



# Ballast Water Management to Combat Invasive Species

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## Summary

The 112<sup>th</sup> Congress may consider legislation to amend and reauthorize the Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990 to further study vessel ballast water management standards and modify how ballast water is handled.

In recent years, people have become increasingly aware that the globalization of trade, the increased speed of travel, the massive volume of cargo shipments, and rising tourism have combined to increase the chance of accidental introductions of foreign species into the United States. Aquatic species arrive through a variety of mechanisms—unintentionally when attached to vessel hulls or carried in vessel ballast water and intentionally when imported for aquaria display, as live seafood for human consumption, or as a transplant to increase sport fishing opportunities.

The arrival of zebra mussels in the Great Lakes and their subsequent damage to city water supplies and electric utilities focused significant attention on ballast water discharge by cargo ships as a high-risk mechanism for species invasion. New management efforts attempt to address this concern.

In late August 2009, the U.S. Coast Guard published proposed regulations to establish quantitative standards for ballast water treatment. The proposed standards would initially follow standards developed by the International Maritime Organization. In a subsequent phase, the quantitative standards would become much more stringent, given sufficient technological development to support achievement of the higher standards. The proposed Coast Guard standards would not preempt existing state ballast water management standards.

In response to litigation, the Environmental Protection Agency published regulations on December 28, 2008, to regulate ballast water discharge under the Clean Water Act through Vessel General Permits. Subsequently, P.L. 110-299 provided a two-year moratorium for commercial fishing vessels and non-recreational vessels less than 79 feet in length from the ballast water discharge provisions, and the 111<sup>th</sup> Congress enacted legislation (P.L. 111-215) to further extend this moratorium through December 18, 2013.

This report provides background on various approaches to ballast water management and reviews current ballast water management laws and programs. This report will be updated as this issue evolves.

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With increases in the number of people traveling, the speed and methods of travel, the types and volume of trade, the ability to move living plants and animals so that more of them survive the journey, and the different modes of transport for hitch-hiking organisms, invasive species have become a global concern. Although there are many ways in which species may invade,<sup>1</sup> this report focuses on ballast water discharge by cargo ships as one of the more significant mechanisms for biotic invasion of coastal and estuarine habitats as well as inland navigable waters.

The arrival of zebra mussels in the Great Lakes in the late 1980s and their subsequent damage to city water supplies and electric utilities<sup>2</sup> focused initial attention on ballast water as a source of invasive species. Reflecting the scope of the problem, the San Francisco Bay-Delta ecosystem is considered to be one of the most disrupted aquatic ecosystems in the United States, with colonization by more than 230 non-native species.<sup>3</sup> Compounding the problem, species that invaded via other mechanisms (e.g., mitten crabs that are believed to have been an illegal seafood introduction) may be further spread through ballast water transport and vice versa (e.g., zebra mussels are spreading to new drainages via recreational boats transported by highway on trailers). In the Gulf of Mexico, ballast water has been implicated in the contamination of commercial oyster beds.<sup>4</sup> Globally, it is estimated that more than 10,000 marine species each day may be transported across the oceans in the ballast water of cargo ships.<sup>5</sup> The ctenophore *Mnemiopsis leidyi* was transported in ballast water from estuaries along the Atlantic coast of North America to the Black Sea, where it is blamed for a massive collapse of the commercial fish harvest. Around 1978, the American jack-knife clam, *Ensis directus*, was introduced through ballast water in the German Bight and has spread rapidly over the North Sea coast, where it has become one of the most common bivalves, replacing many native species.

The economic, social, recreational, and ecological losses/costs attributable to aquatic invasive species are difficult to quantify. While some costs have been estimated, such as the \$5 billion in damages to water pipes, boat hulls, and other hard surfaces by zebra mussels in the Great Lakes,<sup>6</sup> others, such as the losses of native species and environment restoration to pre-invasion quality, are unknown. The 112<sup>th</sup> Congress may consider legislative proposals to reauthorize and amend the Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990,<sup>7</sup> including specific provisions that would modify how ballast water is managed.

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<sup>1</sup> For an in-depth discussion of invasive species generally and their various mechanisms of invasion, see CRS Report RL30123, *Invasive Non-Native Species: Background and Issues for Congress*, by M. Lynne Corn et al. Zebra mussels and other species arriving in ballast water are specifically discussed in “A Gallery of Harmful Non-Native Plants and Animals” in that report.

<sup>2</sup> Colonies of zebra mussels accumulate and block water-intake pipes and screens of drinking water facilities, industrial facilities, power-generating plants, golf course irrigation pipes, and cooling systems of boat engines.

<sup>3</sup> Information from the Natural Resources Defense Council webpage at <http://www.nrdc.org/greengate/wildlife/invasivef.asp>.

<sup>4</sup> Fred C. Dobbs and Andrew Rogerson, “Ridding Ships’ Ballast Water of Microorganisms,” *Environmental Science & Technology*, v. 39, no. 12 (June 15, 2005): 259A-264A.

<sup>5</sup> G. Tracy Mehan, Assistant Administrator for Water, U.S. Environmental Protection Agency, testimony before the Senate Committee on Environment and Public Works, Subcommittee on Fisheries, Wildlife, and Water, June 17, 2003.

