STEMMING THE TIDE: A PLEA FOR NEW EXOTIC SPECIES LEGISLATION

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> [W]hat havoc the introduction of any new beast of prey must cause in a country, before the instincts of the indigenous inhabitants have become adapted to the stranger's craft or power.[1]

I. INTRODUCTION

Since 1492, a variety of exotic species[2] has been introduced[3] into the United States—many intentionally, some accidentally.[4] Although it would be nearly impossible to determine the precise number of introductions, one recent estimate placed the number of self-sustaining exotic species populations at about 4,500.[5] Of these populations, 122 have been officially recognized as "harmful."[6] These non-native species affect the native species and ecosystems of the United States profoundly.[7] Nowhere is this more apparent than in the Hawaiian Islands, where there are as many exotic plant species as

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1. CHARLES DARWIN, THE VOYAGE OF THE BEAGLE 401 (Anchor Books 1962) (1839).

2. In this paper, I shall use the terms exotic, nonindigenous, and non-native interchangeably. *See infra* text accompanying notes 105-08 for various definitions of exotic species.

3. A species is introduced when it is accidentally or intentionally moved from one place to another by humans. Christopher C. Kohler, *Strategies for Reducing Risks from Introductions of Aquatic Organisms*, FISHERIES, Mar.-Apr. 1986, at 2, 2. Therefore, the arrival of a species into a new ecosystem by a natural process (e.g., the wind) is not an introduction.

4. U.S. CONGRESS, OFFICE OF TECHNOLOGY ASSESSMENT, HARMFUL NON-INDIGENOUS SPECIES IN THE UNITED STATES at 5-6 (1993) [hereinafter OTA REPORT]; Robert Devine, *Botanical Barbarians*, SIERRA, Jan.-Feb. 1994, at 50, 54. Perhaps the most literary of intentional introductions involved a Shakespeare enthusiast who decided to introduce every bird mentioned by the bard into Central Park. Around the turn of the century, this erudite New Yorker is said to have introduced the starling, which has become a troublesome nonindigenous species throughout the United States. John Ross, *Zebra Mussels: Tiny Invaders with Gigantic Clout*, SMITHSONIAN, Feb. 1994, at 42.

5. OTA REPORT, *supra* note 4, at 3.

6. *Id.* at 20.

7. *See, e.g.*, Devine, *supra* note 4, at 53 ("We must make no mistake: we are seeing one of the great historical convulsions in the world's fauna and flora." (quoting British ecologist Charles Elston)).

native plant species.[8] Exotic species diminish native species diversity,[9] harm ecosystems,[10] and cost U.S. industries billions of dollars.[11]

With the current problems caused by the zebra mussel,[12] the public has only recently begun to realize the potential impact of nonindigenous species.[13] Moreover, the number of introductions is quite likely to continue at its present level, if not at an increased level, due to expanding world trade.[14]

Thus far, even though the National Park Service recently ranked exotic plant species as the greatest threat and non-native fauna as the fourth greatest threat to U.S. National Parks, the federal government has failed to respond adequately to this challenge.[15] Moreover, the federal government is in the untenable position of introducing certain

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8. *Id.*

9. *See id.* at 53-54. Due to the lack of natural predators, exotic species can sometimes outcompete all native species. David J. Bederman, *International Control of Marine "Pollution" by Exotic Species*, 18 ECOLOGY L.Q. 677, 681 (1991). *See also* Ross, *supra* note 4, at 50 (noting that zebra mussels in Lake St. Clair have caused the extinction of 18 species of native clams since 1986). The introduced species is usually only comprised of a few individuals, so the exotic species itself lacks genetic diversity. *Id.* Of course, some non-native species reduce biodiversity by preying upon native species. Julianne Kurdila, Note, *The Introduction of Exotic Species into the United States: There Goes the Neighborhood!*, 16 B.C. ENVTL. AFF. L. REV. 95, 100-01 (1988). Exotic species pose other threats to native fauna: introduction of new diseases, parasites, and bacteria. *Id.* at 100-01; Bederman, *supra*, at 682.

10. *See* Devine, *supra* note 4, at 54. Exotic plant species can change ground temperature, alter the "pace of erosion," and impact the rate nitrogen is recycled in the soil. *Id.* For example, one scientist fears the zebra mussel is undermining the whole aquatic ecosystem in the Great Lakes by eating the phytoplankton which form the basis of the food chain. Ross, *supra* note 4, at 48. The saltwater snail, or periwinkle, which has shaped the New England coast by stripping away seaweed which allows sediments to be washed away is another example. *Id.* at 42-44.

11. Ross, *supra* note 4, at 41. Efforts to control the zebra mussel will cost the United States $5 billion by 2000. *Id.* The Office of Technological Assessment estimates that exotic "weeds" cost U.S. farmers $3.6 to $5.4 billion per year in crop loss, comprise 50% to 75% of all "weeds," and lead to pesticide use of $1.5 to $2.3 billion. Devine, *supra* note 4, at 53. During fiscal year 1993, the United States Department of Agriculture spent roughly $19 million to combat exotic tree "pests." Faith Thompson Campbell, *Exotic Pests of American Forests*, WILD EARTH, Winter 1993-94, at 32. *See also* OTA REPORT, *supra* note 4, at 5 (noting that just 79 nonindigenous species alone caused $97 billion in "harmful effects" from 1906 to 1991).

12. Ross, *supra* note 4, at 41-48. Zebra mussel veligers (microscopic larvae) arrived in the United States in 1985 or 1986 in the ballast tank of a ship from an Eastern European port. *Id.* at 41-42. On December 14, 1989, the zebra mussel clogged the in-take valve to a municipal waterworks in Monroe, Michigan, temporarily leaving the town without water. Through 1992, the damages caused by the zebra mussel cost the Monroe waterworks $790,000. *Id.* at 47-48.

13. *See, e.g., id.*

14. OTA REPORT, *supra* note 4, at 15.

15. *See id.* at 32-33. The National Park Service only allocates 2% of its budget to research, management, and control of nonindigenous species. Nonetheless, of all federal agencies, the National Park Service is generally regarded as having the strictest regulations and most extensive programs concerning exotic species. *Id.* at 33.

exotic plant species such as sweet clover and alfalfa,[16] while simultaneously seeking the elimination of other exotic plant species through the Federal Noxious Weed Act.[17] Similarly, the federal government protects exotic species such as the longhorn steer and wild horses and burros[18] while attempting to eradicate the zebra mussel through the Nonindigenous Aquatic Nuisance Protection and Control Act of 1990.[19]

To avoid such inconsistencies, the federal government must adopt a comprehensive approach for preventing the introduction of non-native species and controlling or eradicating those that have become established. Therefore, Congress should enact legislation a) creating a federal agency empowered to implement the federal efforts to control exotic species, b) prohibiting the importation or introduction of all exotic species unless the party seeking to do so can show the species will not harm the ecosystem it will be introduced into, and c) requiring the importing/ introducing party to conduct a structured decision-making analysis similar to an environmental impact statement (EIS).[20]

This comment will review the principal U.S. legislation affecting nonindigenous species. In Part III, this comment will propose a basic U.S. policy toward nonindigenous species. In Part IV, this comment will describe the primary methods of prevention, control, and eradication of non-native species. Finally, this comment will propose federal legislation to comprehensively address the problems exotic species pose.

II. LEGISLATIVE EFFORTS TO ADDRESS EXOTIC SPECIES IN THE UNITED STATES[21]

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16. *Id.* at 187.
17. 7 U.S.C. §§ 2801-2814 (1988).
18. Wild Free-Roaming Horses and Burros Act, 16 U.S.C. §§ 1331-1340 (1988).
19. 16 U.S.C. §§ 4701-4751 (Supp. 1992).
20. *See infra* text accompanying notes 203, 205-10 for an explanation of an EIS-type structured decision-making analysis.
21. This section will not consider state law because state law has been marked by both drastically varied definitions of what constitutes an exotic species and what methods should be used in preventing an introduction. *See generally* Kurdila, *supra* note 9, at 107-11. Moreover, states are ill-suited to handle this problem because one state cannot prevent a neighboring state from introducing an unwanted species. *Id.* at 96, 109-10. For instance, Missouri was unable to prevent Arkansas from introducing a carp species which later infested Missouri's water. *Id.* Consequently, a basic premise of this comment is that the federal government is best situated and best able to prevent the introduction of exotic species and has the funding and expertise to aid states in their efforts to control and eradicate nonindigenous species.

