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An Agricultural Law Research Article

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Originally published in ENVIRONMENTAL LAW
23 ENVTL. L. 837 (1993)

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SWIMMING PAST THE HOOK: NAVIGATING LEGAL OBSTACLES IN THE AQUACULTURE INDUSTRY

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Aquaculturists are regulated by various federal laws that control use of water, land development, use of chemical treatments, food processing inspections, and sale of food products. Many states have their own regulations that may or may not mirror the federal laws. The authors examine several state regulatory systems to illustrate interjurisdictional differences in aquaculture law and the types of regulations of which an aquaculturist should be aware. Although the aquaculture industry is coming under increasing regulation, it is expected to continue its rapid growth for some time.

I. INTRODUCTION AND SCOPE

Aquaculture, the art of rearing aquatic organisms,¹ was “developed in China between 3500 and 4000 years ago.”² However,

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1. In the United States, most aquaculture involves animal life; in other parts of the world, particularly Asia, plant life is an important part of the aquaculture industry. The National Aquaculture Act defines aquaculture as “the propagation and rearing of aquatic species in controlled or selected environments, including, but not limited to, ocean ranching.” 16 U.S.C. § 2802(1) (1988).

2. ROBERT R. STICKNEY, *PRINCIPLES OF WARMWATER AQUACULTURE* 5 (1979). Asia remains the world’s leading aquaculture area, producing about 81% of the world’s aquaculture harvest. China, Japan, the Republic of Korea, and the Philippines are the four leading aquaculture countries. U.S. DEP’T OF AGRIC., *THE POTENTIALS OF AQUACULTURE: AN OVERVIEW AND BIBLIOGRAPHY* 4 (1989) [hereinafter

acceptance of this practice was slow in the United States because of our historically abundant natural catch.³ It was not until the 1970s, when many fisheries reached maximum sustainable yields and were overexploited, that aquaculture began to receive focused attention in this country.⁴ That attention resulted in the passage of the National Aquaculture Act (NAA) in 1980.⁵ The NAA recognized the aquaculture industry as a source for "augmenting existing commercial and recreational fisheries . . . [and] producing other renewable resources, thereby assisting the United States in meeting its future food needs and contributing to the solution of world resource problems."⁶ The NAA also directed the Secretaries of Agriculture, Commerce, and the Interior to conduct a study and formulate recommendations for improvement of the aquaculture industry in the United States.⁷

The aquaculture industry has experienced dramatic growth since passage of the NAA, but for the U.S. seafood industry to meet future demands aquaculture practices must continue to expand over the next decade. "Every species of food finfish in the United States marine waters is now fished at or above its capacity to replace itself."⁸ At the same time, demand for seafood products dramatically increased over the past ten years and is expected to increase by as much as two-thirds over the next ten years.⁹ With America already importing over sixty percent of the fish that it consumes,¹⁰ the domestic seafood industry can only meet this demand by expanding aquaculture practices.

Despite the need for expansion, and the increased attention that the aquaculture industry has received since 1980, there are still many impediments to the future growth of the industry. The

POTENTIALS].

3. Margaret R. Grossman & Randall E. Westgren, *Aquaculture in Illinois: The State and Federal Legal and Regulatory Environment*, 1982 S. ILL. U. L.J. 193.

4. JAMES W. MILLER, FLORIDA INST. OF OCEANOGRAPHY & FLORIDA DEP'T OF AGRIC. & CONSUMER SERV., FLORIDA AQUACULTURE REGULATORY SOURCEBOOK 1-1 (1990).

5. 16 U.S.C. §§ 2801-2810 (1988 & Supp. III 1991).

6. *Id.* § 2801(c).

7. *Id.* § 2808.

8. POTENTIALS, *supra* note 2, at 2 (quoting SFI BULLETIN (Sports Fishing Inst.), June 1989).

9. POTENTIALS, *supra* note 2, at 2-3.

10. *Id.*

industry concerns include: state and federal regulations and laws that do not adequately provide for industry growth, environmental issues relating to water quality, and a lack of approved drugs to control fish diseases. For the industry to grow, all government agencies must recognize the industry's needs, aquaculturists must be aware of the industry's legal and business limitations, and natural resources (particularly water resources) must be protected to ensure the safe cultivation of food products.

Section II of this Article evaluates the current status of the aquaculture industry. Section III addresses current state and federal natural resource protection laws and their impact on the freshwater aquaculture industry. Section IV focuses on the special problems of raising and processing fish intended for human consumption. The Article concludes that the aquaculture industry is expanding and will continue to grow in the future. State and federal agencies should recognize the important role that aquaculture plays in our nation's economy. By working with aquaculturists, these agencies can protect the environment without unduly restricting the industry.

II. THE STATUS OF THE INDUSTRY

As part of the NAA, Congress made several findings in 1980 as to the state of the industry. These findings identified certain constraints that impeded the growth of aquaculture in the United States. In 1980, Congress found that the United States imported most of its seafood, which contributed to a negative balance of payments and raised questions as to the certainty of supply.¹¹ Although the dramatic growth of the domestic aquaculture industry in the 1980s resulted in the United States becoming the world's leading seafood exporter by 1988 with annual exports reaching \$2.4 billion,¹² the United States remains among the top five importing countries of edible fish products with annual imports of \$5.5 billion.¹³ Projected continued growth, as well as advances in aquaculture technology,¹⁴ should narrow the trade gap in the

11. 16 U.S.C. § 2801(a)(2) (1982) (amended 1988).

12. DAVID HARVEY, U.S. DEP'T OF AGRIC., AQUA-5, AQUACULTURE; SITUATION AND OUTLOOK REPORT 3 (1991) [hereinafter AQUA-5].

13. *Id.* The United States still imports more than 60% of all the fish that it consumes. POTENTIALS, *supra* note 2, at 3.

14. Currently, recirculating or closed flowing systems are still considered ex-

future.

In 1980, Congress also noted that while "aquaculture currently contributes approximately 10 per centum of world seafood production, less than 3 per centum of current United States seafood production results from aquaculture. Domestic aquacultural production, therefore, has the potential for significant growth."¹⁵ By 1988, aquaculture operations accounted for approximately thirteen percent of the world's fish production and five percent of the American fish harvest.¹⁶ The growth in American production was driven both by more effective aquaculture practices and by a general increase in seafood consumption.¹⁷ Congress has projected continued growth in the aquaculture industry based on the "increasing demand for fish and seafood products," as well as "fears of habitat loss; global over-fishing; and water pollution erod[ing] the productivity of wild fisheries stocks."¹⁸ The Department of Agriculture predicts that "aquaculture could contribute twenty-five percent of total world fisheries production by the year 2000."¹⁹ This continued growth will likely cause more domestic aquaculture producers to look to foreign markets, which should help reduce the current negative impact that the seafood industry has on the balance of payments.²⁰

Congress identified several legal and economic problems that faced the aquaculture industry in 1980. One of the most serious limitations on the industry at that time was inadequate credit.²¹ Lack of credit no longer poses the serious problem it once did. Many states, including Florida²² and Mississippi,²³ have provided aquaculturists with the protections and benefits traditionally available only to terrestrial farmers by amending their statutes to include aquaculture as a form of agriculture for purposes of mar-

perimental. See *infra* note 39. As these systems are implemented, the United States may become more competitive with countries that have lower land use costs and lower labor costs. AQUA-5, *supra* note 12, at 5.

15. 16 U.S.C. § 2801(a)(3) (1982) (amended 1988).

16. H.R. REP. No. 808, 100th Cong., 2d Sess. 2 (1988).

17. By 1989, the annual demand for seafood in the United States had grown to approximately 15.9 pounds per capita. AQUA-5, *supra* note 12, at 9.

18. H.R. REP. No. 808, *supra* note 16, at 1, 2.

19. POTENTIALS, *supra* note 2, at 5.

20. AQUA-5, *supra* note 12, at 4.

21. 16 U.S.C. § 2801(a)(7) (1988).

22. FLA. STAT. § 597.0021(4) (Supp. 1991).

23. MISS. CODE ANN. § 69-7-501(a) (1991).

keting, promotional activities, and financing. The most important benefit is increased financial assistance. Farm Credit Banks, authorized by the Farm Credit Act of 1971,²⁴ can now make loans "to farmers, ranchers, and producers or harvesters of aquatic products for any agricultural or aquatic purposes."²⁵ The Farmers Home Administration now defines "farmers" to include "those persons who are engaged in fish farming," making them eligible for financial assistance.²⁶ In addition, the Small Business Administration now recognizes aquaculture operations as being eligible for loans.²⁷ The Federal Crop Insurance Act defines "agricultural commodity" to include fish raised in an aquaculture environment, making aquaculture operations now eligible for crop insurance.²⁸ Moreover, some states allow aquaculturists to form cooperatives,²⁹ which provide the industry with increased buying and selling powers through economies of scale, and provide tax advantages to qualifying groups.³⁰

The attitude toward the aquaculture industry, reflecting the "new federalism" approach to many programs during the 1980s,³¹ was expressed in another Congressional finding: "The principal responsibility for the development of aquaculture in the United States must rest with the private sector."³² Even with the attention given to aquaculture in the early 1980s, including passage of the NAA and a subsequent National Aquaculture Development

24. 12 U.S.C. §§ 2001-2279aa-14 (1988 & Supp. III 1991).

