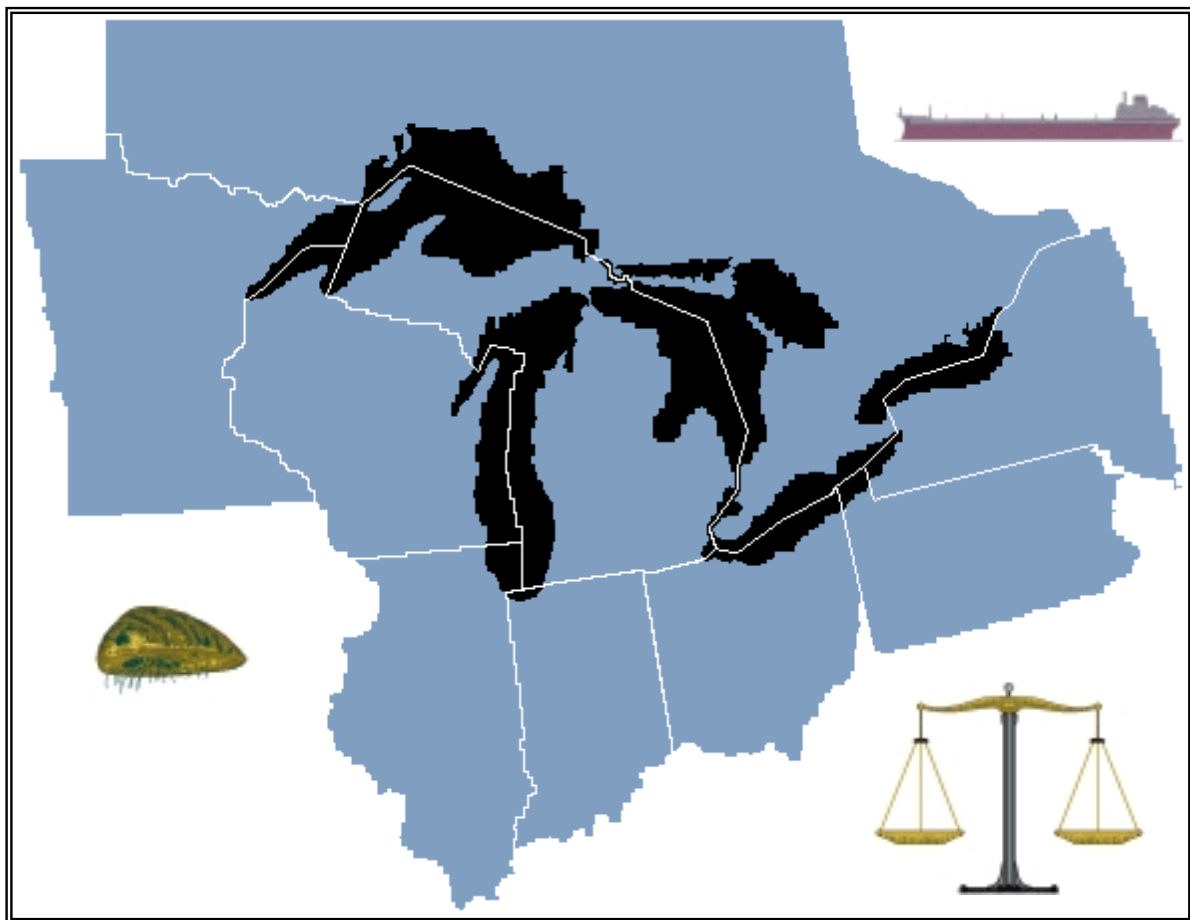

Analysis of Laws & Policies Concerning Exotic Invasions of the Great Lakes

A Report Commissioned by the Office of the Great Lakes

Michigan Department of Environmental Quality



**Eric Reeves
CDR, USCG (RET), JD, MA
March 15, 1999**

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This study was commissioned by the Office of the Great Lakes, Michigan Department of Environmental Quality, in accordance with mandates in the Michigan *Nonindigenous Aquatic Nuisance Species State Management Plan* (Lansing, MI: Office of the Great Lakes, January 1996).

The focus of this study is on laws and policies for the prevention of the invasion of the Great Lakes aquatic ecosystem by exotic organisms (also commonly referred to as aquatic nuisance species or ANS). It is designed to provide Michigan policymakers with:

(a) Basic background, with documentation, on the science, technology, and economics of the major vectors for invasions. This includes a description of (1) commercial shipping carrying ballast water into the Great Lakes, (2) aquaculture in the Great Lakes and Michigan, (3) bait fish importation, and (4) the importation of live fish for aquaria and ornamental ponds.

(b) An analysis of critical legal issues, particularly legal issues regarding the control of exotics in ballast water in cooperation with the US federal government and the other jurisdictions in the Great Lakes. This includes, most importantly, a definitive legal analysis of the issue of federal preemption under US federal law, which determines the scope for Michigan regulation of ballast water in commercial shipping.

(c) An overview of existing legal regimes in the Great Lakes, comprehending the US and Canadian federal, state, and provincial governments with jurisdiction over the Great Lakes, and also international and regional regimes. The purpose of this wide-ranging overview of legal regimes is to (1) identify general patterns in legislation, regulation, and administration of programs for prevention of invasions, and (2) identify specific strengths and weaknesses in the existing regimes. This, it is hoped, will provide a basis for better integration of the laws of all the eleven jurisdictions responsible for the Great Lakes. Special attention is given to the Michigan Aquaculture Development Act of 1996 and the model Minnesota chapter on "Harmful Exotic Species" enacted in 1996.

This study was funded by the Michigan Office of the Great Lakes. Valuable administrative and technical assistance was provided by the Great Lakes Fishery Commission. The researcher and author of the report is Eric Reeves, Cdr., USCG (Ret.), JD, MA (political science), formerly Chief of the US Coast Guard Ninth District Marine Safety Policy and Analysis Branch, responsible for administering the Great Lakes ballast water regulations, and for reporting to the International Joint Commission on Coast Guard responsibilities under Annex VI of the Great Lakes Water Quality Agreement 1978/1987, from 1993-1998.

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EXECUTIVE SUMMARY

Introduction and threat assessment

Harmful exotic aquatic organisms (aquatic nuisance species) do economic damage in the range of several billions of dollars per year, damage native fishery resources, and cause irreplaceable loss to the biodiversity of the planet. Some of the past invaders of the Great Lakes include the sea lamprey, purple loosestrife, the alewife, *furunculosis*, Eurasian watermilfoil, protozoan fish parasites, European ruffe, the Asiatic clam, and the zebra mussel. The threat includes organisms throughout the taxonomic scale, from fish and macroscopic plants to bacteria and viruses. The majority of current aquatic invaders of the Great Lakes enter through the ballast water of transoceanic commercial shipping. Other major vectors of concern are commercial transportation of aquatic organisms across large ecological zones for use as aquaculture, bait, and aquarium or ornamental pond fish. Genetic modification of native species for use in aquaculture is also a matter of concern.

The foreign trade carried between the Great Lakes and the rest of the world by commercial shipping, through the St. Lawrence Seaway, is an essential element in the industrial economy of the Midwest United States and the Province of Ontario. There are three major fleets of commercial vessels operating in the Great Lakes system. The approximately 70 US domestic “lakers” do not operate beyond the Great Lakes. The approximately 80 Canadian “lakers” and “salty lakers” operate in and out of the St. Lawrence Seaway. The “third-party” foreign vessels, making 400 to 600 trips into the lakes each year, operate under all flags and carry cargoes from every port in the world. The third-party fleet is the main source of concern for the transportation of exotic organisms in ballast. They come from many ports with poor sanitation and already heavily infested with exotic organisms from other places in the world. A significant number of these vessels engage in “triangle trade” between the Mediterranean, Northern Europe, and the Great Lakes. The majority of these vessels enter the Great Lakes in a “NOBOB” status, reporting “no ballast on board,” because they are loaded down with incoming cargo. However, they typically have one to two hundred metric tonnes of unpumpable slop and sediment in the bottom of their tanks, which is later discharged in the course of changing cargoes, ballasting, and deballasting from one port to another inside the Great Lakes. The ballast carried on one vessel may vary from a few hundred metric tonnes to over ten thousand metric tonnes. The total ballast carried into the Great Lakes is in the range of six million metric tonnes per year.

Aquaculture is a source for few documented invasions of the Great Lakes in the past, but is a source of concern because it is a new and expanding industry. In general, it is a potentially important new economic sector, a potential source of high quality and healthy protein needed by expanding human populations, and also, perhaps, a means for reducing pressures on natural fish stocks. The number of species used for aquaculture is expanding, and there is potential for future use of strains within species with specialized characteristics or artificially modified genes which could impact native species. Also, control of the spread of fish diseases is a significant concern in the aquaculture industry. The aquaculture industry is a highly varied industry, including very small-scale or part-time producers and large industrial plants, using a variety of techniques for production.

Some of these techniques, such as cage production, are susceptible to the escapement of exotic fish. Others, such as closed recirculating tanks, are not. Approximately seventy small scale aquaculture facilities in the State of Michigan use some sort of private pond system.

Annual sales of wild and cultured bait fish in the US and Canada are approximately \$1 billion dollars per year. They include emerald shiners, golden shiners, fathead minnows, goldfish, carpsuckers, bluntnose minnows, tilapia, suckers, and crayfish. Most baitfish harvesters and dealers are small-scale independent operators, but they sometimes transport live fish for long distances with relatively simple technology such as oxygen tanks, aerators, and live wells. Out of an estimated 168 native species that have become established outside their range within the US, approximately 58 (35%) were introduced as bait or forage fish. A substantial number of baitfish are used outside their native distributions, including many that are illegal to import, and many fishermen routinely dump their unused live bait in receiving waters.

About 10% of homes in the United States have aquaria, and purchases of live “ornamental fish” for aquaria and ponds amount to more than \$600 million a year in the US. A single large aquaria supply house may market 3,000 distinct breed lines. The greatest proportion of these are “tropical fish,” both freshwater and saltwater. Although much smaller, there is a significant trade in freshwater “coldwater” fish, some of which are deliberately used for stocking ornamental ponds in temperate climates. The goldfish, now common throughout North America, was an ornamental fish release from China. Other aquaria releases into the Great Lakes include the bluespotted sunfish, snails, crustacea, and a number of aquatic plants.

Controls on ballast water

US regulations for the Great Lakes were promulgated in 1993 under the Nonindigenous Aquatic Nuisance Species Prevention and Control Act of 1990. This established the first mandatory regime requiring routine ballast exchange in the world. Concern about exotics in ballast, initially articulated by Australia, Canada, and the United States, is becoming widespread among maritime nations around the world. The United States recently enacted the National Invasive Species Act of 1996, intended to expand the general framework of the Great Lakes regime to the rest of the nation. Canada amended their Shipping Act in 1998 to authorize the promulgation of national Canadian regulations. Voluntary guidelines for world shipping have been promulgated by the International Maritime Organization, and there is consideration being given toward development of a world-wide treaty on exotics in ballast. There are no legal controls on exotics in ballast water enacted by the individual states, except limited requirements for reporting and study. However, legislation to establish a comprehensive state control regime was recently introduced in the California Assembly.

All of the current legal controls on exotics in ballast water are tentative and incomplete. They are viewed as the first steps toward effective control regimes. The Great Lakes experience since 1993, under the world’s only mandatory regime, provides a basis for identifying critical issues for future regulatory regimes. Most of the problems limiting effective control of exotics in ballast relate directly to the fact that ballast tanks, piping systems, and other shipboard systems are not designed to deal with this problem. Most ballast tanks have only one pipe end for both filling up the tank and emptying it. This severely limits the safety and effectiveness of ballast exchange as a control technique. The stress created on the hull of a vessel pumping down a set of tanks on the open ocean, particularly in some of the older and more poorly maintained vessels in the third-party fleet, may

literally break a ship in half. Under the Great Lakes regulations, such vessels are not required to exchange on the open ocean, but are required to use alternate exchange sites or take other remedial measures. The “NOBOB” vessels enter the Great Lakes with no pumpable ballast in their tanks because they are loaded down with cargo. These are 75% to 95% of incoming vessels. They carry a substantial amount of slop and sediment in the bottom of the tanks because of the limitations of flushing it out with only one pipe end.

There are a variety of technical and other measures which could be instituted to correct these design problems. But there are currently no legal regimes to force the adoption of such changes or otherwise require the shipping industry to address the problem. Also, it is difficult to force technical changes on vessels entering the Great Lakes until such changes become mandatory for vessels entering all ports of the United States.

It is estimated that more than three years will pass before national regulations are promulgated under the National Invasive Species Act of 1996. Moreover, this act is not likely to force the needed technical changes in the shipping industry because it contains a sweeping “safety exemption” (far broader than the one used in the Great Lakes since 1993). This “safety exemption” explicitly prevents the US Coast Guard from requiring any alternate or remedial measures to be taken once it appears that it is unsafe for a vessel to conduct exchanges on the open oceans within the current design constraints of the vessel.

In addition, any enactment of state controls on ballast in commercial shipping (as currently proposed in California) may raise the same issues litigated before the federal courts with regard to state controls on pollution from oil tankers enacted by the States of Washington and Alaska. In the leading case of *Ray v. Atlantic Richfield Co.* (1977), the US Supreme Court held that Washington requirements specifying construction, design, and equipment requirements were preempted. On the other hand, the Supreme Court held that other operational requirements for the safe navigation of oil tankers through local waters were allowable under both the Commerce Clause and the preemption doctrine. This included a requirement that certain tankers be constructed with double hulls *or* take on a tug escort in Puget Sound.

In the related case of *Chevron USA, Inc. v. Hammond* (1984), a federal court of appeal applied the principles of *Ray* to an Alaskan statute. Alaska required oily ballast to be pumped ashore for treatment unless completely clean, in excess of US Coast Guard requirements. This was also held to be within the proper scope of state pollution controls. These and other cases, along with the National Invasive Species Act of 1996, indicate that a state does have authority to impose operational restrictions on the discharge of ballast water in its ports. A state may require ballast containing exotic organisms to be treated ashore or otherwise controlled, in excess of federal standards, as long as the state controls do not impose specific construction, design, and equipment requirements on vessels.

A survey of US and Canadian federal, state, and provincial laws for the prevention of the invasion of the Great Lakes by exotic organisms

US and Canadian federal agencies generally defer to their state and provincial counterparts for control of exotics in private recreational activities or commercial uses such as aquaculture, bait, and aquaria. All of the eight Great Lakes states, and Ontario, have statutory provisions restricting the

introduction of exotic fish or some larger set of aquatic organisms, more or less, usually subject to wide discretion on the part of the state or provincial conservation agency. The statutes are uneven in their focus and coverage. All of these jurisdictions have a “green list,” in the sense that statutes or regulations require positive permits or listing before fish are introduced, but these may or may not actually be promulgated as public lists in statute or regulation.

Coverage varies widely among jurisdictions. Michigan’s separate green lists, for example, apply only to aquaculture or game fish. The Michigan regulations promulgated under the general conservation statute for other fish, which may be limited by the terms of that statute, have only a “red list” of prohibited species. Most jurisdictions, while requiring positive permitting before any introductions, have few statutory or regulatory standards for fully evaluating such introductions. The prohibitions are typically limited, vague, and qualified. There are few statutory standards for implementation of the statutes by the relevant agencies, *e.g.*, presumptions for or against introduction, provisions for scientific review or interagency and public consultation, or environmental impact studies. There are few provisions for record-keeping and inspection to insure compliance.

Moreover, there is little in the way of legislative strategies – or mandates for agencies to develop strategies – for dealing with different vectors. Nowhere is there any legislation establishing the principle that “the polluter pays,” through either liability or tax schemes. Significant vectors of concern, such as bait fish and aquaria, have not really been addressed. And there are few provisions for interstate and binational coordination of programs in order to establish consistent policies and legally effective rules for the Great Lakes ecosystem as a whole. There is a good foundation for regional coordination of policy in the form of existing organizations such as the Great Lakes Commission and the Great Lakes Fishery Commission. The statutes, however, do not provide authority to establish legally effective regional policies on exotics. None of the statutes giving the conservation agencies authority to control exotics contemplate the idea of a regional green list by providing that disapproval of a species by other jurisdictions in the region or a regional body is a basis for prohibition or regulation. Only one statute, the Minnesota comprehensive chapter on exotics, mandates regional consultations.

Even those statutes which provide broad authority typically lack standards, procedures for enforcement, and a strong mandate to prevent introductions of exotics. (The statutes often focus on the prevention of export of native species from the state.) It is therefore not surprising to find that many of the conservation agencies have not promulgated regulations which implement the full scope of their statutory authority to control exotics.

Although all federal, state, and provincial regimes in the region are surveyed in this report, two state statutory schemes are singled out for special attention because they are good models for developing future legislation. They are the Minnesota comprehensive chapter on Harmful Exotic Species enacted in 1996 (with related provisions in the Minnesota Aquaculture Development Act) and the Michigan Aquaculture Development Act of 1996 (with related provisions on fish disease in the Animal Industry Act).

The Minnesota special-purpose statute on exotics, Chapter 84D on Harmful Exotic Species, is far more comprehensive than any other state or federal statute on the subject. It is implemented by detailed regulations in which the Minnesota Department of Natural Resources fulfills the statutory

scheme with specific procedures for examining new species and the purposes for which they are to be used. All “animals and plants” are subject to regulation, and persons wishing to “introduce” new species not previously examined and listed are required to submit the proposed introduction to the department for listing. There are specific and environmentally protective statutory criteria for categorizing species. The regulations specify the information which the applicant must provide, including “scientific-based information about the ability of the unlisted exotic species to naturalize, displace native species, and harm natural resources or their use in similar climates and latitudes.” There are some technical problems with the definition of “introduce” and the sanctions which apply to an unauthorized introduction.

In addition, the Minnesota statute provides the Department of Natural Resources with a strong mandate for the establishment of a comprehensive administrative program, including strategic planning, educational programs, and regional coordination.

Both Michigan and Minnesota provide for both promotion and regulation of aquaculture under their departments of agriculture, in coordination with their departments of natural resources, with specific provisions for licensing, record-keeping, and inspections. The Minnesota aquaculture statute authorizes the Department of Natural Resources, in consultation with the Department of Agriculture, to establish procedures for approving or rejecting either exotic or genetically altered aquatic species for use in aquaculture. The most important aspect of the Michigan and Minnesota schemes may be the record-keeping and inspection requirements. Both require the aquaculturist to maintain records documenting the origin of shipments, and provide for regular inspections of the facilities by the department of agriculture. Both also have detailed provisions designed to prevent the spread of fish diseases.

The Michigan Aquaculture Development Act of 1996 has specific and limited statutory criteria for “approved species,” and, unique among all the statutes in the region regulating aquaculture, has an exclusive statutory list of approved species. This creates some confusion, however, because it is not clear what purpose the criteria serve. Statutory criteria cannot control future amendments of the statutory list by the legislature. It is not clear, moreover, whether or not the Department of Natural Resources retains authority to prohibit exotics on the approved list found to be harmful under its separate statutory authority. There are also some minor technical problems with the formal definition of the applicability of the act, and there is a need for regulations to supplement the act with more specific standards and procedures in a number of areas. In addition, there is a need to insure effective coordination on exotic issues between the Michigan Department of Agriculture and the Michigan Department of Natural Resources. A related provision in the Michigan Animal Industry Act provides strong authority for control of fish diseases by the Department of Agriculture.

All jurisdictions have some regulation of bait dealers. But this, like the regulation of fishing under conservation or aquaculture statutes, is often designed to protect state stocks rather than to prevent introduction of exotics. Although live bait fish certainly come under other prohibitions on exotic fish in the conservation statutes, few of the jurisdictions have established a program for record-keeping or inspection of bait dealers to insure that prohibited species are not introduced.

None of the jurisdictions actively regulate private aquaria and ornamental fish ponds. Again, as in the case of bait, live fish used in aquaria and fish ponds would come under general prohibitions but there are no provisions for record-keeping or inspection to insure that the prohibitions are

observed. Some of the statutes and regulations specifically note the exclusion of aquaria from regulatory programs.

Several of the states have specific statutory provisions on weeds, often by name, or the zebra mussel.

The most common state structure splits up responsibility over exotics between three state agencies, an environmental agency, a conservation agency, and an agriculture agency. That is the pattern in five of the eight Great Lakes states, Michigan, Minnesota, Illinois, Indiana, and Pennsylvania. Within that group, there is substantial variance in the balance of regulatory authority among the agencies and the degree to which the legislature has provided for clear coordination on the issue of exotics. The two primary forums for regional coordination on exotics are the Great Lakes Fisheries Commission and the Great Lakes Commission Panel on Aquatic Nuisance Species (ANS Panel).

Discussion of legal and policy options

A number of options are submitted for consideration by Michigan policymakers. These range from major legislative initiatives to minor technical amendments or regulatory provisions. The report also urges a continuation of Michigan's support for important regional research on ballast water control measures.

The report also discusses an option for concurrent regulation of exotics in the ballast water of commercial shipping. It discusses the reasons for and against such an approach, and it offers specific recommendations on how such a state regime should be structured if there were a high-level policy decision to pursue such an approach. Similarly, the report describes the relationship between the Jones Act and the problem of "NOBOB" vessels and sets out the rationale for some limited amendment to the Jones Act, but also notes the problems with such an approach.

The report recommends that Michigan and other jurisdictions in the region enact comprehensive legislation on exotics, modeled on the comprehensive Minnesota legislation. Model state legislation still being developed by the Great Lakes Commission Panel on Aquatic Nuisance Species will also provide useful guidance for such legislation. The report recommends that this include specific authorization for establishment of a regional "Great Lakes Green List" negotiated with the other jurisdictions in the region under the auspices of the Great Lakes Fishery Commission and the Great Lakes Commission Panel on Aquatic Nuisance Species.

Finally, the report details a number of areas in which there is opportunity to make relatively minor but useful technical amendments to existing statutes, regulations, and procedures. These include expansion of Michigan Department of Natural Resources authority over "fish" to include all aquatic organisms and strains within species, specific authority for use of the "green list approach," development of emergency response plans in coordination with other state and federal agencies, a correction to the definitional provisions determining the applicability of the Michigan Aquaculture Development Act and Animal Industry Act, clarification of authority to review the aquaculture "green list," and provisions for good coordination between the departments and other state and provincial agencies in the region on exotics in aquaculture.

Recommendations

Policy and Legislative

- The Great Lakes Panel on Aquatic Nuisance Species should develop a regional framework for concurrent state regulation of exotics, modeled after Minnesota legislation, to include ballast water of commercial vessels.
- The Great Lakes Fishery Commission and the Great Lakes Panel on Aquatic Nuisance Species should establish a Great Lakes “green list” identifying aquatic species not able to survive in the Great Lakes. Each Great Lakes state should support the list with statutory provisions that prohibit importation or use of species not included on the list.
- Congress should amend the Jones Act and allow foreign vessels to carry cargo from one Great Lakes port to another. This would decrease the overall volume of water taken in as freshwater ballast and reduce discharges of re-mixed ballast water (NOBOBs), which poses the greatest risk for new species introductions.
- The Michigan Legislature should refine the special statutory definition of “aquaculture” under the Michigan Aquaculture Development Act and the Animal Industry Act to allow more efficient application of the laws.
- The Michigan Legislature should refine the statutory definition of “fish” and “game fish” to include all aquatic organisms and genetic strains within species. This would facilitate the development of a “green list” approach to regulate imports of aquatic species by the Department of Natural Resources.
- The Departments of Natural Resources, Environmental Quality, Agriculture, and Community Health should develop emergency response plans that coordinate state and federal actions aimed at controlling newly introduced species.

Ballast Water

- Michigan should examine the feasibility of developing shore-side infrastructure in the City of Detroit for the treatment of ballast water at the wastewater treatment plant.
- Using a “polluter pay” approach, Michigan should explore the feasibility of levying a tax on ballast water discharges, by metric tonne, that do not meet “exotics free” certification standards.
- Congress should improve the current federal regulatory regime by: a) adopting a performance standard, at an appropriate level of effectiveness, in place of the salinity standard for high-seas ballast exchange, b) amending the special safety exemption which was inserted into the National Invasive Species Act of 1996, c) adopting federal measures for addressing the “NOBOB” vessels, and d) supporting the Canadian Government’s new regulations being promulgated under the Shipping Act.

Aquaculture/Aquaria

- Michigan should encourage the U.S. Department of Agriculture to continue with on-going efforts to create an effective aquaculture inspection system.
- Michigan should establish interagency agreements for the inspection and certification of bait fish rearing and holding ponds, specifically prohibiting the import and export of bait from uncertified locations.
- The Michigan Legislature should strengthen the existing Michigan Aquaculture Advisory Committee by establishing it in either statute or regulation.
- The Great Lakes Fishery Commission should establish an intergovernmental Great Lakes committee on aquaculture to facilitate regional coordination.

Research

- Michigan should continue its support of the Binational Canada-United States Ballast Water Research Strategy, endorsed by the International Joint Commission.
- Michigan should continue its lead role in support of ballast water research examining the potential of non-oxidizing biocides. Moreover, the development of near-term ballast water treatment options for “NOBOB” vessels must be accelerated. They include: enhancing the evaluation of the safety and effectiveness of open-ocean ballast water exchange; partial exchange options; identifying costs of retrofitting systems for flow-through exchange on existing vessels; heating relatively small quantities of water on NOBOBs; and development of enhanced performance tests.

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Figure 1. The Great Lakes and the St. Lawrence Seaway

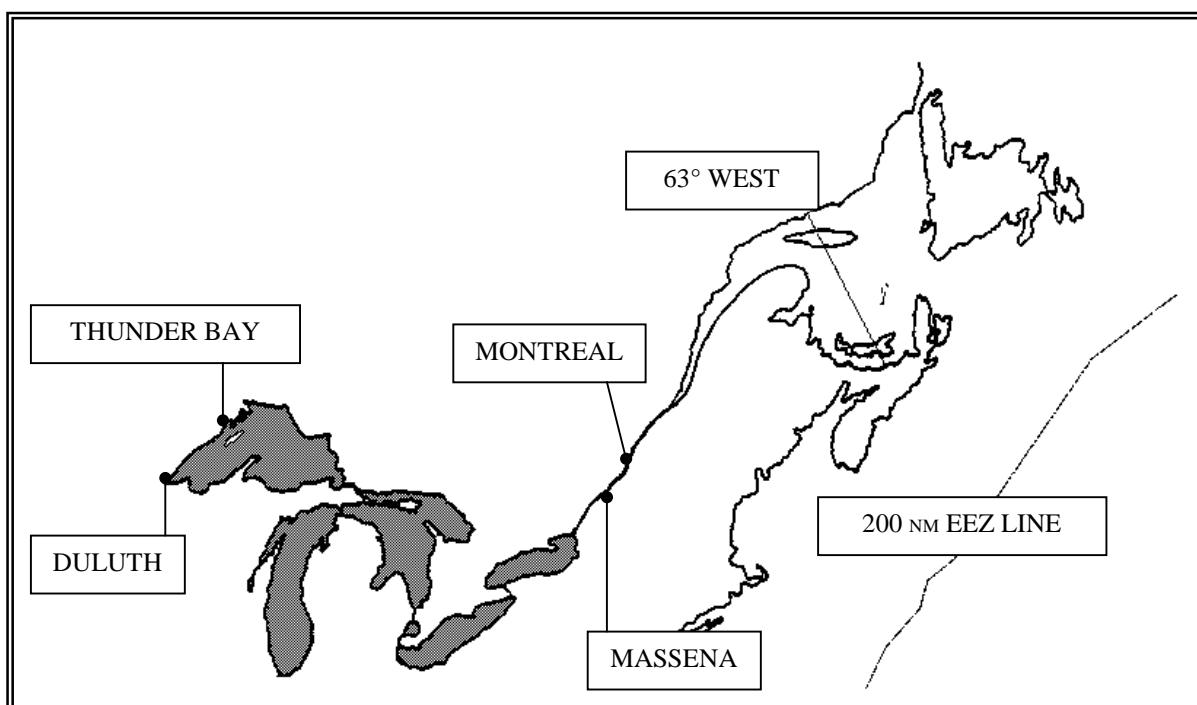


Figure 2a. Ballast tanks

2a(1). Profile of ship with general arrangement of main tanks on typical bulk carrier
(Not showing smaller “peak tanks,” forward and aft, or other small trimming tanks)



2a(2). Cross sections of main tank configurations and structures on typical bulk carriers

(Alternative configurations – all actual tanks are symmetrical)

Design shown on left most common on handy sized bulkers in Great Lakes trade)

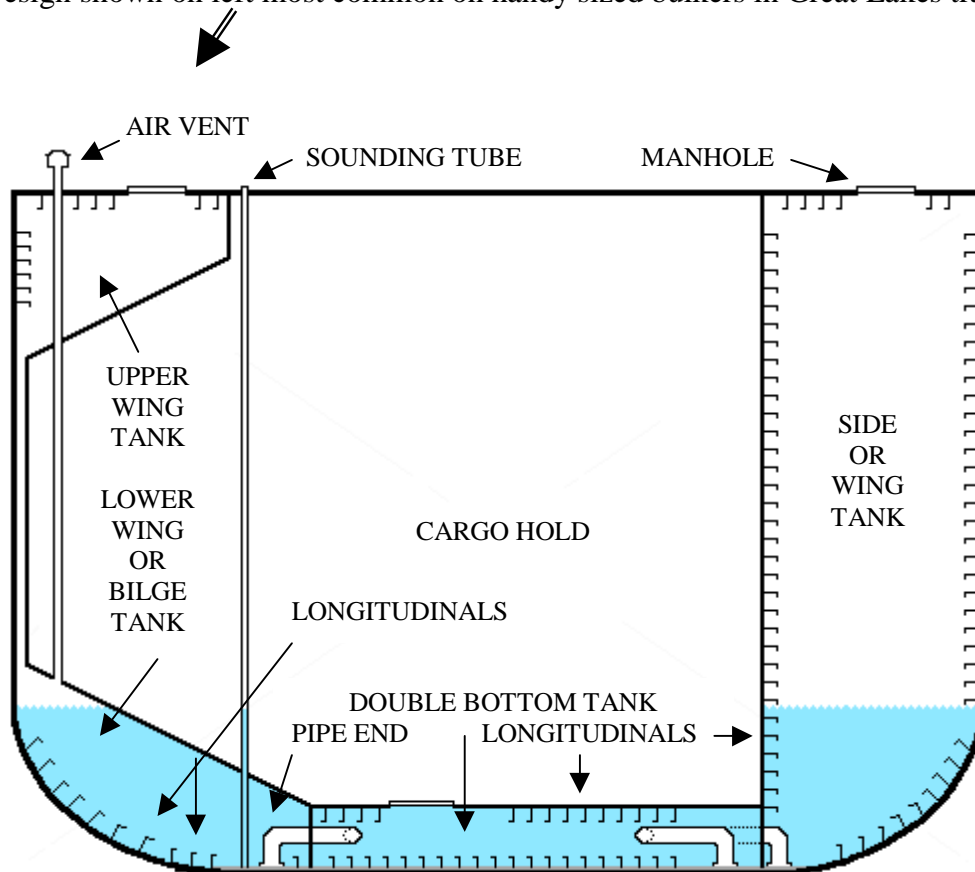


Figure 2b. The NOBOBs



1. Vessel enters Great Lakes loaded with cargo as “NOBOB,” with “no ballast on board,” carrying unpumpable slop in the bottom of the ballast tanks (75% to 95% of vessels).
 2. NOBOB discharges cargo at a Great Lakes port, taking on Great Lakes water over the unpumpable slop.
 3. NOBOB takes on new cargo for outbound voyage at separate port, discharging the mixture of Great Lakes water and slop (approximately 40% of the NOBOBs).
-

Figure 3a. The wall of protection: The definition of the exotic threat subject to control under state and provincial conservation laws

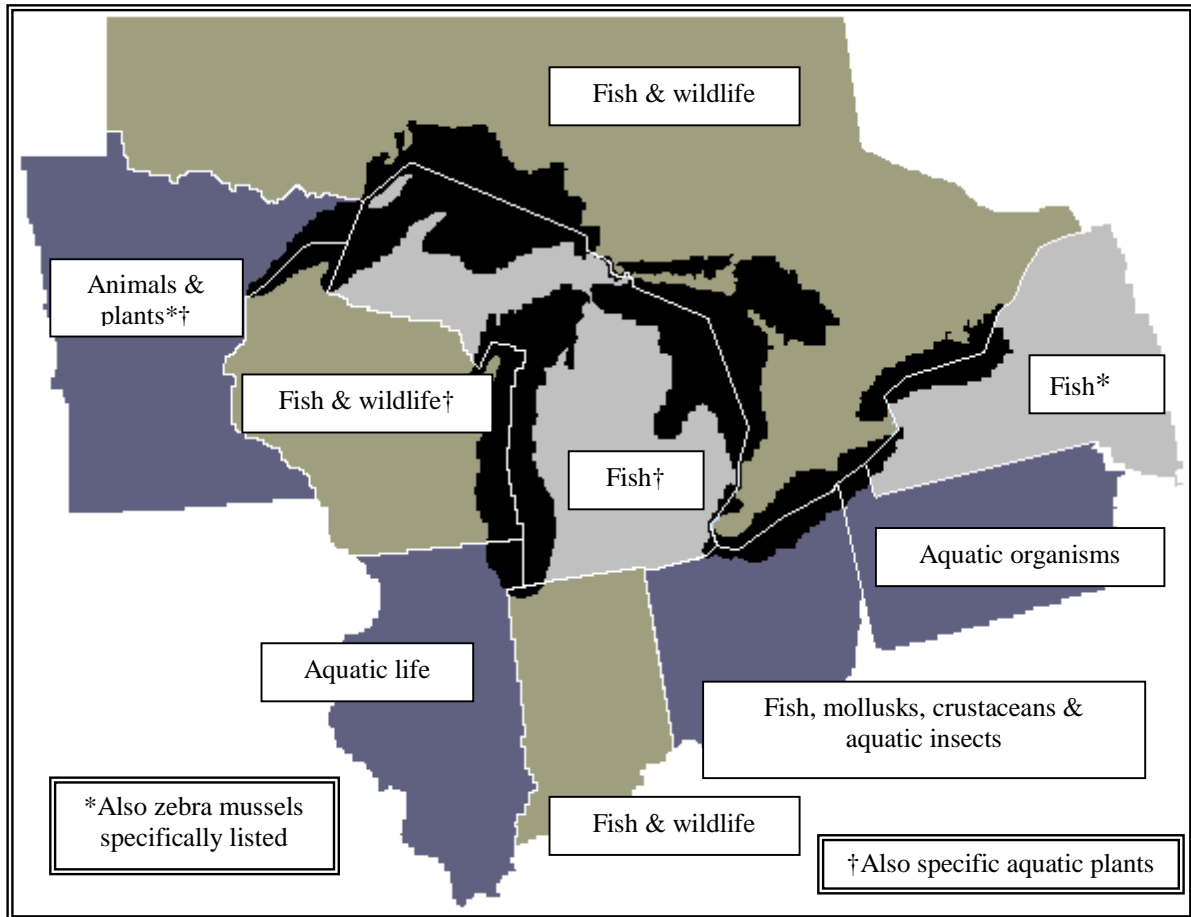
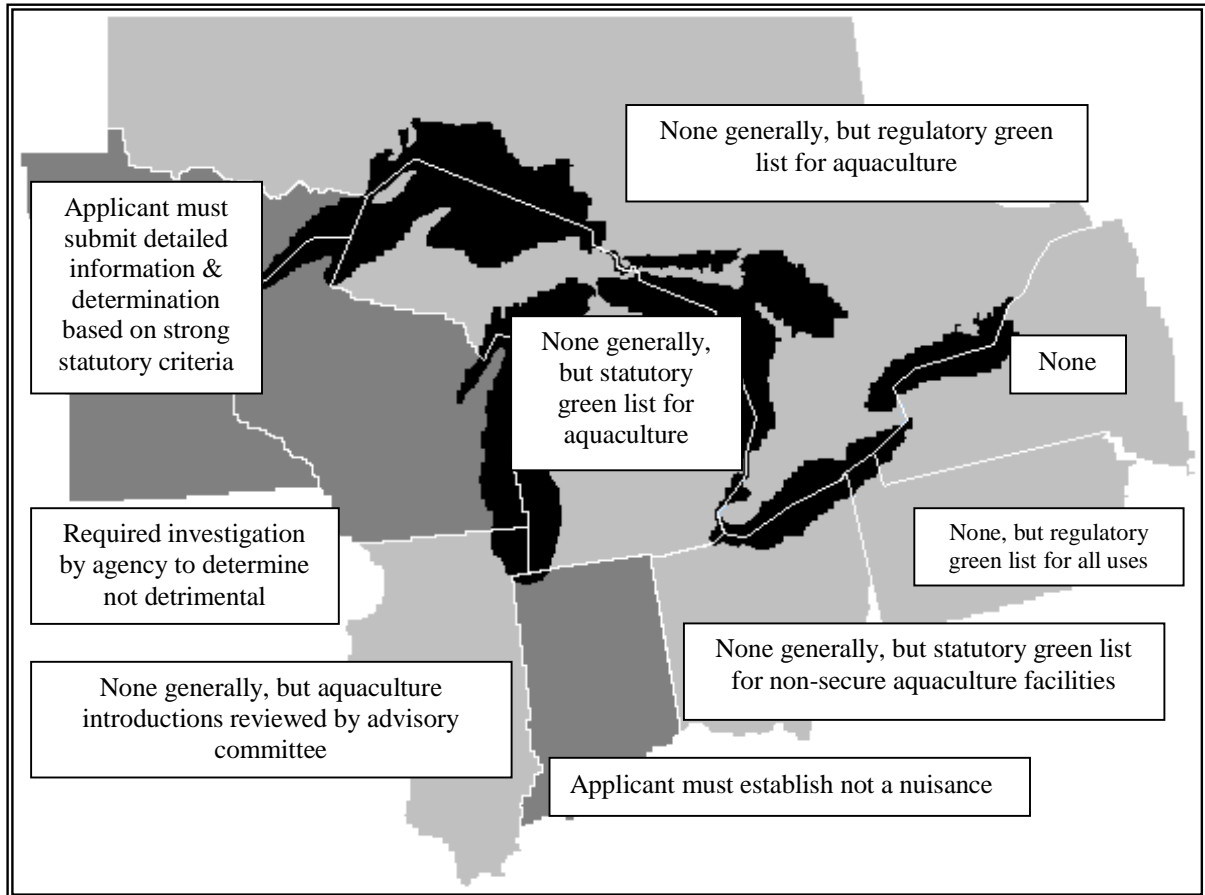
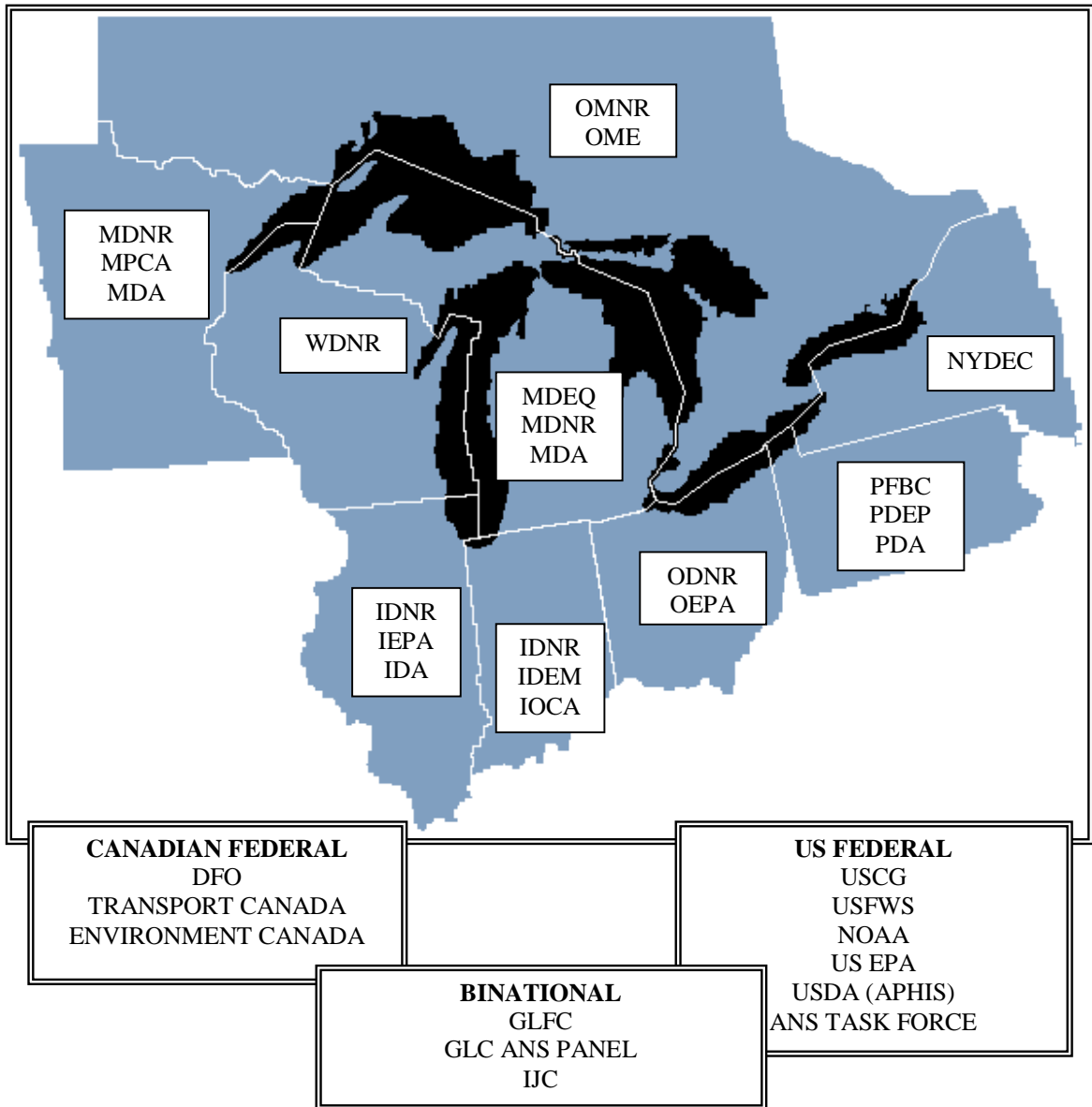


Figure 3b. The wall of protection: Statutory and regulatory standards for permitting the introduction of exotics



Note: The fact that there are no specific statutory or regulatory standards for the review of proposed introductions does not mean that the conservation agency does not have internal procedures or policies for reviewing introductions. What it means, simply, is that such procedures or policies do not have the force of law.

Figure 3c. The wall of protection: The responsible agencies



Part I. Introduction and threat assessment

§ 100. Introduction to the report

§ 101. Purpose of the study

The focus of this study is on laws and policies for the prevention of the invasion of the Great Lakes aquatic ecosystem by exotic organisms. Within that focus, it is designed to provide Michigan policymakers with:

(a) Basic background, with documentation, on the science, technology, and economics of the major vectors for invasions. This includes a description of (1) commercial shipping carrying ballast water into the Great Lakes, (2) aquaculture in the Great Lakes and Michigan, (3) bait fish importation, and (4) the importation of live fish for aquaria and ornamental ponds.

(b) An analysis of critical legal issues, particularly legal issues regarding the control of exotics in ballast water in cooperation with the US federal government and the other jurisdictions in the Great Lakes. This includes, most importantly, a definitive legal analysis of the issue of federal preemption under US federal law, which determines the scope for Michigan regulation of ballast water in commercial shipping.

(c) An overview of existing legal regimes in the Great Lakes, comprehending all eleven US and Canadian federal, state, and provincial governments with jurisdiction over the Great Lakes, and also international and regional regimes of relevance. The purpose of this wide-ranging overview of legal regimes is to (1) identify general patterns in legislation, regulation, and administration of programs for prevention of invasions, and (2) identify specific strengths and weaknesses in the existing regimes. This, it is hoped, will provide a basis for better integration of the laws of all the eleven jurisdictions responsible for the Great Lakes. Special attention is given to the Michigan Aquaculture Development Act of 1996 and the model Minnesota chapter on “Harmful Exotic Species” enacted in 1996.

This is primarily a study of legal regimes. The legal structure, however, is shaped by environmental, economic, and political realities. Most of the discussion in this part, therefore, concerns the economic and technical structure of the commercial activities which constitute the major vectors of concern for new invasions.

To begin with the most obvious ecological and political realities, the Great Lakes are one aquatic ecosystem governed by eleven distinct federal, state, and provincial jurisdictions. Moreover, all of the vectors of concern involve movements in interstate and international commerce. Ballast water in global shipping is the most obvious example, but

even bait fish involves significant movement across the US and Canadian border as well as movement across state and watershed boundaries in the United States. Thus, any action taken by the State of Michigan to prevent invasions of the Great Lakes should take into account the laws and programs of those other jurisdictions, and will obviously be most effective if it promotes regional coordination of prevention. That does not mean, however, that a state or province should wait for complete agreement and coordination of national and regional policies before acting. That would be a plan for inaction, because it would not take account of the political reality of response to such issues. The problem of exotic species in ballast water is on the world stage only because of pressure brought on world shipping by three nations, Australia, Canada, and the United States. Canada and the United States, in turn, initiated this action on ballast water only because of pressure from regional and state interests responding to the invasion of the zebra mussel and other exotics in the Great Lakes. Similarly, both the US and Canadian federal governments have historically looked to their states and provinces to set policy for general management of fishery resources and regulation of other vectors such as aquaculture. All of this is simply a manifestation of the environmental maxim to “Think globally, but act locally.”

The regional organizations in the Great Lakes are models of inter-jurisdictional and international cooperation probably unmatched anywhere else in the world except by the North Atlantic Treaty Organization and the European Union. Long before there was a US federal Aquatic Nuisance Species Task Force (mandated by legislation in 1990) or a national Invasive Species Council (just mandated by an executive order of February 3, 1999), there was a Great Lakes Fishery Commission (established by a convention of 1954), a Great Lakes Commission (established by a compact of 1968), and a Great Lakes Water Quality Agreement (1972). It was a call to action by the Great Lakes Fishery Commission and the International Joint Commission, acting under the Great Lakes Water Quality Agreement, which led directly to the Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990, the first legislation in the world to establish routine mandatory controls on exotics in ballast water. Although international and national action is absolutely necessary to a complete solution of the problem, that action is most likely to come about from pressure from local and regional authorities with the strongest sense of ownership over the resources being damaged.

But that, in turn, does not mean that state and provincial authorities are free to act without considering the same economic constraints and interests which tend to restrict effective action at the national and international levels. The classic conflict between environmental protection and economic development could not be more pointed than in Michigan. It is a state in which both industry and trade,¹ on one hand, and natural resources

¹ The largest categories of employment in Michigan are manufacturing (22.2%) and trade (23.7%). Based on 1996 figures from the US Commerce Department in *The World Almanac and Book of Facts 1998* (Mahwah, NJ: World Almanac Books, 1997), p. 673.

and tourism,² on the other, are both essential foundations of the economy and of the quality of life for its citizens. The zebra mussel and other aquatic invaders cost the economies of the Great Lakes and Upper Mississippi basins more than three billion dollars a year,³ and also cause incalculable long-term disruptions of the ecosystem. The trade moving through the St. Lawrence Seaway brings the Midwest states an estimated two billion dollars per year in direct and indirect income,⁴ plus equally incalculable improvements in the long-term competitive structure of the economy.⁵ How should economic and environmental interests be balanced against each other? The answer, obviously, is that the State of Michigan cannot accept the proposition that it be forced to choose between one or the other.

In fact, however, all the jurisdictions with responsibility for the Great Lakes have so far chosen one over the other. The lack of the development of an effective regime for the control of ballast water and the lack of coherent region-wide policies for the regulation of commercial uses of aquatic organisms amount to a *de facto* policy choice to continue to suffer the uncontrollable effects of new invasions.⁶ Obvious and economically feasible changes needed in shipping design and operational practices have been delayed into the indefinite future by the shipping industry. The development of a national ballast water management policy has been gutted by an industry amendment to the federal legislation.

² The Michigan Department of Natural Resources estimates that out-of-state recreational fishers, alone, bring one billion dollars to the Michigan economy each year. MDNR web site at www.dnr.state.mi.us (February 23, 1999).

³ David Pimentel, "Environmental and Economic Costs Associated with Non-indigenous Species in the United States," unpublished paper presented to the American Association for the Advancement of Science (Anaheim, CA: January 24, 1999). See further discussion, and Table 1, below.

⁴ Martin Associates, *The Economic Impacts of the Great Lakes/Saint Lawrence Seaway*, study prepared for the St. Lawrence Seaway Development Corporation (Lancaster, PA: Marine Association, March 10, 1995), p. E-2. Includes effects of both domestic and foreign traffic. The analysis is based on 1994 tonnage.

⁵ "The Midwest Economy in an Interdependent World Market," *Chicago Fed Letter*, No. 116 (Chicago: The Federal Reserve Bank of Chicago, April 1997).

⁶ These statements are justified in detail in the body of the report below. The researcher fears that this characterization of the current state of regional coordination will be interpreted by some as disparaging to the many competent and dedicated conservation officials working hard in the Great Lakes – and also working well together in such forums as the Great Lakes Commission Aquatic Nuisance Species Panel. No such disparagement is intended. Then why use such terms? *Some* term must be used to characterize a significant fact. Despite conscientious efforts, despite a relatively high level of political support for programs, and despite a level of regional cooperation which is a model for the rest of the nation, there is, nevertheless, no *legally effective regime for regional coordination* of individual jurisdictional policies, and, as a result, a considerable level of inconsistency between the legal regimes of individual states. There is, even more markedly, a noticeable lack of US and Canadian *federal leadership* to solve that obvious problem in the Great Lakes and other distinct ecosystems of North America, despite the efforts of many equally virtuous federal officers working in the area. This is a characterization of legal regimes, and one that must be set forth if the structural problems are to be solved. The word "incoherent" is the most accurate term that seems to apply. But that does not mean that individual officials at the state, provincial, or federal level are incoherent. That would be a classic fallacy of composition, just as it is equally fallacious to assume, going in the other direction, that the individual efforts of intelligent and well-focused people must necessarily result in an intelligent and well-focused policy at collective levels. That simply does not follow. This is a study in law and politics, not a study of the performance or psychology of individuals.

And the shipping industry has so far successfully avoided any thought of applying the principle so well accepted when dealing with pollution of the water by oil and chemicals that “the polluter pays” for the externalized costs of the commercial activity. Commercial importers of exotic organisms in the aquaculture and aquarium industries have so far successfully prevented the development of a national “clean list” or “green list” based on the obvious principle that the proponent a new organism should have to demonstrate its benign nature before it is imported for use. (To be clear, Michigan and other states do have state “green lists” which control the use of organisms in aquaculture. The point, here, is that there are no national or regional green lists to back up these state controls.)

In sum, the results of this study reinforce the appraisal of the situation in the 1996 Michigan *Nonindigenous Aquatic Nuisance Species State Management Plan*, where it says that “Federal and State policies, designed to protect us from unplanned invasions and the spread of nonindigenous species, are not safeguarding our local and national interests in important areas.”⁷ That is also pretty much the conclusion of the senior US federal official with primary responsibility for management of natural resources. The Secretary of the Interior recently characterized our response to the problem as “pitiful.” He went on to say that, “Frankly, in light of the economic and ecological devastation, we have been too timid. We restrain ourselves with voluntary guidelines, a scattered approach and limited, unenforced codes.”⁸

What should be done about this? The goal is to establish a rationally-balanced social calculus of the benefits created by the commercial activity (including the social and environmental benefits as well as the economic benefits of the commercial activity) and the externalized costs. World shipping is indisputably and fundamentally necessary to the economy. (Approximately 80% of world commodities move by ships,⁹ and there is simply no other way to economically move many bulk products.) It is also worth noting that world trade also creates intangible social benefits, and that shipping generally is far less damaging to the environment, per ton of cargo moved, in terms of use of fuel and generation of combustion byproducts.¹⁰ Similarly, aquaculture is a legitimate form of agriculture. More

⁷ Michigan Department of Environmental Quality Office of the Great Lakes, *Nonindigenous Aquatic Nuisance Species State Management Plan* (Lansing, MI: Office of the Great Lakes, January 1996), p. ii.

⁸ Bruce Babbitt, Secretary of the Interior, Remarks at the First National Conference on Marine Bioinvasions at Massachusetts Institute of Technology (January 26, 1999). Those comments followed immediately after a discussion of ballast water discharges, and might thereby have been specifically directed at the inadequacy of controls over that vector (which the analysis in § 210 of this paper, below, clearly supports). However, in an appearance on National Public Radio shortly thereafter, Secretary Babbitt also strongly emphasized the illogic of there being only a national “red list” of exotics prohibited because they had already been proven to be harmful, rather than a national “green list” of exotics demonstrated to be acceptable for importation. Bruce Babbitt, interview on National Public Radio, “Talk of the Nation Science Friday” (February 2, 1999), Hour 2.

⁹ Marine Board, National Research Council, *Stemming the Tide: Controlling Introductions of Nonindigenous Species by Ship’s Ballast Water* (Washington, DC: National Academy Press, 1996), p. 1.

¹⁰ This is, ironically, very relevant to the protection of Great Lakes water quality and the protection of the health of citizens in the region because airborne deposition of heavy metals and persistent toxic chemicals is a source of significant contamination of the Great Lakes food supply, along with less persistent but damaging

than that, it is a potentially important new economic sector and source of high-quality and healthy protein badly needed by expanding human populations. It is also, perhaps, a means for reducing pressures on natural fish stocks which are currently being driven in the direction of extinction. In each case, any regulatory policy which would shut down these industries or impose exorbitant costs on them is out of the question. The question is what reasonable regulation is appropriate, and the devil is in the details.

This analysis is intended to illuminate some of those details. The following sections in Part I provide a description of the major vectors of concern for new introductions of exotics into the Great Lakes ecosystem: ballast water and “commercial uses” of exotics in aquaculture, the bait trade, and the aquarium trade. The purpose of this description is to provide a basic understanding of the structure of each of these economic activities and of how they function as a potential vector for exotics. Without a clear understanding of the business being regulated, regulation is likely to be ineffective as well as obnoxious.

Parts II and III of this report then provide a detailed analysis of the current legal regimes for regulating those vectors. Part I provides an extensive analysis of the current regulation of ballast water, which is by far the predominate vector for new introductions. This includes a candid discussion of the defects in the current US regulatory regime for the Great Lakes and a definitive presentation of the issue of federal preemption of possible state regulation of ballast water. Part III provides a wide-ranging survey of current statutes, regulations, and agreements for the control of the introduction of exotics in all of the eleven federal, state, and provincial jurisdictions of the Great Lakes. This survey does not purport to provide a definitive interpretation of all of the statutes and regulations in these eleven jurisdictions. That would require a legal treatise of several volumes, and would not really serve the purposes of this study. The purpose of the analysis in these sections is to provide policy makers with a comprehensive overview of the general structure of regimes in the region, and to identify a number of specific technical legal issues for their consideration. This should better inform any proposals for improvement of current state regimes in the region. Particular attention is given to the Minnesota legislation on exotics, which has provided a model for the region, and to the Michigan Aquaculture Development Act.

ozone and acid aerosols. See US EPA and Environment Canada, *The Great Lakes: An Environmental Atlas and Resource Book* (Chicago: US EPA Great Lakes National Program Office, 3rd Ed. 1995), p. 31; and US EPA and Environment Canada, *State of the Great Lakes 1997* (Chicago: US EPA Great Lakes National Program Office, 1997), pp. 39-42. A study by the Great Lakes maritime community found that, if the same cargoes carried by domestic Great Lakes shipping were to switch from vessel to rail, trains would burn an additional 14 million gallons of fuel and generate an extra 4,321 net tons of emissions. Lake Carriers' Association, *1996 Annual Report* (Cleveland: LCA, 1997), p. 25. A similar analysis has not been done on the foreign cargoes entering through the Seaway (which cannot be carried by rail across the Atlantic) but the same basic point very well applies. Great Lakes shipping, both foreign and domestic, has also been environmentally friendly in terms of accidental spills. There have been no major spills from commercial vessels in the Great Lakes since 1990 (a fire on a gasoline tank ship, which actually resulted in very little direct pollution of the water) and spills of oil and chemicals into the Great Lakes from shipping sources generally account for less than 1% of total load. Melville Shipping, *Assessment of Pollution from the Great Lakes from Vessel Sources in Comparison to Other Sources*, Canadian Coast Guard contract T1878-5-0147 (Ottawa: Canadian Coast Guard, March 1995), p. 58.

The reasons for concern about exotics have been fairly well documented elsewhere. They will only be discussed briefly, with reference to that documentation, in this introduction. To begin with, however, one should be clear on exactly what the subject of the inquiry is.

§ 102. Defining terms

What exactly are we talking about? This may seem pedantic, but language is important. The choice of a label in a piece of legislation can affect both the nature of the policy debate and the actual legal applicability of a prohibition. The two most common terms, both of which are used here depending on the context, are “exotics” and “aquatic nuisance species” or “ANS.” In various regimes discussed in this study, the subject is also referred to as “nonindigenous species” or “NIS,” “non-native species,” “harmful exotic species,” “ecologically harmful species,” “unwanted aquatic organisms and pathogens,” “biological material,” “nuisance plants and animals,” “pests,” or simply as various things, such as “fish” or “wildlife” (both of which vary widely in their meaning among jurisdictions) which are “harmful” or “injurious.” The most recent addition to the collection, deliberately chosen for the title of the 1996 federal legislation in order to better mobilize political support, is “invasive species.” The most widely used terms have been “nuisance species” and “aquatic nuisance species.” But the managers working on the “ANS” Panel and Task Force (unfortunately stuck with this most inelegant of acronyms) have often felt that the traditional adjective of “nuisance” seriously understates the permanent damage done to the biodiversity of the planet. The term “biological pollution” has been floated lately. It has not yet caught on, but it has already been strongly objected to by shipping interests sensitive to the policy implications of such a term. This is exactly why it is used, and the debate about how ballast water should be regulated may well result in this term becoming more popular.

None of these terms is entirely satisfactory in all contexts. “Exotics,” which has the great virtue of simplicity, is sometimes too broad. Aside from the fact that it includes terrestrials (which is one reason it is often deliberately used here, because control of aquatic exotics is part of larger regimes and issues applicable to control of all exotics), the term “exotics” is sometimes objected to, along with “nonindigenous species,” because not all of them (or even most of them) are harmful. Nevertheless, it often makes sense to think in terms of “exotics” as a broad category of organisms whose nature is undetermined. That is certainly appropriate when dealing with the unknown organisms hiding in ballast tanks. It is also appropriate, although it carries with it a policy bias, when discussing known species which may or may not be harmful, and therefore need to be subject to some process of classification before they are intentionally used in a commercial enterprise. An aquaculturist might well object to the implication that all exotics are presumed harmful. Many biologists would argue that just such a presumption is very well based in both science and policy.

