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Toothless? The Endangered Manatee and the Florida Manatee Sanctuary Act

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TOOTHLESS? THE ENDANGERED MANATEE AND THE FLORIDA MANATEE SANCTUARY ACT

KEITH RIZZARDI*

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I. INTRODUCTION

Manatee populations have been decreasing for over one hundred years.[1] In 1978, the Florida Manatee Sanctuary Act (MSA) was passed to stop that decline.[2] While the MSA often takes a back seat to better-known species protection laws, such as the Endangered Species Act (ESA)[3] and the Marine Mammal Protection Act (MMPA),[4] the MSA is critical to the effort to save the manatee.

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1. Concern over the fate of the manatee existed as early as 1885, when an observer wrote that "there is no doubt that the manatee is fast becoming an extinct animal . . . . Ten years ago the meat could be bought at 50 cents a pound. Of course, the animals are becoming far too scarce to admit of its being sold at all." WARREN ZEILLER, INTRODUCING THE MANATEE 123 (1992). Seven thousand manatees were hunted and killed in the 1950s, but no more than 2,600 exist today. See Thomas J. O'Shea, Manatees, SCI. AM., July 1994, at 68; see also Craig Quintana, Biologists Hope Species Nearing Recovery, ORLANDO SENT., Feb. 23, 1996, at C1.

2. See Florida Manatee Sanctuary Act, ch. 78-252, 1978 Fla. Laws 725 (codified as amended at FLA. STAT. § 370.12(2) (1995)).

3. 16 U.S.C. §§ 1531-1534 (1994).

4. See id. §§ 1361-1407 (1994). Today, the MMPA addresses the need for conservation and management of marine mammal populations by regulating their sale or import, see id. §§ 1371-1372, by regulating takings, see id. § 1373, by requiring permits, see id. § 1374, by providing penalties for violations, see id. §§ 1375-1377, and by creating a Marine Mammal Commission to monitor marine mammal populations and to work with states, federal agencies, and foreign nations, see id. §§ 1401-1406.

Species protection laws have a surprisingly long history.[5] In Florida, manatee protection laws date to 1893, when the Legislature made it illegal to kill or capture a manatee without a permit.[6] A 1939 law empowered the Game & Fresh Water Fish Commission to designate and fence off manatee breeding grounds.[7] Another manatee protection law required permits for scientific uses of manatees and established penalties of up to $600 or one year in jail for killing or capturing a manatee without a permit.[8]

Despite these early protection laws, the manatee remained threatened with extinction.[9] Recognizing the continuing threat, the Florida Legislature passed the MSA[10] in an attempt to alleviate the most common threat to the manatee—speeding boats—by establishing speed limits in waterways frequented by manatees.[11] The MSA and its subsequent modifications built upon and consolidated the earlier laws, requiring permits[12] and empowering the Florida Department of Environmental Protection (DEP) to protect manatee habitats by regulating boat traffic.[13] However, when compared to the earlier manatee protection laws, the penalties for violating the MSA in 1997 are still relatively weak, with maximum first-time penalties of sixty days imprisonment[14] or a fine of $200 to $600.[15]

Despite protective legislation, the number of manatee deaths—particularly those resulting from collisions with recreational boats—

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5. See, e.g., Black Bass Act, ch. 346, 44 Stat. 576 (1926) (repealed 1981); see also Bald Eagle Protection Act, Pub. L. No. 76-567, 54 Stat. 250 (1940) (codified as amended at 16 U.S.C. § 668 (1994)). Still in effect, the "Eagle Act" prohibits the taking of bald or golden eagles for any reason without a permit from the Department of the Interior, see 16 U.S.C. § 668(a) (1994), and allows the use of seizure and forfeiture laws, among other remedies, to enforce the law or to punish violators, see id. § 668b(b). Florida enacted numerous fish and game protection laws in chapter 371, Florida Statutes, after the 1942 constitutional creation of the Game & Fresh Water Fish Commission. See FLA. STAT. ch. 371 (1995); see also FLA. CONST. art. IV, § 9.

6. See Act effective June 6, 1893, ch. 4208, 1893 Fla. Laws 145 (creating a fine of up to $500 or three months in prison for killing or capturing a manatee). This law was modified in 1953 to include imprisonment for up to one year for killing or capturing a manatee. See ch. 28145, § 12, 1953 Fla. Laws 469, 492.

7. See Act effective May 30, 1939, ch. 19192, § 1, 1939 Fla. Laws 392, 392.

8. See ch. 28145, § 12, 1953 Fla. Laws 469, 492.

9. See Robert A. Garrot et al., Trends in Counts of Florida Manatees at Winter Aggregation Sites, 58 J. WILDLIFE MGMT. 642, 642 (1994) (finding that manatee mortality has increased six percent annually since the state carcass recovery program began in the mid-1970s).

10. See Florida Manatee Sanctuary Act, ch. 78-252, 1978 Fla. Laws 725 (codified as amended at FLA. STAT. § 370.12(2) (1995)).

11. See FLA. STAT. § 370.12(2)(f) (1995) (authorizing the passage of administrative rules "to protect the manatees or sea cows from harmful collisions with motorboats").

12. See id. § 370.12(2)(c).

13. See id. § 370.12(f)-(j).

14. See id. § 370.021(2)(a).

15. See id. § 370.021(2)(a), (c)(5)(i) (providing for fines of $100 to $500, with an additional $100 penalty for killing or taking a manatee).

continues to increase.[16] Experts report the cause is partly due to inadequate enforcement of the protection laws, which in turn diminishes the laws' deterrent effects.[17] These and other serious problems that undermine the MSA's effectiveness indicate that it is time for the Legislature to reexamine the MSA and make necessary revisions, such as clarifying and reducing the rulemaking burdens placed upon DEP, increasing protection laws and requiring their strict enforcement, modifying and replacing water control structures, and empowering the agency to implement an effective statewide education program.[18]

Part II of this Article examines the history of species protection and focuses on why species deserve protection. Part III identifies the particular problems facing the manatee. Part IV explores the development of manatee protection policies, while Part V considers the implementation of these policies. Part VI evaluates the existing manatee protection program and suggests alternatives. Finally, Part VII concludes that although once considered visionary legislation, the MSA today does not effectively serve to protect manatee populations and is in need of legislative amendments to strengthen and expand its protective capabilities.

II. THE HISTORY AND BENEFITS OF SPECIES PROTECTION IN GENERAL

At the federal level, legislated species protection originated at the turn of the twentieth century when Congress, recognizing problems with the enforcement of hunting laws, passed the Lacey Act of

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16. See Bruce B. Ackerman et al., Trends and Patterns in Mortality of Manatees in Florida, in POPULATION BIOLOGY OF THE FLORIDA MANATEE 223, 228-29 (Thomas J. O'Shea et al. eds., 1995). Manatee deaths from watercraft collisions, which numbered in single digits in 1974 (three) and 1975 (six), steadily rose thereafter, and exponential regression analysis revealed a 9.3% increase each year from 1976 to 1992. See id. at 231. The rise in deaths bore a linear relationship to boat registration increases in Florida, with very high statistical significance. See id. at 231.

17. Boating speed zones are often ignored and marine patrol resources are far too limited to overcome widespread disregard of the laws. See Telephone Interview with Major Bruce Buckson, Florida Marine Patrol (Apr. 17, 1996) (notes on file with author); Telephone Interview with Scott Calleson, Environmental Specialist, Dep't of Envtl. Prot. (Apr. 17, 1996) (notes on file with author); Telephone Interview with Kipp Frohlich, Biological Administrator, Protected Species Division, Dep't of Envtl. Prot. (Apr. 17, 1996) (notes on file with author); Interview with Frank Lund, Senior Environmental Scientist, Manatee Protection Program, South Florida Water Management District, West Palm Beach, Fla. (Apr. 9, 1996) (notes on file with author). Recent DEP studies found boater compliance with manatee protection speed zone laws to be as low as 50%. See DEP'T OF ENVTL. PROT., SAVE THE MANATEE TRUST FUND, FISCAL YEAR 1994-1995 ANNUAL REPORT 36 (1995). The Florida Manatee Recovery Plan also acknowledged these problems, citing a need for standardized fines, assessment of enforcement successes and shortcomings, and improved law enforcement officer training. See FLA. MANATEE RECOVERY TEAM, FLORIDA MANATEE RECOVERY PLAN, REVISED RECOVERY PLAN 39-40 (1989).

18. See infra Part VI.

1900.[19] Thereafter, Congress began awarding protection to individual species.[20] As scientific understanding of ecosystems and species developed, so did the complexity of the legislation. The Endangered Species Preservation Act of 1966 (ESPA)[21] empowered the Department of the Interior to acquire land for habitat protection and to investigate the threatened or endangered status of species.[22] Marine mammals received more protection in the 1972 MMPA,[23] which established a moratorium on the taking of marine mammals such as the manatee.[24] The MMPA and the ESPA acted as precursors to the ESA.[25] All of those acts, however, built upon four basic principles: (1) economics and science, (2) recreation, (3) ecosystems, and (4) morality.[26]

First, economic, scientific, and research justifications are the most readily understood reasons for species protection. The potential for nature to provide medical cures is often cited by legislators as justifying protection laws.[27] Similarly, a creature with unique genetic characteristics could have enormous value for commercial uses.[28] However, insufficient data is available to justify species pro-

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19. Ch. 553, 31 Stat. 187 (1900) (codified as amended at 16 U.S.C. § 701, 18 U.S.C. § 42 (1994)) (prohibiting the interstate transport of animals killed in violation of state game laws and authorizing the Department of Agriculture to take measures to ensure the preservation and restoration of game and wild birds). Congress passed the Lacey Act to curtail the rampant bird hunting that devastated the Everglades bird population. See STUART MCIVER, TRUE TALES OF THE EVERGLADES 5 (1989). Plume hunters sought to cash in on the $32-per-ounce plume market rate (more than an ounce of gold) offered by manufacturers of women's hats. See id.

20. See Black Bass Act, ch. 346, 44 Stat. 576 (1926) (repealed 1981); see also Bald Eagle Protection Act, Pub. L. No. 76-567, 54 Stat. 250 (1940) (codified as amended at 16 U.S.C. § 668 (1994)).

21. Pub. L. No. 89-669, 80 Stat. 926 (1966).

22. See id. § 2(a)-(b), 80 Stat. at 926-27.

23. Pub. L. No. 92-522, 86 Stat. 1027 (codified as amended at 16 U.S.C. §§ 1361-1407 (1994)).

24. See id. § 102(a)(2)(a), 86 Stat. at 1032. Taking is defined as harassing, hunting, capturing or killing, or attempting to harass, hunt, capture or kill, any marine mammal. See id. § 3(13).