25. *Id.* § 2019(a)(1).

26. 7 U.S.C. § 1991(a)(1-2) (Supp. III 1991).

27. 15 U.S.C. § 632(a)(1) (Supp. III 1991).

28. 7 U.S.C. § 1518 (Supp. III 1991).

29. *E.g.*, Miss. CODE ANN. §§ 79-21-1 to 79-21-19 (1989) (Co-Operative Aquatic Products Marketing Law); *id.* §§ 79-21-51 to 79-21-67 (1989 & Supp. 1991) (Statewide Fresh and Saltwater Co-Operatives). Cooperatives operate at cost for their members. At the time the member aquaculturist turns stock over to the cooperative for marketing, the cooperative pays an advance based on the estimated selling price. At the end of the year an accounting takes place and the aquaculturist either refunds money to the cooperative or receives additional compensation. See Grossman & Westgren, *supra* note 3, at 198-200.

30. See 26 U.S.C. § 521 (1988). See also Grossman & Westgren, *supra* note 3, at 199 (explaining § 521 exemptions).

31. See generally CENTER FOR OCEAN MANAGEMENT STUDIES, THE NEWEST FEDERALISM: A NEW FRAMEWORK FOR COASTAL ISSUES (Thomas Galloway ed., 1982).

32. 16 U.S.C. § 2801(a)(6).

Plan,³³ federal support during the last decade can be summed up with the following observations: (1) "no Department has requested funding under the [NAA]", nor (2) "have funds been appropriated to undertake the activities that the plan directs be undertaken,"³⁴ and (3) while a National Plan was produced, its primary method of dissemination was in microfiche form, which did not facilitate public access. If the aquaculture industry is to continue to prosper, the responsibility for promoting and regulating its development must fall on the private sector and on state governments.

Despite the constraints facing the industry in 1980, aquaculture has experienced a twenty percent annual increase in domestic output of fish, shellfish, and aquatic plants over the last decade.³⁵ This makes aquaculture the fastest growing agricultural industry in the United States.³⁶ The Department of Agriculture estimates that aquaculture production of fish and shellfish in the United States will likely expand from the 1988 figure of 750 million pounds to between two and three billion pounds by the year 2000.³⁷ This dramatic growth will demand serious attention to legal and political matters as the twenty-first century approaches. Among the most important issues will be those relating to protection of natural resources.

III. NATURAL RESOURCE PROTECTION

Federal, state, and local regulation of land use, water use, water quality, and species selection have important impacts on the aquaculture industry. The aquaculturist must comply with regulations promulgated by several agencies at different levels of government. Having to deal with such a multilevel framework exposes the aquaculturists to redundancy and conflicting requirements, which complicates the growth of the industry.³⁸ Neverthe-

33. 16 U.S.C. §§ 2803-2810 (1988 & Supp. III 1991).

34. H.R. REP. NO. 808, *supra* note 16, at 3.

35. MILLER, *supra* note 4, at 1-2. The Department of Agriculture reports that in 1990 American aquaculture had a farm value of close to \$760 million and a growth rate over the past decade of 265%, or more than 20% per year. DAVID J. HARVEY, U.S. DEP'T OF AGRIC., AQUA-7, AQUACULTURE: SITUATION AND OUTLOOK REPORT 22 (1991) [hereinafter AQUA-7].

36. AQUA-7, *supra* note 35, at 22.

37. *Id.*

38. See Ronald J. Rychlak, *Coastal Zone Management and the Search for*

less, careful attention to detail can help the aquaculturist avoid many problems that might otherwise occur.

A. *Site Selection and Land Use Decisions*

The aquaculturist must consider several factors in selecting a site. Those factors include basic business-type issues, such as method of culture,³⁹ adaptability of the species to the geographic location, water availability, right to exclusive use of the area, and size of the operation.⁴⁰ In addition, aquaculturists must evaluate the legal issues relating to the protection of natural resources. These legal issues include: federal land use restrictions in designated areas such as coastal zones, wetland areas, and navigable waterways; zoning and other state land use restrictions; and public trust laws.

1. *Land Use Regulation in the Coastal Zone*

If the aquaculturist decides to locate within the coastal zone of the United States, land and water use operations will be subject to the federal Coastal Zone Management Act (CZMA).⁴¹ The

Integration, 40 DEPAUL L. REV. 981, 994-96 (1991) (discussing the problem of conflicting and redundant requirements at different levels of government).

39. Two primary methods of culture are used in the aquaculture industry, the static method and the flowing method. The most common form of the static method is pond culture. Common forms of the flowing method use tanks, raceways, silos and cages, with a continuous flowing source of water through these rearing chambers. The process is an open flowing system if the water flowing through these chambers is not recirculated within a self-contained system; closed flowing systems recirculate the water within a self-contained system. STICKNEY, *supra* note 2, at 21. However, open flowing systems use enormous amounts of water. Recirculating systems have the advantage of using less land and water while supporting high density populations. AQUA-5, *supra* note 12, at 5. Before the recirculating process can become a major contributor to the aquaculture industry, however, problems relating to disease, cost, and water pollution must be remedied. *Id.*

40. Pond culture of freshwater catfish is the largest form of land use employed by the aquaculture industry. In 1991, the Department of Agriculture estimated that 166,000 acres of water surface area were devoted to this form of land use. AQUA-7, *supra* note 35, at 3.

41. 16 U.S.C. §§ 1451-1464 (1988 & Supp. III 1991). The CZMA defines coastal zones as "coastal waters . . . and the adjacent shorelands . . . strongly influenced by each other." *Id.* § 1453(l). This definition leaves much discretion to the states to determine the inland boundary of their coastal zone. Accordingly,

CZMA was enacted to help deal with the stress placed on coastal land and water resources by population growth, increased industrialization, pollution, and growing commercial and recreational uses.⁴² While the CZMA is primarily concerned with construction and development in the coastal zone, many decisions concerning water use are intricately bound up in decisions and outcomes regarding land use. Accordingly, the CZMA also deals with air, water, and land-based pollution.

The CZMA is premised on a joint federal-state relationship, with agreements under which the federal government offers financial assistance to states that develop a Coastal Management Plan (CMP). A CMP is a comprehensive state plan designed to protect coastal resources and prevent environmental degradation within the coastal zone of the state.⁴³ After the state has promulgated an approved CMP, the federal government delegates most enforcement authority to the state.⁴⁴ Most states rely on a permit system to control development under their CMP.⁴⁵ These permits are

various coastal states have interpreted the CZMA's jurisdictional declarations differently, and individual state programs vary a great deal in scope. See FREDERICK R. ANDERSON, ET AL., ENVIRONMENTAL PROTECTION: LAW AND POLICY 846 (1984) (noting how states have defined their coastal zones differently). See also Rychlak, *supra* note 38.

42. JOSEPH J. KALO, COASTAL AND OCEAN LAW 327 (1990). See SENATE COMM. ON COMMERCE, 94TH CONG., 2D SESS., LEGISLATIVE HISTORY OF THE COASTAL ZONE MANAGEMENT ACT OF 1972, AS AMENDED IN 1974 AND 1976 198 (Comm. Print 1976) (remarks of South Carolina Senator Ernest Hollings). The CZMA's legislative history indicates that "[t]he key to more effective use of the coastal zone in the future is introduction of management systems permitting conscious and informed choices among the various alternatives. The aim of this legislation is to assist in this very critical goal."

43. 16 U.S.C. § 1456(c). Through grants authorized by the CZMA, states can receive up to 80% of the cost of developing a program and 50% of the cost of administering a CMP. 16 U.S.C. §§ 1454-1455. If a state does not develop a CMP, there is no federal agency to step in and fill the gap. KALO, *supra* note 42, at 327.

44. The federal government reviews performance and may withhold federal funds and withdraw federal approval if the state fails to meet national standards. 16 U.S.C. § 1458(d); 15 C.F.R. §§ 923.41(b), 928.1-928.5 (1992).

45. See 16 U.S.C. § 1456(c)(3)(A) (federal approval based on assumption of state permitting process). The permit concept, however, has some built-in problems that make it less than ideal for protecting the coast. For instance, once a person has received a permit to conduct certain activity, there is typically no incentive to further reduce pollution. Lakshman Guruswamy, *Integrating Thoughtways: Re-Opening of the Environmental Mind?*, 1989 WIS. L. REV. 463, 502 (1989). Recent amendments to the CZMA have attempted to deal with this problem by

designed to assure that the proposal will not cause environmental harm beyond that allowed by the CMP and the CZMA. Only after each permit has been obtained and each requirement has been met may the proposed activity proceed.

