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Boats, Ballast, and the Big Battle: The Feds vs. the States in the War against AIS Invasions

Sara E. Richard

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INTRODUCTION

As home to a unique and diverse environment—with its myriad of hunting and fishing opportunities appearing endless—Louisiana more than earns its nickname, the "Sportsman's Paradise."[1] Yet, the state may soon resemble a "Lost Sportsman's Paradise." The danger lies inside the thousands of foreign vessels that pass through Louisiana's waterways and the Gulf of Mexico.[2] Thousands of organisms live within each of these vessels.[3] Without prompt action by both the Federal and Louisiana state governments, these organisms could take over Louisiana's interconnected waterways, causing irreparable damage to the State's environment and seafood-dependent economy.[4]

Ballast water is outside water taken in by a vessel and stored in tanks to maintain the vessel's stability and maneuverability throughout its voyage.[5] Once a ship loads cargo, it no longer needs ballast water on board for stability and discharges the water at that location. Depending on vessel size, thousands to *millions* of gallons of ballast water are used per voyage.[6] However, water is not the only thing found in ballast water tanks. In fact, more than 10,000 species of organisms are transported around the world

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1. Alysia R. Kravitz et al., Ctr. for Bioenvironmental Research at Tulane and Xavier Universities, State Management Plan for Aquatic Invasive Species in Louisiana 25 (July 2005).

2. NOAA, The Gulf of Mexico at a Glance: A Second Glance 20 (June 2011).

3. SeaWeb, *Ocean Issue Briefs: Ballast Water and Non-Indigenous Species*, http://www.seaweb.org/resources/briefings/ballast.php [https://perma.cc/8YQ8-XA78] (last visited July 7, 2016).

4. *See infra* Part II(B) for discussion of how these organisms can impact Louisiana's environment and economy.

5. Corrina Chase et al., *Marine Bioinvasions Fact Sheet*: *Ballast Water Treatment Options*, MIT SEA GRANT COASTAL RES. 1, http://massbay.mit.edu/resources/pdf/ballast-treat.pdf [https://perma.cc/4L3G-6F8T] (last modified Dec. 7, 2009); *see also* Eric V. Hull, *Climate Change and Aquatic Invasive Species: Building Coastal Resilience Through Integrated Ecosystem Management*, 25 Geo. Int'l Envtl. L. Rev. 51, 58 (2012) (stating that a vessel will generally intake ballast water where it departs and discharge that same water where it arrives).

6. *See* M. Falkner et al., Cal. State Lands Comm'n, Report on Performance Standards for Ballast Water Discharges in California Waters 1 (Jan. 2006); *see also* Andrew N. Cohen, Cal. Urban Water Agencies, Ships' Ballast Water and the Introduction of Exotic Organisms into the San Francisco Estuary Current Status of the Problem and Options for Management 3 (Oct. 1998) (stating that certain categories of oil tankers may carry over 21 million gallons of ballast water, while categories of smaller cargo ship may only carry 1 million gallons) (emphasis added).

in vessel ballast tanks each day.[7] Further, when ballast water is discharged in foreign water bodies, like the Mississippi River, a number of these organisms are capable of surviving and rapidly reproducing.[8] This causes billions of dollars in economic and environmental damage.[9] For example, zebra mussels (*Dreissena polymorpha*) were introduced into the Great Lakes through ballast water and spread rapidly throughout U.S. waterways within a few years.[10] These mussels gather to create large clusters capable of blocking water intake pipes for industrial facilities.[11] The mussels also displace food sources, causing native fish stock to drop.[12] Further, invasive species are unlike other man-made environmental disasters such as oil spills, toxic emissions, and fires; once an invasive species establishes itself in an area it is virtually impossible to destroy.[13]

Aquatic Invasive Species (AIS) are non-indigenous species, which, when introduced into aquatic environments, result in environmental or economic harm.[14] Federal regulation targeting the introduction of AIS has been largely reactionary, initiated only after catastrophic damage has occurred.[15] While the Environmental Protection Agency (EPA) and the United States Coast Guard (USCG) have begun to enact stricter ballast water regulations, the progression towards a more stringent regulatory scheme has proven dangerously slow. Thus, this places U.S. waters at potential risk. Recognizing the problem, several states have attempted to enact legislation to better protect their waterways.[16] Although Louisiana places significant importance on the seafood industry and its coastal

7. J. Tamelander et al., *Guidelines for Development of a National Ballast Water Management Strategy*, GloBallast Monograph Series No. 18, 6 (2010), http://globallast.imo.org/wp-content/uploads/2014/11/Mono18_English.pdf [https://perma.cc/2PHG-8NHE].