25. 16 U.S.C. §§ 1531-1534 (1994). One scholar declared that the ESA is a "declaration of war against the growing problem of species extinction." Andrew Wetzler, Ethical Underpinnings of the ESA, 13 VA. ENVTL. L.J. 145, 145 (1993).

26. These four principles can be traced to National Wildlife Federation Conservation Hall of Famer Aldo Leopold, whose 1949 book A Sand County Almanac is widely regarded as marking the beginning of environmental ethics. In Part III of his book, subtitled The Upshot, Leopold wrote about "the wilderness for science," "the wilderness for wildlife," "the wilderness for recreation," and the "land ethic." ALDO LEOPOLD, A SAND COUNTY ALMANAC 188-210 (1949). See also Richard L. Knight, Aldo Leopold, the Land Ethic and Ecosystem Management, 60 J. WILDLIFE MGMT. 471, 471-74 (1996).

27. See, e.g., H.R. REP. NO. 93-412, at 5 (1973) ("Who knows, or can say, what potential cures for cancer or other scourges, present or future, may lie locked up in the structures of plants which may yet be undiscovered, much less analyzed?").

28. See MCIVER, supra note 19, at 51-52. Companies in Key West at one time supplied 90% of all sponges used in the United States, employing as many as 1,400 men. See id.

tection solely upon economic grounds, and other factors must be considered.[29]

Second, and related to economics, recreational considerations also warrant species protection. From Maine to Hawaii, people travel thousands of miles to go whale watching.[30] Similarly, in the Florida Keys, tourist groups don snorkels and diving suits to view coral reefs.[31] Ecotourism is an increasingly popular recreational pastime, and many communities are seeking to attract visitors to their unique environments.[32]

Third, ecosystem concerns also justify species protection because of the interconnectedness of species, including humans, in the Earth's ecosystem.[33] For example, the preservation of the California condor helps to ensure that decaying carcasses are consumed before they spread disease,[34] and the existence of the grey wolf in Yellowstone National Park is necessary to prevent an overabundance of deer that overconsume Yellowstone's vegetation.[35] Protecting ecosystems also preserves genetic diversity, which enables populations to adapt to changing environments.[36]

Finally, moral or intrinsic reasons justify species protection.[37] Human progress need not be at the expense of other creatures, which could be considered self-defeating or arrogant.[38] The biblical account of Noah and the Ark suggests that species protection even has ancient origins.[39] Some scholars suggest that animals and plants

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29. See NAT'L RESEARCH COUNCIL, SCIENCE AND THE ENDANGERED SPECIES ACT 190 (1995).

30. See Jeff Phillips, Humpback Comeback, SUNSET, Nov. 1995, at 26-28.

31. See DIVISION OF TOURISM, FLORIDA DEP'T OF COM., FLORIDA VACATION GUIDE 18 (1996).

32. See Caroline Arlen, Ecotour, Hold the Eco, U.S. NEWS & WORLD REP., May 29, 1995, at 61-63; Herb Hiller, Ecotourism: Can We Use Tourism to Help Conserve the Best of What's Left?, FLA. NATURALIST, Fall 1996, at 7-8.

33. See R. Margalef, On Certain Unifying Principles in Ecology, 97 AM. NATURALIST 357, 357 (1963).

34. See Todd Wilkinson, Homecoming, 70 NAT'L PARKS, May 1996, at 5-6, 40-45.

35. See Wolf Reintroduction to Yellowstone (visited Oct. 24, 1996) <http://www.intermarket.com/Yellowstone/wreintro.htm> (copy on file with Fla. St. U. L. Rev., Tallahassee, Fla.); A Yellowstone Chronology (visited Oct. 24, 1996) <http://www.defenders.org/ynpchro.html> (copy on file with Fla. St. U. L. Rev., Tallahassee, Fla.); see also LEOPOLD, supra note 26, at 129-33.

36. See NAT'L RESEARCH COUNCIL, supra note 29, at 134-35.

37. See LEOPOLD, supra note 26, at 205 (describing the "ecological conscience" and encouraging humans to recognize themselves as only one part of the "biotic team"); see also Wetzler, supra note 25, at 170-74.

38. See LEOPOLD, supra note 26, at 204; see also generally DAVID EHRENFELD, THE ARROGANCE OF HUMANISM (1978); Richard L. Wallace, Why Endangered Species Protection vs. Economic Development Doesn't Have to Be a Win-Lose Scenario (visited Oct. 24, 1996) <http://www.spectacle.org/196/rich1.html> (copy on file with Fla. St. U. L. Rev., Tallahassee, Fla.).

39. See Genesis 6-9.

should be granted rights under law.[40] All of these concepts provide moral or ethical foundations for species protection laws.

Based upon these four fundamental justifications for species protection, the Florida Legislature should reaffirm its commitment to the protection of the manatee and recognize that problems with the MSA warrant amendments to expand the protective powers of the law.

III. PROBLEM IDENTIFICATION AND THE NEED FOR MANATEE PROTECTION

The West Indian manatee, or trichechus manatus, is native to both the warm waters of Florida's coastline and inland waters.[41] Resembling a cross between a seal and a walrus, but lacking tusks or long whiskers, manatees are playful mammals that spend most of their time eating,[42] resting, and endlessly searching for warmer waters.[43] They can grow as large as thirteen feet, weigh as much as 3,500 pounds, and live as long as sixty years.[44]

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40. See CHRISTOPHER D. STONE, SHOULD TREES HAVE STANDING? 3-10 (1988); see also Rodger Schlickeisen, Protecting Biodiversity for Future Generations: An Argument for a Constitutional Amendment (visited Oct. 24, 1996) <http://www.defenders.org/bio-co00.html> (copy on file with Fla. St. U. L. Rev., Tallahassee, Fla.).

41. Generally, manatees live throughout the tropical waters of Florida, including inland rivers, lakes, canals, brackish estuaries, and saline coastal areas. See Sea World Educ. Dep't, Habitat and Distribution (visited Oct. 24, 1996) <http://www.bev.net/education/SeaWorld/manatee/habdistman.html> (copy on file with Fla. St. U. L. Rev., Tallahassee, Fla.). Telemetry studies have used radio and satellite links to monitor manatees travelling along the Atlantic Coastline. See Bureau of Protected Species Mgmt., Telemetry and Related Information (visited Oct. 24, 1996) <http://www.dep.state.fl.us/psm/webpages/telemtry.htm> (copy on file with Fla. St. U. L. Rev., Tallahassee, Fla.); Save the Manatee Club, Manatee Sighted in Virginia Most Likely Chessie, (visited Oct. 24, 1996) <http://objectlinks.com/manatee/news.htm> (copy on file with Fla. St. U. L. Rev., Tallahassee, Fla.).

42. See Sea World Educ. Dep't, Diet and Eating Habits (visited Oct. 24, 1996) <http://www.bev.net/education/SeaWorld/manatee/dietman.html> (copy on file with Fla. St. U. L. Rev., Tallahassee, Fla.); Bureau of Protected Species Mgmt., Manatee Anatomy Facts and Trivia (visited Oct. 24, 1996) <http://www.dep.state.fl.us/psm/webpages/anatomy.htm> (copy on file with Fla. St. U. L. Rev., Tallahassee, Fla.). Manatees consume as much as nine or ten percent of their body weight in aquatic vegetation each day. See Sea World Educ. Dep't, supra.

43. See Sea World Educ. Dep't, supra note 41; Bureau of Protected Species Mgmt., Where Are the Manatees? (visited Oct. 24, 1996) <http://www.dep.state.fl.us/psm/webpages/florida.htm> (copy on file with Fla. St. U. L. Rev., Tallahassee, Fla.). Manatees prefer water temperatures greater than 68 degrees Fahrenheit. See Sea World Educ. Dep't, supra note 41. In the winter months, water temperatures drop, and the manatees travel in search of warmer waters, often ending up in Florida's springs or near artificial warm water discharges. See id.

44. See Sea World Educ. Dep't, Physical Characteristics (visited Oct. 24, 1996) <http://www.bev.net/education/SeaWorld/manatee/phycarman.html> (copy on file with Fla. St. U. L. Rev., Tallahassee, Fla.); Sea World Educ. Dep't, Longevity and Causes of Death (visited Oct. 24, 1996) <http://www.bev.net/education/SeaWorld/manatee/deathman. html> (copy on file with Fla. St. U. L. Rev., Tallahassee, Fla.).

Documented countings of manatee populations are a fairly recent effort,[45] but history demonstrates that manatee counts today are far lower than they once were. Native Americans once hunted manatees for food, oils, and hides simply by wading into the waters.[46] In fact, manatees were hunted commercially until 1973; close to 7,000 were killed in the 1950s.[47] Yet manatee research did not become an important scientific subject until the early 1950s, when Joseph C. Moore, an Everglades National Park biologist, began identifying manatees by the boat propeller scars on their backs.[48] Later, in 1974, the University of Miami and the U.S. Fish & Wildlife Service jointly began a systematic study of manatee population biology.[49] In Florida, pursuant to the directives of the MSA, DEP is currently among the leaders in manatee research.[50] Along with scientists around the world, DEP has been monitoring manatee populations through the use of aerial flights and satellite tracking technology both for further study and to gauge manatee populations.[51]

In February 1996, an aerial census placed the manatee population at 2,600, a dramatic increase above previous counts, such as the 1995 census that spotted 1,443 manatees.[52] While the 1996 figure appears to reflect an increase in the manatee population, the increase could be attributed to improved observation techniques.[53] Moreover, it does not reflect the catastrophic manatee "die-off" in southwest Florida, which resulted in 158 manatees deaths in early

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45. See DEP'T OF ENVTL. PROT., supra note 17, at 9 (noting that the first systematic assessments of manatee populations began in the 1970s).

46. See ZEILLER, supra note 1, at 114-16; see also O'Shea, supra note 1, at 68.

47. See O'Shea, supra note 1, at 68.

48. See id. at 70. The practice of identifying manatees by propeller scars is still in use today. See Scott Wright & Bruce Ackerman, Analysis of Watercraft Related Mortality of Manatees in Florida, in POPULATION BIOLOGY OF THE FLORIDA MANATEE 259, 259-68 (Thomas J. O'Shea et al. eds., 1995) (studying the scar patterns and wounds of 628 dead manatees recovered from 1979 through 1991).

49. See John E. Reynolds, Florida Manatee Population Biology: Research Progress, Infrastructure, and Applications for Conservation and Management, in POPULATION BIOLOGY OF THE FLORIDA MANATEE 6, 6-7 (Thomas J. O'Shea et al. eds., 1995).