Twenty-four coastal states have federally approved CMPs.⁴⁶ Significant differences in purpose and goals are not always apparent in various states' CMPs, but they can be found in the implementation and comprehensiveness of states' supporting regulatory framework. For instance, Florida's Coastal Management Act defines coastal zones as "that area of land and water from the territorial limits seaward to the most inland extent of maritime influences."⁴⁷ Due to geography, Florida's CMP will govern most of the state, and most aquaculturists in the state will have to comply with the CZMA through Florida's CMP and obtain various permits to establish an aquaculture operation.⁴⁸ Depending on the location, the aquaculturist will also have to comply with state, regional and local development plans,⁴⁹ state building codes,⁵⁰ coastal construction control lines (setback lines),⁵¹ and coastal building zones⁵² that are incorporated into the state's coastal program.

Mississippi's CMP,⁵³ on the other hand, applies to compara-

establishing a Coastal Zone Enhancement Grants Program that is designed to encourage states to continually improve their CMP. 16 U.S.C. § 1456(b). For a general review of the recent CZMA amendments, see Laura Howorth, *Coastal Zone Management Act: Highlights of the 1990 Amendments*, 10 WATER LOG 11, 12 (1990).

46. LINDA A. MALONE, ENVIRONMENTAL REGULATION OF LAND USE 2-5, n.4, (Environmental Law Series, Clark, Boardman, looseleaf service, 1991). The coastal states (including states on the Great Lakes) of Georgia, Illinois, Indiana, Minnesota, Ohio and Texas did not have federally approved plans as of 1989. *Id.*

47. See FLA. STAT. §§ 380.19 to 380.33 (1988 & Supp. 1992) (Florida's Coastal Management Plan).

48. See *id.* at § 380.23(2)(c).

49. FLA. STAT. §§ 380.012 to 380.10 (Florida's Environmental Land and Water Management Act of 1972). See also *id.* §§ 163.3161-.3243 (Florida's Local Government Comprehensive Planning and Land Development Regulation Act, providing county and municipal development regulations).

50. See FLA. STAT. § 553.73.

51. See FLA. STAT. §§ 161.052, .053 (Beach and Shore Preservation Act).

52. See FLA. STAT. §§ 161.52-161.58 (1990) (Coastal Zone Protection Act of 1985).

53. See MISS. CODE ANN. § 57-15-6 (1989) (authorizing the preparation and implementation of a Coastal Management Plan). While Mississippi's coastal zone

tively few aquaculture operations, because more than ninety-six percent of the state's aquaculture operations are located outside the state's three coastal counties.⁵⁴ Moreover, Mississippi has a history of granting exemptions for the catfish portion of the aquaculture industry.⁵⁵ If the CMP proved a significant barrier to catfish farming, it is possible that the legislature would revise the CMP or grant an exemption to the catfish industry. While the lenient regulatory climate in Mississippi may make it easier to establish an aquaculture operation in that state, selection of a site based on a lenient regulatory climate could prove unwise in the long run if such leniency leads to over-exploited resources.

2. *Wetland Regulations*

At one time, swamps were drained for health reasons, and

is comprised of only three counties, its CMP goals relevant to aquaculture operations include a desire to:

provide for reasonable industrial expansion in the coastal area and to insure the efficient utilization of waterfront industrial sites so that suitable sites are conserved for water dependent industry;. . . favor the preservation of the coastal wetlands and ecosystems, except where a specific alteration of a specific coastal wetland would serve a higher public interest in compliance with the public purposes of the public trust in which the coastal wetlands are held;. . . protect, propagate, and conserve the state's seafood and aquatic life in connection with the revitalization of the seafood industry;. . . conserve the air and waters of the state, and to protect, maintain, and improve the quality thereof for public use, for the propagation of wild-life, fish, and aquatic life, and for domestic, agricultural, industrial, recreational, and other legitimate beneficial uses;. . . [and] consider the national interest involved in planning for and in the siting of facilities in the coastal area.

BUREAU OF MARINE RESOURCES, MISSISSIPPI DEP'T OF WILDLIFE CONSERVATION, MISSISSIPPI COASTAL PLAN § 1, at I-2 (1988) (on file with authors).

54. MISSISSIPPI AGRICULTURE & FORESTRY EXPERIMENT STATION, MISSISSIPPI STATE UNIVERSITY, TECHNICAL BULLETIN 155, ECONOMIC ANALYSIS OF FARM-RAISED CATFISH PRODUCTION IN MISSISSIPPI 1 (1988) [hereinafter MISS. BULLETIN 155] (on file with authors). Less than two percent of the state's aquaculture operations lie within the state's coastal zone as defined in the state's CMP. *Id.* Most aquaculture growth in the state has been in the Delta Region, where 96.4% of the operations are located. *Id.* Reasons for the restricted location of aquaculture growth include the availability of land coupled with the legislative desire to accommodate the use of this land for the development of the industry to the economic advantage of the state. *Id.*

55. See *infra* notes 113-115 and accompanying text.

their eradication was celebrated as human achievement.⁵⁶ More recently, scientists and environmentalists have recognized the critical role that wetland areas play in the earth's ecosystem. As such, today there are strict regulations to protect their existence. Wetland protection is crucial for the long-term health of the aquaculture industry. "Fully two-thirds of commercially harvested fish in the United States waters depend on wetlands for food or spawning and rearing grounds,"⁵⁷ and an even greater percentage of the recreational catch depends on wetland environments.⁵⁸ Thus, wetland protection helps preserve wild stock for those who fish and provides insurance for future aquaculture seed stock. Wetland protection is provided by regulations at both the state and federal level.

a. *Federal Wetland Regulations*

The first step in developing a wetlands protection program is defining the term "wetlands." Originally this was done—at the federal level—on an agency-by-agency basis. Because of discrepancies over the methods for determining what constituted a wetland, the Army Corps of Engineers, the Environmental Protection Agency (EPA), the Fish and Wildlife Service (FWS), and the Soil Conservation Service (SCS), produced a comprehensive manual providing uniform criteria by which to identify wetlands.⁵⁹ The new federal definition includes those areas "that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions."⁶⁰ This definition has had the effect of

56. One court "remembers when wetlands were called swamps, when their draining or filling was deemed progress, and when their main environmental impact was in the production of noxious disease-bearing mosquitos." *Florida Rock Industries v. United States*, 791 F.2d 893, 902 (Fed. Cir. 1986), *cert. denied*, 479 U.S. 1053 (1987).

57. Michael C. Blumm & D. Bernard Zaleha, *Federal Wetlands Protection Under The Clean Water Act: Regulatory Ambivalence, Intergovernmental Tension, and A Call for Reform*, 60 U. COLO. L. REV. 695, 697 (1989).

58. MALONE, *supra* note 46, at 2-3.

59. FEDERAL INTERAGENCY COMM. FOR WETLAND DELINEATION, FEDERAL MANUAL FOR IDENTIFYING AND DELINEATING JURISDICTIONAL WETLANDS (1989) [hereinafter FEDERAL MANUAL].

60. 40 C.F.R. § 230.41(a)(1) (1992) (EPAs definition). See FEDERAL MANUAL, *supra* note 59, at 20. See also 33 C.F.R. § 328.3(b) (1992) (Corps of Engineers

bringing areas within the law's coverage which had been excluded under at least some of the prior definitions.

If the aquaculture operation is located in an area that meets the federal wetland classification, activities on the site are subject to federal control under section 404 of the Clean Water Act (CWA),⁶¹ which imposes a permitting system administered by the Corps for the discharge of dredged or fill material.⁶² If aquaculture operations or preliminary site preparations include dredge or fill discharges into wetlands, the aquaculturist must obtain federal and state approval under the permitting system. On request, the Corps will issue a permit application packet, which may include state permit applications as well as the federal forms, minimizing duplication for the applicant. By filing an application, the aquaculturist initiates a process that includes public notice and an opportunity for a public hearing before discharge of any pollutants into waters of the United States can take place.⁶³ The EPA retains final veto authority over the Corps wetland decisions.⁶⁴

b. State Wetland Regulations

State wetland protection laws vary greatly from one state to another. Florida identifies its wetlands through a vegetative index similar to the criteria set forth in the Federal Manual.⁶⁵ Approval of activities within Florida's wetlands is contingent upon state satisfaction that water quality will not be threatened by the pro-

definition, which is similar, but adds the phrase, "wetlands generally include swamps, marshes, bogs and similar areas.").

61. 33 U.S.C. § 1344 (1988 & Supp. III 1991). Although the term wetlands connotes a land mass, protection of these areas and their important ecosystems comes primarily through water-quality regulations. KALO, *supra* note 42, at 320-21.