> The current federal framework is a largely uncoordinated patchwork of laws, regulations, policies, and programs. Some focus on narrowly drawn problems. Many others peripherally address NIS [nonindigenous species]. In general, present Federal efforts only partially match the problems at hand.[22]

Over the last century, Congress has passed a variety of statutes addressing the environment, wildlife, and natural resources.[23] On a few occasions, some of these statutes have addressed nonindigenous species.[24] Likewise, the Executive Branch has addressed nonindigenous species in Executive Order 11,987.[25] This comment first describes the Lacey Act,[26] its amendments, and its regulations. Next, it briefly discusses the Federal Noxious Weed Act of 1974.[27] Third, it considers Executive Order 11,987.[28] Finally, it analyzes the Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990.[29]

A. The Lacey Act[30]

The Lacey Act of 1900[31] was the first U.S. legislation to ban the importation of non-native species.[32] Specifically, the Lacey Act made it unlawful for any person to import undesirable species such as the starling, fruit bat, mongoose and "such other birds or animals as the Secretary of Agriculture may from time to time declare injurious to the interest of agriculture and horticulture."[33] Thus, the original intention behind the Lacey Act was to safeguard agriculture.[34] Restricting importation of exotic species led to fewer nonindigenous introductions, but limiting non-native introductions was merely a positive side effect of the Act's main goal of protecting agriculture from exotic pests.[35] In 1926, the Black Bass Act[36] supplemented the

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22. OTA REPORT, *supra* note 4, at 163. The quoted language is a formal finding by the OTA.
23. *See, e.g., infra* notes 26-29.
24. *See, e.g., infra* notes 26-29.
25. Exec. Order No. 11,987, 3 C.F.R. 116 (1976-1980), *reprinted in* 42 U.S.C. § 4321 (1988).
26. 18 U.S.C. § 42 (1988).
27. 7 U.S.C. §§ 2801-2814 (1988).
28. 42 U.S.C. § 4321 (1988).
29. 16 U.S.C. §§ 4701-4751 (Supp. 1992).
30. Ch. 553, 31 Stat. 187 (1900) (current version at 18 U.S.C. § 42 (1988)).
31. *Id.*
32. Bederman, *supra* note 9, at 691.
33. 18 U.S.C. § 42 (1988).
34. MICHAEL J. BEAN, THE EVOLUTION OF NATIONAL WILDLIFE LAW 115 (1983).
35. *Cf.* Bederman, *supra* note 9, at 691 (explaining that the Lacey Act pursued its primary goal of enhancing "the powers of the Agricultural Department" by restricting the importation of exotic species).
36. 16 U.S.C. §§ 851-856 (1976) (repealed 1981).

Lacey Act by adding fish to the list of covered organisms.[37] Together, these acts did not represent a concerted federal effort to control the importation of foreign wildlife; rather, they were merely "a tool for supporting state wildlife laws."[38] Thus, the Lacey Act left most decisions regarding intentional introduction of species to the discretion of state legislatures.[39]

In 1981, Congress amended the Lacey Act and consolidated the Black Bass Act into it.[40] Consequently, the scope of the Lacey Act was substantially broadened: the amendments made it illegal to import any foreign wild animal, and some plants, without a special permit.[41] As a result of this broad language, the Lacey Act now applies to more species than any other environmental law.[42] By amending the Lacey Act, Congress also attempted to make the Act more effective by increasing the penalties for violating the Act[43] and by authorizing the granting of awards to people giving the federal government useful information.[44]

The Lacey Act employs a "black list" approach concerning which species may be introduced.[45] That is, excluding species the Act specifically declares are injurious, the U.S. Fish and Wildlife Service (FWS) must determine whether a species is harmful before requiring a special permit for its importation.[46] In 1973, however, the Department of the Interior had proposed regulations which employed "white list" screening.[47] Under the white list approach, all species were declared

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37. *Id.* *See generally* Kurdila, *supra* note 9, at 103 (noting that prior to the passage of the Black Bass Act, there was some confusion as to whether the Lacey Act covered any species that were not "game birds" or "fur bearing mammals").

38. Kurdila, *supra* note 9, at 104.

39. OTA REPORT, *supra* note 4, at 24.

40. Pub. L. No. 97-79, 95 Stat. 1073 (1981) (codified as amended at 16 U.S.C. §§ 3371-3378 (1988)). The Lacey Act was also amended in 1935 and 1949. For a discussion and analysis of these earlier amendments, *see* BEAN, *supra* note 34, at 108-13.

41. 16 U.S.C. § 3372(a) (1988).

42. *Cf.* Bederman, *supra* note 9, at 691 ("The Lacey and Black Bass Acts were called `in many ways [the United States'] most important wildlife laws since they affect the thousands of species subject to State and foreign laws.'") (quoting SENATE COMM. ON ENV'T AND PUB. WORKS, LACEY ACT AMENDMENTS OF 1981, S. REP. NO. 123, 97th Cong., 1st Sess. 2 (1981), *reprinted in* 1981 U.S.C.C.A.N. 1748, 1749).

43. 16 U.S.C. § 3373(a),(d) (1988). The civil penalties authorized by the Act are $10,000 per violation and criminal penalties of a maximum $20,000 fine and/ or imprisonment of up to five years per offense. *Id.*

44. 16 U.S.C. § 3375(d) (1988) ("the Secretary . . . shall pay . . . a reward to any person who furnishes information which leads to an arrest, criminal conviction, civil penalty assessment, or forfeiture of property . . . .").

45. 50 C.F.R. § 16.11 (1993). See OTA REPORT, *supra* note 4, at 22 for discussion of the black list approach; see also Kurdila, *supra* note 9, at 104; Bederman, *supra* note 9, at 693.

46. 50 C.F.R. § 16.11 (1993).

47. *See* BEAN, *supra* note 34, at 116. The 1973 proposed regulations were the Department of the Interior's first attempt to implement its authority under the Lacey Act. *Id.*

"injurious," but a species could be imported if the species was shown to pose a "low risk."[48] After much resistance from the pet trade, scientific researchers, and zoos,[49] the Department of Interior eventually abandoned these proposed regulations.[50]

Overall, the Lacey Act has been ineffective in preventing the importations, and subsequent introductions, of exotic species.[51] First, the Act fails to address unintentional or accidental importation of species. Second, the black list approach is inherently reactive because FWS cannot determine if an introduced species is harmful until the species has already established itself.[52] Third, the length of the listing process, coupled with the lack of emergency provisions, eliminates the possibility of FWS quickly banning the further importation of a harmful non-native species.[53] Fourth, the Act lacks a comprehensive scheme for regulating the movement of banned species through interstate commerce.[54] Last, FWS efforts to enforce the Act have been piecemeal.[55] Thus, the Lacey Act is only partially effective in preventing the introduction of exotic species.

B. The Federal Noxious Weed Act of 1974[56]

The Federal Noxious Weed Act[57] bans

> [t]he importation or distribution . . . of noxious weeds . . . which interfere with the growth of useful plants, clog waterways and interfere with navigation, cause disease, or have other adverse effects upon man or his environment and therefore is *detrimental to the agriculture and commerce of the United States and to the public health.*[58]

Noxious weeds are defined as plants of "foreign origin, [which are] new to or not widely prevalent in the United States" and which have

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48. *Id.*

49. OTA REPORT, *supra* note 4, at 24. Not surprisingly, the OTA recently concluded that the nursery, pet, aquaculture, and agriculture industries oppose any further regulation of the introduction of nonindigenous species. *Id.* at 18.

50. BEAN, *supra* note 34, at 116-17. After dropping the proposed regulations, the Department of the Interior asked for a clarification of its authority from Congress, which it still has not received. *Id.* at 117.