8. *See Frequently Asked Questions About Invasive Species*, U.S. Fish & Wildlife Ser., https://www.fws.gov/invasives/faq.html [https://perma.cc/EEA8-HAFP] (last updated Nov. 20, 2012).

9. *See* discussion *infra* Part I(A).

10. *See e.g.*, NOAA, *Zebra Mussels Changing Great Lakes Ecosystem*, www.publicaffairs.noaa.gov/pr96/mar96/noaa96-11.html [https://perma.cc/E6C3-9YSZ] (last visited Oct. 14, 2015).

11. *See id.*

12. *See id.*

13. *See* H.R. Rep. No. 108-324, pt. 2, at 2 (2003).

14. Exec. Order No. 13,112, 64 Fed. Reg. 6183 (Feb. 3, 1999).

15. Ballast Water Management (BWM) regulation resulted from the damage caused by the 1980's Zebra Mussel invasion in the Great Lakes. *See* discussion *infra* Part I(A).

16. *See* EPA, Vessel General Permit for Discharges Incidental to the Normal Operations of Vessels (VGP) 91–137 (Mar. 28, 2013).

environment,[17] it has taken no such action to defend its waterways against the detrimental organisms found in ballast water.[18]

This comment addresses the dangers associated with the introduction of AIS into U.S. waters through ballast water discharge; the grave impact it has on Louisiana's economy and environment; and the necessary steps Louisiana must take to rectify the problem. First, this comment argues that the slow progression and deferral of Ballast Water Management (BWM) regulation in the United States, at both the federal and state level, has hindered any significant progression in the battle against AIS. Further, it explains how Louisiana's massive shipping industry and interconnected waterways create the need for stricter regulation. Next, this comment discusses the importance of protecting Louisiana's vital waterways, environment, and economy. Finally, this comment illustrates how intensive monitoring, recordkeeping, and compliance assurance is necessary to protect Louisiana's economic and environmental interests until federal regulations can provide adequate protection. [19]

I. BACKGROUND

This section will provide background on invasive species and ballast water and the dangers they pose. It will then detail the history of BWM regulation and the insufficiency of the current federal regulatory scheme administered by the EPA and USCG. Finally, this section will conclude with a discussion of state BWM regulation and the federal preemption issues that arise with it.

A. Invasive Species and Ballast Water

Congress has defined *invasive species* as "alien species whose introduction does or is likely to cause economic or environmental harm or harm to humans."[20] This comment focuses specifically on AIS,[21] which

17. *See infra* Part II.
18. *See* EPA, *supra* note 16.
19. *See infra* Part III.
20. *See supra* note 13.
21. The term Aquatic Invasive Species (AIS) is used interchangeably with Aquatic Nuisance Species (ANS). Aquatic Nuisance Species Task Force, Strategic Plan (2013–2017) 6 (May 3, 2012), http://www.anstaskforce.gov?Documents /ANSTF%20Strategic%20Plan%202013-2017.pdf [https://perma.cc/U7PR-7Z82].

invade aquatic ecosystems and negatively impact biodiversity,[22] the economy, and human health. AIS cost the United States over $120 billion in damages each year.[23] For example, in 1991, 10,000 Peruvians died and another million were infected from exposure to drinking water contaminated by Cholera (*vibrio cholerae*)[24] infested ballast water.[25] Months later, the same strain of the bacteria appeared in ballast tanks in Mobile, Alabama—only a short distance from Louisiana.[26] Mobile closed its commercial oyster beds for nearly half of the year due to safety concerns.[27]

Estimates show that nearly 80% of non-indigenous species invading U.S. waters have done so through ballast water discharge.[28] During the 1980s, the United States failed to address the effects of ballast water discharge. During this time, the zebra mussel made its way into the Great Lakes through foreign vessel ballast water and caused billions of dollars in damage.[29] In response, Congress enacted the Non-Indigenous Aquatic Nuisance Prevention and Control Act (NANPCA) in 1990, commencing the inefficient and largely ineffective battle against AIS.[30] Unfortunately, the majority of the damage occurred by 1993—zebra mussels had spread from Quebec to Louisiana. Thus, because the damage had already occurred, this reactionary regulatory approach proved to be a poor choice.