62. 33 U.S.C. § 1344.

[D]ischarge of fill material means the addition of fill material into waters of the United States [including] [p]lacement of fill that is necessary for the construction of any structure in a water of the United States; the building of any structure or impoundment requiring rock, sand, dirt, or other material for its construction

33 C.F.R. § 323.2(f) (1992).

63. *Id.* § 1344(a).

64. *Id.* § 1344(c).

65. FLA. STAT §§ 403.91(7), .912, .913 (1986 & Supp. 1992); FLA. ADMIN. CODE ANN. 17-3.022 (1984).

ject and that the project is not contrary to the public interest.⁶⁶ Mississippi, on the other hand, focuses on publicly held coastal wetlands.⁶⁷ Mississippi regulates activities affecting these public wetlands by issuing permits for activities such as dredging and filling, killing or damaging flora or fauna, and the erecting of structures.⁶⁸

Other states have taken different approaches. Maryland is among the minority of states to have adopted the more encompassing Federal Manual to determine wetland status, and is the first state to enact President Bush's once-claimed goal of "no net loss" for its nontidal wetlands.⁶⁹ South Carolina, on the other hand, recognizes its tidal wetlands as "critical areas"⁷⁰ and requires strict criteria to be met before such areas can be disturbed.⁷¹ Louisiana's definition of wetlands follows the definition used by the Corps, but adds "exclusively excluding fastlands and land more than five feet above mean sea level which occur within the designated coastal zone of the state."⁷² The wide variety of ways that states approach wetland regulation makes it clear that the aquaculturist should contact the Corps and any relevant state agencies for current requirements.

3. *Waterway Site Regulations*

Some aquaculture methods call for use of flowing water-

66. FLA. STAT. §§ 403.91-929 (1986 & Supp. 1992).

67. See MISS. CODE ANN. §§ 49-27-1 to -69 (1990).

68. *Id.* § 49-27-5(c).

69. MD. NAT. RES. CODE ANN. § 8-1202(b) (1990).

70. S.C. CODE ANN. § 48-39-10(J) (Law. Co-op. 1987 & Supp. 1991). Critical areas include coastal waters, tidelands, beaches, and the beach-dune system. *Id.*

71. *Id.* §§ 48-39-20, -30, -150 (1987); S.C. CODE REGS. 30-11(B) (1983). The screening criteria includes determining: (1) whether the activity is water-dependent; (2) the extent the activity would harmfully obstruct the natural flow of navigable water; (3) the extent the project would affect production of marine life or wildlife, water, and oxygen supply; (4) the effect on public access to tidal and submerged lands, navigable waters, and beaches; and (5) the extent of adverse environmental impacts which cannot be avoided by reasonable safeguards. *Id.* at 11(B)(1)-(5), (9).

72. LA. REV. STAT. ANN. § 49:214.3(3) (West Supp. 1992). Louisiana's regulation is directed toward its 3.5 million acres of coastal wetlands, most of which are privately owned, through enhancement projects and requiring permits for activities that could significantly affect those projects. *Id.* § 49:214.30.

ways.⁷³ Depending upon the type of waterway at which the operation is situated, the aquaculturist may be faced with both federal and state regulation. If the waterway is navigable, the aquaculturist must comply with the Federal Rivers and Harbors Act.⁷⁴ Under this Act, the Corps must authorize any project that includes the building or placement of any structure, not authorized by Congress, that would create an obstruction in the navigable waters of the United States.⁷⁵ While this Act will not affect most upland aquaculture operations, it could apply to an aquaculturist using a flowing system alongside a waterway.

If the site includes tidelands (foreshore) or submerged lands, the aquaculturist will also have to comply with the state's public trust laws.⁷⁶ Terms of this trust vary from state to state, but the underlying rationale of the doctrine is that tidelands and submerged lands are so intrinsically important to the state that every citizen must have free access if society is to develop and prosper.⁷⁷ In general, the public trust doctrine provides that states have title to the land underneath navigable waters and to tidally affected lands.⁷⁸ These lands are to be "held in trust for the public benefit."⁷⁹ To protect access for all, the trust restricts anyone wishing to have exclusive use of trust property. If the aquaculture operations require use of public trust land, the aquaculturist typically is required to obtain a lease from the state.⁸⁰ In order to

73. See *supra* note 39.

74. 33 U.S.C. § 403 (1988).

75. *Id.* See also 33 C.F.R. § 329.4 (1992).

76. See DAVID SLADE, *PUTTING THE PUBLIC TRUST TO WORK* (1990); Ronald J. Rychlak, *Thermal Expansion, Melting Glaciers, and Rising Tides: The Public Trust in Mississippi*, 11 *MISS. C. L. REV.* 95 (1990).

77. *Martin v. Waddell*, 41 U.S. (16 Pet.) 367, 414 (1842). See Joseph L. Sax, *The Public Trust Doctrine in Natural Resource Law: Effective Judicial Intervention*, 68 *MICH. L. REV.* 471, 475-78 (1970).

78. See, e.g., *Pollard's Lessee v. Hogan*, 44 U.S. (3 How.) 212 (1845) (confirming a grant by Alabama of submerged lands in Mobile Bay); *Manchester v. Massachusetts*, 139 U.S. 240 (1890) (upholding Massachusetts right to regulate fishing in a bay area).

79. *Cinque Bambini Partnership v. State*, 491 So. 2d 508, 512 (Miss. 1986) (after the American Revolution, citizens of each state took title to navigable waters), *aff'd sub nom. Phillips Petroleum Co. v. Mississippi*, 484 U.S. 469, *reh'g denied*, 486 U.S. 1018 (1988).

80. See, e.g., *FLA. STAT.* § 253.68 (1991). See also M. Richard DeVoe & Andrew S. Mount, *An Analysis of Ten State Aquaculture Leasing Systems: Issues and Strategies*, 8 *J. SHELLFISH RES.* 233 (1989). DeVoe and Mount argue that

obtain such a lease, the aquaculturist would have to show that the lease would be in the public interest.⁸¹

4. Upland Site Constraints

An aquaculture operation on an upland site within a coastal zone must not only comply with the CZMA and the state CMP,⁸² but also with development plans from other levels of government. These may include state-wide, regional, county, and municipal development plans, along with zoning requirements.⁸³ If the upland site supports a freshwater wetland, then section 404 of the CWA applies as well.⁸⁴

B. Water Use and Water Quality Regulations

The aquaculturist's second important natural resource protection concern centers around water use and water quality controls. Water quality is obviously critical for breeding and raising aquatic creatures. Indeed, "[t]he ultimate role of aquaculture will depend in large part on the intelligent use and conservation of water"⁸⁵ The same regulations that will in the long run serve to protect the aquaculture industry, however, provide short-term limitations on what the aquaculturist can do, especially in terms of waste water disposal or use of navigable waterways.

states need to review their leasing practices because most of them, while professing a desire to assist aquaculture, do not adequately provide for the needs of aquaculture operations in their leasing programs. For instance: several states do not allow for exclusive use by the aquaculturist; several states have residency requirements; some states have a minimum acreage requirement that would prevent small operations from starting up; the duration of leases in some states is only one year; and royalty fees in some states make it hard for a new business to project costs.

81. Rychlak, *supra* note 76, at 109-10.

82. See *supra* notes 43-55 and accompanying text.

83. Developments within Mississippi's three coastal zone counties require compliance with regional, county, and municipal comprehensive development plans. See MISS. CODE ANN. §§ 17-1-1 to 17-1-39 (Supp. 1991). See also FLA. STAT. §§ 186.001, 186.031, 186.801-911 (Supp. 1991).

84. 33 U.S.C. § 1344 (1988 & Supp. III 1991). See *supra* notes 61-64 and accompanying text.

85. STICKNEY, *supra* note 2, at 318.

1. *Surface Water and Ground Water Use*

Water use regulations relate to surface water diversion, surface water use, and ground water withdrawal. If a diversion involves a navigable river, the aquaculturist will have to comply with the Federal Rivers and Harbors Act.⁸⁶ More commonly, aquaculturists are concerned with regulations dealing with the use of contained surface water or the extraction of groundwater through a well. Use and extraction regulation falls under state jurisdiction. The primary means by which states regulate aquaculturists is by requiring them to obtain permits, both for the pumping of surface water from free flowing water sources and for well installation and modification. As with other state permitting processes, procedures for water use management vary; therefore, an aquaculturist should consult the permitting agencies.⁸⁷

2. *Water Quality Discharge Requirements*

Water quality discharge standards maintain surface water quality by regulating the discharge of pollutants into "waters of the United States."⁸⁸ The aquaculture industry depends on clean surface water, but aquaculture operations themselves can degrade water quality. For this reason, aquaculturists are also subject to regulations relative to the discharge of used water. The federal discharge regulations provide for supervision at both the federal and state level.

a. *Federal Regulations*

Discharge of any pollutant into the waters of the United

86. See *supra* notes 74-75 and accompanying text.

87. See, e.g., MISS. CODE ANN. §§ 51-3-1 to -55 (1990) (Water Resources, Regulation and Control); BUREAU OF LAND AND WATER RESOURCES, MISSISSIPPI SURFACE WATER AND GROUNDWATER USE AND PROTECTION REGULATIONS MANUAL (1990); FLA STAT. §§ 373.026, .023-.249, .303-.342 (1988 & Supp. 1992).

