

Aquaculture White Paper No. 5
NRAC Publication No. 03-005

A Review of Legal and Policy Constraints To Aquaculture in the US Northeast

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September 2003

A REVIEW OF LEGAL AND POLICY CONSTRAINTS TO AQUACULTURE IN THE US NORTHEAST

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Acknowledgements: We thank Dr. Tom Jamir and the NRAC staff for their help in the preparation of this document. We acknowledge the candid contributions of the many unnamed industry participants and government officials who provided us with insights on the issues constraining the aquaculture industry in the US Northeast.

Cover photo: Ortho photo of Wellfleet Harbor, an important shellfish growing area on Cape Cod, Massachusetts. Source: Geo-Image Library for the Massachusetts Coast, <http://coast.mit.edu/> (last accessed on 25 September 2003). Copyright © 1998 Massachusetts Institute of Technology.

States vary widely in their sea-bottom leasing or rental practices, and in many States exclusive use of water areas is not permitted. To many qualified observers, it is these legal and institutional problems which are the greatest barrier to a viable commercial aquaculture program in the United States today.

Stratton Commission (1969)

Aquaculture resembles agriculture rather than fisheries in that it presumes ownership or leased rights to such bases of production as ponds or portions of, or sites in, bays or other large bodies of water. . . . Combinations of biological and engineering skills are necessary for full exploitation of aquacultural potentials; these are only partially realized because economic incentives may be lacking to tend aquatic organisms rather than to secure them from wild stocks, because of social, cultural, and political constraints.

Professor John E. Bardach (1968)

I. Introduction

Throughout the northeastern United States, aquaculture operators face a wide variety of laws and regulations that govern the manner in which they plan, site, and operate aquaculture facilities. Many local, state, and federal laws and regulations have been designed to enable aquaculture to exist as a viable industry and to flourish. It is obvious that aquaculture cannot be conducted in the absence of a legal system that establishes property rights, provides a means for the enforcement of these rights, and ensures the safety of the product for consumers.

Although a legal framework is necessary for aquaculture to exist as an industry, there are many instances where uninformed, outdated, or inappropriate regulatory regimes impede aquaculture development (DoC 1999; MCZM 1995; Ewart *et al.* 1995; Rychlak and Peel 1993; Bye 1990; DeVoe and Mount 1989; Kennedy and Breisch 1983; NRC 1978). Inconsistencies in the law can lead to an uncertain legal environment for aquaculturists.¹ Regulators are put in the conflicting position of promoting the development of the industry and regulating its effect on other uses of the land and sea (DeVoe 1999; NRC 1992). Operators are sometimes forced to undertake activities while lacking adequate information or a complete understanding of laws and regulations. Conflicts and concerns often may be left unresolved until an issue is brought before an adjudicatory body. Legal constraints such as these detract from the stability and certainty that otherwise would facilitate sustainable aquaculture development, slowing or halting the growth of the industry, or perhaps even leading to its decline. Such constraints make the statements quoted above as true today as they were 35 years ago.

Policies that both facilitate and constrain aquaculture have been reviewed by a number of commentators (McCoy 2000; Brennan 1999; Barr 1997; Reiser and Bunsick 1999; Reiser 1997; Hopkins *et al.* 1997; Rychlak and Peel 1993; Eichenberg and Vestal 1992; Wildsmith 1982; Kane 1970). In 1981, the US Fish and Wildlife Service sponsored a comprehensive review of aquaculture regulation across the nation (the "Aspen Report"). The report's authors identified at least 120 federal laws that, at that time, either directly (50 laws) or indirectly (70 laws) affected aquaculture. Further, the authors found more than 1,200 statutes regulating aquaculture in 32

¹ For example, Ewart *et al.* (1995) observe that inconsistencies among state effluent discharge policies often are cited as a legal constraint to the development of aquaculture.

states (ASC 1981). An important finding of the Aspen Report was that aquaculture businesses must obtain at least 30 permits, on average, in order to site and operate their businesses. McCoy (2000) concludes from his review of the Aspen Report and other studies that aquaculture may be the most highly regulated industry in America.² In its responses to periodic surveys of constraining factors, the industry seems to agree with McCoy by consistently ranking legal and regulatory constraints near the top of the list of factors.

Wypyszinski *et al.* (1992) begin to assemble the body of law relating to marine aquaculture in the US Northeast, although their work remains unfinished due to insufficient resources. A number of excellent analyses emerged from that effort, including a study of the public trust doctrine by Eichenberg and Vestal (1992) and a study of “reverse regulation” of the oyster industry in Long Island Sound.³

Here we examine a range of aquaculture policies in an effort to identify those laws and regulations that may impede development unnecessarily within the northeastern United States. Through a survey of industry and government officials and a review of the literature, we find that specific laws and policies or the *absence* of laws and policies can be argued to impose constraints on growth in certain segments of the industry.

II. Methods

This White Paper incorporates information obtained from three main sources. First, as soon as the White Paper team was assembled, we drafted two survey instruments (please see the Appendices) to gather information as quickly and efficiently as possible from both the industry and from state aquaculture coordinators (or from the relevant state regulators). Second, we reviewed the published and topical literatures to identify research on legal constraints to aquaculture development and to find discussions or news reports about more recent issues.⁴ Third, we conducted a limited number of telephone interviews with experts from both industry and government.⁵

Part of our charge has been to identify the universe of laws and regulations pertaining to aquaculture, including policies that both promote and constrain the industry. We have developed a database of state statutes and case law (available from the authors upon request). We discuss briefly some of the promotional efforts that have been undertaken at the state level in recent years before focusing our attention in greater detail on the legal constraints.

²Such conclusions are common in published commentary about the aquaculture industry in the United States. We are unaware of any analytical study, however, comparing regulation across industries to assess the extent to which one industry may be more regulated than another.

³The term “reverse regulation” refers to the situation where one industry or activity must curtail or terminate its operations because of the external effects of another industry or activity. In the case of shellfish culturing, public safety regulations limit production when pathogen levels, which result from non-aquaculture activities, exceed a specified health standard.

⁴The published literature is listed in the references section at the end of this white paper. The topical literature we reviewed included *Fish Farming News*, *Aquaculture Magazine*, and *World Aquaculture*. We reviewed issues of these journals dating back to 2000.

⁵We treat all survey responses and personal communications with the industry as proprietary and confidential.

We consider the identification and brief description of specific legal constraints to be the most important part of this charge. In Table 1, we present an organizing framework that is extended from the work of Wypyszinski *et al.* (1992). General categories of legal issues are listed in the leftmost column. Broad geographical/technological categories are listed as headings for each row. The numbers in the table correspond to the ranking (from 1 to 11) of legal constraints that we discuss in greater detail below.

We note that the survey cannot be considered to be an unbiased sampling of industry opinion. The survey was executed under a very tight time constraint, and there has been little time to follow up on non-respondents. The responses to surveys are presented in Table 2. We are unable to report a response rate, because many of the surveys were distributed by state aquaculture extension agents to their own confidential list of industry participants. To a large extent, the survey responses are “validated” with our review of the literature, some limited telephone interviews, and our own personal knowledge of the issues. As a consequence of the limited, self-selected nature of the survey responses, the ranking of legal constraints that is derived from the survey responses and that we present below should be regarded as somewhat subjective. Nevertheless, we consider the identification and ranking of the issues to be an important first step for organizing industry efforts to reduce or remove the constraints.

We use the industry survey results to help establish a ranking of legal constraints to aquaculture development. We assume that the purpose of such a ranking is to establish priorities for efforts by NRAC and other industry participants to modify the relevant policies so that these constraints can be mitigated or removed. The development of strategies to modify constraining policies is the logical next step, but the identification and characterization of such strategies is beyond the scope of this White Paper.⁶ We note, however, that the most effective approach may depend upon the ease with which specific policies can be changed. Thus, a policy that is highly ranked as a legal constraint (*e.g.*, the public trust doctrine in certain states) might be extremely difficult to change. As a consequence, such a policy might be ranked lower than one that is more easily modified.