<sup>6</sup> 16 U.S.C. §4701(a)(4).

<sup>7</sup> Title I of P.L. 101-646; 16 U.S.C. §§4701-4741.

## Ballast Water Management

Ballast water is water that is held in tanks and/or cargo holds of ships to provide stability and maneuverability during a voyage when ships are not carrying cargo, are not carrying heavy enough cargo, or require more stability due to rough seas.<sup>8</sup> Ballast water may be either fresh or saline. Ballast water may also be carried so that a ship rides low enough in the water to pass under bridges and other structures. Ballast water management (BWM) for vessels includes all measures that aim to prevent unwanted aquatic nuisance species from being transported between ports in the ballast. Seaports in which ships exchange ballast water daily are at severe risk of invasions. Organisms transported to U.S. ports from foreign harbors with similar physiochemical characteristics (e.g., water temperatures, salinity regimes) pose an especially high risk of invasion. Even if only a tiny proportion of newly arriving non-native species survive in new habitats, such as San Francisco Bay, Chesapeake Bay, or Boston Harbor, the actual number of successful invasive species can be very large.

There are several different ways of managing ballast water. Currently, the most widely used is ballast water exchange. Ballast water exchange means that ships on their way to the next port release the lower-salinity coastal water they brought aboard in their last port and replace it with higher-salinity open-ocean water. Although this measure is not perfect, it reduces the number of potentially invasive species in the ballast tanks and replaces them with oceanic organisms that are less likely to survive in the lower-salinity near-shore waters of the ship's next port.<sup>9</sup> However, organisms with a wide tolerance for differing salinities may survive ballast water exchange, especially any such organisms that may reside in the unpumpable residual water and sediment remaining in the tanks during any ballast water exchange.

Another approach to BWM is treatment.<sup>10</sup> Ballast water treatment is the subject of extensive current research and development, and several technologies and methodologies have been proposed. These include mechanical methods (e.g., filtration and separation), physical methods (e.g., sterilization by ultraviolet light, ozone, heat, electric current, or ultrasound), and chemical methods (using biocides). In addition, treatment may combine several of these methods.<sup>11</sup>

Treatment may be an appropriate management option on occasions when vessels temporarily operate without ballast—a “no-ballast-on-board” (NOBOB) situation. When a ship is carrying no ballast water, it presents unique treatment problems because large numbers of organisms can reside in the unpumpable residual water and sediment remaining in the ballast tanks. Few of the tested methodologies have been applied to the control of organisms in NOBOB situations.<sup>12</sup> The

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<sup>8</sup> Massachusetts Institute of Technology Sea Grant, *Marine Bioinvasions Fact Sheet: Ballast Water*, Cambridge, MA, Dec. 4, 2002; available at <http://massbay.mit.edu/exoticspecies/ballast/fact.html>.

<sup>9</sup> National Ballast Information Clearinghouse, *Present Ballast Water Management Practices*; available at <http://invasions.si.edu/nbic/managementpract.html>.

<sup>10</sup> A detailed discussion and evaluation of various ballast water treatment options is presented in Chapter 4 (“Shipboard Treatment Options”) of Commission on Engineering and Technical Systems, *Stemming the Tide: Controlling Introductions of Nonindigenous Species by Ships’ Ballast Water*, National Academy of Sciences (Washington, DC: 1996), 141 pp.

<sup>11</sup> For example, Australian researchers established a pilot plant to sterilize ballast water using a combination of filtration, ultraviolet light, and sonic disintegration. For more information, see David Salt, “Shipboard Pests get Sterile Treatment,” *ABC Science Online*, Sept. 30, 2003; available at [http://www.abc.net.au/science/news/enviro/EnviroRepublish\\_956770.htm](http://www.abc.net.au/science/news/enviro/EnviroRepublish_956770.htm).

<sup>12</sup> The Coast Guard is studying methods to address NOBOB concerns; for more information, see 70 *Fed. Reg.* 1448- (continued...)

treatment option favored by many ship operators because of its intrinsic simplicity and relatively low cost is biocide application, whereby chemical agents are added to the ballast water to minimize the number of (i.e., kill) viable organisms. This approach also has the potential to address the NOBOB condition.<sup>13</sup> Concerns remain relating to establishing and enforcing standards for the appropriate disposal of biocide-treated ballast water and sediments.

Although estimates of the costs of ballast treatment may be imprecise and vary from vessel to vessel, there is some general agreement on average costs.<sup>14</sup> For example, it may cost an estimated \$400,000 per vessel for modification of container/bulk vessels to use onshore ballast water treatment facilities at California ports. More generally, the cost of retrofitting vessels to treat ballast water has been estimated at between \$200,000 and \$310,000 per vessel for mechanical treatment and around \$300,000 for chemical treatment.<sup>15</sup> Most of this expense will be borne by foreign shipping companies, as the U.S. flag fleet is a small percentage of the global fleet,<sup>16</sup> and likely passed along to consumers of products imported on these ships. The likelihood of compliance by the foreign flag fleet was increased by the February 2004 conclusion of an international agreement on ballast water management (see “International Efforts,” below).