Finally, it should be noted that “species” is not a relevant distinction. Exotic strains within what technically constitutes a “species,” such as artificially-modified genes in aquaculture fish, natural genetic drifts in mussels, or distinctly different strains of *E. coli* bacteria, are just as much a reason for concern as exotic species. In practice, “species” is often used as an attempt to simply say “organism,” thus avoiding distinctions among “plant,” “animal,” or something else in what has now grown to be a five-fold system of kingdoms in modern taxonomy. (Indeed, some of the specific life forms of greatest concern, particularly in Australia, but also in North America, are the toxic dinoflagellate algae, *Dinomastigota*, which are classified as neither “plants” nor “animals” but as “protocists.”) And all bacteria occupy a further-distant kingdom of their own known as “prokaryotes.”) The general terms “life” or “organisms” include all of these, but do not include viruses, although “biological material” might be broad enough for that. Or “organisms and pathogens,” used some time ago by the International Maritime Organization, might be more certain to cover everything.

This report uses a variety of these terms, each depending on the context. When specific statutes and regulations are being cited, this report uses whatever terms are used in those statutes and regulations.

By way of example, some of the most notorious invaders of the Great Lakes are the sea lamprey,¹¹ purple loosestrife,¹² the alewife,¹³ furunculosis,¹⁴ Eurasian watermilfoil,¹⁵ *Glugea hertwigi*,¹⁶ European ruffe,¹⁷ and the infamous zebra mussel.¹⁸ This is only a short list of some of the worst – those which biologists believe to have had “substantial impacts” – out

¹¹ *Peromyzon marinus*, a parasitic eel, apparently introduced through the canal systems in the 1830s, although some believe it to be native to Lake Ontario. Edward L. Mills, Joseph H. Leach, James T. Carlton, and Carol L. Secor, “Exotic Species in the Great Lakes: A History of Biotic Crises and Anthropogenic Introductions,” *Journal of Great Lakes Research*, vol. 19, no. 1 (1993), pp. 1-54.

¹² *Lythrum salicaria*, a robust aquatic weed which squeezes out other plants and animals, first recorded in 1869, apparently introduced by railroads or canals. Mills, *et al.* (1993), *supra*.

¹³ *Alosa pseudoharengus*, a garbage fish, prone to cataclysmic blooms and dieoffs, but with some use as feed stock, recorded in 1873. Like the lamprey, this may have been native to Lake Ontario, but apparently was introduced from the Atlantic by canals. Mills, *et al.* (1993), *supra*.

¹⁴ *Aeromonas salmonicida*, a bacterium pathogenic to fish, introduced to the Great Lakes, perhaps from Germany, by an unknown vector, sometime before 1902. Mills, *et al.* (1993), *supra*.

¹⁵ *Myriophyllum spicatum*, a robust aquatic weed which squeezes out other plants and animals, and also alters water temperature, spread from the Atlantic sometime before 1952, apparently by either aquarium release or transport in vessels. Mills, *et al.* (1993), *supra*.

¹⁶ A protozoan fish parasite, discovered in 1960, apparently introduced with its host, rainbow smelt, which was intentionally stocked in 1912. Mills, *et al.* (1993), *supra*.

¹⁷ *Gymnocephalus cernuus*, a garbage fish from Europe with great potential to displace native species, apparently introduced through the ballast water of oceanic ships sometime before 1986. Mills, *et al.* (1993), *supra*.

¹⁸ *Dreissena polymorpha*, a European mussel which fouls industrial water systems, smothers and starves out other benthic organisms, dramatically alters nutrient balances and lower food chains, and which may play a significant role in making toxics more bioavailable, apparently introduced through the ballast water of oceanic shipping sometime before 1988. Mills, *et al.* (1993), *supra*.

of more than 140 documented introductions to the Great Lakes since the 1800s.¹⁹ Note that this list includes more than just the larger organisms such as the sea lamprey and the zebra mussel. Those are the easiest to identify and study. But exotic species which may be of real threat include every form of flora and fauna up and down the taxonomic scale. The threats include invertebrate eggs in the range of 20 to 100 microns, microscopic pieces of weeds, algae cysts in the range of 5 to 25 microns, fungi in the range of 1 to 100 microns, protozoa in the range of 1 to 80 microns, and bacteria and viruses which measure less than 1 micron.

§ 103. Measuring the cost

Why do we care? The Michigan *Nonindigenous Aquatic Nuisance Species State Management Plan* is premised on the observation that harmful exotics, even if a minority of total introductions, “cause significant environmental, socio-economic, and public health damage.”²⁰ The evidence, before and since, supports that premise. The now-defunct Congressional Office of Technology Assessment (OTA) attempted a comprehensive survey of all invasions of the United States – over 4,000 species, including 2,000 plants, 2,000 insects, 239 plant pathogens, 142 terrestrial vertebrates, 91 mollusks, and 70 species of fish. OTA reported in 1993 that the damage from those which are harmful runs into real money, anywhere from hundreds of millions to billions of dollars per year, but declined to offer precise estimates of the economic damage, or to put a value on what the OTA called “profound environmental consequences.”²¹

A more recent study at Cornell University reported in 1999 that it counted more than 30,000 exotics in the United States and totaled up the economic costs of the harmful ones at about \$123 billion per year.²² Some of these figures need to be read with caution. For example, the Cornell study included the costs from domestic cats, which can certainly carry serious diseases and kill birds, but which have historically served a valuable economic function (quite aside from their considerable aesthetic value) in controlling human diseases and damage to grains caused by rats and other pests. (Economic costs of exotic rats came in at \$19 billion per year.) However, few such compensatory qualities can be claimed for zebra mussels, the Asiatic clam, nuisance fishes, and aquatic nuisance plants. (Whatever benefit might have been expected from zebra mussels cleaning up the water column has been pretty well counteracted by the starvation of beneficial fish, concentration of contaminants in the food chain, and possible preferential selection of toxic algae.²³) The

¹⁹ Mills, *et al.* (1993), *supra*, especially Figure 6, p. 43.

²⁰ Michigan Department of Environmental Quality Office of the Great Lakes, *Nonindigenous Aquatic Nuisance Species State Management Plan* (Lansing, MI: Office of the Great Lakes, January 1996), p. ii.

²¹ Office of Technology Assessment, *Harmful Non-Indigenous Species in the United States* (Washington DC: US Government Printing Office, 1993), p. 3, Table 1-1, and p. 5.

²² David Pimentel, “Environmental and Economic Costs Associated with Non-indigenous Species in the United States,” unpublished paper presented to the American Association for the Advancement of Science (Anaheim, CA: January 24, 1999).

²³ See Glenn Zorpette, “Mussel Mayhem Continued: Apparent Benefits of the Zebra Mussel Plague are Anything But,” *Scientific American*, vol. 275, no. 2 (August 1996), pp. 22-23.

following is a partial accounting of the annual cost to the nation, as calculated by the Cornell study, for aquatic exotics:

Table 1. Annual costs of aquatic exotics in the United States²⁴

Zebra mussels	\$3,000,000,000
Asiatic clam	1,000,000,000
Fish	1,000,000,000
Aquatic plants	110,000,000

The table does not include the costs yet to be accounted for from the ongoing growth of exotic organisms identified in the Great Lakes but yet to make their full impact: species such as the European ruffe, the round and tubenose gobbies, and the spiny water flea.

More importantly, exotic species are a threat to the survival of native species in the areas they invade and the long-term biological heritage of the human species. The Convention on Biodiversity identifies exotics and genetically modified organisms as major threats to global biodiversity.²⁵ Exotics “cause fundamental, irreversible alterations in the structure of communities through predation, competition, disturbance and the introduction of disease and parasites. No introduced marine organism, once established, has ever been successfully removed or contained....”²⁶ A recent report by the Environmental Defense Fund was one of the few attempts at a quantitative assessment of environmental threats. It finds that invasions by exotics in general are second only to destruction of habitats as a cause of extinctions – although aquatic species are third, behind destruction of habitats and pollution, as a cause of extinctions.²⁷ (The study includes changes in aquatic habitat characteristics as a form of pollution. That, in fact, is one of the effects of some exotics.) Mention of endangered species helps to put the problem into perspective, because what we are really talking about here is protecting endangered ecosystems. The damage may not be as immediate and dangerous to human health as toxic contaminants, but it is forever.

²⁴ David Pimentel, “Environmental and Economic Costs Associated with Non-indigenous Species in the United States,” unpublished paper presented to the American Association for the Advancement of Science (Anaheim, CA: January 24, 1999). Cost of “aquatic plants” via personal communication from Dr. Pimentel.

²⁵ Convention on Biological Diversity (adopted at Rio by the UN Conference on Environment and Development, “Earth Summit,” June 5, 1992), Article 8, §§ (g)-(h). The convention has been ratified by Canada, December 4, 1992, and signed for the United States, June 4, 1993, but not yet ratified by the US Senate. The text is available from the Secretariat of the Convention on Biodiversity, Montreal, at www.biodiv.org.

²⁶ James T. Carlton, “Biological Invasions and Biodiversity in the Sea: The Ecological and Human Impacts of Nonindigenous Marine and Estuarine Organisms,” in *Nonindigenous Estuarine & Marine Organisms (NEMO)*, proceedings of workshop at Seattle, WA, April 1993 (Washington DC: National Oceanic and Atmospheric Administration, April 1993), p. 8.

²⁷ David S. Wilcove, David Rothstein, Jason Dubow, Ali Phillips, and Elizabeth Losos, “Quantifying Threats to Imperiled Species in the United States,” *Bioscience*, vol. 48, no. 8 (August 1998), pp. 607-615.

§ 110. The threat from ballast and other ship discharges

Ballast water began to be commonly used in ships with the introduction of steel construction in the mid 1800s.²⁸ Since that time, the threat of transport of exotics has grown as (a) total world trade has increased, (b) ships have become larger, and (c) ships have become faster. Large transoceanic vessels could not enter the Great Lakes until after the opening of the St. Lawrence Seaway in 1959, although some much smaller traffic from ports around the world could make it in from the Hudson River after the opening of the Erie Canal in 1825. Since 1960, however, introductions attributable to transoceanic ballast water have accounted for both a clear majority of all recent introductions (perhaps 60% of introductions 1960-1997) and a dramatic surge in introductions since that time. “In fact, almost one-third of the exotic species in the Great Lakes have been introduced in the last 30 years, and this surge corresponded with the opening of the St. Lawrence Seaway.”²⁹ The sea lamprey eel may have come up the Erie Canal. All of the more recent invaders of note, the zebra mussel, the European ruffe, the round goby, the tubenose goby, and the spiny water flea, are attributable to ballast water.³⁰ Some of the researchers have calculated that, at any given time, there may be “somewhere in excess of 3,000 species” (presumably not including bacteria and viruses) “in motion in the ballast water of ocean-going ships around the world.”³¹

Ballast water is not the only potential shipping vector. Organisms may also be carried across the ocean as fouling on the hulls, in marine sanitation devices and graywater, and in incidental slop in anchor lockers and other miscellaneous places aboard a vessel. But modern anti-fouling paints and exposure to the open action of the ocean during a voyage tend to reduce the threat from hull foulings,³² and none of the other sources of water aboard the ship amount to anything like the magnitude of the organically-laden water carried in the ballast tanks. (Inadequately operated marine sanitation devices are a source of concern for introduction of exotic pathogens. However, as discussed below, ballast water often contains much larger quantities of raw sewage.)

²⁸ Christopher J. Wiley, “Aquatic Nuisance Species: Nature, Transport, and Regulation,” in Frank M. D’Itri, *Zebra Mussels and Aquatic Nuisance Species*, pp. 283-299 (Chelsea, MI: Ann Arbor Press, 1997), pp. 55-63.

²⁹ Edward L. Mills, Spencer R. Hall, and Nijole K. Pauliukonis, “Exotic Species in the Great Lakes: From Science to Policy,” *Great Lakes Research Review*, vol. 3, no. 2 (February 1998), pp. 1-7, 2. See also Edward L. Mills, Joseph H. Leach, James T. Carlton, and Carol L. Secor, “Exotic Species in the Great Lakes: A History of Biotic Crises and Anthropogenic Introductions,” *Journal of Great Lakes Research*, vol. 19, no. 1 (1993), pp. 1-54.

³⁰ Mills, *et al.* (1993), *supra*.

³¹ James T. Carlton, “Biological Invasions and Biodiversity in the Sea: The Ecological and Human Impacts of Nonindigenous Marine and Estuarine Organisms,” in *Nonindigenous Estuarine & Marine Organisms (NEMO)*, proceedings of workshop at Seattle, WA, April 1993 (Washington, DC: National Oceanic and Atmospheric Administration, April 1993), p. 7.

³² See Mills, *et al.* (1993), *supra*; and Carlton, *supra*, p. 6.

Somewhere around six million metric tonnes³³ of foreign ballast mixed with lake water, most of it an organic soup, are discharged into the Great Lakes each year.³⁴ Although other vectors from both ships and terrestrial sources need to be more closely examined, it is clear that prevention of ballast water invasions takes the highest priority.

§ 111. Shipping in the Great Lakes

Commercial traffic on the Great Lakes is divided into three distinct parts: (a) the US flag fleet of “lakers,” (b) the Canadian flag fleet of “lakers” and “salty lakers,” and (c) the third-party foreign “salties” from around the world.

US lakers. The largest, although not the most numerous, ships sailing the lakes belong to a fleet of about 70 large US domestic bulk carriers called “lakers.”³⁵ The majority of the companies owning these vessels belong to the Lake Carriers’ Association (LCA). They are also sometimes referred to as “Jones Act” vessels by the LCA because these are the US “enrolled” vessels which are the only ones allowed to carry “coastwise” cargo from one US port to another under the US Jones Act.³⁶ This is the US version of “cabotage” laws common among all maritime nations, including Canada, giving the right to carry domestic cargoes exclusively to vessels “flagged” by that nation. (The Canadians, however, have some complaints about more restrictive rules in the US cabotage laws as to which vessels are eligible for US flagging.) The cabotage laws, on both sides, allow vessels of any nation to carry cargoes from one side to the other.³⁷

³³ A metric tonne of mass (1,000 kilograms) is equal to 1.102 English short or net tons (2,000 pounds) and 0.98 English long or gross tons (2,240 pounds). (None of these are the same as ship “tonnage.”) Metric tonne is used here as a very close approximation to a cubic meter of water, sometimes expressed “m³,” which is 1.3 times a cubic yard. Shipping volumes are generally expressed in tons or tonnes, English or metric, not gallons. Approximately, 1 metric tonne (or m³, to be more precise) = 264 US gallons.

³⁴ Actual sampling by the Canadians in a representative year, 1994, produced an upper estimate of 5.7 million metric tonnes. Aquatic Sciences, *Examination of Aquatic Nuisance Species Introductions to the Great Lakes through Commercial Shipping Ballast Water and Assessment of Control Options, Phase, ASI Project E9225/E9285* (St. Catharines, ON: Aquatic Sciences, Inc., August 1996), Final report, p. 13. A statistical study by the University of Michigan in 1994 came up with an estimated range between 4 and 7 million metric tonnes. Rendall B. Farley, “Analysis of Overseas Vessel Transits into the Great Lakes through Commercial Shipping Ballast Water and Assessment of Control Options, Phase I and Phase II,” unpublished paper (Ann Arbor, MI: University of Michigan Department of Naval Architecture and Marine Engineering, October 1996). A “metric tonne,” a close equivalent to a cubic meter of water, is 1.102 short tons and 0.98 long tons. A cubic meter equals 264 gallons. Thus, 6 million metric tonnes equals 1.6 billion gallons of ballast water.

³⁵ Lake Carriers Association, *1996 Annual Report* (Cleveland, OH: LCA, 1996), pp. 70, 78-79. Current cargo statistics are available from LCA at www.lcaships.com. Not all of the 70 ships are in service every year.

³⁶ 46 USC § 883.

³⁷ Also, US and Canadian vessels are guaranteed the right to equal navigation of all the Great Lakes except Lake Michigan, subject to reasonable and nondiscriminatory regulation, under the Treaty between the United States and Great Britain relating to Boundary Waters, and Questions Arising between the United States and Canada, signed at Washington, DC, January 11, 1909, 36 Stat. 2448, TS 548, 12 Bevans 319, Article I.

The US lakers range from around 600 to 1,000 feet in length and most of them are “landlocked” inside the Great Lakes because they cannot fit through the locks in the St. Lawrence Seaway. Many of the vessels are old, with a medium age of about 25 years, and vessels as old as 70 years are on the roles, although not always in operation. The fact that they operate exclusively in fresh water significantly reduces the amount of corrosion, the constant enemy of vessels around the world, and they are probably the best maintained major commercial vessels in the world. The laker shipping companies and the steel producers they serve (some of which are vertically integrated in some form) have a tremendous investment of fixed capital (“sunk” investment) in these ships. That capital investment most probably can not be duplicated under modern market conditions. The value of the taconite ore coming out of the mountains of the Superior basin has been level or in real decline over the last several decades, and increasing imports of foreign steel and ore present the lakers with intense competition.³⁸ The import of these economics is, to put it bluntly, that no more of the 1000-footers are likely to ever be built, and there are probably no excess profits available to support significant retrofitting of these large vessels, even if significant retrofitting were required of their foreign competitors. The internal laker industry probably has too much relative value sunk into the current fleet, and the economic environment of the lakers is not directly determined by head-to-head competition with the third-party vessels.³⁹ Thus, a small increase in the cost of third-party shipping due to any requirement to retrofit ballast tanks would not come out in the wash if also applied to the US lakers.

The lakers carry a variety of general bulk cargoes, but their main purpose in being is the transportation of iron ore pellets (taconite), coal, and stone, from areas in the upper lakes, to feed the steel mills in the industrialized belt in the lower lakes. Total cargo carried amounts to a little more than 100 million metric tonnes in a typical year. They also transport several million metric tonnes of ballast around the Great Lakes each year, particularly on their return trips without cargo from Chicago, Toledo, and Cleveland for iron ore at Duluth. But they are incapable of importing anything from outside the lakes. Thus, they are only of concern insofar as they might be a vector for the intra-basin transfer of exotics already in the system. When considering that threat, one must also note that, aside from the fact that the

³⁸ See, for a good overall analysis of the structure of the industry, Donald F. Barnett and Louis Schorsch, *Steel: Upheaval in a Basic Industry* (New York: Ballinger, 1983), app. B, pp. 299-301. That analysis is dated, and the Midwest steel industry has dramatically revived, in response to foreign competition, in the 1990s. But that revival relies on, as well as competing against, increasing imports of foreign steel. See current characterizations of the steel market at the “SteelNet” web site, www.steelnet.org, and the complaints of the lakers at the LCA web site, www.lcaships.org. Thus, although predictions about the death of the Midwest steel industry by Barnett and Schorsch may have been exaggerated, their analysis of the fundamental structure of the industry is still quite sound.

³⁹ They are, most certainly, affected by imports of foreign steel. But it is more complicated than that. Steel can also come up the Mississippi and in other ports on the Northeastern seaboard, and the overall economic viability of the lakers is determined much more by the general viability of the Midwest’s heavy industries rather than marginal changes in the costs of international shipping, which are generally overwhelmed by yearly changes in the world price of grain and changes in the demand for foreign products. (That is one of the effects of the Jones Act insulation.)

lakes are hydrologically connected, they are also home to more than 2.2 million US recreational vessels.⁴⁰

Canadian lakers and salty lakers. There is a comparable Canadian fleet of about 80 vessels,⁴¹ tending to be a little smaller in size, operating inside the Great Lakes. These are also called “lakers,” but they are more difficult to define because a good number of them are “salty lakers” which are small enough to fit through the Seaway and operate on the ocean, sometimes seasonally, often making regular runs through the St. Lawrence Seaway. They carry similar cargoes of iron ore, coal, and stone, but carry more cargoes of other varieties than do the US lakers. Most of the companies owning these vessels belong to the Canadian Shipowners Association (CSA).⁴² They enjoy the analogous privilege of being the exclusive carriers of cargoes from one Canadian port to another under their cabotage laws. Unlike the US lakers, one of their important functions is to connect the heavy industries on the south shores of Ontario with the eastern coast of Canada, and many of the Canadian salty lakers make regular runs for that purpose, not crossing the ocean.

The Canadian motor vessel *Algonorth*, which has been used as platform for demonstrating the use of ballast water filters, has often been pointed to as a typical Canadian salty laker. It is 223 meters (730 feet) by 23 meters (75 feet), just small enough to fit through the Seaway. The Canadian fleet on the Great Lakes carries a little more than half the total tonnage of the US fleet, a little more than 50 million metric tonnes,⁴³ along with a corresponding several million metric tonnes of ballast each year. Little, if any, of that ballast comes from across the ocean. But a good deal of it does come from Montreal Harbor and other busy Canadian ports with heavy foreign traffic.

The Canadian laker fleet is generally newer than the US laker fleet – more in line with average world fleets – although greatly varied. Canada has marine safety laws and inspection programs closely comparable to those of the United States, and both nations are signatories to most of the same international conventions on marine safety. (There is also a high level of operational coordination between the marine agencies of the two nations.) Most importantly, perhaps, the Canadian companies have a similar sense of institutional pride and commitment to good long-term public relations in the Great Lakes community. Like the US laker fleet, therefore, the Canadian lakers and salty lakers are very well maintained.

Representatives of both CSA and LCA have been actively involved in early discussions of the problem of exotics in ballast water. It was in fact those two industry associations, not the US and Canadian marine safety agencies, who initiated the voluntary guidelines for

⁴⁰ Estimate, based on 1996 registrations, from the Ninth US Coast Guard District Law Enforcement Branch, Cleveland, OH.

⁴¹ There are currently 88 vessels in the CSA companies, but not all of these operate inside the Great Lakes.

⁴² Web site, with current statistics on ships and cargoes, at www.shipowners.ca.

⁴³ Lake Carriers Association, *1996 Annual Report* (Cleveland, OH: LCA, 1996), p. 44.

open-lake exchange of ballast on vessels leaving the western end of Lake Superior in order to help slow down the spread of the European ruffe.

Third-party salties. Depending on yearly variations in the markets, there are somewhere between a little more than 400 to a little more than 600 round trips by large transoceanic foreign or “third-party” vessels (neither US nor Canadian) in and out of the Great Lakes through the St. Lawrence Seaway (some of those repeat trips by the same vessel).⁴⁴ They are a highly varied fleet from most of the maritime nations of the world. Some of them are owned or operated by major companies doing business in the Great Lakes with good reputations and high standards of maintenance. Some of them are more what the public associates with the term “tramp” vessel (which technically just means a vessel without a regular repeat cargo run). That is to say that some of them are vessels frequently changing ownership or charter, operating under “flags of convenience” from countries with doubtful enforcement of marine safety laws, sometimes under “bare boat charter” for only one specific cargo run, sometimes owned by a “shell corporation” whose assets are little more than the one vessel.

The great majority of the vessels in the third-party fleet are safe and clean. Rates of serious accidents (collisions, fires, and other things that kill people) are so small as to almost be unnoticeable – not counting the sinking of the motor vessel *Flare*, a typical third-party vessel 26 years of age, which occurred outside the Seaway in 1998. (See “Breaking ships in half” in § 212 below.) Along with the US and Canadian fleets, the third-party foreign vessels spill very little oil or chemicals.⁴⁵ But a small number of the third-party vessels, maybe 10 to 20 out of the 400 to 600 in a typical year, show up with serious and obvious problems such as bad navigation equipment, defective lifesaving gear, and inoperative marine sanitation devices. Occasionally, but less than once a year, US and Canadian authorities have to deal with a vessel which has been abandoned in port, sometimes with a crew stranded on board and running out of food, because the company operating the vessel has simply gone out of business.⁴⁶

⁴⁴ Statistics kept from vessel boardings in the Seaway by the Ninth US Coast Guard District Marine Safety Analysis and Policy Branch, Cleveland, OH, and confirmed by statistics gathered from ports around the Great Lakes by Dr. Al Ballard, Great Lakes Commission, Ann Arbor, MI. There are over a thousand trips in and out of the Seaway each year, but not all of those are transoceanic voyages.

⁴⁵ The total spilled into the Great Lakes from shipping sources is less than 900 metric tonnes per year, less than 1% out of a total of 142,000 metric tonnes per year from all sources. Melville Shipping, *Assessment of Pollution from the Great Lakes from Vessel Sources in Comparison to Other Sources*, Canadian Coast Guard contract T1878-5-0147 (Ottawa: Canadian Coast Guard, March 1995), p. 58. Incomplete statistics from US waters on the Great Lakes, kept by the US Coast Guard Marine Safety Information System, indicate that contributions towards that 1% by the third-party vessels is a little less than that of the US and Canadian lakers, in total amounts, but it might be a little more if calculated in terms of tonne miles of each fleet.

⁴⁶ These observations are based on the researcher’s tenure as the Chief of the Marine Safety Analysis and Policy Branch of the Ninth US Coast Guard District, 1993-1998, and systematic review of Coast Guard historical data (USCG Marine Safety Information System) as well as reports from field units during that period.

The only thing the vessels of this third-party fleet have in common is that almost all of them are “bulk carriers,” bulk cargo carriers, and all of them are what are referred to in the trade as “handy sized” vessels. This means vessels of the area of 30,000 deadweight tonnes (DWT) or less, about 35% of the world fleet, which happen to be small enough to fit through the Seaway limits of 225.5 meters (740 feet) by 23.7 meters (78 feet). On average, these “handy sized” vessels are old. Vessels in the area of 25 years of age are quite common, and they are becoming older. (That is not old in comparison to US lakers, which have a medium age of just about 25 years. But the fact that lakers run in fresh water, which is much less corrosive, and the very high standards of maintenance on both US and Canadian lakers, make that a meaningless comparison.) There were 13,000 handy sized vessels in the world in 1996,⁴⁷ but there had been only 89 new vessels of this class built in a ten-year span from 1984 to 1993.⁴⁸ Some of the third-party vessels coming into the lakes are in fact “rust buckets” on their last legs, and with little remaining capital value.

They generally carry high value cargoes such as steel, heavy machinery, and other manufactured goods into the Great Lakes. Steel, weighing in at about 5 million metric tonnes and valued at about 2 billion dollars,⁴⁹ is carried on about 75% of the incoming vessels⁵⁰ each year. (Although the foreign steel is of great concern to those in the domestic raw steel industry, such as the US lakers, this high quality feed to US and Canadian industries helps them to remain competitive in world markets.) The most important outgoing cargo is low value grain (low value only in the sense of a low price per ton) from the North American heartland. Most of this is shipped out of Duluth and Thunder Bay, the major US and Canadian ports on the western end of Lake Superior. Vessel operators always try to run with cargo both ways. Anywhere from 75% to 95% of them, more towards 95% in a typical year, if there is such a thing for this trade, run “in cargo” rather than “in ballast” on the way in. These report themselves as “no ballast on board” or “NOBOB” upon entry, but they actually carry a substantial amount of slop in the bottom of their tanks (see § 112 below). Many of these also discharge part of their cargo at Montreal before proceeding to the first locks of the Seaway System, often because they have to lighten up to meet the Seaway draft limits of 8.0 meters (26 feet, 3 inches). After discharging that partial cargo in Montreal, they may then have ballast back on a few hundred or thousand metric tonnes to adjust trim. A much smaller number will have to ballast down a little to meet the Seaway “air draft” limit of 35.5 meters (116 feet 6 inches) of clearance above the water. But most of the ballast they bring in comes from elsewhere.

The triangle trade. The third-party ships, running under about 45 different flags, come into the lakes from every continent and climatic zone in the world. In 1994, when US and

⁴⁷ Kevin O’Malley, “Seaway Fleet Study,” *DOT Today* (Washington, DC: US Department of Transportation, May 1996), reporting results of SLSDC study, *State of the St. Lawrence Seaway Vessel Fleet*.

⁴⁸ St. Lawrence Seaway Development Corporation, *Log Book* (Washington, DC: SLSDC, March 1994), p. 2.

⁴⁹ Canadian Shipowners Association and Chamber of Maritime Commerce, *A Competitive Vision for the Great Lakes – St. Lawrence Seaway: An Initiative of Canada’s Marine Industry* (Ottawa: CSA, October 1997), § III.

⁵⁰ Analysis, based on port reports, by Dr. Al Ballard, Great Lakes Commission, Ann Arbor, MI.

Canadian marine safety officers combined forces to prevent the illegal discharge of a load of freshwater ballast from the motor vessel *Pal Wind* (which has since changed ownership and name at least twice), they discovered from the ship's log that the fresh water was from the mouth of the Congo River. However, the major overseas markets are Western Europe, the Baltic, the Mediterranean, and the Middle East.⁵¹ (The Mediterranean, Black, and Baltic Seas have also been heavily impacted by invasions of exotics, including organisms from North America.⁵²) Perhaps about 70% of the vessels follow a typical pattern of "triangle trade," carrying grain from the Great Lakes to ports in the Mediterranean, then to ports in Northern Europe, often with Mediterranean ballast in their tanks, to pick up steel, machinery, and other high value cargoes for the Great Lakes.⁵³ Transit time across the North Atlantic, sometimes with intermediate stops on the US or Canadian seaboard, may run from around ten days to two weeks. Although the Seaway is only open from late March to late December, the North Atlantic in their operating area of latitudes 40° to 50° is frequently cold and stormy, especially during the last runs before the end of December. Exchange of ballast on the open ocean, under the limitations of current tank and piping designs, can be dangerous. That was very well illustrated when the motor vessel *Flare* (discussed in detail in § 212 below) broke in half off Newfoundland on January 16, 1998.

It may be that this typical triangle trade pattern could not be better designed for the transoceanic transportation of live aquatic life. As yet unpublished research on ballast tank ecology being conducted for the US Coast Guard by the Smithsonian Environmental Research Center tends to confirm some common-sense suspicions about the relevant variables: (a) There is a greater concentration of organisms (including pathogens) in ballast from warm-water ports. (b) Transit-time has a strong inverse relationship to the survival of the organisms in the tank. (c) Cold water tends to preserve the organisms longer.⁵⁴ Ballasting up in warm water ports in the Mediterranean (themselves heavily contaminated), adding a little water from the Rhine (also heavily contaminated), and then taking a relatively fast trip across the cold waters of the North Atlantic, may be the ideal way to carry chilled but quite viable organisms to the Great Lakes.

Total cargoes carried through the Seaway (both ways) by the third-party vessels range from a little over 40 to about 50 million metric tonnes each year. (The figures given each year by the Seaway are much higher, because they include 30 to 40 million metric tonnes of Canadian salty laker cargoes.) While the average annual variance in US and Canadian

⁵¹ Canadian Shipowners Association and Chamber of Maritime Commerce, *A Competitive Vision for the Great Lakes – St. Lawrence Seaway: An Initiative of Canada's Marine Industry* (Ottawa: Canadian Shipowners Association, October 1997), § III.

⁵² See a number of articles in *Nonindigenous Estuarine & Marine Organisms (NEMO)*, proceedings of workshop at Seattle, WA, April 1993 (Washington, DC: National Oceanic and Atmospheric Administration, April 1993).

⁵³ Analysis by Dr. Al Ballard, Great Lakes Commission, Ann Arbor, MI.

⁵⁴ Personal communication from Dr. Gregory M. Ruiz, Ecologist, Smithsonian Environmental Research Center (SERC), Edgewater, MD.

tonnage is in the area of 2.25%, the average annual variance for the Seaway is double that at about 4.5%.⁵⁵ (Actual changes in individual years are sometimes much more dramatic.)

Along with that cargo, they import about 6 million metric tonnes of ballast water into the Great Lakes each year.⁵⁶ The ballast goes to all US and Canadian ports, but the two grain ports at Duluth and Thunder Bay receive about as much of this foreign ballast as all others Great Lakes ports combined.⁵⁷ (Other ports receiving the largest quantities, in that order, are Hamilton, Detroit, and Toledo.) It is thus no accident that Duluth has been the original site for the identification of the European ruffe and some of the other exotics established in the lakes. Because of their low temperatures, Duluth Harbor and the St. Louis River are not hospitable to the growth of zebra mussels, and thus would not seem able to sustain a dense population. But they do. One theory currently being investigated by biologists is that the population of zebra mussels in Duluth is being continually refreshed by cross-ballasting by vessels in all three of the fleets from other ports in the Great Lakes.⁵⁸

§ 112. The NOBOBs

That illustrates the particular problem with the third-party “NOBOBs” operating in the Great Lakes. The “NOBOBs” are vessels entering the lakes reporting “no ballast on board” because they contain no pumpable ballast in their tanks. Nevertheless, because of the difficulty of cleaning out the bottom of the tank with only the one pump end installed in almost all ballast tanks, there is a considerable amount of unpumpable slop still in these tanks. These have varied between 75% and 95% of the vessels entering the system in recent years.⁵⁹ The big problem with the NOBOBs is that somewhere around 40% of those vessels engage in a cross-transfer of ballast inside the Great Lakes. A typical scenario goes thus: (a) First, a vessel enters the lakes reporting itself “NOBOB,” but carrying some amount of unpumpable slop and sediment. A 1991 Canadian study of exchange estimated that this slop and sediment ranged from 59 to 468 metric tonnes, and averaged 157.7 metric tonnes per vessel.⁶⁰ (b) Next, the vessel discharges cargo at an intermediate Great Lakes port such as Detroit and takes on Great Lakes water for stability and trim. (c) Finally, the vessel arrives at another Great Lakes port, most often Duluth or Thunder Bay, where it takes on its

⁵⁵ Based on analysis of 1992-1996 tonnage reports from the Seaway and the lakers.

⁵⁶ Aquatic Sciences, *Examination of Aquatic Nuisance Species Introductions to the Great Lakes through Commercial Shipping Ballast Water and Assessment of Control Options, Phase I & Phase II* (St. Catherines, ON: Aquatic Sciences, March 1996), Phase II, p. 12.

⁵⁷ Aquatic Sciences, *supra*, Phase II, Table 1.

⁵⁸ Personal communication from Dr. Andy Cohen, San Francisco Bay Estuary Institute, Richmond, California.

⁵⁹ This is probably typical of vessels, or at least bulk traders, around the world. They have their ballast tanks pumped down as far as possible because they are loaded with cargo, which is, from the point of view of the commercial operations, the ideal state for vessels to always be in. Percentages based on US Coast Guard Ninth District Marine Safety Analysis and Policy Branch figures from boardings of large transoceanic commercial carriers over the years 1993-1997.

⁶⁰ A. Locke, D.M. Reid, W.G. Sprules, J.T. Carlton, and H.C. van Leeuwen, *Effectiveness of Mid-Ocean Exchange in Controlling Freshwater and Coastal Zooplankton in Ballast Water*, Fisheries and Aquatic Sciences Report 1822 (Burlington, ON: Great Lakes Laboratory, 1991), p. 9.

outbound cargo (usually grain) for its voyage back across the ocean. At that point, the vessel has to discharge the Great Lakes water it took on, about 8,000 metric tonnes on average,⁶¹ mixed with that 160 metric tonnes of slop and sediment. As discussed below (§ 212), the NOBOBs are not subject to any controls under the current US regulatory regime.

§ 113. Pathogens

Exotics are a form of plague, and ships have always been carriers of plague. In the Fourteenth Century of Medieval Europe, a growing network of shipping connecting the Mediterranean and the North Atlantic ports with faster and more seaworthy ships played a significant roll in spreading the black rats and fleas which carried the Black Death.⁶² Similarly, the development of steam-powered ships in the latter part of the Nineteenth Century resulted in a global outbreak of what was probably the same epidemic.⁶³ Rats and fleas are fairly well controlled on most modern vessels, but cargoes invested with pests and diseases have continued to be of concern. In the United States, the Animal, Plant, and Health Inspection Service (APHIS) of the Department of Agriculture has been inspecting cargo to control importation of exotics much longer than the US Coast Guard has been inspecting ballast water. In Australia, the lead agency for development of federal policy on ballast water is the Australia Quarantine and Inspection Service (AQIS).

Ballast water, in particular, has long been recognized as a means for the transport of pathogens. During the negotiations of the first International Convention for the Prevention of Pollution from Shipping in 1973, the International Maritime Organization in London asked the World Health Organization to conduct research on epidemic disease bacteria in ballast water, but that research seems to have never been carried out.⁶⁴ Later on, after the identification of the zebra mussel and other exotic organisms in the Great Lakes and other places, the international maritime community expanded the focus to all scales of life with the *International Guidelines for Preventing the Introductions of Unwanted Organisms and Pathogens from Ships' Ballast Water and Sediment Discharges*.⁶⁵ Recent studies of ballast in vessels entering the Great Lakes by the Canadians confirmed the suspicion that it contains

⁶¹ Based on a survey of 16 vessels entering the Great Lakes in 1995 conducted by the researcher, previously reported in Katherine Weathers and Eric Reeves, "The Defense of the Great Lakes Against the Invasion of Nonindigenous Species in Ballast Water," *Marine Technology*, vol. 33, no. 2 (April 1996), pp. 92-100; and M. Eric Reeves, "Techniques for the Protection of the Great Lakes from Infection by Exotic Organisms in Ballast Water," in Frank M. D'Itri, *Zebra Mussels and Aquatic Nuisance Species*, (Chelsea, MI: Ann Arbor Press, 1997), pp. 283-304.

⁶² William H. McNeill, *Plagues and Peoples* (New York: Anchor, 1976), p. 165. The Black Death has been tentatively identified as a form of bubonic plague, *Pasteurella petis*.

⁶³ McNeill, *supra*, pp. 156-7.

⁶⁴ Daniel Gauthier and Deborah A. Steel, *A Synopsis of the Situation Regarding the Introduction of Nonindigenous Species by Ship-Transported Ballast Water in Canada and Selected Countries*, Fisheries and Aquatic Sciences Report 2380 (Mont-Joli, Québec: Fisheries and Oceans Canada, 1996), § 5.0, pp. 13-14.

⁶⁵ Gauthier and Steel, *supra*, § 5.0, p. 14.

a whole range of organisms from bacteria to the larger “squishies and crunchies”⁶⁶ which are more usually thought of as the invasive species of concern.⁶⁷ They did not test for viruses in the Great Lakes study, but we know that they are there. They have been found when looked for in the very few studies conducted.⁶⁸ Ships ballast up in crowded ports near urban centers, where they discharge their cargo, in ports all around the world. Most of those communities have poor to nonexistent water treatment facilities. The waters in almost all ports of the world (including those of United States and Western European nations as well as those of underdeveloped nations) have been described by biologists as “microbial soup,” or “veritable stews of viruses, plasmids, transposons, and bacteria,” and there is evidence that algae provides a protective packaging for the transportation of bacteria and viruses.⁶⁹ A typical load of ballast water contains a good amount of sewage, often accompanied by excess nutrients facilitating the culturing of the microbes in the tank during the voyage. “Viruses attach themselves to both solid and semi-solid fecal matter, and they are present both in the matter that settles to the bottom of the water column and in the matter that continues to float in the water column for a longer period. This means that ballast tank filling is a highly likely source of virus collection, and that the coastal water sediments act as reservoirs for the viruses.”⁷⁰ Ballast is not the only source of exotic and potentially dangerous pathogens. Shipboard marine sanitation devices (MSDs) range from the minimally adequate to non-operational on many of the third-party (neither US nor Canadian) vessels entering the Great Lakes and other ports.⁷¹ But the far greater quantities of sewage, all of it untreated, are carried by ballast.

⁶⁶ This wonderfully imprecise term for a whole range of organisms of concern comes from one of the leading researchers on zebra mussels and other organisms in the Great Lakes, Dr. Ellen Marsden.

⁶⁷ Aquatic Sciences, *Examination of Aquatic Nuisance Species Introductions to the Great Lakes through Commercial Shipping Ballast Water and Assessment of Control Options, Phase I & Phase II*, ASI Project E9225/E9285 (St. Catherines, Ontario: Aquatic Sciences, Inc., March and June 1996), Phase I. The organisms included Mollusca (mussels), Bivalvia (mussels), Rotifera, Copepoda, Cladocer (water fleas), Diptera (flies), Oligocha (worms), Polycha (worms), Nematoda (worms), *E. coli*, *V. alginoliticus*, *V. fluvialis*, *A. hydrophila*, *Pseudomonas sp.*, *Providencia rettgeri*, *Ps. Aeruginosa*, *A. sobria*, and *A. caviae*. *V. cholerae* was initially identified, but it was later reclassified as a “closely related species of *Aeromonas*.” “The anti-serum originally used to type the bacteria was thought to have had some cross reactivity. Samples sent to Health Canada's Laboratory Centre for Disease Control (LCDC) in Ottawa continued to show positive for *V. cholerae* 01 using the original anti-serum but were determined to be negative using LCDC's anti-serum which has been purified to prevent this type of cross reactivity. The isolates in question were ultimately determined to be *Aeromonas sobria* and *Aeromonas caviae*, which are also pathogenic but considered to be more cosmopolitan in nature and therefore considered less significant.” *Ibid.*, pp. 20-1.

⁶⁸ Studies conducted around the world are summarized in Jennifer Toy, “The Impacts of Ballast Water on Human Health,” unpublished paper (San Francisco: Center for Marine Conservation, 1998).

⁶⁹ Lauri Garrett, *The Coming Plague: Newly Emerging Diseases in a World Out of Balance* (New York: Farrar, Straus and Giroux, 1994), Chapter 16, especially pp. 560-561.

⁷⁰ Toy, *supra*, p. 3.

⁷¹ See Rhae Giacoma and Eric Reeves, “Working Together to Keep the Great Lakes Clean,” *Seaway Review*, vol. 26, no. 1 (July-September 1997), pp. 57-59, which provides the background on how marine sanitation devices work, how they are regulated in the Great Lakes, and why they are of concern. The concerns are put in relatively mild terms in that article for the sake of encouraging cooperative efforts with the industry (which has not been very responsive in the year since). During the researcher's tenure on the staff of the Ninth US Coast

It is often presumed that the Great Lakes are not likely to suffer ill effects from exotic pathogens because (a) the lakes are cold and (b) the lakes do not have any of the shellfish industries which commonly function as the medium for transmittal of pathogens to humans in warm-water areas. Those two factors are likely to have provided considerable protection, but may sometimes have only masked the chain of transmission. Although there are no outbreaks of human disease linked to foreign shipborne pathogens in the Great Lakes, we know the following two things: (a) The lakes are in fact quite warm enough in summer months (also the height of the shipping season, when ballast and marine sanitation device effluent is being discharged into ports very near public beaches) to require frequent closings due to documented outbreaks of *E. coli*. (b) Swimmers, particularly children who tend to ingest more water when swimming, are subject to more (usually undocumented) infections than the rest of the population.⁷² What we also know is that there has simply been very little good research in this area. The lack of scientific verification does not constitute verification that there is no problem.

§ 120. The threat from commercial uses of aquatics: Aquaculture, bait, and aquaria

Ballast water is well understood to be the most important vector for the introduction of aquatic organisms. World shipping is a well-established and technologically sophisticated industry. And government regulators have obvious targets of opportunity for effective interdiction of the threat in the form of ships, ballast tanks, seaways, and ports. Although the ballast water problem is far from solved, it has a certain clarity. The other major vectors for introduction of aquatic organisms present problems which are different in almost every way and are far more difficult to get into clear focus. To begin with, there is considerable confusion (or debate) about how much of a threat they pose. The commercial interests are much more resistant to government regulation. They represent some highly varied commercial activities, most of which are not highly sophisticated. And the vectors are highly diffuse, presenting fewer critical points for effective interdiction of harmful exotics.

This study attempted to get a focus on the major potential vectors for cross-basin and intercontinental invasions through “commercial uses” of live aquatic organisms. These

Guard District supervising environmental programs in the Great Lakes, the Coast Guard typically had to deal with from four to six third-party vessels appearing in the lakes with completely and obviously inoperable MSDs, sometimes evidenced by raw sewage being pumped overboard or raw sewage overflowing the decks of the living quarters. A much larger number of vessels with apparently operable MSDs can be presumed to be operating below standard, sometimes with virtually no real treatment taking place, because of the lack of any of the quality control programs which the Coast Guard was attempting to convince the third-party marine community to adopt at that time. Both Canadian and US domestic shipping, it must be noted, have internal quality control programs for maintaining MSDs which range from very good (Canadian) to outstanding (US).

⁷² Greg Steele, “The Old Swimming Hole: An Epidemiological and Bacteriological Paradox,” in Leslie Dorworth, ed., *A National Healthy Beaches Symposium: Research, Monitoring and Cooperative Efforts*, proceedings of conference at Indiana Dunes State Park, August 7, 1997 (Hammond, IN: Purdue University Calumet Illinois-Indiana Sea Grant Program, 1997), pp. 15-19; and other articles in the same proceedings.

include “aquaculture” (which is subject to different definitions), bait fish transportation, and aquarium and ornamental fish imports. Escapes of exotics from these commercial activities are lumped under various labels. They are sometimes called “unintentional releases,” defined to include “escape from cultivation, aquaculture and aquaria, and accidental releases due to fish stocking and from unused bait.”⁷³ But the distinction between an “unintentional” and “intentional” release is fuzzy. For example, the US Aquatic Nuisance Species Task Force defines “escapes from aquaculture or aquarium facilities and activities such as dumping of bait-fish and home aquarium species,” along with deliberate fish stocking, as “intentional introductions.”⁷⁴ Instead of focusing on the metaphysics of “intent” (certainly none of the people in these legitimate industries intend to release harmful organisms) this report proposes that the defining characteristic of these introductions is that they are all byproducts, whether intentional, unintentional, or undesired but foreseeable, of the “commercial use” of aquatic life. The term “commercial uses” focuses on two important elements common to aquaculture, bait, and the aquaria:

(a) Because they are commercial activities, they have a potential to transport a large number of aquatic organisms across wide ecological boundaries. Some purely private or recreational activities, such as private collection of bait fish or simple movement of recreational boats around the country, also move exotics around. On the whole, however, the scale of that transport, in terms of both quality and distance, is less by orders of magnitude. This is especially relevant when considering the intercontinental movement of exotics which are, on the whole, likely to be far more dangerous to native ecosystems. (That results from the simple fact that organisms already in a continental ecosystem already have had, for millions of years, many other opportunities to cross local watersheds. However, that logic does not apply as much to potential saltwater invasions from one seaboard to another on the continent.) Private recreational fishers and boaters, moreover, do not introduce genetically modified organisms.

(b) Because they are legitimate and useful activities, these commercial uses cannot be outlawed. Moreover, the legitimate special interests who engage in this commerce will naturally exert constant pressure to widen the use of exotics – including the use of genetically modified organisms. (Commercial vessel operators, whatever their own special interests and opposition to incurring any cost for control measures, have no interest whatsoever in transporting exotics in their ballast tanks. If there is a very cheap way to totally get rid of them, no one will be more happy to see it implemented. They were, in fact, conducting open ocean exchanges to clean sediment out of their tanks long before that was adopted as an exotics control measure.) On the other hand, some of these businesses also have a strong interest, within certain limits, in preventing unintentional introduction of

⁷³ Edward L. Mills, Spencer R. Hall, and Nijole K. Pauliukonis, “Exotic Species in the Great Lakes: From Science to Policy,” *Great Lakes Research Review*, vol. 3, no. 2 (February 1998), pp. 1-7, 3.

⁷⁴ Aquatic Nuisance Species Task Force, *Findings, Conclusions, and Recommendations of the Intentional Introductions Policy Review*, report to Congress under Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990 § 1207, 16 USC § 472 (Washington DC: US Fish and Wildlife Service, March 1994), p. i.

exotics and diseases associated with them. More generally, there are naturally some control measures used in these business as a matter of quality control for their own purposes, and there are sometimes natural concentrations of storage or transport facilities in large scale commerce. This offers some natural targets of opportunity, “critical control points,” at which government regulators might interdict exotics in cooperation with the businesses concerned.

§ 121. Aquaculture

The term “aquaculture” is sometimes used to mean any form of cultivation of aquatics, which includes growing of fish for bait or aquaria as well as for food, or even stocking of natural waterways. It is used here in the more limited and common sense of production of aquatic organisms under controlled conditions (more or less) for use as food. That point is important, particularly to aquaculturists who resent being painted with a broad brush, when considering the history of exotic invasions in the Great Lakes. A general survey of all documented introductions between 1810 and 1991 conducted by some of the leading researchers in the Great Lakes, often cited in the literature, ascribed 29% of total introductions to “unintentional releases,” including aquaculture. But their actual coding of 33 species of aquatic fauna – including fish, mollusks, crustaceans, oligochaetes, other invertebrates, and bacterial and protozoan pathogens – included none that were actually classified as releases from “aquaculture” *per se*.⁷⁵ In fact, a case can be made that “aquaculture” – in the limited sense distinct from older practices of cultivating new species of fish in natural lakes and rivers which were associated with the introduction of the alewife, common carp, furunculosis, and *Glugea hertwigi* – has never been clearly associated with a significant introduction to the Great Lakes.⁷⁶ (One exception may be whirling disease, caused by *Myxobolus cerebralis*, a protozoan whose mechanism of release is unclear, although it was first documented in an Ohio aquaculture facility.⁷⁷) Thus, proponents of the aquaculture industry may argue that there is no scientific basis for even considering that industry to be a vector of concern.⁷⁸

That is an argument, but one which is not persuasive, if for no other reason than the fact that aquaculture is a relatively new and expanding industry in the United States. Fishery managers tend to look back at artificial stocking in natural lakes and rivers as the precursor to modern aquaculture, and then lump them together in the classification of “unintentional releases” or “intentional introductions,” because those were the closest historical precursors. More to the point, there are perfectly logical reasons to be wary of accidents occurring as a

⁷⁵ Edward L. Mills, Joseph H. Leach, James T. Carlton, and Carol L. Secor, “Exotic Species in the Great Lakes: A History of Biotic Crises and Anthropogenic Introductions,” *Journal of Great Lakes Research*, vol. 19, no. 1 (1993), pp. 1-54, 7-8, Table 3.

⁷⁶ See also the list of the thirteen most significant introductions in Mills, *et al.*, *supra*, pp. 1-54, 43.

⁷⁷ Mills, *et al.*, *supra*, pp. 1-54, 20.

⁷⁸ This was the sense of comments from one or more industry experts at the American Fisheries Society Symposia, “Private Agriculture Safeguards for Great Lakes Biological Integrity” (Dearborn, MI, August 29, 1996).

result of the expansion of aquaculture in the future regardless of the lack of clear historical or empirical proof of danger. Exotic species used for aquaculture are likely to be exactly the sort of species successful at invasion if released by reason of their adaptability to the climate and strong breeding characteristics. As one scientist puts it, there are “ecological perils implicit in the characteristics of those species that make those species ideal for aquaculture.”⁷⁹ The really big and bad ones such as the sea lamprey and the zebra mussel come along only infrequently, and each has its own unique history. One might have learned, from the devastation of the sea lamprey, that the key is to watch out for what swims up the canals. But that historical lesson was not good preparation for the invasions of the European ruffe and the zebra mussel in ballast water. Attempts to attack these problems “scientifically” with careful statistical analysis are of limited value as a guide to evaluating future threats.⁸⁰

In fact, up until now the great preponderance of aquaculture in the United States has used native catfish and trout species, with almost half of total production (49%) being catfish, which has been concentrated in the southern states. But the industry is now beginning to make more use of exotics such as African tilapias and Asian carps.⁸¹ An exotic blue tilapia which escaped from aquaculture in Florida has established itself in the Everglades, where it is causing serious damage to native fish and vegetation.⁸² Considering that there have been few exotic fish used in aquaculture in the Great Lakes in the past, just as there have been few alligators cultivated here, it therefore is not particularly significant to

⁷⁹ Dr. George Spangler, comments at the American Fisheries Society Symposia, “Private Agriculture Safeguards for Great Lakes Biological Integrity” (Dearborn, MI, August 29, 1996).

⁸⁰ That sort of statistical study is of very real value, but only within limits. Scientists are trained to quantify. Few biologists want to appear at a conference without their bar and whisker graphs. But the quantifications, trends, and linear correlations they seek to draw out of those data sets are often vague or misleading (as they themselves often warn their audiences) because of the inability to control for historical change in the ecosystem, including the historic and non-repetitive perturbations of human activities as well as the chaotic and nonlinear changes in ecosystem interactions. Ecology, which might be thought of as the current history of paleontology, is very much what the paleontologist Stephen Jay Gould has called a “historical science,” in which “verification by repetition,” the stereotypical talisman of the scientific method, is inapplicable “because we are trying to account for uniqueness of detail that cannot, both by laws of probability and time’s arrow of irreversibility, occur together again.” Stephen Jay Gould, *Wonderful Life: The Burgess Shale and the Nature of History* (New York: W.W. Norton, 1989), p. 278. This point is far from being merely academic or philosophical. It plays a critical part in the politics of ecology. Whether the subject is aquaculture or global warming, there will always be an argument, based on a false image of science, that we need to wait for more “science” to prove the connection in quantitative terms. That will only come, if at all, after it is too late. This false image also has an insidious effect on the research agenda. Because it is much more difficult, although not impossible, to quantify the changes in the threat of exotics in ballast water under different conditions, a tremendous amount of public money and time has been wasted in duplicative studies counting metric tonnes of water going into various ports of the United States. But it is not the water which is the threat. It is the organisms in the water, and their viability, which we need more information on.

⁸¹ Rebecca Goldberg and Tracy Triplett, *Murky Waters: Environmental Effects of Aquaculture in the US* (New York: Environmental Defense Fund, October 1997), p. 22, Figure 1.3, p. 50.

⁸² Goldberg and Triplett, *supra*, pp. 11, 52.

observe that we have suffered few invasions from exotic fish or alligators from aquaculture in the past.

The best expert opinion on the nature of the threat comes from the US National Science and Technology Council Joint Subcommittee on Aquaculture (JSA), which is a strong proponent of aquaculture development. The JSA has identified the following “challenges” in their national plan for aquaculture in the United States:

As US aquaculture continues to expand, it must be sustainable and environmentally compatible. We need substantially better knowledge about possible interactions between aquaculture and natural environments to minimize the potential for habitat degradation, disease transmission, genetic dilution of wild stocks through interbreeding with cultivated strains, introduction of non-indigenous species into natural waters, and discharges of wastes, toxins, and excess nutrients.⁸³

Also, it is important to note that the possible injury to biodiversity can come from more than just the introduction of a new species of fish. It includes (a) pathogens, to which agricultural fish are highly susceptible because of their high concentrations and the stresses of their artificial environment, and (b) dilution of the genetic diversity of native species by specialized aquaculture strains of the same species.

Profile of the aquaculture industry. Aquaculture in the United States and Canada is very much on the beginning or “take off” segment of the S-curve so familiar to both economists and ecologists. That does not mean that it can safely be predicted to climb to the top of the curve. It just means that current growth is relatively rapid, beginning from very low levels, and that it has definite potential. Promotional literature for the development of aquaculture often points out that fish farming was first practiced as long ago as 2,000 BCE in China.⁸⁴ Nevertheless, aquaculture is still more of a potential than a major economic activity at the end of the Twentieth Century. It did not begin in the United States, and then only in a rather limited form, until the last part of the Nineteenth Century. Up until the early 1960s, it was fairly restricted in the types of fish cultivated, and “Many of these early attempts at fish husbandry failed....”⁸⁵ Aquaculture in the United States includes catfish, salmonids (predominantly trout), mussels, oysters, shrimp, and even alligators. The oldest, largest, and most economically viable sector of aquaculture is the farming of catfish in the southern states. (Catfish accounts for 49% of total production⁸⁶ and 84% of the increase in US production from 1983 to 1993.⁸⁷) Even this is small scale, although it has been growing.

⁸³ National Science and Technology Council Joint Subcommittee on Aquaculture (JSA), *Draft National Aquaculture Development Plan of 1996* (Washington DC: JSA, 1996), § 4.4.5, p. 9. (This is still the most current version of this policy statement by JSA as of the end of 1998.)

⁸⁴ LaDon Swann, *A Basic Overview of Aquaculture*, Illinois-Indiana Sea Grant Program Technical Bulletin Series #102 (West Lafayette, IN: Purdue University, August 1992), p. 2.

⁸⁵ LaDon Swann, *supra*.

⁸⁶ Goldberg and Triplett, *supra*, p. 22.

⁸⁷ JSA, *supra*, § 2, p 3.

Catfish farming has gone from approximately 400 acres in 1960 to 161,000 acres in 1991, with 59% percent of that in the State of Mississippi.⁸⁸ Generally, aquaculture in the United States has been described as “the fastest growing agricultural sector, with production increases of 265 percent reported between 1980 and 1993.”⁸⁹ However, “Despite this rapid growth, domestic aquaculture still provides less than 10 percent of the nation’s total seafood supplies. Over 40 percent of the fish and shellfish consumed in the US is imported...”⁹⁰ (And that, it must be remembered, is a limited part of the US diet. Although seafood has been increasing in popularity, the average per capita consumption of seafood in the United States was still only 15.5 pounds in 1990.⁹¹) The most recent figures available from the JSA show that aquaculture production for food in the United States in 1997 weighed in at 774 million pounds and was valued at \$717 million.⁹² (Not a staggering amount in a national economy with a GNP of over 7 trillion in 1995. But it does represent a simple annual average growth of 17% in weight and 19% in value during the last ten years of 1987-1997.)

In the “North Central Region” of the United States, a US Department of Agriculture (USDA) region which includes all of the Great Lakes states except Pennsylvania and New York, the two predominant species are catfish and trout. The largest percentage of catfish producers in the North Central region are in Missouri, Kansas, Illinois, Ohio, and Nebraska (in that order) and the largest percentage of producers of trout are in Wisconsin, Michigan, and Minnesota (in that order).⁹³ Wisconsin production has a “current” estimated value (probably based on mid-1990s figures) of \$8.8 million a year.⁹⁴ Pennsylvania, the leading state in the USDA’s “Northeast Region,” produced trout worth \$16 million in 1995, but it is unclear how much of this was in the Great Lakes watershed.⁹⁵ Aquaculture in the Province of Ontario has been almost entirely production of rainbow trout, by reason of provincial policy, although the Ontario Ministry of Natural Resources significantly widened the number of species allowed for production in 1995.⁹⁶ The great majority of the Ontario aquaculture facilities are in the “southern peninsula” between Lake Huron and the eastern

⁸⁸ LaDon Swann, *supra.*, p. 3.

⁸⁹ Michigan State University, *Water Impacts*, vol. 16, No. 3 (Lansing, MI: Michigan State University Institute of Water Research, March 1995), p. 3.

⁹⁰ *Water Impacts*, *supra.*

⁹¹ LaDon Swann, *supra.*, p. 3.

⁹² Joint Subcommittee on Aquaculture, “US Private Aquaculture Production for 1985-1997,” at ag.ansc.edu (Washington, DC: JSA, February 18, 1999).

⁹³ Leroy J. Hushak, *North Central Regional Aquaculture Industry Situation and Outlook Report*, vol. 1 (Ames, IA: Iowa State University North Central Region Aquaculture Center, August 1993), p. 16.

⁹⁴ Wisconsin Sea Grant Advisory Services web sit on “Aquaculture” at www.seagrant.wisc.edu (October 27, 1998).

⁹⁵ M.J. Spatz, J.L. Anderson, and S. Jancart, *Northeast Region Aquaculture Industry Situation and Outlook Report*, Rhode Island Agriculture Experiment Station publication no. 3352 (Kingston, RI: Rhode Island Agriculture Experiment Station, 1996).