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22. Approximately 42% of species found in the Federal Threatened or Endangered species lists are at risk from predation, parasitism, and competition from non-native species. *See* David Pimentel et al., *Update on the Environmental and Economic Costs Associated with Alien-Invasive Species in the United States*, 52 Ecological Econ. 273 (2005).

23. U.S. Fish & Wildlife Serv., The Cost of Invasive Species (Jan. 2012), http://www.fws.gov/verobeach/PythonPDF/CostofInvasivesFactSheet.pdf [https://perma.cc/97PY-ZGA5]. *See also* Stephanie Showalter Otts & Terra Bowling, *Legislative and Regulatory Efforts to Minimize Expansion of Invasive Mussels Through Watercraft Movements*, 3 Ariz. J. Envtl. L. & Pol'y 61, 64 (2013).

24. Cholera is a harmful infectious bacterium that causes intestinal infection when ingested by humans. It is most often associated with food poisoning. *See Cholera*, WHO, http://www.who.int/mediacentre/factsheets/fs107/en/ [https://perma.cc /P8VQ-KP2E] (last updated July 2015).

25. NOAA Fisheries Serv., *Ballast Water: A Pathway for Aquatic Invasive Species* 1, http://www.habitat.noaa.gov/pdf/best_management_practices/fact_sheets?Ballast%20Water%20Factsheet.pdf [https://perma.cc/P4E8-JUZS].

26. *Id*.

27. N. Dobroski et al., Cal. State Lands Comm'n Marine Facilities Div., 2015 Biennial Report on the California Marine Invasive Species Program 3 (Feb. 2015).

28. *Id*. at 4.

29. Amy J. Benson et al., *Dreissena polymorpha (zebra mussel) Fact Sheet*, USGS Nonindigenous Aquatic Species Database (June 17, 2015), http://nas.er.usgs.gov /queries/factsheet.aspx?speciesid=5; *see also supra* note 9 and accompanying text [https://perma.cc/FB6W-6W8Z].

30. 16 U.S.C. § 4701 (1990).

These AIS continue to maintain a presence in these locations.[31] As a result of this invasion, the U.S. became aware that ballast water was a serious issue, one that would likely continue to cause significant economic and environmental problems. The newfound focus on counteracting the spread of AIS prompted federal BWM regulation, aimed at preventing further spread of invasive species.

B. Federal Ballast Water Regulation: Past to Present

BWM is the practice of preventing the transportation of unwanted AIS through vessel ballast water.[32] The regulation prevents or limits when, where, and how ballast water may be discharged. The United States established its earliest AIS preventative regulations through the Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990 (NANPCA),[33] which delegates BWM regulatory authority to the USCG.[34] The National Invasive Species Act (NISA),[35] passed in 1996, reauthorized and amended NANPCA, with minor changes.[36] Further, in 2008, the Clean Water Act (CWA)[37] mandated that the EPA regulate ballast water discharge through its pollution discharge permit system.[38] Thus, the authority to regulate ballast water discharge lies with two federal agencies, the USCG and the EPA.[39] In addition to these agencies, individual states are permitted to enact their own ballast water regulations as long as they meet the EPA and USCG requirements.[40] Currently, none of the federal BWM regulations provide complete protection against invasions and create numerous problems.

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31. Benson, *supra* note 29.

32. *See* Eugene H. Buck, Cong. Research Serv., Ballast Water Management to Combat Invasive Species 2 (Apr. 10, 2012), https://www.fas.org/sgp/crs/misc/RL32344.pdf [https://perma.cc/ZG2Y-T4YW].

33. 16 U.S.C. §§ 4701–4751 (1990).

34. 16 U.S.C. § 4701 (1990). The USCG was the first federal agency responsible for the creation and enforcement of BWM regulations.

35. 16 U.S.C. § 4711 (1996).

36. *Id*.

37. 33 U.S.C. §§1251–1387.