## Current U.S. Law

Attempts to address ballast water concerns in the United States began with the Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990 (NANPCA),<sup>17</sup> which established a federal program to prevent the introduction and to control the spread of unintentionally introduced aquatic nuisance species. The U.S. Coast Guard, U.S. Environmental Protection Agency (EPA), U.S. Fish and Wildlife Service (FWS), Army Corps of Engineers, and National Oceanic and Atmospheric Administration (NOAA) share responsibilities for implementing this effort, acting cooperatively as members of an Aquatic Nuisance Species (ANS) Task Force to conduct studies and report to Congress to (1) identify areas where ballast water exchange can take place without causing environmental damage; and (2) determine the need for controls on vessels entering U.S. waters other than the Great Lakes. Under §1101 of NANPCA, a Great Lakes BWM program (voluntary in its first two years) became mandatory in 1992. This section directed the Coast Guard to issue regulations (33 CFR Part 151, Subpart C) to prevent the introduction and spread of aquatic nuisance species into the Great Lakes through the ballast water of vessels and established civil and criminal penalties for violating these regulations. NANPCA also encouraged the Secretary of Transportation (now the Secretary of Homeland Security) to negotiate with foreign

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1449 (Jan. 7, 2005).

<sup>13</sup> David T. Stocks, “Biocides Testing in the Great Lakes,” *BMT Focus* (Summer 2002): 12; available at <http://www.bmt.org/brochures/Focus%20Summer%202002.pdf>.

<sup>14</sup> State Water Resources Control Board, *Evaluation of Ballast Water Treatment Technology for Control of Nonindigenous Aquatic Organisms*, California Environmental Protection Agency (December 2002); available at <http://www.calepa.ca.gov/Publications/Reports/Mandated/2002/BallastWater.pdf>.

<sup>15</sup> Frans J. Tjallingii, *Market Opportunities for Ballast Water Treatment*, Royal Haskoning, International Ballast Technology Investment Fair, Chicago, IL, Sept. 21, 2001, available at <http://www.nemw.org/fairtjallingii.pdf>.

<sup>16</sup> As of July 2003, U.S. flag vessels comprised 1.65% of the global merchant fleet tonnage, according to statistics from U.S. Maritime Administration, available at [http://www.marad.dot.gov/Marad\\_Statistics/mfw-7-03.htm](http://www.marad.dot.gov/Marad_Statistics/mfw-7-03.htm).

<sup>17</sup> Title I of P.L. 101-646; 16 U.S.C. §§4701, et seq.

countries, through the International Maritime Organization, to prevent and control the unintentional introduction of aquatic nuisance species.

In 1996, the National Invasive Species Act (NISA) amended NANPCA to create a national ballast management program modeled after the Great Lakes program wherein all ships entering U.S. waters (after operating outside the U.S. Exclusive Economic Zone) are directed to undertake high seas (i.e., mid-ocean) ballast exchange or alternative measures pre-approved by the Coast Guard as equally or more effective. While not initially enforced on a ship-by-ship basis, this national program was to have become mandatory within three years of the date the Coast Guard issued interim voluntary guidelines<sup>18</sup> if ships did not show adequate compliance with the program<sup>19</sup> in the absence of enforcement.

The National Ballast Information Clearinghouse (NBIC) was developed jointly by the Coast Guard and the Smithsonian Environmental Research Center to synthesize, analyze, and interpret national data concerning BWM. During the first two years (July 1999 through June 2001), the NBIC found that nationwide compliance with ballast exchange reporting requirements was low, with only 30.4% of vessels entering the U.S. Exclusive Economic Zone (EEZ) filing reports with the NBIC.<sup>20</sup> In addition, a Coast Guard Report to Congress concluded that reporting compliance was insufficient to allow an accurate assessment of voluntary BWM.<sup>21</sup> On January 6, 2003, the Coast Guard proposed penalties for those who failed to submit BWM reports required by 33 U.S.C. §151 Subpart D for most vessels entering U.S. waters.<sup>22</sup> On June 14, 2004, the Coast Guard published final regulations establishing penalties for failure to comply with reporting requirements.<sup>23</sup> On July 28, 2004, the Coast Guard published final regulations changing the voluntary ballast water management program to a mandatory one.<sup>24</sup>

NISA encouraged negotiations with foreign governments to develop and implement an international program for preventing the introduction and spread of invasive species in ballast water. NISA also required a Coast Guard study and report to the Congress on the effectiveness of existing shoreside ballast water facilities used by crude oil tankers in the coastal trade off Alaska, as well as studies of Lake Champlain, the Chesapeake Bay, San Francisco Bay, Honolulu Harbor, the Columbia River system, and estuaries of national significance.<sup>25</sup> Under NISA, a Ballast Water Management Demonstration Program was authorized to promote the research and development of technological alternatives to ballast water exchange.

NISA has been criticized as inadequate and faulted for several alleged shortcomings, including agency weakness or delay in implementing some of its provisions.<sup>26</sup> Since NISA exempted most

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<sup>18</sup> 64 *Fed. Reg.* 26672-26690 (May 17, 1999). The voluntary guideline interim regulations were effective July 1, 1999. Final regulations were published in 66 *Fed. Reg.* 58381-58393 (Nov. 21, 2001).

<sup>19</sup> If the voluntary program did not result in sufficient compliance, reporting of BWM practices would become mandatory for nearly all vessels entering U.S. waters (33 CFR 151.2040).