50. See id. at 7.

51. See id.; see also Bruce B. Ackerman, Aerial Surveys of Manatees: A Summary and Progress Report, in POPULATION BIOLOGY OF THE FLORIDA MANATEE 13, 13-33 (Thomas J. O'Shea et al. eds., 1995).

52. See Craig Quintana, Biologists Hope Species Nearing Recovery, ORLANDO SENT., Feb. 23, 1996, at C1; MARINE MAMMAL COMM'N, 1994 ANNUAL REPORT TO CONGRESS 9 (1995).

53. See Garrot, supra note 9, at 653. As surveyors become more experienced, counts may increase, thus reducing the comparative value of the data. See id. Some error in the manatee count is to be expected, and aerial counts are especially affected by visibility problems and difficulties in coordinating a statewide aerial survey. See Ackerman, supra note 51, at 17-19. The February count could be a result of near-perfect viewing conditions. Craig Quintana, Manatees Lumber Toward Safer Status, ORLANDO SENT., Feb. 23, 1996, at C1.

1996.[54] Furthermore, it is very difficult to estimate the natural fluctuations in manatee populations. Surveys cannot reveal the exact number of female manatees; therefore, estimates of manatee reproductive rates range from eight to eighteen percent annually.[55] Estimates of total population growth are similarly uncertain,[56] although some reports indicate that this growth is zero.[57] Thus, the census data, while informative, is not comprehensive. What is clear is that the total manatee population is dangerously low, and could reach the point where extinction is inevitable.[58]

The endangered status of the manatee is particularly disappointing given the fact that humans are the manatees' sole enemy.[59] Manatees are confronted with many man-made threats to their continued existence, some more severe than others, which have caused more than 2,000 of their deaths since 1974.[60]

Today, collisions with boats and boat propellers are one of the biggest threats to the manatee, causing roughly twenty-five percent of all manatee deaths.[61] Water control structures occasionally crush or drown manatees, accounting for approximately five percent of manatee deaths.[62] Another significant cause of the declining population is the disappearance of manatee habitats, which primarily results from water quality problems, coastal development, and alteration of water levels caused by Florida's flood control systems.[63] Of course, not all manatee deaths can be prevented. More than thirty-five percent of manatee deaths are a result of natural causes, such

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54. See Lisa Holewa, Scientists Blame Strain of Red Tide for Death of Manatees, FT. LAUD. SUN SENT., July 3, 1996, at 20A. Subsequent studies by DEP concluded that red tide, a microscopic organism, was responsible for the die-off. See id.

55. See Miriam Marmontel, Age and Reproduction in Female Florida Manatees, in POPULATION BIOLOGY OF THE FLORIDA MANATEE, 98, 115 (Thomas J. O'Shea et al. eds., 1995). Despite captive breeding, scientists have been unable to determine exact gestation periods for manatees. See Daniel K. Odell et al., Reproduction of the West Indian Manatee in Captivity, in POPULATION BIOLOGY OF THE FLORIDA MANATEE 192, 192-93 (Thomas J. O'Shea et al. eds., 1995).

56. See Thomas J. O'Shea, Population Biology of the Florida Manatee, in POPULATION BIOLOGY OF THE FLORIDA MANATEE 280, 281-82 (Thomas J. O'Shea et al. eds., 1995).

57. See Dean Solov, Manatees Holding Own, Report Says, TAMPA TRIB., Mar. 10, 1994, at 1. A 16-year University of Florida study released in March 1994 found manatees to be maintaining a zero population growth. See id.

58. See Ackerman, supra note 16, at 254. Low population growth rates require a stable environment to facilitate reproduction. See id. Given the manatee's slow breeding rates, a serious die-off could mean the extinction of the manatee. See id.

59. See O'Shea, supra note 1, at 71. Although crocodiles and sharks have been identified as predators of West African and Amazonian manatees, there is no documented predation of West Indian manatees. See id.

60. See Ackerman, supra note 16, at 228.

61. Thomas A. Lewis, Slow Creature Caught in a Fast World, NAT'L WILDLIFE, Dec.-Jan. 1992, at 42, 44; see also Ackerman, supra note 16, at 230.

62. Ackerman, supra note 16, at 225, 238.

63. See DEP'T OF ENVTL. PROT., supra note 17, at 20-21; see also Reynolds, supra note 49, at 9-10.

as bacterial infections, perinatal deaths, or cold weather stress, and another thirty percent of the deaths are from undetermined causes.[64]

IV. DEVELOPMENT OF FLORIDA'S MANATEE PROTECTION POLICIES

Since 1893, Florida law has attempted to improve the plight of the manatee. The 1939 manatee protection law enabled the Game & Fresh Water Fish Commission to fence off manatee habitats.[65] The 1953 manatee protection law revisited the permitting requirements established in the 1893 law, and established a program with penalties of up to $600 or one year in jail for killing or capturing a manatee without the required permit.[66] In 1959, however, the penalties were reduced to $500 and no more than six months in prison.[67] The 1959 law remained intact until 1971, when the penalties were further adjusted.[68]

Before 1978, the manatee protection laws primarily focused on requiring permits for killing a manatee and punishing those who illegally killed, harmed, or harassed them.[69] The Legislature substantially revised those manatee protection laws by enacting the MSA,[70] which requires permits for scientific or propagational uses of manatees[71] and makes it illegal to intentionally or negligently kill or harm a manatee.[72] The MSA symbolically declares the manatee to be Florida's state marine mammal[73] and provides for the forfeiture of any instrument used to kill or harm a manatee.[74] Most significantly, the MSA authorized the Florida Department of Natural Resources (now known as DEP)[75] to use rulemaking procedures to identify and

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64. See DEP'T OF ENVTL. PROT., supra note 17, at 4-8; see also Ackerman, supra note 16, at 228. The total percentage is less than 100% due to rounding error.

65. See Act effective May 30, 1939, ch. 19192, § 1, 1939 Fla. Laws 392, 392.

66. See ch. 28145, § 12, 1953 Fla. Laws 469, 492.

67. See Act effective June 19, 1959, ch. 59-483, § 1, 1959 Fla. Laws 1623, 1623.

68. See Act effective Jan. 1, 1972, ch. 71-136, § 289, 1971 Fla. Laws 552, 671. Killing, annoying, injuring, molesting, or torturing a manatee became a second-degree misdemeanor punishable by a fine of $500 or no more than 60 days in jail. See id.

69. See supra notes 65-68 and accompanying text.

70. See Florida Manatee Sanctuary Act, ch. 78-252, 1978 Fla. Laws 725 (codified as amended at FLA. STAT. § 370.12(2) (1995)).

71. See FLA. STAT. § 370.12(2)(c) (1995) (providing that a special permit may be granted to possess a manatee if DEP is satisfied that the interest of science will be served).

72. See id. § 370.12(2)(d) (defining "harm" as "to annoy, molest, harass, or disturb or attempt to molest, harass, or disturb any manatee; . . . capture or collect or attempt to capture or collect any manatee; pursue, hunt, wound, or kill or attempt to pursue, hunt, wound, or kill any manatee; or possess, literally or constructively, any manatee or any part of any manatee").

73. See id. § 370.12(2)(b).

74. See id. § 370.12(2)(e) (stating that "any gun, net, trap, spear, harpoon, boat of any kind, aircraft, automobile of any kind, other motorized vehicle, chemical, explosive, electrical equipment, scuba or other subaquatic gear, or other instrument, device, or apparatus . . . used in violation of any provision of subparagraph (d) may be forfeited upon conviction").

75. See id. § 370.12(2)(g).

implement boating speed limits in crucial areas "to protect the manatees or sea cows from harmful collisions with motorboats."[76]

Subsequent amendments to the MSA include deleting the commercial vessels exemption,[77] expanding the use of speed limits beyond the winter migration season,[78] and enlarging protected areas.[79] Funding mechanisms also were adjusted in 1984,[80] and again in 1989.[81] Criminal penalties for violations of manatee speed zones remained intact, but because many members of the public had limited knowledge of the manatee protection laws, law enforcement officials were reluctant to subject citizens to criminal arrest or conviction.[82] In 1993, the Legislature rewrote the punishment provisions to create noncriminal infractions for boating speed limit violations and for refusing to sign a boating infraction, and to increase penalties for failure to respond to a citation.[83]

As a result, violations of the MSA in 1997 generally carry less punishment than they did in 1978 or 1953. Killing or capturing a manatee without a permit was a violation of the 1953 manatee protection law, with penalties of up to $600 or one year in jail.[84] Violations of the 1978 MSA were punishable as first-degree misdemeanors,[85] with penalties of up to $1,000 in fines[86] or up to one year imprisonment.[87]

Today, boaters who violate manatee speed zones, as established by administrative rules, are issued a fifty-dollar uniform boating citation.[88] Failure to post bond and accept the citation is punishable as

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76. See id. § 370.12(2)(f). The provision authorized DEP to adopt rules regarding the expansion or construction of marine facilities and mooring or dock slips, and the regulation of motorboat traffic. See id. Regulation of the operation and speed of boats was authorized "only where manatee sightings are frequent and it can be generally assumed, based on available scientific information, that they inhabit these areas on a regular or continuous basis." See id. "These areas" encompassed thirteen counties listed in sections 370.12(2)(f)(1)-(13). See infra note 95.

77. See Act effective July 1, 1981, ch. 81-228, § 6, 1981 Fla. Laws 938, 941 (amending FLA. STAT. § 370.12(2)(j)).

78. See Act effective June 8, 1983, ch. 83-81, § 1, 1983 Fla. Laws 270, 271 (amending FLA. STAT. § 370.12(2)(f)).

79. See id.

80. See Act effective July 1, 1984, ch. 84-338, § 68, 1984 Fla. Laws 1917, 1954 (establishing a $250,000 program for manatee protection and recovery efforts, including research and enforcement, to be supported by the Motorboat Revolving Trust Fund).

81. See ch. 89-168, § 7, 1989 Fla. Laws 592, 597 (establishing the Save the Manatee Trust Fund to support public and private programs furthering manatee protection and recovery).

82. See Buckson, supra note 17.

83. See Act effective Oct. 1, 1993, ch. 93-254, § 1, 1993 Fla. Laws 2491, 2492-93 (codified at FLA. STAT. § 370.12(2)(k), (r), (s) (1995)).

84. See FLA. STAT. § 370.12 (1953).

85. See id. § 370.12(2)(d) (Supp. 1978).

86. See id. § 775.083(1)(d).

87. See id. § 775.082(4)(a).

88. See id. § 327.74 (1995) (establishing a $50 civil penalty).

a second-degree misdemeanor, with sixty days imprisonment[89] or a $500 fine.[90] Other violations of the current version of the MSA are punished as a misdemeanor, with first-time violators receiving sixty days imprisonment[91] or a fine of $200 to $600.[92]

V. IMPLEMENTATION OF THE MANATEE PROTECTION PROGRAM

Today, Florida's manatee protection program operates primarily by establishing manatee habitat speed and no-entry zones, enforcing the speed limits, and reducing manatee deaths from other human factors, all of which are objectives supported through educational programs.[93] Unfortunately, these activities have failed to protect the manatee population sufficiently.