⁹⁶ Richard D. Moccia and David J. Bevan, *Aquastats 95*, ACE order no. 96-001 (Guelph, ON: University of Guelph, August 1996), available at www.aps.uoguelph.ca.

lakes, squarely within the Great Lakes watershed. Ontario production came between 7.0 and 7.5 million pounds and C\$12.5 to C\$14.0 in 1995.⁹⁷

Aquaculture in Michigan. Being made up of those other two peninsulas in the middle of the Great Lakes, the State of Michigan might be assumed to be a big producer of fish. It is not. Michigan is a net importer of fish, and the production from aquaculture and fishing in Michigan, combined, accounts for only 12% of consumption.⁹⁸ There are only about 70 aquaculture facilities currently in operation in the State of Michigan.⁹⁹ These are predominately small-scale operations – many of them “mom and pop” or “backyard” operations which do not provide the sole source of income for their owners – and the turnover rate (*i.e.*, the rate of failure) is high.¹⁰⁰ 75% of Michigan aquaculture businesses had gross incomes of \$25,000 or less, and only 6% more than \$150,000, in 1990.¹⁰¹ Michigan production is concentrated on trout, and the state has moved from twelfth to seventh in the nation for trout production.¹⁰² The estimated value of all species produced in Michigan in 1991 was \$4.5 million.¹⁰³

Aquaculture technology. As a matter of basic physics and biology, aquaculture has an obvious potential for producing high-quality protein far more efficiently than terrestrial agriculture.¹⁰⁴ But small-scale producers frequently meet with unpleasant surprises in the form of large capital investments required for the facilities,¹⁰⁵ the difficulty of maintaining consistent water quality (including problems with levels of heat, air, nutrients, and toxins, the problem of handling waste water), and the problems of preventing spread of diseases in highly concentrated and stressed populations. Aquaculture facilities are quite varied in design and degree of sophistication. They may consist of isolated ponds, cages connected to public waters, artificial raceways (almost exclusively for trout), and closed recirculating systems. Ponds, which may resemble the layout of terrestrial agricultural fields, require a lot of land. Cages (highly disfavored by conservation agencies) result in discharge of wastes to public waters and present a high danger of escapes. Raceways require specialized

⁹⁷ Moccia and Bevan, *supra*.

⁹⁸ Michigan State University, *Water Impacts, supra*, p. 3.

⁹⁹ Michigan State University, *Water Impacts, supra*, p. 3.

¹⁰⁰ Joyce R. Newman, *Michigan Aquaculture Fact Sheet*, Michigan State University Extension bulletin E-2456 (East Lansing, MI: Michigan State University, October 1993), p. 2; Charles J. Chopak and Joyce R. Newman, *Aquaculture: Status and Potential of Michigan Agriculture – Phase II*, Michigan State University Agricultural Experiment Station Special Report no. 50 (East Lansing, MI: Michigan State University Agricultural Experiment Station, September 1992), p. 5; and personal discussions with Dr. Don Garling, an aquaculture specialist and member of the Michigan Aquaculture Advisory Committee, at Michigan State University in Lansing, MI.

¹⁰¹ Newman, *supra*.

¹⁰² Newman, *supra*, pp. 1-3.

¹⁰³ Newman, *supra*, p. 1.

¹⁰⁴ LaDon Swann, *A Basic Overview of Aquaculture*, Illinois-Indiana Sea Grant Program technical bulletin series #102 (West Lafayette, IN: Purdue University, August 1992), p. 3.

¹⁰⁵ Personal interview of Dr. Don Garling, an aquaculture specialist and member of the Michigan Aquaculture Advisory Committee, at Michigan State University in Lansing, MI; and Swann, *supra*.

construction and a good source of fresh water, unless they are combined with a water recirculating system. Closed recirculating systems, which may resemble huge, factory-like aquaria, require expensive pumping, feeding, cleaning, and water control equipment. But they can be highly productive and environmentally clean. One closed recirculating facility in Pennsylvania produces 500,000 pounds of hybrid striped bass, tilapia, steelhead, and yellow perch in huge tanks while recirculating 98% of its water.¹⁰⁶ From the point of view of preventing both escapes of exotics and discharge of harmful waste water, these systems are much preferred over the others, especially the cages.¹⁰⁷ The relatively small scale aquaculture facilities in the State of Michigan mainly use some sort of private pond system.

The supply and transportation of organisms. The fish or their eggs may come from anywhere. This includes (a) natural stocks in the same watershed (which almost always require a permit from the conservation authorities), (b) cross-trading between different aquaculture farms (which may require little in the way of permits and documentation), or, (c) more commonly, one of a relatively small number of large farms (which will usually require some sort of permit or health certification from agriculture or conservation authorities). Most of the trout producers in the eastern United States buy eggs from large farms in the western United States.¹⁰⁸ Michigan brook and brown trout eggs are produced almost entirely within Michigan,¹⁰⁹ but most of the rainbow trout producers in Michigan buy eggs from a single large supplier in the State of Washington, which sends them by air freight, along with a certification that they are free from disease.¹¹⁰

Aquaculture diseases. Disease is a major concern for the aquaculture industry. Many of the same pathogens which have minimal effects in the natural environment become a serious problem for aquaculture fish because of their high densities, poor water quality, inadequate nutrition, and poor sanitation.¹¹¹ In addition, the transportation of fish for use in aquaculture, even if not exotic species, has the potential to transport exotic pathogens which can have a serious impact on native strains of the same species with less resistance to those pathogens.¹¹²

¹⁰⁶ Rebecca Goldberg and Tracy Triplett, *Murky Waters: Environmental Effects of Aquaculture in the US* (New York: Environmental Defense Fund, October 1997), p. 15.

¹⁰⁷ Goldberg and Triplett, *supra*.

¹⁰⁸ Swann, *supra*, p. 8.

¹⁰⁹ Joyce R. Newman and Niles R. Kevern, *Production of Michigan Aquacultural Products*, Michigan Agricultural Experiment Station research report RR 526-1 (East Lansing, MI: Michigan State University Agricultural Experiment Station, April 1994), p. 7.

¹¹⁰ Charles J. Chopak and Joyce R. Newman, *Aquaculture: Status and Potential of Michigan Agriculture – Phase II*, Michigan State University Agricultural Experiment Station special report no. 50 (East Lansing, MI: Michigan State University Agricultural Experiment Station, September 1992), p. 7; and Newman and Kevern, *supra*.

¹¹¹ APHIS, *Overview of Aquaculture in the United States* (Fort Collins, CO: USDA APHIS Centers for Epidemiology & Animal Health, October 1995), p. 16; and LaDon Swann, *Diagnostic Services in Illinois and Indiana*, Sea Grant #IL-IN-SG-FS-91-10 (West Lafayette, IN: Purdue University, undated), p. 1.

¹¹² Rebecca Goldberg and Tracy Triplett, *Murky Waters: Environmental Effects of Aquaculture in the US* (New York: Environmental Defense Fund, October 1997), p. 52.

The Joint Subcommittee on Aquaculture (JSA) has observed that “the US government’s ability to prevent and control aquatic animal diseases is presently inadequate. The government’s effectiveness is impaired by a fragmented, uncertain, and incomplete Federal regulatory framework, often characterized by disagreements among agencies with roles and responsibilities in aquatic animal health.”¹¹³ Also, the lack of a “competent authority” for aquaculture disease control at the federal level in the United States (meaning, technically, one agency with clear authority over the issue) has been of concern to authorities in the European Union, who do not generally consider US regulation of the industry to be up to par.¹¹⁴ The US Animal and Plant Health Inspection Service (APHIS) in the US Department of Agriculture (USDA) is developing regional laboratories for better certification of US agriculture products for export.

On the import side, the Michigan Department of Agriculture (MDA) and Michigan State University (MSU) are working to develop cheaper and faster laboratory techniques for the identification of diseases in fish imported for aquaculture,¹¹⁵ and the Great Lakes Fishery Commission (GLFC) has published a set of protocols, known in the business as the “Blue Book,” for controlling pathogens in salmonid imports.¹¹⁶ The GLFC Blue Book guidance is provided to aquaculturists, but not actually required to be used, under the Michigan Aquaculture Development Act.¹¹⁷ MDA has active programs, in coordination with the Michigan DNR, for monitoring specific diseases such as the whirling disease, which is common among salmonids.¹¹⁸ (Whirling disease is caused by *Myxobolus cerebralis*, a protozoan originally exotic to the Great Lakes, whose mechanism of release is unclear, although it was first documented in an Ohio aquaculture facility.¹¹⁹)

The diagnosis of diseases depends on specific protocols, developed by biologists and veterinarians in response to specific outbreaks. There is no *Star Trek* “tricorder” that an

¹¹³ JSA, *Draft National Aquaculture Development Plan of 1996* (Washington DC: National Science and Technology Council Joint Subcommittee on Aquaculture, 1996), § 4.4.6, p. 9. (This is still the most current version of this policy statement by JSA as of the end of 1998.)

¹¹⁴ Terry L. Medley, *APHIS Aquaculture Industry Report* (Riverdale, MD: Animal and Planet Health Inspection Service Legislative and Public Affairs, July 1996), p. 1; and *Draft National Aquaculture Development Plan of 1996, supra*, § 4.4.6, p. 10.

¹¹⁵ Presentations at the Michigan Department of Agriculture Aquaculture Advisory Committee, Lansing, MI, November 10, 1998.

¹¹⁶ *Great Lakes Fish Disease Control Policy and Model Program*, Great Lakes Fishery Commission Special Publication 93-1 (Ann Arbor, MI: Great Lakes Fishery Commission, January 1993).

¹¹⁷ Michigan Compiled Laws, MCL § 286.877(c). See the discussion in § 344 of this report.

¹¹⁸ Denise Yockey, *State Agriculture Director Announces Monitoring Strategy for Whirling Disease in Fish*, MDA news release (Lansing, MI: MDA Marketing and Communications Division, August 25, 1998); MDA, *Reportable Animal Disease List*, MDA public advisory, apparently annual (Lansing MI: MDA Animal Industry Division, August 1998).

¹¹⁹ Edward L. Mills, Joseph H. Leach, James T. Carlton, and Carol L. Secor, “Exotic Species in the Great Lakes: A History of Biotic Crises and Anthropogenic Introductions,” *Journal of Great Lakes Research*, vol. 19, no. 1 (1993), pp. 1-54, 20.

MDA inspector can wave at a tank of fish or a box of eggs to see if any unknown exotic pathogens are present. Nor do there even seem to be any established field or laboratory protocols for the detection of a wide number of pathogens known to be present in other species of fish around the world,¹²⁰ but not yet known to be a problem in the Great Lakes. It does seem to be feasible, however, to detect generalized symptoms of disease in fish if one has a chance to observe them for a period of time. These include behavioral signs such as failure to feed properly and gasping at the surface, and physical signs such as swollen bellies or excessive mucus.¹²¹ It may seem trivial to point out that seeing some fish go belly up and float on the surface is a sign that something is wrong. But is it? How many fish, out of what kind of population, under what conditions of artificial stress in an aquaculture tank, over what period of time? (It could well be that the fish went belly up simply because they were physically stressed during shipment or did not have enough dissolved oxygen in their water.) Disease diagnosis, for fish as well as humans, requires a fair amount of expertise and experience.¹²² It also requires an opportunity to observe the population under controlled conditions. The fact that the industry is structured in such a way that most imported eggs are supplied by a small number of large and easily identified farms offers government regulators an excellent target of opportunity for quality control of the supply. But that requires some effective exercise of authority at federal and international levels.

Genetic modification. Genetic modifications bear on the exotics problem in two ways. Genetic modification can be used as a method for preventing invasions. Grass carp and other salmonids which have been modified at the point of fertilization to have an extra set of genes, making them “triploids” instead of normal “diploids,” are thereby made sterile. This has been particularly desirable in the case of grass carp because they are useful in the control of exotic and other nuisance aquatic weeds. It may also have collateral benefits for aquaculture in that triploid fish will not fully mature, and thus maintain more desirable flesh.¹²³ But this technique is far from foolproof. It requires careful testing of stocks (using blood tests) to insure that no normal diploids have sneaked in among the triploids and, contrary to early expectations, a diploid male may be able to impregnate the eggs of a triploid female. Also, experiments with oysters indicate that some sterilized organisms can revert back to a fertile state.¹²⁴

Genetic modifications, through either simple selection and inbreeding or more sophisticated techniques for modifying genes or transplanting them from one organism to

¹²⁰ See the list of pathogens around the world in APHIS, *Overview of Aquaculture in the United States* (Fort Collins, CO: USDA APHIS Centers for Epidemiology & Animal Health, October 1995, pp. 14-15, Table 7.

¹²¹ LaDon Swann, *Diagnostic Services in Illinois and Indiana*, Sea Grant #IL-IN-SG-FS-91-10 (West Lafayette, IN: Purdue University, undated), p. 2.

¹²² See Joyce R. Newman and Niles R. Kevern, *Production of Michigan Aquacultural Products*, Michigan Agricultural Experiment Station research report RR 526-1 (East Lansing, MI: Michigan State University Agricultural Experiment Station, April 1994), p. 10.

¹²³ From the Victorian Fisheries Institute web site at www.fishnet.au (February 18, 1999).

¹²⁴ Rebecca Goldberg and Tracy Triplett, *Murky Waters: Environmental Effects of Aquaculture in the US* (New York: Environmental Defense Fund, October 1997), p. 14.

another (“transgenic” organisms) amount to human creation of exotics. Some species, such as salmon, may be deliberately selected for characteristics which make them more suitable for aquaculture, such as lower aggression, but which have the potential to be harmful if spread to the native stock.¹²⁵ More generally, the simple fact that the inbred stocks have less genetic diversity can cause ultimate loss of genes in the native population.¹²⁶ Such inbred strains have not been considered a major threat to biodiversity by many biologists, based on good experience with terrestrial organisms. But some researchers point out that “terrestrial breeding programs may not be an appropriate model upon which to base regulations for the aquatic sector, partly because so much of aquatic biodiversity is found in wild populations,”¹²⁷ and others warn that the escape of exotic cultured stocks could cause “devastation.”¹²⁸ The potential for contamination of native stocks by genetically modified fish is considered a matter of concern by the United Nations Food and Agriculture Organization (FAO).¹²⁹

A vice president of the World Bank has said that “The next great leap in producing food will come from ‘domesticated’ and genetically improved varieties of fish and other seafood.”¹³⁰ The only US policy statement on the issue seems to be the general note of concern in the “challenges” quoted above in the JSA plan for aquaculture.¹³¹ The Canadian Government is actively promoting a “biotechnology strategy” which includes creation of transgenic fish and other aquatic organisms.¹³² That program is led by the Department of Industry (Industry Canada). The Department of Fisheries and Oceans (DFO) is supportive of the Industry Canada plan, but somewhat more cautious about the use of transgenics. DFO notes that “transgenics, such as carp that have the rainbow trout growth hormone gene, are considered by some as new organisms for which there is little existing information relevant to their behavior, interaction, or performance in the wild; nor is there any appropriate theoretical basis for prediction.”¹³³

¹²⁵ Goldberg and Triplett, *supra*, pp. 53-55.

¹²⁶ Kjetil Hindar, Nils Ryman, and Fred Utter, “Genetic Effects of Aquaculture on Natural Fish Populations,” *Aquaculture*, vol. 98 (1991), pp. 259-261.

¹²⁷ Devin M. Bartley and Eric M. Hallerman, “A Global Perspective on the Utilization of Genetically Modified Organisms in Aquaculture and Fisheries,” *Aquaculture*, vol. 137 (1995), pp. 1-7, 4.

¹²⁸ James W. Fetzner, Robert J. Sheehan, and Lisa W. Seeb, “Genetic Implications of Broodstock Selection for Crayfish Aquaculture in the Midwestern United States,” *Aquaculture*, vol. 154 (1997), pp. 39-55, 50.

¹²⁹ See FAO, *Code of Conduct for Responsible Fisheries* (Rome: UN FAO, 1995), § 9.3.1.

¹³⁰ Ismail Serageldin, quoted in DFO, *Aquatic Biotechnology*, Department of Fisheries and Ocean discussion document attached to the Canadian Biotechnology Strategy (Ottawa: Industry Canada, Bio-Industry Branch, August 6, 1998), § 3.

¹³¹ JSA, *Draft National Aquaculture Development Plan of 1996* (Washington DC: National Science and Technology Council Joint Subcommittee on Aquaculture, 1996), § 4.4.5, p. 9. (This is still the most current version of this policy statement by JSA as of the end of 1998.)

¹³² DFO, *Aquatic Biotechnology*, Department of Fisheries and Ocean discussion document attached to the Canadian Biotechnology Strategy (Ottawa: Industry Canada, Bio-Industry Branch, August 6, 1998), § 3.

¹³³ DFO, *supra*, § 5a.

§ 122. Bait Fish

Bait fish dealers are an even more diffuse and varied group than aquaculturists, although the two categories overlap, and the regulatory challenge is even greater in this area. A few general surveys of bait fish activities in the general region have been conducted.¹³⁴ Researchers from Michigan and Minnesota Sea Grant are currently conducting an in-depth field study of bait fish, with the cooperation of some industry interests, in order to (a) better evaluate the nature of the exotics threat, and (b) identify specific points where government or industry interdiction of exotic transfers might be effective.¹³⁵ Their final report, unfortunately, will not be available for some time. What we do already know is that a substantial amount of live bait is moved around the Great Lakes states and the Province of Ontario, across watersheds, and that it is subject to very little control.

Annual sales of both wild and cultured bait fish in the US and Canada are worth something in the area of one billion dollars per year.¹³⁶ “Although the exact size of the industry is not known, nearly all states east of the Rocky Mountains, as well as Arizona and California west of the continental divide, have some bait farming. Species of fish and shellfish produced include: golden shiners, fathead minnows, goldfish, carpsuckers, bluntnose minnows, tilapia, suckers, and crayfish.”¹³⁷ Most baitfish harvesters and dealers are small-scale independent operators,¹³⁸ but they are quite capable of transporting live fish for long distances with relatively simple technology such as oxygen tanks, aerators, and live wells.¹³⁹ Bait may be collected out of either public waters, with permits from the local conservation agencies, or from private ponds specially maintained for that purpose. What bait is used, where it comes from, and where it goes, may vary during the season, especially in the Great Lakes region.

¹³⁴ E.g., some of the more recent are Thomas J. LoVullo and Jay R. Stauffer, Jr., “The Retail Bait Industry in Pennsylvania,” Matthew K. Litvak and Nicholas E. Mandrak, “Ecology of Freshwater Baitfish Use in Canada and the United States,” *Fisheries*, vol. 18, no. 12 (December 1993), pp. 6-13; and Herbert R. Ludwig, Jr., and Jay A. Leitch, “Interbasin Transfer of Aquatic Biota via Anglers’ Bait Buckets,” *Fisheries*, vol. 21, no. 7 (1996), pp. 14-18.

¹³⁵ Brief from Dr. Douglas Jensen, Minnesota Sea Grant, and Dr. Ron Kinnunen, Michigan Sea Grant, to the Great Lakes Commission Panel on Aquatic Nuisance Species, Ann Arbor, MI, January 28, 1999. Their study seeks to apply the “HACCP” system, developed in food safety control, to the management of exotics in bait handling and aquaculture. “HACCP” stands for “hazardous analysis of critical control points,” i.e., strategic analysis of targets of opportunity for effective control of a system, by either the government or the industry. Their study is near the end of the first of two years of scheduled work.

¹³⁶ Matthew K. Litvak and Nicholas E. Mandrak, “Ecology of Freshwater Baitfish Use in Canada and the United States,” *Fisheries*, vol. 18, no. 12 (December 1993), pp. 6-13, 6. One billion dollars is a very round figure, based on 1991 estimates that were rather rough at that time, and is offered here just to establish an order of magnitude.

¹³⁷ LaDon Swann, *A Basic Overview of Aquaculture*, Illinois-Indiana Sea Grant Program technical bulletin series #102 (West Lafayette, IN: Purdue University, August 1992), p. 6.

¹³⁸ Litvak and Mandrak, *supra*, pp. 6-13, 12, also citing L.A. Neilson, “The Bait-Fish Industry in Ohio and West Virginia, with Special Reference to the Ohio Sport Fishery,” *North American Journal of Fisheries Management*, vol. 2 (1982), pp. 232-238.

¹³⁹ Litvak and Mandrak, *supra*.

Those dealers making an ongoing business out of it do have a natural interest in avoiding the collection of non-target organisms and parasites. It is common to use nets or screens of specific mesh size to filter out unwanted fish, and some of the dealers make a practice of transporting their own clean water to the harvest site in order to avoid picking up veligers and microorganisms.¹⁴⁰ It is not clear how common these preventative measures are, or what their true level of effectiveness is.

Historically, out of an estimated 168 native species that have become established outside their range within the US, it is believed that about 58 (35%) were introduced as bait or forage fish.¹⁴¹ Researchers conducting actual sampling of bait have found that “a substantial number of baitfish were used outside their native distributions,” including many that are illegal to import, and that many fishers routinely dump their unused live bait in the non-native waters.¹⁴² Other researchers studying the transfer of bait from the Mississippi River Basin to the Hudson Bay basin came up with following calculations, which can be applied with even greater force to transfer of bait into the Great Lakes basin:

Specifically, we estimate that probability of a single angler on a single angling day in the Hudson Bay releasing live bait from the Mississippi River basin to be 1.2/100. But when the cumulative number of trials – 19 million angler days per year – was considered, the estimated probability of bait bucket transfer occurring one, 100, or even 10,000 times in 1 year approaches 1.0. In light of these findings, we conclude that drastic policy measures would have to be undertaken to reduce anglers’ potential for contributing to the dispersal of aquatic species.¹⁴³

As discussed in detail in Part III of this report, all of the Great Lakes states and the Province of Ontario have statutes authorizing their conservation agencies to prohibit such introductions. But the enforcement problems can be overwhelming. The following comment from one state administrator in the Great Lakes provides, as he puts it, a good “reality check” on the problem of regulating bait fish. It also indicates the manner in which transportation of baitfish for use in local aquaculture as well as angling complicates the nature of the problem:

Virtually all of the baitfish used both for angling bait and for feeding predator fish in culture in Illinois are produced out of state. I can’t begin to estimate how many hundred

¹⁴⁰ Brief from Dr. Douglas Jensen, Minnesota Sea Grant, and Dr. Ron Kinnunen, Michigan Sea Grant, to the Great Lakes Commission Panel on Aquatic Nuisance Species, Ann Arbor, MI, January 28, 1999.

¹⁴¹ Litvak and Nicholas E. Mandrak, “Ecology of Freshwater Baitfish Use in Canada and the United States,” *Fisheries*, vol. 18, no. 12 (December 1993), pp. 6-13, 7, citing W.R. Coutenay, Jr., and J.N. Taylor, presentation to the Symposium on Stock Enhancement in the Management of Freshwater Fish (Rome: European Inland Fisheries Advisory Commission, 1984).

¹⁴² Litvak and Nicholas E. Mandrak, “Ecology of Freshwater Baitfish Use in Canada and the United States,” *Fisheries*, vol. 18, no. 12 (December 1993), pp. 6-13, 9, 10, Table 2.

¹⁴³ Herbert R. Ludwig, Jr., and Jay A. Leitch, “Interbasin Transfer of Aquatic Biota via Anglers’ Bait Buckets,” *Fisheries*, vol. 21, no. 7 (1996), pp. 14-18, 14 (abstract).

million fish.... We have neither the personnel nor the resources to institute a *meaningful* inspection program for ANS contained in these shipments and have the fish arrive at their destination *alive*. We have one fish hatchery in our system which receives 50,000,000 fathead minnows annually just to feed musky fingerling and bass broodstock. This is not to mention the hundreds of small mom and pop bait shops which receive small shipments weekly. We can and do request that producers spot check their shipments for unwanted species. We do not have a practical, enforceable way of requiring it.¹⁴⁴

Further insight may be provided by the Sea Grant study mentioned above. But it seems obvious from the basic structure of the industry that any effective controls will have to be put in place at the source (at the location of major harvesting waters) rather than in the stream of transportation (during which time for inspections, as well as opportunities, are rather limited) or at the receiving point (at hundreds of small shops). This, in turn, requires a high level of coordination between the conservation authorities of the receiving jurisdiction and the conservation or agriculture authorities of the sending jurisdiction.

§ 123. Aquaria and ornamental ponds

About 10% of homes in the United States have aquaria, and purchases of live “ornamental fish” for aquaria and ponds amount to more than \$600 million a year in the US.¹⁴⁵ A single large aquaria supply house may market 3,000 distinct breed lines. It has been estimated that there are 1,500 fish per second imported through Tampa, Florida,¹⁴⁶ and that the sales of these imports through Florida alone are worth over \$7 million per year.¹⁴⁷ The greatest proportion of these are “tropical fish,” both freshwater and saltwater. The majority of these are imported from countries such as Thailand, Indonesia, Singapore, Hong Kong, and the Philippines.¹⁴⁸ Many other tropical fish are cultivated in Florida and other southern states for both domestic and foreign sales.

The term “tropical fish” is sometimes used as a synonym for aquaria fish. Although it is much smaller, there is also a significant trade in “coldwater” fish (all freshwater), some of which are deliberately used for stocking ornamental ponds in temperate climates. For example, aquaria supply houses advertise the Japanese Colored Koi (*Cyprinus carpio*), a coldwater freshwater fish recommended for use in either large aquaria or ponds, which is most active in temperature of 50°-74° F, and will also survive in ponds frozen over on the

¹⁴⁴ Mike Conlin, Chief, Division of Fisheries, Illinois DNR, letter to the researcher (February 9, 1999), p. 2.

¹⁴⁵ Aquatic Nuisance Species Task Force, *Findings, Conclusions, and Recommendations of the Intentional Introductions Policy Review*, report to Congress under Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990 § 1207 (16 USC § 472) (Washington, DC: US Fish and Wildlife Service, March 1994), p. 6, based on data from the Pet Industry Joint Advisory Council in 1994.

¹⁴⁶ Personal communication from Dr. Don Garling, an aquaculture specialist and member of the Michigan Aquaculture Advisory Committee, at Michigan State University in Lansing, MI.

¹⁴⁷ Aquatic Nuisance Species Task Force, *supra*, p. 6.

¹⁴⁸ APHIS, *Overview of Aquaculture in the United States* (Fort Collins, CO: USDA APHIS Centers for Epidemiology & Animal Health, October 1995), p. 16; and LaDon Swann, *Diagnostic Services in Illinois and Indiana*, Sea Grant #IL-IN-SG-FS-91-10 (West Lafayette, IN: Purdue University, undated), p. 11.

surface.¹⁴⁹ More generally, fish are highly varied creatures. Some species double as both “tropical” and “coldwater,” although it might be few if any of these which would survive in a frozen-over pond. The goldfish, now common throughout North America, was an ornamental fish release from China. Other aquaria releases into the Great Lakes include the bluespotted sunfish, snails, crustacea, and a number of particularly noxious aquatic weeds.¹⁵⁰ With the continuing increase in the popularity of exotic fish for aquaria and ponds, there is no reason not to expect such invasions to continue.

¹⁴⁹ See the “Coldwater Species Profiles” at Aquaria Central web site, www.aquariacentral.com/fishinfo/cold.

¹⁵⁰ Edward L. Mills, Joseph H. Leach, James T. Carlton, and Carol L. Secor, “Exotic Species in the Great Lakes: A History of Biotic Crises and Anthropogenic Introductions,” *Journal of Great Lakes Research*, vol. 19, no. 1 (1993), pp. 1-54.

Part II. Controls on ballast water

§ 210. Introduction to Part II: A historical review

The history of environmental law is a story of legislation by disaster. Moreover, the political and legal responses to those disasters are usually incremental and incomplete. The wreck of the *Torrey Cannon* in Great Britain prompted the Congress of the United States to enact the Water and Environmental Quality Improvement Act of 1970.¹ Continued deterioration of water quality under that legislation, characterized by Congress and the Supreme Court as “inadequate in every vital respect,”² led to a total overhaul of our theory and practice of water pollution control in the Federal Water Pollution Control Act Amendments of 1972³ (and to the first Great Lakes Water Quality Agreement of 1972⁴). The discovery of toxic waste dumps at Niagara Falls, New York, at Montague, Michigan, and at other locations around the United States led to the enactment of the US Superfund Act (CERCLA) in 1980.⁵ And, finally, the *Exxon Valdez* oil spill led to significant changes in

¹ US Public Law 91-224 (April 3, 1970), with legislative history in House Public Works Committee, House Report No. 91-127, HR 4148 (March 25, 1969), at 1970 USCCAAN 2691, 2692. Although the original Federal Water Pollution Control Act was actually enacted in 1948 (62 Statutes 1155, June 30, 1948), and often amended after that, the 1970 amendments were significant, albeit inadequate, in adding “new sections on liability for cleaning up oil discharges, discharge of hazardous substances, discharge of sewage from vessels [and] demonstration projects for cleaning up pollution in the Great Lakes....” Senate Public Works Committee, Senate Report No. 92-414, S 2770 [Public Law 92-500] (October 28, 1971), at 1972 USCCAAN 3668, 3670, which reviews the history of federal water pollution legislation from 1948 to 1972 at pp. 3669-3670. One of the most important provisions was the enactment of the principle of strict liability for the costs of oil spills, within low limits, whereas the previous legislation on oil spills applied only to spills which were grossly negligent or willful. House Public Works Committee (1969), *ibid.*, at 1970 USCCAAN 2692.

² *EPA v. California*, 426 US 200, 203 (1976), quoting Senate Public Works Committee, Senate Report No. 92-414, S 2770 [Public Law 92-500] (October 28, 1971), at 1972 USCCAAN 3674.

³ US Public Law 92-500 (October 18, 1972), codified at 33 USC §§ 1251 *et seq.*, and now known commonly as the Clean Water Act, since amendments in US Public Law 95-217 (December 27, 1977), as well as the Federal Water Pollution Control Act. “Water pollution law today begins with...the Federal Water Pollution Control Act Amendments of 1972....” William H. Rodgers, Jr., *Environmental Law* (St. Paul, MN: West, 1994), § 4.1, p. 247. “For point sources, costs of achieving but the first levels of technological controls were enormous: \$10 billion for municipalities, \$36 billion for industry....” *Ibid.* Although this was a system for permitting pollution, it was consciously designed to squeeze down the amount of pollution permitted over the years (with the unrealistic goal of total elimination by 1985). One of the most important features of the permitting system was that it was designed to be “technology-forcing.” *Ibid.*, § 1.4, p. 53. The other critical element of the regime was expansion of the principle of strict liability for the cost of all spills first established in 1970. (This also became the central element in the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), 42 USC §§ 9601 *et seq.*, enacted in 1980.)

⁴ See Theodora E. Colborn, Alex Davidson, Sharon N. Green, R.A. (Tony) Hodge, C. Ian Jackson, and Richard A. Liroff, *Great Lakes: Great Legacy?* (Washington, DC: Conservation Foundation, 1990), p. 3.

⁵ The Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), US Public Law 96-510 (December 11, 1980), codified at 42 USC §§ 9601 *et seq.* The waste sites are discussed in

ship design and navigation requirements enacted in the Oil Pollution Act of 1990 (OPA 90).⁶ Between the *Torrey Cannon* and the *Exxon Valdez*, while we were still struggling with the relatively simple technical matter of what should be required for moving big steel tubs of oil safely around on the water without running into rocks, the world suffered spills in excess of a million gallons, each, from the *Argo Merchant*, the *Burmah Agate*, the *Georgia*, the *Olympic Glory*, the *Arkas*, the *Alvenus*, and the *Puerto Rican*.⁷

Although the invasion of the zebra mussel (*Dreissena*) via ballast water is likely to have much more severe long-term effects on the ecology of North America than the *Exxon Valdez* oil spill,⁸ it has obviously had nothing like the same impact on the public consciousness. In terms of politics, the zebra mussel is more like the *Torrey Cannon*. It therefore should not be a surprise that the first piece of legislation designed to address the problem on a national level, the National Invasive Species Act of 1996 (NISA 96),⁹ is just as “inadequate”¹⁰ as was the Water and Environmental Quality Improvement Act of 1970. NISA 96 and other tentative measures on exotics being adopted around the world only make sense if understood as the first attempts to frame a rational and effective regime.

The following sections (§§ 211-214) describe the current controls (or lack of them) on ballast water in the United States and around the world. This discussion puts special emphasis on the world’s first regulatory regime established in the Great Lakes under the Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990 (NANPCA 90),¹¹ and

House Interstate and Foreign Commerce Committee, House Report No. 96-1016, HR 7020 (May 16, 1980), pp. 18-19.

⁶ US Public Law 101-380 (August 18, 1990), which made amendments to the Clean Water Act (Federal Water Pollution Control Act), 33 USC §§ 1251 *et seq.*, and other places. See the description of “operational and technological controls” imposed on the shipping industry by OPA 90 in William H. Rodgers, Jr., *Environmental Law* (St. Paul, MN: West, 1994), § 4.9E, pp. 387 *et seq.*

⁷ Rodgers, *supra*, § 4.9, Table 4-13, p. 376, using information from *Golob’s Oil Pollution Bulletin*.

⁸ See Glenn Zorpette, “Mussel Mayhem Continued: Apparent Benefits of the Zebra Mussel Plague are Anything But,” *Scientific American*, vol. 275, no. 2 (August 1996), pp. 22-23. There are, of course, still lingering effects from the spill in Prince William Sound, including lack of full recovery of some native aquatic populations in 1999. But the basic fact is that those effects are limited in space and time. The zebra mussel is creating comparable injury to native habitats as it continues to spread across the North American Continent, and it only become worse with time.

⁹ National Invasive Species Act of 1996, US Public Law 104-332 (October 26, 1996), making amendments to the Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990, US Public Law 101-646 (November 29, 1990), codified at 16 USC §§ 4701 *et seq.* “NISA” is used here as the popular name for the amended act. “NISA 96” refers to the specific changes, mandating a national regulatory regime, in 1996.

¹⁰ Environmental groups commenting on the proposed national guidelines under NISA generally agree that “in light of the significant problems posed by non-native species, the proposed regulations are inadequate for managing the threat of these species for several reasons.” Warner Chabot and Michael Lozeau, Center for Marine Conservation, US Coast Guard NPRM Docket USCG-98-3423, Comment #27 (June 8, 1998), p. 1.

¹¹ US Public Law 101-646 (November 29, 1990), codified at 16 USC §§ 4701 *et seq.* Technically, the act is still “NANPCA” after the amendments by “NISA” in 1996. But “NISA” is being rapidly adopted as the popular name of the current law, if for no other reason than the fact that it is much easier to remember and pronounce, and “NISA” is used in this report when referring to the current law.

on the faltering efforts to develop a national regime for the United States under NISA 96. Francis Bacon, the great English philosopher of science, pointed out that “Truth will sooner come out of error than from confusion.” The struggle with the many imperfections of NANPCA 90 and NISA 96 over the decade has added considerable clarity to what is needed in order to create an effective regime.

Another lesson from the history of environmental law in the United States is the need to work within, and take advantage of, the constitutional structure of federalism. The comprehensive National Pollution Discharge Elimination System (NPDES) initiated by the Federal Water Pollution Control Act Amendments of 1972 was possible to implement only because of the delegation of authority to enforce that system to state agencies.¹² After a long and hard-fought political battle over the issue, Congress made a clear policy decision to *not* preempt state authority to proscribe concurrent liability for vessel spills under OPA 90¹³ despite the traditional predominance of the federal government in the regulation of commercial shipping. This was in essence an enactment of the environmental maxim to “Think globally, but act locally.” Despite peals of outrage from shipping interests, and assertions that this and other liability provisions of OPA 90 would stop ships from coming to the shores of the United States, world trade continues to come. Some ships, in fact, have been discouraged from trading in the United States. But some of those are precisely the older and more poorly managed ships which the Congress and the Coast Guard seek to discourage from coming to US waters as a matter of public policy. The institution of that policy in 1994, known as the “Port State Control Program,” had no noticeable effect on the amount of commerce entering the Great Lakes through the Seaway.¹⁴

Exaggerated fears of the apocalypse that will be visited on commercial shipping by state regulation also ignore the obvious interest that state and local governments have in encouraging international trade. Local controls imposed on tankers calling on west coast ports, litigated up to the US Supreme Court before being accepted by industry, have not stopped the flow of oil. Seaway trade brings significant economic activity to the Great

¹² Clean Water Act at 33 USC § 1342. “The program for permits initiated in 1972 for all point sources...was a mammoth administrative undertaking that generated over 40,000 permits by June 30, 1975....” William H. Rodgers, Jr., *Environmental Law* (St. Paul, MN: West, 1994), § 4.1, p. 263.

¹³ OPA 90 at 33 USC § 2718.

¹⁴ The Port State Control Program was not created by statute, but it is an agency enforcement policy which was instituted in direct response to expressions of Congressional concerns about substandard vessels operating in US waters. The general concept is to deliberately focus unwelcome regulatory attention on the marginal operators in order to encourage them to either clean up their act or not come back. See Eric Reeves, “Port State Control in the Great Lakes,” in Canadian and US Coast Guards, *1995 Joint Report of the Canadian and US Coast Guards on Progress towards Achievement of the Objectives of the Great Lakes Water Quality Agreement of 1978*, report to the International Joint Commission under Annex VI, § 2 of the GLWQA 1978/1987 (Cleveland, OH: US Coast Guard, 1995), Appendix G. Cargo levels have continued to climb since then, and the Seaway reported another record year at the end of 1998. See St. Lawrence Seaway Management Corporation (SLSMC) press release, “Successful 1998 Navigation Season Comes to an End on the St. Lawrence Seaway” (Cornwall, ON: December 29, 1998), and statistics available at www.seaway.ca (Canadian SLSMC) and www.dot.gov/slsdc (US SLSDC).

Lakes region,¹⁵ it is widely understood that international trade has been a critical component in the rebuilding of Midwest industrial competitiveness, and there is a strong political commitment to encouraging the flow of commercial shipping through the St. Lawrence Seaway on the part of the Great Lakes states.¹⁶ But the same states also have a strong and legitimate interest in protecting their natural resources. Therefore, the delicate issue of whether or not Michigan or other states in the region might be free to impose their own controls on the ballast from commercial ships is analyzed in detail in §§ 220-225 below.

§ 210. National and international controls on ballast

§ 211. An overview of political and legal responses to exotics in ballast water

The best way to understand the current political response to ballast water, or to understand the possibilities for future control regimes, is by looking at the history of it.¹⁷ Although exotics in ballast water are now an issue to all the major maritime nations of the world, more or less, it is an issue that bubbled up from two places. It was Canada and the United States, acting in response to the invasions of the unique freshwater system of the Great Lakes by the ruffe and the zebra mussel, and Australia, acting in response to invasions of its unique saltwater ecosystem by toxic dinoflagellate algae and other organisms, which made this an issue for the world. Canada has led the way in researching the biology of ballast water. Australia, closely followed by Canada, has led the way in researching possible control technologies. Australia and Canada, together, have led initiatives for international action. The United States promulgated the first mandatory legal regime requiring regular ballast water exchange for vessels entering the Great Lakes. Canada is now about to join the United States in promulgating mandatory regulations. Canada and the United States, together, have articulated the first international research strategy for solving the problem. While keeping mind the important role that Australia has played, particularly in demanding international attention to the issue, one can in fact say that it all began here in the Great Lakes. Table 2 below outlines the chronology of the most significant political and legal actions:

¹⁵ See Martin Associates, *The Economic Impacts of the Great Lakes/Saint Lawrence Seaway*, study prepared for the St. Lawrence Seaway Development Corporation (Lancaster, PA: Marine Associates, March 10, 1995).

¹⁶ See *The Declaration of Indiana: A maritime agreement for the Great Lakes-St. Lawrence Maritime System* (Ann Arbor, MI: Great Lakes Commission, May 15, 1991). On the similar support for the Seaway on the Canadian side, see *A Competitive Vision for the Great Lakes – St. Lawrence Seaway: An Initiative of Canada's Marine Industry* (Ottawa: Canadian Shipowners Association, October 1997).

¹⁷ One of the most famous maxims of the law is Justice Holmes's comment that "The life of the law has not been logic: it has been experience." Oliver Wendell Holmes, Jr., *The Common Law* (Boston: Little, Brown, and Co., 1923), p. 1. That is all the more true for the vague mix of law, politics, and diplomacy at issue here.

Table 2. A chronology of political and legal actions on exotics in ballast water

AUG 1988	In response to the detection of the ruffe and the zebra mussel in the Great Lakes, the Great Lakes Fishery Commission and the International Joint Commission request that the Governments of the United States and Canada require the exchange of ballast water on ships entering the Great Lakes. ¹⁸
MAY 1989	The Canadian Coast Guard issues Voluntary Guidelines for the Control of Ballast Water Discharges from Ships, recommending use of exchange. ¹⁹
FEB 1990	In response to outbreaks of toxic dinoflagellates, the Australian Quarantine and Inspection Service (AQIS) issues Voluntary Guidelines for Ballast Water and Sediment Discharge from Overseas Vessels Entering Australian Waters. ²⁰
SEP 1990	The International Joint Commission and the Great Lakes Fishery Commission issue a joint report recommending that the Governments of the United States and Canada require the exchange of ballast water on ships entering the Great Lakes, coordinate their programs, promote international standards, and develop a long-term research strategy, including study of redesign and retrofitting of vessels to maximize safe and effective ballast exchange. ²¹
NOV 1990	The United States enacts the Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990 (NANPCA 90), ²² which applies only to the Great Lakes and connected waters, mandating the US Coast Guard to issue voluntary guidelines six months after the act and mandatory regulations two years after the act. ²³

¹⁸ James M. Ridenour and Carlos M. Fetterolf, Jr., Great Lakes Fishery Commission, letters to George Schultz, US Secretary of State and Joe Clark, Canadian Secretary of State (August 4, 1988). A similar letter, supporting the Fisheries Commission request, was also sent to each government by the secretary for each of the two sections of the International Joint Commission on August 9, 1988.

¹⁹ Daniel Gauthier and Deborah A. Steel, *A Synopsis of the Situation Regarding the Introduction of Nonindigenous Species by Ship-Transported Ballast Water in Canada and Selected Countries*, Fisheries and Aquatic Sciences report 2380 (Mont-Joli, Québec: Fisheries and Oceans Canada, 1996), § 3.2, p. 5.

²⁰ Gauthier and Steel, *supra*, § 5.2.1., p. 24.

²¹ International Joint Commission and Great Lakes Fishery Commission, *Exotic Species and the Shipping Industry: The Great Lakes-St. Lawrence Ecosystem at Risk* (Ann Arbor, MI: Great Lakes Fishery Commission, September 1990), recommendations on p. 9.

²² US Public Law 101-646 (November 29, 1990), codified at 16 USC §§ 4701 *et seq.*

²³ 16 USC § 4711(b).

Table 2. (cont.)

JUL 1991	The Marine Environment Protection Committee (MEPC) of the International Maritime Organization (IMO) issues draft International Guidelines for Preventing the Introduction of Unwanted Aquatic Organisms and Pathogens from Ships' Ballast Water and Sediment Discharges, recommending ballast exchange. ²⁴
DEC 1991	The Canadian Great Lakes Laboratory for Fisheries and Aquatic Sciences issues a report on the effectiveness of ballast exchange in the Great Lakes under the 1989 Canadian guidelines. ²⁵
APR 1993	The US Coast Guard issues mandatory regulations under NANPCA 90, requiring exchange or alternative measures on all vessels entering the Great Lakes in ballast (applicable to vessels headed to both US and Canadian ports in the Great Lakes). ²⁶
JUL 1993	At the urging of Australia, with support from New Zealand, Canada, and the United States, the Marine Environment Protection Committee (MEPC) of the International Maritime Organization (IMO) forms a Ballast Water Working Group (BWWG). ²⁷
NOV 1993	The International Maritime Organization (IMO) General Assembly adopts Guidelines for Preventing the Introduction of Unwanted Aquatic Organisms and Pathogens from Ships' Ballast Water and Sediment Discharges, recommending ballast exchange. ²⁸
MAY 1994	The Australian Quarantine and Inspection Service (AQIS) develops a draft Australian Ballast Water Strategy for a comprehensive program of research on control measures. ²⁹
OCT 1996	The United States enacts the National Invasive Species Act of 1996 (NISA 96), ³⁰ mandating the US Coast Guard to issue national voluntary guidelines one year after the act and national mandatory regulations three years after issuance of the guidelines, if the voluntary guidelines are found to be ineffective. ³¹

²⁴ International Maritime Organization Marine Environment Protection Committee Resolution 50(31), 31st Session (London: IMO, July 1991).

²⁵ A. Locke, D.M. Reid, W.G. Sprules, J.T. Carlton, and H.C. van Leeuwen, *Effectiveness of Mid-Ocean Exchange in Controlling Freshwater and Coastal Zooplankton in Ballast Water*, Fisheries and Aquatic Sciences Report 1822 (Burlington, ON: Great Lakes Laboratory, 1991).

²⁶ 58 *Federal Register* 18334 (April 8, 1993), adding 33 CFR Part 151, Subpart C, §§ 151.1500 *et seq.*

²⁷ Daniel Gauthier and Deborah A. Steel, *A Synopsis of the Situation Regarding the Introduction of Nonindigenous Species by Ship-Transported Ballast Water in Canada and Selected Countries*, Fisheries and Aquatic Sciences report 2380 (Mont-Joli, Québec: Fisheries and Oceans Canada, 1996), § 5.0, pp. 14-15.

²⁸ Resolution A.774(18), 18th Assembly (London: IMO, November 4, 1993).

²⁹ Gauthier and Steel, *supra*, § 5.2.1., p. 25.

³⁰ US Public Law 104-332 (October 26, 1996), amending Public Law 101-646 (November 29, 1990), 16 USC §§ 4701 *et seq.*

³¹ 16 USC § 4711(c), (e), and (f).

Table 2. (cont.)

OCT 1997	The Canadian Department of Fisheries and Oceans (DFO), the Canadian Department of Transport (Transport Canada), and the US Coast Guard adopt a Binational Ballast Water Research Strategy to support critical changes in the Great Lakes regime. ³²
APR 1998	The US Coast Guard proposes national voluntary guidelines under NISA 96, along with revisions to the existing Great Lakes mandatory regulations raising the regulatory standard for measuring the adequacy of ballast exchange. ³³ The date of closure on public comments, thus allowing promulgation of the guidelines and revisions, is originally scheduled for June 9, 1998. However, because of strong opposition by the shipping industry, particularly to the raising of the standard for measuring the adequacy of exchange in both the Great Lakes regulations and the national guidelines, the revised Great Lakes regulations and national guidelines have still not been issued as of the end of January 1999. ³⁴
OCT 1998	Canada enacts an amendment to the Shipping Act authorizing the government to issue mandatory regulations for the management of ballast water throughout Canada. ³⁵

A number of other countries, and some state and local authorities in the United States and Canada, have taken limited regulatory action. Australian agencies have authority to act against specific identifiable outbreaks of toxic dinoflagellates (a health threat to the shellfish industry) and other identifiable organisms under various health and pest control laws, but there is a lack of clear responsibility for administration of a ballast water program among federal and state officials.³⁶ New Zealand promulgated Voluntary Controls on the Discharge of Overseas Ballast Water within New Zealand in March 1992.³⁷ The New Zealand Ministry of Agriculture has authority to take action against an identifiable infestation under the Biosecurity Act of 1993, but use of that authority has been largely limited to requesting reports of compliance with the voluntary guidelines³⁸ and emergency action against

³² Canadian DFO, Transport Canada, and US Coast Guard, *1996-1997 Binational Report on Protection of Great Lakes Water Quality*, report to the International Joint Commission under Annex VI, § 2 of the GLWQA 1978/1987 (Cleveland, OH: US Coast Guard, October 14, 1997), §§ 240-242.2, pp. 17-21. A slightly amended version of the binational ballast water research strategy was also endorsed by the Great Lakes Commission Panel on Aquatic Nuisance Species in February 1998.

³³ 63 *Federal Register* 17782 (April 10, 1998).

³⁴ See comments in the Department of Transportation public docket file for Notice of Proposed Rulemaking docket USCG-98-3423, available on-line from US DOT at dms.dot.gov.

³⁵ Canadian Shipping Act, Revised Statutes of Canada, RS-9, § 657.1, as added October 31, 1998.

³⁶ Daniel Gauthier and Deborah A. Steel, *A Synopsis of the Situation Regarding the Introduction of Nonindigenous Species by Ship-Transported Ballast Water in Canada and Selected Countries*, Fisheries and Aquatic Sciences report 2380 (Mont-Joli, Québec: Fisheries and Oceans Canada, 1996), § 5.2.1, pp. 25-26.

³⁷ Gauthier and Steel, *supra*, § 5.3.1, p. 31.

³⁸ Gauthier and Steel, *supra*, § 5.3.1, pp. 31-32.

Tasmanian ballast carrying larvae of the North Pacific seastar (*Asteria amurensis*).³⁹ General regulations were issued under the Biosecurity Act in 1998.⁴⁰

Other regulatory action has been taken in Israel, Chile, Japan, Tasmania, the Red Sea Ports, the Ukraine, Humbolt Bay, CA, and the Port of Vancouver, BC.⁴¹ Guidelines or advisories, sometimes backed up by limited emergency authorities, have been promulgated in the United Kingdom, Germany, and Sweden.⁴² The regulation is typically tentative. For example, the Harbor Master of the Port of Vancouver, British Columbia, has issued a “standing order” under local authority, mandating ballast water exchange.⁴³ However, despite the fact that compliance has only been about 80%, the port has yet to test its authority to enforce the standing order.⁴⁴

Three states of the United States on the Pacific Ocean have taken some legislative action, but only of the most tentative nature. One of those states, California, has potentially significant legislation introduced in the Assembly.

The Alaska legislature passed a 1992 resolution requesting that the US Coast Guard prohibit all discharge of ballast from foreign coasts in Alaskan waters.⁴⁵ The US Coast Guard has no general authority over discharge of ballast in Alaska until eventual implementation of mandatory regulations under NISA 96, which is still more than three years away at best. But there is a presidential memorandum⁴⁶ imposing limited exchange requirements on tankers engaged in the export of Alaskan oil under separate statutory authority to allow such exports with “such terms and limitations...as are necessary or appropriate to ensure that such exports are consistent with the national interest.”⁴⁷

California and Hawaii have each enacted temporary measures for information-gathering and coordination. California enacted a state Aquatic Nuisance Prevention and Control Act (ANSPCA) in 1992,⁴⁸ which declares that the California Department of Fish and Game “shall adopt the International Maritime Organization’s ‘Guidelines for Preventing the Introduction

³⁹ Andrew N. Cohen, *Ships’ Ballast Water and the Introduction of Exotic Organisms into the San Francisco Estuary: Current Status of the Problem and Options for Management* (Richmond, CA: San Francisco Estuary Institute, October 1998), Appendix C, pp. 64-65, citing B. Hayden, “A New Zealand Perspective on Ballast Water,” in J.T. Carlton, ed., *Ballast Water: Ecological and Fisheries Implications* (Copenhagen: International Council for the Exploration of the Sea, in press).

⁴⁰ Cohen, *supra*, Appendix C, pp. 64-65, citing New Zealand Ministry of Fisheries Import Health Standards (Biosecurity Act 1993) for Ships’ Ballast Water from all Counties (1998).

⁴¹ Cohen, *supra*, Appendix C, pp. 65-67.

⁴² Gauthier and Steel, *supra*, § 5.4. pp. 34-36.

⁴³ *Vancouver Port Corporation, Ballast Water Exchange Program* (Vancouver, BC: May 1997).

⁴⁴ Personal communication from the Vancouver Harbor Master. The port views the compliance problems as a matter of lack of knowledge of the requirements. Also, there is concern about the safety of exchange.

⁴⁵ Cohen, *supra*, Appendix C, p. 66, citing Alaska Legislative Resolve No. 85 (June 8, 1992).

⁴⁶ Presidential Memorandum (April 28, 1996), at 61 *Federal Register* 19507 (May 31, 1996).

⁴⁷ US Public Law 104-58 (November 28, 1995), § 201, amending 30 USC § 185(s).

⁴⁸ California Statutes 1992, Chapter 840, amending California Fish and Game Code §§ 6430-6439.

of Unwanted Aquatic Organisms and Pathogens from Ships' Ballast Water and Sediment Discharges' as adopted on July 4, 1991, as the policy of this state...."⁴⁹ It is not clear what legal significance it has for a state to adopt voluntary international guidelines as "policy." The California act does not give the Department of Fish and Game any enforcement authority other than authority to demand that vessel operators return ballast water report forms distributed in cooperation with the US Coast Guard.⁵⁰ It appears that the department may not have even attempted to implement this.⁵¹ By its own terms, the California ANSPCA expires on January 1, 2000.⁵² Similarly, Hawaii enacted a temporary law directing state agencies to form a state "alien aquatic organism task force," in cooperation with federal agencies, in order to develop a "comprehensive plan" on preventing introductions.⁵³ That statutory direction already expired, by its own terms, on June 30, 1998.⁵⁴ Neither of these state enactments was calculated to test the limits of state authority over ballast water in commercial shipping.

A bill just introduced in the California Assembly on February 24, 1999,⁵⁵ would enact a comprehensive regime for control of ballast water which goes far beyond the current US regime or that of any other country in the world. It would require an exchange of water, at the level of 95% of volume, or alternative treatment, unless exchange is unsafe and no reasonable alternative treatment is available. Moreover, it is explicitly designed to force technological change according to a legislated schedule. After January 1, 2003, the ship operators would be required to have made the necessary investments, in either ship or shore side facilities, to be able to exchange or treat the water safely and effectively.

The issue of exotics in ballast water is now on the international agenda in the form of discussions and voluntary guidelines recommending ballast exchange developed by the International Maritime Organization (IMO) in London.⁵⁶ IMO promulgated non-binding Guidelines for the Control and Management of Ships' Ballast Water to Minimize the Transfer of Harmful Aquatic Organisms and Pathogens in 1997.⁵⁷ These, very much like

⁴⁹ California Fish and Game Code § 6432.

⁵⁰ California Fish and Game Code §§ 6433-6435.

⁵¹ Andrew N. Cohen, *Ships's Ballast Water and the Introduction of Exotic Organisms into the San Francisco Estuary: Current Status of the Problem and Options for Management* (Richmond, CA: San Francisco Estuary Institute, October 1998), Appendix C, p. 66.

⁵² California Fish and Game Code § 6439.

⁵³ Hawaii Act 237, Relating to Harmful Aquatic Life (June 17, 1997), Laws 1997, Chapter 237, § 1.

⁵⁴ Hawaii Act 237, Relating to Harmful Aquatic Life (June 17, 1997), Laws 1997, Chapter 237, § 2(d).

⁵⁵ California Assembly Bill, AB 703, introduced by Assembly Member Lempert on February 24, 1999.

⁵⁶ The International Maritime Organization (IMO) is a "specialized agency" of the United Nations, originally established as the "Inter-Governmental Maritime Consultation Organization" in 1948, a forum for consultation on matters of safety and prevention of pollution in shipping, and the forum in which most of the major international conventions on maritime safety and environmental protection are negotiated.

⁵⁷ Resolution A.774(18) of the IMO 20th General Assembly (London: IMO, November 4, 1993). These were developed by a committee of IMO, the Marine Environment Protection Committee (MEPC), and a Ballast Water Working Group (BWWG) within that committee. The three nations with the primary interest in the subject, the United States, Canada, and Australia, have had the most active representation in the BWWG.

the US regulations and the Canadian voluntary guidelines, recommend the use of exchange when possible but caution against the risk of losing stability or incurring hull stress. A revision to these guidelines in 1997⁵⁸ added more specific guidance on safety considerations limiting the use of exchange,⁵⁹ and recognized the use of the flow-through method of exchange as a means to avoid the stability and stress problems.⁶⁰ At this time the IMO ballast water guidelines are just guidelines, not part of any legal convention. Australia is strongly advocating that the guidelines be made into a binding international convention as an “annex” to the International Convention for the Prevention of Pollution from Ships (MARPOL),⁶¹ which would then have to be specifically adopted and implemented by maritime nations before coming into effect as international and domestic law.⁶² Most other nations have no noticeable enthusiasm for a ballast water convention.⁶³ Even Canada and the United States, despite their own domestic legislation on the subject, have some reservations about adoption of an international convention because of the issue of the safety of exchange on current vessels.⁶⁴

⁵⁸ Resolution A.686(2), IMO 20th General Assembly (London: IMO, November 27, 1997).

⁵⁹ Resolution A.686(2), *supra*, Appendix 2.

⁶⁰ Resolution A.686(2), *supra*, Appendix 2, § 1.3.2. The “flow-through method” is some means of changing the water while maintaining a constant (or near constant) load of water in the tank, thus avoiding any of the problems with stability and hull stress created by the pump-down and pump-up method of exchange. However, absent the retrofitting of new pipe ends, the only way that most existing vessels can accomplish a flow-through exchange is by pumping the water upward and out through the hatches or vent pipes on the deck. This is not as efficient, and may also create safety problems through either over-pressurization of the tanks or free water on the decks. A much more effective, and completely safe, flow-through exchange could be accomplished by simply adding one new pipe end to the top of each tank and flushing the water out the bottom via the existing pipes. See § 212 of this report below.

⁶¹ The International Convention for the Prevention of Pollution from Ships, done at London, November 2, 1973, amended by the Protocol of 1978. (These are ratified treaties, with Senate treaty numbers, 92-2 and 96-1, but they have not yet been entered in the Department of State’s official listing in Treaties and International Agreements (TIAS). They are unofficially reported in full, with annotations, at The Maharaj Nagendra Singh, *International Maritime Law Conventions* (London: Stevens & Sons, 1983), vol. 3, pp. 2272 *et seq.* and 2414 *et seq.*) and also available (by mail order purchase) from IMO in London at www.imo.org. They are collectively called “MARPOL 73/78” or just “MARPOL,” (although this is not actually an acronym for the name of the convention), with various “annexes” on specific types of pollution: Annex I on oil, Annex II on noxious liquid substances in bulk, Annex III on harmful substances in packages, containers, or tanks, Annex IV on sewage, and Annex V on garbage. Each of these amount to an independent convention. For example, the annex on garbage, an “optional annex” which has been adopted by the United States, but not by Canada, is “MARPOL Annex V.” The United States has adopted all annexes, but Annex IV on sewage is an “optional annex” which has not yet gained the required adoption to come in to force. Most of the major maritime nations, including the United States and Canada, are signatories to MARPOL and most of its annexes.

⁶² Any new annex on ballast water would be an “optional annex.” The rules of the basic MARPOL convention provide that an optional annex comes into force when not less than 15 states having a combined merchant fleet making up 50% of the world’s tonnage assent to it. MARPOL 73, Article 15.

⁶³ Personal discussion with Mr. Thomas Morris, Transport Canada, Ottawa, the Canadian representative to the Ballast Water Working Group.

⁶⁴ Personal discussions with US Coast Guard and Transport Canada officials.

§ 212. Exchange and its limitations under the Great Lakes regime

All of the laws, guidelines, and regulations on ballast water cited above are built around a concept of “exchange or alternative management” originally adopted in Canada, Australia, and the United States. Unfortunately, there are no forms of alternative management currently available, and all the regimes therefore center on the use of exchange. Our six years of experience with an exchange regime under the mandatory regulations in the Great Lakes⁶⁵ is therefore quite relevant to evaluating the advantages and disadvantages of such regimes around the world.

