry eds. 1959); THE PUBLIC INTERESTS: NOMOS V (C. Friedrich ed. 1962); V. HELD, THE PUBLIC INTEREST AND INDIVIDUAL INTERESTS (1970); Y. SIMON, PHILOSOPHY OF DEMOCRATIC GOVERNMENT (1951); R. Dahl, PREFACE TO DEMOCRATIC THEORY (1956). For good reviews of the literature, *see* Cochran, *Political Science and the Public Interest*, 36 J. POL. 327 (1974); Cochran, *The Politics of Interest: Philosophy and the Limitations of the Science of Politics*, 17 AM. J. POL. SCI. 745 (1973).

15. N. MYERS, THE SINKING ARK 4 (1979) [hereinafter cited as N. MYERS].

16. "In the long run every species becomes extinct." R. BREWER, PRINCIPLES OF ECOLOGY 115 (1979) [hereinafter cited as R. BREWER].

17. *See* N. MYERS, *supra* note 15, at 4-5. *See also* J. TURK, INTRODUCTION TO ENVIRONMENTAL STUDIES 70 (1980) [hereinafter cited as J. TURK].

Extinction on our continent is not new. Primitive people who drifted across the Bering Strait, perhaps 11,000 years ago, encountered many species which are extinct in the United States today.[18] No one is sure why all these extinctions happened over a relatively brief period in the scale of evolutionary time. Changes in climate may have had something to do with it.[19] The bones of these animals, however, are found amid the kitchen midden of Stone Age hunters. A likely hypothesis, then, relates the extinction of certain large animals in North America to the arrival and the hunting techniques of man.[20]

For the world as a whole, the millennia between primitive and modern times were, ecologically, comparatively stable: the increase in the number of human beings did not cause a large decrease in the number of other species. During the early modern period, from 1600 to 1900, hunting continued to be the largest cause of extinction—muskets and rifles destroyed perhaps seventy-five animal species in that time.[21] The enormous increase in the rate of extinction, perceived today, began in the last half of the nineteenth century. More than half of the known extinctions over the last 2000 years occurred during the last 60 years.[22] Rates of extinction are likely to accelerate indefinitely if trends in resource use and land management are not changed.[23]

A. *Extent of the Problem*

Estimates differ widely concerning the number of species which are endangered or threatened; indeed, the total number of species which exist in the world is a matter of conjecture. The Council for Environmental Quality reports that

> [f]or every class of animals surveyed by the Department of the Interior's Office of Endangered Species, approximately 1 out of

18. *See* J. TURK, *supra* note 17, at 69. Early North American extinctions include: mastodons, mammoths, wild pigs, giant sloths, horned bison, musk oxen, beavers as big as bears, camels, sabretooth tigers, dire wolves, and varieties of deer.

19. R. BREWER, *supra* note 16, at 242. This possibility, among others, is raised in his critical account of the Martin-Wright thesis. *See* note 20 *infra*. *See also* Davis, *Pleistocene Biogeography of Temperate Deciduous Forests*, 13 GEOSCIENCE AND MAN 13-26 (1976).

20. For discussion, *see* PLEISTOCENE EXTINCTIONS: THE SEARCH FOR A CAUSE (P. Martin and H. Wright eds. 1967).

21. J. TURK, *supra* note 17, at 69.

22. *Id.*

23. *See* N. MYERS, *supra* note 15, at 4.

> every 10 species native to the United States may be endangered or threatened. This statement appears true for major animal groups of both higher and lower classes—mammals, birds, reptiles, amphibians, and fishes as well as crustaceans, clams, and snails.[24]

The same report indicates that of the higher plants native to the continental United States, including Alaska, more than one-tenth may be endangered, threatened with becoming endangered, or recently extinct.[25]

The severity of the problem, insofar as it concerns native American species, is perhaps best suggested by a Smithsonian study prepared for the Department of Interior in 1975 and revised in 1978.[26] It concludes that 2,000 of 22,000 known plant species in the United States are endangered or threatened. Moreover, of approximately 2,200 native Hawaiian plants, a depressing fifty percent fall into these categories.[27]

The problem of extinction is as serious internationally as it is in the United States. No one knows how many species there are on earth, but the magnitude may approach ten million.[28] Only about 1.5 million of these have been identified; the rest are at present unknown. Of the species which have been identified, ten percent are thought to be endangered or threatened with extinction worldwide, a proportion similar to that in the United States.[29] This would support the estimation that nearly one million species may be under threat of extinction. Since species tend to be interdependent, the extinction of some may accelerate the rate of extinction among others.

24. U.S. COUNCIL ON ENVIRONMENTAL QUALITY, SIXTH ANNUAL REPORT 408-18 (1975).

25. *Id.* at 408.

26. E.S. AYENU & R. DE FILIPPI, ENDANGERED AND THREATENED PLANTS OF THE UNITED STATES (1978) [hereinafter cited as E.S. AYENU & R. DE FILIPPI]. This is an updated version of the oft-cited SMITHSONIAN INSTITUTION: REPORT ON ENDANGERED AND THREATENED PLANT SPECIES OF THE UNITED STATES (1975).

27. E.S. AYENU & R. DE FILIPPI, *supra* note 26, at 11; *see also* U.S. Fish and Wildlife Service, Dep't of Interior, ENDANGERED SPECIES TECH. BULL., Jan., 1980, at 12. The U.S. Fish and Wildlife Service has recently issued lists of such plants being considered for protection under the Act. 45 Fed. Reg. 82,480 (1980) (to be codified in 50 C.F.R. § 17).

28. For a general survey of the problem internationally, see EXTINCTION IS FOREVER (F. Prance and T. Elias eds. 1977); THE NATURE CONSERVANCY, THE PRESERVATION OF NATURAL DIVERSITY: A SURVEY AND RECOMMENDATIONS (1975).

29. *See* N. MYERS, *supra* note 15, at 31.

While the Act has strict provisions regarding the importation of animals and animal products,[30] this addresses only part of the international problem. What causes the disappearance of species most often is the destruction of their habitats.[31] Activities such as mining, timbering, farming, road-building, and ranching do destroy habitats. In the forestry industry alone many leading United States firms—including Weyerhaeuser, Georgia Pacific, Westvaco, and International Paper—are heavily engaged in logging projects in tropical regions. Plainly, concern with the preservation of species must affect the activities of logging companies, and international corporations generally, as well as importers of furs. Thus, a sound assessment of the need to preserve species, along with an understanding of the principles and strategies which may best be used in preserving them, will be useful not only domestically, but internationally as well.

B. *The Legislative Response*

Unlike earlier legislation, which merely encouraged federal departments and agencies to take the needs of endangered species into account, the Act requires the Secretaries of Commerce and Interior to review all programs administered by them to insure that they are consistent with and further the goal of species preservation. Much of the force of the Act derives from section 7;[32] virtually all litigation concerning the Act has arisen under this section. It instructs all federal departments and agencies to promote the purposes of the Act and to take whatever action is necessary "to insure that actions authorized, funded, or carried out by them do not jeopardize the continued existence" of endangered or threatened species or their habitats.[33]

Between 1973 and July 1978, when the Amendments[34] were passed by the Senate,[35] only four cases were litigated under the Act.[36]

30. 16 U.S.C. § 1538 (1976 & Supp. II 1978).
31. *See* N. MYERS, *supra* note 15, at 32.
32. 16 U.S.C. § 1536 (1976 & Supp. II 1978 & Supp. III 1979).
33. *Id.*
34. Amendments, *supra* note 12.
35. S. 2899, 95th Cong., 2d Sess. (1978); 124 CONG. REC. S11,158 (daily ed. July 19, 1978). The House was slower, passing its version of the Amendments in October, three days before adjourning. H.R. 14,104, 95th Cong., 2d Sess. (1978); 124 CONG. REC. H12,877 (daily ed. Oct. 14, 1978). The quickly prepared conference compromise bill was passed the last day of the term. *See* 124 CONG. REC. H13,579-80 (daily ed. October 14, 1978).
36. Hill v. TVA, 437 U.S. 153 (1978); Sierra Club v. Froehlke, 534 F.2d 1289 (8th

Since that time at least one more important case has been decided.[37] The principal question presented to the courts so far is whether section 7 permits a balancing test, that is to say, whether it might permit agencies to authorize projects which jeopardize endangered species if other important public interests are served. In *Sierra Club v. Froehlke* ("*Froehlke*"),[38] the Court of Appeals for the Eighth Circuit held that the Corps of Engineers could go forward with a project likely to jeopardize the continued existence of the Indiana bat. It was enough, the court said, that the Corps "manifested, on the record, a balancing, on the one hand, of the benefits expected to be derived from the project . . . against . . . the importance of an unspoiled environment."[39]

In *Hill v. TVA*,[40] which concerned the Tellico Dam and the snail darter, the Sixth Circuit came to the opposite conclusion. It specifically rejected a balancing test under section 7. The court said that

> the welfare of an endangered species may weigh more heavily upon the public conscience, as expressed by the final will of Congress, than the write-off of those millions of dollars already expended for Tellico.[41]

Moreover, "[e]conomic exigencies . . . do not grant courts a license to rewrite a statute no matter how desirable the purpose or result might be."[42]

The United States Supreme Court granted certiorari in the *Hill* case in order to resolve the issue between the Sixth and Eighth Circuits. The Court affirmed the Sixth Circuit decision by ruling that the Congress intended to give highest priority to the preservation of endangered species, whatever the cost.[43] The Supreme

Cir. 1976); Nat'l Wildlife Fed'n v. Coleman, 529 F.2d 539 (5th Cir. 1976); United States v. Cappaert, 375 F. Supp. 456 (D. Nev. 1974).