A. Designating Manatee Habitat Speed and No-Entry Zones

Limiting the speed that boats travel in manatee habitat helps prevent deadly collisions between boaters and manatees.[94] Consequently, the Legislature provided for the designation of manatee habitat speed zones, motorboat-prohibited zones, and no-entry zones.[95] Speed zones restrict the speed of boats and limit their wakes;[96] motorboat-prohibited zones restrict the use of engine-powered boats;[97] and no-entry zones prevent any human disturbance of a designated manatee habitat.[98] The Legislature also limited DEP's ability to create these zones by requiring DEP to weigh

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89. See id. § 775.082(4)(b).

90. See id. § 775.083(1)(e).

91. See id. § 370.021(2)(a).

92. See id. § 370.021(2)(a), (c)(5)(i) (providing for fines of $100 to $500, with an additional $100 penalty for killing or taking a manatee).

93. See id. § 370.12. Two key educational programs are the sign-posting program, which includes placing "Caution—Manatee Area" signs in boat traffic areas, and the public education program, which includes distribution of flyers, posters, and decals and participation in public forums by DEP personnel. See DEP'T OF ENVTL. PROT., supra note 17, at 30-31, 34-35.

94. See FLA. ADMIN. CODE ANN. r. 62N-22.001(3) (1995) ("[R]egulations governing the speed and operation of motorboats in manatee use areas constitute the most direct mechanism for protecting manatees from harmful impacts and death . . . .").

95. See FLA. STAT. § 370.12(2)(g)-(n) (1995) (empowering DEP to create manatee speed zones); see also id. § 370.12(2)(o) (empowering DEP to designate manatee safe havens). Twelve of thirteen counties identified as essential to manatee protection have boating speed limits: Brevard, Broward, Citrus, Collier, Dade, Duval, Indian River, Lee, Martin, Palm Beach, Sarasota, St. Lucie, and Volusia. See id. § 370.12 (f)(1)-(13). Rulemaking remains incomplete in Lee County because of a successful 1995 rulemaking challenge. See DEP'T OF ENVTL. PROT., SAVE THE MANATEE TRUST FUND, FISCAL YEAR 1993-1994 ANNUAL REPORT 23 (1994); MARINE MAMMAL COMM'N, 1995 ANNUAL REPORT TO CONGRESS 15 (1996).

96. See FLA. ADMIN. CODE ANN. r. 62N-22.002(7), (11)-(13) (1995).

97. See id.

98. See id. r. 62N-22.002(6) (defining "motorboat prohibited zones" or "no entry zones").

their burden on boaters against evidence justifying manatee protection.[99]

These zones are critical to manatee protection. Since 1950, coastal development and declining water quality have caused approximately eighty-one percent of the seagrasses in Tampa Bay to disappear, and human activities have caused the loss of another thirty percent of the historical seagrass coverage in the Indian River.[100] Such habitat depletion critically affects the manatee population,[101] yet critical habitat designation received the lowest priority ranking for implementation in the Florida Manatee Recovery Plan.[102] The low ranking of habitat protection in this instance is ironic, because Florida's 1939 manatee protection law was written to protect manatee habitats by empowering the Game and Fresh Water Fish Commission to fence them off.[103]

Instead of no-entry or motorboat-prohibited zones, DEP has emphasized protection by implementing speed zones that are regularly subjected to administrative challenges.[104] In Bonita Bay Properties v. Department of Environmental Protection ,[105] boaters won a victory in the battle over establishment of manatee speed zones when the Lee County manatee protection rules were rejected by an administrative law judge (ALJ). Citing language within the MSA, the ALJ found that DEP did not present sufficient evidence that manatees were "frequently" sighted,[106] that DEP had failed to consider whether the rules created "undue interference" with boaters,[107] that the rule "regulates excessively,"[108] and that DEP had failed to consider all appropriate evidence.[109]

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99. See FLA. STAT. § 370.12(2)(j) (1995). The MSA states that "[t]he Department shall adopt rules regulating the operation and speed of motorboat traffic only where manatee sightings are frequent and it can be generally assumed that they inhabit these areas on a regular or continuous basis . . . ." Id. § 370.12 (2)(g).

100. See DEP'T OF ENVTL. PROT., supra note 17, at 20.

101. See id. (noting that "[a] viable population of manatees cannot exist without the natural resources it needs to flourish"); see also FLA. MANATEE RECOVERY TEAM, supra note 17, at 43-56; Save the Manatee Club, West Indian Manatee Facts (visited Oct. 24, 1996) <http://www.objectlinks.com/manatee/manfcts.htm> (copy on file with Fla. St. U. L. Rev., Tallahassee, Fla.).

102. See DEP'T OF ENVTL. PROT., supra note 17, at 20. In ranking the items in the Florida Manatee Recovery Plan for implementation, the Florida Manatee Recovery team gave "characterize and map important habitats," "designate additional areas as critical habitat," and "manage habitats for enhancing use by manatees" the lowest ratings. See FLA. MANATEE RECOVERY TEAM, supra note 17, at 43-56.

103. See Act effective May 30, 1939, ch. 19192, § 1, 1939 Fla. Laws 392, 392.

104. See DEP'T OF ENVTL. PROT., supra note 17, at 24-25.

105. 18 F.A.L.R. 1289 (Fla. Dep't of Envtl. Prot. 1995).

106. Id. at 1296, 1305.

107. Id. at 1297.

108. Id. at 1307.

109. Id. at 1303. DEP is currently redeveloping its rules. See Calleson, supra note 17.

The Bonita Bay decision is somewhat surprising because, at the time, the legal burden of proving the invalidity of rules rested on the challenger,[110] rules were presumed valid,[111] and an agency's interpretation of its enabling statute was entitled to great judicial deference.[112] Accordingly, the ALJ could have deferred to the agency. However, this standard has been altered by recent changes to the Florida Administrative Procedure Act (APA),[113] which states that in the future, agency rules will not be presumed valid or invalid, and that the agency will be required to prove that a proposed rule is not an invalid exercise of delegated legislative authority.[114]

DEP's ability to implement manatee protection zones also has been affected by its relationship with county governments. In 1989, DEP began a comprehensive effort to implement the MSA through county-wide manatee protection plans in each of the thirteen key counties identified in the statute.[115] DEP sought local support for manatee protection programs through a coordinated implementation effort, which DEP hoped would better address potentially controversial localized issues.[116] Unfortunately, the development of thirteen individual programs has seriously slowed the implementation process.[117]

B. Reducing Deaths from Propellers and Flood Control Structures

The MSA does not require DEP to find technical solutions to all of the problems causing manatee deaths. However, technical solutions

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110. See General Tel. Co. of Fla. v. Florida Pub. Serv. Comm'n, 446 So. 2d 759, 763 (Fla. 1984).

111. See Agrico Chem. Co. v. Florida Dep't of Envtl. Reg., 365 So. 2d 759, 762-63 (Fla. 1st DCA 1978) (stating rules are valid so long as reasonably related to the purpose of the legislation and not arbitrary or capricious); Palm Bay v. Florida Dep't of Transp., 588 So. 2d 624, 628 (Fla. 1st DCA 1991).

112. See Florida Cable Television Ass'n v. Deason, 635 So. 2d 14, 15 (Fla. 1994).

113. See Act effective Oct. 1, 1996, ch. 96-159, 1996 Fla. Laws 147 (codified at FLA. STAT. ch. 120 (Supp. 1996)).

114. See FLA. STAT. § 120.56(2)(a)(c) (Supp. 1996). According to the legislative history, the APA once "accorded wide discretion" to agencies, but the revisions require the agency to "prove that the proposed rule is not an invalid exercise of delegated legislative authority as to the objections raised . . . ." See Fla. S. Comm. on Gov't Reform & Oversight, CS for SBs 2290 & 2288, Staff Analysis 2, 20 (Mar. 21, 1996) (on file with comm.). A commission appointed by Governor Lawton Chiles had earlier issued a report that stated that "a more level playing field for the regulated public is needed in some proceedings." GOV.'S ADMIN. PROC. ACT REV. COMM'N, FINAL REPORT 2 (1996). While the revised APA may have leveled the playing field, this leveling may not be the appropriate goal given the need for strengthening and enforcing manatee protection laws. See infra Part VI.A.

115. See Calleson, supra note 17; see also DEP'T OF ENVTL. PROT., supra note 17, at 23-27. Rules are in place for 11 of the 13 counties. See supra note 95. Collier County rules were still undergoing public comment in October 1996, and public workshops on the Lee County rules began in the winter of 1996-1997. See Telephone Interview with Dawn Griffin, Planner, Rules Section, Dep't of Envtl. Prot. (Oct. 6, 1996) (notes on file with author).

116. See Griffin, supra note 115.

117. See id.

may be available for two of the problems. Manatee deaths from watercraft collisions can be reduced by using propeller guards, and deaths from flood control structures can be reduced by using manatee sensor devices.

As the speed zone regulations and statistical data discussed above have demonstrated,[118] watercraft collisions are a major cause of manatee deaths, and as many as forty percent of these deaths are caused by open-bladed propellers.[119] Some manatee deaths are tragic stories, such as the May 1990 incident in which a U.S. Navy tugboat killed a female manatee and her calf in Kings Bay Submarine Base, just north of the Florida-Georgia border.[120] The incident led the Navy to install propeller guards on its entire tugboat fleet at Kings Bay, and no deaths have occurred since that time.[121] Still, the MSA does not require propeller guards.

Propeller guards have existed for many years. In fact, the first patent for a cage-type propeller guard was issued in 1938.[122] Eighteen such patents were issued by 1964.[123] Today, a propeller guard can be installed on an open-bladed propeller for anywhere from $300 to $1400, depending upon the design.[124] Some boaters have voluntarily attached the devices to their boats, including some manatee research vessels.[125] However, not all Florida agencies involved in the manatee protection effort have installed the guards on their boats. At the time this Article was being prepared for publication, DEP's Bureau of Protected Species Management was still installing propeller guards on its boats; the last boat was scheduled to have a custom-made propeller guard installed by the end of 1996.[126] By contrast, DEP's Division of Law Enforcement, which is responsible for enforcing the manatee protection laws, has no propeller guards on any of its boats.[127]

Recently, DEP has been exploring the possibility of requiring propeller guards on all boats in return for an exemption from mana-

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118. See supra notes 61-64 and accompanying text.