A caveat for the reader relates to the organization of the northeastern “aquaculture industry,” which in reality is a set of markets that may or may not be closely linked or even share technological approaches. Typically, we conceptualize the structure of a market as a “vertical” flow of product from hatchery to growout to the downstream activities of processing, distribution, and final retail sale to the consumer. Firms may or may not be vertically integrated from production through retail. A number of separate markets exist for individual species of fish or shellfish. Some of these markets may be closely related; for example, blue mussels and hard clams are economic substitutes. Others may be very distinct, as baitfish are not close substitutes for farm-raised trout. Another cross-cutting issue concerns production technologies, which might be similar across markets but could differ within the same market.

All of these factors could influence the extent to which a particular law or policy is perceived as a constraint. As a hypothetical example, a firm that processes cultured shellfish might like to see more farm production, which would reduce the price that it pays for raw product. Thus, this firm,

⁶ Part of the charge to our group is to suggest how NRAC-funded research could help surmount each constraint. We believe that the responsibility of NRAC and the industry is to develop a strategy for reducing or removing constraining policies. Additional research may or may not be a component of such a strategy, and the potential for research to contribute to any strategy should be assessed during strategy development.

situated downstream in the processing sector of the industry, might argue that riparian rights limiting the number of tideland leases are a clear constraint to industry development.⁷ On the other hand, firms with existing leaseholds might prefer that it be difficult for competitors to obtain access to additional areas because more production could reduce their own revenues. The extent to which these considerations are valid depends upon competition in the market, *i.e.*, are producers price-takers who are selling their product at marginal cost? These are the kinds of issues that should be kept in mind when thinking about the extent to which laws and regulations are truly constraints in a broadly defined US northeastern aquaculture industry.

III. Policies that Facilitate Aquaculture Growth and Expansion

It is obvious that aquaculture cannot take place in a policy vacuum. For example, some analysts have pointed to the *absence* of a federal policy for open-ocean aquaculture in the US exclusive economic zone (EEZ) as a significant constraint on the development of an offshore industry (Brennan 1999; DoC 1999). Clearly, legal rules that establish and enforce private property rights are critical to the development of the industry both onshore and offshore (Hoagland *et al.* 2003). Other policies, including those that encourage R&D, curb degradation of water quality, and promote public health also must be seen as contributing to the development of the industry.

While some laws and regulations may be deemed as constraining factors, others work to foster a natural environment in which aquaculture operations can grow. Salient examples at the state level include interagency coordination, technical assistance, sponsorship of R&D efforts, marketing assistance, and other forms of industry promotion (Jarvinen and Magnusson 2000). For example, Jarvinen (2000) finds that public sector financing has promoted the development of aquaculture technology and leads to the sharing and diversification of aquaculture investment risks.

Lead Agencies and Formal Guidance

In light of the fact that aquaculture operations, because of their nature, fall under the legal and regulatory jurisdiction of multiple agencies (agriculture, environmental protection, public land management, coastal or marine resources, *etc.*), states ordinarily designate one state agency as the “lead” agency. Such designation directs existing and prospective operators to a “liaison” or starting point agency that will then direct the operators toward or through the relevant regulatory regime governing the particular type of aquaculture operation. Most states also have created inter-agency coordinating committees or task forces to facilitate multi-agency jurisdictional issues.

In Connecticut, lawmakers have established an Interagency Aquaculture Coordinating Committee comprised of the departments of agriculture, environmental protection, consumer protection, and economic development to provide for the development and enhancement of aquaculture in that state.⁸ The Commissioner of Agriculture serves as chairperson of the coordinating committee. Similarly, Delaware established an Aquaculture Council to examine the legal and regulatory structure governing aquaculture activities and make recommendations to “simplify regulatory processes or otherwise enhance the regulatory climate with respect to the efficient siting and

⁷ This example is drawn from personal communications with market participants in the northeast oyster growing industry.

⁸ CT Gen. Stat. Ch. 422 § 22-11e.

operation of aquaculture” activities.⁹ The legal framework governing aquaculture operations in Maryland includes the authorization of a lead ‘aquaculture’ agency (the state department of agriculture), the designation of the University of Maryland as the state’s lead agency for research in aquaculture production, and the establishment of an aquaculture advisory committee charged with the responsibility of “formulat[ing] and mak[ing] proposals for advancing Maryland aquaculture.”¹⁰

In an effort to assist prospective aquaculture operators, Massachusetts state authorities constructed a guidance document designed to answer the question: “What permits will my aquaculture operation require?”¹¹ Massachusetts has also created a three-center network to assist the aquaculture industry. This network carries out programs to assist industry members with cultivation, business, and marketing skills.

Pennsylvania’s Aquaculture Advisory Committee¹² was established to encourage, *inter alia*, long-term investment by reducing the number of agencies involved (by transferring most authority to the Department of Agriculture) and including aquaculture in promotional and economic developmental programs that are available to other industry sectors.¹³ As the lead agency, Pennsylvania’s agriculture department was also directed to “develop a plan to promote and develop aquacultural industry.”¹⁴ In an effort to monitor the health of the industry, Pennsylvania also calls for a biennial survey of the industry itself.¹⁵

In 1988, lawmakers in Maine established an Aquaculture Innovation Center (MAIC) designed to promote the development of a variety of aquaculture operations in the state.¹⁶ The aquaculture “industry” in Maine comprises salmon, trout, mussels, softshell clams, and oyster operations. The center has also identified other species as potentially viable (halibut, clams, groundfish, urchins and scallops). The center supports aquaculture by bringing experts in business and science together with the state’s Commissioner of Economic and Community Development, the Maine International Trade Center, and the Maine Technology Institute. MAIC also funds technological development projects.¹⁷ Delaware calls on the state’s Department of Agriculture to “develop and implement a technical assistance and marketing program to assist owners and operators of aquacultural facilities and to promote Delaware aquaculture products.”¹⁸ The Maryland Industrial Partnership (MIPS) program was developed to fund innovation in aquaculture, among

⁹ 3 De. C. § 405.

¹⁰ MD AGRIC § 10-1301 to 10-1302.

¹¹ Massachusetts Aquaculture Permit Guidance Document (Massachusetts Department of Food and Agriculture--Aquaculture Coordinators Office - Massachusetts Aquaculture Advisory Group 1998)

¹² PA ST 3 Pa.C.S.A. § 4216.

¹³ PA ST 3 Pa.C.S.A. § 4202.

¹⁴ PA ST 3 Pa.C.S.A. § 4215.

¹⁵ PA ST 3 Pa.C.S.A. § 4217.

¹⁶ 5 M.R.S.A. § 13141.

¹⁷ See <http://www.maineaquaculture.org/>

¹⁸ 3 De. C. § 404.

other industries. MIPS teams scientists with businessmen to solve targeted industry problems. These state-funded partnerships have greatly assisted Maryland's aquaculture industry.

Like many other states, New Jersey established an advisory body in the form of an Aquaculture Advisory Council within the state department of agriculture.¹⁹ The state also created a distinct Aquaculture Task Force to "define the roles of the various concerned state agencies in carrying out a permanent program to promote the development of an aquaculture program."²⁰ Similar efforts to designate coordinating agencies and establish aquaculture development efforts exist in other NRAC states.

Water Quality

Most northeastern states have revised their water quality protection laws to take into account specifically the environmental effects that state-run or state-permitted projects may have on areas that support aquaculture operations (Ewart *et al.* 1995). As a consequence, proponents of a wide range of development projects must demonstrate that such projects will not significantly impact water quality for aquaculture operations.

Information and Technology Transfer Efforts

In Rhode Island, the recent development of a state aquaculture extension program has provided opportunities for technology transfer and problem solving for the industry. All northeastern states employ the time and resources of agricultural or marine resource extension services personnel to address questions and concerns on aquaculture issues. In Connecticut, the Bureau of Aquaculture located in the Department of Agriculture promotes the aquaculture industry. Industry members have benefited from strong shellfish pathology and water quality monitoring programs. NRAC itself has a strong aquaculture extension network in the northeastern United States. Extension personnel develop educational programs on priority topics identified by industry and facilitate technology transfer between NRAC funded researchers and the aquaculture industry.

Tax Treatment, Property Protection, and Land Use Policies

A number of states grant favorable tax treatment to aquaculture operations in the form of exemptions from sales or use taxes.²¹ Some northeast states have instituted specific civil or criminal penalties for trespass on aquaculture areas or damage to aquaculture operations.²² States

¹⁹ NJ ST 4:27-5(a).

²⁰ NJ ST NJ ST 23:2B-10.