37. Nebraska v. Rural Electrification Administration, 12 ENVIR. REP.-CASES (BNA) 1156 (D. Neb. Oct. 2, 1978). This involves the Greyrocks Dam project, which was halted by the district court, in part, because it could have threatened the downstream habitat of the whooping crane, an endangered species. *Id.* at 1180-81. Section 5 of the Amendments (amending section 10 of the Act), *supra* note 12, directs the Endangered Species Committee to consider exempting the Tellico Dam and the Greyrocks Dam from § 7 of the Act. For discussion of these committee actions, *see* Liner, *The Endangered Species Act Amendments of 1978: Congress Responds to Tennessee Valley Authority v. Hill*, 25 WAYNE L. REV. 1327, 1339 (1979).

38. 534 F.2d 1289 (8th Cir. 1976).

39. *Id.* at 1305.

40. 549 F.2d 1064 (6th Cir. 1977), *aff'd*, 437 U.S. 153 (1978).

41. *Id.* at 1074.

42. *Id.* (relies on West Virginia Div. of Izaac Walton League of America, Inc. v. Butz, 522 F.2d 945, 955 (4th Cir. 1975)).

43. TVA v. Hill, 437 U.S. 153, 172-73 (1978).

Court decided, then, that the Tellico Dam project could continue only if the Act were amended.

Congress, at the end of the 1978 term, responded to the Supreme Court by amending the Act.[44] The amendments, however, do not appear to emasculate the Act. They add a balancing test which, according to the Supreme Court, the original Act did not permit,[45] yet "balancing" is to be done not by the courts but by a high-level Endangered Species Committee, and then only in cases of "irresolvable conflict"[46] where the interest served by the proposed project outweighs that of protecting endangered species.[47] The language of section 7 remains intact, except that it allows for exemptions through the committee process.[48]

The Amendments of 1978 charged the Endangered Species Committee to consider for exemption the Tellico and Grayrocks Projects.[49] The Committee unanimously voted to deny an exemption to the Tellico Dam; it permitted the Grayrocks reservoir to continue, after conditions were met to mitigate its effect on the habitat of the whooping crane. In September, 1979, the Senate, following an earlier House action, overruled the Endangered Species Committee, permitting the completion of the Tellico Dam.[50]

C. *The Battles Ahead*

There are several areas in which the nation is very likely, in the next two decades, to experience extreme conflict between the goals of species preservation and the development of natural resources for human use. The following sections address each of these areas of concern.

44. Amendments, *supra* note 12, § 3 (amending 16 U.S.C. § 1536 (1976 & Supp. II 1978 & Supp. III 1979)).

45. TVA v. Hill, 437 U.S. 153, 184-85 (1978).

46. Amendments, *supra* note 12, § 3 (amending 16 U.S.C. § 1536 (1976 & Supp. II 1978 & Supp. III 1979)). "Irresolvable conflict" is defined at 16 U.S.C. § 1532(11) (1976 & Supp. II 1978 & Supp. III 1979).

47. The Committee is empowered to grant an exemption to the Act only if five of the seven members of the Endangered Species Committee, voting in person, determine that no reasonable and prudent alternatives to the action are available; and that the action is in "the public interest" and has benefits that "clearly outweigh" the benefits of alternatives that would conserve the endangered species or its habitat; and that the action is of regional or national importance. *See* note 44 *supra*.

48. *Id.*

49. *See* note 37 *supra*.

50. For a history of these events, *see* Note, *Endangered Species Act Amendments of 1978: A Congressional Response to Tennessee Valley Authority v. Hill*, 5 COLUM. J. ENVT'L L. 283 (1979).

1. Water Supply

It is not an accident that the most famous cases litigated under the Act involve water projects. The growing demand for, and scarcity of precious water supplies, especially in the West, are bound to compete with the need to maintain the free-flowing rivers and streams that remain as habitats for endangered species. Ronald Fisher,[51] in testimony concerning the Colorado River, stated that "the Endangered Species Act does have within it the seeds of preventing the Western United States from properly utilizing its water resources, can seriously cripple Western agriculture, and can certainly have adverse impacts on farms, indeed on consumers, especially consumers of agricultural products and electrical energy."[52]

Water resource projects tend to disturb habitats and destroy wildlife either by inundation (flooding) or by depletion of streamflow. They cause, in other words, either too much or too little water for the survival of some species. Since 1973, problems of inundation vexed the proposed Maramec Dam (Indiana bat), Dickey-Lincoln Dams (furbish lousewort), Tellico Dam (snail darter) and Juniper Dam (Colorado squawfish). Depletion problems arose for the Grayrocks Dam (whooping crane) and the Warner Valley project (the woodfin).[53]

2. Farming, Timbering and Real Estate

Even if the Act did not pose irrigation problems, farmers and ranchers would still have costs associated with predatory species, such as the timber wolf and the owl. The effects of pesticides on endangered species—for example, the relation of DDT to pelicans—are being studied.[54] The trend toward "no-till" methods of agriculture in the eastern part of the country, for example, might be reversed if the herbicides in use, notably atrazine, are found to endanger local underwater vegetation.[55]

51. Director, as of 1977, Colorado River Water Conservation District.

52. W. HARRINGTON, *supra* note 10, at 1.

53. *Id.* at 16.

54. The book that created current concern about pesticides and the environment is R. CARSON, SILENT SPRING (1962). *See also* F. GRAHAM, SINCE SILENT SPRING (1970). Some other studies include A. BROWN, THE ECOLOGY OF PESTICIDES (1978); POLLUTION AND THE USE OF CHEMICALS IN AGRICULTURE (D. Irvine and B. Knights eds. 1974); D. PIMENTAL, ECOLOGICAL EFFECTS OF PESTICIDES ON NON-TARGET SPECIES (1971).

55. U.S. ENVIRONMENTAL PROTECTION AGENCY, RESEARCH SUMMARY: CHESAPEAKE BAY 9-16 (May 1980).

The effects of the Act on the Forest Service have been considerable. All timber contracts, sales, and management plans have to be reviewed to incorporate the needs of endangered species.[56] As demands for wood products grow, the pressure on forested habitats is bound to increase. The advance of housing into rural areas, moreover, also must contribute to the problem.[57]

Highways and airports, among other public works and "pork barrel" projects, have been and will be affected. A six-mile segment of highway in Mississippi was completed only after changes were made—required by the courts—to protect a subspecies of sandhill crane consisting of forty individuals.[58] The Act may be used and, some would say, has been used, to stop the most environmentally egregious "pork barrel" construction. Two important cases litigated under the Act involved projects included on President Carter's 1977 "hit list" of undesirable, unjustifiable giveaways.[59]

3. Mining

Certain threatened species—for example, the Houston toad—seem to have a knack of placing their habitats on known oil reserves.[60] As resource depletion continues, choices will have to be made between habitat preservation and mineral extraction. This conflict is particularly troublesome insofar as it affects deep sea and off-shore mining. Aquatic ecosystems are the largest in the world; they are also the ones about which we know the least. To what extent must we investigate or at least describe these habitats before taking action which may destroy them? The scraping of the sea bottom for magnesium nodules has been proposed for areas which are enormously rich not only in minerals but in vast, utterly unexplored ecosystems. The prospect of mining the sea poses the greatest perplexities for policymakers who must make their decisions responsive to the Act.[61]

56. As required by section 7 of the Act, 16 U.S.C. § 1536 (1976 & Supp. II 1978 & Supp. III 1979).

57. For a discussion, *see* Lachenmeier, *supra* note 2, at 55-61. For an example, *see* U.S. Fish and Wildlife Service, Dep't of Interior, *Prime Bald Eagle Roosting Site Protected from Logging*, ENDANGERED SPECIES TECH. BULL., July, 1978, at 3.

58. W. HARRINGTON, *supra* note 10, at 13.

59. *Id.* at 24. They are the Dickey-Lincoln Dams and the Maramec Park Dam. *See* 35 CONG. Q. WEEKLY REPORT 378 (1977).

60. Sayre, *Audubon Action*, 78 AUDUBON 138-39 (1976); U.S. Fish and Wildlife Service, Dep't of Interior, *Critical Habitat Determined for Houston Toad*, ENDANGERED SPECIES TECH. BULL., Feb., 1978, at 1, 3.