119. See DEP'T OF ENVTL. PROT., supra note 17, at 38. Another five percent of deaths are caused by a combination of the impact of the boat on the manatee and direct contact with the propeller. See Wright & Ackerman, supra note 48.

120. JEFFREY R. COHN, NAT. RESOURCES DIV., DEP'T OF THE NAVY, FROM THE LAND . . . TO THE SEA . . . THE NAVY PROTECTS ENDANGERED SPECIES 9 (1995).

121. See id.

122. See Kent Smith, Propeller Guard Update, MANATEE TECHNICAL ADVISORY COUNCIL UPDATE, Apr.-June 1995, at 1-2.

123. See id. at 2.

124. See id.

125. See id. The Florida Marine Research Institute has reported high satisfaction with the propeller guards on its manatee research vessels. See id.

126. See id.; Telephone Interview with Kent Smith, Biological Scientist IV, Dep't of Envtl. Prot. (Oct. 6, 1996) (notes on file with author).

127. See Telephone Interview with Capt. Jim Brown, Law Enforcement Div., Dep't of Envtl. Prot. (Oct. 6, 1996) (notes on file with author).

tee speed zone requirements.[128] If the program is implemented, permittees would be given a list of acceptable guards, and the installation of the guard would become a condition of the permit.[129]

DEP's Bureau of Protected Species Management has resubmitted a budget request to fund a comprehensive propeller guard engine efficiency study.[130] The study is intended to address the counterargument that propeller guards are not a viable solution to the manatees' troubles. Boating industry officials offer three main arguments against propeller guards. First, they claim that propeller guards will increase manatee deaths because most cage-type guards enlarge the striking surface around propellers by thirty to fifty percent, increasing the likelihood of blunt trauma at speeds over seven to eight miles per hour.[131] Second, industry officials note that certain types of propeller guards can entrap limbs or body parts, causing more severe injuries than an open propeller.[132] Third, they state that propeller guards will decrease engine efficiency by collecting debris and causing vibration and steering problems.[133]

Flood control structures also kill manatees.[134] Manatees can get caught between the moving parts of flood control gates, which open and close to allow water to pass, or they can be pinned against the flood control structure's stationary concrete walls or floors, causing them to be crushed or drowned.[135]

The MSA does not address this problem, which causes as many as sixteen deaths a year, or approximately five percent of all manatee deaths annually.[136] Although these structures are killing mana-

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128. See Smith, supra note 122, at 3. The administrative rules implementing the MSA currently allow issuance of a permit exempting boats from the speed zones for scientific purposes or economic hardship. See FLA. ADMIN. CODE ANN. r. 62N-22.003 (1995).

129. See Smith, supra note 122, at 3. However, Smith cautioned that installation of propeller guards should not be mistaken for an ultimate solution to the manatees' problems and noted that other protection measures, such as speed zones, must be retained. See id.

130. See id.

131. See Jim Flannery, Emilio's Mom Revives Prop Guard Debate, SOUNDINGS: THE NATION'S BOATING NEWSPAPER, July 1996, at 16A.

132. See Memorandum from Dick Snyder, Mercury Marine, to Jim Getz, Chairman, Subcomm. on Prop Guarding, Nat'l Boating Safety Advisory Council 3 (Oct. 6, 1988) (on file with author).

133. See id. at 4-5. A 1989 Boating Safety Advisory Council study concluded that some existing guards affect performance and steering at higher speeds. See Flannery, supra note 131.

134. See U.S. ARMY CORPS OF ENGINEERS, MANATEE PROTECTION PLAN (PART 1) 5 (1995). Acting as the Interagency Manatee Task Force, the U.S. Army Corps of Engineers, the South Florida Water Management District, the Dade County Department of Environmental Resources Management, DEP, and the U.S. Fish & Wildlife Service have been working on reducing structure-related mortalities since 1991. See id.

135. See U.S. ARMY CORPS OF ENGINEERS, SECTION 1135 PROJECT MODIFICATION MANATEE PROTECTION PLAN AT SELECTED NAVIGATION AND WATER CONTROL STRUCTURES IN CENTRAL AND SOUTHERN FLORIDA 17 (1995).

136. See DEP'T OF ENVTL. PROT., supra note 17, at 7; see also Ackerman, supra note 16, at 230. The Central and South Florida Flood Control (C&SF) system was responsible for 99 manatee deaths between 1975 and 1995. See Lund, supra note 17.

tees in violation of the MSA,[137] there are no consequences for the violations. The federal government, which owns these structures, is immune from any liability relating to flood waters.[138] Because the South Florida Water Management District (Water Management District) is operating the structures to prevent residential and commercial flooding in south Florida pursuant to guidelines established by the U.S. Army Corps of Engineers, no penalties have ever been imposed.[139]

While the MSA has not expressly provided protection from flood control structures for the manatee, the potential for third-party lawsuits based upon the federal ESA,[140] as well as directives of the federal and state Interagency Manatee Task Force[141] to protect the manatee, have motivated some actions by the Water Management District and Army Corps of Engineers.[142]

To reduce structure-related mortality, the Water Management District and the Army Corps of Engineers are installing over two million dollars worth of devices to detect manatees before they are crushed or drowned by the gates.[143] The original design of these pressure-sensitive devices enabled the flood control structure operators to detect an object between or below the closing structure gates, much like the sensors on an elevator door.[144]

Unfortunately, the prototype models installed on the Water Management District's S-27 (Little River) and S-29 (Snake Creek) struc-

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137. The MSA makes it illegal to intentionally or negligently "annoy, molest, harass . . . injure or harm . . . pursue, hunt, wound, or kill any manatee . . . ." FLA. STAT. § 370.12(2)(d) (1995). In addition, any "instrument, device or apparatus" used to violate this section "may be forfeited upon conviction." Id. § 370.12(2)(e).

138. "No liability of any kind shall attach to or rest upon the United States for any damage from or by floods or flood waters at any place . . . ." 33 U.S.C. § 702c (1994). This clause has been interpreted to preserve governmental immunity for activities integrally related to flood control. See Pierce v. United States, 650 F.2d 202, 205 (9th Cir. 1981). Furthermore, the federal government is ever immune from liability for human deaths caused by flood control structures, despite the Federal Tort Claims Act. See Dawson v. United States, 894 F.2d 70, 74 (3rd Cir. 1990).

139. See Lund, supra note 17.

140. See 16 U.S.C. § 1540 (1994). Under the ESA, third parties can bring "citizen suits" to enjoin a governmental entity from violating the act. See id. § 1540(g). Civil penalties may include fines of up to $25,000 per manatee death. See id. § 1540(a)(1). Criminal penalties of up to one year in prison and $50,000 in fines also are available. See id. § 1540(b)(1). Such penalties could be avoided if the Water Management District were to apply for a permit pursuant to 50 C.F.R § 17.22(b) (1995). By developing a conservation plan showing that actions are being taken to minimize manatee deaths and that alternatives are being pursued, the Water Management District could obtain an incidental takings permit and avoid ESA liability for manatee deaths. See 16 U.S.C. § 1539(a)(1)(B) (1994). No such permit has been obtained. See Lund, supra note 17.

141. See Smith, supra note 126.

142. See U.S. ARMY CORPS OF ENGINEERS, supra note 134, at 11.

143. See DEP'T OF ENVTL. PROT., supra note 17, at 37.

144. See Lund, supra note 17; see also U.S. ARMY CORPS OF ENGINEERS, supra note 134, at 45-46.

tures in Dade County—both of which are responsible for roughly twenty-five percent of all manatee deaths caused by water control structures[145]—were plagued with maintenance problems.[146] As a result, the Water Management District and the Army Corps decided to delay implementation of the project, instead developing a new pressure control device using piezo electric film.[147] The film, which conducts an electric current, is 1/1000th of an inch thick and attaches to the floor on either side of the gate.[148] When touched, an alarm is triggered.[149] If the piezo electric film proves effective, the detectors will be installed on the S-27 and S-29 structures during the winters of 1996 and 1997, and on other structures thereafter.[150]

C. Educating the Public About Manatee Protection

DEP has emphasized educational efforts, such as the Adopt-a-Manatee program, manatee decal and publication distribution,[151] and license plate promotions[152] to protect the manatee. Counties also are beginning to discuss extensive boater education programs. Dade County has suggested teaching boaters about locations of designated manatee protection zones.[153]

A 1995 DEP report to the Legislature lists a variety of educational programs used in 1994 and 1995.[154] A voluntary contribution campaign promoted public awareness and raised $85,000 by distributing "Boomer" decals and bumper stickers after the death of the popular manatee known through the Adopt-a-Manatee program.[155] In addition, DEP staff worked at boat shows and participated in the development of public service announcements, brochures, and teachers' guides, and the Bureau of Protected Species Management published a newsletter for the Manatee Technical Advisory Council.[156]

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145. DEP'T OF ENVTL. PROT., MANATEE MORTALITY AT SOUTH FLORIDA STRUCTURES: 1975-1995, at 4 (1995) (copy on file with Fla. St. U. L. Rev., Tallahassee, Fla.).

146. See Lund, supra note 17; see also DEP'T OF ENVTL. PROT., supra note 17, at 37-38.

147. See Heather Graulich, Manatee Sensor Uses Soft Touch to Save Gentle Giants, PALM BCH. POST, Feb. 29, 1996, at 1B.

148. See id.

149. See Lund, supra note 17; see also Graulich, supra note 147.

150. See Lund, supra note 17.

151. See DEP'T OF ENVTL. PROT., supra note 17, at 34-35.

152. See DEP Bureau of Protected Species Mgmt., License Plates (visited Oct. 24, 1996) <http://www.dep.state.fl.us/psm/webpages/license.htm> (copy on file with Fla. St. U. L. Rev., Tallahassee, Fla.).

153. See KEVIN E. MAYO, METRO. DADE COUNTY DEP'T OF ENVTL. RESOURCE MGMT., DADE COUNTY MANATEE PROTECTION PLAN, DERM TECHNICAL REPORT 95-5, at 101 (1996). Boaters would be required to complete a boater education class that includes information on manatee protection. See id. A brochure on Dade County manatee protection zones would be distributed and discussed in class. See id.