²¹ See e.g., RI ST § 20-10-3.1 Sales and use tax exemption.

Any person engaging in aquaculture shall be eligible for the tax exemption in § 44-18-30(33) provided that the requirements set forth in that section are met. Id.;

NJ ST 54:32B-8.16(a)

Receipts from sales of tangible personal property and production and conservation services to a farmer for use and consumption directly and primarily in the production, handling and preservation for sale of agricultural [including aquacultural] or horticultural commodities at the farming enterprise of that farmer are exempt from the tax imposed under the "Sales and Use Tax Act." Id.;

See also, 36 M.R.S.A. § 2013. Refund of sales tax on depreciable machinery and equipment purchases [including aquacultural equipment]; MD TAX GENERAL § 10-724(b) (individual may claim a credit against the State income tax in an amount equal to 100% of the purchase price of aquaculture oyster floats).

²² RI ST § 20-10-16 Penalties.

also may promote aquaculture production specifically via zoning designation regulations or waterfront revitalization programs.²³

IV. Policies that Constrain Aquaculture Growth and Expansion

Recent research findings in the legal and social sciences literature indicate that the regulatory and policy constraints on freshwater and marine aquaculture development relate directly to the socio-economic concerns of coastal and traditional fishing community members, as well as the physical, chemical, and biological capacities of prospective development sites. Some of the recurring barriers identified by legal and policy analysts (Reiser 1997; NRC 1978) over the course of the last 25 years include:

- the limited availability of property rights or other interests that can secure a producer's investment;
- poorly defined or enforced standards (*e.g.*, water quality) that fail to reduce conflicts among competing resource users;
- poorly defined agency jurisdictions and responsibilities, leading to delays in defining applicable standards or regulations or in taking actions, such as permit issuance;
- the existence of redundant regulations due to overlapping agency responsibilities;
- inappropriate application of restrictions designed to protect wild stocks (*e.g.*, size limits).²⁴

Aquaculture operators seek clearly defined property interests. A reasonable contention is that effective aquaculture development depends on the ability of individuals to secure financing, which in turn is related directly to the ability of prospective developers to identify their legal

(b) Any person damaging, disturbing, or interfering with any area subject to an aquaculture permit or any person damaging, disturbing, interfering, or taking by any means whatsoever, or possessing the cultivated species in an area subject to an aquaculture permit, without the permission of the permittee, is guilty of a misdemeanor and subject to imprisonment not exceeding one year or a fine of not more than one thousand dollars (\$1,000), or both. In addition to that fine and/or imprisonment, all vessels, dredges, tongs, rakes, and other implements used to damage, disturb, interfere, or take cultivated species in those areas may be forfeited to the state. *Id.*

²³ See *e.g.*, RI ST § 45-24-30 (6).

General purposes of zoning ordinances.

Zoning regulations shall be developed and maintained in accordance with a comprehensive plan prepared, adopted, and as may be amended, in accordance with chapter 22.2 of this title and shall be designed to address the following purposes . . . Providing for the preservation and promotion of agricultural production, forest, silviculture, aquaculture, timber resources, and open space. *Id.*

See also, NY EXEC § 915 (5) (re: waterfront revitalization programs)

local government waterfront revitalization program [may be eligible for program benefits where the local program supports] . . . waterborne transportation facilities and services, and support facilities for commercial fishing and aquaculture. *Id.*

²⁴ Rieser (1997) citing NRC (1978).

interests in areas and resources that may serve as collateral. Public concerns include a general wariness of government-led efforts that are perceived as creating or reallocating property rights or interests in public water areas or resources. Particular concerns are raised by historical users of public waterways and tidelands.

Vestal (1999) points out the direct contrast between the agricultural concepts of exclusive use (sought by aquaculture operators) and the open access/multiple use policies that have applied to public waterways historically and that invariably invite conflict. Yet little work has been conducted on the means by which marine and land-based aquaculture developers might gain the requisite financing by pledging legally valid aquaculture-related property interests as security. Some commentators have indicated that even the legal interest in profits resulting from aquaculture development are insufficiently acknowledged (DoC 1999).

While there has been no talk by state or federal governments of conveying away complete and exclusive rights in the ocean to aquaculture development, certain legal interests (leasehold terms of limited duration, *etc.*) could be utilized to establish identifiable interests and serve to address the requirements of financing institutions.²⁵ Corollary to those rights, legal responsibilities should be clearly identified to address the concerns of other stakeholders.

Efforts to establish regulatory operating environments within which aquaculture might take place have led to the creation of Hydra-like legal regimes. Some researchers are working on the development of technologies and the design of institutions to streamline siting and regulatory processes. Yet, jurisdictional overlap, redundancy, and buck-passing continue to be cited as factors frustrating aquaculture development.

Federal, state, and local laws and policies that constrain or fail to mitigate impediments to aquaculture operations may in fact prevent future growth and expansion of the industry. Wypyszinski *et al.* (1992) note that: “[s]tate statutory and case law is generally very state- and situation-specific, and a range of use conflicts may arise between non-aquaculturists and aquaculturists, including: visual impact; economic (diminution in value) impact to proximate property owners; and alienation of public trust lands.” In addition to those conflicts, new disputes have arisen over the course of the last twelve years that indicate the current legal and regulatory framework constrains aquaculture development.

In what follows, we use the results of the surveys to rank the leading policy and regulatory constraints to aquaculture in the Northeast. Brief descriptions of these issues follow. A number of other issues with some potential to cause constraint were identified by the northeastern aquaculture industry, including fallowing requirements (*e.g.*, salmon net pens in Maine); the management of natural hazards and risk assessments (*e.g.*, the bonding of leases on which structures have been installed in most coastal states); and organic certification requirements (*e.g.*, Connecticut shellfish growers are unable to obtain USDA organic certification under current guidelines).

²⁵ White Paper team member Professor John Duff is currently researching legal attributes of aquaculture property interests pursuant to a NOAA National Marine Aquaculture Initiative grant. Results of that research will be available later in 2003.

1. Administrative and Jurisdictional Overlaps

In areas of nearshore marine aquaculture, regulatory jurisdiction falls under the aegis of multiple local, state, and federal agencies. Because many states recognize aquaculture as a form of agriculture, regulatory control falls within the state agriculture department; however, these departments may not have jurisdiction over the public lands where much aquaculture takes place. Public lands management typically falls under the authority of the state department of environmental protection (or management or conservation, *etc.*). The regulatory picture becomes even cloudier when towns or counties are accorded jurisdiction over local waters. Confusion over administrative policies can lead to delays in permit granting and subsequent loss of revenue to the grower.

It is important to recognize that criticisms of administrative overlaps sometimes are inapt in that there may be no explicit “overlap” in the strict sense of two agencies regulating the same activity. In discussions with both industry participants and government officials, we have found that the term “overlap” often is used in a general sense to connote the complexity of regulation and the confusion that is the predictable consequence of that complexity.

A review of state statutes governing the designation of aquaculture “lead agencies” suggests that northeast states have made substantial efforts in recent years to respond to concerns about jurisdictional overlap. The recurring identification of administrative overlap as an industry impediment may be one of perception as much as effect. Nonetheless perceptions may have real impacts and, as such, states might consider efforts that would characterize aquaculture-related laws and regulations as residing in one “place.”

2. Leasing, Tenure, and Permitting Policies – Private and Public Rights

Coastal and marine-based aquaculture operations must deal with the complexity of utilizing what are considered the “public trust” resources, *i.e.*, state intertidal and sub-tidal lands, “great ponds” (in the case of Massachusetts and Maine), and state water columns. The doctrine itself dates back to the Roman Code of Justinian and was adopted as a legal principle by English sovereigns. As a doctrine of English common law, the rule was retained by the United States upon gaining independence. Simply put, certain public lands (tidelands and coastal waters) are deemed so important to the general public, that they are held in trust by the sovereign (currently each state) for the benefit of the citizens of the state for purposes including fishing, navigation, and commerce. In some cases, public trust purposes have “evolved” to include ecological functions, public recreation, or other recognized uses (Eichenberg and Vestal 1993).