88. Although the Clean Water Act refers to discharges into "navigable waters," that term is defined as the "waters of the United States, including the territorial seas." 33 U.S.C. §§ 1344(a), 1362(7), 1362(12) (1988). Thus, the word "navigable" seems to have lost most of its meaning. See *United States v. Riverside Bayview Homes, Inc.*, 474 U.S. 121, 139 (1985) ("navigable waters" extends to encompass wetlands).

States from a "point source"⁸⁹ is regulated by the federal government through the National Pollutant Discharge Elimination System (NPDES), as set forth in section 402 of the Clean Water Act (CWA).⁹⁰ Ultimate regulatory authority rests with the EPA, but responsibility may be delegated to approved states.⁹¹ When a state qualifies for delegation, it handles all of the permitting process, and federal involvement is kept to a minimum. If a state is not delegated for NPDES purposes, the aquaculture facility discharge must comply with existing state water quality standards and EPA regulations in accordance with the CWA.⁹²

Aquaculture operations normally fall under the NPDES program because hatcheries and fish farms are "concentrated aquatic animal production facilities," and, therefore, are classified as point source dischargers.⁹³ The final determination of whether a particular site will fall under the NPDES program, however, is made on a case-by-case basis after an on-site inspection and determination by the Director.⁹⁴ The Director considers the following factors in making this determination: "(i) The location and quality of affected water; (ii) The holding, feeding, and production capacities of the facility; (iii) The quantity and nature of the pollutants; and (iv) Other relevant factors."⁹⁵ The discharger need not apply for a permit until the Director has made an inspection and reached a decision on the classification.⁹⁶ It seems clear, however, that most aquaculture operations should be subject to NPDES regulation.

The NPDES program strives to achieve maximum "effluent

89. "Point source means any discernible, confined, and discrete conveyance, including but not limited to, any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, land-fill leachate collection system, vessel or other floating craft from which pollutants are or may be discharged." 40 C.F.R. § 122.2 (1992).

90. 33 U.S.C. § 1342. *See* 40 C.F.R. § 122.

91. 33 U.S.C. § 1342(b). *See* 40 C.F.R. § 123.

92. 33 U.S.C. § 1313(a)(2). *See* 40 C.F.R. § 122.

93. 40 C.F.R. § 122.24(b). *See also* 40 C.F.R. § 122 App. C (1992).

94. "Director" means the Regional EPA Director where there is no approved state program, and where there is a state program, then Director means State Director. 40 C.F.R. §§ 122.2, 122.24(c)(1) & (c)(2).

95. 40 C.F.R. § 122.24(c)(1)(i-iv). *See also id.* § 122 App. C (criteria for determining whether an operation is a concentrated aquatic animal production facility).

96. 40 C.F.R. § 122.24(c)(2).

limitations" on point source discharges, including restrictions on quantities, rates, and concentrations of chemical, physical, biological or other constituents which are discharged from point sources.⁹⁷ This permitting system places the burden on the point source discharger to make sure that the relevant permits have been obtained.⁹⁸ Aquaculturists must check with the regional or state EPA office before undertaking any significant activity that involves the discharge of used water.

b. State Regulations

Where enforcement of NPDES has been delegated to a state, the aquaculturist need only deal with the state permitting process. The state guidelines, which must meet federal EPA minimum standards, are designed to assure that the waters are being adequately protected.⁹⁹ The different approaches taken by various states in regulating water quality discharges can be seen by comparing a nondelegated state (Florida) with a delegated state (Mississippi).

(1) Nondelegated State Approach: Florida

Since Florida is not yet a delegated state for NPDES purposes,¹⁰⁰ applicants must comply with federal regulations¹⁰¹ and state permitting requirements. Thus, in addition to working with the EPA to assure that the discharges are permissible under NPDES, the aquaculturist must also deal with the relevant state agencies to make certain that there is no violation of state law. The Florida law regulating the water quality of discharges is the Florida Air and Water Pollution Control Act,¹⁰² which requires an

97. 33 U.S.C. § 1312(a).

98. Based on sections 301 and 309 of the CWA, mushroom farmers were convicted of a crime and sentenced to both a fine and imprisonment for negligent discharges without a permit. *United States v. Frezzo Bros., Inc.*, 602 F.2d 1123 (3d Cir. 1979) (discharges were caused by rainfall that exceeded the capacity of the farm's equipment).

99. 33 U.S.C. §§ 1314(i)(2), 1342(b).

100. Florida has recently indicated a desire to obtain delegation in order to efficiently regulate discharge of pollutants into waters of the state, and to eliminate duplication with the federal NPDES program. *FLA. STAT. § 403.0885* (Supp. 1992).

101. *See* 40 C.F.R. § 124.3 (1992).

102. *FLA. STAT. §§ 403.011-.064* (1986 & Supp. 1992).

applicant to obtain either a General Permit¹⁰³ or an Industrial Wastewater Treatment Permit.¹⁰⁴ A General Permit is appropriate if Florida's Department of Environmental Regulation determines that the project's discharge will have only "a minimal adverse environmental effect."¹⁰⁵ If the discharge exceeds the minimum adverse effect limit, the aquaculturist must obtain an Industrial Wastewater Treatment Permit.¹⁰⁶ The Industrial Wastewater permitting process, which is much more burdensome to the applicant, includes detailed application procedures and continued effluent monitoring. Florida, however, has amended its permitting laws as they relate to aquaculture water discharges. In February 1991, the state completed a new plan to delegate some authority for regulating discharges from the Department of Environmental Regulation to five Water Management Districts.¹⁰⁷ The plan is designed to streamline and utilize General Permits rather than Wastewater Permits since many aquaculture operations have minimal discharges that can be treated through simple best management practices. The new General Permit procedures outline requirements on a species-specific basis.¹⁰⁸ Once the appropriate permit forms are submitted by the aquaculturist, the Department is to respond within thirty days.¹⁰⁹ If there is no response, the applicant may assume that authority has been granted and begin construction and operation under the terms of the permit.¹¹⁰ The streamlined permitting process should prove beneficial to aquaculturists.

103. *Id.* § 403.814(1).

104. *Id.* § 403.087.

105. *Id.* § 403.814(1). See DEPARTMENT OF ENVTL. REGULATION ET AL., A PLAN FOR THE DELEGATION OF PERMITTING AUTHORITY FOR AQUACULTURE FACILITIES TO THE WATER MANAGEMENT DISTRICTS (1991) [hereinafter FLORIDA'S DELEGATION PLAN] (on file with authors).

106. FLA. STAT. § 403.011 (1986).

107. *Id.* § 597.007. See also FLORIDA'S DELEGATION PLAN, *supra* note 105. Florida's attention to the aquaculture industry also includes publication of a comprehensive Florida Aquaculture Source Book which addresses all permits required by prospective aquaculturists. See MILLER, *supra* note 4.

108. The types of operations requiring permit development include: catfish farms, fingerling production farms, *Tilapia* farms, tropical fish farms, alligator farms, crayfish farms, clam nurseries, and oyster nurseries. FLORIDA'S DELEGATION PLAN, *supra* note 105.

109. *Id.* at 2.

110. *Id.*

(2) *Delegated State Approach: Mississippi*

When EPA delegates authority to the state, the permitting process should be easier for the aquaculturist because all NPDES dealings are with one level of government. The state is required to verify that all federal minimal guidelines are met, as well as any additional state regulations. Ideally, this process offers the best of all possible worlds, but there have been some problems. State and local planning units are typically in charge of land use planning and zoning issues,¹¹¹ but they have conflicting interests. The economic interest in new industry, and the political clout of development interests, sometimes makes it difficult for local regulators to fully protect the environment. For those reasons, state and local regulators have been seen as "push overs" for development interests.¹¹² As such, there are concerns about delegating too much authority to state and local agencies. This problem is evident as it relates to the Mississippi catfish industry.

Mississippi is an NPDES delegated state.¹¹³ Pursuant to its authority, the state has granted a de facto blanket exemption (subject to the right to evaluate discharges at any time) to the 95,000 acres of producing catfish ponds within the state.¹¹⁴ Because the EPA has delegated its authority to the state, this exemption has had the effect of removing the Mississippi catfish industry from all NPDES permitting requirements at the harvesting stage.¹¹⁵ The scale of the catfish industry in Mississippi not only dwarfs all other aquacultural operations within the state, but leads the entire nation in production. Clearly, this exemption to such a large industry will impact the state's ability to control discharge pollution and protect state water quality.