<sup>20</sup> G. M. Ruiz, et al., *Status and Trends of Ballast Water Management in the United States: First Biennial Report of the National Ballast Information Clearinghouse* (Edgewater, MD: Smithsonian Environmental Research Center, Nov. 16, 2001), p. 4.

<sup>21</sup> U.S. Coast Guard, *Report to Congress on the Effectiveness of the Voluntary BWM Program*, June 3, 2002.

<sup>22</sup> 68 *Fed. Reg.* 523-530 (Jan. 6, 2003).

<sup>23</sup> 69 *Fed. Reg.* 32864-32871 (June 14, 2004).

<sup>24</sup> 69 *Fed. Reg.* 44952-44961 (July 28, 2004).

<sup>25</sup> As defined for the National Estuary Program in 33 U.S.C. §1330.

<sup>26</sup> Letter of Feb. 11, 1999, to Hon. Carol Browner, Administrator of the U.S. Environmental Protection Agency, from (continued...)

coastwise vessel traffic from ballast water exchange guidelines, vessels traveling short distances between U.S. ports (e.g., from San Francisco Bay, which is highly invaded, to Puget Sound, which is less so) are exempt from controls. Others are critical of the provisions of 16 U.S.C. §4711(k)(2)(A) giving the vessel owner a blanket exemption to ignore any mandatory regulations if the master determines that the vessel might not be able to safely conduct a ballast water exchange on the open ocean. Whereas earlier provisions applicable to the Great Lakes provided a safety exemption, the master/captain of a vessel was required to report the problem to the Coast Guard and conduct alternate BWM measures, often negotiated on a case-by-case basis. Critics believe the NISA language has eliminated any incentive to change ballast water piping systems or adopt other management or treatment options to deal with the problem safely. Finally, NISA has been criticized for its apparent failure to actually prevent additional introductions of damaging organisms into the Great Lakes, despite this being the one area where the requirements for managing ballast water have been the most stringent for the longest time.<sup>27</sup>

## Federal Agency Programs

### U.S. Coast Guard

Under NANPCA, the Coast Guard is responsible for developing and implementing a BWM program to prevent the unintentional introduction and dispersal of nonindigenous aquatic species into waters of the United States from ship ballast water.<sup>28</sup> Initially this was accomplished through a mandatory BWM program for the Great Lakes ecosystem and voluntary guidelines for the remainder of U.S. waters. Relevant regulations, published at 33 CFR Part 151, Subpart C, went into effect in 1993.<sup>29</sup> Under these regulations, the Coast Guard enforced mandatory requirements for ballast water management only for the Great Lakes. Ballast water reporting data for inbound vessels was submitted via fax either directly to the Captain of the Port (COTP) Buffalo or U.S. Coast Guard's Marine Safety Detachment (MSD) Massena, or via the Saint Lawrence Seaway Development Corporation (SLSDC) to MSD Massena at least 24 hours before arrival (33 CFR 151.2040). Compliance with these requirements was essentially 100%. Every vessel that reports that it is carrying ballast water on board (BOB) while transiting to the Great Lakes underwent ballast water inspections by either MSD Massena at the locks in Massena, NY, or by the SLSDC in Montreal. Compliance with the mandatory ballast water requirements averaged approximately 92% in the late 1990s and early 2000s for those vessels declaring BOB. Those vessels found to not have conducted proper exchange were ordered not to discharge ballast water in the Lakes. For these vessels, or if the vessel declared that it intended to retain its ballast water on board while in the Great Lakes system, then MSD Massena again boarded the vessel after it has made port calls in the Lakes and passed the lock in Massena on its outbound transit to ensure the vessel had not

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Representatives George Miller, Jim Saxton, and 16 other Members of the U.S. House of Representatives.

<sup>27</sup> Union of Concerned Scientists, *The National Invasive Species Act: An Information Update* (Cambridge, MA: August 2002); available at [http://www.ucsusa.org/assets/documents/invasive\\_species/nisa-1.pdf](http://www.ucsusa.org/assets/documents/invasive_species/nisa-1.pdf).

<sup>28</sup> An April 29, 2008 lawsuit by the Izaak Walton League and several other environmental groups in a Minnesota federal district court seeks to require the Coast Guard to prevent vessels from taking on and moving ballast water from waters of the Great Lakes to prevent the spread of viral hemorrhagic septicemia to Lake Superior from adjacent lakes. For additional information, see [http://www.greatlakeslaw.org/blog/files/vhs\\_complaint.pdf](http://www.greatlakeslaw.org/blog/files/vhs_complaint.pdf).