The public trust doctrine operates much like a private trust at the elemental level. There are three components to the trust: property, trustee(s), and a defined set of beneficiaries. Unlike a private trust, however, all three elements of the public trust are uniquely public in nature. The unique nature of public trust lands and the common law terms of the trust relationship generally prohibit the state as trustee from divesting the property through permanent alienation (*i.e.*, fee simple sale). Limited exceptions may apply where a state can show that a section of land being conveyed is limited so as not to disrupt the purpose of the trust while at the same time such conveyance is deemed to be in the public interest. It is important to remember that courts have

not hesitated to overturn state legislative and or executive branch actions deemed to impair substantially the public's interest in these uniquely situated trust lands.²⁶

Leasing, tenure, and permitting have become overwhelming tasks for operations involved in marine-based aquaculture in the northeastern United States. The public trust doctrine applies to state owned submerged lands out to three nautical miles, but its application varies by state. In five Atlantic states, Massachusetts, Maine, Pennsylvania, Rhode Island and Virginia, the intertidal lands (between mean high and mean low water) may be held as private property (Underwood 1997). Those private ownership rights, however, remain encumbered by the public's right to "fish, fowl and navigate" in or over them.²⁷ In Massachusetts, aquaculture is not considered one of the public trust purposes that must be accommodated.

Because of the public trust, the very spaces that are valuable for marine aquaculture operations cannot ordinarily be transferred from the state to private entities or individuals. Faced with this restriction, states are limited in the type of access they may grant to prospective aquaculturists. In most cases, marine aquaculturists may gain access and use only to sub-tidal lands and water column space in the form of permits or leases. Even where multi-year leases are granted, aquaculture activities can be restricted or revised if they interfere with other uses of the coastal zone such as recreational and commercial fishing, shipping, boating, and other types of recreation.

In the case of marine aquaculture, public rights of use and access may restrict businesses. Those most significantly impacted are shellfish and finfish operations, which utilize gear (cages, net-pens, longlines, *etc.*) in the water column that interferes with other uses of the coastal zone such as recreational and commercial fishing, shipping, and boating. In several northeast states, aquaculture is given lower priority than navigation, fishing, and most other uses of the coastal zone. The subordination of aquaculture and other "non-traditional" uses of coastal areas is evident in a number of state constitutions.²⁸ This has constrained some operations.

Some states accord a preference for certain uses of submerged lands to owners of upland property adjacent to navigable waters (riparian rights). The most important preference is a right of access by dredging, filling, or wharfing. Aquaculture may be constrained by riparian rights to the extent that these activities displace aquaculture or put aquaculturists who are non-riparian owners at a competitive disadvantage. The application of riparian rights varies by state.

²⁶ Secure Heritage, Inc. v. City of Cape May, 825 A.2d 534 N.J.Super.A.D.,2003 (public trust doctrine dictates that trust lands must be held, protected, and regulated for the common use and benefit); McQueen v. South Carolina Coastal Council, 580 S.E.2d 116 (So. Carolina 2003) (state cannot permit activity that substantially impairs the public interest in marine life, water quality, or public access); State v. Central Vermont Ry., Inc., 571 A.2d 1128 (Vt. 1990) (title to lands submerged beneath navigable waters is held by people as sovereign, in trust for public uses).

²⁷ Opinion of the Justices, 424 N.E.2d 1092 (Mass.1981) ; Bell v. Town of Wells, 557 A.2d 168 (Maine 1989).

²⁸ See e.g. RI CONST Art. 1, § 17 Fishery rights -- Shore privileges --

The people shall continue to enjoy and freely exercise all the rights of fishery, and the privileges of the shore, to which they have been heretofore entitled under the charter and usages of this state, including but not limited to fishing from the shore, the gathering of seaweed, leaving the shore to swim in the sea and passage along the shore; and they shall be secure in their rights to the use and enjoyment of the natural resources of the state with due regard for the preservation of their values. Id.

Geographic location may provide an advantage to riparian owners over the public in enjoying public trust rights. Riparian rights may not substantially interfere with public trust rights, however.

In coastal areas, the industry also may be subject to the "federal consistency" requirements of the federal Coastal Zone Management Act. The CZMA may prompt a determination of the extent to which federally permitted aquaculture operations in state waters or in the US exclusive economic zone are consistent with a state's coastal management plan. One such federal permit is that issued by the US Army Corps of Engineers (ACoE) under section 10 of the Rivers and Harbors Act (RHA). The section 10 permit is required for the installation of aquaculture gear in navigable waters. This permit relates to potential obstructions to navigation and is not an aquaculture permit *per se*. Further, it is not a legal right to the exclusive use of navigable waters. Application for a permit may trigger the ACoE's "public interest review process," which could involve the assessment of environmental impacts and the development of an environmental impact statement (EIS). In the course of evaluating a section 10 permit application, ACoE seeks comments from the National Marine Fisheries Service's (NMFS) Protected Resources Division, which determines the likelihood of any impacts from a project on endangered or threatened species or marine mammals, and from other federal (U.S. Environmental Protection Agency, U.S. Coast Guard, US Fish and Wildlife Service) and relevant state agencies.

3. Control of Disease

Disease control is a problem prominent in most segments of the aquaculture industry of the northeastern United States. Each type of disease may require particular control methods and rules. The control of disease is important to the viability of aquaculture operations, but implementing controls may be costly. Not surprisingly, government and industry officials may disagree over the nature and scope of disease control.

A national aquatic animal health plan now is being developed under the auspices of the Joint Subcommittee on Aquaculture (JSA). One component of this national plan is an aquatic animal health plan for salmonids in the EEZ, which is being put together by NMFS. A New England Salmonid Health Committee, made up of fish and wildlife experts from the six New England states, has adopted guidelines for the uniform handling among the interested states of disease issues for salmon and trout (NESHHC 2001).

The management of an outbreak of infectious salmon anemia (ISA) in Maine in 2001 is a recent example of disease control in practice. Control of the disease required the slaughter of 2 million fish, requirements for the fallowing of net pen sites, and disinfection of the surfaces of vessels and equipment below the waterline. Net pens now may be restocked only at lower densities and with only one year class, and movements of fish are to be restricted and subject to monitoring for the disease. An integrated pest management (IPM) system must be implemented to control sea lice, a fish parasite that may harbor the ISA virus. Control of disease, although vital to operational success, can be a costly constraint to the industry.

In New York, as is the case in some other states, the lack of diagnostic support to handle disease pathology and testing for importation has caused considerable problems for the industry; however, this is changing, as funding has been allocated to begin a state laboratory there. In other states, such as Massachusetts and Connecticut, designated shellfish pathologists have been a

major asset to those industries. And Vermont requires all of its hatcheries to be certified on a regular basis.

Until recently, restrictive policies on the use of pharmaceuticals has limited the options that the aquaculture industry has to prevent or control disease in cultured fish. For example, Massachusetts' shellfish growers have noted that they are restricted by these policies because even a minute amount of chemical treatment to induce triploidy in oysters makes the product unmarketable. Industry participants now recognize, however, that triploidy may be more easily induced by employing traditional cross-breeding methods that utilize tetraploid and diploid strains.

The lack of drugs to treat disease is a significant problem faced by aquaculture producers. It is thought that the small size of the markets relative to the costs of development for drugs to treat so-called "minor species" (defined to include all aquaculture species) is the primary reason that few drugs exist. In 1996, Congress asked the US Food and Drug Administration (FDA) to develop proposals to increase the legal availability of animal drugs for minor uses and minor species (MUMS). In 1998, with input from industry and other stakeholders, FDA published a set of proposals, including monetary grants for clinical studies, tax credits, protocol assistance, and prolonged periods of marketing exclusivity (FDA 1998). FDA's proposals, which follow the lead of the successful "orphan drug" program for humans, have been incorporated into legislative proposals during the last two congresses, but none has been enacted to date.²⁹

4. Interstate Transport of Product

State rules concerning the imports of fish eggs, fingerlings, and shellfish seed from other states are non-uniform. Confusion, misinformation, or non-compliance has contributed to the introduction of non-indigenous species and increased incidence of disease, devastating some aquaculture businesses and changing the nature of local or regional ecosystems. While many states have restricted transport to a few trusted companies, other states do not follow a strict protocol or possess testing facilities for the transport of live fish, eggs, or seed. The existence of inconsistent policies for interstate shipment of these aquaculture products has hampered the ability to develop a comprehensive interstate transport program. When limited supplies of eggs, fingerlings, or shellfish seed are available, market prices are usually driven up by the lack of competition.