111. See Gilbert L. Finnell, Jr., *Intergovernmental Relationships in Coastal Land Management*, 25 NAT. RES. J. 31, 40 (1985).

112. Richard G. Hildreth & Ralph W. Johnson, *CZM in California, Oregon, and Washington*, 25 NAT. RESOURCES J. 103, 113 (1985). Distrust of local governments was at the heart of many efforts to centralize coastal protection laws. *Id.*

113. Mississippi's EPA-approved criteria is published, in draft form. See STATE OF MISSISSIPPI, WATER QUALITY CRITERIA FOR INTRASTATE, INTERSTATE AND COASTAL WATERS (1991) (on file with authors).

114. Letter from Jim Morris, Water Quality Management Branch, Department of Environmental Quality (Feb. 20, 1992) (on file with authors).

115. Catfish processing activities, however, are not exempted.

C. *Limits on Species Selection*

Selection of a species is normally the aquaculturist's first decision, and it determines site location and water needs. Not all species may be commercially propagated. States and the federal government place restrictions on the propagation of some species because those populations are threatened or endangered. Other species are regulated because they are exotic (nonnative) to the country or the state to which importation is desired, and officials are concerned about the impact that they would have on native populations if released into the wild.

1. *Federal Control of Species Selection*

The federal government protects those species whose existence is at risk under the Endangered Species Act (ESA).¹¹⁶ Aquaculture operations would be prohibited by ESA from raising listed species because such species cannot be sold, offered for sale, imported, exported, taken, received, or shipped in interstate commerce.¹¹⁷ There are some exceptions made for scientific purposes, enhancement of the species, or for educational purposes,¹¹⁸ but few commercial aquaculture operations would qualify for these exceptions.

A second federal limitation on species selection comes from the Lacey Act Amendments of 1981.¹¹⁹ This Act makes it a crime "to import, export, transport, sell, receive, acquire, or purchase any fish . . . taken, possessed, transported, or sold in violation of any law, treaty, or regulation of the United States or in violation of any Indian tribal law."¹²⁰ The purpose of this Act is to restrict importation of a species that might "be injurious to human beings, to the interests of agriculture, horticulture, forestry, or to wildlife or the wildlife resources of the United States."¹²¹ Recent controversy over importation of exotic species has focused on the

116. 16 U.S.C. §§ 1531-1544 (1988 & Supp. III 1991). The list of threatened and endangered species is set forth at 50 C.F.R. § 17.11 (1992).

117. 16 U.S.C. § 1538 (1988 & Supp. III 1991). See also 50 C.F.R. §§ 17.21, 17.31.

118. 16 U.S.C. § 1539; 50 C.F.R. §§ 17.22, 17.32 (1992).

119. 16 U.S.C. §§ 3371-3378 (1988 & Supp. III 1991).

120. *Id.* § 3372(a)(1).

121. 19 C.F.R. § 12.26(a)(xi).

Grass Carp and the *Tilapia*.¹²² Some scientists fear that, if fish of these species escaped domestic enclosures used in aquaculture, the escapees might reproduce and out compete native species for resources. Also, because these species are known for rapid reproduction, there is concern that they could overpopulate an area and overconsume its vegetation which might lead to disruption in nutrient cycles and possible water quality deterioration. In any case, it is obvious that the aquaculturist will have to comply with applicable federal restraints on importation of exotic species.

2. State Control of Species Selection

Like the federal government, some states have endangered species acts under which they list and protect threatened and endangered species. State endangered species lists typically include species identified on the federal lists along with those designated as threatened or endangered by that specific state. Most states also have Lacey Act equivalents which restrict certain species from entering the state. However, states vary in their willingness to risk possible detrimental impacts caused by imported exotics. For instance, because of the increased likelihood that an escaped exotic could survive and cause harm in tropical waters,¹²³ Florida is more strict in its regulation of exotic species than are most other states. Florida requires several permits for selling, propagating, collecting, and importing most exotic species,¹²⁴ while it completely prohibits the import of other species.¹²⁵

Permitting is the typical way for states to regulate the importation, breeding, and harvesting of protected species. Often one

122. These species are native to eastern Asia, Africa, and the Middle East, where the year-round climate is warmer than most of the United States. It is not known whether these fish could survive in warmer U.S. climates and subsequently pose any threats to the native population. STICKNEY, *supra* note 2, at 10.

123. STICKNEY, *supra* note 2, at 10-11.

124. See MILLER, *supra* note 4, at 4-66 (complete list and explanation of required Florida permits).

125. Florida restricts some varieties of the controversial *Tilapia* and Grass Carp, with entry only allowed upon issuance of a special permit; other varieties of *Tilapia* are completely prohibited. *Id.* at 4-60 to 4-67. Mississippi and Louisiana allow propagation of these species. MISS. CODE ANN. § 79-22-9 (1989); LA.REV. STAT. ANN. § 56:327 (West 1987 & Supp. 1992). South Carolina prohibits the Grass Carp unless they are nonreproducing. S.C. CODE ANN. § 50-13-1630 (Law Co-op. 1992).

permit is needed to produce a certain species and another is required for selling it.¹²⁶ In some states, for example Mississippi, an aquaculturist need only make a single application to obtain all necessary permits.¹²⁷

Despite these federal and state regulations, there is a wide variety of fish that can be commercially propagated in the United States. Nonetheless, seven species comprise most of the aquaculture market. Of the seven, freshwater catfish dominates the industry with 176.3 million pounds sold in 1989.¹²⁸ The other six species include: crawfish with 95 million pounds produced in 1987;¹²⁹ trout with 58.9 million pounds produced in 1987;¹³⁰ shrimp with 20.8 million pounds produced in 1989;¹³¹ salmon with about 11 million pounds produced in 1989;¹³² *Tilapia* with about 8 million pounds produced in the first half of 1990;¹³³ and tropical fish with \$34 million worth sold in 1989.¹³⁴

IV. WHOLESOMENESS OF STOCK AND THE FOOD PRODUCT

Like all producers of food crops, aquaculturists are driven to minimize stock loss in order to maximize profitability. Stock loss, however, remains a serious threat to the industry. Catfish producers in Mississippi alone lost more than 140 million fish in the first half of 1990,¹³⁵ up forty-two percent over the previous year.¹³⁶ The primary causes of stock loss are chemically contaminated water, fish disease, and parasites. The disease and parasite losses are magnified due to a lack of approved drugs with which to fight these problems.¹³⁷

126. See MILLER, *supra* note 4.

127. See MISS. CODE ANN. § 79-22-19 (1989).

128. AQUA-5, *supra* note 12, at 9.

129. POTENTIALS, *supra* note 2, at 2.

130. *Id.*

131. AQUA-5, *supra* note 12, at 17.

132. *Id.* at 14.

133. *Id.* at 13.

134. POTENTIALS, *supra* note 2, at 2.

135. AQUA-5, *supra* note 12, at 12.

136. *Id.*

137. STICKNEY, *supra* note 2, at 261.

A. Chemical Contamination of Water

Aquaculture operations, and the farms that often adjoin them, are usually dependant on properly used chemicals to minimize problems and maximize the harvest. Unfortunately, when chemicals are improperly used, or when they are accidentally discharged into waters used for aquaculture operations, they can contaminate the water and harm the fish product. The most serious threats to aquaculture water come from herbicides used to control aquatic vegetation in fish ponds;¹³⁸ runoff of pesticides, herbicides, and fertilizers from fields adjoining the aquaculture ponds;¹³⁹ overspray falling into ponds from aerial spraying;¹⁴⁰ and aquifer contamination due to pollution of the recharge water.¹⁴¹ Aquaculturists can minimize the risks to their food product by adhering to regulations relating to the application of agricultural chemicals.

1. Agriculture Chemicals

To a certain extent, it may be difficult for aquaculturists to avoid the risk of chemical contamination from aquaculture products. For one thing, such contamination may come from neighboring farms. Moreover, when chemicals travel in the water supply, they may come from distant farms. In such cases, there is little that the aquaculturist can do to avoid the pollution. Informed aquaculturists can, however, minimize their risks by considering these issues at the time of site selection and by avoiding the creation of dangerous situations on their property.

The best way for the careful aquaculturist to avoid risk of chemical pollution is to strictly follow the instructions for use of fertilizers and chemical pesticides. Marketing and use of many of these chemicals is regulated under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA).¹⁴² In addition to possible en-

138. *Id.* at 110-11.

139. *Id.* at 154-55.

140. *Id.* at 155. See also Sarah E. Redfield, *Chemical Trespass*, 73 Ky. L.J. 855, 857 (1985).