61. *See, e.g.*, U.S. Fish and Wildlife Service, Dep't of Interior, *Corps/Service*

4. Other Projects

Large-scale military projects, of which the proposed MX missile serves as an example, are likely to be questioned, perhaps litigated, under the Act. It is hard to miss the irony that modern weaponry poses a very serious threat of extinction to mankind, yet criticism comes to these large-scale military projects because of the threat they may pose to other species.[62]

Projects concerned with production of energy may raise the greatest overall problem for environmental quality in general, and the preservation of species in particular. The most striking example of this may be the refinery which, for the last eight years, the Pittston Company of New York has been trying to build in Eastport, Maine. In that time, the cost of the project has jumped from $350 million to $750 million.[63] Moreover, the likelihood of increased population, and the possibility of oil spills, emissions of mercury and sulfur dioxide, and other pollution would threaten endangered species of eagles and whales.[64]

Nonetheless, the Department of Energy and the Department of Defense support the refinery as important to oil-starved New England, as well as to national security and the balance of payments.[65] The Department of Interior, protector of eagles, and the Department of Commerce, protector of whales, on the other hand, have acted to stop the project, in part because of the Act.[66] In January, 1979, Pittston applied to the Endangered Species Committee for an exemption. The difficulties it has faced so far in even obtaining a hearing provide a cautionary tale to any industry which would pin its hopes on the Act's review process.[67]

Many conflicts and controversies under the Act are likely in

Cooperate to Protect Endangered Mussels, ENDANGERED SPECIES TECH. BULL., Sept., 1978, at 3.

62. For an overview of the problem, *see* U.S. FOREST SERVICE, DEP'T OF AGRICULTURE, PROCEEDINGS OF THE CONFERENCE ON ENDANGERED PLANTS IN THE SOUTHWEST (1977); For a report on cactus listings, *see* U.S. Fish and Wildlife Service, Dep't of Interior, *Service Lists 32 Plants*, ENDANGERED SPECIES TECH. BULL., Nov., 1979, at 1.

63. *See Refinery Resisted Where the Eagle Flies*, Washington Post, July 16, 1979, at A7, col. 3.

64. *Id.*

65. *Id.*

66. *Id.*

67. U.S. Fish and Wildlife Service, Dep't of Interior, *Exemption Process Stayed as Agencies Reinitiate Consultation on Marine Refinery*, ENDANGERED SPECIES TECH. BULL., Mar., 1979, at 1.

areas other than those now mentioned. What has been said, however, makes one prediction safe: if we are to continue to have a useful and effective Act, we must devise and justify appropriate principles and strategies for endangered species policy. The next section presents and criticizes these principles and strategies, within the framework of conceptual and normative issues which those charged with administering the Act must confront.

III. Principles and Strategies

What are the best strategies for implementing the Endangered Species Act? One can find suggestions in litigation, in law review articles, and in academic and journalistic debate. We have already come across two positions which appear to present the extreme poles of discussion. The Supreme Court, in *Tennessee Valley Authority v. Hill*,[68] interpreted the 1973 law to mean exactly what section 7 says. Chief Justice Burger, speaking for the Court, said "[o]ne would be hard pressed to find a statutory provision whose terms were any plainer than those in Section 7 of the Endangered Species Act . . . . This language admits of no exception."[69]

Chief Justice Burger wrote that Congress intended to preserve every endangered species and its habitat come what may. This is something Congress can do under the Constitution; what more, then, could be said by the Court? Only what the Court did say: the law, as written, rules out an "interest-balancing" or "cost-benefit" test. No agency, then, could permit a project that jeopardized an endangered species, no matter how compelling were the needs the project would serve.

That Congress did not intend to make a law *this* strong is indicated by its response to the Court, namely, amending the Act. Yet, the idea that Congress intended to make a law *almost* that strong must remain. Congress, with Chief Justice Burger's decision in hand, left much of the Draconian letter and spirit of the legislation intact.

At the opposite extreme, we find the *Froehlke*[70] decision. It approved a "cost-benefit" or "interest-balancing" test.[71] The Eighth

68. 437 U.S. 153 (1978).
69. *Id.* at 173.
70. Sierra Club v. Froehlke, 534 F.2d 1289 (8th Cir. 1976).
71. The Eighth Circuit said:
[i]t is clear that the decisions reached by the Corps, in the light of conflicting

Circuit reasoned that if the value of a water project is greater than that of a species of bat, then we might do without the bat.[72] This approach may have been consistent with the 1966 Act.[73] But is it consistent with the 1973 legislation? The will of the people, in our republic, is expressed by congressional legislation—and not, necessarily, by market surveys or cost-benefit studies. Species are in danger—and Congress moved to protect them—not because they are economically valuable, but because they are not.[74]

We may think the principle stated by the Supreme Court requires too much; the approach accepted by the Eighth Circuit, however, permits too much. It is plausible to think that the conscience of the nation, as expressed in an act of Congress, insists upon saving species even when the costs are greater than the benefits. But how much greater? Where is one to draw the line? Where can we find reasonable and workable strategies for species preservation which are neither too weak nor too strong?[75]

considerations involved, were difficult and onerous, but they were far from capricious. There is manifested, on the record, a balancing, on the one hand, of the benefits expected to be derived from the project by way of flood control, water supply and abatement of pollution, and recreation, among other considerations, against, on the other hand, the importance of an unspoiled environment.

Id. at 1305.

72. In taking this approach, the court cited with approval the standard adopted by the Fifth Circuit in Nat'l Wildlife Fed'n v. Coleman, 529 F.2d 359 (5th Cir. 1976). *Froehlke*, 534 F.2d at 1304-05. This standard is more familiar in its previous use in Citizens to Preserve Overton Park, Inc. v. Volpe, 401 U.S. 402, 416 (1971). The standard of review, which rests on § 706 of the Administrative Procedure Act, 5 U.S.C. § 706 (1976), requires that the reviewing court determine whether the agency acted within the scope of its authority, and then whether the decision reached was "arbitrary, capricious, an abuse of discretion, or otherwise not in accordance with law." This standard was employed in *Froehlke* to build a "balancing" test into a statute that appeared to the Supreme Court in *TVA v. Hill* not to permit one. TVA v. Hill, 437 U.S. at 173.

73. The Endangered Species Preservation Act of 1966, Pub. L. No. 89-669, 80 Stat. 926 (repealed 1973), requires federal agencies to protect endangered species "insofar as is practicable and consistent with the primary purposes" of those agencies.

74. The Supreme Court in TVA v. Hill, 437 U.S. 153, 174 (1978), lays out, from the legislative history of the Act, evidence that Congress intended to preserve species *not for the sake of* but *from* economic exploitation and the demands of "progress." The Court cites especially *Hearings on Endangered Species before a Subcommittee of the House Committee on Merchant Marine and Fisheries*, 93d Cong., 1st Sess. (1973). For a relevant discussion of these hearings, *see* Coggins, *Conserving Wildlife Resources: An Overview of the Endangered Species Act of 1973*, 51 N.D. L. REV. 315, 321 (1974).

75. For one approach to the problem of setting cost limits on regulatory zeal in applying the law, *see* Demuth, *Constraining Regulatory Costs: Part I: The White*

We may begin with the language of the Act. There, Congress finds and declares that endangered species of "fish, wildlife, and plants are of esthetic, ecological, educational, historical, recreational, and scientific value to the Nation and to its people."[76] Assuming that it is not possible to save all species, or, indeed, even to list all those which are endangered, we may ask the question whether we can use some ordering of values—esthetic through scientific—to establish a set of principles upon which to base decisions when the preservation of species conflicts with other pressing public interests. What are the ecological, esthetic and economic values of *species*? How can these be protected? This is the kind of question we must answer if we are properly to apply the Act.

A. *Ecological Values*

The problem of defining ecological values in a way which can be useful in public policy is as recent as it is perplexing. Earlier in this century, legislators acted to conserve resources from wasteful exploitation; but there the motive was economic, not ecological.[77] The concept of ecological value, indeed, seems to have had its debut in public forums in the 1960s, not long after being introduced by the environmental movement.[78] Before that time, the ecology as a whole, as contrasted with specific natural resources, did not seem to merit specific legislative protection.

Several strategies may be proposed for preserving species on the basis of their ecological values. Two such strategies are to preserve ecological communities and to preserve diversity.

House Review Programs, REGULATION, Jan./Feb. 1980, at 13; Demuth, *Constraining Regulatory Costs: Part 2: The Regulatory Budget*, REGULATION, Mar./Apr. 1980, at 29-44. *See also* U.S. DEP'T OF COMMERCE, REGULATORY REFORM SEMINAR 17-31 (Oct. 1978).

76. 16 U.S.C. § 1531 (1976 & Supp. III 1979).

77. *See generally* S. HAYS, CONSERVATION AND THE GOSPEL OF EFFICIENCY: THE PROGRESSIVE CONSERVATION MOVEMENT 1890-1920 (1969); W. OPHULS, ECOLOGY AND THE POLITICS OF SCARCITY 167-83 (1977).