<sup>29</sup> 58 *Fed. Reg.* 18330-18335 (Apr. 8, 1993). Regulations were extended to include vessels entering the Hudson River in 59 *Fed. Reg.* 67632-67634 (Dec. 30, 1994).



discharged while in the Lakes. Vessel compliance with the order not to discharge has been excellent.<sup>30</sup>

As stated in the Secretary of Transportation's November 2001 *United States Coast Guard Report to Congress on the Voluntary National Guidelines for Ballast Water Management*,<sup>31</sup> the Coast Guard began developing regulations requiring active BWM of all ships that enter U.S. waters after operating beyond the EEZ, including sanctions for failure to comply. On July 30, 2003, the Coast Guard proposed mandatory BWM practices for all vessels with ballast tanks bound for ports or places within the United States or entering U.S. waters, but excluding domestic port-to-port voyages.<sup>32</sup> The Coast Guard published final regulations on July 28, 2004, extending BWM requirements already in place for vessels entering the Great Lakes and Hudson River to all U.S. ports and waters.<sup>33</sup> The Coast Guard requested comments on potential revisions to mandatory ballast water management reporting requirements in early 2007.<sup>34</sup>

The Coast Guard also has taken action to establish a quantitative ballast water treatment performance standard; protocols for testing, verifying, and reporting on treatment technologies; and a program to facilitate experimental shipboard installation and operation of promising technologies. On March 4, 2002, the Coast Guard published an advance notice of proposed rulemaking, seeking comments on development of a ballast water treatment goal and an interim ballast water treatment standard as part of regulations that would make guidelines for ballast exchange mandatory.<sup>35</sup> On September 26, 2003, the U.S. Coast Guard announced its intent to prepare a Programmatic Environmental Impact Statement for proposed regulatory action to establish a ballast water discharge standard.<sup>36</sup> Such a standard would establish the required level of environmental protection necessary to prevent introductions and combat the spread of invasive species from ballast water discharges. Comments were accepted on this proposal through December 26, 2003. On May 2, 2006, the U.S. Coast Guard published a request for public comment on the status of research and development of ballast water management systems and analytical technologies for testing such systems.<sup>37</sup> On August 28, 2009, the Coast Guard published proposed regulations to establish standards for ballast water treatment.<sup>38</sup> The proposed standards would initially follow standards developed by the International Maritime Organization (see "International Efforts," below), and would become much more stringent in a subsequent phase, given sufficient technological development to support compliance with these higher standards. The proposed Coast Guard standards would not preempt state ballast water management standards (see "State Programs," below).

On January 2, 2004, the U.S. Coast Guard announced the beginning of a program to facilitate the installation of experimental shipboard ballast water treatment systems on both foreign and

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<sup>30</sup> Personal communication with Jill R. Teixeira, Lieutenant Junior Grade, U.S. Coast Guard, Office of Congressional & Governmental Affairs, Washington, DC, Mar. 30, 2004.

<sup>31</sup> This report is available at [http://dmses.dot.gov/docimages/pdf84/211672\\_web.pdf](http://dmses.dot.gov/docimages/pdf84/211672_web.pdf).

<sup>32</sup> 68 *Fed. Reg.* 44691-44696 (July 30, 2003).

<sup>33</sup> 69 *Fed. Reg.* 44952-44961 (July 28, 2004).

<sup>34</sup> 72 *Fed. Reg.* 2536-2537 (Jan. 19, 2007).

<sup>35</sup> 67 *Fed. Reg.* 9632-9638 (Mar. 4, 2002).

<sup>36</sup> 68 *Fed. Reg.* 55559-55563 (Sept. 26, 2003).

<sup>37</sup> 71 *Fed. Reg.* 25798-25799 (May 2, 2006).

<sup>38</sup> 74 *Fed. Reg.* 44632-44672 (Aug. 28, 2009).

domestic vessels.<sup>39</sup> This Shipboard Technology Evaluation Program (STEP) aims to promote research and development of shipboard ballast water treatment systems through regulatory incentives, creating more options for vessel owners seeking alternatives to ballast water exchange. Regulatory incentives would grant conditional equivalencies for accepted vessels in the STEP that might not meet discharge standards mandated by future regulations. On August 5, 2004, the U.S. Coast Guard announced its interest in establishing a program to approve ballast water treatment systems to assure that approved systems meet ballast water discharge standards the Coast Guard anticipates implementing.<sup>40</sup> On August 28, 2009, the Coast Guard published proposed regulations that would establish an approval process for ballast water management systems.<sup>41</sup>

On August 31, 2005, the Coast Guard published a notice of policy establishing best management practices for NOBOB vessels entering the Great Lakes that have residual ballast water and ballast tank sediment.<sup>42</sup>

## **Department of State**

The Department of State participated in negotiations through the International Maritime Organization to develop an international convention to control the spread of invasive species from the exchange of ships' ballast water. (See "International Efforts," below.)

## **National Oceanic and Atmospheric Administration**

Through both the National Sea Grant College program and a BWM technology development program, NOAA has funded research on alternatives to ballast water exchange as methods of BWM.<sup>43</sup> NOAA's Great Lakes Environmental Research Lab (GLERL) targets prevention and control to stop the inflow and spread of new aquatic organisms, with particular emphasis on ship ballast. GLERL, with combined funding from NOAA and several other agencies, developed and provides leadership for the Great Lakes NOBOB and Ballast Exchange research program, focusing on the biological assessment of ballast tank residuals and the experimental determination of effectiveness of ballast exchange. In this program, GLERL scientists collaborate with scientists at several universities and the Smithsonian Environmental Research Center. In a related project, scientists at GLERL and the University of Michigan are evaluating two chemicals for use on residuals in NOBOB tanks. In addition, GLERL has been working on developing a model of ballast tank flow during ballast tank exchange. NOAA also has managed a Ballast Water Management Demonstration Program grant competition,<sup>44</sup> but no recent grant announcements have been published.