The basic design of the Great Lakes regime. Under the Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990 (NANPCA 90)⁶⁶ and the US Coast Guard ballast water regulations promulgated in 1993,⁶⁷ all vessels coming into the Great Lakes from outside the 200-mile limit and carrying any amount of ballast water beyond that which cannot be physically pumped out of the tanks are subject to the Great Lakes regime, even if not headed for a US port on the Great Lakes.⁶⁸ The statute and regulations do not contain any express exemption for unpumpable ballast – and, indeed, amendments to the statute in NISA 96 emphasized that the statute covers the unpumpable slop on the bottom of the tanks.⁶⁹ But the US Coast Guard has not attempted to enforce the regulations against vessels carrying unpumpable slop, the “NOBOBs,”⁷⁰ because it had never been envisioned that it

⁶⁵ Most of the following discussion of the US Coast Guard regulations is based on the researcher’s personal experience as the senior staff officer responsible for administering the program in the Great Lakes. Also see material previously published as Katherine Weathers and Eric Reeves, “The Defense of the Great Lakes Against the Invasion of Nonindigenous Species in Ballast Water,” *Marine Technology* (April 1996), vol. 33, no. 2, pp. 92-100; and M. Eric Reeves, “Techniques for the Protection of the Great Lakes from Infection by Exotic Organisms in Ballast Water,” in Frank M. D’Itri, *Zebra Mussels and Aquatic Nuisance Species* (Chelsea, MI: Ann Arbor Press, 1997), pp. 283-299.

⁶⁶ Public Law 101-646 (November 29, 1990), later amended by the National Invasive Species Act of 1996 (NISA 96), Public Law 104-332 (October 26, 1996), codified at 16 USC §§ 4701 *et seq.*

⁶⁷ 33 CFR Part 151, Subpart C, §§ 151.1500 *et seq.*

⁶⁸ The physical design of the Seaway and the lock system is such that no vessel can enter the Great Lakes without passing through both Canadian territorial waters (lower locks, beginning at Montreal) and US territorial waters (upper locks, ending at Massena) before reaching the open waters of Lake Ontario. Because these are internal territorial waters of each nation, not subject to any right of “innocent passage” under the law of the sea, both the United States and Canada have full authority to apply their internal domestic law to the vessels of any nation passing through their locks. The general compatibility of US and Canadian maritime laws, and friendly coordination of enforcement policies between the regional commands in Cleveland and Sarnia, has avoided any of the conflicts one might expect from this dual jurisdiction. In the matter of ballast water policy, in particular, the regional administrative officers have coordinated very closely in creating a *de facto* binational regime. This collegial relationship should only become stronger with the development of mandatory Canadian regulations under the Shipping Act.

⁶⁹ US Public Law 104-332 (October 26, 1996), § 2(b)(2), amending 16 USC § 4711(b)(2)(A).

⁷⁰ Vessels reporting “no ballast on board.” As a matter of custom, the mariners considered themselves to be in this status if the pumps lost suction and could not pump anything else out, even though, in fact, excepting only a vessel that has just come out of a shipyard, there is no such thing as a true “NOBOB.” See discussion below.

would do so when the regulations were originally proposed and submitted for public comment.⁷¹

The regulations are enforced by Marine Safety Office Buffalo, the operational command covering the eastern end of the US Great Lakes, with a subsidiary field unit, Marine Safety Detachment Massena, conducting the actual boardings on the incoming vessels. In recent years, almost half of these boardings have been conducted in Montreal with the cooperation of the Canadian Saint Lawrence Seaway Authority (now reorganized as a semi-public corporation called the Saint Lawrence Seaway Management Corporation). The program has been supervised by the staff of the Ninth District Command in Cleveland, which is the regional US Coast Guard command covering the Great Lakes – with a great deal of cooperation from the Canadian Department of Transport (Transport Canada) and the Canadian Department of Fisheries and Oceans (DFO). Both of the US and Canadian regional commands have enjoyed a minimum of interference from national headquarters in Washington DC or Ottawa in administering this peculiar Great Lakes regime. Even though the Canadian agencies have no authority to enforce the US regulations, their active support was essential to making enforcement practical.

Under the US regulations, vessels are required to (a) conduct an exchange of ballast in the open ocean, 200 nautical miles to sea, in a depth of at least 2000 meters, so that the resulting water has at least 30 ppt salinity, (b) retain the ballast throughout the voyage in the Great Lakes, or (c) use an alternative method of ballast water management, which must first be approved by the US Coast Guard. To date, no one has completed a formal proposal for approval of an alternate method, and there are no good candidates under consideration. Many proposals have been scoped out and discussed but none has yet been developed as a practical alternative. The regulations also provide for approval of alternate exchange sites if vessels are having difficulty conducting exchanges within their loading parameters because of sea or weather conditions. As a matter of administrative practice, the relatively sheltered

⁷¹ The previous version of § 4711(b)(2)(A) in NANPCA 90 had applied to vessels “carrying ballast” after operating beyond the exclusive economic zone (EEZ, the 200-mile zone). Under the general definition in 33 USC § 4702(1), the same in both versions, “ballast water” means “any water and associated sediments used to manipulate the trim and stability of the vessel.” It was the opinion of the US Coast Guard officer who took over administration of the program in the summer of 1993 (the researcher here) that this was quite sufficient to cover the unpumpable slop. But there was some disagreement about this, and in fact the officers who had drafted the original regulations, along with their technical advisor, had clearly never envisioned applying the regulations to the “NOBOBs” entering with only unpumpable slop. As a matter of administrative practice and practical politics, the NOBOBs had been left out. After the office in the Ninth District brought attention to the issue, the consultant drafting NISA 96 for Senator John Glenn (Democrat, Ohio) specifically changed the statement of applicability in 16 USC § 4711(b)(2)(A) in order to settle that issue. The statute now applies to “all vessels equipped with ballast water tanks” that enter from outside the EEZ. Another provision added by NISA 96 specifically mandated national guidelines on “ballasting practices of vessels that enter the waters of the United States with no ballast water on board,” 16 USC § 4711(c)(2)(E)(ii), which propagates the oxymoron of “NOBOB” into federal law, but clearly indicates the Congressional intent to reach ballast slop. The problem, however, is that the US Coast Guard still does not have an operational plan for how to regulate the NOBOBs with the unpumpable slop.

waters of the Gulf of St. Lawrence, east of the 63° west line of longitude have been customarily used as an alternate exchange site, based on advice that 63° west is the approximate area where the Gulf begins to be brackish.⁷² This provides an exchange in a distinct ecological area, but not an area which is as reliable a barrier as the open ocean zone beyond 200 miles.

The exchange requirement. The primary defense against exotics in all current ballast water regimes is the requirement for an open ocean exchange. Where did that come from in the first place? In fact, exchange was something that mariners had done on their own in the past, occasionally, for the purpose of cleaning excessive loads of sediment out of their tanks. They thereby reduced both deadweight and corrosion. Exchange was therefore seized upon by those who developed the first voluntary guidelines in Canada and Australia as a practical measure which could be immediately adopted at very little cost to the industry. Under the US Coast Guard regulations (which are being reviewed for possible revision⁷³) the exchange must be carried out beyond the exclusive economic zone (200 nautical miles from the baseline) in a depth of at least 2000 meters, and must achieve a resulting level of salinity in the ballast water equal to or exceeding 30 parts per thousand (ppt). The salinity of sea water varies in various parts of the ocean from 30 to 39 ppt, but stays fairly close to a mean of 35.3 ppt in the middle of the North Atlantic.⁷⁴ Thus, a reading of 30 ppt or more from an exchange in the North Atlantic nominally indicates that 84.98% (30/35.3) or more of a tank previously carrying fresh water has been exchanged. However, an analysis of salinity readings which the Ninth District conducted on vessels during the 1997 season indicates that a substantial number of vessels begin with high salinity water (probably from the Mediterranean, a common area for the delivery of grain from the Great Lakes). This clearly undermines the validity of the salinity standard as a guarantee of exchange. Also, it should be kept in mind that a 100% exchange, not 85%, is the goal. The regulatory level of 30 ppt, or a nominal 85% exchange, was purely a practical accommodation for the shipping industry because of the difficulty that many vessels have in accomplishing a 100% exchange, and not because of any scientific basis for saying that 30 ppt salinity, or 85% exchange, provides a critical level of protection.

What is the purpose of requiring an exchange of ballast in the open ocean? Contrary to what is often assumed, the main idea is not to salt up the tanks to kill or inhibit the reproduction of fresh water organisms in the ballast. Salting might be a useful attack against some organisms. But that is not an effect which can be relied upon, and is at best a secondary purpose of the exchange requirement. There are many organisms in a variety of

⁷² A. Locke, D.M. Reid, W.G. Sprules, J.T. Carlton, and H.C. van Leeuwen, *Effectiveness of Mid-Ocean Exchange in Controlling Freshwater and Coastal Zooplankton in Ballast Water*, Fisheries and Aquatic Sciences Report 1822 (Burlington, ON: Great Lakes Laboratory, 1991), p. 43.

⁷³ See the discussion of the proposed revisions and nationwide guidelines below in this section.

⁷⁴ A. Locke, *et al.*, *supra*, p. 26.

taxa – the lamprey eel⁷⁵ and the cholera bacterium⁷⁶ come immediately to mind – who can make the transition from salt to fresh water quite nicely.

Moreover, many exclusively freshwater organisms can live in a dormant form while exposed to salt water and become active again when exposed to fresh water. “A surprisingly diverse group of [freshwater] taxa, representing protozoans and 11 animal phyla, possess resting stages which may be capable of surviving extended saltwater immersion (although experimental data for most of these taxa are lacking).”⁷⁷ One of the seminal researchers in the field, Dr. James Carlton of Williams College, christened this the “Malinska Effect” after finding the freshwater calanoid copepod *Eurytemora affinis* still doing quite nicely after living for two weeks in the 30 ppt exchanged water of the motor vessel *Malinska*.⁷⁸ The sediments in the ballast tanks give all of the organisms a place in which to shelter themselves from the salinity.⁷⁹

The main purpose of the exchange requirement is to dump the freshwater or coastal saltwater organisms out of the tank and trade them for organisms from the very different ecology of the open ocean (highly oligotrophic, high in salinity and ultraviolet light).

⁷⁵ The sea lamprey (*Petromyzon marinus*) is an anadromous species originally living in the Atlantic Ocean and spawning in the Northeastern rivers. It is not thought to have been a ballast introduction. It may have come up the Erie Canal System, or may even have been native to Lake Ontario, and spread later to the upper lakes. See Edward L. Mills, Joseph H. Leach, James T. Carlton, and Carol L. Secor, “Exotic Species in the Great Lakes: A History of Biotic Crises and Anthropogenic Introductions,” *Journal of Great Lakes Research*, vol. 19, no. 1 (1993), pp. 6, 9.

⁷⁶ Cholera, caused by the bacterium genus *Virbio*, is a particularly instructive example of the adaptability of simple organisms. It has various species and strains, some of which are not pathogenic to humans, some of which thrive more in salt or fresh water. But some of the pathogenic forms can certainly make the transition. A 1961 pandemic of cholera in Peru was caused by the El Tor strain, *Vibrio cholerae* 01, which “was particularly well equipped, genetically, for long-term survival inside algae....” Also, “The El Tor strain was capable of shrinking itself 300-fold when plunged suddenly into cold salt water. In that form it was the size of a large virus, very difficult to detect....add nitrogen, raise the temperature, decrease the salinity, and bingo! instant cholera.” It is believed that the El Toro strain infected Peru via water carried by a Chinese freighter from the Asian seas. Lauri Garrett, *The Coming Plague: Newly Emerging Diseases in a World Out of Balance* (New York: Farrar, Straus and Giroux, 1994), p. 564.

⁷⁷ James T. Carlton, Donald M. Reid, and Henry van Leeuwen, *The Role of Shipping in the Introduction of Nonindigenous Aquatic Organisms to the Coastal Waters of the United States (other than the Great Lakes) and an Analysis of Control Options*, Shipping Study I, USCG Report No. CG-D-11-95 (Springfield, VA: National Technical Information Service, April 1995), p. 161. See also Australian Quarantine and Inspection Service (AQIS), *Ballast Water Treatment for the Removal of Marine Organisms*, AQIS Ballast Water Research Series Report No. 1 (Canberra, Australia: Australian Government Publishing Service, June 1993), pp. 8-9; and A. Locke, D.M. Reid, W.G. Sprules, J.T. Carlton, and H.C. van Leeuwen, *Effectiveness of Mid-Ocean Exchange in Controlling Freshwater and Coastal Zooplankton in Ballast Water*, Fisheries and Aquatic Sciences report 1822 (Burlington, Ontario: Great Lakes Laboratory, 1991), p. 39.

⁷⁸ James Carlton, Williams College Maritime Studies in Mystic Seaport, letter to Jonathan Burton, US Coast Headquarters, Washington, DC (February 12, 1993).

⁷⁹ A. Locke, D.M. Reid, W.G. Sprules, J.T. Carlton, and H.C. van Leeuwen, *Effectiveness of Mid-Ocean Exchange in Controlling Freshwater and Coastal Zooplankton in Ballast Water*, Fisheries and Aquatic Sciences Report 1822 (Burlington, ON: Great Lakes Laboratory, 1991), p. 39.

Although there can be a good number of organisms in the open ocean, the marine biologists have advised that “the probabilities of reciprocal introductions are virtually non-existent.”⁸⁰ So exchange is in fact “contrary ballasting” between two distinct ecological zones, using the fact that open ocean is a natural barrier to invasion. It is of course not a barrier to any pelagic saltwater organism which maintains viability while floating on or near the surface of the open ocean, from which the water for exchange is taken. But any such organism does not need the assistance of a ride in a ballast tank to reach our shores (and to hitch a ride up to the lakes from there) unless it is from a separate ocean (Atlantic or Pacific).⁸¹

Effectiveness of the regime. Compliance with the Great Lakes regime has been generally good. Coast Guard enforcement statistics collected since the beginning of the regime in 1993 have indicated a steady decline in the number of “problem vessels” having difficulty meeting the regulatory standard of a 30 ppt exchange.⁸² In essence, the marine community has easily adapted to the 30 ppt exchange requirement. But the problem, discussed below, is that this may not mean much in terms of actual effectiveness of the regime. There are three serious limitations to an exchange regime. These are (a) safety, (b) the problem of residual slop and sediment in the “empty” tanks of “NOBOB” vessels, and (c) the lack of effectiveness of exchange in actually flushing out the organisms. All three of these defects are directly related to the fact that ballast tanks on vessels currently in service were simply not ever designed for the purpose of exchange. In addition, (d) there is serious question as to whether or not the US Coast Guard’s reliance on a regulatory salinity standard has any validity in confirming the fact of an exchange.

⁸⁰ James T. Carlton, Donald M. Reid, and Henry van Leeuwen, *The Role of Shipping in the Introduction of Nonindigenous Aquatic Organisms to the Coastal Waters of the United States (other than the Great Lakes) and an Analysis of Control Options*, Shipping Study I, USCG Report No. CG-D-11-95 (Springfield, VA: National Technical Information Service, April 1995), p. 153.

⁸¹ See the discussion of natural ocean surface current migration of pelagic organisms in Joel Hedgpeth, “Nonanthropogenic Dispersal and Colonization in the Sea,” in *Nonindigenous Estuarine & Marine Organisms (NEMO)*, proceedings of workshop at Seattle, WA, April 1993 (Washington DC: National Oceanic and Atmospheric Administration, April 1993). There is relatively little mixing between the two major halves of the planetary ocean, and the coldness of the polar waters also provides a natural barrier. This sort of detailed oceanographic analysis, however, has not so far been worked into the US Coast Guard regulatory regime. NOAA has commissioned a study, mandated by Congress, of the collateral effects of exchange due to surface ocean currents. This would provide some of the needed information for the regulators, but it has been years overdue in being completed.

⁸² The number of “problem vessels,” relative to the number of vessels entering with ballast, declined from 7.4% to 1% over the five years from 1993 to 1997. In addition, the ratio between the number of vessels entering with ballast and retaining their water throughout the voyage and those entering with ballast after conducting an exchange at sea declined, from almost an equal ratio (.933) in 1993 to about one in eighteen (.057) in 1997, thus indicating that vessel operators are getting in the habit of conducting an exchange instead of resorting to retention. Figures from US Coast Guard Ninth District Marine Safety Analysis and Policy Branch, Cleveland, Ohio.

*The design of ballast tanks.*⁸³ Conventional ballast systems are built with only one two-way pipe end in the bottom of each ballast tank. Unless some other provision is made for flushing the water through the tank, the only way it can be exchanged is by pumping down a full (or partially full) tank and refilling it. When conducting a pump-down exchange, the vessel operators typically do one set of side-by-side (port and starboard) tanks at a time in order to avoid endangering stability. (Even if it were feasible within the limits of the pumping system to pump down all tanks at once, lightering the whole ship at once would create a dangerous instability. That is why the ballast tanks are there in the first place.) There is no general principle of marine engineering or naval architecture which requires there to be only one pipe end connecting to each tank.⁸⁴ Before exotics species became an issue in the late 1980s, there was simply no need for another pipe end to be built into the ballast system for each tank.

In addition, getting a good flush of the tank is impeded by a large number of structural members typically lining the sides and bottoms of a ballast tank. This *is*, to a large extent, a constraint of naval architecture. The hull of vessel must be supported by a semi-rigid internal structure of steel framing in order to supply overall strength to the hull and prevent the tendency of tubular shells to buckle. This is more critical the larger the vessel, and the higher the ratio of the length to the breadth of the vessel. The vessel is kept from excessive bending along the length by “longitudinals,” which are steel beams running fore and aft along the inside of the hull, which means the inside the ballast tanks. It is difficult to put them anywhere else, because other design constraints dictate that the ballast tanks are generally on the outside, or underneath, the cargo spaces,⁸⁵ and because the longitudinals would interfere with the cargo if they were inside the cargo spaces. Under modern construction, which seeks to obtain maximum structural strength with minimum consumption of steel and weight, the longitudinals are welded tightly to the inside of the ballast tank shell, as closely to a right angle to the shell as possible, with a minimum of gaps in the weld. Some older designs did have longitudinals welded to vertical or transverse frames, thus creating large gaps which would have been excellent for allowing ballast water to flush through, but that was a far less efficient use of steel.

⁸³ The following discussion is based on general principles of marine construction, apparent in any basic reference, such as Robert Taggart, ed., *Ship Design and Construction* (New York: Society of Naval Architects and Marine Engineers, 1980).

⁸⁴ In fact, almost all large commercial vessel ballast piping systems have a set of multiple main pipes, either running down the centerline of the vessel or in parallel port and starboard, connected to two or more main pumps in the flow between the internal system and the seachests for taking on and discharging water, with lots of valves and controls for moving water in different directions. There is considerable independent pumping capacity and piping already built in. There just are not any outflow pipe ends put in at the tops of the tanks.

⁸⁵ The tanks cannot very well perform one of their primary purposes, which is to provide stability, unless they are on the outside or bottom of the cross-section, away from the center of gravity. (That is why you instinctively stick your arms out when you are trying to regain balance.) In addition, having the ballast tanks on the outside allows them to perform the valuable function of serving as a shield against damage to critical machinery, cargo, or fuel in the event of a grounding or collision. Many a vessel has been saved from having a really bad day, and spilling oil, by the fact that it was “only a ballast tank” that got holed.

Steel could be saved, while still maintaining strength, through carefully calculated “lightening holes” in the longitudinals (just like the holes in the framing of an aircraft, which are more closely calculated to save weight while maintaining strength). This would increase construction costs, but should result in compensatory savings in terms of steel, weight, cost of cleaning, and reduction of corrosion from trapped pockets of water. That may well be a practical option for new construction, and is certainly one which should be considered.⁸⁶ But (unlike retrofitting for additional pipe ends) it is probably outside the realm of economic and engineering practicality for retrofitting on existing vessels. It would be difficult to insure that the holes were safely located and cut on an existing vessel without having the opportunity to make changes in the overall design of the framing.⁸⁷

It is important to realize that these two design problems interact. The longitudinals serve to trap water and sediment when the water rises and falls during a pump-up pump-down cycle. They will trap much less of the original water and the sediment if there is a sustained flow-through flush, top to bottom, which cascades down the side of the shell like water going over the steps of a fish ladder.⁸⁸ How efficient a process can be created depends a great deal on the specific configuration of the tank and whether or not the piping dictating the pattern of flow is strategically located. Computer modeling conducted by Brazil indicates that relatively slight variations in the placing of inlets and outlets can cause significant differences in the effectiveness of the flushing action.⁸⁹ In addition, there is no design or safety constraint which prevents the installation of small, relatively cheap plastic or non-marine steel piping systems inside the tank for the purpose of cleaning off the longitudinals.⁹⁰

Those are only a few of the technical changes which could be made. There is a whole range of available technologies for treating ballast water, including filtering, heat, ultraviolet light, biocides, and shore side treatment of water, some of which may well be economically

⁸⁶ The Marine Board of the National Research Council recommends consideration of “structural and piping designs that trap less sediment and are easier to clean” at the time of “construction or major alteration to existing vessels.” Marine Board, *Stemming the Tide: Controlling Introductions of Nonindigenous Species by Ships’ Ballast Water* (Washington DC: National Academy Press, 1996), Appendix D, p. 106. Insofar as the *structural framing* is concerned, this may be practical only in the event of new construction.

⁸⁷ Also, the idea of sending workmen down to cut away in the structure of an older vessel, typically suffering from corrosion, broken welds, and hairline cracks, is something that would send chills down the spine of a US Coast Guard or Transport Canada marine safety officer.

⁸⁸ Confirmed by actual experimentation on models by the researcher.

⁸⁹ Submission to IMO MEPC Ballast Water Working Group by the representatives of Brazil, “Harmful Aquatic Organisms in Ballast Water: Results of Ballast Water Exchange Tests Using the Dilution Method,” MEPC Document 40/10/4 (London: IMO, July 18, 1997).

⁹⁰ The Marine Board of the National Research Council recommends consideration of “structural and piping designs that trap less sediment and are easier to clean” at the time of “construction or major alteration to existing vessels.” Marine Board, *supra*, Appendix D, p. 106. Insofar as *piping* is concerned, it is not clear why this would necessarily require a “major alteration.”

feasible for particular types of vessels and trades.⁹¹ None of them require invention of new technology. In the absence of a legal regime requiring such changes, however, there is little incentive for any shipping company to make the required investment.

Breaking ships in half. The pump-up and pump-down method of exchange, dictated by the piping systems on most existing vessels, creates some amount of unavoidable hull stress because of the change in buoyancy in one section of the vessel at a time. The degree to which this creates a safety problem varies with the general design of the ship, the strength of the structural members, the size of the ship, the length-to-breadth ratio, the age of the ship, its maintenance history, and other stresses which may be created by high seas or distribution of the weight of the cargo in the vessel. It is important to understand that hull stress is a chronic problem, particularly with older bulk carriers – related to age, maintenance, cargo loading, and sea conditions – regardless of whether or not those vessels are required to conduct ballast exchanges. Figures from the International Association of Classification Societies (IACS), which has expressed strong concern about hull stresses incurred by improper cargo loading practices, show that around the world from 1983 to 1997 there were 73 bulk carriers lost or written off due to structural failure, and another 40 suffering serious damage.⁹² We know that hull stress is a problem. What we do not know is how much, and under what specific circumstances, ballast exchange may contribute to that problem.

Some engineering analyses have been conducted on a small number of vessels in order to obtain a picture of the problem. That picture, unfortunately, is highly confused. The University of Michigan Department of Naval Architecture and Marine Engineering analyzed three sample ships – a dry bulk carrier, a tanker, and a containership – taken as typical of ships trading to US ports.⁹³ That study found that “ballasting/deballasting can be done at sea with safety as long as wave heights are below a maximum value. From [the] small sample of three ships it appears that this maximum lies between 10 and 20 feet.”⁹⁴ On the other hand, a similar study conducted by Melville Shipping for Transport Canada concluded that two sample vessels would not be able to safely conduct an exchange due to bending moment and sheer force limitations.⁹⁵ Both of the vessels used in the Melville study were larger than the upper physical limits of what can fit through the St. Lawrence Seaway. However, one of those vessels, a bulk carrier 225 meters in length and 32 meters in beam, was uncomfortably close to the Seaway limits of 226 meters by 24 meters. It has been generally assumed that

⁹¹ The technical literature on these treatment technologies is reviewed in M. Eric Reeves, “Techniques for the Protection of the Great Lakes from Infection by Exotic Organisms in Ballast Water,” in Frank M. D’Itri, *Zebra Mussels and Aquatic Nuisance Species* (Chelsea, MI: Ann Arbor Press, 1997), pp. 283-299. This does not mean that any one treatment technology is suitable for all types of vessels and trades.

⁹² International Association of Classification Societies, *Bulk Carriers: Handle with Care* (London: IACS, undated, circa 1998), p. 3.

⁹³ J.B. Woodward, M.G. Parsons, and A.W. Troesch, “Ship Operational and Safety Aspects of Ballast Water Exchange at Sea,” *Marine Technology* (October 1994), vol. 31, pp. 315-326.

⁹⁴ Woodward, Parsons, and Troesch, *supra*, pp. 315-326, 324.

⁹⁵ Melville Shipping, *Ballast Water Exchange Study: Phase I*, Transport Canada Contract T8080-4-6801 (Ottawa: Melville Shipping Ltd., March 1995).

hull stress is primarily a big boat problem, with the rule of thumb sometimes given as being that it is of concern with vessels of more than 40,000 deadweight tonnes (DWT).⁹⁶ A typical “handy sized” bulk carrier small enough to fit through the St. Lawrence Seaway might run anywhere from around 15,000 to 30,000 DWT. It was therefore assumed by many that hull stress from ballast exchange was not an issue for the Great Lakes.

A 1996 Canadian report warned that this might not be a good assumption, particularly for the smaller but narrower vessels entering the Great Lakes through the Seaway:

While the safety implications of ballast water exchange continue to be debated internationally the emphasis appears to be placed on larger ships, bulk carriers over forty thousand tonnes deadweight, which are too large to enter the Great Lakes. However, the bulk carriers built specifically for the lakes trade and designed to a length to breadth ratio of 10:1 have a history of structural cracking on North Atlantic passages. This condition could be further aggravated by the exchange of water ballast, particularly as these ships age, and change ownership and/or management.

The program [the voluntary Canadian ballast water exchange program beginning in 1990] has been in effect for seven years without serious incident, which would tend to indicate it can continue. However, over a period where the majority of entries have been in a loaded condition [NOBOB], it is easy to be lulled into a false sense of security.⁹⁷

Those words were prophetic. On January 16, 1998, the motor vessel *Flare* broke in half off Newfoundland while on its way in ballast from Rotterdam to Montreal.⁹⁸ There were 25 in the crew, of which 21 drowned and 4 were rescued. The *Flare* was a bulk carrier, 181 meters long and 23 meters wide (approximately 8:1 length to breadth ratio), of 29,222 DWT,⁹⁹ and built in 1972 (26 years old). The St. Lawrence Seaway was closed at that time and Montreal was the final destination, so the *Flare* was not subject to the US mandatory regulations, but it apparently conducted a pump-down pump-up ballast exchange in accordance with the 1990 voluntary Canadian guidelines. Seas were reported to be as high as 4 meters (13.2 feet) at the time of the hull failure. (The ship may have been manipulating ballast in a tank for another purpose. Unfortunately, it seems that any of the ship’s officers who could have explained exactly what was done did not survive.) The failure was

⁹⁶ Deadweight tonnes (DWT) is an expression of the overall carrying capacity of a vessel, commonly expressed in either metric tonnes, 1,000 kilos, or English long tons, 2,205 pounds, which are close enough to each other for general purposes, particularly as DWT is only an approximate expression of deadweight cargo carrying capacity (DWCC), which is really what is of interest to shippers. DWCC is always something just a little bit less, because of variable deductions for bunker (fuel), potable water, stores, etc. A metric tonne of mass is equal to 1.102 English short or net tons (2,000 pounds) and 0.98 English long or gross tons (2,240 pounds). Because water was used as the basic reference for mass standards in the metric system at one time, a “metric tonne” is also used as a rough expression for a cubic meter (m³) of water in volume.

⁹⁷ Aquatic Sciences, *Examination of Aquatic Nuisance Species Introductions to the Great Lakes through Commercial Shipping Ballast Water and Assessment of Control Options, Phase I & Phase II*, ASI Project E9225/E9285 (St. Catharines, ON: Aquatic Sciences, Inc., March and June 1996), Phase II, p. 12.

⁹⁸ Information on the *Flare* case from Transport Canada and Canadian Department of Fisheries and Oceans.

⁹⁹ Deadweight tonnes. See note 96, *supra*.

catastrophic in nature, occurring without any advance warning. The phrase “broke in half” is not a salty metaphor. There was, literally, only one half of the vessel on the surface of the ocean when Canadian rescue forces arrived.

At 26 years, this was a relatively old vessel, but not uniquely so. It was flagged under Cyprus, owned by a Greek company, and crewed with a mixture of nationalities. In 1993, it had been temporarily abandoned because of problems with shifting steel in the holds. The case is still under investigation by the Canadian Transport Safety Board and there are no conclusions about the cause of the hull failure at this time. In particular, it cannot yet be said whether or not a pump-down ballast exchange contributed to the hull failure. It can be said, however, that this is dramatic and tragic confirmation of the systemic problems discussed in the 1996 Canadian report.

The fundamental problem to be dealt with, as far as ballast exchange is concerned, is that this is something the ships, ballast tanks, pumps, and piping systems were simply not designed for.¹⁰⁰ In order to make exchange both safe and effective, there must be some changes in those systems.

The infamous NOBOBs. The “NOBOBs” are vessels entering the lakes reporting “no ballast on board” because they contain no pumpable ballast in their tanks, but which carry a considerable amount of unpumpable slop still in these tanks. (See the discussion of the trade pattern in §§ 110-112 above.) This is a gaping hole in the protection provided by our current regulatory regime, and is likely to be just as large a problem for any expansion of an exchange regime to the rest of the United States. Although the concept was suggested some time ago,¹⁰¹ little serious consideration has been given to the idea of requiring some sort of partial exchange, what is known informally as a “swish and spit,” to help clean the slop out of the bottom of the NOBOBs. The NOBOBs typically come across the ocean at or close to their marks (literally, the marks on the outside hull which designate the safe loading limits), with some cargo that is offloaded at Montreal or an earlier Canadian port in order to come up to the Seaway draft limits. They do come up a little along the voyage as they burn off fuel during transit, typically about ten days long. This may provide a few hundred metric tonnes of clearance, but only near the end of the transit. However, a ship would not necessarily have to forgo a great deal of cargo in order to add enough margin for a swish and spit, particularly when that is compared to the total cargo being carried.

Just for example, to provide a sense of the order of magnitude, a fairly typical “handy-sized” vessel capable of fitting through the Seaway and loaded to the marks during the ocean

¹⁰⁰ “Complete exchange of ballast water in mid-ocean as a regular practice in an operation that was not foreseen, nor designed for in any exiting ships.” Alex Bilney, International Chamber of Shipping, US Coast Guard NPRM Docket USCG-98-3423, Comment #54 (August 6, 1998), p. 2.

¹⁰¹ A. Locke, D.M. Reid, W.G. Sprules, J.T. Carlton, and H.C. van Leeuwen, *Effectiveness of Mid-Ocean Exchange in Controlling Freshwater and Coastal Zooplankton in Ballast Water*, Fisheries and Aquatic Sciences Report 1822 (Burlington, ON: Great Lakes Laboratory, 1991), p. 43.

transit might carry around 20,000 metric tonnes of cargo (in weight, not volume, because it is likely to be heavy high-value cargo on the west-bound leg from Europe to the Great Lakes). If it needs to free up 300 metric tonnes of weight in order to take on about twice the volume of the average amount of slop (157 mt) for each cycle of a swish and spit (with no limit on the number of cycles which can be conducted) that is only 1.5% of the cargo which needs to be left behind in Europe in order to protect the Great Lakes. (If the ship is larger or smaller, the amount of slop to be washed out is likely to be correspondingly larger or smaller.) Some shippers will immediately protest that a 1.5% loss of cargo is enough to wipe out their profit margin. And they may be telling the truth. World shipping is an extremely competitive business run on very tight margins. But that argument has no validity if all shippers must comply with the same requirements. Moreover, if there were a commercial premium to be paid for running with sloppy tanks, it is likely that operators would find ways to significantly reduce the amount of slop they carried. There are also possibilities for some sort of interim treatment of the slop and sediment in NOBOBs – during the decades or so during which it may take to force changes in piping design – by either heat or chemicals. Heating the water is relatively expensive, and so is the use of environmentally acceptable chemicals. Both of these treatment options are unlikely to be feasible for water in full tanks on the order of tens of thousands of metric tonnes. But it might well be practical to thermally or chemically treat the small amount of slop, in the order of a couple hundred metric tonnes or so, in the bottom of a NOBOB tank.¹⁰²

¹⁰² Chemical biocides are extremely controversial, primarily out of concern for the environmental side-effects. Biocides also tend to raise concerns about crew safety and corrosion, and tend to be expensive as well. But the devil is in the details, and there is in fact a good argument for *limited* use of certain types of biocides. Some chemicals which do not produce persistent toxic byproducts may provide an environmentally sound, safe, and cost-effective interim measure to deal with the relatively small quantities of slop in the bottom of the NOBOBs during the next twenty to thirty years of the lives of the existing vessels. Without collateral cost to the environment, we might use biocides to plug the gaping hole in our existing regulatory regime during the years needed to embed other options in new construction and thereby prevent the irreversible damage done by new invasions through this temporary measure. We have no prospect of ever removing the lamprey eel from the Great Lakes. Because of that irreversible invasion, we are committed to the use of a toxic chemical (3-trifluoromethyl-4-nitrophenol, or TFM) needed to control the lamprey for the foreseeable future of the lakes. Similarly, various biocides have been resorted to for the control of the zebra mussel in water intakes. Chlorine (in the form of sodium hypochlorite and chlorine dioxide), potassium permanganate (KMnO₄), TD 2335 (an aquatic pesticide not precisely described), Penaten[®] (an anti-foulant containing petroleum jelly, lanolin, zinc oxide, talc, petroleum distillates with pantethenol, sorbitan sesquioleate, cetylpyridinium chloride, etc.), and other coatings are reported to be in various degrees of use for zebra mussel control. See articles on zebra mussel control measures in Frank M. D'Itri, ed., *Zebra Mussels and Aquatic Nuisance Species* (Chelsea, MI: Ann Arbor Press, 1997).

Given that reality, it would be irrational to shy away from the temporary use of carefully selected biocides in quantities of slop in the bottom of NOBOB tanks which are orders of magnitude less than the quantities of water in the rivers and water systems currently treated for lampreys and zebra mussels. The Marine Board of the US National Science Foundation recently suggested consideration of some specific nonoxidizing biocides such as glutaraldehyde (C₅H₈O₂), which “generally decay fairly rapidly into nontoxic byproducts.” Marine Board, *Stemming the Tide: Controlling Introductions of Nonindigenous Species by Ships' Ballast Water* (Washington, DC: National Academy Press, 1996), p. 66. Glutaraldehyde is currently being explored in a project sponsored by the Michigan Office of the Great Lakes and the University of Michigan. The conclusions of their detailed evaluation are that it could well be an environmentally sound, safe, effective,

The effectiveness of exchange. Although Canada has not yet promulgated mandatory regulations for protection of the Great Lakes, it was actually Canadian work which laid the foundation for the United States regime currently in place on the Great Lakes. A study conducted for the Canadian Government¹⁰³ confirmed the feasibility and relative effectiveness of mid-ocean exchange as a control measure for vessels entering the St. Lawrence Seaway, but warned that it was far from completely effective. Based on a sampling of 12 vessels following the voluntary Canadian guidelines for exchange, the Canadian Government found that:

Although the absence of live freshwater zooplankton from most saltwater ballast samples indicated ballast exchange to be very useful, their presence in a few cases indicates exchange to be less than 100 percent effective. We calculated effectiveness of ballast exchange using ships originating in foreign freshwater ports and exchanging ballast water in mid-ocean.... Four vessels (33%) carried zooplankton that could live in the Great Lakes. Thus effectiveness of ballast water exchange was 67 percent.¹⁰⁴

The Australians have found exchange to be less effective on the larger vessels calling at their ports, especially for removal of the dinoflagellate cysts which are of great concern to them. Some of their tests “showed that among 32 vessels which explicitly claimed to have exchanged ballast water in mid ocean, 14 were still found to contain significant amounts of sediments, including dinoflagellate cysts.”¹⁰⁵ In other words, to make the same calculation, although the basis is not exactly the same, the effectiveness on these larger vessels is 56%. A follow-up study on vessels entering the Great Lakes conducted by the Canadians in 1996 confirmed that a large range of invertebrates and bacteria are carried in both exchanged water and NOBOB slop.¹⁰⁶ They did not test for viruses, but it certainly can be presumed

and practical means for treating ballast in the relatively low quantities found on NOBOBs on the Great Lakes for a cost ranging between \$40 and \$1,400 per application depending on the concentration needed and the volume of slop and sediment in a particular NOBOB. Larissa M. Lubomudrov, Russell A. Moll, and Michael G. Parsons, *An Evaluation of the Feasibility and Efficacy of Biocide Application in Controlling the Release of Nonindigenous Aquatic Species from Ballast Water* (Ann Arbor, MI: University of Michigan, November 1997).

¹⁰³ A. Locke, D.M. Reid, W.G. Sprules, J.T. Carlton, and H.C. van Leeuwen, *Effectiveness of Mid-Ocean Exchange in Controlling Freshwater and Coastal Zooplankton in Ballast Water*, Fisheries and Aquatic Sciences report 1822 (Burlington, ON: Great Lakes Laboratory, 1991).

¹⁰⁴ Locke, *et al.*, *supra*, p. 34.

¹⁰⁵ G.R. Rigby, I.G. Steverson, C.J. Bolch, and G.M. Hallegraeff, “The Transfer and Treatment of Shipping Ballast Water to Reduce the Dispersal of Toxic Marine Dinoflagellates,” *Toxic Phytoplankton Blooms in the Sea* (Amsterdam: Elsevier, 1993), pp. 169-176, 173.

¹⁰⁶ Aquatic Sciences, *Examination of Aquatic Nuisance Species Introductions to the Great Lakes through Commercial Shipping Ballast Water and Assessment of Control Options, Phase I & Phase II*, ASI Project E9225/E9285 (St. Catharines, ON: Aquatic Sciences, Inc., March and June 1996), Phase I. The organisms included Mollusca (mussels), Bivalvia (mussels), Rotifera, Copepoda, Cladocera (water fleas), Diptera (flies), Oligochaeta (worms), Polychaeta (worms), Nematoda (worms), *E. coli*, *V. alginoliticus*, *V. fluvialis*, *A. hydrophila*, *Pseudomonas sp.*, *Providencia rettgeri*, *Ps. Aeruginosa*, *A. sobria*, and *A. caviae*. *V. cholerae* was initially identified, but it was later reclassified as a “closely related species of *Aeromonas*.” “The anti-serum originally used to type the bacteria was thought to have had some cross reactivity. Samples sent to Health Canada’s

that a wide range of those are also contained in the water.

The problem with salinity. This confirmation of the limited effectiveness of the current exchange regime is not surprising when we consider the nature of the current regulatory regime. The current regulations¹⁰⁷ are framed in terms of a salinity standard of 30 parts per thousand (ppt). There are two problems with this standard: (a) If the vessel begins with completely fresh water in the tank and we assume an open ocean salinity of 35.3 ppt, this requires an exchange of only 84.98% of the water by volume. (b) In fact, many if not most vessels begin with salty or brackish water before beginning an exchange, and the 30 ppt standard therefore guarantees much less than the nominal 84.98% exchange. A significant number of vessels coming into the lakes with ballast which pass the regulatory standard have salinities which are too *high*, thus indicating that they begin with highly saline water before conducting an inadequate exchange.¹⁰⁸ Given the fact that a large amount of the North American grain shipped out of the Great Lakes is offloaded in Mediterranean ports, this probably reflects a significant amount of Mediterranean water left in the tank – some of which becomes even more saline through evaporation in the tank.

If the purpose of the regulatory requirement were to salt up the tanks, this would be fine. But that was never the main purpose, and no one has ever provided evidence that treating water with salt in the range of 40 ppt or less is a meaningful biocide for a wide range of freshwater organisms. The purpose of the regulatory requirement was to guarantee a reasonably good exchange in the mid-ocean ecological barrier. It is obviously not effective at doing so. At this time, in response to that defect in the design of the regulatory system, the US Coast Guard is (a) researching the feasibility of other chemical or biological indicators, in addition to salinity, which would better identify the origin of water in the tanks, and (b) considering changing the regulations to require a 90% exchange by volume

Laboratory Centre for Disease Control (LCDC) in Ottawa continued to show positive for *V. cholerae* 01 using the original anti-serum but were determined to be negative using LCDC's anti-serum which has been purified to prevent this type of cross reactivity. The isolates in question were ultimately determined to be *Aeromonas sobria* and *Aeromonas caviae*, which are also pathogenic but considered to be more cosmopolitan in nature and therefore considered less significant." *Ibid.*, pp. 20-21.

¹⁰⁷ 33 CFR § 151.1510(a)(1).

¹⁰⁸ Based on an analysis of the salinity readings from 59 vessels entering the Great Lakes with ballast in 1997 (a majority of the vessels entering with ballast during that year), conducted by the researcher when serving as the senior officer administering the program on the staff of the Ninth US Coast Guard District. Because individual tanks on a vessel can vary significantly, the data were analyzed in terms of total high tank and total low tank readings, all of which came from the same set of vessels. The largest number of low tank readings (a mode of 15) fell right on the regulatory minimum of 30 ppt. The largest number of high tank readings (a mode of 13) fell on 36 ppt, and the mean of those high tank readings fell on 35.65 ppt, very close to the mid-Atlantic average of 35.3 ppt. (It is probably more meaningful to speak in terms of a mid-Atlantic range, which is about 35 to 37, except that ice melt from the Arctic can lower the salinity on North Atlantic water near the Canadian-Greenland gap to the range of 34 ppt.) However, a number of tanks came in with remarkably high readings, including 4 low tanks and 6 high tanks that came in at 40 ppt, above the highest levels to be expected anywhere in the Atlantic, or even the eastern Mediterranean.

instead of a given level of salinity.¹⁰⁹

§ 213. Revision of the Great Lakes regulations and nationwide guidelines under NISA 96

The National Invasive Species Act of 1996 (NISA 96)¹¹⁰ mandates a nationwide regime which is generally modeled after the regime in the Great Lakes under the Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990 (NANPCA 90),¹¹¹ but with some variations which significantly weaken it. The legislation was passed in the closing days of the 104th Congress in October of 1996 by unanimous consent motions in both houses, with very little debate or discussion, after last-minute amendments were negotiated off the record to satisfy the objections of the shipping industry.¹¹² Although there was a large number of cosponsors for the legislation and unanimity in the votes, this broad agreement was obtained only because (a) the legislation, as originally drafted, was designed to move the nation only slowly and tentatively towards a nationwide regulatory regime, and (b) the last-minute amendments obtained by the shipping industry, particularly a sweeping safety exemption, effectively eviscerated the ability of the US Coast Guard to develop a meaningful regime. Both those issues are discussed below.

A mandate for delay. NANPCA 90 directed the US Coast Guard to put out voluntary guidelines six months after enactment, to be followed by mandatory regulations two years after enactment on November 29, 1990.¹¹³ The Coast Guard was able to almost meet that

¹⁰⁹ Notice of proposed rulemaking at 63 *Federal Register* 17782 (April 10, 1998). See § 213 below.

¹¹⁰ National Invasive Species Act of 1996, US Public Law 104-332 (October 26, 1996), making amendments to the Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990, US Public Law 101-646 (November 29, 1990), codified at 16 USC §§ 4701 *et seq.* “NISA” is used here as the popular name for the amended act. “NISA 96” refers to the specific changes, mandating a national regulatory regime, in 1996.

¹¹¹ Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990, US Public Law 101-646 (November 29, 1990), codified at 16 USC §§ 4701 *et seq.* “NANPCA 96” is used here to refer to the statute before the 1996 amendments in NISA 96.

¹¹² The final bill was HR 4283, substituting for similar bills introduced as HR 3217 (Congressman LaTourette of Ohio, Republican) and S 1660 (Senator Glenn of Ohio, Democrat), both of which had numerous co-sponsors from both parties, with amendments by the managers on the floor of the House (therefore never discussed in either hearings or committee reports) before final passage. The first version voted on, as HR 3217, which had already been amended to meet objections in the Senate, was passed in the House of Representatives by unanimous consent at 142 *Congressional Record* H10918-H10927 on September 24, 1996. The Senate objections, mainly objections from the shipping industry, were not satisfied. Without consideration in the Senate, it was brought back to the floor of the House as HR 4283, with further amendment, and passed by unanimous consent at 142 *Congressional Record* H12147-12152 on September 28, 1996. In that version it was brought to the Senate and passed by unanimous consent at 142 *Congressional Record* S12398-12401 on October 3, 1996. It was signed by the President on October 26, 1996. Comments from the American Maritime Congress on the proposed nationwide guidelines relate the effects of industry lobbying to have the special safety exemption inserted at the last minute. Gloria Cataneo Tosi, American Maritime Congress, US Coast Guard NPRM Docket USCG-98-3423, Comment #57 (August 7, 1998), p. 5 of document, p. 3 of AMC enclosure.

¹¹³ 16 USC § 4711(a)-(b).

direction with regulations issued on April 8, 1993.¹¹⁴ NISA 96 now directs the Coast Guard to put out national voluntary guidelines within one year after enactment on October 26, 1996,¹¹⁵ and to follow that up with national mandatory regulations,¹¹⁶ if the guidelines are found to be inadequate after a review to be conducted not less than three years after issuance of the guidelines,¹¹⁷ and *after* a report to that effect to Congress.¹¹⁸ NISA 96 also directs the federal Aquatic Nuisance Species Task Force (ANS Task Force) to develop criteria for the Coast Guard to use in determining the effectiveness of the voluntary guidelines.¹¹⁹

All of these requirements may seem like minor points of administrative process. However, especially given the controversy which has already arisen over the proposed national guidelines, they are in fact prescriptions for significant delay before any national mandatory regulations go into effect. This was very much part of the original compromise built into the legislation. The primary sponsor of the legislation in the House of Representatives was Congressman Steve LaTourette.¹²⁰ He explained the overall design of the legislation on the floor of the House:

This balanced, moderate approach has broad bipartisan support. There are now 40 cosponsors for this legislation. There are some interests who want an enforceable regulatory program immediately while there are others who only want voluntary guidelines with no possibility of mandatory regulations. The bill chose to take the middle path, the compromise approach of requiring mandatory regulations only if they are necessary.¹²¹

The US Coast Guard has been directed to navigate a political course somewhere between the rock of industry opposition to any requirements for changes in ship design and the whirlpool of vacuous guidelines which will invite new invasions of exotics. This is not a course which the Coast Guard (or any other federal agency) can be expected to sail with any confidence or speed. It was not until April 10, 1998, six months after guidelines were to go into effect, that the Coast Guard put out proposed guidelines.¹²² On June 16, 1998, in response to several requests from the shipping industry (along with strong objections to the

¹¹⁴ 58 *Federal Register* 18334 (April 8, 1993), adding 33 CFR Part 151, Subpart C, §§ 151.1500 *et seq*

¹¹⁵ 16 USC § 4711(c)(1). All of the Congressional directions in the act are to “the Secretary of the department in which the Coast Guard is operating,” a customary technicality which is understood to mean that the Coast Guard is the agency responsible for implementing them (just as the Canadian Parliament’s authorization for regulations to be issued by the “Governor in council” is taken to mean the cabinet and responsible ministries).

¹¹⁶ 16 USC § 4711(f)(1).

¹¹⁷ 16 USC § 4711(f)(1) and (e)(1).

¹¹⁸ 16 USC § 4711(f)(1) and (2)(A).

¹¹⁹ 16 USC § 4711(e)(3).

¹²⁰ He is a conservative Republican from a relatively diverse district on Lake Erie near Cleveland, Ohio, which has been noticeably impacted by the zebra mussel. He is one of the many conservative Republicans in the Midwest United States who are distinctly progressive when it comes to protecting the resources of the Great Lakes.

¹²¹ 142 *Congressional Record* H10925 (September 24, 1996).

¹²² 63 *Federal Register* 17782 (April 10, 1998).

guidelines) the Coast Guard extended the comment period on the proposed guidelines until August 8, 1998.¹²³ As of March 1999, the Coast Guard has still not issued the guidelines, and they are not expected to be out until June 1999.¹²⁴ However they come out, it may be expected that there will be considerable delay, as well as political difficulty, in conducting the evaluation of the program, obtaining the statutorily required guidance from the ANS Task Force, framing a politically defensible report to Congress, overseeing the necessary research projects, and developing actual nationwide regulations. It is worse than that, in fact, because meaningful regulations cannot be written without returning to Congress for new statutory authority. As explained below, the special safety exemption obtained by industry at the last minute from the Senate has made any such regulations unenforceable.

A shell game over "safety." The provisions on the Great Lakes regime and the US nationwide regime in NISA (each regime is separately laid out in the current version of the statute) are just enough alike to be misleading. Both say, basically, (a) exchange your water, (b) if you can do so safely, or (c) develop some sort of alternative means for managing the problem. But there are subtle differences in the way those propositions are stated for the two regimes, an important difference between the two safety exemptions, and a critical difference between how the safety exemption relates to the development of alternative management. This calls for a detailed parsing of the language of the statute. In the following, except where otherwise noted, the subsections discussed are subsections of 16 USC § 4711 in NISA as currently enacted.

To begin with, although there is an analogous transition from guidelines to regulations in each regime, the structure is different. The provisions on the Great Lakes regime laid out in Subsections (a) and (b) of § 4711 mandate guidelines in brief and general terms, and then provide detailed requirements for what should be contained in the subsequent regulations. The provisions on the national regime in Subsections (c) and (f) of § 4711 provide separate detailed requirements for what should be contained in the national guidelines, and then mandate regulations in brief and general terms, along with a provision at (f)(3) which allows for general revision of the regulations in accordance with any "international agreement." This opens up the valuable possibility that future nationwide regulations could be much more flexible and creative than either the Great Lakes regulations or the nationwide guidelines. But that possibility is still limited by the special safety exemption.

To be clear, there is no question but that there must be a safety exemption in some form. No one argues that breaking ships in half is an acceptable way to prevent exotic invasions. The questions are (a) who decides that the use of the exemption is valid, and (b) what happens then, after it is determined that a certain vessel cannot safely exchange? The views of the shipping industry on this issue are clearly articulated in formal comments submitted to the Coast Guard on the proposed national guidelines, which presumably reflect many of the points raised during lobbying done off the record with the Senate. They argue (a) that it

¹²³ 63 *Federal Register* 32780 (June 16, 1998).

¹²⁴ Discussions with Coast Guard staff in Cleveland.

ought to be the unquestionable decision of the master of the vessel, and (b) after that, once it becomes obvious that particular vessels or fleets cannot conduct safe exchanges, the industry has absolutely no further obligation to do anything. That comes through quite clearly in the comments on the proposed national guidelines. A comment by the International Chamber of Shipping begins as follows with the inarguable proposition that safety must come first:

...there should be much greater emphasis on the need for the absolute acceptance of the mater's decision on whether to commence the process, suspend operations when in progress, or abandon the process, if he feels that safety is or may be jeopardized, that machinery is in doubt, or crew fatigue demands it.¹²⁵

Accordingly, the International Chamber of Shipping urges the adoption of a clause in the regulation which specifies that the mater "retains absolute discretion"¹²⁶ to forgo any exchange, subject to no requirement of evidence of reasonableness or review by the Coast Guard. Even more, the Chamber argues than any requirement to exchange in an alternate site will be dangerous:

In the very early stages of discussion at IMO [the International Maritime Organization].... It was recognized that if a master knew that there was a requirement for alternative procedures and subsequent delay by diversion into a designated area or the need to discharge ballast elsewhere than the loading berth, this may create the commercial pressures that will lead to him taking a chance in mid-ocean when conditions are marginal. The tighter a bad weather schedule is, the more likely such a risk will be run.¹²⁷

The vessel must not ever be delayed, for fear that the master will break it in half in order to avoid that delay. Why? Who sets the parameters for how close to the edge the master operates in order to avoid the cost of delay? In this manner, an otherwise legitimate concern for safety is used to negate any responsibility for the environment, using the lives of the crew as hostage.

The American Maritime Congress also urges recognition of the "absolute discretion" of the master, although in slightly more reasonable terms leaving some possible opening for a "good faith" test,¹²⁸ and then adds a critical point about the overall evolution of the regime:

¹²⁵ Alex Bilney, International Chamber of Shipping, US Coast Guard NPRM Docket USCG-98-3423, Comment #54 (August 6, 1998), p. 2.

¹²⁶ Bilney, *supra*, p. 2.

¹²⁷ Bilney, *supra*, p. 3.

¹²⁸ Gloria Cataneo Tosi, American Maritime Congress, US Coast Guard NPRM Docket USCG-98-3423, Comment #57 (August 7, 1998), pp. 4-5 of document, pp. 2-3 of AMC enclosure. Similarly, the Chamber of Shipping of America argues that the master's decision "if made in good faith, should be absolute and not subject to challenge by the port state authorities," but goes on to say, "The Chamber, however, recognizes the need for some objective criteria which provides guidance to the US Coast Guard and the regulated community as to what constitutes a 'good faith' decision...." Kathy J. Metcalf, Chamber of Shipping of America, US Coast Guard NPRM Docket USCG-98-3423, Comment #60 (August 6, 1998), p. 3.

And additionally, any record of compliance or non-compliance must take into account the design of the vessel. For certain vessels, it is inherently unsafe to accomplish ballast water exchange when underway on the high seas – as it may also be for any vessel under certain sea and weather conditions. Neither the master of these vessels nor the owner/operators should be penalized or given a “black mark” for non-compliance for safety reasons, or, in essence, for failing to be able to put a square peg in a round hole.¹²⁹

No vessel, nor its owner, is to be singled out for notice on account of the fact that it is incapable of running a clean operation. Although not explicitly stated, the obvious concern is that the Coast Guard or the Congress will then begin to require the necessary design changes for making the fleets able to run clean.

Throughout the many comments from these and other industry groups, the theme of “safety first” is strongly and consistently articulated. That is a theme which resonates deeply with the ethic of the Coast Guard. What is not usually so clearly articulated is that, in fact, “safety” is a euphemism for “commercial convenience.” It is as if the owners of the oil tankers announced that they should not be expected to clean up their spills because, after all, it is highly dangerous for untrained merchant seamen to go mucking about in an oil slick without specialized equipment and training in occupational health safeguards. That is certainly true. But it was one of the purposes of the Clean Water Act and OPA 90 that they should be required to develop or contract for competent and safe response capability. The marine industry is no doubt just as acutely aware of this obvious analogue as anyone in the environmental community, and it is for that reason that they also object to the characterization of biological spills in ballast water as “pollution.”¹³⁰

Unfortunately, the maritime industry succeed in obtaining a poorly considered exemption for “safety” which enacted a significant portion of their demands. This occurred during the last minute action at the end of the 104th Congress as NISA 96 came up for a second try in the House, rewritten to satisfy the Senate.¹³¹ In order to clearly understand what happened during this complex political maneuvering, it is best to take it from the beginning and work through the chronology.

What we began with was the Great Lakes regime under NANPCA 90, which contained

¹²⁹ Gloria Cataneo Tosi, *supra*, p. 7 of document, p. 5 of AMC enclosure.

¹³⁰ The International Chamber of Shipping argues that “the emotive word ‘pollution’ should not be used.” Bilney, *supra*, p. 4. The comment from the German Federation of Shipowners starts by arguing about the philosophical concept. “In the sense of the term ‘pollution’ the matter is not really pollution. Spread of aquatic nuisance species is a naturally occurring phenomenon. Marine creatures are free to move around the globe anyway, and nature will always create checks and balances in the medium and long term.” German Federation of Shipowners (*Verband Deutscher Reeder*), US Coast Guard NPRM Docket USCG-98-3423, Comment #33 (June 12, 1998), p. 3. The German Federation of Shipowners goes on, however, to say that an exchange of “90% can surely be accepted as a practical target.” *Ibid*.

¹³¹ In the House at 142 *Congressional Record* H10918-H10927, re HR 3217 (September 24, 1996) and 142 *Congressional Record* H12147-12152, re HR 4283 (September 28, 1996). In the Senate at 142 *Congressional Record* S12398-12401, re HR 4283 (October 3, 1996).

its own provisions designed to insure safety. Subsection (b) of § 4711, originally enacted under NANPCA 90, directed the Coast Guard to insure that the regulations “(F) protect the safety of– (i) each vessel; and (ii) the crew and passengers...and (G) take into consideration operating conditions...” But that provision did not trump another provision in the same subsection, § 4711(b)(2), which authorized the Coast Guard to require an exchange in “other waters,” inside the usual 200-mile limit of the exclusive economic zone, when safety permitted, or to require some environmentally sound method of alternate treatment to be used. Following that statutory guidance, the Coast Guard promulgated a provision in the Great Lakes regulations giving the master appropriate alternatives:

The master of any vessel subject to this subpart [the Great Lakes regulations in 33 CFR Part 151, Subpart C] who, due to weather, equipment failure, or other extraordinary conditions, is unable to effect a ballast water exchange before entering the EEZ [200-mile zone], must employ another method of ballast water management...or request from the COTP [the Coast Guard Captain of the Port in Buffalo] permission to exchange the vessel’s ballast water within an area agree to by the COTP at the time of the request and must discharge the vessel’s ballast water within that designated area.¹³²

The designated area was left open to negotiation, but as a matter of administrative practice it has been understood that a request to use the Gulf of St. Lawrence west of the 63° west line of longitude would be approved. The Coast Guard has also been attempting to obtain advice from the scientific community on other appropriate sites which might be available in more sheltered waters along the Northeast Coast of the United States. In many cases, the vessel operators and the Coast Guard agreed upon an alternate treatment method, on a case by case basis, as an alternative to use of the alternate exchange site. That was not because the vessels in those cases could not have safely exchanged in the Gulf of St. Lawrence or in the open Atlantic. It was simply because they were already well up into the St. Lawrence Seaway when problems with their original exchange were detected in boardings and they had no wish to turn around.

In other words, as became clear in the actual implementation of the regime by the Coast Guard in the Great Lakes, the Coast Guard would never force a master to conduct an exchange which the master felt was unsafe, but that did not give the vessel a free pass to dump the dirty water in the Great Lakes. They were instructed to inform the operational command at the Buffalo Marine Safety Office and some alternative was agreed to. It was an agreement under compulsion, to be sure, because the Coast Guard would not allow a vessel to discharge ballast and take on cargo otherwise. But it was very much a matter of polite negotiation over what options were reasonable, in which industry always had the option of appealing up the chain of command to Washington, DC. The alternative was either an exchange in the more sheltered waters of the Gulf of St. Lawrence, or a specially authorized alternative treatment on a case by case basis, before the vessel was cleared to

¹³² 33 CFR § 151.1514.

enter and discharge.¹³³

That authority remains in place for the Great Lakes. But the safety exemption now applicable to any nationwide regulations is very different. How different, unfortunately, is made clear by the comparison between the two provisions appearing in NISA 96 when it was passed twice by the House of Representatives. When it came up the first time on September 24, 1996, it contained the following provision, at Subsection (k) of § 4711, set forth as a special statutory safety exemption rather than as a consideration for the Coast Guard in framing the regulations:

(k) Safety exemption

(1) Master discretion

The master of a vessel is not required to conduct a ballast water exchange if the master decides that the exchange would threaten the safety or stability of the vessel, its crew, or its passengers because of adverse weather, vessel architectural design, equipment failure, or any other extraordinary conditions.