78. The best short survey of the literature on the concept of ecological value in economics is Fisher & Peterson, *The Environment in Economics: A Survey*, 14 J. ECON. LITERATURE 1 (1976). According to that survey, the seminal essay was Kenneth Boulding's *The Economics of Coming Spaceship Earth*, in ENVIRONMENTAL QUALITY IN A GROWING ECONOMY 3-14 (H. Jarrett ed. 1966). *See also* K. BOULDING, THE MEANING OF THE 20TH CENTURY: THE GREAT TRANSITION (1965); Nelkin, *Scientists and Professional Responsibility: The Experience of American Ecologists*, 7 SOC. STUD. OF SCI. 75 (1977); Samuels, *Ecosystem Policy and the Problem of Power*, 2 ENVT'L AFF. 580 (1972).

1. Preserve Ecological Communities

This approach would target for preservation, not species, but communities, ecosystems or ecounits, within larger environments. The reasoning is that ecounits, rather than the individual species within them, have biological value. It is the functioning, for example, of the entire salt marsh or forest community, and not just the vitality of the wildlife in them, which we must protect if we are to show concern and respect for the ecosystem as a whole. The preservation of species, of course, requires the preservation of the habitats which are critical to them.[79] But the suggestion here is to establish priorities among habitats, and therefore among endangered species, based on the role these play in larger ecological systems. This could lead us to identify geographic regions which are biologically rich or productive. We may give priority to the protection of endangered species within those areas.

Recently, the United States Fish and Wildlife Service spent over $2 million to acquire fifty-five acres of sand dunes in northern California, to protect the habitat of Lange's Metalmark, a species of butterfly.[80] This might be justified under the "ecounit" strategy because the area is rich in other species, including other endangered species. Rich ecosystems, such as aquatic communities, would also be likely candidates for protection.

The suggestion, then, is not so much to save a biological community to preserve a species; rather, it is to preserve the species in order to save the community. This approach has certain advantages. It is more likely to succeed, over the long run, than is the attempt to preserve isolated habitats apart from the surrounding communities. It is also likely to add to the predictability of investment: industries will have a better idea in advance where not to locate. The social costs may be smaller—although they may not appear so—than if they were spread more thinly in geographical terms. It may be difficult to define areas which are comparatively self-contained in their ecology, but the identification and protection

79. The other possibility would be to preserve species in captivity or in artificial or changed habitats. This interpretation of the Act, in principle, could remove its effect on protecting the *environment*. *See* U.S. Fish and Wildlife Service, Dep't of Interior, *Semen Preservation and Artificial Insemination Could Make the Difference*, ENDANGERED SPECIES TECH. BULL., Mar., 1980, at 4.

80. U.S. Fish and Wildlife Service, Dep't of Interior, *Antioch Dunes Acquired for Butterfly and Two Plant Species*, ENDANGERED SPECIES TECH. BULL., Apr., 1980, at 6.

of communities of that kind would constitute a plausible way to read and apply the Act.

2. Preserve Diversity

This strategy looks primarily at the uniqueness of a species or its rarity within a genus.[81] While it is sometimes difficult to establish the meaning of these concepts in theoretical terms, they lend themselves to explanation by example.[82] The snail darter has many close relatives: eighty or ninety species of darter exist in Tennessee alone, and new ones are being discovered at the rate of about one a year.[83] On the other hand, "relict" species, like the sequoia, have a very high uniqueness value, having survived geological changes which destroyed near relatives.

An interesting variant of this strategy would, in general, give priority to K-selected over r-selected species,[84] since a K-selected organism is unusually well adapted to its particular niche and makes

81. *See* THE NATURE CONSERVANCY, THE PRESERVATION OF NATURAL DIVERSITY: A SURVEY AND RECOMMENDATIONS (1975).

82. For a view of the conceptual issues, *see* Gehlback, *Investigation, Evaluation, and Priority Ranking of Natural Areas*, 8 BIOL. CONSERV. 79 (1975).

83. The snail darter itself may have been discovered elsewhere in Tennessee. The New York Times reported that "[w]hat is believed to be a new population of snail darters, the three-inch fish whose possible demise led the Supreme Court to halt construction of Tellico Dam in Tennessee for three years, has been found alive and well in a previously unknown habitat 80 miles from the dam." New York Times, Nov. 8, 1980, at 6, col. 6.

84. The traditional view of natural selection assumes that species that reproduce faster will increase in population relative to those that reproduce at a slower rate. As a result, it would seem to follow that genotypes which produce fewer eggs, have longer maturing times, and raise relatively fewer offspring, would eventually disappear from evolution. Yet many successful species—man among them—produce at most one or a few offspring each year and take a long time to reach reproductive age. R. MacArthur and E.O. Wilson have proposed, to explain this fact, that evolution takes different paths in species that live under crowded and unstable conditions and in those that live in more stable conditions but at about carrying capacity. For the former, the intrinsic rate of natural increase (r in the logistic equation) is decisive, since intraspecific competition is unimportant; for the latter, who live at the carrying capacity of the ecosystem (K in the equation), ability to compete and increased specialization are favored. Thus, r-selected species are likely to be short-lived, small in size, and will produce a larger number of seeds or eggs at an early age, thus dispersing easily. K-selected organisms, larger and longer-lived, will reproduce in smaller numbers in order to protect in intraspecific competition the young they have. For a technical discussion, *see* R. MACARTHUR & E.O. WILSON, THE THEORY OF ISLAND BIOGEOGRAPHY (1967). For specific application, *see* Gadgil & Salbrig, *The Concept of r- and K-selection: Evidence from Wild Flowers and Some Theoretical Considerations*, 106 AM. NAT. 14 (1972).

efficient use of a limited range of opportunities. Organisms developed in this way will very likely contribute much more to overall diversity that those which breed much faster and spread large numbers of young over various environments. Whether or not a general relation between "specialization" and "diversity" holds, however, need not concern us here. It does suggest some of the problems which may lie in the way of fully analyzing the relevant concepts.

The question "What is diversity?" poses additional problems. How is it to be measured? Why should we think the diversity of species has an ecological value? It is believed by some that the diversity of species is connected with the stability of ecosystems. Is there anything in this principle which may guide or justify policies for applying the Act?

B. *Esthetic Values*

The reasons for giving some species priority over others, based upon recreational and esthetic principles, need to be investigated, for their importance is not fully understood. Sometimes these arguments are hastily dismissed. One may say, for example, that they apply only to creatures that, like the bald eagle and the peregrine falcon, excite admiration or serve as symbols of superior qualities.[85] Similarly, it is comparatively easy to defend the recreational importance of species that can be fished or hunted, or that are large and showy. An impulse in humans to protect and cuddle babies seems to extend to certain species that, one way or another, suggest the embryonic state.[86] However, if esthetic arguments for the preservation of species ended with these observations, they would not be very helpful. They surely would not help with the vast majority of endangered plant and animal species, most of which are small, rarely recognized even by those who notice them, and are not prized for their beauty or admired for their strength.

Esthetic and recreational arguments for the preservation of species, however, cannot be so easily dismissed. It is important to recognize that environmentalists and others who value the natural world for esthetic reasons and who seek to contemplate and enjoy nature in its variety do not necessarily favor one species over an-

85. For this suggestion, *see* Sagoff, *On Preserving the Natural Environment*, 84 YALE L.J. 205, 245-67 (1974).

86. *See* Gould, *This View of Life*, NAT. HIST., May, 1979, at 30.

other. What they value is nature itself as the product of evolutionary history; they value wilderness and natural environments for the qualities nature expresses or exemplifies as a whole.

Esthetic values are hard to distinguish from historical values; perhaps it is not useful to do so. What we appreciate esthetically in nature—as in art—is that which has a history of a certain kind; and we value it as an expression of that history.[87] The attempt to preserve species on esthetic grounds may apply, then, not just to pretty, cuddly creatures or symbolic ones but also to that which exemplifies our heritage of evolution. The problem of valuing species as *parts* in relation to nature as a *whole*—the general difficulty in assessing the value of nature as an ideal—will occupy us later in this discussion.

C. *Economic Values*

It is noteworthy that Congress did not include *economic values* among the reasons it found for preserving species. Two explanations may be given for this. First, endangered species are not, in general, economically the most valuable ones.[88] The idea of the Act is to preserve economically "useless" species among the rest.[89] Second, Congress may not have wanted to give the impression of preserving species simply or primarily for their economic uses. For that would invite the courts and others to surmise that Congress intended to permit the extinction of species when the economic benefits exceed the costs. This seems to be the sort of inference which the language of the Act seeks to avoid at every point.[90]

87. For controversy concerning this point, *see* Krieger, *What's Wrong with Plastic Trees?*, 179 SCI. 446 (1973); Tribe, *Ways Not to Think About Plastic Trees: New Foundations for Environmental Law*, 83 YALE L.J. 1315 (1974); Sagoff, *On Restoring and Reproducing Art*, 75 J. PHIL. 453 (1978); Tribe, *From Environmental Foundations to Constitutional Structures: Learning from Nature's Future*, 84 YALE L.J. 545 (1975).

88. For discussion, *see* Ehrenfeld, *The Conservation of Non-Resources*, 64 AM. SCIENTIST 648 (1976) [hereinafter cited as Ehrenfeld].

89. *See* note 74 *supra*.