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<sup>39</sup> For additional information, see [http://www.uscg.mil/hq/g-m/nvic/04/NVIC\\_01-04.pdf](http://www.uscg.mil/hq/g-m/nvic/04/NVIC_01-04.pdf).

<sup>40</sup> 69 *Fed. Reg.* 47453-47454 (Aug. 5, 2004).

<sup>41</sup> 74 *Fed. Reg.* 44632-44672 (Aug. 28, 2009).

<sup>42</sup> 70 *Fed. Reg.* 51831-51836 (Aug. 31, 2005).

<sup>43</sup> The last request for proposals for ballast water treatment technology testing and demonstration projects was published by NOAA at 71 *Fed. Reg.* 33898-33929 (June 12, 2006).

<sup>44</sup> A notice of grant funding available for FY2008 was published at 72 *Fed. Reg.* 73325-73335 (Dec. 27, 2007).

## Department of Defense

The Department of Defense (DOD) is promulgating joint regulations with the EPA covering discharges from DOD vessels (40 CFR 1700) to implement §312(n) of the Clean Water Act (33 U.S.C. §1322(n)). When complete, they will set discharge standards for vessel ballast water to address the environmental effect of non-native species introduction via that ballast water (as well as addressing chemical pollution from other Armed Forces vessel discharges). The regulations are being developed in three phases. The first, completed in May 1999, determined which ballast water discharges would require control. The second, currently in progress, will set performance standards, and the third will promulgate regulations for meeting those standards.

## Smithsonian Institution

The Smithsonian Environmental Research Center performs research to examine patterns of ballast water delivery and measures species transfer associated with shipping. In cooperation with the Coast Guard, the center established the National Ballast Information Clearinghouse (NBIC)<sup>45</sup> to measure the changing patterns of ballast water delivery and management for vessels arriving in U.S. ports and to synthesize national data on patterns and impacts of alien species in coastal ecosystems.

## Environmental Protection Agency

The EPA establishes water quality standards and regulates discharges under the Clean Water Act.<sup>46</sup> On September 9, 2003, the EPA announced that it was denying a 1999 petition by the Pacific Environmental Advocacy Center, Center for Marine Conservation, San Francisco Bay Keeper, and a number of other concerned groups to require regulation of vessel ballast water discharges through Clean Water Act permits, arguing that the Coast Guard was the more appropriate regulatory agency.<sup>47</sup> This decision did not alter the development and implementation of the joint EPA-DOD regulations covering discharges from DOD vessels (discussed above) because this DOD effort is specifically authorized in statute. In late December 2003, three Pacific Coast environmental groups filed suit, seeking to force the EPA to regulate ballast water discharges under the Clean Water Act.<sup>48</sup>

On September 18, 2006, the federal district court ruled that EPA's regulation exempting ballast water discharges from the Clean Water Act was contrary to congressional intent and ordered EPA to promulgate new regulations within two years (i.e., September 30, 2008).<sup>49</sup> This ruling, which the government appealed to the U.S. Court of Appeals for the Ninth Circuit,<sup>50</sup> directs EPA to

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<sup>45</sup> For more information on the NBIC, see <http://invasions.si.edu/NBIC/ballast.html>.

<sup>46</sup> 33 U.S.C. §§1251, et seq.

<sup>47</sup> 68 *Fed. Reg.* 53165-53166 (Sept. 9, 2003). A copy of the EPA decision was available at [http://www.epa.gov/npdes/pubs/ballast\\_report\\_petition\\_response.pdf](http://www.epa.gov/npdes/pubs/ballast_report_petition_response.pdf).

<sup>48</sup> Cathy Zollo, "Environmental Groups Seek EPA Rules for Ballast Water," *Naples Daily News*, Dec. 24, 2003, available at [http://www.naplesnews.com/news/2003/dec/24/ndn\\_environmental\\_groups\\_seek\\_epa\\_rules\\_for\\_ballas/](http://www.naplesnews.com/news/2003/dec/24/ndn_environmental_groups_seek_epa_rules_for_ballas/).

<sup>49</sup> *Northwest Environmental Advocates, et al. v. U.S. Environmental Protection Agency*, Case No. C 03-05760 SI (N.D. Cal., decided Sept. 18, 2006).

<sup>50</sup> The appellate court upheld the lower court decision; 9<sup>th</sup> Circuit Court, on appeal from the U.S. District Court for the District of Northern California, July 23, 2008.

ensure that shipping companies and other vessels comply with the Clean Water Act by restricting the discharge of invasive species in ballast water under that act's permit program. In response, EPA published regulations for Vessel General Permits on December 29, 2008.<sup>51</sup> Environmental groups have expressed concern over the effectiveness of the EPA regulations.<sup>52</sup>

In light of this ruling, concern arose in the 110<sup>th</sup> Congress as to what extent legislation proposing national standards for ballast water management to be administered by the Coast Guard might conflict with EPA regulation of ballast water discharges as water pollutants under the Clean Water Act.<sup>53</sup> In response to these concerns, the 110<sup>th</sup> Congress enacted P.L. 110-299 to provide a two-year moratorium on Clean Water Act permitting for discharges (except for ballast water discharges) from commercial fishing vessels and non-recreational vessels less than 79 feet in length in response to the Northwest Environmental Advocates litigation.<sup>54</sup> During the moratorium, EPA is to study the discharges from these vessels and submit a report to Congress. The 111<sup>th</sup> Congress, in P.L. 111-215, extended this moratorium through December 18, 2013.