51. The Act has several significant loopholes. For example, the criminal pen alties do not apply if the value of the exotic species involved is $350 or less. 16 U.S.C. § 3373(d)(1)(B) (1988).

52. Bederman, *supra* note 9, at 693; OTA REPORT, *supra* note 4, at 22.

53. *See* OTA REPORT, *supra* note 4, at 22. In fact, only six species were added to the "list" between 1966 and 1988. *Id.*

54. *Id.* at 22.

55. *Id.* The OTA was unable to assess FWS and other agencies' efforts in implementing the Lacey Act due to a lack of either performance standards or routine evaluations. *Id.* at 164.

56. 7 U.S.C. §§ 2801-2814 (1988).

57. *Id.*

58. 7 U.S.C. § 2801 (1988) (emphasis added).

an adverse economic impact on "fish or wildlife resources."[59] The Act authorizes the Secretary to quarantine plants before they can enter the United States,[60] to use emergency measures,[61] and to impose criminal penalties of a $5,000 fine and/ or one year imprisonment.[62]

Although the Act could be read as granting the Secretary of Agriculture broad power to ban any exotic plant that is harmful to the environment, in reality, the Act is only used to eliminate agricultural pests.[63] Nonetheless, the Act could be used to more widely address nonindigenous plant species if the Secretary chose to do so.[64]

C. Executive Order 11,987[65]

In 1977, President Carter signed Executive Order 11,987[66] which requires executive agencies to "restrict the introduction of exotic species into the natural ecosystems on [the federal] lands and waters" under each agency's jurisdiction.[67] This Order defines introduction as "the release, escape, or establishment of an exotic species into a natural ecosystem."[68] "Exotic species" are defined as "all species of plants and animals not naturally occurring, either presently or historically, in any ecosystem of the United States."[69]

Executive Order 11,987 covers more exotic species than any other federal statute, rule, or regulation because plants as well as animals are within its scope.[70] In fact, this Order even directs federal agencies to restrict the exportation of a potentially exotic U.S. species to another country.[71] Unfortunately, this Order "does not apply to the introduction of any exotic species . . . if the Secretary of Agriculture or the Secretary of the Interior finds that such introduction . . . will not have an adverse effect on natural ecosystems."[72] By placing the burden upon federal agencies to determine whether the exotic species will be harmful, the Order undermines the clear policy against exotic

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59. 7 U.S.C. § 2802(c) (1988).
60. 7 U.S.C. § 2804 (1988).
61. 7 U.S.C. § 2805 (1988).
62. 7 U.S.C. § 2807 (1988).
63. *See* BEAN, *supra* note 34, at 118.
64. *See id.*
65. Exec. Order No. 11,987, 3 C.F.R. 116 (1976-1980), *reprinted in* 42 U.S.C. § 4321 (1988).
66. *Id.*
67. 42 U.S.C. § 4321(2)(a) (1988).
68. 42 U.S.C. § 4321(1)(b) (1988).
69. 42 U.S.C. § 4321(1)(c) (1988). *See infra* text accompanying notes 118-21 for a discussion of the difficulties created by this definition.
70. *See* BEAN, *supra* note 34, at 118.
71. 42 U.S.C. § 4321(2)(c) (1988).
72. 42 U.S.C. § 4321(2)(d) (1988).

introductions and, in essence, recreates the black list approach of the Lacey Act.[73]

Once again, this federal effort has not lived up to its potential. First, despite an explicit mandate to enact regulations, the Secretary of the Interior has never done so.[74] Consequently, federal agencies have ignored this potential watershed in the treatment of nonindigenous species.[75] Second, even if fully implemented, this Order would have a limited impact on exotic species. The Order only has the status of binding law on federal agencies, so state agencies and private individuals can ignore it.[76] Furthermore, the Order would only regulate the introduction of species onto federal land.[77] Although the Order is a noteworthy attempt to address the problem of non-native introductions, Executive Order 11,987 has failed to have any significant effect on the introduction and eradication of exotic species.

D. The Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990[78]

The Nonindigenous Aquatic Nuisance Prevention and Control Act[79] embodies a more significant approach to preventing and eliminating introduced species.[80] The Act is specifically designed to address the zebra mussel infestation of the Great Lakes.[81] However, its potential scope is broad: one purpose of the Act is "to develop and carry out environmentally sound control methods to prevent, monitor and control unintentional introductions of nonindigenous species . . .

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73. *See supra* notes 45-46 and accompanying text for an explanation of the black list approach.

74. BEAN, *supra* note 34, at 118; Kurdila, *supra* note 9, at 103.

75. Bederman, *supra* note 9, at 693. *See also* OTA REPORT, *supra* note 4, at 166 (a formal finding by OTA).

76. Bederman, *supra* note 9, at 693.

77. *See* 42 U.S.C. § 4321(2)(c) (1988). Of course, regulating federal lands is itself significant because such lands comprise roughly 35% of the United States and most of the important wildlands are on federal lands.

78. 16 U.S.C. §§ 4701-4751 (Supp. 1992).

79. *Id.*

80. *See* Bederman, *supra* note 9, at 694.

81. *See generally* Bederman, *supra* note 9, at 708-09. In the Act, Congress legislatively finds that the zebra mussel was accidentally introduced into the Great Lakes through the ballast tanks of a ship, is expected to infest two-thirds of the freshwater bodies in the continental United States, will cause up to $5 billion in control efforts by 2000, and will have a severe impact on biodiversity. 16 U.S.C. § 4701(a) (Supp. 1992). The Act goes on to state that it is designed to control the zebra mussel. 16 U.S.C. § 4701(b)(2) (Supp. 1992). For a general description of the effect of the zebra mussel on the Great Lakes *see generally* Ross, *supra* note 4.

."[82] Thus, this Act could complement the Lacey Act by regulating the unintentional introduction of species.[83]

The Act requires the promulgation of rules designed to eliminate the introduction and spread of exotic species into the Great Lakes through the ballast water of ships.[84] The Act also creates the National Ballast Water Control Program to determine the best method to prevent further introductions.[85] Most notably, the Act provides for the creation of an Aquatic Nuisance Species Task Force (the Task Force),[86] which is assigned the task of developing a program to prevent the introduction and dispersal of nonindigenous aquatic species.[87] Significantly, the Act also requires the Task Force "to monitor, control and study such species," as well as release information about non-native aquatic species.[88] Congress indicated its commitment to the Act by authorizing appropriations to implement its provisions.[89] Thus, perhaps more than any other federal effort in this area, the Act could have a significant effect on the non-native species problem.[90]

The Office of Technology Assessment has recently criticized the Nonindigenous Aquatic Nuisance Prevention and Control Act on several fronts.[91] First, the Act does not provide the Task Force with detailed guidelines or even general parameters.[92] Second, the Task Force is further weakened by the differing agency cultures and perspectives of its constituent members.[93] As a result, the Task Force struggled through a period of administrative start up delays.[94] Third, although funding is authorized, Congress has been slow in

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82. 16 U.S.C. § 4701(b)(3) (Supp. 1992).

83. See *supra* text accompanying notes 30-55 for a description and analysis of the Lacey Act.

84. 16 U.S.C. § 4711(a) (Supp. 1992). Violation of this provision carries possible penalties of a $25,000 civil fine or constitutes a Class C felony if done knowingly. 16 U.S.C. § 4711(c)-(d) (Supp. 1992).

85. 16 U.S.C. § 4712 (Supp. 1992).

86. 16 U.S.C. § 4721 (Supp. 1992). The Task Force is co-chaired by FWS, the National Oceanic and Atmospheric Administration, and five other federal agency members. 16 U.S.C. § 4721(b)-(d) (Supp. 1992).

87. 16 U.S.C. § 4722(a) (Supp. 1992).

88. 16 U.S.C. § 4711(a) (Supp. 1992).

89. 16 U.S.C. § 4741 (Supp. 1992). Congress occasionally passes a law without providing funding which makes it highly unlikely that any of the goals of the legislation will ever be realized.

90. *See* Bederman, *supra* note 9, at 695 (suggesting the Act may "set in motion a policy-making process" which will ultimately lead to a significant attempt to eliminate the introduction of nonindigenous species generally).