90. Documents related to the history of the Act do recognize the economic and other benefits of the preservation of natural diversity. *See* note 122 *infra*. This sort of argument, however, tends to be labeled as "narrow" by those who make it, thus suggesting that ideological or non-economic arguments are at least as important. For example, this message: "[f]rom the most narrow possible point of view, it is in the best interests of mankind to minimize the losses of genetic variations. The reason is simple: they are potential resources. They are keys to puzzles we cannot solve, and may provide answers to questions which we have not yet learned to ask." HOUSE COMM.

In spite of what has been said, however, an economic criterion may be suggested for establishing priorities among species. The use of such a criterion in order to establish priorities among species does not commit one to the view that species should be preserved simply for economic reasons. One may argue, on the contrary, that the will of the nation is to protect species at considerable economic cost even after the benefits of protection are taken into account. Nevertheless, since not *all* species can be saved, we may use economic considerations to determine which ones we shall sacrifice, so that the economic benefits may be maximized, even if they do not equal costs.[91]

We may assume that species which are very useful will be preserved for their use. No one fears the extinction of the barnyard pig or the dairy cow. The problem is the preservation of comparatively "useless" species. What kind of economic ordering can we apply to them?

David Ehrenfield, in *The Conservation of Non-Resources*,[92] lists nine general categories into which economic arguments for the preservation of "useless" species fall. These include:

1. Recreational and esthetic values
2. Undiscovered or undeveloped values
3. Ecosystem stabilization values
4. Value as examples or problem-solving
5. Environmental monitoring values
6. Scientific research values
7. Teaching values
8. Value in reconstructing lost or damaged habitats
9. Fear of going too far: irreversible damage.[93]

Several of these categories may present reasons for preserving "useless" or threatened species *in general* but do not seem to offer ways of determining economic priorities among them. Consider, for example, "undiscovered or undeveloped values." Who knows

ON MERCHANT MARINE AND FISHERIES, REPORT ON ENDANGERED AND THREATENED SPECIES CONSERVATION ACT OF 1973, H.R. DOC. NO. 93-412, 93rd Cong., 1st Sess. 5 (1973).

91. But for problems with this approach, *see* Bishop, *Endangered Species and Uncertainty: The Economics of a Safe Minimum Standard*, 60 AM. J. AGRIC. ECON. 10 (1978).

92. Ehrenfeld, *supra* note 88, at 648.

93. *Id.* at 648-51.

what neglected or unnoticed species will turn out to have an immense medical or other importance? One thinks of the lowly *Penicillium* as an example. Can we find a way to predict the sorts of species likely to make as great contributions in the future? The answer to this question must be left to future research.

The value of various species in teaching, environmental monitoring, and scientific research is well known. However, can we presume from these species that undiscovered species will possess similar beneficial qualities? The firefly, for example, has an exemplary method of making much light with little heat. What other organisms have solved problems so efficiently that we may learn from them? Plainly, no secure answers to these questions can be given. But something may be done to set directions for answering them.

Finally, many Americans are concerned that we must, as a nation, "dig in our heels" somewhere. We suspect that, for most endangered species and most of the projects which threaten them, it will be arguable that the particular project is "worth more" than the particular species. Yet each species may contribute more to the ecosystem as a whole, than each highway contributes to the highway system as a whole, or each dam contributes to an irrigation network. Some members of Congress may have reasoned that we have to stop destroying species altogether in order to "save" nature as we know it.[94] If we cannot save them all, can we tell which species make the greatest contribution, not to us directly, but to ecological stability overall?

D. *Other Strategies*

1. Triage Systems

One strategy for implementing the Act may direct itself not so much to the comparative *value* of endangered species, but to the *degree* to which they are endangered. Such an approach may employ an analogue of that used by the French army to treat the wounded during World War I. Following this practice, we would divide all threatened species into three categories: those threatened only slightly; those endangered but with good prospects for recovery; and those with just a few left in the breeding population. One may then decide to commit the largest share of available re-

94. *See* SENATE COMM. ON COMMERCE, REPORT ON ENDANGERED SPECIES ACT OF 1973, S. DOC. NO. 93-307, 93rd Cong., 1st Sess. 2-5 (1973).

sources to species within one of these categories. One might, following the French example, try to save the species in the middle category, where limited resources may have the greatest effect. However, reasons may be offered for committing resources to species in another category. For example, it may seem reasonable to keep species from becoming endangered,, rather than to try to save those which are already in a critical condition. Concerns of this kind are likely to arise within any strategy we adopt for implementing the Act.

2. Mixed Strategies

It is likely that the strategy we should adopt for implementing the Act would contain a mixture of the priority systems outlined above. The problem policymakers now confront, therefore, concerns not only different principles for implementing the Act, but also the ways and means of choosing among a range of acceptable principles in addressing different circumstances. Plainly, species of high symbolic and esthetic importance—for example, the bald eagle and the blue heron—would have to be protected on those grounds alone. Other species may obtain a high priority for other reasons—economic value, important ecological function, or a more general triage evaluation. Policymakers must therefore weigh alternative objectives in preservation policy. For this purpose, "point-systems" may be useful, but they have been heavily criticized.[95] The greatest need, however, is not for a programmable system for obtaining "scores." The fundamental need is to gain an understanding of the values and concepts which lie behind and are, in a way, expressed by the Act.

3. Competing Interests

Finally, problems may arise in establishing priorities, not among species, but among the projects or developments which threaten them. Environmentalists groups and federal agencies have used

95. For discussion of the way points may be awarded for vulnerability, esthetic interest, and place in a taxonomic system, *see* Ramsay, *Priorities in Species Preservation*, 5 ENVT'L AFF. 595, 608-09 (1976) [hereinafter cited as Ramsay]. Ramsay observes: "[i]n one test evaluation, the Devil's Hole pupfish—a well known object of preservationist concern—received a poor ranking, 58.0 out of 180.0 possible points. This intuitively unsatisfying result, the apparent overlapping nature of the categories considered, and the arbitrariness of the weights assigned to each, suggests that the system contains serious deficiencies." *Id.* at 608.

and will use the Act to block projects which are anathema to them. Environmentalists objected to Tellico, of course, for many reasons besides the snail darter: indeed, the darter might not have been discovered, except as part of the campaign to stop the dam.[96] Likewise, groups or agencies which tend to take a dim view of suburban sprawl and the growing commercialization of the American environment, may see the Act not just as a means of preserving species, but as a way of providing a certain sort of zoning as well.

Problems are sure to arise concerning competing public interests when these are represented not in economic but in human terms. It is one thing to destroy the habitat of a toad or butterfly in order to expand the parking lot of a liquor store or shopping center. It is another thing to argue that this is the only place one can put low-income housing. Someone may argue that the Act provides a limit on the degree to which we can alter the environment in the name of the economic efficiency. But what about the claims of justice and social equality? Some way should be built in the process of implementing the Act to recognize the relative worth of competing public interests. And these interests, like the Act itself, must be understood in political and social, as well as economic, terms.

IV. Issues

In the final part of this article, consideration is given to those normative and conceptual issues which are crucial to the choice we must make among strategies for implementing the Act. Discussion shall be limited to three issues. The first, which involves the concept of diversity, arises in the context of assessing the ecological value of species. The second concerns esthetic value: the importance of individual species to an esthetic or organic whole to which they belong—nature, ecology or evolution. The third issue involves the possibility that Congress intended to protect species in part to "draw a line" beyond which the economic encroachment on the environment cannot go. This seems to imply that non-economic, political, or ideological values are at stake in the motivation of the Act. The question arises, then, what these values are and how policy decisions may best take them into account.

96. For a description of this campaign, *see* N.Y. Times, June 4, 1978, § 6 (Magazine), at 38, col. 1.

A. *The Diversity of Species*

That the diversity of nature is admirable and worthy of preservation is beyond dispute. The idea of nature as an ascending scale of life—perfect in its continuity and plenitude—lies at the heart of the western intellectual tradition.[97] This ascending scale, in which every species has its place, and from which none can be removed without a loss to all, has been studied and championed by authors, artists, and philosophers since Plato and Aristotle.[98]

The philosophical and religious tradition which stretches from Plato and Aristotle to Aquinas stresses the value of every species insofar as it contributes to the diversity of things, which is in itself an important good.[99] This tradition persists today.[100] Most of us believe that a world which includes a great number of species is better than one which contains few. A world in which man lived alone, with no other animals, would be a very sad one, even if we had all the dams, parking lots, refineries, and highways anyone ever could want. The belief that nature in its variety has a metaphysical or intrinsic value is one which most, if not all, people share. This belief is consistent with the fact that animals may be less useful, or less productive from the point of view of consumable goods, than are parking lots and refineries.[101]

97. For discussion, *see generally* A.O. LOVEJOY, THE GREAT CHAIN OF BEING (1936) [hereinafter cited as A.O. LOVEJOY].

98. In the PHYSICS and DE ANIMA, Aristotle does not merely classify the things in the world, but ranks them in terms of value; in the METAPHYSICS (especially ch. 11, bk. 5 (Delta) and ch. 8, bk. 9 (Theta)), Aristotle employs the notion of the prior and posterior to grade objects and place them within a general axiology. Modern philosophies, after Descartes, departed from Aristotle with respect to the notion that natural objects may be more or less intrinsically valuable.