While a comprehensive analysis of individual state laws restricting the importation or transshipment of aquaculture products was not conducted as part of this research, it is important to note that some states may run afoul of the commerce clause of the US Constitution. The commerce clause, designed to maintain and protect interstate commerce, may pre-empt state aquaculture importation restrictions. Through its police power, a state may retain authority to regulate matters of legitimate local concern even though interstate commerce may be affected.

In determining whether a state has overstepped its role in regulating interstate commerce, the courts will distinguish between state laws that burden interstate transactions only incidentally and those that affirmatively discriminate against such transactions. Laws in the former category

²⁹ Currently, companion bills in the House (H.R. 2079) and Senate (S. 741) would amend the federal Food, Drug, and Cosmetic Act to provide grants or contracts for the development of designated new animal drugs, expedited approval for use, and exclusive marketing rights.

violate the commerce clause only if the burdens they impose on interstate trade are clearly excessive in relation to local benefits. Laws in the latter category are subject to more demanding scrutiny, and the state must demonstrate that the statute serves legitimate local purpose *and* that such purpose could not be served as well by available nondiscriminatory means.³⁰

5. Foreign Competition

Competition with low-cost seafood imports can reduce sales of native products. Increasing imports of foreign products (*e.g.*, Vietnamese “catfish”) impacts native markets and further reduces the expansion of US products into the worldwide markets. Northeast producers are now seeking niche markets in which to sell high-priced or value-added products.

US trade law provides US aquaculture producers with the opportunity to initiate complaints in antidumping cases, triggering investigations into aquaculture imports that are sold in the US market at below production cost. Both southeastern US catfish farmers and Maine mussel farmers have been successful in obtaining redress in recent antidumping actions. Collected countervailing duties are distributed to aggrieved US firms through the provisions of the so-called Byrd Amendment, which was enacted in 2001. The direct distribution of these duties to firms runs counter to the provisions of international trade law, according to a recent ruling by the World Trade Organization. It is likely that legislative action will modify the Byrd Amendment’s system of distribution, resulting in the wider distribution of countervailing duties to affected communities or possibly the deposit of collected duties into US Treasury accounts. Consequently, the benefits to US aquaculture firms of initiating trade investigations will be reduced.

Shellfish industry members have been particularly jeopardized by the mislabeling of brand name shellfish. Cultured clams grown originally outside the Northeast have been labeled improperly as local product. The inability of the government to mandate and verify the origin of aquaculture products has not only reduced sales of local product; it has tarnished the industry’s reputation.

Recently, Congress enacted a “Country of Origin” provision requiring the labeling of both farm-raised and wild fish as to country of origin and to distinguish between wild and farm-raised fish. Regulations to implement this language are required by 30 September 2003.³¹

6. Policies Governing Interactions with Protected Species or Impacts on Habitat

Federal action that has been determined to have a “significant effect on the quality of the human environment” may require the drafting of an environmental impact statement (EIS) under provisions of the US National Environmental Policy Act. Federal actions include the issuance of permits, licenses, or leases. An example of the relevance of this policy to aquaculture in the EEZ was the opposition expressed by the Boston-based Conservation Law Foundation to the proposed Norwegian American Fish Farm salmon pen operation on grounds that a federal EIS was

³⁰ Maine v. Taylor, 106 S.Ct. 2440 (1986) (upholding a Maine statute restricting the importation of live bait fish where the state could show that importation could introduce a parasitic health threat to local species).

³¹ P.L. 107-171.

required. The drafting of an EIS is a substantial undertaking involving months or years of time and significant budgetary expenditures.

Similarly, some states have state environmental protection acts (SEPA) that would trigger environmental reviews where a state action (including permit grant) could have adverse environmental impacts. Several states in the northeastern region are requiring aquaculture businesses to conduct pre-permit environmental assessments and to conduct continuous environmental monitoring once a permit is issued. Expensive monitoring equipment, the utilization of paid consultants, the loss of wages, among other things do add significant expenses to the cost of growing aquaculture products.

Where cultured species are farmed in the vicinity of stocks of endangered species, the aquaculture industry may face additional restrictions. The best example concerns the Atlantic salmon farming industry in Maine. In 2000, eight salmon runs in Maine were listed as endangered. The industry is involved with several stakeholder groups in crafting a salmon recovery plan under the federal Endangered Species Act (ESA), which may impose additional burdens on the industry related to containment, fish marking, the use of non-North American strains, and disease control. The industry has voluntarily implemented a code of practice for fish containment. The industry has argued that the ESA salmon recovery plan provisions should match the requirements to be set forth in national pollution discharge elimination system (NPDES) permits under the US Clean Water Act.

Other protected species issues relate to potential interactions with marine mammals or turtles through entanglements in gear or adverse effects on habitat and the loss of eelgrass beds in estuarine environments. In particular, these concerns are most heightened where the proposed installation is within a transit, feeding, or nursery area. This issue can be very contentious, one in which perceptions of problems may be as important as actual impacts. In particular, there are significant concerns about the potential for the entanglement of individuals of the western North Atlantic stock of the northern right whale (*Eubalaena glacialis*), which is a highly endangered species. These concerns have the potential to halt activity on any proposed project. In some cases, the development of a biological assessment under section 7 of ESA may be required. Biological assessments are to be conducted by the relevant lead federal agency, but, in order to expedite the process, industry applicants for federal permits often end up doing much if not all of the work.

A noted example of rules concerning protected species which restricts cultivation practices has occurred in West Virginia. Aquaculture of paddlefish has become popular and necessary for stock restoration. However, commercial or scientific culture for research is prohibited because the species is still considered “protected.”

7. Rules Concerning the Culture of Commercially Harvested Species

A small number of states have regulations that prevent the culture of species that are commercially or recreationally harvested by fishermen. Recently in Maine, an aquaculturist

engaged in the production of sea worms has prompted a “worm digger protest” with traditional harvesters seeking protection from “unnatural” production efforts.³²

A more difficult problem faced by aquaculturists concerns the export of their product to states that have commercial fishery rules that define the characteristics of the product. For example, a three-inch size restriction on the commercial harvest of oysters in Massachusetts prevents the sale or even the transport through the state of smaller oysters grown in Connecticut or Rhode Island. Resolution of this problem may require the development of technologies that enable state inspectors to distinguish between cultured and wild-harvest product. Such technologies might also provide a resolution to some of the mislabeling and brand poaching that goes on.

In some cases, regulations have been promulgated for the specific purposes of preventing competition between fishermen and aquaculturists. New Jersey and Massachusetts, for example, limit shellfish cultivation to bottom areas that do not naturally produce shellfish. These regulations have caused problems in New Jersey, where aquaculture industry participants have pointed out that lease areas suitable for shellfish growout are unavailable.

8. Federal and State Effluent Regulations

Federal rules have been proposed to regulate the discharge of pollutants from three types of aquatic animal production facilities: recirculating systems, flow-through systems, and net pens. When they become effective next year, the rules will apply to aquaculture operations producing more than 100,000 pounds of fish annually. A numerical standard is to be set for the discharge of total suspended solids (TSS) for recirculating and flow-through systems. Achievement of the TSS standard is expected to lead to reductions in discharges of nutrients and biochemical oxygen demand (BOD). Feed monitoring requirements are also to be established for marine net pen operations. Drugs, pesticides, non-native species, and pathogens will be controlled through proposed best management practices (BMPs). Molluscan shellfish culturing, closed pond systems, and lobster pounds are exempt from the rules. Shellfish hatcheries with discharges will be subject to the proposed rules. The rules would be promulgated by the federal Environmental Protection Agency (EPA) by June 2004 and enforced by EPA or an authorized state agency.

In the area of freshwater aquaculture, federal regulations concerning effluent management hinder growth in some businesses due to the expense of converting growout systems. Compliance with these guidelines, however, may promote aquaculture as a more “environmentally-friendly” method of food production. In marine aquaculture, and specifically in net pen culture, the industry will be less likely to experience major operation conversion costs. Although feed monitoring requirements will require an additional expense, reduced feed waste may offset these expenses to some extent.