154. See DEP'T OF ENVTL. PROT., supra note 17, at 34-35.

155. See id.

156. See id.

These numerous but relatively small-scale educational efforts reflected only 2.25% of the manatee protection program budget.[157]

D. Facing the Threat of Natural Causes

While Florida's legal and educational efforts seek to limit human impact upon manatees and their habitats, these actions cannot protect manatees from naturally occurring harm. In early 1996, natural causes killed more than 150 manatees on Florida's west coast.[158] The massive die-off significantly reduced the manatee population and further diminished the genetic pool enabling manatees to adapt to changing conditions.[159]

Catastrophies similar to the recent die-off do occur naturally.[160] In 1992, an outbreak of red tide caused thirty-seven deaths in Lee County.[161] Hurricanes also have caused manatee deaths by forcing salt water into fresh water manatee habitats, destroying food supplies and stranding manatees.[162] Cold stress, a syndrome caused by the rapid onset of extremely low water temperature, can kill manatees and can sometimes be catastrophic when it strikes areas where manatees have congregated.[163] Cold stress also can kill by lowering disease resistance, thus enabling bacteria and viruses to rapidly spread among the congregated manatees.[164]

Death from natural causes could force the manatee population to fall below the critical numeric threshold.[165] Dr. Gregory Bossart, a veterinarian at the Miami Seaquarium, has suggested that the manatee population today cannot withstand any significant natural die-offs.[166] Even with the successful implementation of regulations that reduce the number of manatee deaths caused by humans, the manatee will continue to face extinction if it cannot breed faster

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157. See id. at 35.

158. See Phil Long, Mystery Illness Kills More Manatees, MIAMI HERALD, Mar. 28, 1996, at B1. Although the deaths were attributed to "natural causes," they were indirectly caused by humans. See id. Scientists determined that all the manatees that died in February and March of 1996 suffered from pneumonia probably generated by red tide outbreaks, a result of human pollution. See id.; see also Neil Santaniello, As Manatees Die, Experts Still Puzzled, FT. LAUD. SUN SENT., Apr. 19, 1996, at 1A.

159. See Marla Cone, Die-Off of Endangered Manatees Puzzles Scientists, THE RECORD, Apr. 21, 1996, at 24A.

160. See Ackerman, supra note 16, at 252-53.

161. See id.

162. See id. In 1993 and 1985, severe weather forced salt water into the Crystal River, killing area vegetation and destroying manatee habitats. See id.

163. See id. at 252-53.

164. See id. at 254.

165. See Elizabeth Culotta, Minimum Population Grows Larger, 270 SCIENCE, 31, 31-32 (1995).

166. See Larry Copeland, Florida's Popular Manatees Dying Off Rapidly, DALLAS MORNING NEWS, Mar. 24, 1996, at 10A.

than its death rate and if deaths from natural causes continue.[167] Accordingly, the most important thing the MSA can achieve is to ensure that the manatee population is large enough to withstand the threats of death from natural and even catastrophic causes.

VI. EVALUATION OF AND SUGGESTIONS FOR ALTERNATIVE MANATEE PROTECTION PROGRAMS

The difficulties associated with implementing species protection programs are not unique to the MSA.[168] The 104th Congress recently considered rewriting the ESA.[169] The Legislature should likewise reassess the MSA and consider clarifying rulemaking requirements, accelerating development of technical solutions, improving enforcement, and encouraging MSA compliance through improved educational programs.

A. Clarifying Agency Rulemaking Duties

Given the litigation and delays hindering DEP's rulemaking efforts under the MSA, the Legislature should give clear directions to expedite the agency's efforts. This can be done in three ways.

First, the Legislature should direct DEP to pursue ecosystem solutions to manatee protection and to develop rules for no-entry zones. Rather than focus on protection of individual species, many scholars and scientists argue that protection of entire habitats and ecosystems better ensures the survival of endangered and threat-

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167. See Garrott, supra note 9, at 642 (noting that "any significant increase in mortality may lead to a decline in population"); see also Marmontel, supra note 55, at 116 (stating that "slowly reproducing species are not good colonizers and could not recover quickly after a population crash or massive destruction").

168. The ESA, for example, also is plagued with implementation problems. The listing process, or the process through which endangered species are identified and subsequently chosen to be protected under the ESA, is perhaps the ESA's most significant implementation problem. The listing process is slow and expensive, requiring extensive research and public hearings, and consequently some species are not appropriately designated as threatened or endangered. See Douglas H. Chadwick, Dead or Alive, NAT'L GEOGRAPHIC, Mar. 1995, at 9. Currently more than 3,700 officially recognized candidates await species protection. See id. When the Nature Conservancy proposed an increase in funding to expedite and more efficiently conduct the listing process, Department of the Interior officials objected, stating that the "lower priority activity" ran counter to the goal of reducing the federal deficit, and that additional listings would require more funding of law enforcement and other activities. See Oliver Houck, The Endangered Species Act and Its Implementation by the U.S. Departments of the Interior and Commerce, 64 U. COLO. L. REV. 277, 293-94 (1993). The 104th Congress attempted to resolve the listing problem by placing a moratorium on the listing of any new species. See S. 503, 104th Cong. § 2 (1995)). The bill, which died in committee, would have "solved" the implementation problem by allowing the implementing agencies to ignore it. Many other ESA implementation problems still await congressional solutions. See Houck, supra at 298.

169. See Government and Commerce, Issue: Endangered Species Act, 51 CONG. Q. WKLY. REP., Jan. 6, 1996, at 36-37.

ened species.[170] The Legislature already recognized this concept when it enacted an ecosystem management bill in 1995.[171]

For the manatee, habitat protection might require complete removal of potentially harmful human activities, such as watercraft traffic and development. A legislative mandate, requiring counties and DEP to designate certain areas as no-entry zones, could prove highly effective in protecting manatees. A similar program is being implemented within the Florida Keys National Marine Sanctuary.[172] In fact, the designation of specific manatee habitats has already been an effective tool in manatee protection; at the Crystal River and Blue Spring sites in Florida, both designated no-entry zones, manatee populations are increasing.[173] Researchers found that maintenance of habitat quality and protective measures reducing human impact are accompanied by high rates of adult manatee survival.[174]

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170. See, e.g., Thomas Eisner et al., Building a Scientifically Sound Policy for Protecting Endangered Species, 269 SCIENCE 1231, 1231-32 (1995).

171. See Act effective July 1, 1995, ch. 95-275, 1995 Fla. Laws 2555 (creating three ecosystem management demonstration projects, including a Florida panther habitat project administered by the Game & Fresh Water Fish Commission).

172. See 16 U.S.C. § 1433 (1994). While this measure is popular among many, it is not without controversy. Some Monroe County residents bitterly opposed no-entry zones because they placed entire reefs and ocean areas off-limits to many human activities, such as commercial and recreational fishing. See Del Milligan, Could Be Perfect Weekend for Kings off Tampa Bay Area; Bill Could Kill Fishing in the Keys, THE LEDGER, Apr. 12, 1996, at C2 (encouraging fishermen to protest the sanctuary); see also The Florida Keys National Marine Sanctuary Act, An Alternative Conclusion: Oversight Hearing on the National Marine Sanctuaries Act Before the Subcomm. on Fisheries, Wildlife, and Oceans of the House Comm. on Resources, 104th Cong. (1996), available in LEXIS, Legis Library, Cngtst File (criticizing wildlife sanctuary before congressional committee based upon economic impact, lack of due process, and disregard for Everglades ecosystem water quality). However, the sanctuary also is recognized as being necessary to give the Keys ecosystem an opportunity to repair itself and to preserve recreational uses. See id.; see also Robert McClure, Fishing Could Be Off-Limits in 6% of Florida Keys, ORLANDO SENT., Dec. 19, 1995, at D7; National Marine Sanctuary Program (visited Oct. 24, 1996) <http://www.nos.noaa.gov/ocrm/nmsp/welcome.html> (copy on file with Fla. St. U. L. Rev., Tallahassee, Fla.); Florida Keys National Marine Sanctuary (visited Oct. 24, 1996) <http://florida-keys.fl.us/ntmarine.htm> (copy on file with Fla. St. U. L. Rev., Tallahassee, Fla.).

173. See Thomas J. O'Shea & Catherine A. Langtimm, Estimation of Survival of Adult Florida Manatees in the Crystal River, at Blue Spring, and on the Atlantic Coast, in POPULATION BIOLOGY OF THE FLORIDA MANATEE 194, 207-09 (Thomas J. O'Shea et al. eds., 1995).

174. See id. The need for the development of no-entry zones also parallels the movement behind the ongoing land-based ecosystem restoration efforts in Florida. The combined watershed of the Kissimmee River, Lake Okeechobee, the Everglades, and Florida Bay is an excellent example of Florida's effort to interconnect water- and land-based habitats to preserve wildlife. See Jan P. Loftin, Which Way to the Nearest Greenway?, FLA. WATER, Summer 1995, at 2, 4-5. Although recent discussions of ecosystem management and development of an "Ecosystem Management Implementation Strategy Report" suggest that DEP is beginning to address the need for no-entry zones, the Legislature should consider mandating such no-entry designations in appropriate areas. See David Arnold, Ecosystem Management and Manatees, MANATEE TECHNICAL ADVISORY COUNCIL UPDATE, July-Sept. 1995, at 1-2.

Second, the Legislature should address the problems engendered by the Bonita Bay decision and the 1996 amendments to the APA. Despite rules jointly developed by DEP and Lee County, as well as testimonial evidence of manatee sightings, the Lee County rules failed to withstand an administrative challenge.[175] Given the fact that Lee County was designated a "critical county" in the Save the Manatee Trust Fund report[176] presented to the Legislature, and given the MSA's express recognition of the need for protective regulation in some areas of Lee County,[177] the DEP rulemaking effort should have been expedited. Unfortunately, as the final order in Bonita Bay recognized, the language in the MSA creates some ambiguity when applied in a rulemaking challenge. Bonita Bay included disputes over words such as "frequently," "undue interference," "periodic," and "seasonal."[178]

Addressing the semantic confusion created by the MSA, the Florida Fourth District Court of Appeal ruled in May 1996 that the MSA was not an unconstitutional or invalid delegation of legislative authority in Marine Industries Association of South Florida, Inc. v. Department of Environmental Protection .[179] Included in the court's opinion was a review of specific terms in the MSA such as "frequently" and "congregate."[180] Relying upon the "Legislature's concerted efforts to protect the manatee," the court upheld the MSA.[181]

The 1996 APA amendments also will have a substantial impact upon the MSA. The MSA already restricts DEP rules from "unduly interfering with the rights of fishers, boaters and water skiers using the areas for recreational and commercial purposes."[182] The loss of the presumption of rule validity under the revised APA[183] will make it even more difficult for DEP to develop manatee protection rules because future manatee rules are likely to undergo even more rigorous scrutiny during administrative challenges.