99. Consider this passage by Aquinas:

> Although an angel, considered absolutely, is better than a stone, nevertheless two natures are better than one only, and therefore a Universe containing angels and other things is better than one containing angels only.

A.O. LOVEJOY, *supra* note 97, at 77.

100. *See* J. PASSMORE's discussion of diversity in MAN'S RESPONSIBILITY FOR NATURE 119 (1977). *See also* A. LEOPOLD, *The Land Ethic*, in A SAND COUNTY ALMANAC 201 (1949). For a defense of the concept of metaphysical value in connection with endangered species, *see* Gunn, *Why Should We Care About Rare Species?*, 2 ENVT'L ETHICS 17 (1980); N. RESCHER, *Why Save Endangered Species*, in UNPOPULAR ESSAYS ON TECHNOLOGICAL PROGRESS 79 (1980).

101. I ignore the possibility of awarding "shadow" prices to the "amenity," "fragile," or "intangible" values represented in the love we feel for whales, eagles, and so on. Commentators have suggested that by "shadow" pricing, these "moralisms" may be brought into cost-benefit accounting or into market or economic ap-

Since it may not be feasible for us to preserve *all* species, we must ask to which species we should give priority. The idea of nature as valuable in its variety suggests answers to this question. First, one may give priority to species "higher" in the scale of evolution. This presumes that there exists an "order" or "scale" in evolution, which might justify priorities for species preservation. The idea that the variety of species expresses an order, or *telos*, culminating in man, is a religious, not a biological one. From an evolutionary point of view, man seems to be an afterthought of creation, and not the crowning purpose of it.[102] It is hard to make out, with scientific support, any positive thesis about progress, perfection, or hierarchy in nature.[103] Nevertheless, certain eminent biologists, E.O. Wilson among them, have argued recently for reintroducing notions of optimality and, therefore, purpose or direction, into ecology.[104] The concept of nature as perfect, or at least as purposive, exerts a powerful grip on the mind, sometimes in spite of contrary evidence.

Second, one may try to preserve those species that contribute most to the diversity of nature. This raises the question of what diversity is, and how we are to measure it. We should also ask why we wish to preserve diversity, assuming that we understand what it is, at least enough to measure the relative diversity of species.

proaches to policy analysis. *See, e.g.*, B. ACKERMAN, THE UNCERTAIN SEARCH FOR ENVIRONMENTAL QUALITY 141 (1974); Tribe, *Ways Not to Think About Plastic Trees: New Foundations for Environmental Law*, 83 YALE L.J. 1315, 1319 (1977). My own view is that the attempt to "shadow" price fragile values as if they were market externalities (that is, to count in the pain and suffering of "bleeding hearts" who hate to know that seals are being killed) undercuts the political or legislative process which, one might argue, exists to give ideological views an avenue for effective expression. Moreover, the ease with which "fragile" values can be detected and priced suggests that an economic analysis can be made to support any law for which there is a sizable constituency—thus turning what seemed an empirical investigation of costs and benefits into an irrefutable, because trivial, justification exercise. *See* Wildavsky, *Aesthetic Power or the Triumph of the Sensitive Minority Over the Vulgar Mass*, in POLLUTION AND PUBLIC POLICY 36, 38-40 (D. Paulsen and R. Denhardt eds. 1973).

102. For Darwin's insistence on this view, *see generally* H. GRUBER & P. BARRETT, DARWIN ON MAN (1974).

103. *See, e.g.*, E. MAHR, *Accident or Design: The Paradox of Evolution*, in EVOLUTION AND THE DIVERSITY OF LIFE 30 (1976). *See also* Jacob, *Evolution and Tinkering*, 196 SCI. 1161 (1977).

104. G.F. OSTER & E.O. WILSON, CASTE AND ECOLOGY IN THE SOCIAL INSECTS (1978). *See also* Cody, *Optimization in Ecology*, 183 SCI. 1156 (1974); Smith, *Optimization Theory in Evolution*, 9 ANN. REV. ECOL. SYS. 31 (1978); *cf.* Lewontin, *Fitness, Survival, and Optimality*, in ANALYSIS OF ECOLOGICAL SYSTEMS 3 (1978).

1. What Is Diversity?

The first problem in analyzing the concept of *diversity* among species lies in understanding the concept of a species. If we use the standard Linnean system, we would think of a species as a set of organisms which interbreed in the wild. The relation, "interbreeds in the wild," however, is not necessarily a transitive one: if *A* interbreeds with *B*, and *B* with *C*, it may not be the case that *A* interbreeds with *C*. Thus the question arises whether *A*, *B* and *C* belong to the same species, two species or three species. This is one of a variety of complicated issues in taxonomy to which the policymaker should be sensitive.[105]

Once organisms are discriminated into species, one must then establish the "similarities" and "differences" among those taxa. The questions are complex and important. One may ask, for example, whether morphological or behavioral traits should count more, since biologists may use both to classify or relate species of animals. Likewise, we may wonder whether to establish *analogy* or *homology* as the basis for similarity.[106] Analogous structures, such as the eye of an octopus and the eye of an ape, have much the same function and structure, but evolved independently. The eye of an ape and the eye of a man, however, are homologous because they derive from the same evolutionary history.

Once we have established some idea of what species are and some conceptual basis for describing them as more or less similar, we need to explain ways of comparing the "distance" or "diversity" among different pairs of species. This may be done, for example, by thinking in terms of geographical separation, temporal separation in evolutionary history, morphological characteristics, or in some other terms.[107]

105. For discussion, *see* Ramsay, *supra* note 95, at 595; Gould, *This View of Life: Evolution and the Brain*, 84 NAT. HIST. 24 (1975). *See also* Buck & Hull, *The Logical Structure of the Linnaean Hierarchy*, 15 SYSTEMATIC ZOOLOGY 97 (1966); R. CROWSON, CLASSIFICATION AND BIOLOGY (1970); Gheselin, *A Radical Solution to the Species Problem*, 23 SYSTEMATIC ZOOLOGY 536 (1974); Hall, *The Effect of Essentialism on Taxonomy*, 15 BRIT. J. PHIL. SCI. 314 (1965); THE SPECIES PROBLEM (E. Mays ed. 1957) (A.A.A.S. Pub. No. 50).

106. For discussion of this distinction, *see* Boyden, *Homology and Analogy: A Critical Review of the Meaning and Implications of These Concepts in Biology*, 37 AM. MIDLAND NATURALIST 648 (1947).

107. One may think even of behavior as a dimension along which "diversity" can be measured. *See* J.H. CROCK, SOCIAL BEHAVIOR IN BIRDS AND MAMMALS: READINGS ON THE SOCIAL ETIOLOGY OF ANIMALS AND MAN xxi-xxxiii (1970).

2. Why Preserve Diversity?

Many reasons for respecting and preserving the diversity of species have been advanced. They may be divided into two kinds. Arguments of one kind defend the view that diversity has an ecological value in contributing to the resilience of ecosystems. Arguments of the second kind defend the intrinsic, esthetic, or "metaphysical" value of the diversity of species.

People have often argued that diversity has an ecological value. The hypothesis that diversity contributes to the stability of ecological systems is used to support policies protecting the environment.[108] The Senate Committee on Commerce adopted this approach, stating that species in their diversity "perform vital biological services to maintain a 'balance of nature' within their environments."[109] This congressional statement reflects the popular assumption that "the more complex an ecosystem, the more successfully it can resist a stress . . . . Like a net, in which each knot is connected to others by several strands, such a fabric can resist collapse better than a simple, unbranched circle of threads—which if cut anywhere breaks down as a whole.[110] Yet evidence has been mixed in support of this view." On one hand, monoculture is more prone to destruction by pests than is a more diverse system of farming. In successive biological communities, on the other hand, earlier stages sometimes contain a greater quantity and variety of life than the final, stable climax community.[111] One critic, surveying the literature on this problem, comments that:

> the predisposition to expect greater stability of complex systems was probably a combined legacy of eighteenth century theories of political economics, esthetically and perhaps religiously moti-

108. *See, e.g.*, L. ELTON, THE ECOLOGY OF INVASIONS BY ANIMALS AND PLANTS 145-46 (1958); Hutchinson, *Homage to Santa Rosalia or Why There Are so Many Kinds of Animals*, 93 AM. NAT. 145 (1959). Hutchinson writes: "a complex trophic organization of a community is more stable than a simple one." *Id.* at 155. *See also* MacArthur, *Fluctuations of Animal Populations and a Measure of Community Stability*, 36 ECOLOGY 533 (1955).

109. SENATE COMM. ON COMMERCE, REPORT ON ENDANGERED SPECIES ACT OF 1973, S. DOC. NO. 93-307, 93rd Cong., 1st Sess. 2 (1973).