The Federal Water Pollution Control Act (also known as the Clean Water Act [CWA]) prohibits the discharge of any pollutant into the waters of the United States without a permit. The US Environmental Protection Agency (EPA) administers a national pollutant discharge elimination system (NPDES) pursuant to section 1342 of the CWA. Pursuant to section 1328, EPA has been

³² For example, see the editorial that appeared on 24 August 2003 in the *Boston Globe* (p. D10) entitled “Bait and Switch.”

given specific authority to grant discharge permits to aquaculture operators. EPA, in turn, may delegate this permit-granting authority to states, as has been the case in Maine.

In Maine, operators of salmon aquaculture operations began applying for NPDES permits in the early 1990s. EPA indicated that the applications were under consideration for a lengthy period, prompting environmental organizations to sue the aquaculture operators for discharging without a permit. While the operators claimed that the permit applications should have held any such suit in abeyance, a federal court decided otherwise.³³ The operators were deemed in violation of the CWA and the court imposed conditions on the continuing operations. At the same time, the court rebuked EPA for its failure to establish effluent standards for aquaculture operations. With the recent delegation of CWA authority to the state, on 19 June 2003, the Maine Department of Environmental Protection issued a Maine Pollutant Discharge Elimination System General Permit for Atlantic Salmon Aquaculture.³⁴ Other states have also fashioned discharge permit standards for aquaculture operations.³⁵

9. Culture of Genetically Modified Organisms

The utilization of genetically modified organisms (GMOs) for aquaculture is a modern issue in which the absence of regulation or the inappropriate nature of regulation is perceived as a constraint by some segments of the northeastern aquaculture industry. Some entrepreneurs who are at the vanguard of research in the bioengineering of fish and shellfish may not yet be in the business of growing fish. As a consequence, it is unclear that they are regarded by some as actual participants in the aquaculture industry. These individuals or firms are potential entrants into the industry, and the absence of policy or the existence of an inchoate regulatory regime could constrain the growth of the industry in this area.

Traditional selective breeding techniques have been practiced ever since the emergence of aquaculture as a form of food production. More recent technological advances now permit the manipulation of the actions of specific genes, allowing the rapid growth of fish that exhibit certain desired properties, such as color, texture, disease resistance, temperature tolerance, or taste.

Where the effects of the human consumption of genetically engineered fish are unknown, the protection of public health remains a leading concern. Preliminary marketing studies have revealed reluctance on the part of some consumers about purchasing GMO fish, and, consequently, some aquaculture operators have chosen to advertise the fact that they are *not* producing GMO fish. Public education remains a priority for acceptance of these cultured products. Environmental implications are at issue as well, including escapement from net pens resulting in the loss of habitat for wild stocks or the degradation of natural gene pools (Kapuscinski and Hallerman 1991). The latter issues have attracted considerable negative attention from environmental organizations (Goldburg and Tripplett 1997).

Because the genetic modification of fish or shellfish for aquaculture is a biotechnology that is still in its infancy, the regulation of such modifications is undeveloped (Gorski 1993). At the

³³ U.S. Public Interest Research Group v. Atlantic Salmon, 215 F.Supp.2d 239 (D. Me. 2002).

³⁴ See <http://www.maine.gov/dep/blwq/docstand/aquaculture/MEG130000.pdf> (last accessed 1 Sept. 2003).

³⁵ See PA ST 3 Pa. C.S.A. § 4213.

federal level, both the National Environmental Policy Act and the Endangered Species Act are likely to be invoked as relevant laws. The utility of both laws may be limited, however, in cases where it is impossible to know or difficult to predict the impacts of releases of GMOs until after the fact. Other laws, including the Food, Drug, and Cosmetic Act, the Toxic Substances Control Act, and the CWA, appear to be poor fits to serve as the basis for regulating the production of GMO fish, but they are sure to be called upon by opponents to control this form of aquaculture. Indeed, in a recent case, the CWA was relied upon to justify the exclusion of the growing of non-native strains of salmon in netpens off the coast of Maine (*n.b.*, these strains are not GMOs, however). In a settlement agreement in a related case, another Maine salmon producer agreed not to stock its netpens with GMO salmon.

Guidelines for GMO research and development have been developed by both the National Institute of Health (NIH) and USDA. These guidelines are used to regulate releases of GMO fish from research facilities, but they are applicable only to federally funded research activities. Privately funded research is beyond the reach of these guidelines. While the lack of regulation would seem to be beneficial to the industry in this instance, the absence of government oversight over R&D in such a frontier area could actually inhibit development of the market.

10. Introduction of Exotic or Non-indigenous Species for Purpose of Culture

The Lacey Act is used to regulate the import and interstate transport of non-native species. Some non-native species have found beneficial use in the control of pests in aquaculture operations. Regulation of these species as “non-native” would therefore adversely affect those aquaculture operations. An example is the black carp, which is used to control levels of ram’s horn snails in pond culture. The ram’s horn snail is an intermediate host of yellow grubs, which can infest hybrid striped bass, making them unfit for sale. Black carp are now produced as a triploid variety, which cannot reproduce and invade non-culture habitats, but this variety has also been prohibited for interstate sale.

Although some exotic or introduced species have proven beneficial to aquaculture operations initially, the environmental effects of exotics that do not remain within the culture area has proved devastating. The introduction of the non-native oyster, *Crassostrea ariakensis*, into the Chesapeake Bay for aquaculture purposes, has created major concerns not only within the shellfishing industries of Maryland and Virginia, but in the eyes of the public. Non-native species have the potential to introduce disease and to compete with native organisms for food supplies. Further, non-native species such as *C. ariakensis* can change habitat structure, and they have no natural predators. Development of effective regulations to stop the introduction and establishment of harmful exotic species are being examined.

11. Permitting in the U.S. Exclusive Economic Zone

The regulation of offshore aquaculture in the United States is problematic and unsettled. At present, there is no federal policy pertaining specifically to the permitting of aquaculture in the area from three to 200 nautical miles offshore known as the exclusive economic zone (EEZ). Public debate over the establishment of any such policy is still only in its early stages (Reiser and Bunsick 1999; Reiser 1997). At a minimum, a section 10 permit is required from the US Army Corps of Engineers.

The responsibility for aquaculture policy is not yet clearly defined and a permitting system is not in place for offshore marine aquaculture in the U.S. Exclusive Economic Zone. In the absence of a regulatory framework, not only is expansion of the existing industry impossible, but potential future growth and research in this area is discouraged (Barr 1997).

In 1993, the General Counsel of the National Oceanic and Atmospheric Administration determined that aquaculture facilities in the EEZ are subject to the federal Magnuson-Stevens Act at the discretion of the regional fisheries management councils. In order to formalize their authority, these councils must prepare fisheries management plans (FMPs). FMP preparation is a public process requiring approval of the relevant council's membership (a group historically dominated by commercial wild harvest fishery interests), followed by approval from NMFS. The New England Council has not prepared an FMP specifically for aquaculture, but in December 1996 it issued a "Draft Aquaculture Policy." This draft statement makes it clear that the New England Council intends to develop an "aquaculture management strategy" at some point in the future (Brennan 1997). The details have yet to be worked out, but it is clear that the New England Council will be concerned about any potential impacts on existing commercial fisheries, including both biological impacts and loss of access to specific areas.

V. Conclusions and Research Recommendations

Participants in the aquaculture industry in the northeastern region are faced with a wide variety of laws and regulations that govern the manner in which they plan, site, and operate aquaculture facilities. Aquaculture may be one of the most heavily regulated industries in the United States, but many of the relevant regulations and administrative programs clearly benefit the industry. Given the diverse characteristics of the industry, in terms of the multiplicity of markets, political jurisdictions, and technologies, it is inevitable that some policies will be perceived as constraints on industry growth. Indeed, because of the large number of distinct markets comprised by the aquaculture industry, it is likely that any specific regulation or policy might be perceived by some segment of the industry as constraining. In many cases, the same regulation or policy might be regarded as facilitating by some other segment of the industry.

Using surveys and a literature review, we have identified a range of policy and legal issues that likely constrain the growth of the industry. We have ranked these issues on a scale of 1-11. The most important issue concerns administrative complexity (often referred to as administrative "overlap"), where confusion about the relevant rules may lead to excessive financial and time costs.