When Marine Industries, Bonita Bay, and the APA revisions are considered together, it becomes apparent that the Legislature must revise the language in the MSA to enable DEP to properly implement the Act. Given the continued struggles of the manatee, the Legislature should remove from the MSA qualifying terms such as

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175. See Bonita Bay Prop. v. Department of Envtl. Prot., 18 F.A.L.R. 1289, 1307 (Fla. Dep't of Envtl. Prot. 1995).
176. See DEP'T OF ENVTL. PROT., supra note 17, at 23-24.
177. See FLA. STAT. § 370.12(2)(f)(1) (1995).
178. See 18 F.A.L.R. at 1296-97.
179. 672 So. 2d 878 (Fla. 4th DCA 1996).
180. See id. at 881-82.
181. Id. at 883.
182. FLA. STAT. § 370.12(2)(j) (1995).
183. See id. § 120.56(2)(c) (Supp. 1996).

"frequently," which have led to litigation and rulemaking delays, and decrease the burden on agency rulemaking.

Third, the Legislature should establish specific timelines for rulemaking and implementation of legislative directives. The 1978 MSA included provisions authorizing the Department of Natural Resources to "initiate rule adoption procedures under chapter 120 regulating the operation and speed of motor boat traffic . . . ."[184] Almost twenty years later, rulemaking is still incomplete even in the counties that DEP designated as critical.[185] In the future, to avoid delays and prevent continued manatee deaths, the Legislature should direct DEP to complete the rulemaking effort by a date certain.

B. Accelerating Development of Technical Solutions

In implementing the MSA to protect the manatee, federal and state governmental entities have considered propeller guards and manatee sensors on flood control gates as two technical solutions to slowing manatee deaths.[186] The Legislature should give further direction in these areas.

While propeller guards cannot prevent every manatee death that results from a watercraft collision, the guards could potentially reduce such deaths by up to forty percent because an enclosed propeller prevents the deep gashes that open-bladed propellers cause in the flesh of the animal.[187] Of the many watercraft-related manatee deaths each year, approximately fifty-five percent are caused by impact with watercraft, forty percent are caused by direct contact with open-bladed propellers, and five percent are a combination of the two.[188]

As discussed earlier,[189] boating industry representatives argue that propeller guards are unnecessary expenses and could even increase injuries to manatees.[190] DEP personnel disagree.[191] Accordingly, more research is probably warranted.

Since some DEP boats already have propeller guards, informal experiments with their use as a tool for manatee protection have already begun.[192] If propeller guards are considered a realistic solution to the problems of manatee protection, then it is an embarrassing

184. Id. § 370.12(f)-(g) (Supp. 1978).
185. See DEP'T OF ENVTL. PROT., supra note 17, at 23-24.
186. See discussion supra Part V.B.
187. See Smith, supra note 122, at 3.
188. See DEP'T OF ENVTL. PROT., supra note 17, at 38; see also Wright & Ackerman, supra note 48, at 264.
189. See supra notes 131-33 and accompanying text.
190. See Smith, supra note 122, at 3.
191. See Smith, supra note 126.
192. See id.

fact that not every DEP watercraft has one. The Legislature should immediately increase funding for the Bureau of Protected Species Management, allocating the money needed to install some type of propeller guards on all of its watercraft.

While propeller guards may provide a solution to propeller injuries, another option is to encourage the use of boats without propellers. Alternative boat engine designs are increasingly being used in watercraft.[193] For example, personal jet-skis and jet-drive propulsion boats, which do not have exterior propellers and have a shallow draft, present less of a risk to the manatee.[194] These boats may provide an alternative to the potential problem created by propeller-driven boats with propeller guards.

The Legislature should direct DEP to engage in additional research concerning propeller guards and alternative engine designs. Eventually, depending upon the results of this research, the Legislature should encourage the use of propeller guards or alternative designs on all Florida-registered boats to further reduce the number of boating-related manatee deaths. As an incentive, the Legislature could consider reducing boat registration fees for owners of boats with guarded propellers or alternative designs.[195] Finally, if warranted by the additional research, the Legislature should require the Florida Marine Patrol to install propeller guards on its boats as well.

The Legislature also should expedite the installation of manatee sensors on flood control structures, such as the sensors being installed by the Water Management District and the Army Corps of Engineers.[196] The MSA already requires the use of devices to stop the crushing of manatees between vessels and bulkheads or wharves;[197] an amendment to this provision should address the crushing of manatees in flood control and similar structures. Such an amendment could expedite the implementation of the pressure sensitive devices on the flood control structures in South Florida.

In a few instances, the Legislature should consider removing or replacing existing flood control structures. The Dade County Mana-

193. See Wright & Ackerman, supra note 48, at 267.

194. See id.

195. In designing a program to encourage the use of propeller guards, the Legislature must be conscious of constitutional limitations. Because interstate commerce is regulated by Congress, and because boats traveling in Florida come from many states, Florida's regulatory powers are limited by the Commerce Clause. See U.S. CONST. art. I, § 8, cl. 3; see also generally JOHN E. NOWAK & RONALD D. ROTUNDA, CONSTITUTIONAL LAW § 8.7, at 291-95 (5th ed. 1995) (discussing state powers to regulate transportation). Furthermore, absent permission from the U.S. Secretary of Transportation, the Federal Boat Safety Act, 46 U.S.C. §§ 4302-4306 (1994), gives the U.S. Coast Guard the exclusive authority for developing boating safety regulations. See Elliot v. Brunswick Corp., 903 F.2d 1505, 1508 (11th Cir. 1990).

196. See supra notes 143-50 and accompanying text.

197. See FLA. STAT. § 370.12(2)(q) (1995).

tee Protection Plan suggests replacing some older structures with newer models that allow water to spill over the top of the gates.[198] Many flood control gates in south Florida allow the water to flow under the gates; when the gates begin to close, the manatee is crushed as though it had put its head in a guillotine. The alternative gates proposed by the Dade County Manatee Protection Plan could eliminate the risk of manatees being crushed when they close. However, these gates are costly and also could cut off manatee access to upstream habitats.[199] Accordingly, the Legislature should authorize further research and encourage the careful placement of these structures—if they need to be used at all.

C. Improving Enforcement

Enforcement of the MSA can be improved. Available options include increasing penalties under the MSA, developing new enforcement techniques, enhancing existing enforcement—especially through additional funding—and putting the MSA forfeiture provisions to work.

The Legislature should provide for increased penalties and stricter enforcement to deter violations of the MSA. The deterrent value of current penalties is uncertain. The MSA provides for a fifty-dollar citation for violating boating speed limits[200] or prosecution for a second-degree misdemeanor for any other violation.[201] Such threats are minor, as shown by the recent DEP study concluding that as many as one-half of all boaters violated speed limits.[202]

Increasing the penalties for violations could boost the deterrent effects of these laws, although it also could deter some law enforcement officers from issuing citations with harsh penalties to unsuspecting boaters.[203] Accordingly, appropriate intermediate levels of sanctions and deterrence must be found.

Encouraging new approaches to enforcement, such as rewarding witnesses who report boats that exceed posted limits in manatee

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198. See MAYO, supra note 153, at 107.

199. See U.S. ARMY CORPS OF ENGINEERS, supra note 135, at 23.

200. See FLA. STAT. § 327.73(1) (1995).

201. See id. §§ 370.012(2)(s), .021(1)-(2).

202. See DEP'T OF ENVTL. PROT., supra note 17, at 36. Although DEP uses the study's conclusions in numerous publications, Major Bruce Buckson of the Florida Marine Patrol has sharply criticized the report's data. See Buckson, supra note 17.

203. See Buckson, supra note 17. Major Buckson also stated that the revisions to the MSA providing for lower penalties and uniform boating citations were intended to increase law enforcement officers' willingness to fully enforce the MSA. See id. The tougher penalties of the older law, he believes, caused many officers to issue only warnings to speed zone violators. See id.; see also James M. Seif & Terry Bossert, Pa. Dep't of Envtl. Prot., Thoughtful and Thorough Enforcement (visited Oct. 24, 1996) <http://www.dep.state.pa.us/dep/seif/depenforcethought.htm> (copy on file with Fla. St. U. L. Rev., Tallahassee, Fla.).

speed zones or requiring mechanics who repair propellers damaged by manatees to disclose their findings, also could increase manatee protection.[204] However, even if new methods to enforce the MSA were found, they likely would be of little value without the presence of additional marine patrol officers and other law enforcement personnel to enforce them.[205] Budgetary constraints inevitably play a significant role in determining whether additional enforcement personnel can be hired; however, if Florida is truly committed to the preservation of the manatee, better enforcement of the MSA is a necessity, not a luxury.

MSA forfeiture provisions allow for the confiscation of equipment including scuba gear, cars, and boats.[206] Significantly, this forfeiture provision has never been used.[207] Theoretically, the use of existing forfeiture laws could create new funding sources for Florida's marine patrols because in many areas of law, such as those dealing with criminal drug distribution, the proceeds of forfeiture proceedings help fund enforcement agencies.[208]

However, the Legislature must be cautious in applying forfeiture laws in the area of environmental regulation. While forfeiture law also has been used to promote species protection, most notably under the Bald Eagle Protection Act[209] and the ESA,[210] the items forfeited are generally limited to the items actually taken from the endangered species.[211] Furthermore, civil forfeiture is a severe option,

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204. See Calleson, supra note 17; see also Frohlich, supra note 17. According to staff in the DEP Bureau of Protected Species Management, it is extremely difficult to identify people responsible for killing a manatee, in particular because manatee carcasses are often decayed when discovered. See Frohlich, supra note 17.

205. See Buckson, supra note 17; Calleson, supra note 17; Frohlich, supra note 17; see also Reynolds, supra note 49, at 7 (noting that funding has been insufficient to hire adequate enforcement staff). Florida Marine Patrol and DEP officials recognize the importance of enforcement, but note the budgetary restraints involved in expanding the size of the marine patrol. See Buckson, supra note 17; Calleson, supra note 17; Frohlich, supra note 17; Lund, supra note 17.

206. See FLA. STAT. § 370.12(2)(s)(2) (1995).

207. The author's research of case law and Florida Marine Patrol databases indicates that no violation has ever been prosecuted under section 370.12(2)(e), Florida Statutes. Officials at the Water Management District, DEP, and the Florida Marine Patrol stated that they could not think of even a single instance in which a person forfeited property pursuant to the MSA. See Buckson, supra note 17; Calleson, supra note 17; Frohlich, supra note 17; Lund, supra note 17;

208. See Suzette Hackney, Craftier Dealers Put Crimp in Drug Division's Budget, DET. NEWS, Jan. 8, 1996, at 4C (stating that "city's $22.6 million drug forfeiture fund will be depleted by year-end, prompting an increase in money the narcotics division will need from the Police Department's general fund").