During 2010, the EPA's Science Advisory Board's Ecological Processes and Effects Committee met several times to provide advice on technologies and systems to minimize the impacts of invasive species in vessel ballast water discharge.

## State Programs

In addition to federal programs and sometimes in response to perceived deficiencies in federal regulation, several states have chosen to regulate aspects of ballast water management, including Maryland,<sup>55</sup> California,<sup>56</sup> Oregon,<sup>57</sup> Washington,<sup>58</sup> and Michigan.<sup>59</sup> In light of this state action, several bills in the 110<sup>th</sup> Congress proposed to preempt state ballast water discharge standards that are more stringent than federal standards, while continuing to allow states to inspect and enforce federal ballast water standards.

## International Efforts

In July 1991, the International Maritime Organization's (IMO's) Marine Environmental Protection Committee (MEPC) issued voluntary *International Guidelines for Preventing the Introduction of Unwanted Aquatic Organisms and Pathogens for Ships' Ballast Water and*

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<sup>51</sup> 73 *Fed. Reg.* 79473-79481.

<sup>52</sup> For example, see <http://www.cbulletin.com/314010.aspx>.

<sup>53</sup> Detailed information on legislation addressing BWM issues in the 110<sup>th</sup> Congress can be found in CRS Report RL34640, *Regulating Ballast Water Discharges: Legislative Issues in the 110<sup>th</sup> Congress*, by Claudia Copeland.

<sup>54</sup> See CRS Report RS22878, *Clean Water Act: 110<sup>th</sup> Congress Legislation on Discharges from Recreational Boats*.

<sup>55</sup> See <http://www.mde.state.md.us/businessinfocenter/pollutionprevention/ballast%20water%20management/index.asp> for details on Maryland's program.

<sup>56</sup> See [http://www.slc.ca.gov/division\\_pages/dep/dep\\_programs\\_and\\_reports/shore\\_terminals/text/40%20appendix%20e.doc](http://www.slc.ca.gov/division_pages/dep/dep_programs_and_reports/shore_terminals/text/40%20appendix%20e.doc) for details on California's program.

<sup>57</sup> See <http://www.deq.state.or.us/wmc/pubs/factsheets/cu/oregonballastwatermanagement.pdf> for details on Oregon's program.

<sup>58</sup> See <http://www.wdfw.wa.gov/fish/nuisance/ballast.htm> for details on Washington's program.

<sup>59</sup> See <http://www.olemiss.edu/orgs/SGLC/National/Ballast%20Water.pdf> for details on Michigan's program.

*Sediment Discharges*, adopted in Resolution (50) 31 by a diplomatic conference of the IMO in November 1993. IMO members were requested to follow these guidelines, which also called for exchange of ballast water in the open ocean (to reduce transfer of species from port to port). A review conducted by Australia in 1993 revealed that few countries had implemented the guidelines. In 1994, the MEPC established a ballast water working group to draft regulations for the control and management of ships' ballast water. These draft regulations were debated at the November 1998 and June 1999 MEPC meetings. IMO subsequently proposed these management protocols as a formal IMO instrument. This instrument requires all ratifying member nations to follow the regulations, which would include open-ocean exchange.

On February 13, 2004, an *International Convention for the Control and Management of Ships' Ballast Water and Sediments* was adopted at the International Conference on Ballast Water Management for Ships in London, England. This Convention will enter into force 12 months after ratification by 30 nations, representing 35% of the world merchant shipping tonnage.<sup>60</sup> The United States was one of the major proponents of this convention, which requires all ships to implement a Ballast Water and Sediments Management Plan. In addition, all ships must carry a Ballast Water Record Book and will be required to conduct BWM procedures in conformity with a specified standard. These standards will be phased in for various vessels, depending upon when they were constructed.<sup>61</sup> Resistance by vessel owners to the new international requirements for ballast water treatment is tempered by their interest in global standards under the IMO Convention as opposed to the increasing number of national ballast water programs developed around different approaches for addressing this concern. However, proposed U.S. Coast Guard regulations could mandate ballast water treatment standards as much as 100 times more stringent than those required by the IMO Convention, possibly making the IMO Convention irrelevant, if the more stringent standards could be met with readily available treatment technology at no substantially greater expense.<sup>62</sup> A Global Industry Alliance—a partnership among IMO, the United Nations Development Program, the Global Environment Facility, and four private shipping corporations—was formed in March 2009 to coordinate international research and development of cost-effective BWM technologies.<sup>63</sup> The United States has neither signed nor has become a contracting party to this IMO Convention.

Bilaterally with Canada, the United States is cooperating through the North American Commission for Environmental Cooperation (CEC),<sup>64</sup> the Great Lakes Commission, and the International Joint Commission to better understand, coordinate, and address ballast water management concerns. Improved ballast water management is one component of the CEC's project on "Closing the Pathways of Aquatic Invasive Species across North America."<sup>65</sup> The Great Lakes Commission convened the "Great Lakes Panel on Aquatic Nuisance Species" in late

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<sup>60</sup> As of October, 2010, this Convention had been ratified by 27 nations, representing 25.32% of the world merchant shipping tonnage. Updated status information can be found at <http://www.imo.org/OurWork/Environment/BallastWaterManagement/Pages/Default.aspx#5>.