Based upon feedback from participants at the 2003 NRAC Industry Summit, issues relating to interstate trade are perceived by many in the industry to be among the most constraining. In the future, research might usefully be directed at characterizing the laws and policies among the states of the northeast region that relate to animal health, including disease inspections and certifications. Also, state laws and regulations that restrain trade on the basis of conserving and managing wild harvest fisheries ought to be characterized. Increasing the transparency of these rules and highlighting non-uniformities among disparate state approaches to the control of movements of diseases and invasive species, as well as to conservation of fishery resources, is likely to lead ultimately to a more homogeneous and less confusing regional legal regime.

We also heard interest voiced by the industry in the development of so-called best management practices (BMPs). There are a number of precedents in other regions or internationally, such as the aquaculture industry in Europe, where BMPs have been adopted and implemented by participants in specific markets. A perceived advantage of the BMP approach is that it emerges as the product of consensus among industry participants, sometimes guided by government agencies. As such, BMPs are a form of soft law, a set of normative principles that does not involve explicit regulation. It would be productive to direct legal and policy research toward understanding the implications of BMPs for market structure, their effectiveness in achieving stated objectives, their costs in comparison with government regulation, and their resiliency over time.

Many of the legal and policy constraints identified in this document might be addressed through a process that brings stakeholders from the region together to debate and possibly resolve relevant issues. The NRAC Regional Extension Project provides a mechanism through which such a process could be realized. Through this project, which is funded outside of the normal scientific request for proposal (RFP) process, NRAC Extension Agents are able to sponsor meetings and other fora to facilitate communication among industry participants, government officials, scientists and engineers, and other stakeholders.

References

- Aspen Systems Corporation (ASC). 1981. Aquaculture in the United States: regulatory constraints. Final report. Rockville, MD: Fish & Wildlife Service, US Department of the Interior (16 March).
- Bardach, J.E. 1968. Aquaculture. *Science* 161:1098-1106.
- Barr, B.W. 1997. Mariculture in offshore critical habitat areas: a case study of Stellwagen Bank National Marine Sanctuary. *Ocean and Coastal Law Journal* 2:273-287.
- Brennan, W.J. 1999. Aquaculture in the Gulf of Maine: a compendium of federal, provincial, and state regulatory controls, policies and issues. Mimeo. Boston, Mass.: Aquaculture Committee, Gulf of Maine Council for the Marine Environment (21 June).
- Brennan, W.J. 1997. To be or not to be involved: aquaculture management options for the New England Fishery Management Council. *Ocean and Coastal Law Journal* 2:261-271.
- Bye, V.J. 1990. Legal, political, and social constraints in aquaculture. In N. DePauw and R. Billiard, eds., *Aquaculture Europe '89—Business Joins Science*. Spcl. Publ. No. 12. Bredene, Belgium: European Aquaculture Society, pp. 123-144.
- Department of Commerce (DoC). 1999. Special summer of 1999 aquaculture workshop report. Mimeo. Silver Spring: National Oceanic and Atmospheric Administration (11-13 August).
- DeVoe, R. 1999. Marine aquaculture in the United States: current and future policy and management challenges. In B. Cicin-Sain, R.W. Knecht, and Nancy Foster, eds., *Trends and Future Challenges for U.S. National Ocean and Coastal Policy*. Silver Spring: National Oceanic and Atmospheric Administration.
- DeVoe, M.R. and A.S. Mount. 1989. An analysis of ten state aquaculture leasing systems: issues and strategies. *Journal of Shellfish Research* 8(1):233-239.

- Eichenberg, T. and B. Vestal. 1992. Improving the legal framework for marine aquaculture: the role of water quality laws and the public trust doctrine. *Territorial Sea Journal* 2:339.
- Ewart, J.W., J. Hankins and D. Bullock. 1995. State policies for Aquaculture effluents and solid wastes in the northeast region. NRAC Bulletin No. 300. North Dartmouth, Mass.: Northeastern Region Aquaculture Center, USDA.
- Environmental Protection Agency (EPA). 2002. Effluent limitations guidelines and new source performance standards for the concentrated aquatic animal production point source category. Proposed rule. *Federal Register* 67(177):57872-57928 (12 September).
- Food and Drug Administration (FDA). 1998. Proposals to increase the legal availability of animal drugs for minor species and minor uses. Report of the Animal Drug Availability Act (ADAA) Minor Use/Minor Species Working Group. Washington (19 August).
- Goldburg, R. and T. Triplett. 1997. *Murky Waters: Environmental Effects of Aquaculture in the United States*. New York: Environmental Defense Fund.
- Gorski A.G. 1993. The one that got away: the analysis of the federal regulation of the release of genetically engineered fish. *University of Baltimore Journal of Environmental Law*.
- Hallerman, E.M. and A.R. Kapuscinski. 1995. Incorporating risk assessment and risk management into public policies of genetically modified finfish and shellfish. *Aquaculture* 137:9-17.
- Hoagland, P., K.M. Riaf, D. Jin and H.L. Kite-Powell. 2003. A comparison of access systems for natural resources: drawing lessons for ocean aquaculture in the US Exclusive Economic Zone. In Bridger, C.J. and B.A. Costa-Pierce, eds., *Open-Ocean Aquaculture: From Research to Commercial Reality*. Baton Rouge, LA: World Aquaculture Society, pp. 23-44.
- Hopkins, D.D., R. Goldburg and A. Marston. 1997. An environmental critique of government regulations and policies for open ocean aquaculture. *Ocean and Coastal Law Journal* 2:235-260.
- Jarvinen, D. 2000. Federal and state support for aquaculture development in the United States. *Aquaculture Economics and Management* 4(3/4): 209-225.
- Jarvinen, D. and G. Magnusson. 2000. Public resources for private mariculture: Northeastern United States, Atlantic Canada and Scotland after NAFTA and GATT. *Marine Policy* 24: 21-32.
- Kane, T.E. 1970. Aquaculture and the law. Tech. Bull. No. 2. Miami, Fla.: University of Miami Sea Grant College Program.
- Kapuscinski, A.R. and E.M. Hallerman. 1991. Implications of introduction of transgenic fish into natural ecosystems. *Canadian Journal of Fisheries and Aquatic Sciences* 48(Supp. 1):99-107.
- Kennedy, V.S. and L.L. Breisch. 1983. Sixteen decades of political management of the oyster fishery in Maryland's Chesapeake Bay. *Journal of Environmental Management* 16:153-171.
- Marine Law Institute (MLI). 1992. Legal methods for promoting local salmon farming operations in downeast Maine. Report to the National Coastal Resources Research and Development Institute. Portland, Maine: University of Southern Maine.
- Massachusetts Coastal Zone Management (MCZM). 1995. Aquaculture white paper & strategic plan. Mimeo. Boston, Mass.: Executive Office of Environmental Affairs, pp. 68-80.

- McCoy, H.D. 2000. *American and International Aquaculture Law*. Peterstown, WV: Supranational Publishing Company.
- National Research Council (NRC). 1978. *Aquaculture in the United States: Constraints and Opportunities*. Washington: National Academy Press.
- National Research Council (NRC). 1992. *Marine Aquaculture: Opportunities for Growth*. Washington: National Academy Press.
- New England Salmonid Health Committee (NESHC). 2001. New England salmonid health guidelines. Mimeo. South Waterbury, VT: Vermont Department of Fish and Wildlife.
- Rieser, A. 1997. Defining the federal role in offshore aquaculture: should it feature delegation to the states? *Ocean and Coastal Law Journal* 2:209-234.
- Rieser, A. and S. Bunsick. 1999. Aquaculture in the US exclusive economic zone (EEZ): legal and regulatory concerns. In B. Cicin-Sain, R.W. Knecht, and Nancy Foster, eds., *Trends and Future Challenges for U.S. National Ocean and Coastal Policy*. Silver Spring, MD: National Oceanic and Atmospheric Administration.
- Rychlak, R.J. and E.M. Peel. 1993. Swimming past the hook: navigating legal obstacles in the aquaculture industry. *Environmental Law* 23:837-868.
- Stratton Commission (Commission on Marine Science, Engineering and Resources). 1969. Our nation and the sea: a plan for national action. Washington: US Government Printing Office, p. 118.
- Thunberg, E.M., R.N. Weldon, H. Thomforde and D.E. Vaughan. 1992. Marine aquaculture enforcement: passing the buck. *Journal of Shellfish Research* 11(1):177-182.
- Underwood, J. 1997. Intertidal zone aquaculture and the public trust doctrine. *Ocean and Coastal Law Journal* 2:383-414.
- Vestal, B. 1999. Dueling with boat oars, dragging through mooring lines: time for more formal resolution of use conflicts in state waters. *Ocean and Coastal Law Journal* 4:1-79.
- Wildsmith, B.H. 1982. *Aquaculture: The Legal Framework*. Toronto: Edmond-Montgomery Limited.
- Wypyszinski, A.W. et al. 1992. Governmental regulation of growth and development: improving the legal framework for aquaculture in the northeastern United States. Mimeo. South Dartmouth, Mass.: Northeast Regional Aquaculture Center, USDA.