91. OTA REPORT, *supra* note 4, at 168.

92. *Id.*

93. *Id.*

94. *Id.*

appropriating it.[95] Authorized funds for state programs[96] have not been forthcoming either.[97]

Eventually, the Task Force released its Draft Plan on November 12, 1992.[98] The Draft Plan does not assign duties to the various agencies on the Task Force, nor does it set forth future funding requirements.[99] The Draft Plan also lacks an emergency provision,[100] thus significantly decreasing its possible effectiveness. Consequently, by stating that intentional introductions are beyond its purview, the Draft Plan prevents the Nonindigenous Aquatic Nuisance Prevention and Control Act from being a much needed comprehensive federal tool for combating exotic species.[101]

In conclusion, the Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990 comes closer to addressing the problems posed by nonindigenous species than any other federal action.[102] Both the Task Force's narrow reading of its mandate and Congress's reluctance to disperse the authorized funding, however, has made it unlikely that the scope of the Act will expand beyond the importation of the zebra mussel.

A clear, comprehensive federal program is necessary to address nonindigenous species as the primary goal of the legislation, rather than as a mere afterthought.[103] But before recommending such legislation, this comment will consider the underlying policy issues which must be resolved before effective legislation can be enacted[104] and will then consider control and eradication methods.

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95. *Id.*
96. 16 U.S.C. § 4741(c) (Supp. 1992).
97. OTA REPORT, *supra* note 4, at 32.
98. *Id.* at 54.
99. *Id.* at 168.
100. *Id.* at 169.
101. *Id.*
102. In 1990, Representative Jim Saxton introduced a bill entitled the Species Introduction and Control Act of 1990. H.R. 5852, 101st Cong., 2d Sess. (1990). This bill creates rules and procedures that require "publication of submitted proposals [to introduce an exotic species], notification to potentially affected states, . . . an extensive literature review [on scientific studies of an exotic species], . . . opportunity for public comment and review, scientific peer review [of a proposed introduction], and final approval by affected states." 136 Cong. Rec. E3321-01 (1990). As of this writing, the author has been unable to determine the fate of this ambitious bill (although it presumably lost out in the House to the Aquatic Nuisance Prevention and Protection Act of 1990).
103. Bederman, *supra* note 9, at 695.
104. One commentator noted that U.S. legislation in this area has "lacked a cohesive underlying policy." *Id.*

III. PROPOSED U.S. POLICY CONCERNING NONINDIGENOUS SPECIES

Any attempt to create a legislative approach to control non-native species must first address a few basic policy questions. In this section, this comment proposes a basic U.S. policy toward nonindigenous species. First, this comment will define the term "exotic species." Second, this comment will discuss the appropriate role of a "harmfulness" determination in developing legislation prioritizing the application of resources in controlling each non-native species.

A. Definition of Exotic Species

As mentioned in earlier sections of this comment, although many different definitions of "exotic species" exist,[105] there is no standard definition. Generally, an exotic species is one that has been introduced into an area to which it is not native.[106] But a key question in defining "exotic species" is whether species from the same country, but not native to a particular ecosystem are "exotic." Some scientists have resolved this question by drawing a distinction between species from outside a country (an exotic species) and species from within a nation, but from outside the ecosystem (a transplant species).[107] Since a biologically homogenous country is only slightly better than a biologically same planet,[108] U.S. policy must treat transplants like exotic species.

Federal policy must be based on an ecosystem approach in defining "exotic species." The artificial boundaries of U.S. states often divide ecosystems and have many separate ecosystems within each state. For example, California has over twenty climatic regions, each with its own unique ecosystem.[109] Therefore, introducing a species native to the Mojave desert into the coastal redwood forest would be as potentially harmful as introducing a blue crab from Chesapeake Bay into San Francisco Bay. Consequently, this comment proposes

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105. For example, Exec. Order 11,987 defines an exotic species as "all species of plants and animals not naturally occurring, either presently or historically, in any ecosystem of the United States." 42 U.S.C. § 4321, 1(c) (1988). The Aquatic Nuisance Prevention and Control Act defines "nonindigenous species" as "any species or other viable biological material that enters an ecosystem beyond its historical range, including any such organism transferred from one country into another." 16 U.S.C. § 4702(9) (Supp. 1992).

106. *See* sources cited *supra* note 105.

107. Kohler, *supra* note 3, at 2.

108. *See, e.g.*, Alan Burdick, *It's Not the Only Alien Invader*, N.Y. TIMES, Nov. 13, 1994, § 6, at 49.

109. *See generally*, L.A. TIMES, Metro Section, at B (the weather chart for the State of California delineates the various climatic regions).

that federal policy should reflect this reality by treating all species introduced from outside an ecosystem as nonindigenous.

B. When Is an Established Species Exotic?

A more difficult policy question is how much time must pass before an introduced species is considered native. For example, horses became established in the Southwest and Great Plains after Spaniards introduced them in the sixteenth century.[110] Although horses are not native to the United States, most Americans consider them so and, in fact, would contend they are a vital part of our national heritage. In fact, Congress has even given federal protection to wild horses on federal lands through the Wild Free-Roaming Horses and Burros Act.[111] If one draws the temporal line at 100 or even 300 years, horses are indeed native; however, if the crucial biological event is the arrival of Columbus, horses clearly are not native. Any definition depending on a temporal line, particularly one drawn at a hundred or more years ago, will become bogged down in a morass of historical inquiry and a lack of definitive data. Since many of the most harmful introductions have occurred in the last ten years, such historical inquiries often will serve no practical purpose.[112]

Rather than split hairs in this manner, a consideration of each species on its own merits would be more useful: a species-by-species consideration of an exotic organism's effect and role in its new environment. This individualized analysis would focus on the ecological impact of the species; the rate or likelihood of its spread into other ecosystems; its effect on other species, especially endangered species; and the ecological value of the areas it has invaded or likely will invade.[113] In the case of the zebra mussel, for instance, the analysis is straightforward: the zebra mussel poses great threats to the environment and endangered species and is spreading rapidly. Therefore, the zebra mussel should be considered an exotic species. Conversely, free-roaming horses and burros are a more difficult case. Any significant ecological impact on the environment which horses

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110. *See American People, Native*, 13 THE NEW ENCYCLOPAEDIA BRITANNICA 379 (15th ed. 1985).

111. 16 U.S.C. §§ 1331-1340 (1988).

112. *See* Ross, *supra* note 4, at 44. A bright-line test has the advantage of being very clear and thus would be preferable. However, given the multitude of factors involved in determining how harmful a recently introduced exotic species is or will become, efforts to formulate such a test are quixotic. Perhaps, over the course of many years, an administrative common law might develop which would provide the decision-maker with more clear cut rules.

113. In essence, these factors are the same as those addressed in the structured decision-making process proposed *infra* in the text accompanying notes 205-16.

and burros may have caused probably occurred hundreds of years ago. As long as their populations do not explode, they probably pose little threat to the environment. Therefore, horses and burros should not be considered exotic species. As these two examples illustrate, a species-by-species determination would be more practical in determining which species should be considered exotic.

C. "Harmfulness" Determination

Due to the economic concerns that drive some federal exotic species legislation, an exotic species only comes within the scope of the legislation if the species is economically harmful. For example, the Federal Noxious Weed Act[114] has a clear economic slant. The name of the Act tips its hand: the Federal *Noxious Weed* Act.[115] "Noxious" and "weed" are value-laden terms. In particular, a weed is "an economically worthless plant," which is often harmful to agriculture.[116]

Recently, however, a more environmental definition of harmfulness has emerged. The Aquatic Nuisance Prevention and Control Act[117] defines an "aquatic nuisance species" as "a nonindigenous species that threatens the diversity or abundance of native species or the ecological stability of infested waters, or commercial, aquacultural or recreational activities dependent on such waters."[118] Although this definition retains some economic elements, a fundamental shift to a concern about ecosystems has occurred.