141. STICKNEY, *supra* note 2, at 154.

142. 7 U.S.C. §§ 136-136y (1988 & Supp. III 1991). "The term 'pesticide' means (1) any substance or mixture of substances intended for preventing, destroying, repelling, mitigating any pest, and (2) any substance or mixture of sub-

dangerment of the stock, an aquaculturist who does not follow the directions may be liable for criminal penalties.¹⁴³

Further, aquaculturists should be aware that chemical drift or runoff can create an action of chemical trespass against the party from whose property the chemicals flowed.¹⁴⁴ While successful prosecution under the theory of chemical trespass can provide the injured aquaculturist with a remedy, it can also be used against an aquaculturist for contaminating the pond of another. In addition, chemical drift or runoff could result in an action for private nuisance.¹⁴⁵

2. *Restrictions on Commerce*

In addition to restrictions on the use of certain chemicals, states and the federal government also have laws that require food products to be safe if they are to travel in commerce. The federal government's power over interstate commerce gives it the preeminent role in this area, but states have followed that lead by modeling their rules after the federal statutes.

The Food, Drug, and Cosmetic Act (FDCA)¹⁴⁶ regulates aquaculture food products by prohibiting contaminated or adulterated food from traveling in interstate commerce.¹⁴⁷ FDCA's definition of "adulterated" includes fish products that contain chemical residue in amounts beyond a level that is considered safe.¹⁴⁸ Transporters of adulterated food are subject to criminal sanctions, even if they were unaware of the violation.¹⁴⁹

stances intended for use as a plant regulator, defoliant, or desiccant" *Id.* at § 136(u). "[P]lant regulator means any substance or mixture of substances intended, through physiological action, for accelerating or retarding the rate of growth or rate of maturation, or for otherwise altering the behavior of plants or the produce thereof" *Id.* at § 136(v).

143. 7 U.S.C. § 136l (1988 & Supp. III 1991). While the penalties vary depending on the type of infraction, private applicators generally face fines of up to \$1,000 and up to 30 days in prison per violation. *Id.*

144. *See generally* Redfield, *supra* note 140, at 855-58. Drift control regulation is primarily a matter of state law. *Id.* at 860.

145. *See* Ronald J. Rychlak, *Common-Law Remedies for Environmental Wrongs: The Role of Private Nuisance*, 59 Miss. L. J. 657 (1989).

146. 21 U.S.C. §§ 1-695 (1988 & Supp. III 1991).

147. *Id.* § 342. *See also id.* § 331 (listing prohibited acts under FDCA).

148. *Id.* § 346a.

149. *United States v. Dotterweich*, 320 U.S. 277 (1943) (interpreting FDCA as

In order to detect chemical residue or chemical contamination, the aquaculturist must screen the product during the food processing stage.¹⁵⁰ Without a mandatory seafood inspection program that tests for chemical residue, such as those in the beef and poultry industries, the aquaculturist must rely on the NMFS's voluntary inspection program.¹⁵¹ Taking advantage of the voluntary program could prevent the aquaculturist from being subject to fines, imprisonment, or both for violating FDCA.¹⁵²

Despite the federal government's dominant role in food quality control, reductions in federal staff and budgets along with deregulation of some programs have forced states to play a more active role in the enforcement of food quality controls.¹⁵³ It is not uncommon for state regulations to be modeled after federal statutes, creating a more comprehensive and cooperative state-federal effort.¹⁵⁴

At least forty-five states, including Florida, Maryland, and South Carolina,¹⁵⁵ have enacted statutory schemes modeled after FDCA.¹⁵⁶ Sanctions for violating these state statutes are also modeled after the FDCA penalties and include injunctions, civil sanctions, and criminal sanctions.¹⁵⁷ Because of the variation among the state laws, the aquaculturist must carefully check the applicable state statutes.

a strict liability statute).

150. See generally Clausen Ely, Jr., *Regulation of Pesticide Residues in Food: Addressing the Critical Issues*, 40 FOOD DRUG COSM. L. J. 494 (1985) (discussing factors to be considered in regulating pesticide uses for food production).

151. See *infra* notes 184-188 and accompanying text.

152. 21 U.S.C. § 333 (1988 & Supp. III 1991). See generally Barbara E. Chernoff, *Federal Food and Drug Act Violations*, 26 AM. CRIM. L. REV. 843 (1989).

153. Norman E. Kirschbaum, *Role of State Government in the Regulation of Food and Drugs*, 38 FOOD DRUG COSM. L. J. 199 (1983).

154. The Mississippi Pesticide Law of 1975 follows the federal lead by requiring registration of every pesticide "distributed, sold, . . . offered for sale . . . or transported within the state;" registration of pesticide dealers; and state certification of applicators. MISS. CODE ANN. § 69-23-7 (1991).

155. FLA. STAT. § 500.02 (1988); MD. HEALTH-GEN. CODE ANN. § 21-101 to -1215 (1990 & Supp. 1991); S.C. CODE ANN. § 39-25-90 (Law. Co-op. 1988).

156. Kirschbaum, *supra* note 153, at 200. At least 80 percent of these states update their laws to include amendments to the federal laws. *Id.*

157. *E.g.*, S.C. CODE ANN. § 39-25-50 (Law. Co-op. 1985).

B. Limitations on Approved Drugs

Like any farming operation, aquaculturists must protect their stock from disease if they are to profit and prosper. Unfortunately, aquaculturists have a limited number of medicines which can be utilized to fight disease. This problem is exacerbated because fish raised for human consumption can only be treated with a limited variety of chemicals and antibiotics that have been approved by the Food and Drug Administration (FDA).¹⁵⁸ At present, there are only two available antibiotics and one topical treatment approved by FDA for the treatment of food fish diseases.¹⁵⁹ The FDA's registration requirement for all drugs used in the prevention and control of diseases and parasites has contributed to this scarcity.¹⁶⁰ Registering a "new animal drug"¹⁶¹ takes a great deal of time and money for research and testing. Fish, unlike many terrestrial farm animals, do not generate the high return on a drug company's research investment that would warrant the time and money required for research and testing.¹⁶² Considering the attention now being given to expedite the approval process of human drugs,¹⁶³ it may be reasonable for the aquaculture industry to lobby for an expedited process for new animal drugs and additional financial incentives for drug and

158. John A. Plumb, *How to Bring Up Cultured Catfish*, in U.S. DEP'T AGRICULTURE, 1984 Y.B. AGRIC. ANIMALS AND PETS 336 (Dep't. of Agric.).

159. JURI HOMZIAK, MISSISSIPPI STATE UNIV., ENVIRONMENTAL GUIDELINES FOR SITE SELECTION, OPERATION, & MONITORING OF OFFSHORE AQUACULTURE IN MISSISSIPPI COASTAL WATERS 33 (1992) (available from Mississippi Bureau of Marine Resources). Mr. Homziak identifies three antibiotics, including sulfamerazine (which is no longer marketed), Romet 30, and Oxytetracycline. *Id.* The one topical chemical is Formalin. *Id.* It should be noted that additional efforts to help the aquaculturist in the prevention of fish disease are being undertaken by the Department of Agriculture through research of fish "vaccines," which are not regulated by the FDA.

160. See 21 U.S.C. § 360(b) (Supp. III 1991).

161. A "new animal drug" is defined to include "any drug intended for use for animals other than man, including any drug intended for use in animal feed . . ." 21 U.S.C. § 321(w) (1982 and Supp. III 1991).

162. See STICKNEY, *supra* note 2, at 267-68.

163. "The Food and Drug Administration plans to implement the most sweeping changes in the drug-approval process in 30 years, including letting private contractors review applications to market new drugs, lifting key regulations governing pharmaceutical research and creating an approval 'fast track' for drugs intended to treat life-threatening illnesses." Malcolm Gladwell, *FDA to Change Rules to Speed Up Review of New Drugs*, SEATTLE TIMES, Nov. 8, 1991, at B2.

chemical companies to invest in necessary research and development. State regulation in this area is overshadowed by the federal registration and approval requirements, leaving state regulation primarily to mirror or reference federal law.

C. *Processing the Food Product*

Aquaculturists whose operations include processing facilities must comply with federal and state seafood processing regulations that are designed to ensure that the food product is fit for human consumption. While current federal standards are not strict,¹⁶⁴ the recent growth in the seafood industry has focused consumer concern on the shortcomings of the current fish and shellfish inspection programs.¹⁶⁵ There is now a strong possibility that federal inspection standards will be strengthened in the near future.¹⁶⁶ Moreover, individual states have created programs to help fill the gaps in the current federal program. This has created a "patchwork of federal and state agencies attempting to address only some limited aspects of seafood safety."¹⁶⁷

1. *Federal Seafood Regulations*

The federal government currently does not have a comprehensive federal seafood inspection process.¹⁶⁸ In fact, "[f]ish is the

164. One critic has noted:

Much of the inspection in place today focuses on visible plant or store deficiencies, such as dirty walls and floors and the lack of paper towels in employee restrooms. While important, these problems have little to do with whether a fish is laced with PCBs or methylmercury or whether disease-causing bacteria are present.