(2) Other requirements

A vessel that does not exchange ballast water on the high seas under paragraph (1) shall not be restricted from discharging ballast water in any harbor unless the Secretary [the Coast Guard] issues requirements applicable to such vessel under subsections (b)(2)(B)(ii), (b)(2)(B)(iii), (c)(2)(D)(ii), or (c)(2)(iii).¹³⁴

The subsections cross-referenced are the provisions mandating the Great Lakes regulations and the national guidelines which authorize the Coast Guard to require use of

¹³³ This researcher personally participated in the resolution of most of those cases, in consultation with the operational commander. The results of some of these “problem vessel” cases are reported in M. Eric Reeves, “Techniques for the Protection of the Great Lakes from Infection by Exotic Organisms in Ballast Water,” in Frank M. D’Itri, *Zebra Mussels and Aquatic Nuisance Species* (Chelsea, MI: Ann Arbor Press, 1997), pp. 283-299, 288-289, Table 1, notes a-e. One vessel, early on before his tenure, was allowed to salt up the tanks. That was quickly declared to be an insufficient treatment option for any future case. Two other vessels chlorinated their tanks, subject to approval of the local authorities, in Canada, where they discharged the residual water. One vessel, a chemical carrier, had the fairly unusual capacity to shift the water to a heated cargo tank and pasteurize it. One vessel which had chosen its own alternate exchange site without prior approval was allowed to proceed after biological testing confirmed the effectiveness of that exchange. And one vessel was forbidden to discharge, subject to a threat of criminal prosecution brought personally home to the master by a joint boarding of Canadian and US marine safety officers in Canadian territory, backed up by a US attorney in New York ready and willing to indict if the vessel failed the outgoing inspection. (The Canadians also levied a criminal fine against them for having filed a false report on their exchange during entry into the Gulf of St. Lawrence.) These cases illustrate both the seriousness of the Coast Guard’s effort to enforce the regime and the creativity with which individual cases were worked out in negotiations with the industry. It may, however, have succeeded too well in convincing the industry they were going to dislike an expansion of the Great Lakes regime to the United States as a whole.

¹³⁴ 142 *Congressional Record* H10920 (September 24, 1996).

alternate exchange sites or alternate management methods. Thus, this provision would have authorized the same procedure already used in the Great Lakes for the nationwide regime. In case there was any doubt about that intent, Congressman Boehlert from Tennessee commented on the floor that “This language codifies the existing exemption found in the Great Lakes regulations.... We note that the bill authorizes the Secretary [the Coast Guard] to identify other methods of managing ballast water or other locations for ballast water exchange. If safe and available, a vessel may be required, by regulation, following notice and opportunity for comment, to conduct such other ballast water management practices as are identified by the Secretary [Coast Guard]....”¹³⁵

This, however, was not the sort of safety exemption that industry wanted. The Senate declined to act on the legislation until the House of Representatives brought it back to the floor on September 28, 1998, with what is now the version of the special safety exemption in NISA 96. Paragraph (k)(1) was not changed. The insidious change appeared as Subparagraph (k)(2)(A):

(k) Safety exemption

(1) Master discretion

The master of a vessel is not required to conduct a ballast water exchange if the master decides that the exchange would threaten the safety or stability of the vessel, its crew, or its passengers because of adverse weather, vessel architectural design, equipment failure, or any other extraordinary conditions.

(2) Other requirements

(A) In general

Except as provided in subparagraph (B), a vessel that does not exchange ballast water on the high seas under paragraph (1) shall not be restricted from discharging ballast water in any harbor.

(B) Great Lakes

Subparagraph (A) shall not apply in a case in which a vessel is subject to the regulations issued by the Secretary under subsection (b) of this section [authorizing the regulations for the Great Lakes].¹³⁶

Subparagraph (A) gives the vessel a free pass to dump the dirty water under any national regulations. Subparagraph (B), fortunately, preserves the terms of the existing exemption and alternative procedures for the Great Lakes. The clear intent of

¹³⁵ 142 *Congressional Record* H10923-H10924 (September 24, 1996).

¹³⁶ 142 *Congressional Record* H12149 (September 28, 1996), and as codified at 16 USC § 4711(k).

Subparagraph (A), unfortunately, is highlighted by the contrast with both the previous version rejected by the Senate and the contrast with the provision in Subparagraph (B).

Although the members of the House interested in this legislation spoke in oblique terms about the “limited amendments requested by the other body,”¹³⁷ some of them did realize that a lot had been given away to industry. Congressman LaTourette noted that “Many concerns were raised about the potential impact of the Senate amendments.”¹³⁸ Congressman Oberstar¹³⁹ noted that “this bill contains certain exemptions which concern me. I intend to further examine these provisions and their impacts when we return this year.”¹⁴⁰ That offers hope that there may in fact be time to fix this fatal defect between now and three years hence when the Coast Guard begins to propose national regulations. But it would be a strategic mistake of the highest order to wait until after those regulations are promulgated, more than three years from now, and then litigate the effect of this exemption. That battle, won by industry in the Congress, cannot be reversed by the Coast Guard or the courts. It must be fought again in the Congress.

Aside from a general interest in preserving the biodiversity of the nation and the planet, what difference does this defect in the national regime make to resource managers and environmental groups working to protect the Great Lakes? A great deal. Even though there is legal authority to force retrofitting design changes on the vessels entering the Great Lakes through the Seaway, it will remain a political impossibility to do so as long as any such action discriminates against the Seaway trade. The costs, small as they may be, must be equal among all the ships sailing to different ports of the United States.

A 90% solution. Because of the defects in the salinity standard discussed above, the Coast Guard has proposed to replace that, in both the Great Lakes regulations and the nationwide guidelines, with a performance standard in which salinity would simply be evidence, among other things, that an adequate exchange has taken place. And in place of a nominal exchange of 85% under the old 30 ppt salinity standard, the Coast Guard has proposed that it should be set, for the present time, at 90% of volume. The Coast Guard calls this a “reasonably complete exchange,” given the current limitations in vessel designs, while emphasizing that a 100% removal or treatment of the water is the ultimate goal.¹⁴¹

¹³⁷ Congressman Oberstar, 142 *Congressional Record* H12146 (September 28, 1996).

¹³⁸ 142 *Congressional Record* H12146 (September 28, 1996).

¹³⁹ Democrat from 8th District of Minnesota, and ranking minority member on the House Transportation and Infrastructure Committee which oversees the Coast Guard. The 8th District center on Duluth, which is the largest port on the Great Lakes.

¹⁴⁰ 142 *Congressional Record* H12146 (September 28, 1996).

¹⁴¹ 63 *Federal Register* 17782 (April 10, 1998), NPRM to amend 33 CFR Part 151. See preamble discussion at 63 *Federal Register* 17785, definition at 17789 and proposed 33 CFR 151.1504, and substantive requirement, with evidentiary presumptions, at 17789 and proposed 33 CFR 151.1508(a)(1). By inventing this term of art, the Coast Guard is incurring the risk of having created an analogue to the infamous “best practicable control technology currently available (BPT)” and “best available technology economically achievable (BAT)” under the Clean Water Act. This researcher pleads guilty to being the one who did it.

Judging from the equally vehement comments from both sides – from the industry groups protesting that 90% is unreasonable, and from the environmental groups protesting that anything less than at least 95% is inadequate – it appears that the Coast Guard has struck just the sort of middle-ground compromise typical and appropriate for a government agency trying to balance environmental protection against economic cost.¹⁴² In fact, given the fallacies of the salinity standard, the simple fact that the Coast Guard is considering moving to a performance standard – and provoking a national debate about how much is enough – is probably much more important than whether the current standard is set at 85%, 90%, or 95%.

§ 214. Regulation of ballast under the Canadian Shipping Act

The Canadian Parliament has just enacted an amendment to the Shipping Act, roughly the equivalent of the US Clean Water Act with regard to pollution from shipping sources, providing in full that “The Governor in Council may make regulations respecting the control and management of ballast water.”¹⁴³ That one sentence is the entire enactment on ballast water. That is the Canadian equivalent to the 53 pages of NISA 96 printed in bill form and the 19 sections of law making up NISA as currently codified in the US Code.¹⁴⁴

The exact language of that one sentence is of great importance. It was originally drafted to authorize regulations requiring the “exchange” of ballast water. That would have made it much more like NISA 96, which relies on exchange as the only available tool for control of ballast water. But careful study of the defects in NANPCA 90, and the loss of the *Flare* off the coast of Canada after apparently conducting a ballast exchange, prompted the Canadian government to request broader authority for “control and management” of ballast water.¹⁴⁵ This general grant of authority, not restricted by the many qualifications and restrictions in the US legislation, will allow the Canadian Department of Transport (acting for the “Governor in Council”) to eventually develop a much more rational and effective ballast water control program. But that may well be several years away, as they will no doubt have to deal with the same strong opposition which shipping interests have had to the proposed US Coast Guard nationwide regulations under NISA.

§ 220. State control of ballast and federal preemption

Would state controls on the ballast water of transoceanic shipping be preempted by federal law? The bottom-line prediction is that it most likely would not be, as long as the

¹⁴² Again, this researcher pleads guilty to the offense.

¹⁴³ Canadian Shipping Act, Revised Statutes of Canada, RS-9, § 657.1, as added October 31, 1998.

¹⁴⁴ 16 USC §§ 4701 *et seq.*

¹⁴⁵ Information on the history of the Canadian amendment, and the loss of the *Flare*, via personal communications from the Canadian Departments of Fisheries and Oceans (DFO) and Transport (Transport Canada).

state stays away from specifying vessel design or construction requirements. But there are a number of nuances which should be observed in order to avoid conflict with federal authority. This is a somewhat complicated and arcane issue, which goes back to the very foundation of the American Republic, and which has been both clarified and confused by extensive litigation before the US Supreme Court. Before discussing the specific cases and statutes which are most relevant, it may be helpful to explain the historical context and outline the analytical framework. This is not normal law, governed by a stable set of “blackletter” rules. This is an issue in fundamental constitutional law, governed by pronouncements of US Supreme Court doctrine which have undergone significant evolution in meaning over the two centuries of the republic.

§ 221. The historical context

What goes under the general label of “preemption” is a whole set of special considerations about the relationship between the state and federal government which come into play when the state enters an area of regulation affecting interstate and international commerce.¹⁴⁶ Some of the considerations have to do with “preemption” *per se*, in the technical sense that a federal regulatory regime may preempt the state regime. Other, more basic considerations, are not technically about “preemption,” but rather about the protection of the freedom of commerce and Congressional prerogative under the “Commerce Clause”¹⁴⁷ of the Constitution.

One of the primary motivations for the replacement of the Articles of Confederation by the Constitution in 1789 was the need to free up the economic potential of the new nation from “distinctions, preferences and exclusions” imposed on the flow of commerce by the separate states.¹⁴⁸ The theme of protecting commerce permeates the discussions in the *Federalist Papers*.¹⁴⁹ It is because of this history that the US Supreme Court, beginning with some of the very first cases, many of which concerned federal authority over shipping¹⁵⁰ and navigable waters,¹⁵¹ is especially sensitive to protection of the power of

¹⁴⁶ “The history of the commerce clause adjudication is, in a very real sense, the history of the concepts of federalism....” John E. Nowak, Ronald D. Rotunda, J. Nelson Young, *Handbook on Constitutional Law* (St. Paul, MN: West, 1978), p. 129.

¹⁴⁷ US Constitution, Article I, § 8, clause 3. “Although the Clause...speaks in terms of powers bestowed upon Congress, the [Supreme] Court long has recognized that it also limits the power of the States to erect barriers against interstate trade.” *Maine v. Taylor*, 477 US 131 (1986), and cases cited therein.

¹⁴⁸ Alexander Hamilton, Federalist Paper # 7, Alexander Hamilton, James Madison, and John Jay, *The Federalist Papers* (New York: Bantam, 1982), p. 29.

¹⁴⁹ Hamilton, *et al.*, *supra*. These are tracts published by the leading advocates of the adoption of the Constitution, the core group of the American “founding fathers,” over the period of 1787-1788.

¹⁵⁰ *Gibbons v. Ogden*, 22 US (9 Wheat) 1 (1824), was the very first preemption case. Chief Justice John Marshall, a leading architect of the new system of government, decided that a state could not grant a monopoly to a steamboat company because it conflicted with federal licensing of ships. *Gibbons v. Ogden* “ranks as one the most important in history,” at least in terms of American constitutional law. John E. Nowak, Ronald D. Rotunda, J. Nelson Young, *Handbook on Constitutional Law* (St. Paul, MN: West, 1978), p. 134.

Congress to regulate commerce under the Commerce Clause. And it is because of this history that commercial shipping interests wishing to keep state enforcement officers off their vessels will come into federal court defending their right to dump dirty ballast water with expressions of profound outrage at this attack on sacred constitutional doctrine, citing a line of cases going back to the foundation of the republic.

But the cases have never ended. The same basic question about conflict between state regulation of steamboats and the federal regulatory scheme which was at issue in the hoary old case of *Gibbons v. Ogden*¹⁵² in 1824 was at issue again when the City of Detroit regulated air pollution from the boilers of a vessel in *Huron Portland Cement Co. v. City of Detroit*,¹⁵³ decided in 1959, and again when the State of Washington regulated the passage of oil tankers through Puget Sound in *Ray v. Atlantic Richfield Co.*,¹⁵⁴ decided in 1977. In *Gibbons* the answer was no, the state may not interfere with federally licensed vessels. In *Huron* it was yes, it may. In *Ray* it was, well, it depends. If the issue is so fundamental, and is one which the US Supreme Court has addressed so many times, why does it continue to be litigated right back up to the Supreme Court?¹⁵⁵ Much like provisions in the basic acts constituting the Canadian Constitution,¹⁵⁶ the US Constitution lays out a general list of federal powers and indicates that some of them are exclusive, some are concurrent, and some are in a fuzzy area in between exclusive or concurrent. The “Commerce Clause” in Article I, § 8 is one of the most exceedingly fuzzy ones. It is clear that the federal power is always preeminent in any case of actual conflict. But it is rarely clear that there is necessarily a conflict, and the argument sometimes centers around incantations about the inchoate or “dormant” power of Congress to regulate things which it has not actually got around to regulating yet.¹⁵⁷

Moreover, on the flip side of the constitutional issue, there has been a tremendous expansion in the number of things which the Supreme Court will allow Congress to reach under the power of the Commerce Clause over the two centuries, especially after the great constitutional conflicts of the “New Deal” under President Roosevelt in the 1930s. Words and doctrines taken from cases decided before that era, although never explicitly overruled

¹⁵¹ *The Daniel Ball*, 77 US (21 Wall) 557 (1875), concerned a vessel by that name operating on the Grand River in the State of Michigan, and decided a fundamental question about the reach of federal admiralty jurisdiction. It also introduced, in the century before the building of the Seaway, the concept that the Great Lakes and its navigable rivers are considered part of international maritime commerce.

¹⁵² 22 US (9 Wheat) 1 (1824).

¹⁵³ 362 US 440 (1959).

¹⁵⁴ 435 US 151 (1977).

¹⁵⁵ The US Supreme Court has almost complete discretion about what kinds of cases the justices wish to deal with. Questions of commerce power and federal state relations seem to have a particularly strong appeal to the justices’ sense of what is of sufficient constitutional import to demand their attention. This is one of the few areas of the law in which the threat “I’ll take this all the way to the Supreme Court” is a realistic threat.

¹⁵⁶ A whole set of fundamental statutes ranging from the British North America Act of 1867, 30-31 Victoria Chapter 3 (United Kingdom), to the Constitution Act of 1982.

¹⁵⁷ John E. Nowak, Ronald D. Rotunda, J. Nelson Young, *Handbook on Constitutional Law* (St. Paul, MN: West, 1978), p. 243.

or disavowed by the Supreme Court, have to be used with care. Their meaning has changed. Generally, since the late 1930s, the Supreme Court has decided that “Congress may exercise its commerce power for clearly noncommercial reasons. The Court has upheld a wide variety of legislation under the commerce power including health regulations, criminal laws, and civil rights acts.”¹⁵⁸ Having thus crossed the watershed and allowed a flood of federal legislation on subjects historically under the sole jurisdiction of the states to be enacted under the almost unlimited reach of the Commerce Clause, the Supreme Court is now just as equally concerned about protecting the right of the states to continue to exercise concurrent power over those matters.

Thus, it is clear that there is a wide area in which things are not clear. This is the area in which there is room for “concurrent” jurisdiction and “balancing” between the federal and state interest. This “balancing” leans most strongly toward exclusive federal power when it rests on matters of interstate and international trade which involve the core power in the Commerce Clause and associated powers expressly enumerated in Article I of the Constitution. But it leans most strongly towards concurrent state power when it rests on matters of “health and welfare” or other general “police powers” traditionally the purview of the states. Even in a case in which it imposes direct restraints on commerce, a state “retains broad regulatory authority to protect the health and safety of its citizens and the integrity of its natural resources.”¹⁵⁹ The problem then – when dealing with any regulation of commercial shipping for the purpose of environmental protection – is that the case has two legs, each standing on either side of the center of balance.

Because it involves ships, it invokes hallowed traditions of admiralty, law of the sea, and principles of international relations going back to the time in the Roman Empire when even the emperor declared that he made law on land, but the law of sea was a matter of sacred tradition with which he would not interfere.¹⁶⁰ Accordingly, the lawyers for the shipping interests will come before the court with a most impressive line of precedents making it seem clear beyond any question that ships are out of bound for the states.

But, because it involves pollution, it invokes a fundamental respect for the traditional police powers of the states. It is well recognized, by both the Supreme Court and the Congress, that pollution prevention “falls within the exercise of even that most traditional concept of what is compendiously known as the police power.”¹⁶¹ Even while enacting the comprehensive federal regime called the “National Pollution Discharge Elimination System

¹⁵⁸ John E. Nowak, Ronald D. Rotunda, J. Nelson Young, *Handbook on Constitutional Law* (St. Paul, MN: West, 1978), p. 151.

¹⁵⁹ *Maine v. Taylor*, 477 US 131, 151 (1986).

¹⁶⁰ The Emperor Antoninus declared, when presented with a case in admiralty, that “I am indeed lord of the world, but the Law is lord of the sea. This matter must be decided by the maritime law of the Rhodians, provided that no law of ours is opposed to it.” 2 *Digest of Justinian* § 14.2.9, p. 398 (Monro Translation, 1909), quoted in Grant Gilmore and Charles L. Black, *The Law of Admiralty*, 2nd Ed. (Mineola, NY: Foundation, 1975), pp. 5-6, note 14.

¹⁶¹ *Huron Portland Cement Co. v. City of Detroit*, 362 US 440, 442 (1959).

(NPDES)” under the Clean Water Act, the Congress made explicit provision for concurrent state legislation and administration of that program.¹⁶² After a long and hard-fought battle over the issue, and protests that this would undermine international conventions and world trade, Congress explicitly disavowed any federal preemption of state standards of liability for oil spills in the Oil Pollution Act of 1990 (OPA 90).¹⁶³ Accordingly, the lawyers for the states and environmental groups will come before the court with an equally impressive line of precedent making it seem equally clear that this is well within the bounds of the sovereign powers of the states.

§ 222. The analytical framework

One must, in the end, get down to cases. But it is important to understand what the language in those cases means – and, therefore, which cases are actually relevant. This quick outline of the doctrine in Table 3 is more of a guide to the terms of art than a checklist for predicting an outcome:

Table 3. Outline of rules on state-federal conflict under the Commerce Clause

- (a) *Dormant Commerce Power.* Fundamental federal power under the commerce clause is offended, even in the absence of Congressional legislation on the subject, if state legislation intrudes into the fundamental commerce power. This is primarily a question of constitutional structure, and the Supreme Court is acting as the guardian of the federal power under this doctrine. Congress has the clear authority to allow the state to enter the field, but “An unambiguous indication of Congressional intent is required before a federal statute will be read to authorize otherwise invalid state legislation....”¹⁶⁴
- (1) *Discrimination or “economic protectionism.”* State legislation is offensive “economic protectionism” if it discriminates between interstate or international commerce, on one hand, and the commerce of the state, on the other hand. “A finding that state legislation constitutes ‘economic protectionism’ may be made on the basis of either discriminatory purpose...or discriminatory effect....”¹⁶⁵ However, discriminatory effect is acceptable if the primary purpose of the state regulation is nondiscriminatory and related to a traditional area of legitimate state regulation. State regulations with discriminatory effects “[i] must serve a legitimate local purpose [*i.e.* not related to economic protectionism], and [ii] the purpose must be one that cannot be served as well by available nondiscriminatory

¹⁶² 33 USC § 1342.

¹⁶³ 33 USC § 2717(a).

¹⁶⁴ *Maine v. Taylor*, 477 US 131, 139 (1986), and cases cited therein, commenting in dicta that the Lacey Act did not sufficiently indicate Congressional intent to authorize state regulation of commerce in fish, but holding that the state did have such authority under general principles and traditional police power.

¹⁶⁵ *Bacchus Imports Ltd. v. Dias*, 468 US 263, 270 (1983), and cases cited therein, holding that a Hawaii tax giving preference to brandy produced from an indigenous shrub violated the Commerce Clause.

Table 3 (cont.)

means.”¹⁶⁶ Analysis tends to focus on purpose and intent rather than effect. In those cases “where discrimination is patent...neither a widespread advantage to in-state interests nor a widespread disadvantage to out-of-state competitors need be shown.”¹⁶⁷

- (2) *Unreasonable burden.* State legislation is offensive, even if the intent of the legislation is entirely legitimate, if it in fact imposes an “unreasonable” burden on the flow of commerce. This is a *balancing* test. In such a balancing, the weight of the traditional state interest in the subject matter, as compared to the weight of the federal interest in uniformity, is relevant. And it is understood that some degree of “reasonable” burden on commerce is acceptable, especially if it serves a traditional state interest. The states “retain authority under their general police powers to regulate matters of ‘legitimate local concern,’ even though interstate commerce may be affected.”¹⁶⁸

- (b) *Preemption.* The state regulation may be “preempted” by Congressional action, or the action of a federal administrative agency acting under Congressional direction, because of express or implicit conflict with the Congressional scheme. When the issue is “preemption” *per se*, the intent of Congress is paramount. *If Congress has expressly disclaimed preemption, there is no further issue to consider.* Congress may freely choose to preempt, not to, or to leave the issue uncertain. The judicial role is to simply divine the intent of Congress. In doing so, the courts will sometimes look to how the federal agency charged to administer the statute has carried out that intent, and action by the agency in accordance with a proper delegation of authority from Congress may be of great importance to determining the outcome. But the opinion of the administrative agency is not binding on the court.
 - (1) *Express preemption.* If Congress expressly preempts state legislation, it is preempted.¹⁶⁹ End of issue, unless one can argue that it is beyond Congressional power and offensive to the Tenth Amendment to the Constitution. (On the other hand, an express disavowal of preemption by Congress is also conclusive.)

 - (2) *Conflict preemption.* If there is conflict in fact between the federal and state legislation, the state legislation is preempted as a matter of fundamental federal supremacy. But the conflict must be a real conflict – it must in fact be impossible to

¹⁶⁶ *Maine v. Taylor*, 477 US 131, 140 (1986), and cases cited therein, particularly *Hughes v. Oklahoma*, 441 US 322 (1979). The two criteria quoted are referred to as the two prongs of the “*Hughes* test,” which is considered a test of the “strictest scrutiny.” *Maine*, at p. 144.

¹⁶⁷ *New Energy Co. of Indiana v. Limbach*, 486 US 269, 276 (1988), and cases cited therein.

¹⁶⁸ *Maine v. Taylor*, 477 US 131, 138 (1986), and cases cited therein, holding that at p. 137 that a complete ban on all imports of live baitfish is allowable even though “Maine’s statute restricts interstate trade in the most direct manner possible.”

¹⁶⁹ *Ray v. Atlantic Richfield Co.*, 435 US 151, 159 (1978), and cases cited therein, holding invalid a state requirement for a local pilot on an enrolled vessel in direct violation of 46 USC § 215.

Table 3 (cont.)

comply with the two provisions of law – and the preemption does not extend any further than the actual conflict. Other provisions of the state law may remain valid.¹⁷⁰

- (3) *Implied preemption.* The general nature of the Congressional scheme, as expressed by its comprehensive structure, declarations of Congressional purpose in the legislation, or legislative history, may imply a need for uniformity of regulation or other purposes, such as a need not to impair the negotiation of international regimes, which implicitly preclude concurrent state regulation – except perhaps concurrent state regulation which is exactly consistent with or lesser in extent than the federal regulation. *However, the base-line rule is a presumption against preemption.* As put by the Supreme Court in a relatively recent case, “we start with the assumption that the historic police powers of the States are not to be superceded by the Federal Act unless that was the clear and manifest purpose of Congress.”¹⁷¹
- (i) *Implied field preemption.* The implication of preemption may be based on the fact that Congress has “filled the field” with a comprehensive scheme. Sometimes, this may also depend on how fully the federal agency has implemented the Congressional mandate.¹⁷²
- (ii) *Implied dominant federal interest preemption.* The implication of preemption may be based on the fact that the Congressional legislation addresses a matter in which there is a “dominant federal interest,” such as an interest in national defense, foreign relations, or one of the other enumerated powers in Article I of the Constitution.¹⁷³ In deciding what constitutes a subject in which there is a “dominant federal interest,” the fact that there is a traditional state interest in the subject will weigh against such a determination.¹⁷⁴ More balancing here.

§ 223. Cases on environmental protection and ships

That guide to the perplexed may be of use in reviewing the relevant cases involving state regulation of pollution from ships. Any clear pronouncement from Congress would make this parsing of the case law unnecessary. Congressional legislation trumps everything else. However, as explained below, Congress has been characteristically ambiguous about

¹⁷⁰ *Ray v. Atlantic Richfield Co.*, 435 US 151, 158 (1978), and cases cited therein, including *Florida Lime & Avocado Growers, Inc. v. Paul*, 373 US 132, 142-143 (1963) and *Hines v. Davidowitz*, 312 US 52, 67 (1941).

¹⁷¹ *Ray v. Atlantic Richfield Co.*, 435 US 151, 157 (1978), and cases cited therein.

¹⁷² *Ray v. Atlantic Richfield Co.*, 435 US 151, 157, 171-173 (1978), and cases cited therein, especially the holding, at pp. 171-173, that whether or not a state requirement for a tug escort on a tanker was preempted would depend on whether or not the US Coast Guard issued regulations on the subject.

¹⁷³ *Ray v. Atlantic Richfield Co.*, 435 US 151, 157 (1978), and cases cited therein, including *Hines v. Davidowitz*, 312 US 52, 67 (1941).

¹⁷⁴ *Maine v. Taylor*, 477 US 131 (1986).

the question of preemption in NISA. Therefore, it is this case law which will determine the outcome.

Maine v. Taylor. A state's interest in protecting its natural resources and environment is a legitimate local interest falling well within the traditional police power of the states. A state restriction on commerce based on that interest may justify a directly discriminatory restriction on commerce which would otherwise be clearly impermissible. One of the most important cases on this point, in part because it is the only Supreme Court case dealing with regulation of exotic species, is *Maine v. Taylor* (1986).¹⁷⁵ In the *Maine* case, the Supreme Court upheld a complete ban on the importation of live baitfish from out of state, imposed by the State of Maine in order to protect against both parasites and introductions of nonnative species.¹⁷⁶ Such a complete ban on imports "discriminates on its face against interstate trade," and thereby must meet the "strict requirements" of what is known as the "*Hughes* test."¹⁷⁷ The *Hughes* test is that the state regulation "[1] must serve a legitimate local purpose, and [2] the purpose must be one that cannot be served as well by available nondiscriminatory means."¹⁷⁸ The complete ban on imports of live bait fish passed this test because the Supreme Court was willing to accept factual findings from the district trial court, which was based on scientific testimony, that there was no other practical means to protect against the parasites and exotics, even though there was contrary scientific testimony. The Supreme Court also held that Maine's efforts to protect against parasites and exotics was not invalidated by "the fact that other States may not have enacted similar bans," or the fact that "fish can swim directly into Maine from New Hampshire."¹⁷⁹ Quoting from a previous case, the Supreme Court said that "The impediments to complete success...cannot be a ground for preventing a state from using its best efforts to limit an [environmental] risk."¹⁸⁰ (Ellipses and insertion by the Supreme Court.) This language would be most encouraging to one state in the Great Lakes attempting to impose unilateral controls on invasions of exotics, despite the fact that fish may still invade from other state and provincial waters.

Fort Gratiot. But it must be recognized that the legitimate state interest in protection of its resources does not always outweigh the Commerce Clause. A number of cases have invalidated state attempts to limit imports of waste from other states. In one of the most recent of these cases, *Fort Gratiot Sanitary Landfill, Inc. v. Michigan Department of Natural Resources* (1992),¹⁸¹ the Supreme Court invalidated a provision in the Michigan

¹⁷⁵ 477 US 131 (1986).

¹⁷⁶ 477 US 131, 142 (1986).

¹⁷⁷ *Maine v. Taylor*, 477 US 131, 138, 144 (1986). The "*Hughes* test" is from *Hughes v. Oklahoma*, 441 US 322 (1979).

¹⁷⁸ *Maine v. Taylor*, 477 US 131, 140, 144 (1986), and cases cited therein, particularly *Hughes v. Oklahoma*, 441 US 322 (1979).

¹⁷⁹ *Maine v. Taylor*, 477 US 131, 150-1 (1986), and cases cited therein.

¹⁸⁰ *Maine v. Taylor*, 477 US 131, 151 (1986), and cases cited therein.

¹⁸¹ 504 US 353 (1992).

Solid Waste Management Act¹⁸² which mandated local counties to restrict the amount of waste they imported from outside the county (and thereby, effectively, from outside the state). The Supreme Court was careful to be very clear about why this was impermissible, and to distinguish the Michigan restriction on waste from the Maine restriction on bait fish, thus emphasizing that the *Maine* case remains good precedent:

Michigan could, for example, limit the amount of waste that landfill operators may accept each year. [Citation omitted.] There is, however, no valid health or safety reason for limiting the amount of waste that a landfill operator may accept from outside the State, but not the amount that the operator may accept from inside the State.

Of course our conclusion would be different if the imported waste raised health or other concerns not presented by Michigan waste. In *Maine v. Taylor*, 477 US 131 (1986), for example, we upheld the State's prohibition against the importation of live baitfish because parasites and other characteristics of nonnative fish species posed a serious threat to native fish that could not be avoided by available inspection techniques.¹⁸³

Huron. The application of these principles to the problem of regulation of pollution from ships is shaped by the Supreme Court cases of *Huron Portland Cement Co. v. City of Detroit* (1959)¹⁸⁴ and *Ray v. Atlantic Richfield Co.* (1978).¹⁸⁵ In the *Huron* case, shipowners docking their vessels in Detroit objected to a restrictions on the output of smoke from their boilers under the Detroit Smoke Abatement Code. They argued that such regulation was preempted by the comprehensive scheme of federal regulation of shipping in Title 46 of the US Code and other statutes, administered by the US Coast Guard, which includes regulation of the safety of boilers. Both the Michigan Supreme Court and the US Supreme Court rejected that objection. The US Supreme Court acknowledged the long-standing federal interest in the regulation of shipping, and reaffirmed the basic principle, citing back to *Gibbons v. Ogden* (1824),¹⁸⁶ that "A state may not exclude from its waters a ship operating under a federal license."¹⁸⁷ Nevertheless, the Supreme Court said, "The mere possession of a federal license...does not immunize a ship from the operation of the normal incidents of local police power, not constituting a direct regulation of commerce,"¹⁸⁸ and "Legislation designed to free from pollution the very air that people breathe clearly falls within the exercise of even the most traditional concept of what is compendiously known as the police power. In the exercise of that power the states and their instrumentalities may act, in many areas of interstate commerce and maritime activities, concurrently with the federal government."¹⁸⁹

¹⁸² Michigan Compiled Laws, MCL § 299.425.

¹⁸³ *Maine v. Taylor*, 477 US 131, 367 (1986).

¹⁸⁴ 362 US 440 (1959).

¹⁸⁵ 435 US 151 (1978).

¹⁸⁶ 22 US (9 Wheat) 1 (1824).

¹⁸⁷ *Huron Portland Cement Co. v. City of Detroit*, 362 US 440, 447 (1959).

¹⁸⁸ 362 US 440, 447 (1959).

¹⁸⁹ 362 US 440, 442 (1959).

Given the mixed holding in the later case of *Ray*, it is worth noting that two justices entered a strong dissent in *Huron*. The dissenting justices emphasized the fact that the US Coast Guard certificate of inspection issued to the vessels clearly authorized the type of boilers used (old fashioned hand-fired Scotch marine boilers which required structural alterations in order to comply with the Detroit smoke limitations) and even specified that coal was the prescribed fuel. They argued that this created a direct conflict in fact between the federal and city regulatory schemes.¹⁹⁰

In rebuttal to that argument, the seven-member majority pointed out the differing purposes of federal and local regulation of the vessels. “The thrust of the federal inspection laws is clearly limited to affording protection from the perils of maritime navigation. [Citations omitted.] By contrast, the sole aim of the Detroit ordinance is the elimination of air pollution to protect the health and enhance the cleanliness of the local community.”¹⁹¹ The majority also pointed to a history of Congressional legislation on air pollution which recognized the legitimate role of the states in controlling air pollution in partnership with the federal government.¹⁹² It should be noted that the theme of federal-state collaboration in the Congressional legislation on air pollution pointed to by the Supreme Court in the *Huron* case is very similar to the strong theme of federal-state cooperation permeating the National Invasive Species Act (discussed further below).

Ray v. Atlantic Richfield. This issue of the exact purpose of the federal legislation applicable to a field which the state seeks to regulate concurrently is the essential issue determining the rather complex and confusing holdings in *Ray v. Atlantic Richfield Co.* (1978).¹⁹³ In the *Ray* case, shipowners objected to a set of regulatory requirements imposed on tank vessels operating in Puget Sound by the State of Washington under its Tanker Law.¹⁹⁴ The US Supreme Court examined each of the specific requirements of the Washington Tanker Law in light of related provisions of the federal licensing, vessel inspection, maritime pollution, and port safety statutes administered by the US Coast Guard. The Supreme Court came to different conclusions about different provisions in the Washington Tanker Law. The case therefore provides an excellent checklist, albeit an incomplete one, of which state provisions are allowable and which are not.

(a) *No general offense to the Commerce Clause in Ray*. First, it should be clearly understood that none of the provisions in the Washington Tanker Law were held invalid on the grounds that they infringed on the general power of Congress to regulate commerce and foreign relations under the Constitution, or that they were discriminatory, or that they unreasonably burdened interstate and international commerce. In other words, none of the

¹⁹⁰ 362 US 440, 449-455 (1959) (dissenting opinion).

¹⁹¹ 362 US 440, 445 (1959).

¹⁹² 362 US 440, 445-6 (1959).

¹⁹³ 435 US 151 (1978).

¹⁹⁴ Washington Revised Code, WRC §§ 88.16.170 *et seq.*

rules outlined above in Table 3 at (a)(1)-(a)(2) were held to be applicable by the Supreme Court. And the fact that certain provisions of the Washington Tanker Law were upheld despite such objections negated any argument that state regulation of major transoceanic vessels offends the general structure of the Constitution. In general, the Supreme Court emphasized that “We do not question in the slightest the prior cases [including *Huron*] holding that enrolled and registered vessels¹⁹⁵ must conform to ‘reasonable, nondiscriminatory conservation and environmental protection measures...’ imposed by a State.”¹⁹⁶

(b) *Express preemption of pilot requirement on enrolled vessels, but not on registered vessels, in Ray.* The Washington Tanker Law required oil tankers of 50,000 DWT¹⁹⁷ or more to take on a local pilot when transiting the sound. This was held preempted¹⁹⁸ by an express provision in the federal licensing and inspection statutes¹⁹⁹ prohibiting states from requiring pilot licenses in addition to those already required from the Coast Guard for enrolled vessels in the coastwise trade. It is highly significant, however, that the Supreme Court took the occasion to expressly uphold the validity of the state local pilot requirement with respect to *registered* vessels using Puget Sound because they have been traditionally required by the states and are not covered by the federal pilotage statute.²⁰⁰ The irony of all this (which has always been built into the traditional division of federal and state regulation of pilotage) is that “enrolled” vessels are those US vessels licensed for “coastwise” trade from one port to another in the United States, while “registered” vessels are those US vessels licensed for international trade. If there were any class of US vessels considered off bounds for state regulation under general principles, it would be the registered vessels.

(c) *Implied field preemption (and dominant federal interest preemption) of construction and equipment requirements in Ray.* Other provisions of the Washington Tanker Law required tankers of 40,001-125,000 DWT navigating Puget Sound to meet certain construction and equipment standards, including specified shaft horsepower, twin screws, double bottoms, back-up radar, and other navigation equipment. Tankers above 125,000 DWT were forbidden to enter the sound completely. All these provisions were held invalid by the Supreme Court, even though there was no express preemption in the federal statutes, under what is generally called the doctrine of “implied field preemption” (Table 3(b)(3)(1) above). The Supreme Court read various statutes administered by the US Coast Guard as amounting to “‘comprehensive minimum standards of design, construction, alteration, repair, maintenance, and operation’ for vessels carrying certain cargoes in bulk, primarily oil

¹⁹⁵ The significance of the phrase “enrolled and registered vessels” is that these are vessels licensed under federal statutes and engaged in interstate and international trade.

¹⁹⁶ *Ray v. Atlantic Richfield Co.*, 435 US 151, 164 (1978), and cases cited therein.

¹⁹⁷ Deadweight tonnes, which is an approximate measure of both size and cargo carrying capacity.

¹⁹⁸ *Ray v. Atlantic Richfield Co.*, 435 US 151, 158-159 (1978).

¹⁹⁹ 46 USC §§ 215, 364.

²⁰⁰ *Ray v. Atlantic Richfield Co.*, 435 US 151, 159-60 (1978). The Supreme Court expressly overruled the holding of the lower federal court on this point.

and fuel tankers”²⁰¹ which “indicates to us that Congress intended uniform national standards for design and construction of tankers that would foreclose the imposition of different or more stringent state requirements.”²⁰² Unlike the situation in the *Huron* case, in which the federal and state schemes were concerned with different purposes, the federal scheme for the regulation of tankers in *Ray* “aims at precisely the same ends”²⁰³ as the Washington Tanker Law, and thus preempts it. “The Supremacy Clause dictates that the federal judgement that a vessel is safe to navigate United States waters prevail over the contrary state judgement.”²⁰⁴ With regard to these specific construction and equipment requirements, the Supreme Court also noted the need for the Congress to exclude more strict state requirements in order not to preclude the adoption of uniform international standards.²⁰⁵ Thus, it also invoked the theme of a “dominant federal interest” over the tanker construction and equipment standards regime (Table 3(b)(3)(ii) above).

(d) *Conditional non-preemption of a tug escort requirement in Ray.* As an alternative, the Washington Tanker Law required all tankers over 40,000 DWT which did not meet the Washington construction and equipment standards discussed above to have a tug escort while transiting Puget Sound. Although the shipowners argued that this was merely an indirect device for forcing them to meet the construction and equipment standards held invalid, the Supreme Court held that the tug escort requirement was not preempted unless the US Coast Guard specifically invoked federal jurisdiction over that issue under the authority of the Ports and Waterways Safety Act (PWSA).²⁰⁶ “Of course, that a tanker is certified under federal law as a safe vessel insofar as its design and construction characteristics are concerned does not mean that it is free to ignore otherwise valid state or federal regulations that do not constitute design or construction specifications.”²⁰⁷

It is important to keep clear on the principle being articulated by the Supreme Court here. The principle is not that design, construction or equipment standards on commercial vessels are subjects of such intrinsically profound import to interstate or international commerce that it they have special protection against state regulation under the constitutional structure of the republic. That would be no more correct a reading of the Supreme Court’s holding here than it would be to read the holding on the pilotage requirement to mean that enrolled vessels have a special constitutional standing superior to that of registered vessels. Those categories are not carved into the Ten Commandments, the Twelve Tablets of Rome, or the Constitution of the United States. The point is simply that PWSA and other statutes enacted a Congressional scheme which happened to be aimed specifically at design, construction, and equipment requirements on tank vessel for the

²⁰¹ *Ray v. Atlantic Richfield Co.*, 435 US 151, 161 (1978), citing the Ports and Waterways Safety Act, 33 USC §§ 1221 *et seq.*, and the vessel inspection statutes in Title 46 of the US Code.

²⁰² *Ray v. Atlantic Richfield Co.*, 435 US 151, 163 (1978).

²⁰³ *Ray v. Atlantic Richfield Co.*, 435 US 151, 165 (1978).

²⁰⁴ *Ray v. Atlantic Richfield Co.*, 435 US 151, 165 (1978).

²⁰⁵ *Ray v. Atlantic Richfield Co.*, 435 US 151, 168 (1978).

²⁰⁶ 33 USC §§ 1221 *et seq.*

²⁰⁷ *Ray v. Atlantic Richfield Co.*, 435 US 151, 169 (1978).

express purpose of preventing environmental disasters as well as loss of property and life. Absent that sort of clearly focused and comprehensive federal regime “filling the field” and expressing a “dominant federal interest” in that particular subject and purpose, there would be no preemption. And that, if there is any doubt, was made quite clear by the Supreme Court holding that preemption of the tug escort requirement was conditional on whether or not the US Coast Guard acted to cover that issue under the authority of PWSA.

On March 24, 1989, a little bit more than eleven years after *Ray* was decided, the *Exxon Valdez* spilled its oil in Prince William Sound. In the Oil Pollution Act of 1990, enacted in reaction to that spill, the Congress legislated tug escort requirements for oil tankers operating in Puget Sound²⁰⁸ which were stricter than those imposed by the Washington Tanker Law, and which also required the phasing in of double hulls on tankers.²⁰⁹

Chevron. Although the Supreme Court cases discussed above set the benchmarks for the issue, one lower federal court case decided since *Ray* helps to delineate the boundaries of what are and are not permissible regulations for states to impose on commercial vessels for the purposes of environmental production. State regulation of ballast water discharges were specifically upheld by the Ninth Circuit Court of Appeals²¹⁰ in *Chevron USA, Inc. v. Hammond* (1984).²¹¹ It should be noted that the *Chevron* case arose before the enactment of NANPCA 90, the first version of the current NISA, and thus did not have opportunity to address the possible impact of federal legislation on ballast water. Nevertheless, it is of definite relevance because the main purpose of the Alaska law was to prevent the discharge of oily ballast. The case therefore raised the analogous issue about preemption of ballast water controls under the Ports and Waterways Safety Act (PWSA),²¹² the Clean Water Act,²¹³ and a set of international conventions on tanker safety and prevention of pollution by

²⁰⁸ OPA 90 § 4116(a), found in a note under 46 USC § 3703. The new federal requirement is for two tug escorts for all single-hulled tankers over 5,000 gross tons.

²⁰⁹ OPA 90 § 4115, 33 USC 3703a.

²¹⁰ The Ninth Circuit covers the US States on the Pacific Ocean, and the most western Rocky Mountain states. The Great Lakes region is divided up among several federal courts of appeal circuits, cutting longitudinally across the region. Michigan and Ohio are in the 6th Circuit. Wisconsin, Illinois, and Indiana are in the 7th Circuit. Minnesota is in the 8th Circuit. New York is in the 2nd, and Pennsylvania is in the 3rd Circuit. There are no federal circuit courts of appeal cases directly on point with these issues decided in any of those circuits, although there is one federal district (trial court) case, *Berman*, mentioned in the text below, decided in the Eastern District of New York. Because of the activism of the States of Washington and Alaska, it is the Ninth Circuit which has taken the lead on these issues. The decisions of the Ninth Circuit are not binding on the Sixth Circuit, if, for example, an issue of preemption arise from Michigan. But, because of the unity of federal law, they are highly persuasive – particularly in the absence of any contrary doctrine developed in other circuits so far.

²¹¹ 726 F2d 483 (9th Cir. 1984).

²¹² 33 USC §§ 1221 *et seq.*

²¹³ 33 USC §§ 1251 *et seq.*

oil, primarily MARPOL 73/78,²¹⁴ which is implemented in domestic federal law by the Act to Prevent Pollution from Ships.²¹⁵

In its regulations²¹⁶ implementing these statutes and conventions, the US Coast Guard had accepted the use of an international standard of “clean ballast” which included some oil in the water, which thereby allowed the discharge of ballast which had been held in oil cargo tanks.²¹⁷ (The Coast Guard promulgated regulations requiring all tank vessels of 20,000 DWT or more built after 1979 to have segregated ballast tanks.²¹⁸ But many older vessels continued in service after that time.) Alaska passed a statute which is particularly interesting because it anticipates exactly what some states might wish to require of vessels in order to protect against exotics species. (Such ballast water controls might, in fact, require exactly the same type of shore reception facilities that have been used for handling oily ballast water.) Alaska prohibited putting ballast water in oily cargo tanks without special permission from the state, and then also provided that:

All ballast placed in cargo tanks shall be processed by or in an onshore ballast water treatment facility and may not be discharged into the waters of the state.²¹⁹

Taking note that there were no provisions of express preemption applicable to the subject of oily ballast discharges in federal law, the Ninth Circuit examined the issue of implied preemption under the precedent of *Ray* and held that there was none. It is important to note that the Ninth Circuit was interpreting one of the central statutes analyzed by the Supreme Court in *Ray*, the Ports and Waterways Safety Act (PWSA).²²⁰ The Ninth Circuit’s holding thereby emphasizes the specific nature of that analysis. The Supreme Court never held that PWSA preempts all state environmental regulation of tankers, much less all other vessels. The Ninth Circuit stressed that “the subject matter of regulation is critical in preemption analysis.”²²¹ “There are significant differences between the subject matter regulated in *Ray* – vessel design features – and that regulated here – ocean pollution discharges.”²²²

²¹⁴ The International Convention for the Prevention of Pollution from Ships, done at London, November 2, 1973, amended by the Protocol of 1978. They are unofficially reported in full, with annotations, at The Maharaj Nagendra Singh, *International Maritime Law Conventions* (London: Stevens & Sons, 1983), vol. 3, pp. 2272 *et seq.* and 2414 *et seq.*) The United States is a signatory to the MARPOL convention and annexes, and they are therefore just as relevant to a preemption analysis as are the federal statutes.

²¹⁵ 33 USC §§ 1901-1911

²¹⁶ 33 CFR Part 157, amended since that time. See the discussion of the regulations in *Chevron USA, Inc. v. Hammond*, 726 F2d 483 (9th Cir. 1984), at p. 486.

²¹⁷ See discussion in *Chevron USA, Inc. v. Hammond*, 726 F2d 483 (9th Cir. 1984), at p. 486.

²¹⁸ 33 CFR Part 157, Subpart B, §§ 157.08 *et seq.*

²¹⁹ Alaska Statutes, AS § 46.03750(e)(1976), amended in 1980 to AS § 46.03.750(a)-(b)(1980).

²²⁰ 33 USC §§ 1221 *et seq.*

²²¹ *Chevron USA, Inc. v. Hammond*, 726 F2d 483, 487 (9th Cir. 1984).

²²² *Chevron USA, Inc. v. Hammond*, 726 F2d 483, 488 (9th Cir. 1984).

Looking at the variety of federal statutes governing water pollution, including particularly the Clean Water Act, the Ninth Circuit observed that the general pattern “provides convincing evidence of Congress’s intent that, within three miles of shore [the territorial sea at that time, over which states have always had jurisdiction], the protection of the marine environment should be a collaborative federal/state effort rather than an exclusively federal one.”²²³ The Ninth Circuit’s reading of the Clean Water Act, in particular, “demonstrates that Congress had indicated emphatically that there is no compelling need for uniformity in the regulation of pollution discharges – and that there is a positive value in encouraging the development of local pollution control standards stricter than the federal minimums.”²²⁴ That specific point about the relevance of the Clean Water Act and its national cooperative regime of water pollution regulation, it should be noted, may be just as relevant to any interpretation of the application of NISA as it was to PWSA. Whether or not it is may depend on the reading of the applicability of the Clean Water Act to biological materials in ballast (discussed below in § 312).

In sum, the Ninth Circuit concluded that “it is difficult to argue convincingly that the Congress or the Coast Guard intended to create a federal right to discharge ballast containing oil into a state’s coastal waters.”²²⁵ The Ninth Circuit also made note that, as of the time of its decision on February 3, 1984, all the oil tankers trading with Alaska except one were making use of shore-side reception facilities in compliance with the Alaska law.²²⁶ The problem of oily ballast will no longer be an issue as vessels without segregated ballast tanks are phased out under Coast Guard regulations.²²⁷ But this only increases the danger from exotic species in the ballast water.

Other cases. The *Ray* case was the last decision on point by the US Supreme Court. The few lower federal court cases on point decided by the lower federal courts since *Ray* (1978) and *Chevron* (1984) simply emphasize the continuing importance of the particular analysis of the federal statutes laid out those cases. The Ninth District returned to the issue again, after OPA 90, in *International Association of Independent Tanker Owners v. Locke* (1998).²²⁸ The State of Washington Office of Marine Safety had promulgated additional regulations, similar to the provisions in the Washington Tanker Law litigated in *Ray*. Again, in careful observance of the rules laid out by the Supreme Court in *Ray*, the Ninth Circuit held that certain Washington requirements to carry specified equipment were invalid under the doctrine of implied field preemption because of extensive regulations on the same subject promulgated by the US Coast Guard under PWSA and the inspection statutes in Title 46. Again, the Ninth Circuit held that certain operational requirements imposed by Washington were not preempted. Consideration of OPA 90 entered into the analysis to the

²²³ *Chevron USA, Inc. v. Hammond*, 726 F2d 483, 489 (9th Cir. 1984).

²²⁴ *Chevron USA, Inc. v. Hammond*, 726 F2d 483, 491 (9th Cir. 1984)

²²⁵ *Chevron USA, Inc. v. Hammond*, 726 F2d 483, 499 (9th Cir. 1984).

²²⁶ *Chevron USA, Inc. v. Hammond*, 726 F2d 483, 500, note 23 (9th Cir. 1984).

²²⁷ 33 CFR Part 157, Subpart B, §§ 157.08 *et seq.*

²²⁸ 148 F3d 1053 (9th Cir. 1998).

extent that the general scheme of federal-state cooperation laid out in OPA 90, as in the Clean Water Act before that, confirmed the continuing relevance of the US Supreme Court holding in *Ray* that Congress intends no general preemption in the field of water pollution control. The greatest importance of *Locke* is that it simply updates the precedent of *Ray* and *Chevron* to 1998.

Finally, there was also a decision on point by the District Court for the Eastern District of New York, a federal trial court in the Second Circuit, in 1992. In *Berman Enterprises, Inc. v. Jorling*,²²⁹ a case affirmed without comment by the US Supreme Court in 1994, the district court applied the analysis in *Ray* to hold that the State of New York was not preempted from imposing licensing and operational requirements on the owner of a tank barge. Although the district court did not discuss the *Chevron* case, its application of the guidance laid out by the US Supreme Court in *Ray* was nearly identical. It also found evidence of a Congressional intent to foster state action in both the Clean Water Act and OPA 90,²³⁰ and emphasized that “*Ray*...only invalidated state provisions where there was an actual conflict between state and federal law. Where there was no such conflict, the [Supreme] Court steadfastly refused to infer preemption in the field of environmental protection, an area that lies at the core of the states’ police powers.”²³¹

§ 224. Provisions relevant to preemption in NISA

The general import of NISA. There is a specific provision in NISA, at 16 USC § 4725, which disclaims Congressional intent to preempt states from acting to control exotics. Before analyzing that preemption (or “anti-preemption”) provision and other specific provisions in NISA in detail, it is worth restating basic principles. The presumption, in the absence of anything clearly said by Congress, is against preemption. Moreover, provisions throughout NISA clearly evidence a general policy of federal-state cooperation (very analogous to the scheme in the Clean Water Act and OPA 90) which puts paid to any challenge of state regulation based “implied field preemption” or “implied dominant federal interest preemption” by reason of an exclusive and comprehensive federal regime (Table 3(b)(3) above). Nor, of course, is there any provision in NISA expressly preempting state action (Table 3(b)(1) above).

The sole “preemption” question therefore, is whether or not there would be “conflict preemption” between a specific state regulation and actions being taken by the US Coast Guard under NISA – and, then, whether or not such conflict preemption is prevented by the provisions in § 4725 disclaiming preemption. Until there is an actual conflict of sorts, there is no need for a state to even resort to § 4725 and an argument over what the language there means. A state might also offend the general principles of the Commerce Clause by imposing some regulation which is deliberately discriminatory or a manifestly unreasonable

²²⁹ 793 F. Supp. 408 (ED NY 1992), affirmed 510 US 1073 (1994).

²³⁰ 793 F. Supp. 408, 416 (ED NY 1992), affirmed 510 US 1073 (1994)

²³¹ 793 F. Supp. 408, 415-416 (ED NY 1992), affirmed 510 US 1073 (1994).

burden on commerce (Table 3(a) above). But until there is a conflict, a deliberate discrimination, or an unreasonable burden, there is clearly a wide area for state action contemplated by Congress in NISA (and in the Clean Water Act and OPA 90 as well). Nor is there any basis for arguing that state standards on handling of ballast which are more strict than Coast Guard standards will somehow impair the ability of the Coast Guard to ultimately negotiate uniform international standards (the argument accepted with regard to construction standards but rejected with regard to operational standards in *Ray*, and rejected with regard to ballast water operations in *Chevron*) because the Coast Guard has made it clear that its policy is to ultimately achieve “a standard of 100 percent removal or kill.”²³²

The preemption provision in NISA. If there were a completely clear provision on preemption in NISA,²³³ none of the review of doctrine and case law analysis above – or the detailed analysis of NISA below – would be necessary. There is in fact a provision on preemption in NISA. It is, however, somewhat ambiguous. It is, indeed, an analogue to the famous preemption provision in OPA 90.²³⁴

The OPA 90 provision says that “Nothing in this chapter [the act] shall...affect, or be construed or interpreted as preempting, the authority of any State or political subdivision thereof from imposing any additional liability or requirements with respect to...the discharge of oil or other pollution by such oil within such State...”²³⁵ That might have seemed clear enough, but it prompted litigation, in the *Locke* and *Berman* cases discussed above, about what that really meant. In those cases, the courts held that (a) the OPA 90 preemption provision did not by its terms apply to other federal statutes such as the Ports and Waterways Safety Act (PWSA),²³⁶ and thereby did not have anything specific to say about preemption of construction and design standards, but (b) it was a significant manifestation of a general Congressional policy, also apparent in the overall structure of both OPA 90 and the Clean Water Act,²³⁷ to encourage state partnerships in control of water pollution.²³⁸ Significantly, with regard to the issue of Congressional policy in general, the Ninth Circuit Court of Appeals emphasized that “As the most recent federal statute in the field, OPA 90 reflects ‘the *full* purposes and objective of Congress’...better than the PWSA,

²³² Coast Guard Notice of Proposed Rulemaking on Implementation of the National Invasive Species Act of 1996, 63 *Federal Register* 17782, 17785 (April 10, 1998).

²³³ National Invasive Species Act of 1996, US Public Law 104-332 (October 26, 1996), making amendments to the Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990, US Public Law 101-646 (November 29, 1990), codified at 16 USC §§ 4701 *et seq.* “NISA” is used here as the popular name for the amended act. (“NISA 96” refers to the specific changes, mandating a national regulatory regime, in 1996) The specific provision on federal preemption discussed here, at 16 USC § 4725, was in the original 1990 act and remained unchanged by the 1996 amendment.

²³⁴ Oil Pollution Act of 1990, Public Law 101-380 (August 18, 1990), codified in various parts of the US Code, particularly Title 33.

²³⁵ OPA 90 § 1018(a), codified at 33 USC § 2718(a)(1).

²³⁶ 33 USC §§ 1221 *et seq.*

²³⁷ 33 USC §§ 1251 *et. seq.*

²³⁸ *International Association of Independent Tanker Owners v. Locke*, 148 F3d 1053, 1062 (9th Cir. 1998); *Berman Enterprises, Inc. v. Jorling*, 793 F. Supp. 408, 416 (ED NY 1992), affirmed 510 US 1073 (1994).

the PTSA, or the Tank Vessel Act, all of which OPA 90 was designed to complement.”²³⁹ If there is a good argument that exotics are a form of “pollution” under the Clean Water Act (see § 321 below), then there is a good argument that the general Congressional policy to invite state action on water pollution under OPA 90 and the Clean Water Act also applies to regulation of exotics. Moreover, the method of the courts in looking at the overall structure and purpose of the federal legislation, used in these cases, is quite applicable to an analysis of NISA.

The preemption provision in NISA reads in full (and it is important to read it in full) as follows:

§ 4725. Relationship to other laws

[1] All actions taken by Federal agencies in implementing the provisions of section 4722 of this title [16 USC § 4722, specifying programs to be developed by the federal ANS Task Force] shall be consistent with all applicable Federal, State, and local governmental laws. [2] Nothing in this chapter [NISA, 16 USC Chapter 67] shall affect the authority of any State or political subdivision thereof to adopt or enforce control measures for aquatic nuisance species, or diminish or affect the jurisdiction of any State over species of fish and wildlife. [3] Compliance with the control and eradication measures of any State or political subdivision thereof regarding aquatic nuisance species shall not relieve any person of the obligation to comply with the provisions of this subtitle.

There are really three separate provisions here, in the three sentences of the section. If resort to § 4725 becomes necessary, the argument is likely to center on exactly what is meant by “control measures” expressly preserved for state action in the second sentence of the section, “Nothing in this chapter [NISA, 16 USC Chapter 67] shall affect the authority of any State or political subdivision thereof to adopt or enforce *control measures*....” The name of the original legislation (still technically the name of the amended act) was the “Aquatic Nuisance *Prevention and Control* Act of 1990,” and there is some basis for arguing that “control” is distinct from “prevention.”

One may then anticipate long litigation about the precise meaning of the word “control.” In the absence of a clearly applicable statutory definition, the general rule of statutory construction is to presume that the legislature used a word in its common meaning.²⁴⁰ The first two definitions out of common dictionary are certainly applicable to any state effort to prevent invasions of exotics in ballast water: “1. To exercise authority or dominating influence over; direct; regulate. 2. To hold in restraint; to check.”²⁴¹ Moreover, as evidence of the common meaning of the word, it is relevant to note that the sailors,

²³⁹ *International Association of Independent Tanker Owners v. Locke*, 148 F3d 1053, 1062 (9th Cir. 1998), citing *Hines v. Davidowitz*, 312 US 52 (1941) (emphasis in original).