A third approach would assume that exotic species are *per se* harmful. For example, Executive Order 11,987[119] defines "exotic species" as "all species of plants and animals not naturally occurring, either presently or historically, in any ecosystem of the United States."[120] If a species comes within this definition, it falls fully within the provisions of the Order, including restricting introductions. That is, an exotic species is *per se* harmful. The *per se* rule discounts the theory that an exotic species can establish itself in an unoccupied "niche" in an ecosystem, thus not displacing another species.[121] Rather, the *per se* rule assumes that any introduction displaces or

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114. 7 U.S.C. §§ 4701-4751 (Supp. 1992).
115. *Id.* (emphasis added).
116. Webster's Third New International Dictionary 2592 (8th ed. 1976).
117. 16 U.S.C. §§ 4701-4751 (Supp. 1992).
118. 16 U.S.C. § 4702(2) (Supp. 1992).
119. 3 C.F.R. 116 (1976-1980), *reprinted in* 42 U.S.C. § 4321 (1988).
120. 42 U.S.C. § 4321(1)(C) (1988).
121. *See* Marc Miller & Gregory Aplet, *Biological Control: A Little Knowledge Is a Dangerous Thing*, 45 RUTGERS L. REV. 285, 291 (1993).

infringes upon a native species and, therefore, upsets the equilibrium of the ecosystem.

The reference to "either presently or historically" detracts from this otherwise desirable definition in two ways. First, it prevents the restoration of a species that has become extinct in an ecosystem, because it is not "presently" occurring. Second, it suffers from significant temporal line drawing problems because it classifies a currently existing species, which was not part of the ecosystem in the past, as exotic, but does not provide a temporal frame of reference. Therefore, Executive Order 11,987[122] could arguably apply to any species introduction that has *ever* occurred, even one pre-dating the arrival of Columbus.

A consideration of the degree of harmfulness is necessary in prioritizing nonindigenous species. In a federal control program, some mechanism is needed for ranking exotic species so that resources can most efficiently and effectively address each species. Some species will pose such immediate ecological and economic harm that they must be addressed immediately (e.g., the zebra mussel), while other species that have been established for hundreds of years may be nonthreatening and therefore warrant only a low ranking on the priority list.

In conclusion, a comprehensive federal policy concerning nonindigenous species would a) view any species from outside an ecosystem as exotic, b) determine if an established species is exotic on an ad hoc basis rather than attempt to draw a temporal line, and c) assume all nonindigenous species are harmful.

IV. TECHNOLOGICAL MEANS OF PREVENTING INTRODUCTION AND CONTROLLING NONINDIGENOUS SPECIES

Before proposing new legislation concerning indigenous species, an examination of the various technological tools available to implement a federal prevention/ control program is necessary. In this section, this comment will analyze the chief means of prevention of introduction and then the methods of controlling or eradicating established exotic species.

A. Methods for Preventing Introduction

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122. 42 U.S.C. § 4321 (1988).

The most effective way of controlling exotic species is by preventing their importation into the United States.[123] Using a military analogy, preventing introduction provides the first line of defense.

1. Customs Inspections

Preventing the importation of a non-native species constitutes the most efficient and effective control method.[124] Therefore, both the U.S. Customs Service and the Animal and Plant Health Inspection Service (APHIS)[125] serve a vital role in screening the baggage of travellers and inspecting international cargo.

2. Quarantine of Imported Goods

In addition to preventing intentional introductions, the U.S. Customs Service and APHIS have other methods for preventing importation in the first place. One such method is by placing non-native organic goods in quarantine until it can be determined that the material is free of exotic species as well as disease.[126] For example, raw logs or timber imported from other countries (or ecosystems) can be placed in quarantine for as long as necessary to determine that they carry no exotic species.[127]

3. Re-Ballasting of Ocean-Going Ships

Ocean-going ships often partake in the common practice of taking on water into their ballast tanks before embarking to make the ship more navigable and then discharging this water after reaching the port of destination.[128] As noted earlier, the zebra mussel entered the Great Lakes through the ballast tank of an Eastern European freighter.[129] Exotic species hitch-hiking across the ocean in ballast tanks pose an ever-increasing risk due to the likely acceleration of

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123. Campbell, *supra* note 11, at 36; Devine, *supra* note 4, at 57; *see* Ross, *supra* note 4, at 50; Bederman, *supra* note 9, at 686-87.

124. *See* sources cited *id.*

125. APHIS, part of the United States Department of Agriculture, inspects shipments of agricultural products from foreign countries. OTA REPORT, *supra* note 4, at 139.

126. Campbell, *supra* note 11, at 37.

127. *See id.*

128. R. MICHAEL M'GONIGLE & MARK W. ZACHER, POLLUTION, POLITICS AND INTERNATIONAL LAW 16 (1979).

129. *See supra* note 12.

world trade.[130] For example, in a recent study of the ballasts tanks of 159 Japanese ships, 367 varieties of marine organisms were found.[131] Currently, 39,000 ships ply the oceans.[132] Consequently, the Aquatic Nuisance Species Prevention and Control Act of 1990[133] requires that an ocean-going ship re-ballast its tanks before entering the Great Lakes.[134] This Act also takes tentative steps toward requiring the re-ballasting of all ships before entering a U.S. port.[135] Such a rule would help eliminate a significant introduction medium.

4. Banning the Importation and Sale of Exotic Species

All potentially harmful non-native species could be banned from importation under the plausible assumption that anything that can be released into an ecosystem will be released into an ecosystem sooner or later. For example, individuals could no longer be permitted to sell exotic seeds and plants through seed catalogs and greenhouses without placing the exotic species involved on the white list.[136] Although the Lacey Act nominally bans the importation of exotic species, the Act's usefulness is limited.[137]

5. Protection of Ecosystems

Exotic species are often able to become established due to a disturbed ecosystem.[138] Usually, a healthy ecosystem can thwart potential invaders just as a healthy human body can fight off disease. But, when the ecosystem is disturbed and thereby weakened, the possibility of an exotic species invasion increases. For example, in the high desert, cattle have disturbed that delicate ecosystem by overgrazing natural plants and destroying the cryptogamic crust[139] covering the ground between plants, thereby allowing such exotic plant species as cheatgrass to encroach upon and eventually overwhelm the native plants.[140] Federal laws and regulations which protect ecosystems

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130. *See* M'GONIGLE, *supra* note 128, at 16; OTA REPORT, *supra* note 4, at 15.
131. Ross, *supra* note 4, at 45-47.
132. *Id.*
133. 16 U.S.C. §§ 4701-4751 (Supp. 1992).
134. 16 U.S.C. § 4711(b)(2) (Supp. 1992). *See, e.g.*, Bederman, *supra* note 9, at 685-87 (discussing the general pros and cons of re-ballasting requirements).
135. 16 U.S.C. § 4712 (Supp. 1992) (creating a national ballast water control program).
136. Devine, *supra* note 4, at 57. For a discussion of the white list approach, see *supra* text accompanying notes 47-48.
137. *See supra* text accompanying notes 30-55 for discussion of the Lacey Act.
138. Devine, *supra* note 4, at 57.
139. The cryptogamic crust consists of lichens, mosses, and other organisms. *Id.* at 55.
140. *Id.*

from overuse and abuse would aid in preventing the introduction of nonindigenous species.

B. Tools and Methods Available to Control Established Species

Once a species has become established, the prevention or limitation of a wholesale invasion becomes much more difficult. Nonetheless, there are three chief means for controlling already established exotic species: pesticides and herbicides, biocontrol, and physical control.[141]

1. Pesticides

The use of pesticides[142] constitutes a mixed blessing of the first magnitude. On the one hand, pesticides have had great success in eliminating species that harm crops, forests, and residential yards.[143] In recent years, herbicides have also been used effectively against a variety of plant invaders.[144]

On the other hand, pesticides have many negative characteristics. First, pesticides often have a limited period of effectiveness due to species' gradual development of tolerance or resistance to it.[145] Cockroaches come to mind as a common example. Second, perhaps most vexingly, pesticides tend to kill or adversely affect species other than the intended target. For example, studies have suggested the pesticide DDT may have contributed to the near extinction of the bald eagle.[146] Third, due to federal regulation, the development time of a pesticide is so slow as to approach glacial speed.[147] For example, the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA)[148] requires that, before a new pesticide can be registered, a pesticide manufacturer must show that "when used in accordance with widespread and commonly recognized practice it will not generally

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141. OTA REPORT, *supra* note 4, at 9.