209. See 16 U.S.C. § 668b (1994).

210. See id. § 1540(4)(A).

211. See, e.g., United States v. One Handbag of Crocodilus Species, 856 F. Supp. 128, 132 (E.D.N.Y. 1994); United States v. Thirty Eight Golden Eagles or Eagle Parts, 649 F. Supp. 269, 272 (D. Nev. 1986); see also Richard J. Lazarus, Meeting the Demands of Integration in the Evolution of Environmental Law: Reforming Environmental Criminal Law, 83 GEO. L.J. 2407 (1995).

particularly because it only requires proof by a preponderance of the evidence and not proof beyond a reasonable doubt.[212] Accordingly, it must be carefully applied so it does not violate private property rights or provoke angry public reactions.[213] For example, MSA forfeiture provisions should only be used against boat owners who are observed harming a manatee through grossly negligent, reckless, or intentional conduct.

By amending the MSA to provide clear directives on the use of the forfeiture provisions, the Legislature could encourage their use in the future. The reasonable use of the forfeiture provisions could create publicity for the consequences of violating the MSA, and proceeds of the forfeitures could be used to provide additional funding to the Florida Marine Patrol, or as a reward to those who report violations.

D. Increasing Public Awareness and Concern

While deterrence through post-incident penalties can help protect manatees by warning others of the consequences of violations, voluntary compliance is preferable. Through revisions to the MSA, the Legislature could increase public awareness of the problems faced by the manatee. Specifically, the Legislature should direct the implementing agencies to encourage voluntary compliance with the MSA through better education. Those education programs should be designed to appeal to Florida's children and to adults' financial interests.

Despite the successes of Florida's educational programs—exemplified by the fact that the "Save the Manatee" license plate is one of Florida's largest selling specialty plates[214]—some people still ignore or even scoff at the "Save the Manatee" message.[215] Justifying manatee protection by relying upon moral or practical reasons can be difficult when unsympathetic adults place greater emphasis on economic values. Sympathy for an animal is often not enough for many people to justify the inconvenience of placing their needs sec-

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212. See United States v. Ursery, 116 S. Ct. 2135, 2147 (1996); Austin v. United States, 509 U.S. 602, 627 (1993).

213. See Mark Arax, Immigrant Farmer's Woes Galvanize Conservatives; Growers, Politicians Rally in Support of Man Accused of Violating Endangered Species Act, L.A. TIMES, June 10, 1994, at 1A.

214. See Randolph Pendleton, Specialty Tags Not So Special in Florida Anymore, FLA. TIMES-UNION, Apr. 6, 1996, at B1; Kimberly Williams, A License to Express Yourself, ORLANDO SENT., Aug. 1, 1996, at F1; Gail Willis, Swimming Against Disease, BALTIMORE SUN, Apr. 24, 1996, at 1A. The manatee tag was the top selling tag in 1995, and the second-most popular in 1996. See Pendleton, supra, at B1. The specialty license plate has raised $11 million since 1990. See Willis, supra, at 1A.

215. See Reynolds, supra note 49, at 7 (noting that "some people are openly antagonistic towards regulations that restrict human activities," although a survey of boaters found overall support for the manatee protection programs).

ond to those of a creature, even one poised on the brink of extinction. However, these same anthropocentric adults may listen to their children and grandchildren.

One particularly effective way to educate the public and ensure future concern and protection for manatees is to educate Florida's children. While local governments are incorporating this tactic in their manatee protection plans,[216] DEP is struggling to develop information for the school districts. The manatee education program consists of one full-time employee. While DEP staff have made appearances in schools and have encouraged counties to incorporate manatee education programs, the staffing shortfall makes it extremely difficult to achieve the program's goals in any comprehensive, statewide manner.

Heightened public concern for the manatee also can be achieved by emphasizing economic reasons for manatee protection. Tourism is an essential part of Florida's economy, and the manatee is a prime Florida tourist attraction. Manatee habitats and refuge areas, from Crystal River Springs to the Florida Power & Light Co. discharge area in Riviera Beach,[217] attract thousands of visitors. Sea World in Orlando[218] and the Miami Seaquarium[219] both have dedicated entire exhibits and attractions to the manatee. The Fort Pierce Utilities Authority recently was awarded a grant from the Water Management District to help pay for the development of a Manatee Observation and Education Center in St. Lucie County.[220] Citizens of Florida need only look around them to understand that manatees should be protected because they have economic value to the state's tourism trade.

Medical and genetic research also may justify manatee protection. In its 1987 report on the future of the world ecosystem, the World Commission on Environment and Development repeatedly emphasized scientific and financial reasons for encouraging nations to enact species protection laws and programs,[221] especially in light

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216. See Telephone Interview with Bonnie Abellera, Info. Specialist, Dep't of Envtl. Prot. (Oct. 6, 1996) (notes on file with author). Dade County and the Metropolitan Dade County School Board are currently developing a supplemental curriculum that includes manatee education. See id. The program consists of field trips and teacher education. See id.; see also MAYO, supra note 153.

217. See Florida Power & Light Co., Florida Manatee (visited Oct. 24, 1996) <http://www.fpl.com/fplpages/environ/specman1.htm> (copy on file with Fla. St. U. L. Rev., Tallahassee, Fla.). According to Florida Power & Light, aerial surveys have counted approximately 1,200 manatees at these facilities. See id.

218. See Destination Florida, Breathing Life into Conservation Commitments (visited Oct. 24, 1996) <http://www.goflorida.com/central/orlando/do/attract/themes/swaniml.html> (copy on file with Fla. St. U. L. Rev., Tallahassee, Fla.).

219. See Miami Seaquarium (visited Oct. 24, 1996) <http://members.aol.com/sealandtou/seaq.htm> (copy on file with Fla. St. U. L. Rev., Tallahassee, Fla.).

220. See FT. PIERCE UTIL. AUTH., ENVIRONMENTAL EDUCATION PROPOSAL (1996).

221. See WORLD COMM'N ON ENV'T AND DEV., OUR COMMON FUTURE ¶¶ 6.9-.10 (1987).

of the emerging science of genetic engineering.[222] The same arguments can be used to justify manatee protection. Scientists have suggested that the manatee could have value in medical research because it has an advanced immune system.[223] Similarly, the manatees' ability to quickly heal and recover from huge propeller gashes provides strong reasons for undertaking comprehensive medical research.[224] Further research may uncover even more economic or genetic values. Thus, economic justifications for manatee protection laws should be communicated to the public as reasons for improving Florida's manatee protection laws, and the Legislature should direct DEP to further explore this route.

E. Providing Sufficient and Stable Program Funding

Manatee programs are funded by state and federal sources, both of which are becoming increasingly unreliable. In 1995, the National Biological Service considered eliminating its support of manatee protection programs as part of its 1996 budget.[225] Had it done so, the loss of nearly $1 million in research funds would have greatly reduced available information used in the effort to protect the manatee.[226] Money from the state comes primarily through voluntary contributions. Of the $2.8 million provided by Florida for manatee protection programs, two-thirds of the money comes from voluntary citizen contributions through the purchase of specialty license plates and the optional check-off donations by boat registrants.[227]

> At the heart of the issue lies the fact that there is often a conflict between the short-term economic interest of the individual nations and the long-term interest of sustainable development and potential economic gains of the world community at large. A major thrust in actions to conserve genetic diversity must therefore be directed at making it more economically attractive, both in the short term and in the longer perspective, to protect wild species and their ecosystems. Developing countries must be ensured an equitable share of the economic profit from the use of genes for commercial purposes.

Id. ¶ 6.13.

222. Genetic engineering or manipulation involves taking genes from their normal location in one organism and using them somewhere else. See Australian Biotech. Ass'n, Educational Leaflet: What Is Genetic Engineering? (visited Oct. 24, 1996) <http://www.aba.asn.au/leaf2.html> (copy on file with Fla. St. U. L. Rev., Tallahassee, Fla.). Scientists can take useful genes from plants or animals and transfer them to microorganisms which will grow the genes more quickly. See id. For example, genetically engineered bacteria are used to produce human insulin for treating diabetes. See id. Furthermore, these genes can be transferred among species, enabling plants, animals, or microorganisms to adapt to new environments more quickly than they might have through evolution. See id.

223. See Copeland, supra note 166.

224. See Frohlich, supra note 17.

225. See MARINE MAMMAL COMM'N, supra note 52, at 14-15.

226. See id.

227. See id.. When the "Save the Manatee" license plate dropped from first place to second in popularity, the manatee program suffered a funding cutback from $1.39 million

Federal government funding sources have been drying up with increasing frequency.[228] The Legislature must recognize that it cannot forever rely upon continued federal funding for research.[229] Similarly, relying upon the goodwill of citizens to fund the bulk of manatee protection programs is dangerous because of the inherent instability in voluntary contributions. While the "Save the Manatee" license plate is a source of revenue for DEP, the Legislature should redesign the manatee protection program budget to guarantee that the program's funding is sufficient, with state funds supplementing specialty license plate revenues and voluntary donations.

Finally, as suggested throughout this article, the Legislature should consider allocating additional funding in some limited areas. These funds should improve DEP's ability to hire essential staff and perform necessary research to identify habitat areas, develop new protection rules,[230] and improve education programs. The funds also could be used to help the Florida Marine Patrol and other enforcement agencies purchase needed boats and pay for additional personnel to increase enforcement of the manatee protection laws.[231]

VII. CONCLUSION

When it was adopted in 1978, the MSA was a visionary species protection program. Today, however, this landmark legislation needs improvement. The Legislature should aggressively act to preserve the manatee population for the future by revising the MSA and addressing its rulemaking, research, enforcement, education, and funding problems. Manatees grow teeth for their entire lifetime. If the Legislature wants manatees to go on living, then it must put teeth in the MSA.

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in 1994 to $1.35 million in 1995. See DEPT. OF ENVTL. PROT., supra note 17, at i; DEPT. OF ENVTL. PROT., supra note 95, at ii.

228. The National Science Foundation recently forecast a 25% reduction in funding for science research by 2002. See Dick Stanley, Federal Money Returns to UT Research; Budget Battles Postponed Grants; Federal Reduction in Science Spending by 2002 Predicted, AUSTIN AMERICAN-STATESMAN, June 3, 1996, at 1B; see also Jim Morrill & Taylor Batten, Cutting Spending Involves Tough Choices; Government Spending Has Entered, Influenced Almost All Walks of Life, ASHEVILLE CITIZEN-TIMES, Mar. 10, 1996, at 1A.

229. Already, DEP has experienced a loss in federal funding because its fiscal year 1996 budget no longer includes grant money from the U.S. Fish & Wildlife Service. See Telephone Interview with Mary Woodworth, Operations and Management Consultant, Dep't of Envtl. Prot. (Oct. 6, 1996) (notes on file with author).

230. See Calleson, supra note 17; see also Reynolds, supra note 49, at 7-9; Abellera, supra note 216.

231. See Calleson, supra note 17. While current staffing levels are inadequate, hiring an additional 250 field officers would cost more than $11 million each year. See id.