Table 1. CLASSIFICATION OF LEGAL AND REGULATORY ISSUES

	ONSHORE POND/RACEWAY	ONSHORE RECIRCULATING	COASTAL SHELLFISH	COASTAL NETPENS	OPEN-OCEAN
SITING					
Lease, Tenure, and Permitting Process	2	2	2	2	2, 11
Public trust			2	2	
Riparian rights			2	2	
Wetland alteration					
Coastal zone management					
Navigation					
Environmental impact assessment					
WATER USE					
Supply					
Effluents	8	8		8	
STOCKING					
Spat collection					
Breeding (incl. GMOs)	9	9	9	9	9
Imports					
Transport					
CULTIVATION					
Feeding					
Disease Control	3	3	3	3	3
Predator control					
Non-native species	10		10	10	10
Protected species interactions				6	6
HARVESTING					
Closed seasons					
Depuration					
PRODUCT MARKETING					
Dealer license					
Labeling (origin, organic)					
Inspection of plant/product					
Barriers to trade	4, 5, 7	4, 5, 7	4, 5, 7	4, 5, 7	4, 5, 7
GOVERNMENT ASSISTANCE	1	1	1	1	1

Table 2: RANKINGS OF GROWTH CONSTRAINING POLICY ISSUES FROM SURVEY RESPONSES*

POLICY ISSUE	INDUSTRY	GOVT	CT	DE	MA	MD	ME	NJ	NY	RI	WV
administrative and jurisdictional overlap (regulatory agencies)	1	1	all		all	all	finfish	all		shellfish	
lease and tenure process	2		all	all	all	all	all	all			
control of disease	3		all				finfish	shellfish	all	shellfish	finfish (fw)
interstate transport of product	4		all		all			shellfish	shellfish	shellfish	finfish (fw)
competition with foreign imports and international trade barriers	5		shellfish	shellfish	shellfish		all	shellfish	shellfish	shellfish	
policies governing interactions with protected species or impacts on habitats	6	2	shellfish		shellfish	shellfish	marine finfish	shellfish		shellfish	
rules concerning the culture of commercially harvested species	7	3	shellfish		all			shellfish	all		
federal and state effluent regulations	8		finfish, shellfish		all		finfish		all		finfish (fw)
culturing of genetically modified organisms	9					all	marine finfish	all			finfish (fw)
introduction of exotics (non-indigenous species for purpose of aquaculture)	10					shellfish	marine finfish		all		finfish (fw)
permitting in the U.S. Exclusive Economic Zone	11				shellfish						

*Respondents (aquaculture industry members and government regulators) were asked to identify key law and policy issues within their states that constrain growth in the aquaculture industry. Entries in the table indicate which general segment of the industry (e.g., shellfish or finfish farmers) identified the relevant policy issue as a constraint. No responses were received from Pennsylvania, Vermont, New Hampshire, or the District of Columbia. Policy issues are discussed in greater depth in the text.

Appendix

Industry Survey

INDUSTRY QUESTIONNAIRE

- 1) **State of Operations (Circle)**
CT | DC | DE | MA | MD | ME | NJ | NH | NY | PA | RI | VT | WV
- 2) **Segment of Industry (Check all that apply)**
 freshwater finfish culture (ponds)
 freshwater finfish culture (recirculating systems)
 marine finfish culture (open ocean, net pens)
 marine finfish culture (recirculating systems)
 shellfish culture (bottom culture, no gear)
 shellfish culture (bottom, submerged or floating gear)
 crustacean culture
 macroalgae culture
 other (please describe)
- 3) **Location of operations (Check all that apply)**
 town waters
 state waters
 federal waters (EEZ)
- 4) **Do any of the following policy issues constrain growth in your aquaculture business or expansion of the industry in your state? (Check all that apply)**
 administrative and jurisdictional overlap (regulatory agencies)
 aquaculture permitting in the U.S. Exclusive Economic Zone
 property rights and access to public land (water)
 lease and tenure process for aquaculture operations
 federal and state effluent regulations
 policies governing interactions with protected species or impacts on habitats.
 requirements for stakeholder input or other public participation in decision-making.
 interstate transport of aquaculture product
 rules concerning the growing of commercially harvested species
 use of genetically engineered species in aquaculture
 rules on the application of pharmaceuticals, pesticides, or herbicides
 HACCP and sanitation requirements
 introduction of exotic (non-indigenous species for purpose of aquaculture)
 taxation issues
 competition with foreign imports and international trade barriers
 mandated environmental monitoring
 industry participation in public policy issues (or lack of)
 organic certification requirements
 rules concerning the growing of protected species
 control of disease
 fallowing requirements
 management of natural hazards and risk assessments
 other (please describe)
- 5) **Please identify the top three policies that constrain growth in your aquaculture business and briefly discuss how these policies affect your business.**
- 6) **Please identify the top three policies that limit expansion of the aquaculture industry in your state and briefly discuss how these policies are restricting growth.**
- 7) **Are there policies within your state, which promote the growth of aquaculture? If so, please list and describe.**
- 8) **What do you anticipate the major constraint(s) to the aquaculture industry will be in the next five years? (Please be specific, if possible)**

State Aquaculture Coordinator Survey

AQUACULTURE COORDINATOR QUESTIONNAIRE

- 1) **State of Jurisdiction (circle)**
CT | DC | DE | MA | MD | ME | NJ | NH | NY | PA | RI | VT | WV
- 2) **Agency of Employment**
 environmental management
 agriculture
 marine resources
 other (please describe)
- 3) **Is aquaculture regulation the primary function of your agency?**
- 4) **Please list other agencies (local, state, federal) with jurisdiction over aquaculture in your state and briefly describe their function.**
- 5) **Do any of the following policy issues constrain growth or expansion of the industry in your state? (Check all that apply)**
 administrative and jurisdictional overlap (regulatory agencies)
 aquaculture permitting in the U.S. Exclusive Economic Zone
 property rights and access to public land (water)
 lease and tenure process for aquaculture operations
 federal and state effluent regulations
 policies governing interactions with protected species or impacts on habitats
 requirements for stakeholder input or other public participation in decision-making.
 interstate transport of aquaculture product
 rules concerning the growing of commercially harvested species
 use of genetically engineered species in aquaculture
 rules on the application of pharmaceuticals, pesticides, or herbicides
 HACCP and sanitation requirements
 introduction of exotic (non-indigenous species for purpose of aquaculture)
 taxation issues
 competition with foreign imports and international trade barriers
 mandated environmental monitoring
 industry participation in public policy issues (or lack of)
 organic certification requirements.
 rules concerning the growing of protected species.
 control of disease
 fallowing requirements
 management of natural hazards and risk assessments.
 other (please describe)
- 6) **Please identify the top three policies that limit expansion of the aquaculture industry in your state and briefly discuss how these policies are restricting growth.**
- 7) **Are there policies within your state, which promote the growth of aquaculture? If so, please list and describe.**
- 8) **What do you anticipate the major constraint(s) to the aquaculture industry will be in the next five years? (Please be specific, if possible)**
- 9) **Please attach any supporting documents (literature, reports, etc.) that would help to describe your regulatory program.**



Funding was provided by the Northeastern Regional Aquaculture Center through Grant number 98-38500-5917 from the U.S. Department of Agriculture Cooperative State, Research, Education, and Extension Service (USDA-CSREES).

Any opinions, findings, conclusions or recommendations expressed in the publication are those of the authors and do not necessarily reflect the views of the U.S. Department of Agriculture, the Northeastern Regional Aquaculture Center, or the University of Massachusetts Dartmouth.

NRAC Project No. WP03-9

Produced for:

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