142. This comment will use the term pesticide as a short hand for all chemical control agents, unless use of a more specific term is appropriate.

143. *See* OTA REPORT, *supra* note 4, at 152.

144. *See* Devine, *supra* note 4, at 57.

145. *Cf.* OTA REPORT, *supra* note 4, at 9 (listing the buildup of pest resistance as one of the difficulties with the development of biological and chemical pesticides). *See, e.g.*, Robert F. Luck et al., *Chemical Insect Control—A Troubled Pest Management Strategy*, 87 BIOSCIENCE 606, 606 (1977).

146. *Cf.* RACHEL CARSON, SILENT SPRING 118-22 (1962) (studies on other birds suggest that DDT has contributed to reproductive problems and was a possible contributor to the decline of the bald eagle population).

147. *Cf.* OTA REPORT, *supra* note 4, at 9 (noting that difficulties involved in the development of pesticides include "ensuring species specificity, slowing the buildup of pest resistance to the pesticide, and preventing harm to nontarget organisms").

148. 7 U.S.C. §§ 136-136y (1988).

cause unreasonable adverse effects on the environment."[149] Fourth, FIFRA has placed many strict, and therefore limiting, requirements on the use of pesticides.[150] FIFRA empowers the EPA to "conduct a program for the certification of applicators of pesticides" if the state in question has not done so.[151] Thus, anyone seeking to eradicate a species must first receive certification. These four factors significantly limit the usefulness of pesticides.

Despite these limitations, pesticide use can be an effective control technique. For example, the Great Lakes Fishing Commission relies on two particular pesticides to control the sea lamprey—which the zebra mussel dethroned as the most invidious exotic species in the Great Lakes—with no significant adverse side effects.[152] Pesticides are a useful, but limited tool, which must be used carefully.

2. Biocontrol

The use of biological agents to control non-native "pest" species dates back hundreds of years.[153] Biocontrol is defined as "the discovery, importation and release of a foreign species with the expectation that it will control a pest population."[154] Usually, the biocontrol species is from the same ecosystem and is a predator of the species to be controlled.[155] The use of cats to control mice in homes and other structures springs to mind as the most common example of biocontrol. Mixed results have also marked biocontrol efforts.

On the positive side, use of biocontrol organisms "has been praised . . . as a non-polluting, ecologically sound, efficient, and sustainable pest control method."[156] Biocontrol efforts have been successful in controlling non-native "pests of citrus trees in California and sugar cane in Hawaii."[157]

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149. 7 U.S.C. § 136a(c)(5)(D) (1988).

150. *See generally* 7 U.S.C. §§ 136-136y (1988).

151. 7 U.S.C. § 136i(a)(1) (1988).

152. OTA REPORT, *supra* note 4, at 161.

153. F.J. Simmonds et al., *History of Biological Control*, *in* THEORY AND PRACTICE OF BIOLOGICAL CONTROL 17 (C.B. Huffaker & P.S. Messenger eds., 1976). This study notes 23 instances of biological control through intentional introduction of an exotic species between 1200 and 1888. *Id.* at 20-21.

154. Francis G. Howarth, Classical Biocontrol: Panacea or Pandora's Box, Presidential Address Before the Hawaiian Entomological Society (Dec. 1986), *in* 24 PROC. HAW. ENTOMOLOGICAL SOC'Y 239, 239 (1988).

155. Miller and Aplet, *supra* note 121, at 291.

156. *Id.* at 287-88. *But see* M. Tomczak, Jr., *Defining Marine Pollution: A Comparison of Definitions Used By International Conventions*, 8 MARINE POL'Y, 311, 321-22 (Oct. 1984) (arguing that nonindigenous species should be viewed as a form of marine pollution).

157. Miller and Aplet, *supra* note 121, at 287.

On the other hand, numerous unintended side effects plague biocontrol. First, the biocontrol agent may directly harm the ecosystem into which it is introduced.[158] For example, the mongoose was introduced into Hawaii to eliminate rats which were infesting the sugar cane fields.[159] Unfortunately, the mongoose also preyed upon native birds, which ultimately led to their demise.[160]

Second, determining which non-native species will most effectively, efficiently, and safely control a pest can be an expensive and time-consuming endeavor.[161] Once scientists find a likely biocontrol candidate, establishing the biocontrol species in the wild and ensuring that it will only affect the target species can be difficult.[162] "For example, of 679 biocontrol organisms introduced into Hawaii between 1890 and 1985, only 243 established, and only 157 of these are believed to attack only their intended target."[163] Moreover, scientists have often failed to take into account the impact a biocontrol species will have on "non-economic species, native pest controls, or ecosystem dynamics."[164] Therefore, biological control efforts suffer from a significant lack of precision.

Third, the concept of introducing one nonindigenous species to control an already established exotic species seems ironic, if not absurd. Still worse is the introduction of a non-native biocontrol agent to control a native species.[165] By definition, a biocontrol agent is intended to both impact and become a self-propagating part of the ecosystem.[166] In this sense, biocontrol poses a greater threat to the environment than does the use of pesticides since pesticides eventually leave an ecosystem.[167] If the biocontrol species establishes itself in its new ecosystem, the biocontrol species will inevitably infringe upon a native species or its habitat.[168] By nature, biocontrol species are "aggressive, voracious," and prolific reproducers.[169] Biocontrol agents

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158. *Id.* at 291 (noting that "[e]ach biocontrol success . . . comes at an often unrecognized cost to the integrity of the ecosystem").

159. *Id.* at 291-92.

160. *Id.*

161. Devine, *supra* note 4, at 57.

162. *See id.*

163. Miller and Aplet, *supra* note 121, at 294, *citing*, George Y. Funasaki et al., A Review of Biological Control Introductions in Hawaii: 1980 to 1985, *in* 28 PROC. HAW. ENTOMOLOGICAL SOC'Y 105, 112 (1988).

164. Miller and Aplet, *supra* note 121, at 288.

165. *Id.* at 297.

166. *Id.* at 295.

167. *Id.*

168. *See supra* text accompanying note 121 for description and refutation of the empty niche theory.

169. Miller and Aplet, *supra* note 121, at 295.

also have the uncanny ability to spread far beyond the area of infestation.[170] As a result of these characteristics, predicting how a biocontrol species will ultimately affect its new home borders on the impossible. In Hawaii, for example, the nonindigenous *lantana camara* vine only became a problem when the common mynah bird was introduced to control the armyworm. The mynah bird unexpectedly began spreading *lantana* throughout Hawaii.[171] Both the mynah bird and *lantana* are now considered pests in Hawaii.[172]

The use of biocontrol agents is fraught with a number of serious shortcomings. The negative side effects are so numerous that biocontrol should only be employed when the party seeking to use it demonstrates that a) this method is the most effective means of controlling another non-native species and b) this method will not be likely to have a significant impact on the ecosystem.

3. Physical Control Efforts

Physical control consists of using the direct application of "mechanical (e.g., mowing), manual (e.g., hand pulling), or cultural (e.g., burning)" forces to kill or maim an exotic species.[173] Manually removing an exotic species, especially plants, constitutes the most environmentally friendly means of ridding an ecosystem of non-native species.[174] Rather than poison the area with pesticides or introduce an unpredictable biocontrol agent, manual removal permits control or eradication without significant negative side effects.

Despite these obvious benefits, attempting to use manual effort to control or eradicate a species approaches the Sisyphean in its endless labor and futility. For example, a group of volunteers began a program to clear a portion of Golden Gate National Recreation Area of all non-native plants. After logging 20,000 human hours, they were only able to clear and keep clear sixty acres.[175]

Even if the potential work force and technology is available, physical efforts tend to be expensive. In the Great Lakes, scientists developed a technology which eliminates zebra mussels through the use of lethal shocks; but, the technology has not been used due to its high energy costs.[176] Given that physical control efforts tend to be labor intensive and/ or prohibitively expensive, other methods will

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170. *Id.*
171. *Id.* at 292.
172. *Id.*
173. OTA REPORT, *supra* note 4, at 151.
174. Devine, *supra* note 4, at 56-57.
175. *Id.*
176. Ross, *supra* note 4, at 48.

often prove more useful, especially for exotic species which have little economic impact.