110. B. COMMONER, THE CLOSING CIRCLE 38 (1972).

111. *See, e.g.*, Mahr, *Accident or Design: The Paradox of Evolution*, in EVOLUTION AND THE DIVERSITY OF LIFE 31-44 (1976). For a major study of relevant issues, *see* R. MAY, STABILITY AND DIVERSITY IN MODEL ECOSYSTEMS (1973). *See also* Leigh, *On the Relation Between Productivity, Biomass, Diversity, and Stability of a Community*, 53 ZOOLOGY 777 (1965).

> vated attraction to the belief that the wondrous variety of nature must have some purpose in an orderly world, and ageless folkwisdom regarding eggs in baskets.[112]

3. How to Measure Diversity?[113]

At least one biologist who has studied the conceptual, semantic, and technical problems surrounding the issue of diversity has suggested that "species diversity has become a nonconcept"[114] and that the term be abandoned. While this may be extreme, the difficulties, for our purposes, can be exposed in a distinction between the concept of *species diversity* and the concept of *species richness*. Species diversity has to do with a relation between the number of species in a community and their relative abundance (or equitability).[115] Richness is usually measured in terms of the number of species present however rare some may be.[116] Thus, of two communities[117] each containing a hundred individuals belonging to any one of four species, the one that contained twenty-five examples of each species would be more diverse than the one that contains a preponderance of a single species, with rare examples of the rest.

Diversity can be understood in terms of a variety of ways of determining it; one widely used criterion, the Shannon-Weaver in-

112. Goodman, *The Theory of Diversity-Stability Relationships in Ecology*, 50 Q. REV. OF BIOLOGY 238 (1975) [hereinafter cited as Goodman].

113. For various attempts to answer this question, *see* Connell & Orias, *The Ecological Regulation of Species Diversity*, 98 AM. NAT. 399 (1964); DeBenedictis, *On the Correlation Between Certain Diversity Indices*, 107 AM. NAT. 295 (1973); Fager, *Diversity: A Sampling Study*, 106 AM. NAT. 293 (1972); Hulbert, *The Nonconcept of Species Diversity: A Critique and Alternative Parameters*, 52 ECOLOGY 577 (1971) [hereinafter cited as Hulbert]; McIntosh, *An Index of Diversity and the Relation of Certain Concepts to Diversity*, 48 ECOLOGY 392 (1967); Pielou, *Species-Diversity and Pattern Diversity in the Study of Ecological Succession*, 10 J. THEORETICAL BIOLOGY 370 (1967).

114. Hulbert, *supra* note 113, at 577.

115. *Id.* For a less technical discussion, *see* R. BREWER, *supra* note 16, at 164-72.

116. *Id.*

117. I ignore the difficulty of defining what is meant by terms like "community," "habitat," and "niche." For discussion of these problems, *see* MacArthur, *The Theory of the Niche*, in POPULATION BIOLOGY AND EVOLUTION 159 (R. Lewantin ed. 1968); Whittaker, Levin, & Root, *Niche, Habitat, and Ecotype*, 107 AM. NAT. 479 (1973); Whittaker, Levin, & Root, *On the Reasons for Distinguishing 'Niche, Habitat, and Ecotype,'* 109 AM. NAT. 479 (1975); Haefner, *Two Metaphors of the Niche*, 43 SYNTHESE 123 (1980). For a less technical text approach to the theoretical issues, *see* E. PIELOU, POPULATION AND COMMUNITY ECOLOGY: PRINCIPLES AND METHODS (1974); E. PIELOU, ECOLOGICAL DIVERSITY (1975).

dex,[118] is used to measure the uncertainty involved in predicting the identity of the next individual organism. Such a criterion is fairly insensitive to the presence in a community of very rare species.[119] This may be appropriate if we take diversity to be a property of community structure, since rare species may contribute very little to the productivity or structure of a system. Thus, while richness may increase with the diversity of a system, it is not bound to do so.

The attempt to protect rare or unique species, having very narrow niches or only a marginal relation to the communities to which they belong, would preserve richness but not necessarily diversity, as it is commonly measured. Thus we might well ask whether the Act should be enforced to emphasize the richness or the diversity of living communities.

The conceptual difficulties do not end here. We have been speaking of different species; we have now to recognize that species differ from each other in different ways and in different degrees. For example, two darters from the same descent but isolated from each other may not be able to mate, and in that sense they might be considered to belong to different species. One might then argue that a community containing members of both species of darter would be as diverse as a community containing only one of those species but also giraffes. It seems plain that we would prefer to preserve a variety of very different species, rather than to preserve every species within a narrow class. To measure variety we may need to define a notion of taxonomic,[120] phylogenetic, or

118. The index, which draws heavily on information theory, was first presented in C. SHANNON & W. WEAVER, THE MATHEMATICAL THEORY OF COMMUNICATION (1973). The Shannon-Weaver (also called "Shannon-Wiener") index measures the degree of uncertainty (H') in predicting the species of the next organism in a community. The formula is:

$$H' = -\sum_{i=1}^{s} P_i \log P_i$$

where s = number of species and P_i = the proportion belonging to the ith species. For further explanation, *see* R. BREWER, *supra* note 16, at 168-69. For discussion of the usefulness of this measure, *see* Goodman, *supra* note 112, at 241.

119. For discussion *see* Hulbert, *supra* note 113, at 577.

120. For discussion of some of these problems, *see* Orloci, *Geometric Models in Ecology*, 54 J. ECOLOGY 193 (1965); Sokal, *Distance as a Measure of Taxonomic Similarity*, 10 SYSTEMATIC ECOLOGY 71 (1961); Buck & Hull, *The Logical Structure of the Linnaean Hierarchy*, 15 SYSTEMATIC ZOOLOGY 97 (1966).

phenotypic distance—and problems here abound. Yet it is fair to say that there are important distinctions among diversity, richness, and variety, and that these distinctions matter in the implementation of the Act.

4. How to Measure Stability?

The desire to protect the stability of ecosystems seems to have played an important role in the passage of the Act.[121] Yet the concept of ecological stability appears to be even more problematical than that of diversity. Intuitively, it refers to the ability of an ecosystem to remain reasonably similar to itself in the presence of perturbations. A difficulty arises in deciding which impacts on an ecosystem would count as perturbations—many changes, for example, those caused by the rise and fall of the sun, would not be relevant. Similarity, moreover, is a slippery notion, since any two things are similar in any number of ways.[122] One should specify the respects in which similarity must occur.

Many suggestions have been made, but none generally agreed to, concerning the nature of stability. Odum, for example, has proposed that stability is related to the choice of pathways for energy flow.[123] MacArthur has suggested an index based on the percent of energy flowing through different pathways.[124] And there are many other suggestions.

The work of Richard Levins[125] and Robert May[126] in this area

121. One senator argued in support of the Act:

"[t]o allow the extinction of an animal species is ecologically, economically, and ethically unsound. Each species provides a service to its environment; each species is a part of an immensely complicated ecological organization, the stability of which rests on the health of its components."

119 CONG. REC. 25,668 (1973) (remarks of Sen. Tunney).

122. *See* Goodman, *Seven Structures on Similarity*, in PROBLEMS AND PROJECTS 437, 443 (1972).

123. G. ODUM, FUNDAMENTALS OF ECOLOGY (1953); Odum, *The Strategy of Ecosystem Development*, 164 SCI. 262-90 (1969).

124. MacArthur, *Fluctuations of Animal Population as a Measure of Community Stability*, 36 ECOLOGY 533-36 (1955). *See also* Hairston, *et al.*, *The Relationship between Species Diversity and Stability: An Experimental Approach with Protozoa and Bacteria*, 49 ECOLOGY 1091-101 (1968); DIVERSITY AND STABILITY IN ECOLOGICAL SYSTEMS (G. Woodwell and H. Smith, eds. 1969) (Brookhaven National Lab. Pub. 22); MacArthur, *Patterns of Species Diversity*, 40 BIOLOGICAL REV. 510 (1965).

125. EVOLUTION IN CHANGING ENVIRONMENTS (1968).

126. STABILITY AND COMPLEXITY IN MODEL ECOSYSTEMS (2d ed. 1974). *See also Will a Large Complex System be Stable?*, 238 NATURE 413 (1972).

—and the controversy between them—is well known. What they and others have accomplished may usefully be applied in the implementation of the Act. As a defense of the Act, the stability-diversity hypothesis may fail since, as these and other investigators have argued, it is open to theoretical attack. But even if the hypothesis cannot survive criticism, it may still be useful, or be justified as a rule of thumb in practical terms. It may be the case that, nevertheless, the effort to preserve species is the best way we may "draw a line"[127] which will, in fact, prevent catastrophic disruptions of the general ecology.[128]

B. *Axiological Arguments*

Axiological arguments have to do with *value*, whether esthetic, religious, moral, or metaphysical. It is helpful to divide axiological arguments for the preservation of species into two kinds. We may be concerned, first, to argue for the preservation of species on *instrumental* grounds. This would operate to preserve species, or to establish priorities among them, on the basis of the uses which they may serve. Some of these uses are quite specific; economic arguments point them out. Sometimes the uses are more general, as we have seen, for example, in relation to the ecological value of species.