Why Doesn't the U.S. Inspect More Fish?, CONSUMER REPORTS, Feb. 1992, at 113.

165. See, e.g., Laura Murray, *Making the Grade*, 23 TEX. SHORES 16, 19 (1990).

166. See Leon Jaroff, *Is Your Fish Really Foul?*, TIME, June 29, 1992, at 70, 71. See also *Is Our Fish Fit To Eat?*, CONSUMER REPORTS, Feb. 1992, at 103 (providing the alarming results of a six month investigation into the quality of fresh seafood and calling for stricter controls).

167. Murray, *supra* note 165, at 19 (citing U.S. Rep. E. "Kika" de la Garza).

168. In 1967, after Congress enacted the Wholesome Meat Act, 21 U.S.C. §§ 601-624 (1982 & Supp. III 1991), a bill was introduced providing for similar inspections of fish food products. Hearings were conducted in 1967, 1968, 1969, 1971, and 1974, but when a primary sponsor died in 1976, the push for a seafood inspection program disappeared until 1990. *Why Doesn't the U.S. Inspect More Fish?*, *supra* note 164, at 113.

only flesh food not subject to a comprehensive, mandatory inspection program."¹⁶⁹ Consumer groups and the aquaculture industry itself, however, have recently begun lobbying for an inspection program.¹⁷⁰

Over the past few years, each House of Congress has considered several bills to establish a comprehensive mandatory seafood inspection program.¹⁷¹ Most of these bills call for a system of inspections known as the Hazard Analysis and Critical Control Point method (HACCP) which stresses preventing problems rather than seeking out already contaminated or adulterated products.¹⁷² Instead of testing the quality of the final product, this program would emphasize testing at critical control points.¹⁷³ The bills have differed, however, as to which phases of the seafood marketing system would be covered.¹⁷⁴ The bills also differ as to the appropriate agency to administer the program. Fish processors want the U.S. Department of Agriculture (USDA) to administer the program, but many consumer groups would prefer that the program be administered by the FDA.¹⁷⁵ Others have suggested that the Department of Commerce's NMFS¹⁷⁶ should be in charge.¹⁷⁷ There are also disputes as to the proper inspection process, the types of tests that should be performed and the source of the funding.¹⁷⁸ Perhaps due to these differences, all recent efforts have failed to survive the conference committee process.¹⁷⁹

169. Murray, *supra* note 165, at 19 (citing U.S. Rep. E. "Kika" de la Garza).

170. David J. Harvey, *Seafood Inspection—Finally a Possibility*, in AQUA-5, *supra* note 12, at 37 (noting that the seafood industry wants an inspection program as a method of building consumer confidence); *Is Our Fish Fit to Eat?*, *supra* note 166 (the Consumers Union calling for more inspections). See also Jaroff, *supra* note 166, at 70 (professional chefs want better seafood inspection).

171. AQUA-5, *supra* note 12, at 37. See also Brian E. Perkins, *An Overview of Proposed Federal Seafood Inspection Legislation*, 9 WATER LOG 3 (1989); Brian E. Perkins, *An Update on the Issues of Seafood Safety and Inspection*, 11 WATER LOG 3 (1991).

172. AQUA-5, *supra* note 12, at 37.

173. *Id.*

174. *Id.*

175. *Why Doesn't the U.S. Inspect More Fish?*, *supra* note 164, at 113.

176. W. STEVEN OTWELL, FLORIDA SEA GRANT COLLEGE PROGRAM, REP. NO. 72, FLORIDA SEAFOOD REGULATIONS AND REGULATORS 9 (1984).

177. AQUA-5, *supra* note 12, at 37.

178. AQUA-5, *supra* note 12, at 37.

179. Interview with David Harvey, USDA, Commodity Economics Div., Eco-

The FDA has an inspection process, but it is "starved for money,"¹⁸⁰ and inspects seafood plants infrequently.¹⁸¹ In 1989, the FDA checked 1604 fish samples for contaminants while the USDA inspected 185,000 samples of meat and poultry that same year.¹⁸² Moreover, the FDA does not have the authority to compel the plants to keep records of temperature and storage conditions, nor does it inspect vessels or retail stores.¹⁸³

The NMFS administers a voluntary fee based inspection program.¹⁸⁴ At present, approximately five percent of the seafood processors in the country, representing twenty percent of the fish consumed, participate.¹⁸⁵ The NMFS volunteer inspection program checks seafood processors for seafood quality, quantity and safety.¹⁸⁶ In addition to helping the processors gain consumer confidence in the quality of the seafood,¹⁸⁷ this inspection program is required of seafood suppliers to U.S. military facilities.¹⁸⁸

The NMFS and the USDA have also recently agreed to operate a trial program under a Memorandum of Understanding.¹⁸⁹ However, jurisdictional and funding issues have not yet been resolved. Whatever method ultimately is adopted, the aquaculture industry is likely to have an inspection process in the near future.¹⁹⁰

nomie Research Serv., Washington, D.C. (April 4, 1991).

180. *Why Doesn't the U.S. Inspect More Fish?*, *supra* note 164, at 113.

181. *Id.* (FDA inspects Seafood plants only about once every four years). *But see Jaroff, supra* note 166, at 71 (FDA inspects only about one third of the processing plants once a year, skipping some for as long as two years).

182. *Why Doesn't the U.S. Inspect More Fish?*, *supra* note 164, at 113.

183. *Id.*

184. 50 C.F.R. § 260.

185. Jaroff, *supra* note 166, at 71.

186. OTWELL, *supra* note 176, at 10.

187. The Kroger grocery store chain and the Red Lobster restaurant chain have both recently advertised their voluntary compliance with this program.

188. 48 C.F.R. § 46.202-2 (1992).

189. Thomas J. Billy & Cynthia Laggett, *Seafood Safety and Inspection—An FDA Perspective*, Ninth Annual National Fishery Law Symposium, Ch.I, Nov. 15, 1991, Univ. of Washington, Seattle, Washington. This effort is known as the FDA/NOAA Co-Operative Joint Initiative.

190. *See Murray, supra* note 165, at 19.

2. State Regulations

States with significant seafood production have, to a certain extent, picked up the slack left by the federal government in assuring a safe food product. Florida law provides for two types of seafood processing inspections applicable to aquaculture processors. The first, administered by the Department of Health and Rehabilitative Services, involves an inspection to ensure conformity with sanitary requirements in facilities processing food for human consumption.¹⁹¹ The second inspection comes under the auspices of the Florida Food Act and incorporates the federal "Food and Drug Administration's guidelines concerning quality, sanitation during food processing, manufacturing, packaging, distribution and storage."¹⁹²

In Mississippi, the Catfish Institute (TCI), a business entity founded in 1986 by a group of catfish farmers for the purpose of promoting the state industry, has instituted its own inspection program known as the "Mississippi Prime Inspection Program."¹⁹³ This program, which was developed in cooperation with the Department of Commerce and the NMFS, boasts of weekly inspections to ensure retention of "high standards of processing and superior taste, appearance, and texture . . ."¹⁹⁴ Processing facilities must meet TCI program requirements in order to place the Mississippi Prime Stamp on their products; presently, only seven facilities in the state are approved.¹⁹⁵ Processors operating under the approval of TCI's program must comply with weekly inspections requirements and pass unannounced inspections by the Department of Commerce.¹⁹⁶

If federal legislation is promulgated in the near future, there will be a greater degree of uniformity in seafood product testing because federal legislation will supplant the varied state tests. For the near future, however, aquaculturists who process their own products into food will have to look to their state regulations for guidance.

191. FLA. STAT. ANN. § 381.031 (West 1983).

192. *Id.* § 570.44. These inspections are carried out by the Florida Department of Agriculture and Consumer Services, Division of Inspections. *Id.*

193. THE CATFISH INSTITUTE, FACT SHEET #2 at 1 (on file with authors).

194. *Id.*

195. *Id.*

196. *Id.* at 2.

V. CONCLUSION

This Article largely has been devoted to identifying legal problem areas and concerns of modern aquaculture operations. These concerns are based on numerous factors, including the local economy, human health, availability and protection of natural resources, and the adaptability of the area for various uses. The modern aquaculturist must satisfy a myriad of state, federal, and local regulations which differ from jurisdiction to jurisdiction, and an aquaculturist will need to carefully research laws applicable to the area of operation. Still, even though aspects of aquacultural operations are coming under increasing regulation, the industry is rapidly growing. With assistance from the states and federal government, the vital resources can be protected and the industry can remain strong well into the future. The course has been charted; all that remains is navigation.