In conclusion, preventing the importation of exotic species provides the best means to prevent introductions. Once a species becomes established, however, pesticides, biocontrol, and physical control methods can be effective, especially immediately after introduction. Thus, preventing importations and introductions provides the first line of defense and efforts to eliminate an established species constitute a second line of defense.[177] Biocontrol and pesticides should be employed selectively and with the utmost care. In section IV, this comment will propose national legislation to comprehensively address the difficulties caused by nonindigenous species.

V. A PROPOSAL FOR AN EXOTIC SPECIES ACT

The recent infestations of the zebra mussel and the specter of killer bees have focused national attention on non-native species and spurred new efforts to study and control exotic species.[178] "Until recently, therefore, the chief conditions for effective environmental policymaking—a perceived need for action coupled with adequate scientific information—were absent."[179] The exotic species issue demands Congressional attention because "[w]hich species to import and release and which to exclude are ultimately cultural and political choices—choices about the kind of world in which we want to live."[180]

In this section, a comprehensive legislative scheme will emerge which centralizes authority over federal programs in one agency, increases federal efforts to prevent the accidental or intentional introduction of non-native species, provides for a structured decision-making process, creates a federal exotic species priority list for control and eradication, mandates post-release monitoring by the releasing party, sets up a national education campaign, and authorizes funding to implement the proposed statute. Before presenting this proposal, however, one must first consider the Constitutional basis of federal action.

A. Constitutional Basis

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177. OTA REPORT, *supra* note 4, at 8-9.
178. *See, e.g.*, Devine, *supra* note 4.
179. Bederman, *supra* note 9, at 695.
180. OTA REPORT, *supra* note 4, at 15.

An argument can be made that exotic species are essentially a local problem and therefore should be governed by state law.[181] Such a view, however, misjudges the scope of the problem and ignores political reality. Currently, a state can permit the introduction of an exotic species over the objections of neighboring states, even though the exotic species will likely invade the neighboring states.[182] Therefore, federal regulation of exotic species is required to prevent such conflicts.

Constitutionally, two means for regulating this area are readily apparent. First, if exotic species are defined as a form of pollution, they can be regulated like any other pollutant.[183] Second, the Commerce Clause provides authority to federally regulate non-native species due to their adverse affect on timber and agriculture.[184] Finally, the Property Clause provides the Constitutional authority to regulate exotic species on federal land.[185] Therefore, ample Constitutional authority exists to regulate nonindigenous species.

B. Centralized Agency Authority

Federal efforts concerning nonindigenous species are currently spread over twenty agencies.[186] As a result, inefficiency and lack of coordinated efforts plague federal exotic species programs.[187] Merely mandating that all federal agencies use their utmost ability to thwart exotic species will not suffice.[188] Perhaps a federal program with coordinated implementation among all federal agencies would partially address the problem.[189] But the inherent inefficiency and diffusion of responsibility of a multi-agency approach would make such a legislative proposal weaker than is necessary to address the problem.[190]

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181. Using a now classic Law & Economics rationale, state nuisance law could be used to address this problem. *See, e.g.*, RICHARD A. POSNER, ECONOMIC ANALYSIS OF THE LAW 56-57 (3d ed. 1986). Of course, such a solution depends upon the federal government divesting itself of all its real estate holdings, which constitutes a serious limitation on the nuisance remedy in this context.

182. *See supra* note 21.

183. Kurdila, *supra* note 9, at 116-17.

184. *See* U.S. CONST. art. I, § 8, cl. 3.

185. *See* U.S. CONST. art. IV, § 3, cl. 2.

186. OTA REPORT, *supra* note 4, at 11.

187. *Id.* at 16-17.

188. *See* Devine, *supra* note 4, at 57 (noting that only "one-tenth of the plants that are recognized as agricultural pests" are listed under the Federal Noxious Weed Act).

189. OTA REPORT, *supra* note 4, at 11.

190. *See id.* at 16-17.

This comment therefore proposes that authority and responsibility for exotic species must be consolidated into one federal agency.[191] Although FWS or APHIS could fill this role, the creation of a new agency would be optimal because it would have a clear mandate and would avoid overburdening the agency with a variety of disparate duties.[192] Therefore, this comment proposes the creation of the Exotic Species Service (ESS). This agency would have the duty of coordinating and overseeing all federal and state efforts[193] and would provide the central authority necessary to avoid piecemeal regulation.[194] ESS would also carry out eradication and control efforts and coordinate scientific research on exotic species.

A significant problem with the current regulatory approach is that most agency actions are reactive: long after the species has become established, the agency takes action.[195] A program must be created to implement an emergency authority at an earlier stage. Such a program would have four steps. First, ESS must carefully monitor all ecosystems in order to detect an invasion as early as possible.[196] Second, when an infestation occurs, ESS must be able to quickly determine a species' potential harmfulness and then prioritize the threat.[197] Therefore, the Act must create an expedited decision-making process.[198] Third, once the threat is assessed, ESS must be willing to take broad actions which may later turn out to be unnecessary.[199] Fourth, the program must have the financial and personnel resources necessary to implement it.[200] Only through the creation of a centralized federal agency with emergency powers can this proposed legislation achieve its goals.

C. Reinforce Efforts to Prevent Introduction

Since preventing importation and introduction provides the first line of defense against exotic species invasions, federal efforts to

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191. *Id.* at 16, 32-33.

192. Although FWS is the agency with the most expertise in this area and is certainly able to fulfill the duties proposed here, FWS already has a great deal of responsibility concerning management of wildlife and endangered species.

193. OTA REPORT, *supra* note 4, at 25. This role mirrors FWS's duties under the Endangered Species Act. *See* 16 U.S.C. §§ 1531-1544 (1988).

194. OTA REPORT, *supra* note 4, at 16, 25.

195. *Id.* at 8. The sooner a response to an infestation occurs, the greater the chance for both success and decreased overall costs. *See id.* at 37-39.

196. *See id.* at 37.

197. *Id.* at 39.

198. *Id.* at 37, 39.

199. *Id.* at 37.

200. *Id.*

prevent intentional and unintentional importations and introductions must be reinforced. Thus, this comment proposes that 1) efforts to intercept non-native species in ports of entry must receive further funding, 2) the federal government should adopt a white list approach for permitting importations, and 3) any unauthorized introduction should be classified as a federal crime.

1. Increase Inspections at Ports of Entry

APHIS and the U.S. Customs Service play a crucial role in preventing exotic species introductions by detecting and excluding such organisms before they enter the United States.[201] To enable these agencies to increase their efforts to exclude exotic species, more personnel and funding must be provided. Thus, this comment proposes that these agencies receive significant increases in financial and human resources.

2. The White List

This comment proposes that all nonindigenous species be banned from importation. The black list approach currently in use under the Lacey Act should be abandoned because it has been unsuccessful in preventing introductions. The Lacey Act approach places the burden on the federal government to determine whether a species is harmful.[202] Before permitting any intentional importation of a nonindigenous species, this comment proposes that the importing party must first conduct an EIS-style analysis, which shows that the species is highly unlikely to be harmful if introduced into a particular ecosystem.[203] Such a requirement would place the onus of the harmlessness showing on the importing party. This approach would avoid burdening ESS with the determination of whether the species should be banned. This approach would also assist in preventing potentially harmful introductions from occurring before a species could be banned, a common occurrence under the Lacey Act.[204]

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201. *See supra* text accompanying notes 123-25.

202. *See supra* note 45 and accompanying text.

203. *See infra* text accompanying notes 205-10 for discussion of this structured decision-making proposal. Such a showing of harmlessness would not be impossible to make because most exotic plants, pets, and zoo animals would be unable to survive in the wild. Further more, once any importer has placed a species on the white list for a particular ecosystem, that importer or any other party could import as many species as they wish.

204. *See supra* text accompanying notes 45-53.