Arguments may also be given in terms of *non-instrumental* or *intrinsic* value. We may refer to such value when we dignify some species as being "higher" on an evolutionary scale and therefore comparatively more worthy of preservation. We also think in terms of non-instrumental ideals when we suppose that a nation which retains a diversity of species, including eagles and whales, is intrin-

127. The need to preserve diversity out of a general fear of going too far is expressed in Murdock & Connell, *All About Ecology*, in WESTERN MAN AND ENVIRONMENTAL ETHICS 156, 169 (I. Barbour ed. 1973); A. LEOPOLD, SAND COUNTY ALMANAC 204, 214, 216-17 (1949).

128. This conviction is expressed in the report of the Nature Conservancy for the U.S. Department of Interior:

> With the rapid growth in recreational and second home development, agricultural reclamation of marginal lands, and the rush to exploit new energy resources, landscape alteration is reaching into even the most remote areas of our country. In the face of this onslaught, fewer and fewer areas retain much of their original natural character; the diversity of biotic species, ecological communities, and other natural elements stand on an even [sic] narrowing base.

THE NATURE CONSERVANCY, THE PRESERVATION OF NATURAL DIVERSITY: A SURVEY AND RECOMMENDATIONS 9 (1975). *See also* U.S. COUNCIL ON ENVIRONMENTAL QUALITY, THE GLOBAL 2000 REPORT TO THE PRESIDENT 37-38 (1980).

sically a better nation than one which continually destroys the products of evolution for the sake of commercial or economic development.

An important responsibility of policymakers is to understand the non-instrumental values which motivate the Act and which, more generally, may be involved in any attempt to formulate and justify endangered species policy.[129]

It is the characteristic of *esthetic* value that it belongs to things independently of the use to which they are or may be put. Esthetic objects, we say, are valuable "in themselves" and not because they *serve some interest*. They give pleasure, of course, but this is not the reason that they are valuable. We enjoy an object because it is valuable; we do not value it merely because we enjoy it. It is the *object* we find excellent; our experience, albeit pleasant, is worthwhile primarily because it is an experience of *that* object and *its* valuable qualities. Esthetic experience is a perception, as it were, of a certain kind of worth.

To value a species is not to put it in a zoo. It is to appreciate and admire it in nature and as a part of nature. One may think, by analogy, of the value of detail in a work of art. A few pieces of paint may be very little, or they may be important, when taken in isolation, but it is their role in the total painting which counts. The philosopher G.E. Moore describes the relation between parts and wholes, and the value of one in terms of the other, in this passage:

> [i]f, then, it is *this* whole, which we know to be good, and not another thing, then we know that material qualities, even though they be perfectly worthless in themselves, are yet essential constituents of what is far from worthless. What we know to be valuable is the apprehension of just these qualities, and not of any others; and, if we propose to subtract them from it, then what we have left is *not* that which we know to have value, but something else.[130]

This passage suggests that we think of the esthetic value of species not apart from evolutionary history but within it. We may

129. For discussion of non-instrumental or non-utilitarian defenses of the Act, *see* Gunn, *Why Should We Care About Rare Species?*, 2 ENVT'L ETHICS 17 (1980); Rescher, *Why Save Endangered Species?*, in UNPOPULAR ESSAYS ON TECHNOLOGICAL PROGRESS 79 (1980); Keller, *Types of Motives for Ecological Concern*, 61 ZYGON 197 (1971).

130. G. MOORE, PRINCIPIA ETHICA 206 (1903).

draw an analogy, perhaps, with the history of art. One may compare the importance of a "relic" species—such as the sequoia—with the value of a great work from an early civilization. The species, like the work, is to be appreciated for its historical significance, for the role it plays in development. The object has value not for its use or its qualities alone; it also has value because of its past and the history to which it belongs.

This is not to say that certain species are not to be valued for their beauty, strength, skill, or symbolic importance. It is to suggest, however, that the appeal individual plants and animals may possess does not exhaust their esthetic value. This depends as much on our appreciation of nature as a whole. Thus, in considering how we may establish priorities among species for preservation, we should be able to relate them to the larger picture, or to the larger history—evolutionary and cultural—of which they are parts.

C. *Political Considerations*

The final issue which concerns us involves the problem of applying an act of Congress which plainly says that no federal agency or department shall permit or approve any project which jeopardizes an endangered or threatened species. It is arguable that the law should be taken to mean just what it says, and should be followed, except where the very cumbersome review process can grant an exemption. This approach, however, if coupled with an aggressive policy of identifying and listing threatened species, may very well bring the economy to a screeching halt. Few large projects, particularly in the area of energy development, could be permitted under the Act.

The possible consequences of the Act, were it taken at its word and applied across the board, makes one think it is inconsistent with, or contrary to, the public interest. This is true, perhaps, on one interpretation of what "the public interest" is. If we take the public interest to be the most efficient trade-off or compromise of the interests of individual consumers,[131] then we may say that a particular dam or refinery would be worth much more than a species like the furbish lousewort. Indeed, if economic efficiency is identical to the public interest, then it seems the endangered spe-

131. For a defense of this view of the "public interest," see Posner, *Utilitarianism, Economics, and Legal Theory*, 8 J. LEGAL STUD. 103 (1979). *Contra*, Dworkin, *Is Wealth a Value?*, 9 J. LEGAL STUD. 191 (1980).

cies legislation of 1966 and 1969 was more in the public interest than is the 1973 Act.

The "public interest" is a concept, however, that admits of an interpretation which does not reduce it to notions of interest-satisfaction and economic efficiency. It is equally plausible to identify the public interest with whatever legislation Congress passes and the President signs, after reasonable debate and consideration.[132] One may say that the public interest in our nation is not found in the outcome of a market, even a perfect market, where externalities are priced. Our political theory, rather, calls for voting majorities in Congress to define the general will.

Those who make policy under the Endangered Species Act confront two contending concepts of the public interest. One is based on what individuals want *as individuals*, which is to say, *as consumers*. The criterion here is *willingness to pay*, and markets, real or imaginary, may function to reveal that willingness.[133] How much would a typical consumer pay to preserve the furbish lousewort? To buy heating oil? The difference between these amounts has encouraged, over the years, the disappearance of species.

Ask an individual what we ought to do *as a nation*, however, and he or she is likely to approve of programs to preserve species, even at some cost to consumers. For what we demand *as citizens* can be quite different from what we are willing to pay for *as consumers*.[134] Many of us want our nation to pursue goals, ideals, and values rather different from those which markets reveal. We believe that Congress should express not just our interests as consumers but our aspirations and convictions as citizens.

Public officials who implement the Act must balance not merely *interests* but *visions* or *views* of the public interest. Policymakers must be sensitive not just to what individuals want in pursuing their own self-interest. They must also be sensitive to the duty of Congress to express and carry out the conscience and will of the nation.[135]

132. *See* note 14 *supra*.

133. A. FREEMAN, R. HAVERMAN & A. KNEESE, THE ECONOMICS OF ENVIRONMENTAL POLICY 23 (1973); E. MISHAN, COST-BENEFIT ANALYSIS 24 (1976).

134. For the distinction between consumer and citizen preference-maps, *see* Marglin, *The Social Rate of Discount and the Optimal Rate of Investment*, 77 Q. J. ECON. 95, 98-99 (1963); R. MUSGRAVE, THE THEORY OF PUBLIC FINANCE 87-88 (1959).

135. For comment on this conflict of constitutive political moralities, *see* Kennedy, *Form and Substance in Private Law Adjudication*, 89 HARV. L. REV. 1685, 1731 (1976).

It is important to understand the different concepts of the "public interest" which are involved in the application of the Act—concepts which reflect, in contemporary terms, Rousseau's distinction between the "will of all" and the "common will."[136] The first is the efficient aggregate of competing interests—the sort of outcome a "social welfare function" is intended to define. The second is the position which representatives of the people, after deliberation, identify as that which is appropriate or right.

Many Americans feel that we must limit the degree to which we can alter the environment in the name of economic efficiency or consumer satisfaction.[137] They believe that we have at stake our ideals as citizens and not just our interests as consumers. Our heritage, integrity, and self-perception as a nation are involved. Perhaps the Act is not the best expression of our shared ideals; but ideology is an inherent part of the motivation for the Act. It remains for us to express and pursue these ideals in practicable and rational policies carrying out that congressional mandate.

136. THE SOCIAL CONTRACT, bk. II, chs. 3, 4 (Paris 1762).

137. *See* U.S. COUNCIL ON ENVIRONMENTAL QUALITY, PUBLIC OPINION ON ENVIRONMENTAL ISSUES (1980). The results of opinion polls concerning environmental quality are remarkable. For example, despite the large sums spent in the 1970s on environmental protection, a plurality of respondents to a 1980 Resources for the Future poll thought environmental protection was too important to consider cost. Given three alternatives, 42% have this one: "[p]rotecting the environment is *so important* that requirements and standards cannot be too high, and continuing improvement must be made *regardless* of cost." *Id.* at 3. (emphasis in original). A large majority—73%—agreed that "an endangered species should be protected even at the expense of commercial activity." *Id.* at 18.