²⁴⁰ 73 American Jurisprudence 2nd Statutes § 206.

²⁴¹ William Morris, ed., *The American Heritage Dictionary of the English Language* (Boston: Houghton Mifflin, 1976), p. 290.

marine engineers, and aquatic biologists charged to study the problem of exotic invasions in ballast water have certainly used the word “control” in this context. A report from the Marine Board of the National Research Council commissioned by the US Coast Guard under the act is entitled “*Stemming the Tide: Controlling Introductions of Nonindigenous Species by Ships’ Ballast Water.*”²⁴² The seminal report on the Canadian voluntary guidelines in the Great Lakes, which led directly to the current US Great Lakes regulations and the proposed national guidelines under NISA, is entitled “*Effectiveness of Mid-Ocean Exchange in Controlling Freshwater and Coastal Zooplankton in Ballast Water.*”²⁴³ The *Algonorth* project, a demonstration of the use of filtering technology on the Canadian motor vessel *Algonorth* in the Great Lakes funded by a combination of federal and state money, has been described by its proponents in a published report as a project “to control the spread of unwanted organisms” in ballast water.²⁴⁴ The common usage of the word “control” indisputably includes controls on ballast water.²⁴⁵

A special statutory definition may modify the common meaning. Neither “control” nor “prevention” is formally defined in the definitional section of NISA,²⁴⁶ but other use of those words in the act does seem to imply a distinction. A provision in the formal definitions on “environmentally sound” methods, etc., refers to things done to “prevent introductions or control infestations.”²⁴⁷ And a provision in the section on federal ANS Task Force programs says that “For purposes of this chapter [NISA, 16 USC Chapter 67], control efforts include

²⁴² Marine Board, National Research Council, *Stemming the Tide: Controlling Introductions of Nonindigenous Species by Ships’ Ballast Water* (Washington, DC: National Academy Press, 1996). This report is specifically referred to by Congress in the NISA 96 amendments, at 16 USC § 4714(b)(4).

²⁴³ A. Locke, D.M. Reid, W.G. Sprules, J.T. Carlton, and H.C. van Leeuwen, *Effectiveness of Mid-Ocean Exchange in Controlling Freshwater and Coastal Zooplankton in Ballast Water*, Canadian DFO technical report no. 1822 (Burlington, ON: Great Lakes Laboratory for Fisheries and Aquatic Sciences, December 1991).

²⁴⁴ Allegra Cangelosi, “The Algonorth Experiment: A Groundbreaking Project in the Great Lakes will Test One Potential Technology to Control the Spread of Unwanted Organisms,” *Seaway Review*, vol. 25, no. 3 (January-March 1997), pp. 29-33. It is also interesting to note, although it does not thereby bind Congress, that Ms. Cangelosi was in fact a primary drafter of both NANPCA 90 and NISA 96 for Senator John Glenn.

²⁴⁵ Aside from evidencing the common use of the word “control” by experts in the field, the proceedings of the Marine Board also evidence a common understanding on the part of the scientific community that the mandate of the new legislation included collaboration between federal and state agencies on the specific problem of ballast water. One of the recommendations of the Marine Board is that “The cognizant US authority, as a matter of priority, should be tasked with developing domestic guidelines to minimize the translocation of unwanted organisms among US ports by vessels engaged trade along US coasts.” (These, actually, would be the “coastwise” US vessels which are subject to exclusive federal license, addressed in the *Ray* case.) A footnote to that recommendation said that “The cognizant US authority may be the Coast Guard, the state, or the port authority, depending on circumstances.” Marine Board, National Research Council, *Stemming the Tide: Controlling Introductions of Nonindigenous Species by Ships’ Ballast Water* (Washington, DC: National Academy Press, 1996), p. 9, n. 5. The Marine Board is not a court, and has no authority to issue a legal opinion on preemption doctrine. But that recommendation is relevant in that it reflects a common understanding of what Congress intended by an important national body – and one whose work was specifically endorsed by Congress in the NISA 96 amendments. See the reference to the Marine Board at 16 USC § 4714(b)(4).

²⁴⁶ 16 USC § 4702.

²⁴⁷ 16 USC § 4702(6).

eradication of infestations, reductions of populations, development of means of adapting human activities and public facilities to accommodate infestations, and prevention of the spread of aquatic nuisance species from infested areas.”²⁴⁸

But what is the actual difference between “prevention of introductions” and “prevention of the spread of aquatic nuisance species from infested areas” as described in this section? One can argue that the difference is between a species which is not a nuisance in its native area – *e.g.*, one of any currently unnoticed creatures living quietly in the Black Sea or the Congo River – and something such as the zebra mussel which is well known to be a nuisance in the Great Lakes, spreading throughout the Mississippi Basin. But that distinction breaks down quickly as a matter of the realities of geography, biology, and shipping. To begin with, the creature in the Black Sea may well be a “nuisance,” and thus an “infestation,” in its native area.

More to the point, the aquatic nuisance species brought to us across the ocean in the ballast water of ships are likely to come via previous infestations of non-native waters in the Mediterranean, Europe, and other ports around the world. (The Rhine, a river used by the ancient Greek and Celt traders hundreds of years before the common era, is one of the most cosmopolitan “infested areas” of the world.) That is likely the case with the most infamous invader, the zebra mussel, originally native to the Black and Caspian Seas, which first invaded the trade ports at the mouth of the Rhine in 1820-1830 before eventually being carried across the Atlantic in the 1980s.²⁴⁹ The US Coast Guard “Shipping Study” on ballast water, conducted under mandate from NANPCA 90, identifies by name six new species of various creatures which are prime candidates for future invasion of North America via ballast water precisely because they have already demonstrated an ability to invade ports around the world – from which “infested areas” they are thereby much more likely to invade North America.²⁵⁰ If we are to hang the analysis on the literal meaning of this language in the act, the reach of “control” expressly preserved for concurrent regulation by the states certainly includes control of the spread of these species from ports around the world.

²⁴⁸ 16 USC § 4722(e)(1).

²⁴⁹ Brian Morton, “The Aquatic Nuisance Species Problem: A Global Perspective and Review,” in Frank M. D’Itri, *Zebra Mussels and Aquatic Nuisance Species* (Chelsea, MI: Ann Arbor Press, 1997), pp. 1-54, 16.

²⁵⁰ James T. Carlton, Donald M. Reid, and Henry van Leeuwen, *The Role of Shipping in the Introduction of Nonindigenous Aquatic Organisms to the Coastal Waters of the United States (other than the Great Lakes) and an Analysis of Control Options*, Shipping Study I, USCG Report No. CG-D-11-95 (Springfield, VA: National Technical Information Service, March 1997, April 1995), p. 102, Box 5-2. The species and the places they have infested, among others, are (1) *Limnoperna fortunei*, a Chinese freshwater mytilid which has infested Taiwan, (2) *Undaria pinnatifida*, an Asian brown algae which has invaded Australia and New Zealand, (3) *Corophium curvispinum*, an amphipod crustacean which has invaded the Rhine, (4) *Potamopyrgus antipodarum*, a New Zealand freshwater hydrobid snail which has invaded Europe, (5) *Caulerpa taxifolia*, a toxic algae, origin unspecified, which has invaded the Mediterranean, and (6) *Neomysis japonica*, a Japanese shrimp which has invaded Australia.

In addition, the other sentences of the express provision on preemption must be considered. The first sentence says that “All actions taken by Federal agencies in implementing the provisions of section 4722 of this title [16 USC § 4722, specifying programs to be developed by the federal ANS Task Force] shall be consistent with all applicable Federal, State, and local governmental laws.” How can federal programs be “consistent” with state and local laws if the actions of federal agencies in promulgating specific regulations on ballast water or other subjects preempt state laws? And the third sentence in the section says that “Compliance with the control and eradication measures of any State or political subdivision thereof regarding aquatic nuisance species shall not relieve any person of the obligation to comply with the provisions of this subtitle.” That is the flip side of preemption. It says, in essence, that state laws do not preempt this federal law. Under the Supremacy Clause of the Constitution,²⁵¹ that would seem to be an unnecessary warning. But it is a basic canon of statutory construction that one must never assume the legislature to have written a provision with no purpose whatsoever. This reverse preemption provision has a purpose because, as is evident in many other sections of the act, the extensive collaboration between the federal and state governments on prevention and control mandated by Congress could raise the implication that states have been delegated authority to modify the application of federal programs. This provision says, no, there is no such delegation. The authority is concurrent.

Other provisions in NISA. More generally, a court may look at the many other provisions in the act which mandate coordination and collaboration for the exercise of that concurrent authority. General provisions of that nature include the mandates for regional ANS panels²⁵² and state ANS management plans.²⁵³ One of the Congressional findings in the preamble section of the act, a direct declaration by Congress on what its overall purposes are, says that “resolving the problems associated with aquatic nuisance species will require the participation and cooperation of the Federal Government and State Governments in the development of *prevention technologies*.”²⁵⁴ Another provision within the section specifically concerned with the federal ballast water management demonstration program authorizes the Secretary of the Interior to “enter into cooperative agreements with appropriate officials of other agencies of the Federal Government, agencies of the States and political subdivisions thereof, and private entities...”²⁵⁵ in order to develop new ballast control technologies. On the contrary side, one might point to the inclusion of “private entities” in this provision and argue that it does not delegate to private persons authority to undertake concurrent regulation of ballast water. No, it certainly does not. But the states do not need to be delegated authority to act. The authority is already there, well within their general police powers, just as private entities retain their private liberty to develop voluntary industry standards to deal with ballast water (as some of the US and Canadian shipowners

²⁵¹ US Constitution, Article VI, § 2.

²⁵² 16 USC § 4723.

²⁵³ 16 USC § 4724.

²⁵⁴ 16 USC § 4701(a)(15). (Emphasis added.)

²⁵⁵ 16 USC § 4721(c)(1)(A).

have done). The point is that this provision is a Congressional mandate for cooperation, not exclusion and preemption, on the specific subject of ballast water as well as other subjects addressed by the collaborative framework of NISA.

Beyond that, one of the specific mandates to the federal ANS Task force reads as follows:

Whenever the Task Force determines that there is a substantial risk of unintentional *introduction* of an aquatic nuisance species by an identified pathway and that the adverse consequences of such an introduction are likely to be substantial, the Task Force shall, acting through the appropriate Federal agency, and after an opportunity for public comment, carry out *cooperative*, environmentally sound efforts *with regional, State, and local entities* to minimize the risk of such an *introduction*.²⁵⁶

A “cooperative” effort to prevent an introduction is manifestly not one in which the federal agencies deprive the state and local entities of their authority to act concurrently.

And finally – which is to say sufficient for these purposes here, not that all such provisions calling for federal-state cooperation have been identified – the Task Force is also directed to provide technical assistance to the states in the following terms:

The Task Force shall, within the program developed under subsection (c) [a prevention program mandated by the provision quoted above] *provide technical assistance to State and local governments* and persons to minimize the environmental, public health, and safety risk associated with aquatic nuisance species, *including an early warning system for advance notice of possible infestations and appropriate responses*.²⁵⁷

The Senate report on this provision, originally enacted as part of NANPCA 90, described it as a provision which “would authorize the Task Force to provide technical assistance to regional, State, and local entities on environmentally sound approaches to *prevention* and control of aquatic nuisances.”²⁵⁸ The specific subject is development of prevention technologies. But there most certainly would be no point in a Congressional mandate to assist the states in developing prevention technologies if it were envisioned that the states were to be deprived of authority to implement the use of those technologies. Altogether, these provisions permeating the substance of NISA should make it clear that Congress has not deprived the states of their legitimate role in the prevention of invasions.

²⁵⁶ 16 USC § 4722(c)(2). (Emphasis added.)

²⁵⁷ 16 USC § 4722(g). (Emphasis added.)

²⁵⁸ Senate Environment and Public Works Committee, Senate Report No. 101-523, S 2244 (October 11, 1990), p. 8, at 1990 USCCAAN 6455, 6462. (Emphasis added.)

§ 225. Concluding observations on the issue of preemption

Putting all this together, one can say with confidence that: (a) Regulation of the handling of ballast water on commercial shipping for the purposes of controlling or preventing introductions of exotics, just like the regulation of ships and ballast water for the purpose of preventing oil pollution, is well within the traditional and legitimate police powers of the states. (b) As long as the states do not regulate ballast water in such a way as to unnecessarily discriminate against foreign commerce, with the purpose of economic protectionism, or otherwise unreasonably burden that commerce, it does not offend general constitutional principles under the Commerce Clause. (c) As long as the states do not intrude into the specific area of specifying requirements for the design, construction, or equipment of commercial vessels assigned to the US Coast Guard under the federal port and vessel safety laws, such regulation of ballast water is not preempted by any express or implied provisions of the Clean Water Act, OPA 90, or NISA. To the contrary, it is positively sanctioned by the Congressional policy of federal-state collaboration expressed throughout those pollution laws.

Part III. A survey of US and Canadian federal, state, and provincial laws for the prevention of the invasion of the Great Lakes by exotic organisms

§ 300. Introduction to Part III: General observations and research questions

§ 301. Introduction

This part presents a survey of the current laws and regulations for prevention of the invasion of the Great Lakes aquatic ecosystem by exotic organisms as of the beginning of 1999.¹ It is comprehensive in the sense that it includes the major statutory and regulatory regimes of relevance in all eleven jurisdictions with direct authority over the Great Lakes – two federal governments, eight states, and a province – with the greater emphasis on US state laws. It is not exhaustive. That is, it does not purport to analyze all legal issues of possible interest in all of these jurisdictions. That would require a multi-volume treatise. This survey conducts a basic comparison of all eleven regimes according to a consistent set of research questions (stated in § 303 below), and selects some specific examples of leading legislation for more detailed analysis of selected issues.

Some parties may well disagree with what they see as omissions or bias in the stated research questions and issues selected for detailed analysis. The results of any research (even in physics and biology, much less law and politics) are determined to a large extent by the questions asked. But that is why the research questions are explicitly stated, and they at least provide a consistent basis for comparison of the eleven regimes. The researcher is not shy about explicitly stating policy preferences or recommendations for action when he intends to do so. Where he does not actually do so, he asks the reader to be slow to infer the implication of a policy preference. In many places the observations are simply that – just observations. For example, it is observed that there is a recent shift in primary supervision of aquaculture from some conservation agencies, which have tended to have more of an enforcement focus, to agricultural agencies which have promotion of aquaculture as an industry as one of their primary missions (and that some of the conservation agencies retaining primary supervision are now more engaged in the promotion of aquaculture). That is a fact. As to whether or not that recent trend is good or bad, the researcher actually has no opinion. It would require a much more extensive analysis of the expertise and institutional cultures of the various agencies to provide a sound basis for such an opinion. It is noted that there are obvious advantages and disadvantages to either assignment of responsibilities.

¹ All legal materials are up to date as of at least June 1, 1998, most later than that, with some variation according to the various legal publication services. All citations include the information required in the standard legal form, but frequently include additional information in order to make sure that the source of the material is clear to both laity and lawyers from other jurisdictions, and special effort has been taken to make the discussion binational.

The focus of this study is on public laws and regulations controlling the major commercial vectors of concern. It does not cover all conceivable human activities which may result in the movement of aquatic organisms across watersheds. Nor does it address the significant but distinctly different issue of intentional stocking of aquatic organisms by public agencies. That is an important public policy issue, but it is one which is governed more by internal agency management policies and political consultations than by the public laws and regulations analyzed here. It should simply be noted that the conservation agencies engaged in public stocking activities obviously have a political obligation to subject their own activities to any of the same standards, scientific reviews, and intergovernmental consultations which are appropriate for control of commercial activities – and, beyond that, have an obligation to conduct their own activities with special expertise and care.

Finally, in the way of caveats, it must be emphasized that this survey is of public *law* – that is, formal, binding, legally enforceable policies and procedures enacted by statute or promulgated by regulation under statutory authority. In many cases, omissions in statutes and regulations may be filled in, to some extent, by internal agency standards, procedures, and enforcement policies. A complete evaluation of enforcement programs in the 29 separate agencies with primary duties relating to exotics in the 11 different jurisdictions would have to examine internal memoranda, enforcement letters, committee proceedings, budgets, personnel training, institutional culture, field operations, rates of compliance, and results of enforcement cases in each of those agencies. Such a programmatic study, which would be of interest, would require years of research and funding far in excess of what was available for this project. Given that caveat, is an analysis of statutes and regulations a meaningful exercise? It is, this researcher would submit, because the embodiment of a policy in statute or regulation is of import in several respects: (a) It determines whether or not the policy is legally enforceable. (b) It carries considerably more weight when the program administrators are faced with pressure from special interests. (c) Especially when the policy is embodied in statute, it provides more justification for funding staff, scientific studies, and enforcement programs. (d) It helps the agency, itself, maintain consistency in enforcement policy. (e) It provides clearer, more accessible, and more impressive guidance to the regulated industry and the public at large. (f) And it provides a foundation for coordination of policies with other agencies and jurisdictions.

With all those caveats, the purposes of this survey are to:

(a) Obtain some indication of the strength of current public policy in the region, as reflected in statutes and regulations, particularly with respect to those vectors which have traditionally been regulated at the state and provincial level.

(b) Note important gaps, inconsistencies, and technical flaws.

(c) And identify salient examples to imitate (or avoid) when developing future legislation and regulation.

That last purpose may be the most important. Given the rapid evolution of public policy in this area (meaning both the subject area and this area of the world), this study should be viewed as a snapshot in time.² The overall purpose of this study is to determine what works as matter of practical lawmaking and regulatory policy, within the real context of government in the Great Lakes region, so that this can be built on and improved as quickly as possible. Although they each have a few technical flaws discussed here, the 1996 Minnesota Chapter 84D on Harmful Exotic Species³ and the 1996 Michigan Aquaculture Development Act⁴ are each valuable models for future legislation. The goal is to make sure that that future legislation is more consistent throughout the region, and incorporates effective provisions for regional coordination. The wall of legal defense around the boundaries of the Great Lakes is only as strong as the weakest section of the wall.

Such is also the purpose of the model state legislation on exotics being developed by the Great Lakes Commission, which this survey supports.⁵ Legislation will necessarily reflect the peculiar political and legal structure of each particular state. This survey makes clear the nature of the problem in melding together those peculiar state structures with a policy structure for the region.

§ 302. General observations on the laws

The Federal Aquatic Nuisance Species Task Force conducted a superficial survey of US state laws controlling exotic species throughout the United States in 1991.⁶ While indicating that many states were beginning to strengthen their authority to control exotics at that time,

² The legislatures are quite. Both the Michigan Aquaculture Development Act, MCL §§ 286.871 *et seq.*, and the comprehensive Minnesota Chapter 84D on Harmful Exotic Species, MS §§ 84D.01 *et seq.*, were enacted in 1996. See § 344 on the Michigan act, and § 334 on the Minnesota act. Ontario enacted a comprehensive revision of its statutes and regulations governing both fish in general and aquaculture, in 1997. Fish and Wildlife Conservation Act of 1997, Statutes of Ontario 1997, Chapter 41. See §§ 333, 342. The Pennsylvania legislature has just enacted a new aquaculture scheme, reorganizing the division of responsibilities between the Fish and Boat Commission and the Department of Agriculture, at the end of 1998. Pennsylvania Aquaculture Development Law, Pennsylvania Act 1998-94 (October 16, 1998), adding Title 3, Pennsylvania Consolidated Statutes, Part VI, Chapter 42, 3 PCS §§ 4201 *et seq.* See § 333 below. A bill which would create a comprehensive state regime for the control of ballast water, potentially revolutionary in its effect, has just been introduced in the California Assembly in February of 1999. California Assembly Bill, AB 703, introduced by Assembly Member Lempert on February 24, 1999. See § 210 above.

³ Minnesota Statutes, MS Chapter 84D, MS §§ 84D.01 *et seq.* See § 334 below.

⁴ Michigan Compiled Laws, MCL §§ 286.871 *et seq.* See § 344 below.

⁵ Great Lakes Commission Panel on Aquatic Nuisance Species, *Model State Guidance for Nonindigenous Aquatic Nuisance Species Prevention and Control: Legislative, Regulatory and Policy Approaches for the Great Lakes Region* (Ann Arbor, MI: Great Lakes Commission, in draft as of February 1999).

⁶ Aquatic Nuisance Species Task Force, *Findings, Conclusions, and Recommendations of the Intentional Introductions Policy Review*, report to Congress under the Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990 § 1207 [16 USC § 4727] (Washington, DC: ANS Task Force, US FWS & NOAA, March 1994). The 1991 study was impressionistic rather than systematic in nature, because it was based on responses to questions and those responses were noticeably uneven in evident interest and detail.

the responses from the states presented a general picture of weakness and incoherence in regulatory policy:

Most of the states that responded cited some form of regulatory authority over the importation (to the state) of introduction of fishes, in some cases only game species. As noted by the New Mexico Department of Game and Fish [7]“this leaves an entire range of aquatic organisms that are unregulated...,” e.g., amphibians, insects, plants. For those species for which state natural resource agencies did have authority, the most commonly cited approach was to use some form of general prohibition on import or introduction that was linked to a permit system. Many states cited no particular criteria by which permit applications are judged.⁸

This survey indicates that only some improvements have been made to that general picture since 1991. All of the states in the region have some provision restricting the introduction of exotic fish, more or less, usually subject to rather wide discretion on the part of the state conservation agency.⁹ But the statutes are rather uneven in their focus and coverage. All of the eight US states and Ontario have what is theoretically a “green list,” in the sense that statutes or regulations require positive permits or listing before fish are introduced, but which may or may not actually be promulgated in statute or regulation. Coverage is uneven. Michigan’s separate green lists, for example, apply only to aquaculture¹⁰ or game fish.¹¹ The Michigan regulations promulgated under the general conservation statute for other fish, which may be limited by the terms of that statute, have only a “red list” of prohibited species.¹² Most jurisdictions, while requiring positive permitting before any introductions, have few statutory or regulatory standards for fully evaluating such introductions. The prohibitions are typically limited, vague, and qualified. There are few statutory standards for implementation of the statutes by the relevant agencies, e.g., presumptions for or against introduction, provisions for scientific review or interagency and public consultation, or environmental impact studies. There are few provisions for record-keeping and inspection to insure compliance.

More generally, there is little in the way of legislative strategies – or mandates for agencies to develop strategies – for dealing with different vectors. Nowhere is there any legislation establishing the principle that “the polluter pays,” through either liability or tax schemes. (Many of the fees, for licenses to import exotics, and penalties for violations of rules against importation or introduction, are miniscule in terms of both the required

⁷ Citation in original to B. Montoya, letter to ANS Task Force (January 27, 1992).

⁸ Aquatic Nuisance Species Task Force, *supra*, p. 10.

⁹ The term “conservation agency” is used here as a generic stand-in for a department or ministry of natural resources, a conservation department, or a fish and wildlife service, division, or commission. The actual governmental divisions and allocations of primary responsibilities for the jurisdictions are discussed in § 391 below.

¹⁰ Michigan Compiled Laws, MCL § 286.875(1). See § 344 below.

¹¹ Michigan Compiled Laws, MCL § 324.45906.

¹² Michigan Administrative Code, MAC R 299.1051, R 299.1052 (1979), issued under the authority of Michigan Compiled Laws, MCL § 324.45906 (replacing MCL § 308.115 *et seq.*). See § 333 below.

regulatory programs and the potential harm of introductions.) Some significant vectors of concern, such as bait fish and aquaria, have not really been addressed. And there are few provisions for interstate and binational coordination of programs in order to establish consistent policies and legally effective rules for the Great Lakes ecosystem as a whole.

A general survey of Canadian provincial wildlife acts recently conducted for the Canadian Wildlife Service came to similar conclusions. That report observed that “considerable variation occurs in the approach used to permit/deny species entry, the words used to mean native or non-native, definition of exotic, the range of prohibited species listed, and the degree of control exercised over the issue of alien species management; thus the approach across Canada at the provincial level is very inconsistent.”¹³

Responsibility for protection of the ecosystem against invasion of exotics is typically assigned to a conservation agency, generally responsible for fisheries and other natural resources, such as a department or ministry of natural resources. That is usually not the same agency with primary responsibility for prevention of water pollution, such as a department of environmental protection, and is sometimes not the same agency responsible for support of aquaculture, usually a department of agriculture. The conservation agency responsible for the fisheries is typically the agency with responsibility for policing watercraft as well. But none of these agencies, or any other agencies at the state and provincial level, have undertaken regulation of commercial shipping. That has been generally been deferred to the federal government.¹⁴

Again, it is much the same pattern on the northern side of the Great Lakes. Provincial responsibility for response to water pollution is generally the responsibility of the Ontario Ministry of the Environment,¹⁵ fisheries are the responsibility of the Ontario Ministry of Natural Resources,¹⁶ which does have authority over licensing of aquaculture¹⁷ (as do some US state conservation agencies), and commercial shipping is generally the responsibility of the federal Department of Transport.¹⁸

¹³ Cathy Keddy, *Canada's Capability for Managing Alien Organisms: Implications for Conserving Native Biodiversity*, report prepared for the North American Wetlands Conservation Council (Canada) and the Canadian Wildlife Service (Ottawa: Canadian Wildlife Service Biodiversity Branch, November 1997), p. 7.

¹⁴ In the US, primarily the US Coast Guard, implementing Titles 33 and 46 of the US Code, as well as the Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990, as amended by the National Invasive Species Act of 1996, US Code at 16 USC §§ 4701 *et seq.*, hereinafter referred to as National Invasive Species Act or NISA. That does not mean that federal authority is exclusive. See § 220 above.

¹⁵ Ontario Environmental Protection Act, Revised Statutes of Ontario, RSO Chapter E.19.

¹⁶ Fish and Wildlife Conservation Act, Statutes of Ontario 1997, Chapter 41. The Ministry shares responsibility for fisheries with the Federal Department of Fisheries and Oceans under the Canada Fisheries Act, Revised Statutes of Canada, RS Chapter F-14.

¹⁷ Fish and Wildlife Conservation Act of 1997, Statutes of Ontario 1997, Chapter 41, § 47.(1), and Game and Fish Act Regulations with Respect to Fish, Ontario Regulation 267/95.

¹⁸ Canada Shipping Act, Revised Statutes of Canada, RS Chapter S-9.

Although there is a good foundation for regional coordination of policy in the form of existing organizations such as the Great Lakes Commission¹⁹ and the Great Lakes Fishery Commission,²⁰ there is no recognition of the need to establish legally effective regional policies in state and provincial statutes on exotics. None of the statutes giving the conservation departments authority to control exotics provide that disapproval of a species by other jurisdictions in the region or a regional body is a basis for prohibition or regulation. None of the various statutory regimes even contemplate the idea of a regional green list.

To be clear, all of the Great Lakes states and the Province of Ontario have statutory provisions of one type or another providing some agency of the state with authority to control the introduction of fish or some larger set of aquatic organisms. No state or provincial executive branch (nor the executives in either of the two federal governments) are completely powerless to act. In general, however, that authority is incoherent, in the sense that legislative enactments in most states are unfocused. They do not reflect a clear legislative policy or a strong mandate for action.

These observations are not meant to disparage the good work of conservation officials throughout the region. To the contrary, this researcher has been consistently impressed by the degree to which dedicated officials in all eleven jurisdictions have done their utmost to fill the breach with intelligent regulatory schemes, local agency policies, management plans, voluntary industry guidelines, and public education programs. They also work well together at the regional level in such forums as the Great Lakes Commission on Aquatic Nuisance Species, which is a model for regional coordination now being imitated by state officials around the country.

But it would be a fallacy of composition to assume that a collection of intelligent and well-focused individuals must necessarily amount to an intelligent and well-focused policy regime at the collective level of their government jurisdictions or the region. And it would do those individuals no favor to ignore the fact that they are plugging holes in dikes. They are running out of fingers. They are forced to frequently devote scarce resources to chasing after species already established in the ecosystem, fighting a rearguard action with few resources and only tentative political support from their legislatures. There is, in fact, only one jurisdiction in the region (Minnesota) which has legislated a comprehensive scheme specifically focused on exotics, which gives their enforcement agency a strong mandate for action. The rest of the agencies, including the several agencies of the two federal governments, are working with a patchwork of various authorities and with much less than a

¹⁹ Great Lakes Basin Compact, authorized with exceptions by US Public Law 90-419 (July 24, 1968), adopted by the Great Lakes states at Illinois Compiled Statutes, 45 ILCS §§ 145/0/01 *et seq.*, Indiana Code, IC §§ 14-25-13-1 *et seq.*, Michigan Compiled Laws, MCL §§ 324.32101 *et seq.*, Minnesota Statutes, MS §§ 1.21 *et seq.*, New York Environmental Conservation Law, ECL §§ 21-0901 *et seq.*, Ohio Revised Code, ORC §§ 6161.01 *et seq.*, Pennsylvania Statutes, 32 PS §§ 817.1 *et seq.*, and Wisconsin Statutes, WS §§ 14.78 *et seq.*

²⁰ Convention on Great Lakes Fisheries between the United States of America and Canada, signed at Washington September 10, 1955, US DOS Treaties and International Agreements Series, TIAS 3326.

clear mandate for strong preventative action. The fact that they have accomplished as much as they have, probably more than in any other region in the world, despite the complexities of the problem, is only a testament to their work. This study is intended to help make their work a little easier in the future.

§ 303. Research questions

The plain language of a statute, however theoretically comprehensive in its terms, may overlook basic practical problems. Albeit that a state agency may have general authority to prohibit the importation of a specified set of organisms, how does the agency identify potential imports, obtain scientific review of the threat, and conduct inspections across a wide variety of economic activities ranging from aquaculture to aquaria to bait buckets? Is there a clear mandate for the agency to act? Is there a record-keeping and inspection system – the mundane but essential details of a regulatory regime – to allow effective action? Is there a basis for regional coordination of policy, and for making that regional policy legally effective?

The following analysis is broken down into several categories – general water pollution, ballast water, conservation and fishing (the main focus of state and provincial programs), bait, aquaria, weeds and zebra mussels, marine sanitation, and intergovernmental coordination – which are not entirely exclusive. As far as they are relevant to each category being discussed, the analysis looks at the following important elements of public policy reflected in the statutes and regulations:

(a) *Scope of regulation.* What organisms and uses of those organisms are subject to regulation? Does the law cover game fish, all fish, or other aquatic organisms? Does the law cover commercial uses, intentional introductions, importation, or any possession of a controlled species?

(b) *Statutory standards.* Is there a clearly articulated legislative policy on exotics? Or, are exotics at best an afterthought of legislation focused on other goals? Are there clear statutory standards for determining which species are to be allowed, prohibited, or otherwise subject to regulation? How strong are any such standards in giving the administrative agency the authority to protect against new introductions? What specific considerations and presumptions are stated, and how relevant are they to development of practical controls?

(c) *Enforcement mechanisms.* Are there provisions, in statute and regulation, for effective enforcement? Specifically, are there (1) required procedures for bringing new species to the attention of the agency, (2) record-keeping requirements, (3) authorities and mandates for regular inspections by the administrative agency, (4) references to scientific or professional protocols for addressing highly technical issues such as control of disease or genetic modifications in aquaculture, (5) clear allocations of authority between different

agencies and provisions for coordination of policy on exotics, or (6) provisions for regional coordination?

§ 310. Water pollution statutes

§ 311. General observations on water pollution statutes

All of the US jurisdictions in the Great Lakes have general prohibitions of water pollution which could theoretically be extended to cover “biological pollution” from exotics. The statutory structure in Canada and Ontario is somewhat more complicated. Half of the Great Lakes states have general language which refers to the biological effects of pollution. The other half of the Great Lakes states (and the US federal government) have general language which refers to biologicals as a source of pollution as well. And one of these, New York, specifically mentions “ballast.”

So far, however, none of the administrative agencies with responsibility for enforcing these general anti-pollution statutes have taken advantage of that logic. Language which can be interpreted to cover the subject in theory is not the same thing as an explicit legislative mandate, and it requires a brave agency or court to institute a whole new area of regulation by an act of pure logic (although a court will be inclined to support a strong lead by an agency) no matter how logical the literal reading of the statute might be. There appears to be no case law on the issue of whether or not exotic species are properly classified as “pollution,” and the question is one which has just begun to arise in the discussions of legal commentators.²¹

This might be thought to be a purely theoretical issue, given the somewhat more specific statutory provisions generally available for use in the conservation statutes of all the same jurisdictions (discussed in § 330 below). But there are some important qualifications and limitations in many of those statutes, and the agencies which enforce the general pollution statutes often have stronger administrative sanctions at their command. There is also basic political issue here. It may be important, as a matter of principle, to achieve recognition of the concept that exotics are a form of pollution.

The peculiar nature of the aquatic biological threat requires a brief digression into the legal metaphysics of “pollution” if the force of general water pollution statutes is to be invoked against it. The organisms which are a threat live in water, and are natural (or naturalized) inhabitants of the original water picked up by the ballast tank of a commercial vessel, the bilge of a recreational boat trailered between lakes, or a bait bucket. Is the

²¹ The question, “are nonindigenous species ‘pollutants?’” was recently raised but not answered in Professor Rodger’s textbook discussion of the definition of pollution. William H. Rodgers, Jr., *Environmental Law*, 2nd Ed. 1997 Pocket Part Supplement (St. Paul MN: West, 1994), § 4.5, p. 300, note 1 (supplement). Chopped up native fish were acknowledged to be “biological material,” under the Clean Water Act, in dicta in *National Wildlife Federation v. Consumers Power Co.*, 862 F2d 580 (6th Cir. 1988).

transmission of natural water from one place to another “pollution”? Sometimes not. A line of cases decided by the US federal courts under the Clean Water Act²² (which have weight in interpreting analogous state statutes) have held that an industrial operation, such as a hydroelectric project, cannot be charged with “adding” a pollutant by simply transferring water from one body to another, even though the source water may contain some contaminants unwanted in the receiving water.²³

But there are other federal cases holding that a human agency has “added” a “pollutant” when moving natural materials from one part of an aquatic system to another, such as by dredging up spoils with the propellers of a tug, moving rock fill, dirt, and organic debris from the bottom of a river, or moving indigenous materials from one part of a riverbed to another in the course of channel maintenance work.²⁴ In this new area of the law, not yet litigated, the fact that the water and organic materials are moved from one distinct aquatic system to another, whether from the Mediterranean to the Great Lakes, or from one inland lake to another inside Michigan, will likely be sufficient for the courts to hold that there has been an anthropogenic “addition” of a “pollutant.”

§ 312. The federal governments

United States. A large coalition of environmental groups in the United States (including Great Lakes United and other groups in the region) has just petitioned the US Environmental Protection Agency (EPA)²⁵ to revoke what they consider an illegal exemption of ballast water from the application of the Clean Water Act.²⁶ Subject to permits from EPA and other

²² 33 USC §§ 1251-1376.

²³ *National Wildlife Federation v. Gorsuch*, 693 F2d 156 (DC Cir. 1982); *National Wildlife Federation v. Consumers Power Co.*, 862 F2d 580 (6th Cir. 1988). See also a state court of appeals case holding that saltwater is not a “pollutant.” *United States v. State Water Resources Control Board*, 182 Cal. App. 3rd 82, 124 (1st Dist. 1986).

²⁴ *United States v. M.C.C. of Florida, Inc.*, 772 F2d 1501(11th Cir. 1985), cert. granted and vacated 481 US 1034, rehearing on unrelated issue 863 F2d 802 (1989); *United States v. Banks*, 873 F. Supp. 650 (SD Fla. 1995); *United States v. Zanger*, 767 F. Supp. 1030 (ND Cal. 1991). Also, in the *National Wildlife Federation* case cited above, the federal district court (trial court level) had held that turning live fish into dead fish during the use and transfer of the water was the creation of “pollution.” That concept actually survived the overruling of the district court by the circuit court of appeals on the grounds that such “pollution” was not “added” to the water, which is also required for the pollution to be actionable under EPA’s interpretation of the Clean Water Act. *National Wildlife Federation v. Consumers Power Co.*, 657 F. Supp. 989 (WD Mich. 1987), reversed 862 F2d 580 (6th Cir. 1988).

²⁵ Craig N. Johnson, Attorney for Pacific Environmental Advocacy Center, letter to Carol Browner, Administrator, US EPA, “Petition for repeal of 40 CFR § 122.3(a)” (January 13, 1999). The groups joining in the petition are Northwest Environmental Advocates, San Francisco Bay Keeper, Center for Marine Conservation, Chippewa-Ottawa Treaty Fishery Management Authority, People for Puget Sound, Great Lakes United, Dogwood Alliance, Great Lakes Sport Fishing Council, Pacific Coast Federation of Fisherman’s Associations, Coastal Waters Project, Friends of San Juan, Association of California Water Agencies, Quoddy Spill Prevention Group, and Delta Keeper.

²⁶ 33 USC §§ 1251 *et seq.*

exceptions, the Clean Water Act prohibits “the discharge of any pollutant.”²⁷ The statute contains a long list of specific materials, such as “solid waste...sewage...chemical wastes....” and, among these, “biological materials.”²⁸ EPA, however, has by regulation exempted a “discharge incidental to the normal operation of a vessel” from the permitting requirements which would otherwise apply to ballast by virtue of these provisions.²⁹

Unless EPA decides to grant the petition, we could soon see a suit against EPA to test whether or not the agency has exceeded its administrative discretion.³⁰ Among other things, EPA might argue that the enactment of the specific legislation on ballast in NISA³¹ evidences a Congressional intent to regulate ballast under the provisions of that more specific statute, subject to all its limitations and qualifications, rather than under the general terms of the Clean Water Act. Or EPA might amend the regulation (voluntarily, or under the compulsion of litigation) to provide for the granting of discharge permits to vessels acting in compliance with NISA. NISA contains clauses providing that regulations and guidelines issued under that act controlling ballast water shall “not affect or supercede any requirements or prohibitions pertaining to the discharge of ballast...under the Federal Water Pollution Control Act [Clean Water Act]....”³² It is not clear whether this was intended to indicate an intent to have exotics in ballast water regulated under the Clean Water Act, or just to indicate that no provision under NISA was intended to permit discharges of ballast containing oils or chemicals always regulated under the Clean Water Act. The later interpretation is implied by the legislative history.³³

Canada. The Canadian Environmental Protection Act³⁴ authorizes the “Governor in Council” (functionally the federal cabinet), subject to advice from a federal-provincial

²⁷ 33 USC § 1311.

²⁸ 33 USC § 1362(6). Chopped up native fish were clearly acknowledged to be such “biological material,” under the Clean Water Act, in dicta in *National Wildlife Federation v. Consumers Power Co.*, 862 F2d 580 (6th Cir. 1988).

²⁹ 40 CFR § 122.3(a).

³⁰ EPA, as the primary agency charged with enforcement of the Clean Water Act by Congress, is accorded some deference by the courts in construing what types of activities Congress intended to have regulated under the act. *National Wildlife Federation v. Consumers Power Co.*, 862 F2d 580 (6th Cir. 1988). But that does not extend to an interpretation which conflicts with the plain language of the statute. *Chevron v. Natural Resources Defense Council*, 467 US 837 (1984).

³¹ National Invasive Species Act (popular name) at 16 USC §§ 4701 *et seq.*

³² 16 USC § 4711(b)(2)(C) and (c)(2)(J).

³³ The Senate report explained this provision by saying that “Ships carrying oily ballast would be exempted from ballast water management regulations to avoid discharge of chemically contaminated ballast on the high seas. However, ships carrying oil ballast would not be exempted from ballast treatment requirements directed at removing chemical contamination under the Clean Water Act or other federal laws.” Senate Environment and Public Works Committee, Senate Report 101-523, S 2244 (October 11, 1990), p. 6, 1990 USCCAAN 6455, 6450. The text of S 2244, the Senate version of the National Aquatic Nuisance Species Act of 1990, was substituted into HR 5390 before HR 5390 was passed as the final act, Public Law 101-646 (November 29, 1990).

³⁴ Revised Statutes of Canada, RS Chapter C-15.3.

advisory committee, to regulate “toxic substances” listed by the ministries.³⁵ A “substance” is “any distinguishable kind or *organic* of inorganic matter, *whether animate or inanimate*,”³⁶ and “a substance is toxic if it is entering or may enter the environment...under conditions...having or that may have an immediate or long-term harmful effect on the environment...constituting...a danger to the environment on which human life depends...or...to human life or health.”³⁷

Canadian federal legislation on the fisheries (also discussed along with other conservation statutes in § 330 below) changes the focus from human health to fish habitat. The Fisheries Act prohibits the “deposit” of any “deleterious substance,”³⁸ which includes “any substance that...would degrade or alter or form part of a process of degradation or alteration of the quality of that water so that it is rendered or is likely to be rendered deleterious to fish or fish habitat or to the use by man or fish that frequent that water,”³⁹ in “water frequented by fish.”⁴⁰ It also provides that no one shall “throw overboard *ballast*, coal ashes, stones or other prejudicial or deleterious substances in any river, harbour or roadstead, or in any water where fishing is carried on.”⁴¹

Although general protection of the environment is a responsibility shared between the provincial and the federal governments in Canada, regulation of shipping is very much within the particular purview of the federal government.⁴² The (Canadian) Shipping Act⁴³ has long had general prohibitions on pollution from vessels which, within the maritime area, are as broad in their terms as the US Clean Water Act. The Governor in Council has general regulatory authority over any “pollutant” from shipping,⁴⁴ and a pollutant is defined as “any substance that, if added to any waters, would degrade or alter or form part of a process of degradation or alteration of the quality of those waters to an extent that is detrimental to their use by man or by any animal, fish or plant that is useful to man.”⁴⁵ There was for some time consideration, inside Transport Canada and DFO, of promulgating a regulation

³⁵ Canadian Environmental Protection Act, Revised Statutes of Canada, RS Chapter C-15.3, § 34.

³⁶ Canadian Environmental Protection Act, *supra*, § 3(1) (emphasis added).

³⁷ Canadian Environmental Protection Act, *supra*, § 11.

³⁸ Canadian Fisheries Act, Revised Statutes of Canada, RS Chapter F-14, § 36(3).

³⁹ Canadian Fisheries Act, *supra*, § 34(1)(a).

⁴⁰ Canadian Fisheries Act, *supra*, § 36(3).

⁴¹ Canadian Fisheries Act, *supra*, § 36(1)(a) (emphasis added).

⁴² The British North America Act, the first of thirty or so statutes which make up the “constitution” of Canada, gives the federal government primacy in the regulation of navigation and shipping. British North America Act of 1867 (United Kingdom), 30-31 Victoria, Chapter 3, § 91(10). Also, because of the international import of shipping, the Shipping Act is considered to take priority in any conflicts with the Fisheries Act, discussed in § 330 below, which is administered in large part by the provinces. This researcher is not qualified to venture an opinion on the question of whether or not any provincial regulation of shipping is preempted by the federal law or constitution in Canada.

⁴³ Revised Statutes of Canada, RS Chapter S-9.

⁴⁴ Canadian Shipping Act, Revised Statutes of Canada, RS Chapter S-9, § 657.

⁴⁵ Canadian Shipping Act, *supra*, § 654. “Substance” is not further defined in the Shipping Act and it is not clear whether or not definitions in the Environmental Protection Act and the Fisheries Act would apply.

specifically including ballast as a “pollutant” under these provisions. Instead, the government obtained an amendment to the Shipping Act by the Parliament, on October 31, 1998, which gave the government specific regulatory authority over ballast water. (See § 214 above.)

§ 313. Great Lakes states

Biological effects in Michigan, Illinois, Indiana, and Pennsylvania. Four of the Great Lakes states have broad language or definitions in their general pollution statutes which, while not specifically mentioning biologicals or ballast water as a *source* of pollution, can be read to include it by way of mentioning biological effects in general definitions of pollution. Michigan prohibits the discharge of “a substance that...may become injurious to...fish, aquatic life, or plants...or whereby the value of fish...may be destroyed.”⁴⁶ Very similar language is used in Illinois, Indiana, and Pennsylvania. Illinois prohibits “the discharge of any contaminants...so as to cause or tend to cause water pollution”⁴⁷ and defines “water pollution” as “such alteration of the physical, thermal, chemical, biological or radioactive properties of any waters...”⁴⁸ Indiana prohibits the discharge of any “deleterious substance,” which includes a substance which “Destroys or jeopardizes any beneficial animal, fish or vegetable life in the water.”⁴⁹ Pennsylvania prohibits any “contamination” which, among other things, may be “injurious” to “fish or other aquatic life,” or “contamination by alternation of...biological properties.”⁵⁰ These provisions mention aquatic life, but focus on biological *effects* rather than biologicals as *agents* of pollution, thus leaving open an argument that the legislatures may not have intended to authorize the regulation of biological contaminants through these statutes.

Biologicals as a source of pollution in Minnesota, Wisconsin, Ohio, and New York. Three states, Minnesota, Wisconsin, and New York, expressly list “biological materials” as pollutants in their general water pollution statutes. One other state, Ohio, accomplishes the same thing through incorporation by reference to the US federal law. New York specifically mentions “ballast” as a source of pollution.

Minnesota mentions “biological materials” in a list of “other wastes” such as garbage, offal, solid waste, sewage, sludge, etc.⁵¹ That leaves open the argument that live organisms which still have value to someone are not “waste,” but it would certainly include living organisms in either ballast water or bait buckets disposed of at the end of their usefulness to those who had them in their possession. Minnesota is the one state to have enacted a

⁴⁶ Michigan Compiled Laws, MCL § 324.3109.

⁴⁷ Illinois Compiled Statutes, 415 ILCS § 5/12(a).

⁴⁸ Illinois Compiled Statutes, 415 ILCS § 5/3.55.

⁴⁹ Indiana Code, IC § 16-41-24-1.

⁵⁰ Pennsylvania Statutes, 35 PS § 691.401.

⁵¹ Minnesota Statutes, MS § 115.01, subdivision 9.

legislative scheme specially designed to control exotics.⁵² That would seem to make questions about the application of the general prohibition irrelevant, except that there are some limitations on the enforcement of the special-purpose exotics law. (See § 334 below.)

Wisconsin defines “pollutant” by a similar enumeration of specific substances which includes “biological materials.”⁵³ New York statutes refer to both “biological materials” and “organic” matter as pollutants.⁵⁴ Also, it is the one state in the region to actually mention “ballast” by name.⁵⁵ (See § 320 below.)

Ohio prohibits pollution of the water by “sewage, industrial waste, or other wastes.”⁵⁶ “Other wastes” is defined by another detailed list of specific substances such “garbage” and “offal” among other things.⁵⁷ This list does not include biological materials. But the same subsection of the statute goes on to include as other wastes “any other ‘pollutants’ or ‘toxic pollutants’ as defined in the ‘Federal Water Pollution Control Act’ that are not sewage or industrial wastes.”⁵⁸ That thereby incorporates by reference the US federal definition discussed above, which includes mention of “biological materials.”⁵⁹

§ 314. No inclusion of biologicals in the Ontario water pollution statute

The (Ontario) Environmental Protection Act provides that “No person shall discharge into the natural environment any contaminant...in excess of that prescribed by the regulation,”⁶⁰ and would thus seem to cover biological contamination. But “contaminant” is specifically defined as “any solid, liquid, gas, odour, heat, sound, vibration, radiation or combination of any of them that may cause an adverse effect,”⁶¹ thereby covering just about anything imaginable except living organisms.

§ 320. State laws on Ballast water

Current and future legal controls on exotics in ballast water are discussed in detail in Part II above (§ 200). And, as noted above, ballast water has just been added, in 1998, as an explicit subject of regulation in the (Canadian) Shipping Act as well as in the US NISA. To

⁵² Minnesota Statutes, Chapter 84D, MS §§ 84D.01 *et seq.*

⁵³ Wisconsin Statutes, WS § 283.01.

⁵⁴ New York Environmental Conservation Law, ECL §§ 17-0105, subsection 17 (“biological materials”) 17-0501 (“organic or inorganic matter”).

⁵⁵ New York Environmental Conservation Law, ECL § 17-0105, subsection 17.

⁵⁶ Ohio Revised Statutes, ORS § 6111.04.

⁵⁷ Ohio Revised Statutes, ORS § 6111.01(D).

⁵⁸ Ohio Revised Statutes, ORS § 6111.01(D).

⁵⁹ 33 USC § 1362(6). There is no difficulty with the technicality of what the federal act is called because Congress provided in some of the underlying legislation that “this Act may be cited as the ‘Federal Water Pollution Control Act’ (commonly referred to as the Clean Water Act).” Public Law 95-217, § 518 (December 27, 1977).

⁶⁰ Ontario Environmental Protection Act, Revised Statutes of Ontario, RS Chapter E.19, § 6.6.(1).

⁶¹ Ontario Environmental Protection Act, *supra*, § 1.1.(1).

date, however, most of the state legislatures have not evidenced an express intent to impose legal controls on ballast water. The State of New York is unique among all the Great Lakes states in actually mentioning the stuff by name in its general pollution statute. The (New York) Environmental Conservation Law provides that:

“Pollution” means dredged spoil, solid waste, incinerator residue, sewage, garbage, sewage sludge, munitions, chemical wastes, *biological materials*, radioactive materials, heat, wrecked or discarded equipment, rock, sand and industrial, municipal, and agricultural waste discharged into the water; and *ballast* which may cause or might reasonably be expected to cause pollution of the waters of the state in contravention of the standards adopted as provided herein.⁶²

The context implies that ballast was mentioned as a potential source of oily waste rather than biologicals, but the language clearly creates authority for the New York Department of Environmental Conservation to regulate it for the purpose of controlling exotics. No such regulations appear in the relevant part of the New York Code of Rules and Regulations.⁶³

The Minnesota Chapter 84D on Harmful Exotic Species, discussed in detail below (§ 334), is also worthy of special note here. It gives the Department of Natural Resources general authority to control exotic “wild animal species or plant species,”⁶⁴ and prohibits the introduction of any unlisted species without the permission of the department.⁶⁵ An operator of a ship would theoretically be liable for a misdemeanor for introduction of an unlisted exotic, but, subject to a special provision on escapes, only if they fail to notify the state and make a reasonable effort to recapture it 48 hours after learning of its escape.⁶⁶

Although the Minnesota chapter has specific provisions for the control of personal watercraft, it does appear to be designed to address ballast water in shipping. “Watercraft” subject to regulation and inspection does include any “contrivance used or designed for navigation on water,”⁶⁷ But the substantive provisions on “watercraft” address boats being moved from lake to lake on trailer, not commercial shipping discharging ballast.⁶⁸ That said, it should be noted that the Minnesota statute is, within the limits of traditional state jurisdiction, a far broader authority for the regulation of exotics than enacted by any other

⁶² New York Environmental Conservation Law, ECL § 17-0105, subsection 17 (emphasis added). The Department of Environmental Conservation is authorized to promulgate standards by ECL § 17-0301, and all pollution in violation of those standards is prohibited by ECL § 17-0501.

⁶³ See Department of Environmental Conservation Water Regulations in New York Code of Rules and Regulations at 6 NYCRR Chapter V, Subchapter D, Part 595.

⁶⁴ Minnesota Statutes, MS § 84D.01.

⁶⁵ Minnesota Statutes, MS § 84D.06.

⁶⁶ Minnesota Statutes, MS §§ 84D.06 (prohibition), 84D.13, subdivision 2 (penalty), and 84D.08 (b) (exemption). The exemption is quoted and discussed in detail below, § 334.

⁶⁷ Minnesota Statutes, MS § 84D.01, subdivision 19.

⁶⁸ Minnesota Statutes, MS § 84D.10.

state – and is, in many respects, far more comprehensive and systematic than the analogous US federal legislation.⁶⁹

Also, a bill recently introduced in the California Assembly⁷⁰ would make California the first state to clearly address ballast water in a comprehensive manner. (See § 210 above.)

§ 330. Conservation statutes

§ 331. General observations on conservation statutes

All of the jurisdictions in the Great Lakes region have some sort of provision for the control of the importation or propagation of fish as part of their conservation statutes (statutes concerning protection of fish, wildlife, and other natural resources). But many of these, like the general pollution statutes, are not clearly focused on the problem of exotic introductions. They are also highly idiosyncratic in their terms. Two of them (Michigan and New York) are similar to the typical statutes discussed in the 1991 nationwide survey by the Federal ANS Task Force (see § 302 above) in that they only address fish or fish and their eggs in their conservation statutes.⁷¹ Several of the states also have miscellaneous provisions on weeds or zebra mussels (see § 370 below).

Even those statutes which provide broad authority typically lack standards, procedures for enforcement, and an overall sense that the legislature is providing the conservation agency responsible for enforcing the statute with a strong mandate to prevent introductions of exotics. (The statutes often indicate a much stronger emphasis on the prevention of export of native species from the state.) It is therefore not surprising to find that many of the conservation agencies have not promulgated regulations which implement the full scope of their statutory authority to control exotics.

The Minnesota Chapter 84D on Harmful Exotic Species⁷² is the one great exception to this overall picture. And it is important that the Minnesota Department of Natural Resources has implemented that legislative mandate with extensive regulations.⁷³ That scheme is discussed in detail below (§ 334).

§ 332. The federal governments

United States. The primary US federal conservation statute applicable to exotics is the Lacey Act, originally enacted in 1909, and administered by the US Fish and Wildlife Service

⁶⁹ NISA, the National Invasive Species Act, 16 USC §§ 4701 *et seq.*, discussed in § 213 above, and the Lacey Act, 18 USC § 42 and 16 USC §§ 3371 *et seq.*, discussed in § 332 below.

⁷⁰ California Assembly Bill, AB 703, introduced by Assembly Member Lempert on February 24, 1999.

⁷¹ Pennsylvania also regulates “fish,” but defines “fish” to include all aquatic organisms.

⁷² Minnesota Statutes, MS §§ 84D.01 *et seq.*

⁷³ Minnesota Rules, Chapter 6216.

(USFWS) in the US Department of the Interior. This act and its administration by the USFWS follows the general pattern, evident in many states, of very general statutory authority, without clear standards or strong mandates, accompanied by tentative implementation by the responsible agency.

Its terms are broad in scope. Part of the act, a section in the US Criminal Code, provides that “importation into the United States...of the zebra mussel...*and such other species* of wild mammals, wild birds, fish (including mollusks and crustacea), amphibians, reptiles, brown tree snakes, or the offspring or eggs of any of the foregoing *which the Secretary of the Interior may prescribe by regulation to be injurious to human beings, to the interests of agriculture, horticulture, forestry, or to the wildlife or the wildlife resources* of the United States, is hereby prohibited.”⁷⁴ Under this provision, the Department of the Interior has authority to prohibit a wide variety of aquatic organisms from being imported into the United States, although the terms of this statute do not extend to plants or microbes. (A long list of other provisions in the US Code gives the Animal and Plant Health Inspection Service (APHIS) in the US Department of Agriculture authority to control the importation of various plants, insects, parasites, and animal pathogens.⁷⁵) Does this part of the Lacey Act authorize the USFWS to prohibit the importation of any exotic not otherwise authorized – thereby creating a regulatory “clean list” or “green list” of approved species? Given the documented damages done by exotics and the substantial nature of the threat of future invasions (see Part I above), it would seem that there is a reasonable basis for categorizing all new imports as presumed “injurious” until otherwise proven.

Other parts of the Lacey Act contained in Title 16 of the US Code on Conservation make it illegal “to import, export, transport, sell, receive, acquire, or purchase in interstate or foreign commerce...any fish or wildlife taken, possessed, transported or sold in violation of any law or regulation of any State or in violation of any foreign law, or...any plant...”⁷⁶ This “piggyback provision,” putting the weight of the US federal government behind the conservation statutes of the states, has been viewed by the Department of Interior and the Fish and Wildlife Service as the primary mandate of the Lacey Act.

Although there seems to be statutory authority to set nationwide regulatory standards for importation of exotic fish and wildlife under the provision in Title 18, DOI and USFWS have shied away from any such program by long-standing policy.⁷⁷ In the words of one USFWS official, “the federal government’s responsibilities are to support state or foreign regulations when such regulations are violated. Regulations that control the introduction of

⁷⁴ US Code, 18 USC § 42(a)(1) (emphasis added).

⁷⁵ Federal Plant Pest Act, 7 USC §§150aa-150jj, Plant Quarantine Act, 7 USC §§ 151-164a, 167, Federal Seed Act, 7 USC § 1581, Federal Noxious Weed Act, 7 USC §§ 2801-2814, provisions on grasshopper control at 7 USC § 148f, on quarantine of imported animals at 21 USC §§ 102-105, on contagious diseases at 21 USC §§ 111-114a-1, and many other specific provisions on specific pests and animal diseases in the US Code.

⁷⁶ 16 USC § 3372(a)(2).

⁷⁷ A very limited set of regulations controlling certain fish and other aquatic organisms, particularly salmonids, promulgated under 18 USC § 41, are in the Code of Federal Regulations at 40 CFR § 16.13.

fish into the open waters of the United States are each state's responsibility."⁷⁸ It is not clear how this is reconciled with the President's executive orders on exotics, issued in 1997 and 1999, which directed federal agencies to take action to restrict introduction within the limits of their authority.⁷⁹ The Secretary of the Interior recently commented on the obvious need for a national "green list," but asserted that the DOI maintained only a "red list" of species already proven to be harmful because that was the only thing authorized by the federal statutes.⁸⁰

Canada. The primary conservation statute is the (Canadian) Fisheries Act.⁸¹ The act is enforced at the federal level by both Environment Canada and the Department of Fisheries and Oceans (DFO), now including the Canadian Coast Guard (which does not, however, have general law enforcement authority), and also by the provincial ministries of natural resources. The Fisheries Act says very little about exotic species in so many terms, but gives the government broad authority to issue regulations "respecting the conservation and protection of fish" and the "transporting, possession and disposal of fish."⁸² More specific provisions in the Ontario Fishery Regulations,⁸³ issued under the Fisheries Act, provide authority for controls on exotics at the provincial level.

There is a complex and fuzzy division of authority between the federal and provincial governments. Theoretically, the federal government has exclusive power to "regulate" fisheries,⁸⁴ but the provinces have a "proprietary" interest in the protection of the fisheries as a natural resource, and the federal government has deputized the provincial ministries to carry much of the Fisheries Act, particularly with regard to the freshwater fisheries of the Great Lakes. (As a matter of practical policy, it is analogous to the deference of the US Fish and Wildlife Service to the US states.) The Canada-Ontario Agreement of 1994⁸⁵ provides for sharing of responsibilities for exotics within the context of Lakewide Management Plans under the Great Lakes Water Quality Agreement of 1978/1987. Both governments have committed to develop and implement "joint federal and provincial plans to control the introduction of undesirable species and mitigate the negative impacts of non-indigenous nuisance species, such as zebra mussels and ruffe. The federal government will continue the control program on sea lamprey."⁸⁶

⁷⁸ James P. Clugston, Director of USFWS National Fishery Research Laboratory, "Strategies for Reducing Risk from Introductions of Aquatic Organism: The Federal Perspective," *Fisheries*, vol. 11, no. 2 (March-April 1986) pp. 26-29, at 28-29.

⁷⁹ OE 11988, Exotic Organisms (May 24, 1977), superceded by EO 13112, Invasive Species (February 3, 1999), 64 *Federal Register* 6183 (February 8, 1999).

⁸⁰ Bruce Babbitt, Secretary of the Interior, interview on National Public Radio, "Talk of the Nation Science Friday" (February 2, 1999), Hour 2.