3. Criminal Penalty

This comment proposes that any violation of the ban on exotic species introduction be classified a criminal offense. Without significant teeth, any benefits that accrue from the enactment of this proposal would be undercut by illegal importations and introductions. If the attempted importation or introduction were negligent, the guilty party should be fined not more than $25,000. Anyone knowingly violating this provision would be guilty of a Class C felony, which would entail a fine of up to $50,000 and/ or a prison term of up to ten years. These provisions would provide a substantial deterrent to merchants and international travelers.

D. Structured Decision-Making Process

Although the intentional introduction of an exotic species would certainly "significantly affect the human environment," EISs have infrequently been conducted for such actions.[205] In fact, the Office of Technology Assessment concluded that Congress would have to issue a specific directive for the National Environmental Policy Act[206] to be applied to exotic species introductions.[207] Therefore, if a state or individual decides to import or release an exotic species, they can do so without considering its impact on the environment[208] because no statute requires a structured analysis.[209] This comment proposes that any individual attempting to introduce an exotic species must first conduct an EIS-type analysis of the likely impact such introduction will have.[210] ESS would oversee this analysis and the states involved would be included in the decision-making process.[211]

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[205]. OTA REPORT, *supra* note 4, at 18. However, the State of New Jersey has recently conducted an EIS concerning a proposed introduction of chinook salmon into Delaware Bay. *Id.*

[206]. 42 U.S.C. §§ 4321-4370b (1988).

[207]. OTA REPORT, *supra* note 4, at 18.

[208]. *Cf.* Miller and Aplet, *supra* note 121, at 299 (stating that "[n]o federal statute currently requires that biocontrols be reviewed before they are introduced").

[209]. *See supra* text accompanying notes 30-104, for discussion of the principal statutes in this area.

[210]. *See generally* Bederman, *supra* note 9, at 699-70 (discussing suggestions made for the Biodiversity Convention project, including the recommendation to include in the Convention on Biological Diversity "language that will impose a duty . . . to initiate programs of research to further study the effects of" introductions of alien species); *see also* OTA REPORT, *supra* note 4, at 23 (addressing the "clean list" alternative to the Lacey Act, which would "prohibit[] all species" unless the importer proves the "species is not harmful").

[211]. *See* Kurdila, *supra* note 9, at 117 (suggesting that federal implementation of proposed guidelines for controlling the introduction of exotic species would not "preclude state participation in the decisionmaking process").

Like an EIS, this analysis would consider the purpose and impact of the release, the ecosystem involved, and the likelihood that the released species will spread into other ecosystems. At the same time, this analysis would employ such techniques as environmental assessment, cost/ benefit analysis, and risk analysis.[212] Perhaps an additional step in the analysis would entail a limited release in a "closed" ecosystem.[213] If any indigenous species could fill the desired role, the proposed release should not be permitted unless the party seeking introduction can make a particularized showing of the need for the exotic species at issue.[214]

In considering the non-native species impact, the decision-making analysis should focus on the likelihood that the introduced species will a) displace native species, b) prey upon native species, c) threaten natural, agricultural, and silvicultural resources, or d) adversely impact humans.[215] Any scientific data on the nonindigenous species should be incorporated in the analysis and, if such information is significantly lacking, scientific studies should be commissioned.[216] This structured decision-making process will ensure that no future ill-considered or unconsidered introductions will take place.

E. Federal Exotic Species Eradication and Control Program

A requisite part of any comprehensive proposal concerning exotic species is the creation of a program for the eradication and control of the most troublesome and threatening species.[217] ESS must incorporate the white list into an overall list of all known nonindigenous species in the United States. ESS must prioritize the species on this eradication and control list for two reasons. First, the cost of actively controlling all species would be astronomical.[218] Consequently, the least damaging non-native species will have to be "written off."[219] Second, some species, such as the zebra mussel, pose

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212. OTA REPORT, *supra* note 4, at 7.

213. Kurdila, *supra* note 9, at 112, 116. By introducing an exotic species into a closed system first, the "potential impact on native species" will be limited, "since the number of species presently in that system is limited." *Id.* at 112.

214. *Id.* at 111, 113.

215. *Id.* at 112-13.

216. *Id.* at 113.

217. *See generally* OTA REPORT, *supra* note 4, at 39 (giving examples of states which design their eradication programs to specifically target those species which they rank as the most threatening and troublesome species). OTA notes that increased eradication efforts are necessary because it is politically unrealistic to significantly increase customs inspections. *Id.*

218. *See, e.g.*, Devine, *supra* note 4, at 57.

219. *See id.* at 71.

an imminent danger to the environment and industry which demands immediate attention.

Between the malignant and the benign lie many exotic species which are harmful, but not terribly so. In prioritizing these species, ESS should consider whether the species is threatening a wilderness area, an island, an area of rich biodiversity, or the habitat of an endangered species, as well as the economic damage it causes.[220] The length of time since introduction should only be considered to the extent that a non-native species has been recently introduced, poses a serious threat, and is likely to spread rapidly.[221] The eradication program and priority list will thus form the second line of defense against exotic species. ESS should be provided with sufficient funding and resources to implement this program.

F. Miscellaneous Provisions

This comment proposes that the comprehensive legislative scheme contain provisions which provide for 1) mandatory post release monitoring of newly released species, 2) educational programs designed to teach the public about the general threat exotic species pose to the environment, and 3) funding for the implementation of this proposal.

1. Mandatory Post Release Monitoring

To ensure that the newly released species has not had unforeseen effects on its ecosystem or has not spread beyond it, this comment proposes that the introducing party must conduct follow up monitoring. The monitoring period should be conducted annually for a minimum of ten years and should continue until the species has reached a state of equilibrium in its ecosystem. Further monitoring should be conducted every five to ten years thereafter to ensure that the species still poses no significant threat to the environment.

2. Education Program

The average person is probably unaware of the general threat that exotic species pose to the environment. Unknowingly, one might exacerbate the problem by importing and introducing exotic species into a local ecosystem.[222] Therefore, this comment proposes that ESS

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220. OTA REPORT, *supra* note 4, at 40.

221. See *id.* at 39-40, for discussion of the debate surrounding to what extent, if any, time should matter in prioritizing species.

222. *See* Ross, *supra* note 4, at 54.

operate a public program of nonindigenous species education.[223] This program could explain why "innocently" smuggling exotic organic material or animals into the United States can be harmful to the environment. The program could also urge the public to refrain from releasing any nonindigenous pets or plants into the environment. Although merely supplemental to the other aspects of this proposal, an education program could help prevent future introductions at relatively low cost.

3. Funding Authorization

In order to implement this proposal, Congress must authorize the necessary funding. Without sufficient funding, this proposal could never be fully realized.

VI. CONCLUSION

This comment has outlined the threats posed by exotic species to the ecosystems and economy of the United States. Federal efforts in the area of exotic species have been piecemeal and inadequate. The underlying reason for a lack of a concerted effort in this area is the absence of a coherent federal policy. The basic definitional issues surrounding exotic species form the basis of federal policy. Therefore, this comment defines exotic species as any species not native to the ecosystem in which it has been introduced. Prevention of importation, pesticides, biocontrol, and physical control efforts constitute the chief means available to control or eradicate non-native species.

To comprehensively address exotic species concerns, this comment proposes an Exotic Species Act. This Act would centralize authority over federal programs in one agency, which would be granted emergency powers and the duty to coordinate state and federal efforts. In addition, this Act would require a structured decision-making process similar to an EIS. This proposal additionally calls for the adoption of a white list approach, which would ban all introductions of nonindigenous species unless the introducing party could show the species is unlikely to have a significant impact on the environment. This legislation would create a federal program for the control and eradication of exotic species. Under this Act, the U.S. Customs Service would be provided with increased federal funds and staff to prevent the accidental or intentional introduction of non-native species. This proposal mandates post-release monitoring by the

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223. OTA REPORT, *supra* note 4, at 34-35.

introducing party. The creation of a national education campaign would supplement the main provisions of this proposed legislation.

The federal government must act now to halt further loss of biodiversity and degradation of the environment by nonindigenous species. The enactment of this proposal would go a long way in safeguarding the ecosystems of the United States from exotic species.