<sup>61</sup> Details on this new Convention were available at <http://globallast.imo.org/index.asp?page=mepc.htm&menu=true>.

<sup>62</sup> Rajesh Joshi, "New US Ballast Water Plan a Threat to IMO Convention," *Lloyd's List*, May 1, 2008, available at <http://www.lloydlist.com/ll/news/new-us-ballast-water-plan-a-threat-to-imo-convention/1209460697594.htm>.

<sup>63</sup> IMO, *United Nations Agencies Partner with Shipping Corporations to Minimize Global Environment Threat*, IMO/UNDP Joint Press Release, March 2, 2009.

<sup>64</sup> Established under the authority of the North American Free Trade Agreement.

<sup>65</sup> Additional information on this project was available at [http://www.cec.org/programs\\_projects/conserv\\_biodiv/project/index.cfm?projectID=20&varlan=english](http://www.cec.org/programs_projects/conserv_biodiv/project/index.cfm?projectID=20&varlan=english).

1991 to coordinate efforts, including ballast water management.<sup>66</sup> In addition, the International Joint Commission (IJC) views invasive species management as an important component of water quality.<sup>67</sup> Furthermore, the Saint Lawrence Seaway Development Corporation jointly administers regulations and seeks to harmonize ballast water regulations for vessels transiting U.S. waters of the Seaway after having operated outside the U.S. EEZ with those required by Canadian authorities for transit in waters under Canadian jurisdiction.<sup>68</sup>

## Congressional Action

Numerous congressional hearings on ballast water issues and implementation of NISA were held in recent Congresses.<sup>69</sup> Certain testimony at these hearings has been particularly critical of the slow progress in promulgating regulations to implement NISA. Information on legislative action to address various aspects of BWM issues in the 110<sup>th</sup> Congress can be found in CRS Report RL34640, *Regulating Ballast Water Discharges: Legislative Issues in the 110<sup>th</sup> Congress*, by Claudia Copeland. Information on bills introduced and legislative action to address various aspects of BWM issues in the 111<sup>th</sup> Congress can be found in CRS Report R40172, *Fishery, Aquaculture, and Marine Mammal Issues in the 111<sup>th</sup> Congress*, by Eugene H. Buck and Harold F. Upton, under the “Invasive Species” heading.

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<sup>66</sup> Additional information on this panel was available at <http://www.glc.org/ans/>.

<sup>67</sup> Additional information on these concerns was available from the IJC’s annual report, available at <http://www.ijc.org/php/publications/html/11br/english/report/chapter3/>.

<sup>68</sup> 73 *Fed. Reg.* 9950-9954 (Feb. 25, 2008).

<sup>69</sup> For example, U.S. Congress, Committee on Resources, Subcommittee on Fisheries Conservation, Wildlife, and Oceans and Committee on Science, Subcommittee on Environment, Technology, and Standards, *H.R. 5395 and H.R. 5396*, Joint legislative hearing, 107<sup>th</sup> Cong., 2d sess., (Washington, DC: Nov. 14, 2002), 80 pp.; U.S. Congress, Committee on Resources, Subcommittee on Fisheries Conservation, Wildlife, and Oceans, and Subcommittee on National Parks, Recreation, and Public Lands, *The Growing Problem of Invasive Species*, joint legislative hearing, 108<sup>th</sup> Cong., 1<sup>st</sup> sess. (Washington, DC: Apr. 29, 2003), 133 pp.; U.S. Congress, Committee on Environment and Public Works, Subcommittee on Fisheries, Wildlife, and Water, *National Aquatic Invasive Species Act of 2003*, legislative hearing, 108<sup>th</sup> Cong., 1<sup>st</sup> sess. (Washington, DC: June 17, 2003), 240 pp.; an as-yet-unpublished joint hearing of Mar. 25, 2004, by the House Committee on Transportation and Infrastructure, Subcommittees on Coast Guard and Maritime Transportation and on Water Resources and Environment, on Ballast Water Management: New International Standards and National Invasive Species Act Reauthorization; U.S. Congress, Committee on Government Reform, Subcommittee on Regulatory Affairs, *Protecting Our Great Lakes: Ballast Water and the Impact of Invasive Species*, oversight field hearing, 109<sup>th</sup> Congress, 1<sup>st</sup> sess. (Fair Haven, MI: Sept. 9, 2005), 133 pp.; an as-yet-unpublished legislative hearing of June 15, 2005, by the Senate Committee on Commerce, Science, and Transportation, National Ocean Policy Study, on Ballast Water Invasive Species Management and Threats to Coral Reefs; U.S. Congress, Committee on Transportation and Infrastructure, Subcommittee on Water Resources and Environment, *The Impact of Aquatic Invasive Species on the Great Lakes*, legislative hearing, 110<sup>th</sup> Congress, 1<sup>st</sup> sess. (Washington, DC: Mar. 7, 2007), 256 pp.