⁸¹ Revised Statutes of Canada, RS Chapter F-14.

⁸² Revised Statutes of Canada, RS Chapter F-14 § 43(b)-(c).

⁸³ Ontario Regulation 89-93.

⁸⁴ *Attorney General of Canada v. Attorney General of Ontario*, AC 700 (1898).

⁸⁵ The Canada-Ontario Agreement Respecting the Great Lakes Basin Ecosystem, 1994. (Effective from April 1, 1994 to March 31, 2000.)

⁸⁶ Canada-Ontario Agreement, *supra*, § 4.3.

§ 333. Great Lakes states and the Province of Ontario

All of the eight Great Lakes states and the Province of Ontario provide some sort of general authority for their conservation agencies to control introductions of exotic fish. In Michigan and New York, the authority to control introductions is limited to fish. In Wisconsin and Indiana, it extends to fish and “other wild animals.” In the other four states, the authority extends to other forms of aquatic life as well as fish. In Ontario, the authority covers fish, shellfish, crustaceans, and marine mammals as well as other wildlife.

Only one state, Minnesota, has a comprehensive set of provisions on exotics, MS Chapter 84D on Harmful Exotic Species. This chapter, which has wide coverage over all animals and plants, provides an array of authorities, and expresses a strong mandate for positive action on the part of the Minnesota Department of Natural Resources, is far in advance of anything else enacted in the region. Michigan and other states are discussed first below. The special Minnesota chapter on exotics is discussed in detail at § 334.

Control over introductions of fish in Michigan and New York. A Michigan statute prohibits the importation of any live *game* fish or viable eggs without a license from the Department of Natural Resources,⁸⁷ and then goes on to provide that “The department may promulgate rules...to prohibit or restrict the importation of...any *other* species of *fish* when the importation of that species would endanger the public fishery resources...”⁸⁸ That language may be taken to be the statement of a criterion for evaluation of new species. It may be a bit narrow. But it is difficult to envision a fish that has potential to cause other ecological disruptions without also having potential to endanger the public fisheries.

The Michigan statutes provide little else in the way of standards for controls, except in the separate provisions in the Michigan Aquaculture Development Act⁸⁹ (discussed in § 344

⁸⁷ Michigan Compiled Laws, MCL § 324.45906.

⁸⁸ Michigan Compiled Laws, MCL § 324.45906 (emphasis added). It is possible to define “fish” to include other aquatic life, as is done in a special statutory definition in the Pennsylvania Fish and Boat Code, 30 PCS § 102, but that does not seem to be the case in Michigan. There is no special statutory definition of “fish” for MCL Part 324.459 (which includes MCL § 324.45906). A definition at MCL § 324.43503(1), in MCL Part 324.459 in the same general MCL Chapter 324, the Michigan Natural Resources and Environmental Protection Act, says that “fish” “means all species of fish,” and that may be contrasted with another definition in the same part at MCL § 342.43502(1) which sets out the term “aquatic species” to mean “any fish, reptile, amphibian, mollusk, aquatic insect, or crustacea or part thereof.” Moreover, in the absence of a clearly applicable statutory definition, the general rule is to presume that the legislature used words in their common meaning. 73 American Jurisprudence 2nd Statutes § 206. In both common and biological dictionaries, a “fish” is an aquatic vertebrate. See entries on “fish” in William Morris, ed., *The American Heritage Dictionary of the English Language* (Boston: Houghton Mifflin, 1976) and Norah Rudin, *Dictionary of Modern Biology* (New York: Barron’s, 1997). The upshot is that “fish” are just “fish” in the Michigan Natural Resources and Environmental Protection Act.

⁸⁹ Michigan Compiled Laws, MCL §§ 286.871 *et seq.*

below), which are not technically guidance to the Michigan DNR.⁹⁰ Nor is there much in the statutes about mechanisms for bringing new species to the attention of the department, authority for inspection of major vectors, scientific protocols, or provisions (in the conservation statutes) for regional coordination.⁹¹ The statute does not provide clear authority for establishing a “green list” approach, prohibiting all species except those specifically approved, and Michigan DNR has not done so. (Its position is analogous to that of the USFWS under the Lacey Act, discussed in § 332 above.) Overall, especially considering the limitation of the authority to fish, it does not constitute a strong legislative mandate for the control of exotics. As may be expected, the implementing regulations promulgated by Michigan DNR are limited. One regulation provides for a system of permits and inspections to control disease in fish and eggs of salmonids.⁹² One other regulation simply requires a permit for the importation of certain other named species.⁹³

In New York, the situation is similar, with limited administrative implementation of the statute. A statute under the curious heading of “Liberation of fish, shellfish, and wildlife,” provides that “Fish or fish eggs shall not be placed in any waters of the state unless a permit is first obtained from the department...”⁹⁴ Although the Department of Environmental Conservation does have some regulations on aquaculture (discussed in § 340 below),⁹⁵ it has not put out any regulations to establish standards or procedures for controlling other introductions in its general regulations on fishing.⁹⁶

Control over fish and other wildlife in Wisconsin, Indiana, and Ontario. Wisconsin statutes provide that “No person may introduce, stock, or plant any fish in the waters of the state unless all of the following apply: 1. The person has a permit issued by the department [of natural resources]. 2. The fish have been certified by a qualified inspector to meet...fish health standards.... 3. The fish is not a species of lake sturgeon.”⁹⁷ Although this reads as though it may have been intended to apply only to aquacultural activities, it is not by its

⁹⁰ The standard for what species should be allowed into the state in the Aquaculture Development Act, Michigan Compiled Laws, MCL § 286.875(1), are very curious in that they are standards which the legislature is declaring to be applicable to its own enactment of a statutory list. Therefore those criteria cannot technically be relied upon by an agency – particularly the agency not charged with implementation of the Aquaculture Act – as legal justification for refusal to allow a party to import a new fish, except as a general expression of public policy of general persuasive weight with a court.

⁹¹ See the separate discussion of the Michigan Office of the Great Lakes, in the Department of Environmental Quality, in § 390 below.

⁹² Michigan Administrative Code, MAC R 299.1051 (1979). (“R” stands for “Rule.” In Michigan, the date of the last compilation of the rule is needed in order to find the yearbook printing the text.)

⁹³ Michigan Administrative Code, MAC R 299.1052 (1979).

⁹⁴ New York Environmental Conservation Law, ELC § 11-0507, subsection 1. Subsection 3, in the same section, says that “No person shall willfully liberate within the state any wildlife except under permit from the Department.” But “wildlife,” for purposes of Article 11 of the ELC, “means wild game and all other animal life existing in a wild state, *except* fish, shellfish, and crustacea.” ELC § 11-0103-6-a (emphasis added).

⁹⁵ New York Code of Rules and Regulations, Title 6 NYCRR Parts 35, 40, 50, and 150.

⁹⁶ New York Code of Rules and Regulations, Title 6 NYCRR Part 10.

⁹⁷ Wisconsin Statutes, WS § 29.736(2)(a).

terms so limited. (Also, this may be contrasted with a section appearing immediately before it in the code, which does specify a permit requirement for “introduction for the purpose...of use as bait or rearing in a fish farm,”⁹⁸ thus making this section redundant unless it is intended to be of more general application.) An implementing regulation promulgated by the DNR, which presumably combines the authority of this statutory section with other statutory authority over birds and wildlife,⁹⁹ establishes slightly more specific requirements for examination of exotics than are common for implementation of such general authority:

NR 19.05 Release and importation of fish and wildlife

(1) It shall be unlawful for any person...to bring into the state to introduce or release or cause to be introduced or released in any manner...any variety of species of wild animal, hybrid of a wild animal, any bird or fish or the eggs or spawn thereof, without first applying for in writing and receiving a written permit.... Such permits shall be granted only after the department...investigates and inspects such wild animals, hybrids of wild animals, birds or fish or the eggs or spawn thereof as it deems necessary to determine that such introduction or release will not be detrimental in any manner to the conservation of the natural resources of the state. Inspection may include removal of reasonable samples of fish and eggs for biological examination....¹⁰⁰

“Animals” are not specifically defined. But “wild animal” is defined in the statutes as “any mammal, bird, fish, or other creature of wild nature endowed with sensation and the power of voluntary movement.”¹⁰¹ Although it is not very detailed, the regulation does at least make clear that there should be a careful examination of each exotic species, and that there is a standard of sorts, which is “will not be detrimental in any manner to the conservation of the natural resources.” This gives the DNR something to work with.

A separate statute, somewhat curious, gives the Wisconsin DNR authority to “remove or cause to be removed” fish which the DNR finds “detrimental” in designated waters.¹⁰² This is implemented by a regulation in which the DNR “finds that all fish species, strains or hybrids that are not indigenous to the waters of the state are detrimental fish in all waters of the state except where their presence is specifically permitted” and may be ordered removed from those waters.¹⁰³ But neither the statute nor the regulation indicates the means (or authorizes such things as the use of biocides or nuclear devices) necessary to accomplish this action.

⁹⁸ Wisconsin Statutes, WS § 29.735(1).

⁹⁹ Unlike the provisions in most administrative codes, the Wisconsin Administrative code provision discussed does not cite the specific statutory authority it is promulgated under.

¹⁰⁰ Wisconsin Administrative Code (DNR), WAC NR 19.05.

¹⁰¹ Wisconsin Statutes, WS § 29.001(90).

¹⁰² Wisconsin Statutes, WS § 29.424.

¹⁰³ Wisconsin Administrative Code (DNR), WAC NR 20.15(7).

Indiana prohibits any person from bringing into Indiana “any live fish...or any other living wild animal” for the purpose of “release or selling for release” without a permit from the Department of Natural Resources.¹⁰⁴ An “animal” is defined to include “all mammals, birds, reptiles, amphibians, fish, crustaceans, and mollusks,”¹⁰⁵ and the term “wild animal” is defined to mean “an animal whose species usually (A) lives in the wild; or (B) is not domesticated.”¹⁰⁶ Administrative regulations, promulgated by the Indiana Natural Resources Commission, prohibit the importation of exotic catfish or rudd without permit,¹⁰⁷ and provide generally that “a person must obtain a fish importation permit...before a person imports any live fish for sale or release,” except for fish to be used in aquaria or zoos.¹⁰⁸ Other provisions in the administrative regulations require permits for aquaculture and fish stocking (discussed in § 340 below). Indiana has little in the way of statutory standards, but the regulations do provide a few administrative standards for importation permits. An application must be submitted ten days in advance and “the applicant must establish that a fish to be imported: (1) is free from any communicable disease; (2) will not become a nuisance; and (3) will not damage a native wild species or a domestic species of animal or plant.”¹⁰⁹ Ten days is manifestly not sufficient time to evaluate the proposed importation of a new species of fish. It is of interest, however, that the Indiana regulation clearly puts upon the applicant the burden of proving that the fish will be benign.

The Ontario Fishing Regulations¹¹⁰ issued under the (Canadian) Fishing Act¹¹¹ provide that “Except as otherwise provided in the provincial Act, no person shall without the appropriate license...(a) ship or attempt to ship or transport live fish other than bait-fish; or (c) deposit or attempt to deposit live fish taken from one body of water into another body of water.”¹¹² Another section in the regulations also prohibits bringing any live bait into Ontario.¹¹³ “Fish” are defined in the Fisheries Act to include “shellfish, crustaceans, marine animals...and the eggs, sperm, spawn, larvae, spat and juvenile stages” of them.¹¹⁴ In addition to that, provisions in the Ontario Fish and Wildlife Conservation Act¹¹⁵ provide that “Except with the authorization of the Minister [of Natural Resources], a person shall not release wildlife or an invertebrate that has been transported into Ontario or has been propagated from stock that was transported into Ontario.”¹¹⁶ “Wildlife” means “an animal that belongs to a species that is wild by nature,” and “animal” means “a member of the class

¹⁰⁴ Indiana Code, IC § 14-22-25-2.

¹⁰⁵ Indiana Code, IC § 14-8-2-7.

¹⁰⁶ Indiana Code, IC § 14-8-2-318.

¹⁰⁷ Title 312 Indiana Administrative Code, 312 IAC § 9-6-7.

¹⁰⁸ Title 312 Indiana Administrative Code, 312 IAC § 9-10-15(a).

¹⁰⁹ Title 312 Indiana Administrative Code, 312 IAC § 9-10-15(b).

¹¹⁰ Ontario Regulation 89-93.

¹¹¹ Revised Statutes of Canada, RS Chapter F-14.

¹¹² Ontario Fishery Regulations 89-93, § 41(1)(b)-(c).

¹¹³ Ontario Fishery Regulations 89-93, § 10.1.

¹¹⁴ Canadian Fisheries Act, Revised Statutes of Canada, RS Chapter F-14, § 2.

¹¹⁵ Statutes of Ontario, Chapter 41.

¹¹⁶ Ontario Fish and Wildlife Conservation Act, Statutes of Ontario, Chapter 41, § 54.(1).

Mammalia (mammals), *Aves* (birds), *Reptilia* (reptiles) or *Amphibia* (amphibians), but does not include a human being.”¹¹⁷ “Invertebrate” is not defined. One way or another then, through this confusing mix of categories, Ontario seems to cover just about everything except exotic plants, algae, and microbes. (Agricultural weeds are subject to limited regulation under other statutes.) There do not seem to be any statutory or regulatory standards for which of these various creatures the Ontario Ministry of Natural Resources (OMNR) will approve for introduction except for some separate provisions on aquaculture (discussed below in § 340).

Controls over introduction of aquatic organisms in Illinois, Ohio, and Pennsylvania. In Illinois, Ohio, and Pennsylvania the statutes give the conservation agencies clear authority to control any introduction of almost all, if not all, aquatic organisms by grant of general regulatory authority over the topic. But in these states the situation may be characterized by the same observation made above about the lack of a strong legislative mandate – indicated by the absence of statutory or regulatory standards, procedures for review of new species, authority for inspections, scientific protocols, or provisions for regional coordination. This does not mean that the conservation agencies are lacking any such procedures. They typically have some sort of internal agency policies and procedures for reviewing proposed introductions. But those policies and procedures, not being enacted as statute or promulgated by public regulation, lack force of law.

Illinois prohibits the “release” of any “aquatic life” without permission of the Department of Natural Resources except for the release of *indigenous* aquatic life into wholly private waters, and also gives the DNR authority to promulgate regulations on possession, transport, and shipping of nonindigenous aquatic life.¹¹⁸ Illinois DNR has promulgated regulations referencing an exclusive list of species approved for importation into the state. But others will be considered on a case by case application, and there is no indication in the regulations of any standards, required protocols for scientific study or interagency and public consultation for approval of new species.¹¹⁹ Other sections in the administrative regulations¹²⁰ provide somewhat more detailed procedures for regulating aquaculture (discussed below in § 340).

Ohio also allows for control of all species by regulation. An Ohio statute provides that the Division of Wildlife (Department of Natural Resources) may permit or forbid or otherwise regulate “the receiving or any species of live wild animals for delivery within the state....”¹²¹ “Wild animals” is specifically defined to include “mollusks, crustaceans, aquatic insects [and] fish.”¹²² The Division of Wildlife has promulgated regulations saying

¹¹⁷ Ontario Fish and Wildlife Conservation Act, Statutes of Ontario, Chapter 41, § 1.(1).

¹¹⁸ Illinois Compiled Statutes, 515 ILCS § 5/10-100.

¹¹⁹ Title 17 of the Illinois Administrative Code, 17 IAC § 870.10.

¹²⁰ Title 17 of the Illinois Administrative Code, 17 IAC §§ 870.20 *et seq.*

¹²¹ Ohio Revised Code, ORC § 1533.31.

¹²² Ohio Revised Code, ORC § 1531.01.

that “It shall be unlawful for any person to possess, import or sell exotic species of fish or hybrids thereof for introduction or to release into any body of water that is connected to or otherwise drains into a flowing stream or other body of water that would allow egress of the fish into public waters, or waters of the state, without first having obtained permission of the wildlife chief, except as provided by this rule.”¹²³ Again, there is no indication in the regulations of any standards, required protocols for scientific study or interagency and public consultation for approval of new species.

In Pennsylvania, similarly, the Fish and Boat Code gives the Pennsylvania Fish and Boat Commission (PFBC) general authority to make regulations “concerning the transportation or introduction of, or importation into or within this Commonwealth or exporting of fish...or the disturbing of fish in their natural habitat.”¹²⁴ A related section in the code gives “fish” a special statutory definition which “includes all game fish, fish bait, bait fish, amphibians, reptiles and aquatic organisms.”¹²⁵ The authority which the PFBC previously had over aquaculture under other statutes has been repealed as part of a transfer of the supervision of aquaculture to the Pennsylvania Department of Agriculture under the Aquaculture Development Law enacted on October 16, 1998.¹²⁶ But the PFBC retains general authority over species approved for introduction under the section just quoted,¹²⁷ and requires that all imports except tropical fish be on an approved list.¹²⁸ Again, there is no indication in the regulations of any standards, required protocols for scientific study or interagency and public consultation for approval of new species.

§ 334. The Minnesota comprehensive chapter on control of exotics

General scheme. As noted above, Minnesota has a comprehensive regulatory scheme which classifies exotics into specific categories and, theoretically, controls all introductions.¹²⁹ The statute, Chapter 84D on Harmful Exotic Species, is far more comprehensive than any other state statute on the issue. Just as important, the statute is implemented by detailed regulations in which the DNR fleshes out specific procedures for examining new species and the purposes for which they are to be used. This includes, for example, a requirement that those wishing to handle a prohibited species for special purposes provide “a written contingency plan for eradication of recapture in the event of an unauthorized introduction of the prohibited exotic species.”¹³⁰ In addition, the Minnesota statute provides the Department of Natural Resources with a strong mandate for the

¹²³ Ohio Administrative Code, OAC Rule 1501: 31-19-01(E).

¹²⁴ Pennsylvania Fish and Boat Code, 30 PCS § 2101(c).

¹²⁵ Pennsylvania Fish and Boat Code, 30 PCS § 102.

¹²⁶ Pennsylvania Act 1998-94 (October 16, 1998), adding Title 3, Pennsylvania Consolidated Statutes, Part VI, Chapter 42, 3 PCS §§ 4201 *et seq.*

¹²⁷ Pennsylvania Administrative Regulations are generally at 58 Pennsylvania Code Chapters 71-73.

¹²⁸ Pennsylvania Administrative Regulations, 58 Pennsylvania Code §§ 73.1, 73.2.

¹²⁹ Minnesota Statutes Chapter 84D, MS §§ 84D.01 *et seq.*

¹³⁰ Minnesota Rules, MR Part 6216.0265, subdivision 5A(6).

establishment of a comprehensive administrative program, including strategic planning, educational programs, and regional coordination.

Defining the coverage of the Minnesota chapter on exotics. The subject is defined broadly in Minnesota. “Exotic species” subject to regulation under the statute include “a wild animal species or aquatic plant species that is not a native species.”¹³¹ It is not obvious why coverage is limited to *wild* animals. Is a new species of goldfish kept in aquaria or ornamental ponds covered? And there may be some question about what constitutes an “animal” or “plant.”¹³² They are not specifically defined in that chapter of the Minnesota statutes or the implementing regulations.¹³³ Courts will sometimes look to related enactments to indicate the intent of the legislature. Other Minnesota statutory sections dealing with the meaning of an “animal,” such as one under the chapter on “Animal Health” defining “animal” as “any cattle, horse, sheep, or mule” are obviously inapplicable.¹³⁴ Various “legal definitions” from case law around the states, interpreting a wide variety of statutes dealing with “animals,” are also unhelpful. Depending on the context, an “animal” has been defined as (a) any of “all living creatures not human” for purposes of property claims and conservation statutes, with one court noting that its natural and ordinary meaning refers to a member of the animal kingdom, (b) not including fish in a pollution statute, (c) including a duck for the purpose of a sodomy statute, (d) including a goldfish under a statute prohibiting the use of animals as prizes in contests, and (e) not including a fighting cock under a cruelty statute.¹³⁵ There is, however, another section in the Minnesota statutes on “plants” which may well be both relevant and helpful. The Minnesota Plant Pest Act, a statutory scheme which is similar in purpose to Chapter 84D on Harmful Exotic Species, specifically defines “plant” as “any living organism, consisting of one or more cells, which does not typically exhibit voluntary motion or possess sensory or nervous organs.”¹³⁶

More generally, the courts tend to look to commonly accepted meanings in the absence of a statutory definition or other indication that the legislature intended to employ a technical meaning.¹³⁷ But the “commonly accepted meanings” can quickly turn round to technical issues. Under “animal” and “plant,” dictionaries typically refer to biological classifications. For example, “Any organism of the kingdom Animalia” for “animal” and “Any organism of the vegetable kingdom” for “plant.”¹³⁸ Under the older two-kingdom

¹³¹ Minnesota Statutes Chapter 84D, MS § 84D.01, subdivision 5.

¹³² This discussion may be thought to beat these animals and plants to death, perhaps in violation of the cruelty statute mentioned. In fact, the question of the coverage of a statute controlling exotics can be extremely important when dealing with algae (such as *Pfiesteria piscicida*) which are protists, or fungi, protozoans, algae, bacteria (such as exotic strains of *E. coli* or cholera), or viruses.

¹³³ Regulations are at Minnesota Rules, MR Chapter 6216, with definitions at MR Part 6216.0200.

¹³⁴ Minnesota Statutes, MS § 35.821, subdivision 5.

¹³⁵ 3 Words & Phrases, “Animal” (1998 supplement).

¹³⁶ Minnesota Statutes, MS § 18.46.

¹³⁷ 73 American Jurisprudence 2nd Statutes § 206.

¹³⁸ William Morris, ed., *The American Heritage Dictionary of the English Language* (Boston: Houghton Mifflin, 1976).

scheme of taxonomy once dominant, that would have included any living thing.¹³⁹ Under the modern five-kingdom system of taxonomy now dominant, “animals” and “plants” would include everything alive except prokaryotes, protocists, and fungi.¹⁴⁰ In other words, it leaves out fungi, algae (protists), bacteria (prokaryotes), and viruses (not generally considered “alive,” at least as far as formal systems of taxonomy are concerned¹⁴¹). Also, any “pathogens and terrestrial arthropods regulated” under the Minnesota Plant Pest Act are specifically exempt from coverage under Chapter 84D on Harmful Exotic Species.¹⁴² The Planet Pest Act does not define “pathogen.” And what is actually “regulated” under that act may vary with administrative programs established by the Department of Agriculture. The upshot, therefore, is the Minnesota Chapter 84D on Harmful Exotic Species has doubtful coverage over fungi, bacteria, and viruses, and some plant-eating insects, but good coverage over all other aquatic organisms.

Procedures and standards for classifying species under the Minnesota chapter. An important feature of the Minnesota statute, notably absent from all other state and provincial statutes in the region, is a definite process for bringing new species to the attention of the conservation agency for classification and regulation. A person “may not introduce” an “unlisted species” without first notifying the Department of Natural Resources (DNR) and submitting it for classification as “prohibited,” “regulated,” or “unregulated.”¹⁴³ The DNR has promulgated detailed regulations on the information which the applicant must provide, including such requirements as “scientific-based information about the ability of the unlisted exotic species to naturalize, displace native species, and harm natural resources or their use in similar climates and latitudes.”¹⁴⁴

The statute also provides the DNR with some criteria for making this classification: “(1) the likelihood of introduction of the species if it is allowed to enter or exist in the state; (2) the likelihood that the species would naturalize in the state were it introduced; (3) the magnitude of potential adverse impacts of the species on native species and on outdoor recreation, commercial fishing, and other uses of natural resources in the state; (4) the ability to eradicate or control the spread of the species once it is introduced in the state; and (5) other criteria the commissioner [Commissioner of the Department of Natural Resources] deems appropriate.”¹⁴⁵

There are some points of interest here, and some potential flaws as well as strengths. The most important flaw is the lack of reference to any regional standards. In order to

¹³⁹ See an old textbook, Willis H. Johnson, Louis E. Delaney, Thomas A. Cole, Austin C. Brooks, *Biology* (New York: Holt, Rinehard and Winston, 4th Ed. 1961) pp. 438-439, which listed four different schemes of taxonomy used by biologists at that time.

¹⁴⁰ Norah Rudin, *Dictionary of Modern Biology* (New York: Barron’s, 1997), p. 406,

¹⁴¹ Norah Rudin, *supra*, p. 385, “virus.”

¹⁴² Minnesota Statutes, MS §§ 84D.14(1) (exemption), and 18.44 *et seq.* (Planet Pest Act).

¹⁴³ Minnesota Statutes, MS § 84D.06, subdivision 1.

¹⁴⁴ Minnesota Rules, MR Part 6216.0290 *et seq.* and Minnesota Rules, MR Part 6216.0290, subpart 1A(9).

¹⁴⁵ Minnesota Statutes, MS § 84D.04, subdivision 2.

protect the Great Lakes as a whole, any individual state agency responsible for classifying species needs to be able to use a regional prohibition as an absolute trump. It may not be fair, however, to expect the Minnesota legislature to have made provision for a regional process which has yet to be created.

In general, the Minnesota listing criteria are environmentally protective. To begin with, the criteria strengthen the power of the DNR because they put the exclusive emphasis on protection of the state ecosystem. The potential economic value of the proposed introduction is *not* a statutory criterion, although it will no doubt have weight regardless. Criterion (4), ability to eradicate or control, also gives the department a powerful shield to fend off proposed uses. Can anyone ever argue that it is feasible to eradicate or control an introduced species? Certainly not, if “introduced” is equated with “established.”

Actions prohibited under the Minnesota chapter. That, however, points out a troublesome use of terms in the scheme. The prohibition cited above is on “introduction” of the species without permission of the DNR.¹⁴⁶ “Introduction” is specifically defined as “the release or escape of an exotic species into a free-living state.”¹⁴⁷ So that is what the DNR has the power to prohibit. There is apparently no power to prohibit a person from actually bringing the new species into the state as long as that person does not release it into a “free-living state,” whatever that is, except for the separate power to regulate aquaculture facilities (discussed below in § 340), unless the species has already been listed as “prohibited.” In that case, a separate section provides that “A person may not possess, import, purchase, sell, propagate, transport, or introduce a prohibited species” except under special permits or conditions.¹⁴⁸ But a new unlisted species may be brought into the state as long as it does not get away.

If it does get away, and happens to be an “animal,” another specific provision under the heading of “Escape of exotic species” comes into effect. This reinforces the equation of “introduction” with “escape” and creates some other enforcement difficulties:

§ 84D.08. Escape of exotic species

(a) A person that allows or causes the introduction of an animal that is a prohibited, regulated, or unlisted exotic species shall, within 48 hours after learning of the introduction, notify the commissioner [of the DNR], a conservation officer, or another person designated by the commissioner. The person shall make every reasonable attempt to recapture or destroy the introduced animal....

(b) A person that complies with this section is not subject to criminal penalties under section 84D.13 for the introduction.¹⁴⁹

¹⁴⁶ Minnesota Statutes, MS § 84D.06, subdivision 1

¹⁴⁷ Minnesota Statutes, MS § 84D.01, subdivision 9.

¹⁴⁸ Minnesota Statutes, MS § 84D.05, subdivision 1.

¹⁴⁹ Minnesota Statutes, MS § 84D.08.

Section 84D.13, subdivision 3, makes it a misdemeanor to violate § 84D.08. But § 84D.08 essentially injects a knowledge element, not otherwise a qualification, into the other prohibitions in the statutory scheme – and is inconsistent with the general prohibition against possession or transport of a prohibited species except to the extent that the person complying with this provision may still be subject to a \$100 civil penalty for the prohibited possession.¹⁵⁰

Lack of strong sanctions in the Minnesota chapter. Minnesota Chapter 84D on Harmful Exotic Species contains fairly limited civil and criminal penalties for violations, and no statutory civil liability for damages done by discharges. The civil penalties for transporting specific organisms range from \$50 to \$100 dollars.¹⁵¹ These imply a lack of legislative intent to apply the statute to major commercial enterprises such as transoceanic shipping or aquaculture, for which such penalties would be far below the normal costs of doing business. (There is one slightly more hefty civil penalty, up to \$1000 for repeat offenders, for “attempting to place into waters of the state a watercraft, a trailer, or plant harvesting equipment that has prohibited species attached...”¹⁵² That, again, illustrates the lack of application to commercial shipping, although it might indicate an attempt to regulate some aquaculture activities.) As discussed above, a knowing introduction of a prohibited species may make one liable for a misdemeanor – but only subject to the defense discussed. Unlike comprehensive statutes on water pollution, such as the Clean Water Act, there are no provisions on civil liability for the damage that one might do by allowing an introduction to occur. However, given the fact that the legislature has officially declared such an act to be unlawful, it would not be unexpected for a court to create a civil action in negligence based on that prohibition.¹⁵³

General observations on the Minnesota chapter. The discussion above subjects the Minnesota regime to intense scrutiny because it is, by far, the best yet enacted in the region. The general import of this quibbling is to highlight the difficulty of formulating precise legislative policy, even in the best regime, for controlling new introductions. What is the appropriate step in the variety of threatening human activities for restrictions or prohibitions to apply? What knowledge or intent is required to make persons liable for violations? What sanctions are appropriate? Is it feasible to formulate general rules, or does it make more sense to tailor regulations to specific activities (such as shipping, boating, fishing, or aquaculture)? The struggle with these policy questions under this new regime in Minnesota should be instructive.

¹⁵⁰ Minnesota Statutes, MS § 84D.13, subdivision 5(3).

¹⁵¹ Minnesota Statutes, MS § 84D.14, subdivision 5.

¹⁵² Minnesota Statutes, MS § 84D.14, subdivision 5(4).

¹⁵³ It is a well accepted principle of the common law that “When a statute provides that under certain circumstances particular acts shall or shall not be done, it may be interpreted as fixing a standard for all members of the community from which it is negligence to deviate.” William L. Prosser, *Handbook of the Law of Torts* (St. Paul, MN: West, 4th Ed. 1971), § 36, p. 190.

§ 340. Aquaculture

§ 341. General observations on aquaculture

Aquaculture, or “fish farming,” has been a relatively limited and small-scale economic activity in the Great Lakes region (see § 121 above). But aquaculture policy is undergoing rapid change on both sides of the Great Lakes at the present time. Substantial revisions were made to the statutes governing aquaculture in Michigan in 1996,¹⁵⁴ in Ontario in 1997,¹⁵⁵ and in Pennsylvania in 1998.¹⁵⁶ It has traditionally been regulated as a specialized type of fishing activity under the state agency responsible for fish conservation. In many of the states, aquaculture is in practice the primary activity which the conservation agencies have focused on in regulations concerning exotics. Because aquaculture tends to generate high volumes of fish wastes or excessive nutrients from the feeding of the fish, it has also been the subject of regulation by the state agencies responsible for general water pollution control (and often requires special local zoning or land use permits because of this problem). And because aquaculture fish are prone to contagion, aquaculture has typically been regulated in some form by either the state conservation agency or the state agriculture agency for the purpose of disease control. Depending on the organization of government in the particular state, that has made as many as three different state agencies with a strong regulatory interest in aquaculture.

Primary responsibility for the supervision of aquaculture in the Great Lakes states has been shifting from conservation agencies to agriculture agencies. In five of the jurisdictions, Wisconsin, Illinois, Indiana, Ohio, New York, and the Province of Ontario, it is still under the general supervision of the conservation agency. In the other three states, Michigan, Minnesota, and Pennsylvania, it is now the primary responsibility of the state agency responsible for agriculture. In two of those states, Michigan and Pennsylvania, that is by means of recent legislation transferring the function. However, in all three states in which it is the primary responsibility of the agriculture agency, the conservation agency still retains some definite authority to regulate which exotic species are appropriate for use in aquaculture, even if not over the day-to-day enforcement of those regulations.

The primary focus of the agriculture agencies, as reflected in their statutory mandates, is typically the promotion of aquaculture as an economic sector by provision of scientific and technical support – and sometimes by serving as the state clearinghouse for reduction or rationalization of regulation. The primary regulatory concern of the agriculture agency tends to be disease control. In some cases, it also has a clear mandate to control exotics in accordance with the policies of the conservation agency (as well as a mandate to control water discharges in accordance with the pollution control agency). Conversely, some of the

¹⁵⁴ Michigan Aquaculture Development Act of 1996, MCL §§ 286.871 *et seq.*

¹⁵⁵ Ontario Fish and Wildlife Conservation Act of 1997, Statutes of Ontario Chapter 41.

¹⁵⁶ Pennsylvania Act 1998-94 (October 16, 1998), adding 3 Pennsylvania Consolidated Statutes Chapter 42.

conservation agencies, particularly the Ontario Ministry of Natural Resources, have themselves taken on a more active promotional role. Judging by the terms of the statutes, it would appear that the power of the conservation agencies to control use of exotics in aquaculture is actually quite strong in those states which have placed primary supervision of the activity under the agriculture agency.

There are obvious advantages and disadvantages to an agency combining both the missions of promoter and regulator (whether a conservation agency or an agricultural agency). On one hand, a promotional agency is always in danger of capture by the special interests being regulated. On the other hand, the combination of roles often gives the agency more expertise and information about the actual working of the industry and greater opportunity to accomplish the regulatory goals through cooperative and voluntary means. It is impossible to say which is a preferable structure in the abstract. (It might be noted that both the US Coast Guard and Transport Canada combine those promotional and regulatory roles with regard to the shipping industry.)

What is obvious is that there is a need for continuing coordination between the conservation agencies and the agriculture agencies in those states where the functions have been divided. A number of the states, including Michigan, have established some form of an aquacultural advisory committee with representation from both the industry and other agencies.¹⁵⁷ Those committees provide natural forums for insuring good coordination between agencies, as well as forums for productive consultations with the industry. Although there is technical support for aquaculture provided at the regional level in the form of a very active “North Central Region” academic group with centers in both Michigan State University and Iowa State University (including all of the Great Lakes states except Pennsylvania and New York) there does not seem to be any body for coordination of aquaculture regulatory policy throughout the Great Lakes basin.

The federal role, on both sides of the Great Lakes, is limited to mainly one of coordination, promotion, and technical support. But that role has recently received increased emphasis. In the United States, the National Aquaculture Development Act of 1980¹⁵⁸ mandates that the US Department of Agriculture (USDA) coordinate among federal agencies in order to “provide advisory, educational, and technical assistance”¹⁵⁹ in support of aquaculture and develop a National Aquaculture Development Plan.¹⁶⁰ (The plan is still in development. The 1996 draft, the current version, is mentioned above in Part I, § 120.)

¹⁵⁷ An advisory committee has been created by Department of Agriculture agency policy in Michigan (and probably has been in a number of other states as well). Other aquaculture advisory committees have been created by Department of Natural Resources regulation in Illinois (17 Illinois Administrative Code § 870.10(e)) and by statute in Pennsylvania (3 Pennsylvania Consolidated Statutes § 4216). The Ohio Department of Natural Resources Division of Wildlife has created a state aquatic nuisance advisory committee, by agency policy, which includes representatives from both the aquaculture and aquarium industries.

¹⁵⁸ 16 USC §§ 2801 *et seq.*

¹⁵⁹ 16 USC § 2804(a).

¹⁶⁰ 16 USC § 2803.

Under that act, USDA has established a Joint Committee on Aquaculture chaired by USDA, with representation from the US Department of Commerce, US Department of the Interior, and nine other federal agencies. A related act in 1984 established an Office of Aquaculture Coordination and Development in USDA.¹⁶¹ Part of the mandate Congress has given USDA and the other federal agencies is to formulate “specific steps the Federal Government can take to remove unnecessarily burdensome regulatory barriers to the initiation and operation of commercial aquaculture ventures.”¹⁶²

In Canada, there is a strong constitutional deference to the “proprietary” interest of the provinces over their fisheries resources, and only limited federal interest in the fresh-water fisheries of the Great Lakes. Regulation of Canadian aquaculture lies almost entirely in the hands of the Ontario Ministry of Natural Resources and other provincial ministries, which have been delegated some of the authority of the federal government under the Fisheries Act. But the federal government of Canada has created a new Commissioner for Aquaculture Development, within the Department of Fisheries and Oceans, just appointed on December 17, 1998.¹⁶³ He is responsible for coordinating policies among the Department of Fisheries and Oceans, the Department of Agriculture and Agri-Food, the Department of the Environment, and other federal agencies. Very much like federal policy in the United States, the policy in Canada is that “the federal role involves such areas as research, technology transfer, training and development, access to financing and environmental sustainability relating to the industry.”¹⁶⁴

The following discussion focuses on state and provincial regulation of aquaculture in the Great Lakes. Michigan has by far the most comprehensive aquaculture statute, the Michigan Aquaculture Development Act of 1996,¹⁶⁵ which is discussed in detail at the end of this section after a general review of the other states and the Province of Ontario.

§ 342. Supervision by conservation agencies in six jurisdictions

Wisconsin. Wisconsin statutes assign the supervision of aquaculture to the Department of Natural Resources (without any specific mandate to promote it) under a number of basic requirements for annual permitting,¹⁶⁶ certification of salmonids,¹⁶⁷ notification before individual shipments (at the discretion of the DNR),¹⁶⁸ an annual fish farm health certificate from a veterinarian or other qualified person,¹⁶⁹ identification of the activities of the farm

¹⁶¹ Public Law 98-623, § 402 (November 8, 1984).

¹⁶² 16 USC § 2808(b).

¹⁶³ Canadian Department of Fisheries and Oceans news release, “Anderson Appoints Commissioner for Aquaculture Development” (Ottawa, Ontario, December 17, 1998).

¹⁶⁴ Canadian Department of Fisheries and Oceans news release, *supra*.

¹⁶⁵ Michigan Aquaculture Development Act, Michigan Compiled Laws, MCL §§ 286.872 *et seq.*

¹⁶⁶ Wisconsin Statutes, WS § 95.60(2)(a).

¹⁶⁷ Wisconsin Statutes, WS § 95.60(2)(b).

¹⁶⁸ Wisconsin Statutes, WS § 95.60(2)(c).

¹⁶⁹ Wisconsin Statutes, WS § 95.60(3).

and the species to be raised,¹⁷⁰ regular inspection by the DNR,¹⁷¹ and regular record-keeping subject to the specific requirements of the DNR.¹⁷² The regulations add little to this basic statutory scheme.

Illinois. Illinois has two connected schemes. The Aquaculture Development Act charges the Illinois Department of Agriculture (IDA) with promotion of aquaculture, and requires the IDA to ensure that aquaculture programs comply with the Fish and Aquatic Life Code and any regulations of the Illinois Department of Natural Resources (IDNR) restricting nonindigenous aquatic life.¹⁷³ According to the Chief of the Division of Fisheries in IDNR, the actual involvement of the IDA in supervision of the industry has been less than what might be implied by the Aquaculture Development Act, and actual regulatory supervision remains entirely within IDNR¹⁷⁴ under the Illinois Fish and Aquatic Life Code.¹⁷⁵ There are no statutory criteria for approvals and prohibitions.¹⁷⁶ IDNR has by regulation established an Aquaculture Advisory Committee (with representation from IDA, other government agencies, and the Illinois Aquaculture Industry Association) to review requests for use of new species.¹⁷⁷ The regulations do not state any specific requirements or presumptions for the evaluation of new species except to provide that “The Chief of the Division of Fisheries shall consider the recommendations of the of the Aquaculture Advisory Committee....” and that “The Aquaculture Advisory Committee’s recommendation and the decisions of the Chief of the Division of Fisheries shall be based upon the potential detriment to the natural fishery resources.”¹⁷⁸ Although not as detailed as the Michigan or Minnesota statutes, the Illinois Fish and Aquatic Life Code provides for permitting, record-keeping, and inspections under the Department of Natural Resources¹⁷⁹ – and these requirements are also implemented by the regulations.¹⁸⁰

Indiana. The Indiana Department of Natural Resources (DNR) regulates aquaculture under the general authority to control introductions discussed above (§ 333). Indiana statutes charge the Office of the Commissioner of Agriculture (OCA) with the promotion of aquaculture, but give the OCA no specific mandate or authority to regulate it.¹⁸¹ (Some of the functions of terrestrial agriculture are in fact performed by the Indiana DNR.) Administrative regulations promulgated by the DNR set some basic permitting requirements. “An applicant must establish that a fish to be imported (1) is free of any communicable

¹⁷⁰ Wisconsin Statutes, WS § 95.60(3m).

¹⁷¹ Wisconsin Statutes, WS § 95.60(4)(a).

¹⁷² Wisconsin Statutes, WS § 95.60(4)(c).

¹⁷³ Illinois Compiled Statutes, Chapter 20, Act 215, 20 ILCS §§ 215/1 *et seq.*, especially 215/5.

¹⁷⁴ Mike Conlin, Chief, Division of Fisheries, Illinois DNR, letter to the researcher (February 9, 1999).

¹⁷⁵ Illinois Compiled Statutes, ILCS § 5/20-90.

¹⁷⁶ Illinois Compiled Statutes, ILCS § 5/20-90.

¹⁷⁷ Illinois Administrative Code, Part 879, IAC § 870.10.

¹⁷⁸ Illinois Administrative Code, Part 879, IAC § 870.10(f).

¹⁷⁹ Illinois Compiled Statutes, Chapter 515, Act 5, Article 1, 515 ILCS §§ 5/1-1 *et seq.*, especially 5/20-90.

¹⁸⁰ Illinois Administrative Code, Part 879, IAC §§ 870.10 *et seq.*

¹⁸¹ Indiana Code, Title 4, Article 4, Chapter 3.8, IC §§ 4-4-3.8-1 *et seq.*

disease; (2) will not become a nuisance; and (3) will not damage a native wild species or a domestic species of animal or plant.”¹⁸² The permit holder must also submit a quarterly report on department forms (the regulations do not make clear what information is required on the forms) and the live fish are subject to inspection at any time.¹⁸³ Import of live fish for aquaria are exempted from all requirements.¹⁸⁴

Ohio. Ohio requires permits for aquaculture or fish farms from the Division of Wildlife (Department of Natural Resources) and authorizes the division to approve new species for production with statutory¹⁸⁵ and regulatory¹⁸⁶ provisions which set up a scheme of classification for both types of species and types of aquaculture facilities, depending on the degree of risk they present, and require a one-time inspection of the higher risk “Class B” facilities. This scheme creates a “green list” in a limited sense, in that only certain specifically listed species are allowed for use in the less-secure “Class A” facilities. And there are very strict standards (probably unique in the region) for the security of the “Class B” facilities, such as a requirement that there be two levels of escapement prevention and that they must be protected from flooding.¹⁸⁷ But there is no specification of standards for which species will be allowed in these facilities. The underlying assumption seems to be that there will be no escapes from “Class B” facilities. There is little specification of requirements for record-keeping, regular inspections, or disease control, except for one regulatory provision that “Records, as required by the chief of the division of wildlife, shall be maintained and open to inspection at all reasonable hours...”¹⁸⁸ and another regulatory provision which requires specific records of sales to be maintained.¹⁸⁹

New York. New York charges the Department of Agriculture and Markets to promote aquaculture with no statutory standards,¹⁹⁰ although there are statutory provisions for licensing of various facilities by the Department of Environmental Conservation (DEC) to issue licenses for private trout and black bass hatcheries, farm fish ponds, fishing preserves, and marine hatcheries.¹⁹¹ The regulations implementing these statutory licensing requirements lump them together under a very short part on “Special Licenses and Permits,” including such things as licenses for falconry and registered muskrat marshes.¹⁹² What few record-keeping requirements are imposed by the statutes are designed to insure that wild fish belonging to the public are not sold as privately raised fish. There is no obvious mandate for the DEC to control the introduction of exotics, and they are not addressed in the DEC’s

¹⁸² Indiana Administrative Code, 312 IAC § 9-10-15(c).

¹⁸³ Indiana Administrative Code, 312 IAC § 9-10-17(d)(5)-(6).

¹⁸⁴ Indiana Administrative Code, 312 IAC §§ 9-10-15(d)(2), 9-10-17(b)(1).

¹⁸⁵ Ohio Revised Code, ORC §§ 1533.632, 1533.39.

¹⁸⁶ Ohio Administrative Code, OAC Rule 1501:31-39-01.

¹⁸⁷ Ohio Administrative Code, OAC Rule 1501:31-19-01(D)(2)(c).

¹⁸⁸ Ohio Administrative Code, OAC Rule 1501:31-19-01(G).

¹⁸⁹ Ohio Administrative Code, OAC Rule 1501:31-39-01(E).

¹⁹⁰ New York Agriculture and Markets Law, AG&ML §§ 16

¹⁹¹ New York Environmental Conservation Law, ECL §§ 11-1909, 11-1911, 11-1913, and 13-0316.

¹⁹² New York Code of Rules and Regulations, Title 6 NYCRR Part 175.

administrative regulations on Fish and Wildlife.¹⁹³ One provision under the part on miscellaneous special licenses does provide that a license holder consents to inspection of his or her premises at any time.¹⁹⁴

Ontario. Aquaculture in Ontario is governed by both the (Canadian) Fisheries Act¹⁹⁵ and the new Ontario Fish and Wildlife Act of 1997,¹⁹⁶ both of which are administered by the Ontario Ministry of Natural Resources (OMNR). In close consultation with the Ontario Aquaculture Association, OMNR has assumed a role of both regulator and advocate for the industry.¹⁹⁷ OMNR regulations specify an exclusive list of species eligible for culture in Ontario, but state very few other regulatory requirements,¹⁹⁸ although other conditions for permits are set by OMNR policy directives.¹⁹⁹ In addition, there are requirements for disease inspection under the Canadian Fish Protection Regulations.²⁰⁰

§ 343. Supervision by agriculture agencies in Michigan, Minnesota, and Pennsylvania

Michigan and Minnesota. Both Michigan and Minnesota provide in detail for both promotion and regulation under the department of agriculture, in coordination with the department of natural resources, with specific provisions for licensing, record-keeping, and inspections. The Michigan act is discussed in more detail below. Minnesota has a similar statute, even if not quite so extensive.²⁰¹ The Minnesota aquaculture statute has a provision worthy of special note which authorizes the Department of Natural Resources, in consultation with the Department of Agriculture, to establish procedures for approving or rejecting either exotic or genetically altered aquatic species for use in aquaculture.²⁰² Minnesota provides statutory criteria for approval of species by the DNR in the chapter on exotic species (discussed in detail in § 334 above). The most important aspect of both the Michigan and Minnesota schemes may be the record-keeping and inspection requirements. Both require the operator to maintain records documenting the origin of shipments,²⁰³ and to provide for regular inspections of the facilities by the department of agriculture.²⁰⁴ Both also have provisions designed to prevent the spread of fish diseases.

¹⁹³ New York Code of Rules and Regulations, Title 6 NYCRR Chapter I.

¹⁹⁴ New York Code of Rules and Regulations, Title 6 NYCRR § 175.6(e).

¹⁹⁵ Revised Statutes of Canada, RS Chapter F-14.

¹⁹⁶ Statutes of Ontario, 1997, Chapter 41.

¹⁹⁷ Ontario Ministry of Natural Resources, *Aquaculture Regulations and Policy Review Discussion Papers* (December 2, 1997) p. 3.

¹⁹⁸ Licenses with Respect to Fish, Ontario Regulation 267/95, § 1.(1) and Schedule 1.

¹⁹⁹ Ontario Ministry of Natural Resources, *Aquaculture Regulations and Policy Review Discussion Papers* (December 2, 1997).

²⁰⁰ Canadian Regulations Chapter 812.

²⁰¹ Minnesota Statutes, MS §§ 17.46 *et seq.*

²⁰² Minnesota Statutes, MS § 17.497.

²⁰³ Michigan Compiled Laws, MCL § 286.876(3); Minnesota Statutes, MS § 17.4984, subdivision 7.

²⁰⁴ Michigan Compiled Laws, MCL § 286.879; Minnesota Statutes, MS § 17.4984, subdivision 6.

Pennsylvania. General supervision of aquaculture was transferred to from the Pennsylvania Fish and Boat Commission (PFBC) to the Pennsylvania Department of Agriculture under the Aquaculture Development Law, which just became effective on December 16, 1998.²⁰⁵ The Department of Agriculture will issue licenses for aquaculture, but the PFBC will continue to issue licenses for imports of exotic fish under its existing authority in the Pennsylvania Fish and Boat Code.²⁰⁶ There is a special provision in the Aquaculture Development Law, however, which allows the Department of Agriculture to permit the use of other fish, not approved by the PFBC, in self-contained systems “whose discharge of water is rendered incapable of containing self-perpetuating living organisms....”²⁰⁷ The Aquaculture Development Law requires aquaculturists to keep records of “all transactions” in fish, but has no other specific provisions for administrative inspections.²⁰⁸ Transportation of fish into the state “is limited to sources of species whose health inspection reports have already been approved by the department,”²⁰⁹ thus giving the Department of Agriculture some supervision over remote supply sources.

§ 344. The Michigan Aquaculture Development Act

General scheme. The Michigan Aquaculture Development Act of 1996²¹⁰ transferred licensing and supervision of aquaculture from the Department of Natural Resources to the Department of Agriculture (MDA). The MDA’s role clearly goes well beyond promotion of the industry. The legislation makes it clear that MDA is expected to actively regulate the industry, and it contains some specific provisions for record-keeping²¹¹ and inspections²¹² as well as authority for the MDA to promulgate implementing regulations.²¹³ MDA has some additional authority to regulate aquaculture under the Animal Industry Act of 1988, which was amended to include a specific section on aquaculture diseases in 1996.²¹⁴ But the statutory requirements are not all that might be logically expected,²¹⁵ and this statutory scheme requires implementing regulations from MDA before this can be called a comprehensive scheme of regulation.

²⁰⁵ Pennsylvania Act 1998-94 (October 16, 1998), adding Title 3, Pennsylvania Consolidated Statutes, Part VI, Chapter 42, 3 PCS §§ 4201 *et seq.*

²⁰⁶ Pennsylvania Consolidated Statutes, 30 PCS § 2102(c).

²⁰⁷ Pennsylvania Consolidated Statutes, 3 PCS § 4219(c).

²⁰⁸ Pennsylvania Consolidated Statutes, 3 PCS § 4222(b).

²⁰⁹ Pennsylvania Consolidated Statutes, 3 PCS § 4222(b)(c)(2).

²¹⁰ Michigan Compiled Laws, MCL §§ 286.871 *et seq.*

²¹¹ Michigan Compiled Laws, MCL § 286.876(3).

²¹² Michigan Compiled Laws, MCL § 286.879.

²¹³ Michigan Compiled Laws, MCL § 286.882.

²¹⁴ Michigan Compiled Laws, MCL §§ 287.701-287.747, especially new § 287.729a on aquaculture diseases.

²¹⁵ *E.g.*, the record-keeping requirement at MCL § 286.876(3) only specifies those records needed “to establish proof of ownership,” and the requirement to have a copy of the Great Lakes fish disease control policy in MCL § 286.877(2)(c) is strangely silent about any requirement to actually follow the policy.

The DNR retains substantial regulatory authority over exotics. Any species prohibited by the DNR under the Natural Resources and Protection Act²¹⁶ is prohibited from use under the Aquaculture Development Act.²¹⁷ The DNR's authority over the approval of species is less than complete, however, because the Aquaculture Development Act contains a long list of species already approved for use in aquaculture by statute.²¹⁸ It appears that the DNR could theoretically prohibit one of the species on the statutory approved list, but that would be politically awkward at best, and might be subject to legal challenge as contrary to the legislative intent.

Coverage of the act. "Aquaculture species" contemplated for use may mean any "aquatic animal organism," specifically including but not limited to "fish, crustaceans, mollusks, or amphibians."²¹⁹ All persons engaging in "aquaculture," but not those operating bait outlets or ornamental fish facilities, are subject to regulation by the Michigan Department of Agriculture (MDA).²²⁰

"Aquaculture" is defined as "the commercial husbandry of aquaculture species on the approved list of aquaculture species."²²¹ This creates a technical problem in definitional circularity. The section specifying rules on approved and prohibited species provides that "Only the aquaculture species on the approved list are allowed for purposes of aquaculture production."²²² And other species are "prohibited for aquaculture or aquaculture research under this act."²²³ In a strictly literal sense, it is impossible for anyone to ever be in violation of this prohibition. If the species they are cultivating are not on the approved list, then what they are doing is not "aquaculture" by definition. That is most certainly not what the Michigan legislature meant to say, and it may be hoped that a court would find a way around the literal language. It is a general rule of statutory construction that "While, ordinarily, statutory definitions control the meaning of statutory words, this rule does not apply where its application creates obvious incongruities in the language of the statute or destroys one of its major purposes."²²⁴ Or, in the words of the Michigan Supreme Court, "If there is a conflict, the spirit and purpose of the statute should prevail over its strict letter."²²⁵ In this case, the literal reading of the definition into the section on species would destroy all

²¹⁶ Michigan Compiled Laws, MCL §§ 324.101 *et seq.*, especially § 324.45906.

²¹⁷ Michigan Compiled Laws, MCL § 286.875(5).

²¹⁸ Michigan Compiled Laws, MCL § 286.875(2).

²¹⁹ Michigan Compiled Laws, MCL § 286.872(f).

²²⁰ Michigan Compiled Laws, MCL § 286.876.

²²¹ Michigan Compiled Laws, MCL § 286.872(b). The same definition of aquaculture is used in the Animal Industry Act, at MCL § 287.703(3), creating the same problem. Technically, a person would be allowed to import a diseased fish as long as it was not an approved fish, because that would not be "aquaculture."

²²² Michigan Compiled Laws, MCL § 286.875(1).

²²³ Michigan Compiled Laws, MCL § 286.875(5).

²²⁴ 73 American Jurisprudence 2nd Statutes § 226, citing *Lawson v. Suwannee S.S. Co.*, 336 US 198 (1948).

²²⁵ *Aikens v. Dept. of Conservation*, 387 Mich. 495, 499 (1972), citing other Michigan cases therein. This sort of technical error, a nightmare to legislative staffs and agency drafting attorneys, is in fact quite common. It is a strong argument against the excessive employment of special statutory definitions, the special meaning of which is often forgotten in later sections of the law, even by the drafters themselves.

the restrictions and prohibitions on use of unapproved species, and would certainly violate the spirit of the legislation. The Michigan courts can probably be relied upon to do the sensible thing. This issue, however, is one that would be likely to be litigated in the context of a civil or criminal penalty action, in which cases the courts tend to be particularly inclined toward strict construction. It is a glitch which should be corrected at the earliest opportunity.

Criteria for approving species. The Michigan act has specific and limited statutory criteria for “approved species,” and, unique among all the statutes in the region regulating aquaculture, has an exclusive statutory list of approved species.²²⁶ This raises the question of what the statutory criteria are for. The legislature cannot legislate against itself, and the criteria therefore cannot limit what species it might add to the list later. But it may serve the political and administrative purpose of clarifying what species are likely candidates for consideration. The criteria are, in theory, very limited. According to the statute, the only species eligible for the approved list are those which are (a) indigenous, (b) already naturalized, (c) incapable of perpetuation in Michigan, or (d) to be held in a confined research facility for the purpose of research.²²⁷

Disease control. The Michigan act requires the MDA to provide the aquaculture facility with a current copy of the *Great Lakes Fish Disease Control Policy and Model Program*, informally known as the “Blue Book,” which contains a detailed protocol for controlling pathogens in salmonid fishes.²²⁸ Oddly enough, however, the act does not actually require that the control policy be observed. That is something which could be required in implementing regulations which the MDA is authorized to promulgate under the act.²²⁹ (Minnesota, in comparison, has less extensive but more definite statutory requirements for a fish health inspection and documentation of disease-free histories.²³⁰) On this issue, additional authority in the Animal Industry Act (also added in 1996) is of relevance. It contains a provision which reads as follows:

MCL § 287.729a. Aquaculture

- (1) A person shall not import aquaculture into this state without a prior entry permit from the director and 1 of the following issued by an accredited veterinarian or fish health official:

²²⁶ Michigan Compiled Laws, MCL § 286.875(1).

²²⁷ Michigan Compiled Laws, MCL § 286.875(1)(a)-(d).

²²⁸ Michigan Compiled Laws, MCL § 286.877(c); *Great Lakes Fish Disease Control Policy and Model Program*, Great Lakes Fishery Commission Special Publication 93-1 (Ann Arbor, MI: Great Lakes Fishery Commission, January 1993). There is also a similar “Blue Book” on disease control published by the American Fisheries Society. John C. Thoesen, ed., *Suggested Procedures for the Detection and Identification of Certain Finfish and Shellfish Pathogens*, 4th Ed., Version 1 (Bethesda, MD: American Fisheries Society Fish Health Section, 1994).

²²⁹ Michigan Compiled Laws, MCL § 286.882. At this time, however, MDA has not promulgated such a requirement.

²³⁰ Minnesota Statutes, MS § 17.4986, subdivisions 2-4.

- (a) Official interstate health certificate.
 - (b) Official interstate certificate of veterinary inspection.
 - (c) Fish disease inspection report.
- (2) A person shall not import aquaculture from a hatchery or other facility with a record of an emergency fish disease within the past 2 years.
- (3) A person shall not import aquaculture exhibiting clinical signs of disease.

With the exception of a potential problem created by the use of the same circular definition of “aquaculture” in the Animal Industry Act,²³¹ this provides a particularly valuable model for dealing with the problem of imports from out of state.

Coordination of policy on aquaculture. As do some other states, MDA has an Aquaculture Advisory Committee. This is chaired by an MDA doctor of veterinary science, with representation from agencies, academic experts, and industry. This offers a foundation upon which to build (a) close intra-governmental coordination between MDA and Michigan DNR, and (b) regional coordination, with both with such committees in other states, and with regional bodies concerned with exotics.

§ 350. Bait

All jurisdictions have some regulation of bait dealers.²³² But this, like much of the regulation of fishing under conservation or aquaculture statutes, is often designed to protect state stocks rather than to prevent introduction of exotics. More to the point, although live bait fish certainly come under other prohibitions on exotic fish in the conservation statutes (§ 330 above), few of the jurisdictions have established a program for record-keeping or inspection of bait dealers to insure that prohibited species are not introduced. Pennsylvania does specifically require keeping records listing the sources and species of bait fish, and authorizes inspection thereof by the Fish and Boat Commission.²³³ Michigan has an extensive public education program for alerting both commercial dealers and recreational fishers to problems with exotics, including requests that fishers examine their bait, not take it from certain waters, and make sure to discharge any live bait in the original waters. But this program is backed up by very little statutory or regulatory authority.

²³¹ Michigan Compiled Laws, MCL § 287.703(3).

²³² See, generally, the survey of typical state regulations in the region in Thomas G. Meroneck, Fred A. Copes, and Daniel W. Cobe, in “A Summary of Bait Regulations in the North Central United States,” *Fisheries*, vol. 20, no. 11 (1995), pp. 16-23. That is based on responses to questionnaires from state conservation agencies (conducted in 1992) rather than a legal analysis of statutes and regulations, but it actually presents a much more complete picture of state regulations because so much of those are embodied in agency policies, orders, and advisories rather than statutes or formally promulgated administrative regulations.

²³³ Pennsylvania Consolidated Statutes, 30 PSA § 3309(a).

§ 360. **Aquaria**

None of the jurisdictions actively regulate private aquaria and ornamental fish ponds. Again, as in the case of bait, live fish used in aquaria and fish ponds would come under general prohibitions but there are no provisions for record-keeping or inspection to insure that the prohibitions are observed. Some of the statutes and regulations specifically note the exclusion of aquaria from regulatory programs.²³⁴ Other statutes or regulations exempt aquaria by implication because they only apply to imports or sales of fish for the purpose of release into the public waters (even though eventual release might be reasonably anticipated).²³⁵ The Minnesota Aquaculture Development act requires a permit from the Department of Agriculture for a *commercial* aquarium facility if the species are already present in the waters of Minnesota, and allows the department to require licenses for other species if they can survive in the waters of Minnesota.²³⁶ Pennsylvania regulations on importation of fish and other aquatic organisms, unique among the jurisdictions in the region, specify that permission “is not needed for the importation of *tropical* fish unless the [Fish and Boat] Commission considers them to be potentially dangerous,”²³⁷ thus making clear that permission is needed for coldwater aquarium organisms.

§ 370. **Weeds and zebra mussels**

Several of the states have specific statutory provisions designed to attack unwanted weeds, often by name, or the infamous zebra mussel. Michigan regulates purple loosestrife (*Lythrum salicaria* and *Lythrum virgatum*) by name.²³⁸ And Michigan, which has already been heavily infested with the zebra mussel in the Lower Peninsula and is now in effect an unwilling exporter, has an extensive program of public education and scientific monitoring designed to help slow down the spread. Minnesota regulates purple loosestrife, Eurasian water milfoil (*Myriophyllum spicatum*), and zebra mussels (*Dreissena*) by name.²³⁹ Wisconsin regulates “nuisance” and “noxious” weeds, including purple loosestrife and multiflora rose as “nuisance weeds.”²⁴⁰ Indiana regulates certain “detrimental plants,” none

²³⁴ Michigan specifically exempts retail ornamental fish facilities and persons using privately controlled waters for noncommercial purposes from regulation under the Aquaculture Development Act. Michigan Compiled Laws, MCL § 286.876(2). New York provides that no permit shall be required to place fish or fish eggs in an aquarium. New York Environmental Conservation Law, ECL § 11-0507, subsection 1. The Indiana Natural Resources Commission specifically exempts live fish for use in the aquarium pet trade from its regulations on importing fish. Title 312 Indiana Administrative Code, 312 IAC §§ 9-10-15(d)(2) and 9-10-17. Ontario specifically exempts aquarium fish from the licensing requirements for trafficking in fish. Game and Fish Act Traffic in Fish Regulations, Ontario Regulations 425/95, § 4.

²³⁵ E.g., Illinois Compiled Statutes, 515 ILCS § 5/10-100, Indiana Code, IC § 14-22-25-2, and Ohio Administrative Code, OAC Rule 1501: 31-19-01(E).

²³⁶ Minnesota Statutes, MS § 17.4988, subdivision 4.

²³⁷ Pennsylvania Administrative Code, 58 Pennsylvania Code § 73.1(b) (emphasis added).

²³⁸ Michigan Compiled Laws, MCL § 286.218.

²³⁹ Minnesota Statutes Chapter 84D, MS §§ 84D.01 *et seq.*

²⁴⁰ Wisconsin Statutes, WS §§ 66.955, 66.96.

of which, however, appear to be aquatic.²⁴¹ Illinois has one of the few generic prohibitions on exotic plants. It is unlawful for any person, or other governmental organization in the State of Illinois, to traffic in exotic plants or seeds without a permit from the Department of Conservation.²⁴² New York provides for the establishment of “aquatic planet growth control districts” by local governments,²⁴³ and expressly provides that no person may “intentionally liberate” zebra mussels (*Dreissena polymorpha*) into the waters of the state.²⁴⁴

§ 380. Marine sanitation devices

Marine sanitation devices on the Great Lakes are generally regulated by combination of US federal law and Canadian federal and provincial law.²⁴⁵ In Canadian waters, commercial vessels are allowed to discharge sewage treated according to Canadian federal standards and recreational vessels are prohibited from any discharge under Ontario regulations. In United States waters, the rule is that both recreational and commercial vessels are allowed to discharge water treated according to federal standards unless a state is granted authority to impose more strict requirements by way of an express exemption from federal preemption by the US Environmental Protection Agency. Two states, Michigan and Wisconsin, have statutory prohibitions against any discharge of sewage from vessels which have been granted that exemption from preemption.²⁴⁶

§ 390. State laws in the Great Lakes region: Intergovernmental coordination

§ 391. Structure of government in the Great Lakes states and the Province of Ontario

The most common state structure splits up responsibility over the subjects discussed above between three state agencies – an environmental agency, a conservation agency, and an agriculture agency. That is the pattern in five of the eight Great Lakes states – Michigan, Minnesota, Illinois, Indiana, and Pennsylvania. Within that group, there is substantial variance in the balance of regulatory authority among the agencies and the degree to which the legislature has provided for clear coordination on the issue of exotics.

²⁴¹ Indiana Code, IC § 15-3-4-1.

²⁴² Illinois Compiled Statutes, 525 ILCS § 10/4.

²⁴³ New York Town Law, TOWN § 202, subsection 3.

²⁴⁴ New York Environmental Conservation Law, ICL § 11-0507, subsection 4.

²⁴⁵ United States Code, 33 USC § 1322, and Code of Federal Regulations, 33 CFR Part 159, Canada Shipping Act §§ 656-657, and Canada Shipping Act Regulation 26, Ontario Environmental Protection Act, Revised Statutes of Ontario, RSO Chapter E.19, § 176(1)(t)-(u), and Revised Regulations of Ontario 1990, RRO Regulation 343, § 2.

²⁴⁶ Michigan Compiled Laws, MCL § 324.9503, and Wisconsin Statutes, WS § 30.71. The Michigan prohibition on all discharge was exempted from federal preemption in all waters of the Great Lakes within Michigan by the US Environmental Protection Agency at 41 *Federal Register* 2274 (January 15, 1976). The Wisconsin prohibition was exempted from preemption by EPA for all water of Lake Michigan in Wisconsin, but not for waters of Lake Superior, at 41 *Federal Register* 11875 (March 22, 1976).

In Michigan, significant responsibilities are shared among the Department of Environmental Quality (including the Office of the Great Lakes), the Department of Natural Resources, and the Department of Agriculture (for regulation of aquaculture). DEQ has overall responsibility for “control of pollution of surface or underground waters of the state,”²⁴⁷ and “is designated the state agency to cooperate and negotiate with other governments, governmental units, and governmental agencies in matters concerning the water resources of the state, including...water quality control planning, development, and management.”²⁴⁸ However, the DNR has substantive authority to promulgate rules controlling the importation of fish.²⁴⁹ The MDA has authority to regulate aquaculture,²⁵⁰ and is also responsible for control of purple loosestrife.²⁵¹ Under the Michigan Aquaculture Development Act, approved species are listed by statute rather than regulation.²⁵²

In Minnesota, significant responsibilities are shared among the Minnesota Pollution Control Agency, the Department of Natural Resources, and the Department of Agriculture. MPCA has the authority “To administer and enforce all laws relating to the pollution of any of the waters of the state.”²⁵³ (As noted above, Minnesota specifically includes “biological materials” as a form of pollution.²⁵⁴) The DNR is the designated agency for implementation of Minnesota’s specific chapter on “Harmful Exotic Species,”²⁵⁵ and has the authority, among other things, to classify exotics as “prohibited,” “regulated,” or “unregulated.”²⁵⁶ The DNR is also responsible for control of purple loosestrife, Eurasian water milfoil, and other nuisance weeds.²⁵⁷ More generally, the DNR is mandated to “seek cooperation with other states and Canadian provinces for the purposes of management and control of harmful exotic species.”²⁵⁸ (A 1991 precursor to the 1995 chapter on Harmful Exotic Species also suggests that “The governor may cooperate, individually and regionally, with other state governors in the midwest for the purpose of ecologically harmful exotic species management and control.”²⁵⁹) The Department of Agriculture (MDA) is designated the state agency for the promotion of aquaculture.²⁶⁰ But it has very little, if any, regulatory authority. The statutes provide that the MDA “shall act as permit or license *coordinator* for aquatic farmers and shall assist aquatic farmers to obtain licenses or permits” and that “Nothing in this section modifies any state agency’s regulatory authority over aquaculture

²⁴⁷ Michigan Compiled Laws, MCL § 324.3103(1).

²⁴⁸ Michigan Compiled Laws, MCL § 324.3104(1).

²⁴⁹ Michigan Compiled Laws, MCL § 324.45906.

²⁵⁰ Michigan Compiled Laws, MCL § 286.873.

²⁵¹ Michigan Compiled Laws, MCL § 286.218.

²⁵² Michigan Compiled Laws, MCL § 286.875.

²⁵³ Minnesota Statutes, MS § 115.03.

²⁵⁴ Minnesota Statutes, MS § 115.01.

²⁵⁵ Minnesota Statutes, MS § 84D.01, subdivisions 3 and 4.

²⁵⁶ Minnesota Statutes, MS § 84D.04, subdivision 1.

²⁵⁷ Minnesota Statutes, MS §§ 84D.01, subdivision 5, 84D.02.

²⁵⁸ Minnesota Statutes, MS § 84D.02, subdivision 5.

²⁵⁹ Minnesota Statutes, MS § 84.969, subdivision 3.

²⁶⁰ Minnesota Statutes, MS § 17.49.

production.”²⁶¹ And, as noted above, the DNR has the specific authority to regulate the use of exotics in aquaculture, subject only to the obligation to consult with MDA (not to receive concurrence from MDA).²⁶²

In three other states, Indiana, Illinois, and Pennsylvania, jurisdiction over these three areas is also split three ways, but with less definite provisions for coordination on exotics. In Illinois, the Environmental Protection Agency is responsible for water pollution,²⁶³ the Department of Natural Resources (formally the Department of Conservation²⁶⁴) is responsible for imports of aquatic life,²⁶⁵ and the Department of Agriculture is responsible for promoting aquaculture.²⁶⁶ In Indiana, the Department of Environmental Management is responsible for water pollution,²⁶⁷ the Department of Natural Resources is responsible for permitting the release of fish into the state,²⁶⁸ and the Office of the Commissioner of Agriculture (OCA) is responsible for promoting (but not regulating) aquaculture.²⁶⁹ Although there is no specific provision for liaison on the issue of exotics, the fact that the DNR carries out some of the functions of agriculture management for the OCA in Indiana should provide a basis for natural coordination. In Pennsylvania, the Department of Environmental Protection (formerly the Department of Environmental Resources) is responsible for water pollution,²⁷⁰ the Fish and Boat Commission is responsible for general regulation of fish,²⁷¹ and the Department of Agriculture is responsible for regulation of aquaculture.²⁷²

In the State of Ohio and the Province of Ontario, there is a two-way split between an environmental agency and a conservation agency. In Ohio, the Environmental Protection Agency is responsible for water pollution²⁷³ and the Division of Wildlife in the Department of Natural Resources is responsible for both general regulation of fish²⁷⁴ and aquaculture.²⁷⁵ In Ontario, the Ministry of the Environment is responsible for water pollution,²⁷⁶ and the Ministry of Natural Resources is responsible for both general regulation of fish and aquaculture.²⁷⁷ Also, as discussed in § 330 above, the Canada-Ontario Agreement of

²⁶¹ Minnesota Statutes, MS § 17.494 (emphasis added).

²⁶² Minnesota Statutes, MS § 17.497.

²⁶³ Illinois Compiled Statutes, 415 ILCS §§ 5/1 *et seq.*

²⁶⁴ Illinois Compiled Statutes, 20 ILCS § 801/1-5.

²⁶⁵ Illinois Compiled Statutes, 515 ILCS § 5/20-95.

²⁶⁶ Illinois Compiled Statutes, 20 ILCS §§ 215/1 *et seq.*

²⁶⁷ Indiana Code, IC § 13-13-5-1.

²⁶⁸ Indiana Code, IC § 14-22-25-1.

²⁶⁹ Indiana Code, IC § 4-4-3.8-2.

²⁷⁰ Pennsylvania Statutes, 35 PS § 691.1.

²⁷¹ Pennsylvania Consolidated Statutes, 30 PCS §§ 102 *et seq.* and §§ 3301 *et seq.*

²⁷² Pennsylvania Act 1998-94 (October 16, 1998), adding 3 Pennsylvania Consolidated Statutes Chapter 42.

²⁷³ Ohio Revised Code, ORC § 6111.01 *et seq.*

²⁷⁴ Ohio Revised Code, ORC § 1533.31.

²⁷⁵ Ohio Revised Code, ORC § 1533.632.

²⁷⁶ Ontario Environmental Protection Act, Revised Statutes of Ontario, RSO Chapter E.19.

²⁷⁷ Ontario Fish and Wildlife Conservation Act, Statutes of Ontario 1997, Chapter 41.

1994²⁷⁸ provides for joint federal-provincial plans for the control of exotics in the Great Lakes.

Two states, Wisconsin and New York, have almost all the relevant state authority within one department. In Wisconsin, the Department of Natural Resources is mandated to “serve as the central unit of state government to protect, maintain, and improve the quality and management of the waters of the state...”²⁷⁹ (As noted above, Wisconsin specifically includes “biological materials” as a form of pollution.²⁸⁰) The DNR is the designated agency for the enforcement of the general statutes on water pollution,²⁸¹ it has the specific authority to permit the importation of non-native fish²⁸² and license fish farms, private stocking, and private fish preserves,²⁸³ and it has the lead authority for the control of nuisance weeds in part with the Department of Agriculture, Trade, and Consumer Protection.²⁸⁴ Wisconsin statutes provide for an “Aquatic Nuisance Control Council” to advise the DNR which includes, in addition to the DNR representative, ten members with “a background in the area of conservation, environmental policy or public health,” but no designated representatives of other state agencies.²⁸⁵

In New York, the Department of Environmental Conservation is responsible for both water pollution (which, as noted above, includes “biological materials”²⁸⁶) and regulation of the fisheries,²⁸⁷ including licenses for private trout and black bass hatcheries, farm fish ponds, fishing preserves, and marine hatcheries.²⁸⁸ The DEC was specifically mandated to submit management plans to the US Aquatic Nuisance Species Task Force.²⁸⁹ New York is a member of a “Tri-State Compact” on control of pollution with New Jersey and Connecticut.²⁹⁰ But the purposes of the compact, stated in Article I of the document, do not mention exotic or nonindigenous aquatic organisms.²⁹¹ New York has also established a “New York State Biodiversity Research Institute.”²⁹²

²⁷⁸ The Canada-Ontario Agreement Respecting the Great Lakes Basin Ecosystem, 1994. (Effective from April 1, 1994 to March 31, 2000.)

²⁷⁹ Wisconsin Statutes, WS § 281.11.

²⁸⁰ Wisconsin Statutes, WS § 283.01.

²⁸¹ Wisconsin Statutes, WS § 281.01(12). The DNR shares a significant amount of its emergency spill response authority with the Wisconsin Department of Military Affairs (Emergency Management).

²⁸² Wisconsin Statutes, WS § 29.735.

²⁸³ Wisconsin Statutes, WS §§ 29.733, 29.736, 29.738.

²⁸⁴ Wisconsin Statutes, WS § 66.955.

²⁸⁵ Wisconsin Statutes, WS § 15.347.

²⁸⁶ New York Environmental Conservation Law, ECL § 17-0105, subsection 17.

²⁸⁷ New York Environmental Conservation Law, ECL Articles 3, 11, and 17.

²⁸⁸ New York Environmental Conservation Law, ECL §§ 11-1909, 11-1911, 11-1913, and 13-0316.

²⁸⁹ New York Environmental Conservation Law, ECL § 3-0301, subsection 2w.

²⁹⁰ New York Environmental Conservation Law, ECL § 21-0501.

²⁹¹ New York Environmental Conservation Law, ECL § 21-0501.

²⁹² New York Education Law, EDUC § 325-a.

§ 392. Structure for regional coordination on exotics

The two primary forums for regional coordination on exotics are the Great Lakes Fishery Commission and the Great Lakes Commission Panel on Aquatic Nuisance Species (ANS Panel). The Fishery Commission, a binational body established by the Convention on Great Lakes Fisheries,²⁹³ is mandated to “formulate a research program...to determine the need for measures to make possible the maximum sustained productivity of any stock of fish...to determine what measures are best adapted for such purpose”²⁹⁴ and “to recommend appropriate measures to the Contracting Parties,”²⁹⁵ which are the federal governments of the United States and Canada. This is exactly what the Fishery Commission did when it recommended action to control exotics in ballast water to the two governments in 1988,²⁹⁶ and thereby prompted the development of the voluntary Canadian ballast guidelines, adopted in 1989, and the enactment of the first legislation on the subject in the form of the US Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990.²⁹⁷

That act, in turn, contained a US Congressional mandate for the Great Lakes Commission to establish a regional Panel on Aquatic Nuisance Species (as well as a mandate for the US federal government to create a national Task Force).²⁹⁸ The original interstate compact creating the Great Lakes Commission provided for full participation by the Provinces of Ontario and Quebec as though they were “states,”²⁹⁹ but this provision and others implying authority to enter into binational arrangements or discussions were excepted from the Congressional approval in definite terms. In the later action mandating the creation of the ANS Panel, Congress partially relaxed its earlier expression of disfavor towards any form of binational coordination, saying that the panel is encouraged “to invite representatives from the Federal, provincial or territorial governments of Canada to participate as observers.”³⁰⁰ The statutory mandate for the ANS Panel is, among other things, to “(A) identify priorities for the Great Lakes region...(B) make recommendations to the [national] Task Force....[and] (C) coordinate, where possible, aquatic nuisance species program activities in the Great Lakes....”³⁰¹ Also, the national Task Force is instructed to “request that the Great Lakes Fishery Commission provide information to the

²⁹³ Convention on Great Lakes Fisheries between the United States of America and Canada, signed at Washington, September 10, 1954, Treaties and International Agreements Series, TIAS 3326 (September 10, 1954).

²⁹⁴ Convention, *ibid.*, Article IV, subsection (a).

²⁹⁵ Convention, *ibid.*, Article IV, subsection (b).

²⁹⁶ James M. Ridenour and Carlos M. Fetterolf, Jr., Great Lakes Fishery Commission, letters to George Schultz, US Secretary of State and Joe Clark, Canadian Secretary of State (August 4, 1988).

²⁹⁷ US Public Law 101-646 (November 29, 1990), codified at 16 USC § 4701 *et seq.*, now commonly referred to as the National Invasive Species Act (NISA).

²⁹⁸ 16 USC § 4723.

²⁹⁹ Great Lakes Basin Compact, Article II, Paragraph B. The original compact is printed in full, along with the Congressional approval with exceptions, in US Public Law 90-419 (July 24, 1968).

³⁰⁰ National Invasive Species Act, 16 USC § 4723(a)(3). It might be argued that this is not permission to speak with “observers,” but the infinitive “to participate” is quite encouraging.

³⁰¹ National Invasive Species Act, 16 USC § 4723(a)(1).

[ANS Panel] on technical and policy matters related to the international fishery resources of the Great Lakes.”³⁰²

Finally, the Great Lake Water Quality Agreement of 1978/1987 (GLWQA 78/79)³⁰³ charged the binational International Joint Commission (IJC) to conduct studies of the Great Lakes ecosystem and provide “advice and recommendations to the Parties [the two federal governments] and to the State and Provincial Governments.”³⁰⁴ The IJC was already established, before the GLWQA 78/79, as a binational commission to mediate rights in the use of Great Lakes water under the Boundary Waters Treaty of 1909.³⁰⁵ The GLWQA 78/79, gave the IJC important new responsibilities for monitoring the quality of that water. The agreement has been primarily focused on chemical contaminants, although exotic species and ballast water are mentioned in Annex 6, Review of Pollution from Shipping Sources, in the current agreement. There is at the present time a debate inside the Great Lakes environmental community about whether or not the focus of the agreement should be expanded from the traditional concentration on chemicals to consider habitats and exotics as well. According to the agreement, its general purpose is “to restore and maintain the chemical, physical, and *biological* integrity of the waters of the Great Lakes Basin Ecosystem.”³⁰⁶

³⁰² National Invasive Species Act, 16 USC § 4723(a)(2).

³⁰³ Great Lakes Water Quality Agreement of 1978, as amended by the Protocol of 1978 (signed at Ottawa by the US Secretary of State and the Canadian Minister of Foreign Affairs, November 22, 1978). The GLWQA 78/87 is not a ratified treaty, but is formally recognized by US statutes and the Canada-Ontario Agreement.

³⁰⁴ Great Lakes Water Quality Agreement of 1978/1987, Article III, § 1(c).

³⁰⁵ Treaty between the United States and Great Britain relating to Boundary Waters, and Questions Arising between the United States and Canada, signed at Washington, DC January 11, 1909, 36 Stat. 2448, TS 548, 12 Bevans 319.

³⁰⁶ Great Lakes Water Quality Agreement of 1978/1987, Article II (emphasis added).

Part IV. Discussion of legal and policy options

§ 410. Major legislative programs

§ 411. Ballast water regimes

Should the State of Michigan undertake the regulation of exotics in the ballast water of commercial shipping? Is there other action that the State of Michigan should take, alternatively or in combination with such a program, to help improve the effectiveness of the federal ballast water regime? Specifically, should the State of Michigan consider some sort of requirement for local shore-side treatment along the lines of the state ballast water regime previously used for oily ballast in the State of Alaska or the more extensive regime currently proposed in the California Assembly? How, as a practical matter, would such a regime work in the State of Michigan? Should the state consider other means for the regulation of ballast water, such as a tax to encourage operational and technical changes? Alternatively, or in combination with such concurrent state regulation, should the state advocate improvements in the current standard for the Great Lakes regime, changes to the special safety exemption in NISA 96, or federal measures for dealing with NOBOBs, including consideration of limited changes in the Jones Act?

Concurrent state regulation of ballast water is an option which should be considered, but one which should not be undertaken lightly. There is nothing else that has as much probability of preventing future invasions. On the other hand, there is nothing else which is likely to engender as much opposition except for the related idea of amending the Jones Act. There clearly is a basis, in both logic and law, for concurrent regulation of ballast water by one or more of the states in the Great Lakes region. Section 110 of this report documents the threat from ballast water. Section 210 explains why the current federal regime for the Great Lakes is inadequate, and is not likely to be improved by the national regime being developed. Section 220 details the reasons why, within certain limits, a state regime would not be preempted by federal law.

Any such action by a state is likely to engender opposition from the marine industry which arose in the State of Washington when that state imposed local control on oil tankers, and which also arose in this region when the State of Wisconsin undertook some very limited regulation of commercial vessel traffic in its waters. There will likely be accusations that the state is turning what was a cooperative relationship with industry into an adversarial one. The US Coast Guard might take the side of industry, defending its own sense of prerogatives, as it did in the Washington and Wisconsin cases. There will be predictions that the economy of Michigan will suffer as ships avoid its ports, or perhaps of a “train wreck” as the deadline for compliance approaches and industry has failed to make the necessary arrangements for the handling of their water.

In response to this, it might well be argued that the current cooperative relationship with industry is merely a polite excuse for inaction, which is now being exposed by the debate over the revision of the Great Lakes regulations. In fact, as explained in § 212 of this report, what industry is doing under the current exchange regime is minimal and manifestly inadequate. The salinity test is fallacious. The NOBOBs, 75% to 95% of the traffic, are wholly unregulated. Industry interests, however, are strongly opposing the revised performance standard. Industry has not been forthcoming, in any way, in helping deal with the NOBOB problem. The idea of giving up some percentage of cargo (certainly much less than 5%, more in the range of 1% to 2%) in order to conduct a partial exchange on NOBOBs has been rejected out of hand whenever raised. As soon as it appears that the industry might have to actually incur some cost to prevent the damage being done by their discharges, their cooperation vanishes.

What of the economic implications to Michigan? The state has 40 commercial ports. Most of the business at those ports is internal Great Lakes trade – mainly iron ore, stone, coal, cement – carried by the US lakers which would not be affected whatsoever by any restrictions on the discharge of overseas ballast. (They would be directly affected by any changes to the Jones Act, discussed below.) But the foreign trade (including the importation of foreign steel, which is disagreeable to the lakers and the domestic steel industry) is also important to the economic viability of the region.

Detroit is by far the largest port in the state, and the only port in the state handling major amounts of foreign trade.¹ It is third in the Great Lakes in terms of foreign tonnage (after Duluth-Superior and Ashtabula) with approximately 6 million short tons foreign in 1997, which accounts for about a third of its total tonnage, and in some years it has been the largest port in the lakes for the importation of steel. Given the difference in the type of cargoes, the foreign tonnage is probably much more than a third in terms of the value of the cargo. About 90% of that 6 million short tons of foreign cargo is imports. Also, as discussed in § 111 of this report, Detroit is fourth in the Great Lakes (behind Duluth, Thunder Bay, and Hamilton) in terms of the amount of foreign ballast it receives. The importance of foreign trade in Detroit cuts both ways on this issue. Because foreign imports are important to Detroit and the industries of the surrounding area, any restrictions on that trade will be resisted. On the other hand, the fact that so much foreign trade does in fact come to Detroit gives the State of Michigan a powerful lever for changing the behavior of the foreign shipping coming into the Great Lakes.

Economic effects occur on the margins, and the devil is in the details. As mentioned in § 111 of this report, the foreign tonnage coming through the Seaway varies about 4.5% a

¹ Figures from US Army Corps of Engineers, *Waterborne Commerce of the United States, Calendar Year 1997* (New Orleans: US COE, 1997), Table “Tonnage for Selected Ports in 1997.” See also US EPA and Environment Canada, *The Great Lakes: An Environmental Atlas and Resource Book* (Chicago: US EPA Great Lakes National Program Office, 3rd Ed. 1995), p. 21, Map “Waterborne Commerce.”

year, on average, due to economic fluctuations. As a rough rule of thumb – a political rule, not based on any economic formula – a restriction on foreign imports of less than that “natural” economic fluctuation would likely be tolerable. (There would also be some compensating economic and political benefit, because the US does in fact suffer from a chronic negative balance of payments, and there are major domestic industrial interests in Michigan and the Midwest who would be quite pleased to see some minor reductions in imports of foreign steel.) So what might Michigan require of the ships, and how much would it cost?

Shore side treatment options. The most practical option, in terms of both economics and law, would be a Michigan requirement for handling ballast modeled directly on the ballast water law successfully applied to tank ships by the State of Alaska in the case of *Chevron USA, Inc. v. Hammond* (1984).² (See § 223.) Alaska required that the ballast water either (a) be authentically “clean,” better than the then-current US Coast Guard standards, (b) be treated before discharge in state waters, or (c) be discharged for treatment ashore. In compliance with the limitations on state laws laid out under the preemption analysis in the case of *Ray v. Atlantic Richfield Co.* (1978),³ the state would not specify any design, construction, or equipment requirements. (See § 223.) The owners of the vessels would have complete choice of whatever technical options, including either use of new equipment or changes in operational procedures, which they themselves determine to be the most cost-effective way of meeting the basic standard. The end-of-the-line requirement, if they chose no other option, is to have it pumped ashore for treatment in the port, just as vessels were required to do in Alaska. In addition, the State of Michigan would do well to imitate the carefully phased compliance schedule proposed in the more extensive state ballast water regime just introduced in the California Assembly.⁴

California Assembly Bill 703 proposes the following: (a) Between April 1, 2000, and December 31, 2002, vessels would be required to conduct an “adequate exchange,” at the level of 95% of volume, or conduct alternative treatment, but would be relieved of this or any other requirement if the master documents the existence of conditions making such an exchange unsafe.⁵ This would essentially duplicate the proposed national guidelines under NISA 96 except for the increase from a 90% to 95% exchange performance standard. It would not be as strict as the current Great Lakes regulations insofar as there would not be any requirement for use of an alternate exchange site. It also requires a certification that no “feasible” alternative treatment is available. But that, given the lack of investment in any such system, will be *pro forma*. (b) Between January 1, 2003 and December 31, 2004, the owner of the vessel must either comply with the performance standard or have “commenced the construction or installation of facilities or mechanisms for treating or managing ballast

² 726 F2d 483 (9th Cir. 1984).

³ 435 US 151 (1978).

⁴ California Assembly Bill, AB 703, introduced February 24, 1999, by Assemblyman Lempert, to amend the California Water Code at §§ 13050, 13360, 13385, 13387, and add §§ 13275, *et seq.*, and § 13387.5.

⁵ AB 703, *supra*, proposed amendment to California Water Code at § 13275(f).

water.”⁶ (c) After December 31, 2004, the vessel must either conduct an adequate exchange or make use of such facilities or mechanisms.⁷

The California bill is appropriately non-specific about what “facilities or mechanisms for treating or managing ballast water” may be chosen by industry. If this is interpreted to be an attempt to require changes in shipboard construction or equipment, it raises the preemption problems raised in *Ray*.⁸ It would likely survive such a challenge, however, because it is stated in terms of a wide range of alternatives, just as the requirement for a tug escort in *Ray* was stated as an alternative to double-hull construction. In other words, just as in the *Chevron* case in Alaska,⁹ the state is requiring that the vessel either solve the problem by some other means of choice or arrange to have the water treated ashore.

Treatment ashore makes economic sense when (a) there is a significant concentration of the vessel traffic in one port, (b) that port has major industrial facilities, including a large municipal water treatment plant, and (c) the topography of the port allows reasonable movement of vessel along the waterfront and reasonable access to pipe connections. The Port of Detroit meets all of those requirements. The Detroit Wastewater Treatment Plant, located on the southwest side of the city near the Detroit River, handles a normal load of approximately 700 million gallons per day and has a surge capacity of up to 1 billion gallons per day.¹⁰ A heavy load of ballast on a “handy size” Seaway vessel is in the order of ten thousand metric tonnes, or 2 to 3 million gallons.¹¹ Most would be much less, in the order of a thousand metric tonnes, or 2 to 3 hundred thousand gallons. Or, to calculate it another way, fairly good estimates of actual ballast inputs during a typical year show Detroit receiving about 240,000 metric tonnes total, from all sources, during a nine-month shipping season, which works out to about 63 million gallons per season and 235,000 gallons per day.¹² There are many variables in these figures. The point, here, is to simply establish the orders of magnitude.

Some new shore side infrastructure would be required. At the least, some new pipes, pumps, and temporary storage tanks.¹³ At the most, some minor expansion in the municipal treatment facilities would be required. The Australian Quarantine and Inspection Service

⁶ AB 703, *supra*, proposed amendment to California Water Code at § 13275(h)(2)(A).

⁷ AB 703, *supra*, proposed amendment to California Water Code at § 13275(h)(2)(B).

⁸ 435 US 151 (1978). (See § 223.)

⁹ 726 F2d 483 (9th Cir. 1984). (See § 223.)

¹⁰ Discussion with Mr. Jared Richards, General Superintendent of the Detroit Water & Sewerage Department Wastewater Treatment Plant, February 26, 1999.

¹¹ Approximately, 1 metric tonne of water (weight) = 1 cubic meter (volume) = 264 gallons.

¹² Aquatic Sciences, *Examination of Aquatic Nuisance Species Introductions to the Great Lakes through Commercial Shipping Ballast Water and Assessment of Control Options, Phase I & Phase II*, ASI Project E9225/E9285 (St. Catherines, ON: Aquatic Sciences, Inc., March and June 1996), Phase II, Table 1. This figure includes large quantities of Great Lakes water mixed in with the slop in NOBOB tanks.

¹³ It is usually assumed that there would have to be new piping installed aboard each ship. This is not necessarily so. The water could be removed by high capacity marine salvage pumps. That is not the ideal way to do it. But it is a way to avoid the “train wreck” of ships showing up unprepared to comply with the law.

conducted a study of the capital costs of dedicated onshore treatment facilities for large “cape size” oceanic vessels which discharge much larger quantities and estimated it to be in the order of \$20-30 million.¹⁴ Treatment in a municipal system, as opposed to dedicated facilities, should be much less. It is also far more practical than has often been assumed. The first objection always raised is that sanitary engineers do not want salt water mixed in with their system because it might interfere with the secondary treatment stage of biological breakdown. In fact, the particulate and biological load in ballast water is so thin, relative to untreated sewage, that it can go directly to tertiary treatment (disinfection) after basic media filtration – thus saving both cost and the possibility of interference with the fresh-water bacteria.¹⁵ Whereas screen filters aboard ships are highly problematic because of the difficulty of getting down to low levels of microns and maintaining the integrity of the filters aboard ship, media filtration on shore, using sand, can be highly effective in removing everything but bacteria and viruses.¹⁶ Also, significant mortality may be obtained by simply holding the water for a while in tanks.¹⁷ Because ballast water is in fact a somewhat different problem than municipal sewage, a completely separate special-purpose system would be more logical in the abstract. The problem, however, is one of predicting what the future demand for such a system would be. Neither government nor industry will wish to make a major capital investment in a treatment system, only to see the shipping industry immediately begin to shift to lower-cost alternatives, such as a simple installation of new piping for flow-through exchanges at sea. Thus, the first (and perhaps the last) version of such a shore side treatment facility is most likely to be a hybrid system which combines a very basic first stage collection, holding, and media filtration system with a connection by pipe to the tertiary stage of the municipal treatment plant.

¹⁴ Australian Quarantine and Inspection Service, *Ballast Water Treatment for the Removal of Marine Organisms*, AQIS Ballast Water Research Series Report No. 1, (Canberra, Australia: Australia Government Publishing Service, 1993), p. 73. AQIS gave a range, from 12 to 19 million in Australian dollars, which were 0.6801 to the US dollar in 1993. Again, the point here is to simply establish orders of magnitude.

¹⁵ Discussion with Dr. Andrew N. Cohen, a marine biologist and a leading researcher on exotics in ballast water, based on his investigation of local treatment systems in San Francisco, and also discussion with Mr. Jared Richards, General Superintendent of the Detroit Water & Sewerage Department Wastewater Treatment Plant. The greatest concern about this concept raised by the General Superintendent of the Detroit Wastewater Treatment Plant was the fear that the city might be accepting legal responsibility for uncontrollable trace chemical contaminants from foreign ports along with the water. That is a legitimate concern which would have to be addressed by Michigan DEQ and US EPA. As a matter of basic public policy, it would make no sense to penalize the city for helping treat water which is otherwise dumped directly into the lakes under the US EPA’s general exemption for ship discharges. Detroit uses chlorine gas for its tertiary disinfection stage, and has plans to install dechlorinators, using hydrogen sulphide, before final discharge.

¹⁶ Filtration through sand, in effect the natural means of filtering water, is wonderfully simple and effective. After a long period of use, it might then be appropriate to simply dispose of the sand at sea. It would not be toxic material or garbage. It would simply be material containing organisms which are in the wrong place, and which would do no harm whatsoever in the depths of the sea.

¹⁷ Andrew N. Cohen, *Ships’ Ballast Water and the Introduction of Exotic Organisms into the San Francisco Estuary: Current Status of the Problem and Options for Management* (Richmond, CA: San Francisco Estuary Institute, October 1998), pp. 27-28.

Once one begins to consider the concept, some interesting scenarios develop. The City of Detroit would of course charge for the service of receiving the water, to cover both capital and operating costs. The more water it processed, the more likely economies of scale would obtain. Detroit would be in a position to sell this valuable service to other ports up the line in the lakes, particularly the Port of Duluth. (On shore treatment is more difficult at Duluth because the topography restricts the movement of vessels to convenient terminals and more capacity is needed to pump the water up the hills to a remote treatment facility, although it is certainly not impossible there as well.) A vessel could stop at Detroit along the way, discharge its load of ballast, load on a relatively small amount of heated water or water containing a safe biocide such as glutaraldehyde in order to neutralize the remaining slop, and refill its tanks with water from the Detroit river in order to run in ballast the rest of the way to Chicago, Thunder Bay, or Duluth. In other words, this could become a new economic activity for Detroit, and perhaps one which would encourage more cargo to come to Detroit. As noted above, however, it might be a temporary business.

Tax Options. Another approach, which would avoid the difficulties of trying to predict the future shape of vessel technology in a fluid environment, would be to tax rather than prohibit. The state would levy a user tax, per metric tonne, graduated according to how dirty the water is, for the prospective damage to the state's water. Any discharge in violation of US Coast Guard standards would still be prohibited, thus backing up the federal regime and maintaining the principle that a certain level of threat will simply not be tolerated. Any water that meets a reasonably high standard, such as proof of an effective 98% exchange at sea or certification to be free of any fresh water indicator organisms through a standard protocol of laboratory tests, would be free of any tax. Any water in between would be taxed at a level depending on either the percentage of non-open-ocean water or the percentage of certain indicator organisms established beforehand. Testing does not have to be real time in the field. Samples can be collected, cultured, and examined later in laboratories before a final determination of the level of tax to be levied. The tax collected would go to a dedicated fund, strictly restricted to paying for (a) the cost of the monitoring and enforcement program, and (b) research on ballast technology, including funding of any pilot projects, such as installation of a pilot shore side treatment facility or treatment of NOBOBs with glutaraldehyde.

It would be the first step in establishing the vital principle that "the polluter pays." It also has the potential of being a graduated approach. Instead of an absolute all or nothing requirement, the graduated tax approach allows considerable room for negotiation and experimentation. The disadvantage is that it manifestly accepts a certain level of continued contamination as a matter of public policy, contrary to the obvious need to prevent all future invasions. However, such a public policy has already been adopted, *de facto*, under the current federal regime. Any steps that the State of Michigan takes to improve upon the current low level of protection can only be good. In doing so, if through a graduated tax system, the state legislation should clearly state that (a) the regime is considered a purely *interim* measure, explicitly intended to be "technology forcing," not a final solution to the

problem, and (b) payment of the tax, which only covers the expense of enforcement, and less than the cost of development of new control measures, does *not immunize* the industry from any future liability for the cost of the devastation caused by exotic invasions.

The public debate stimulated by such proposals could be extremely useful. It would (a) put political pressure on the Congress and the US Coast Guard to make meaningful improvements in the federal regime, and (b) force the industry to publicly defend the proposition that they should be immune from any liability whatsoever for the external cost of their activities. The debate, alone, could create significant change in public policy.

Specific elements of a state control or tax regime. There is little point in proposing specific language for legislative proposals here. There are significant policy issues to be addressed first, and the experts in the Michigan Legislative Service Bureau will have their own opinions as to what exact language would best fit the existing statutory structure in Michigan. The point, here, is to just lay out the essential elements:

(a) *Non-discrimination.* Any state regime, whether an absolute control regime or a tax regime, must be scrupulously non-discriminatory in its terms. There should be no mention of the flag of a vessel, where it sails from, or the nature of its cargo. The requirements should be stated purely in terms of the water and where it comes from. That is to say, it should clearly focus on the threat being legitimately regulated, not on the nature of the trade. For example, instead of referring to “vessels equipped with ballast tanks that enter a United States port on the Great Lakes after operating on waters beyond the exclusive economic zone,” as in the current federal regime,¹⁸ it should refer to “water carried in ballast tanks, including unpumpable slop and sediment, which contains or is likely to contain organisms not native to either the Great Lakes or the coastal waters of the Northeastern seaboard of North America.” To be clear, the federal regime is not discriminatory. If a Canadian or US laker does perchance make its way out the Seaway and into the coastal waters of Europe, it is currently covered. The point here, however, is to emphasize the fact that the State of Michigan has no interest in the nature of the business of the ship – only in the water and the organisms it may contain. This is a case in which it would also be helpful to premise any legislation with specific legislative findings emphasizing the non-discriminatory purpose of the legislation, as well as the nature of the threat being addressed. (See § 223.)

(b) *Realistic statement of the state’s role.* The legislation should emphasize, perhaps through specific legislative findings or statement of purpose, that the purpose of the legislation is to *reduce the probability or rate of future invasions* of Michigan waters, not to eliminate all invasions of the Great Lakes. That is the only thing that is possible, and within the jurisdiction of the State of Michigan. As in the case of *Maine v. Taylor* (1986),¹⁹ however, it is entirely legitimate for one state to do what it can to reduce the number of invasions of its own waters despite the fact that invasions may nevertheless spread from

¹⁸ 16 USC § 4711(b)(2).

¹⁹ 477 US 131 (1986).

adjoining state waters. (See § 223.) The proposition is also scientifically valid. Although the biologists cannot ever quantify the probability of future invasions, they do generally agree that it is likely that any given organism has many opportunities for invasion before it actually becomes established.²⁰

(c) *No ship design, construction, or equipment requirements.* Again, the state legislation should focus exclusively on the water and what is done with it, as a matter of operations, and stay away from specifying any design, construction, or equipment changes which industry may choose to adopt, on their own, to meet the state's bottom-line requirements regarding the actual water and the quality of the water discharged in its ports. The state may thereby avoid any intrusion into the US Coast Guard vessel safety regimes which the US Supreme Court found to be preemptive in *Ray v. Atlantic Richfield Co.* (1977).²¹ (See § 223.)

(d) *Federal-state cooperation.* The legislature should emphasize that the purpose of any state regime is to complement the federal regime, and to support the federal goal of obtaining a 100% level of protection articulated by the US Coast Guard.²² To the greatest extent possible, the state should avoid allowing this to degenerate into a turf battle between the federal and state agencies. Some sort of general endorsement of the state legislation by regional bodies, particularly the federally mandated Great Lakes Commission Panel on Aquatic Nuisance Species, would be helpful in this respect.

The Jones Act and the NOBOBs. The Jones Act²³ (see § 111) is of relevance to the problem of the NOBOBs (see §§ 112, 212) because it rules out, *a priori*, any consideration of creative ways to avoid cross-ballasting inside the lakes. The slop in the bottom of a NOBOB tank is of no threat to the ecology of the Great Lakes if it is never discharged inside the lakes. It only becomes necessary to discharge it when a third-party vessel unloads foreign cargo at an intermediate port (such as steel unloaded in Detroit) before proceeding further on to where it picks up its outgoing cargo (such as grain from Duluth), at which time it must discharge the mixture of Great Lakes water and foreign slop in order to make room for that outgoing cargo. Under the Jones Act, a cabotage law common among maritime nations, the third-party vessel cannot carry cargo of any type from the intermediate US port (such as Detroit) to the final US port (such as Duluth). Therefore, it must load the ballast instead.

If the US Congress were to make a limited amendment to the Jones Act regarding the NOBOB vessels – in an explicit *quid pro quo* for a prohibition on NOBOB cross-ballasting

²⁰ See James T. Carlton, Donald M. Reid, and Henry van Leeuwen, *The Role of Shipping in the Introduction of Nonindigenous Aquatic Organisms to the Coastal Waters of the United States (other than the Great Lakes) and an Analysis of Control Options*, Shipping Study I, USCG Report No. CG-D-11-95 (Springfield, VA: National Technical Information Service, March 1997, April 1995), Chapter 5, pp. 96 *et seq.*, especially p. 102, Box 5-2.

²¹ 435 US 151 (1977).

²² 63 *Federal Register* 17782 (April 10, 1998), NPRM to amend 33 CFR Part 151, especially preamble discussion at 63 *Federal Register* 17785.

²³ 46 USC § 883.

between US ports – it might allow them to avoid this problem with very little actual change in the competitive balance between foreign and domestic flag vessels. The foreign vessels would be granted the privilege of finding some other cargo to carry, instead of ballast water, from the intermediate port to the final port. (They would likely still have to take on some limited amount of ballast for trim. But that much lower amount could be carried out of the lakes with the final cargo.) This would not be a great boon to the foreign carriers (who are just as likely to oppose the overall scheme as the domestic carriers are) because it would be difficult to find appropriate cargoes in all cases. They would sometimes have to carry low value cargoes below cost. They might, for example, have to pay a laker to bring them limestone from Rodgers City, Michigan, to Detroit, for them to carry up to the taconite processing plants in Duluth. In essence, they would be paying a fee for the privilege of carrying solid ballast in their holds. And they would sometimes not be able to find any appropriate cargo, and thereby be forced to forego either part of the incoming cargo (in order to conduct a partial exchange of the slop at sea) or forego some of their low-value outgoing cargo (in order to take all of the cross-ballasted water out of the lakes). Nevertheless, domestic shipping interests would almost certainly oppose any such scheme on principle. Even if not an attractive proposition for the foreign carriers, it would be viewed as the camel's nose for eventual repeal of the Jones Act in its entirety. Strangely enough, because of separate political and business interests at stake, this is a zero-sum game which might well be viewed as a losing proposition for both competitors.

Nevertheless, it is a proposition which could result in significant gains for the protection of the ecology without any real change of significance in the competitive balance between domestic and foreign shipping interests or loss to the larger economy. Given the fact that there are other legitimate interests advocating repeal of the Jones Act on the basis of general economic principles,²⁴ this proposition may be open for consideration.

General support for changes in the federal regimes. More generally, either separately or in conjunction with concurrent state legislation, the State of Michigan should most certainly lend political support for the necessary improvements in the federal regimes, including (a) adoption of a “performance standard” at an appropriate level of effectiveness, in place of a salinity standard (see § 212) in US Coast Guard regulations, (b) amendment of the special safety exemption which industry had inserted into NISA 96 (see § 213) by the US Congress, (c) adoption of federal measures for dealing with the NOBOBs (see §§ 112, 212), and (d) new regulations to be promulgated by the Canadian Government under the Shipping Act (see § 210).²⁵

²⁴ On the Jones Act political and economic debate, see, e.g., Tim Sansbury, “Senator Vows Push to Change Jones Act,” *Journal of Commerce* (September 16, 1998), p. 12A. A good sense of the vehemence of the political debate, and detailed information on the positions of both sides, can be easily found by a simple internet search on “Jones Act.”

²⁵ It is not hereby being suggested that the state improperly engage in international negotiations, but simply that the state support policy discussions, by federal agencies, at appropriate binational forums such as the Great Lakes Fishery Commission, the International Joint Commission, and the Binational Executive Committee.

§ 412. National and interstate regimes for controlling commercial uses

It is the opinion of this researcher that there is simply no effective way for one state, acting alone, to effectively control invasions of exotics via aquaculture, transportation of bait, and importation of aquarium fish. That does not mean that independent state control measures are without value, and specific improvements to existing Michigan laws on those subjects are proposed in § 420 below. The diffuse nature of commerce in these organisms, however, makes it impractical to intervene and screen for exotic organisms and pathogens except at natural concentration points (or “critical control points,” in the language of the HACCP system). (See § 120.) For aquaculture, those natural concentration points are centralized stock breeding operations, such as a major facility in the State of Washington which supplies fish eggs to many of the Great Lakes states (see § 121). For bait fish, those are less-concentrated but identifiable harvesting ponds, frequently located outside the Great Lakes basin (see § 122). For aquaria, those are major supply houses and importation ports, most of which are outside the State of Michigan (see § 123).

That does not mean that problem is impossible to deal with. To begin with, the basic nature of the problem has often been overstated. Major aquaculture supply facilities have a natural business interest in maintaining the consistency and health of their stocks. There is no reason they cannot be expected to cooperate with some sort of federal or state inspection system to enforce a high industry standard for them and their competitors. Bait dealers have a similar interest, and there is no reason why they should not cooperate with some sort of scheme for regular inspection of their harvesting ponds by state conservation officers in order to be able to certify that the fish from those ponds are suitable for export to other states. The sheer number of fish imported for aquaria and ornamental ponds has often been given as a reason why any effective regulation of that industry is impracticable. That misstates the nature of the problem. Each one of those fish has an extraordinarily high value in terms of dollar per pound of fish. The supply houses take great care to identify the specific characteristics of each fish being sold, including the origin of that species and the environmental conditions under which that species can survive. Only a small percentage of the exotic fish being imported, probably well under 10% of the total, are freshwater and coldwater fish which might survive if released in the wild in the Great Lakes basin. (Other limitations would apply to the specific categories of fish which represent a threat to other regions of the continent.) There is nothing unreasonable in requiring those specific species to be sorted out, evaluated for the degree to which they represent a threat, and approved for importation on a “green list” before they are shipped into specific regions. As in all other cases, the industry should have the burden of proving that the species to be introduced is benign.

How would such regimes be created? There is obviously a leading role to be played by the federal agencies. APHIS should be encouraged to continue with existing efforts to create an effective aquaculture fish inspection system. USFWS should be encouraged to develop,

by either regulation or request for new legislative authority from Congress, the national “green list” for all imports advocated by the Secretary of the Interior. (The recent and extremely blunt public statements by the Secretary of the Interior should be interpreted as a plea for the necessary political support.) There is also a significant role for the states. The states, particularly the states in the Great Lakes region, can take the following actions:

(a) Establishment of a “Great Lakes Green List” under the joint sponsorship of the Great Lakes Fishery Commission and the Great Lakes Commission Panel on Aquatic Nuisance Species. That, in turn, needs to be supported by legislation or regulations in each state, specifically prohibiting the importation or use of species not on the regional list.

(b) Establishment of interagency agreements, perhaps under the general sponsorship of the Great Lakes Commission Panel on Aquatic Nuisance Species, for cooperation on inspection and certification of bait fish harvesting ponds (or other water bodies) by conservation authorities in the donor states. That, in turn, needs to be supported by legislation or regulations in each state, specifically prohibiting the importation of bait from uncertified locations.

(c) Prohibition of importation of any freshwater and coldwater species of fish for use in aquaria or ornamental ponds (or any other use) unless it is on the “Great Lakes Green List.” In other words, there would be no exemption from the general prohibition on imports and uses of fish not on the regional list for use in aquaria ornamental ponds unless they are clearly saltwater or tropical fish which cannot survive in the Great Lakes region.²⁶ In fact, the great majority of aquarium fish will still be exempted from regulation in the Great Lakes. But it will be the obligation of the aquarium supply houses to identify the few which are not and submit them for evaluation.

All of these actions at the state and regional level are well within the authority of the states to protect their natural resources under the doctrine of *Maine v. Taylor* (1986).²⁷ (See § 223.) As in the case of the regulation of ballast water, however, the states should seek to maintain a cooperative relationship with the federal agencies.

§ 413. Comprehensive state exotics legislation

Although specific improvements to existing provisions of law are recommended below, these do not replace the clear legislative mandate which is created by a well-focused, comprehensive act on the subject of exotic invasions. The obvious models are the Minnesota Chapter 84D on Harmful Exotic Species²⁸ (see § 334) and the generic model legislation currently under development by the Great Lakes Commission Panel on Aquatic Nuisance Species. The State of Michigan should consider such an act, with provisions to

²⁶ There is a precedent for that approach in 58 Pennsylvania Code § 73.1(b), discussed in § 360 of this report.

²⁷ 477 US 131 (1986).

²⁸ Minnesota Statutes, MS Chapter 84D, MS §§ 84D.01 *et seq.*

correct some of the technical problems identified in this report. The most important of these are (a) addition of specific legislative authority to prohibit by regulation the importation of any species not on a regional list of approved species developed in consultation with other states belonging to the Great Lakes Basin Compact (the “Great Lakes Green List”) even if a list is yet to be developed, (b) prohibition of any use, importation, or introduction (rather than simply introduction) of a species not approved, and (c) a clear enunciation of the principle that liability for the damage done by an illegal introduction is not limited by “good faith” defenses or *ad hoc* remedial measures.

§ 420. Other legal and administrative measures

§ 421. The Michigan Natural Resources and Environmental Protection Act²⁹

Aquatic organisms. The Michigan Department of Natural Resources should have clear authority over all aquatic organisms and pathogens, in line with the more expansive authority common in other jurisdictions (see § 333). Also, although this would be a relatively new sort of provision, there should be clear authority to regulate genetically modified strains within a species. This could be accomplished by a simple amendment to MCL § 324.45906 which replaces references to “game fish” and “fish” with reference to “aquatic organisms and pathogens, including all stages of the growth of aquatic organisms and genetically distinct strains within a species.”

Green lists. The Michigan Department of Natural Resources should not be required to specifically identify an aquatic organism as one endangering the public fisheries before it is controlled. Again, many other conservation agencies have authority to permit or approve all introductions (see § 333). The same section in the act, MCL § 324.45906, can be amended to provide that the importation, possession, or introduction of any organism not on a regulatory list of approved species is prohibited. It should be phrased in terms of a regulatory list, not a “permit” (although an associated permitting process is needed) in order to encourage a clear, public declaration of which species are allowed. Also, the DNR should be specifically authorized to (a) promulgate regulatory standards for approval of species, based on the principle that the proponent of introduction has the burden of proving its benign nature, and (b) to include a requirement that any species to be approved has also been approved by a regional list for the Great Lakes basin, subject to the future negotiation of such a list with other conservation agencies by the DNR.

Emergency authority. In the unlikely but conceivable event that there is an identifiable “spill” of exotic organisms which have not yet had a chance to establish themselves – such as an accidental release reported from an aquaculture facility or a new and dangerous organism identified in after-the-fact laboratory analysis of discharged ballast water – there should be clear authority to take any practical remedial measures just as though this were a

²⁹ MCL Chapter 324.

spill of oil or hazardous chemicals, including the emergency application of biocides if scientifically appropriate. In order to mobilize an effective emergency response, the state should activate the same interagency response system developed for oil and chemical spills. This involves coordination among the Michigan State Police, DEQ, DNR, and local emergency response agencies, along with US EPA, USFWS, and the US Coast Guard, under the National Contingency Plan (NCP)³⁰ and the overall guidance of the Region V Regional Response Team (RRT). (In Michigan, the State Police have the lead responsibility for coordination of emergency response.) It might, for example, be appropriate to provide for the emergency use of biocides under interagency consultative procedures modeled after the procedures developed by the Region V RRT for use of chemical dispersants in oil spills under the NCP. If that basic concept has appeal to Michigan policymakers, this researcher would recommend that Michigan ask for a joint meeting between the Great Lakes Commission Panel on Aquatic Nuisance Species and the Region V RRT to discuss how it would actually work as a matter of operational doctrine and agency lead roles. Those issues need to be discussed and agreed upon before it would be appropriate to propose any new legislative authority.

§ 422. The Michigan Aquaculture Development Act³¹ (and the Animal Industry Act³²)

Applicability of the acts. The technical error in the definition of “aquaculture,”³³ in both the Michigan Aquaculture Development Act and the Animal Industry Act should be corrected. (See § 344.) In fact, there is probably no need for a special statutory definition at all. The common-sense definition, as it is used in the scientific and business community, is perfectly suitable and would avoid this sort of technical difficulty.³⁴

Review of the statutory green list. There should be some clearly agreed-upon mechanism for the Michigan Department of Natural Resources to review and amend the statutory “green list” of approved species³⁵ in light of either (a) new scientific information, or (b) disapproval of a species on the list by other jurisdictions in the Great Lakes. (See § 344.)

³⁰ 40 CFR Part 300.

³¹ MCL §§ 286.871 *et seq.*

³² MCL §§ 287.701-287.747, especially new § 287.729a on aquaculture diseases.

³³ MCL §§ 286.872(b), 287.729a.

³⁴ “Aquaculture” is a relatively new term, not in many common one-volume dictionaries, which is no doubt why it was thought that a special statutory definition was necessary. But it is coming into more common use, and does appear in many one-volume scientific dictionaries. See, *e.g.*, *QPC Science Encyclopedia* (New York: Quality Paperback Book Club, 1998), p. 47, defining it as simply “the cultivation of fish and shellfish for human consumption.” There may be a need to expand that to include cultivation for bait fish production, if in fact there is a deliberate policy decision that bait fish production should be controlled by the same regulatory scheme. If so, however, it is much better to simply say so, *e.g.* say “aquaculture and bait fish production,” thus making clear what the actual design of the regulatory regime is, rather than create special legal language.

³⁵ MCL § 286.875.

Implementing regulations. It may be expected that the Michigan Department of Agriculture will fill out the general outline of the act with more specific agency regulations.³⁶ For example, the record-keeping requirement at MCL § 286.876(3) only specifies those records needed “to establish proof of ownership,” and the requirement to have a copy of the Great Lakes fish disease control policy in MCL § 286.877(2)(c) is strangely silent about any requirement to actually follow the policy. There will no doubt be many other areas in which MDA will find it appropriate to promulgate specific requirements to strengthen its inspection system at the operational level as it gains experience with administration of the act.

§ 423. Coordination between agencies on aquaculture

There is a need to ensure regular coordination between the Michigan Department of Natural Resources and the Michigan Department of Agriculture on the subject of exotics in aquaculture. This is, in turn, only a reflection of the need to coordinate policy between such agencies in other states and in the Great Lakes region as a whole. The Michigan Aquaculture Advisory Committee established by agency policy in the MDA, under the expert guidance of an MDA doctor of veterinary medicine, is an excellent forum for such consultations. It is recommended that Michigan agencies consider (a) strengthening that consultative mechanism by formally establishing it in either statute or regulation, perhaps by joint regulations issued by both the MDA and the DNR, and (b) encouraging the development of an intergovernmental regional Great Lakes committee on aquaculture (including Pennsylvania, New York, and Ontario as well as the states in the “North Central Region” used by USDA). A regional aquaculture committee might be generally modeled on the Great Lakes Commission Panel on Aquatic Nuisance Species, and would then be a natural point for coordination with the ANS Panel as well as a useful forum for regional coordination on a whole range of aquaculture issues.

³⁶ Authorized by MCL § 286.882.

§ 430. Research agenda

§ 431. Glutaraldehyde project

Because of the significant gap in the federal regulatory regime created by the NOBOBs (see §§ 112, 212), the State of Michigan and the Great Lakes Fishery Trust Fund should continue with all possible speed on their initiative to test glutaraldehyde (GA).³⁷ This is the only project currently being pursued at any level of government which has a realistic chance of plugging that gap in the near future. GA might also become an important means for incidental treatment of problem vessels under any state control regime.

§ 432. Binational research strategy

More generally, the State of Michigan should continue its support of the “Binational Canadian-United States Ballast Water Research Strategy” endorsed by the International Joint Commission and the states on the Great Lakes Commission ANS Panel.³⁸ The main points of that strategy are:

(a) Better evaluation of the safety and effectiveness of open ocean exchange, including development of better performance tests.

(b) Evaluation of near-term options for dealing with NOBOB vessels, including partial exchange options, the costs of retrofitting systems for flow-through exchange on existing vessels, and heating the relatively small quantities of water on NOBOBs.

(c) Continuation of Canadian and Michigan initiatives for the study of environmentally acceptable biocides (including GA).

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³⁷ Also C₅H₈O₂. See Larissa M. Lubomudrov, Russell A. Moll, and Michael G. Parsons, *An Evaluation of the Feasibility and Efficacy of Biocide Application in Controlling the Release of Nonindigenous Aquatic Species from Ballast Water* (Ann Arbor, MI: University of Michigan, November 1997).

³⁸ Approved by the GLC ANS Panel in February 1998. Copies are available from the Great Lakes Commission in Ann Arbor, MI. A full discussion of the background and rationale of the binational research strategy is contained in Department of Fisheries and Oceans (Canadian Coast Guard and Science Branch), Transport Canada, and US Coast Guard, *1996-1997 Binational Report on Protection of Great Lakes Water Quality* (Cleveland, OH: 9th US Coast Guard District (map), October 14, 1997), §§ 240-242.2. See also the discussion of ballast water control options in M. Eric Reeves, “Techniques for the Protection of the Great Lakes from Infection by Exotic Organisms in Ballast Water,” in Frank M. D’Itri, ed., *Zebra Mussels and Aquatic Nuisance Species* (Chelsea, MI: Ann Arbor Press, 1997), pp. 283-299.