38. *See* Northwestern Envtl. Advocates v. EPA, 537 F.3d 1006, 1020–21 (9th Cir. 2008). The National Pollution Discharge Elimination System allows permit holders to discharge pollutants though a point source into U.S. waters with limits on what can be discharged, monitoring and reporting requirements, and other provisions to ensure that the discharge does not hurt water quality or people's health. *Id.*

39. *See* 33 C.F.R. § 151; EPA, Vessel General Permit for Discharges Incidental to the Normal Operations of Vessels (VGP) 91–137 (Mar. 28, 2013).

40. *See* Fednav, Ltd. v. Chester, 547 F.3d 607 (6th Cir. 2008).

1. United States Coast Guard (USCG)

In accordance with NISA, the USCG released the first mandatory BWM regulations in 2004.[41] The regulation mandated a ballast water exchange for all vessels operating outside of the Exclusive Economic Zone.[42] A ballast water exchange is the process of emptying and refilling ballast water in the open ocean in order to increase salinity[43] and rid the water of many organisms.[44] This method, which merely decreases the amount of organisms present in ballast water, is unreliable and was enacted as a temporary solution during the early stages of BWM regulation.[45] However, this method is still permitted today under various circumstances.[46] Additionally, the Shipboard Technology Evaluation Program (STEP) was established at this time to promote research and development of BWM systems.[47] Since its enactment in 2004, the USCG has not approved any technology through the STEP program.[48] Thus, the

41. 69 Fed. Reg. 44952 (July 28, 2004). The USCG regulation was initially voluntary and recommended for implementation in 1999. Unsurprisingly, there was a significant lack of involvement by vessel owners and operators. As business operators, unwilling vessel owners lacked any incentive to expend money to comply with the optional regulations. Consequently, the guidelines were made mandatory in 2004.

42. The Exclusive Economic Zone extends 200 nautical miles (nm) from the territorial sea baseline and is adjacent to the 12 nm territorial sea of the United States. *See* NOAA, *U.S. Maritime Limits & Boundaries*, http://www.nauticalcharts.noaa.gov/csdl/mbound.htm [https://perma.cc/ACQ3-L9NQ] (last updated Sept. 13, 2013).

43. The concentration of dissolved salts in water. *Salinity*, OXFORD DICTIONARY OF ENGLISH (2016), https://en.oxforddictionaries.com/definition/salinity (Sept. 22, 2016).

44. Many organisms are unable to survive in water with a high saliency and thus die off during a BWE.

45. The method was enacted as a temporary solution during the early stages of BWM practices until a more effective method became available. The method is inadequate and should be disallowed entirely. *See* Eric V. Hull, *Climate Change and Aquatic Invasive Species: Building Coastal Resilience Through Integrated Ecosystem Management*, 25 Geo. Int'l Envtl. L. Rev. 51, 70 (2012) ("[E]ven after conducting a ballast water exchange a tank may contain as many as 300 million cysts of toxic dinoflagellates."). *See also* Cal. State Lands Comm'n, 2014 Assessment of the Efficacy, Availability, and Environmental Impacts of Ballast Water Treatment Technologies for Use in California Waters 6 (Aug. 2014) (noting that while some scientists report BWE 99% effective at removing organisms from ballast tanks, others have only reported the method 70% effective, creating controversy over the method and its reliability).

46. *See* 33 C.F.R. § 151.2025 (2012).

47. S. Rep. No. 114-96, at 2 (2015).

48. World Shipping Counsel, *U.S. Approval for Ballast Water Treatment Technology*, http://www.worldshipping.org/industry-issues/environment/vessel-discharges/u-s-approval-for-ballast-water-treatment-technology [https://perma.cc/S6AZ-M9GB] (last visited July 9, 2016).

USCG has not established that any BWM system is compliant with the USCG's BWM regulation.

The current 2012 USCG regulations took a small step forward by adopting the International Maritime Organization's (IMO) Regulation D-2 numeric discharge standards.[49] These standards limit the acceptable amount of organisms that may be discharged per metric ton of ballast water.[50] They require ballast water discharge to contain less than ten organisms per cubic meter of ballast water for organisms greater than or equal to fifty micrometers, or less than ten organisms per milliliter for organisms less than fifty micrometers.[51] While this may appear to significantly reduce the presence of organisms found in ballast water discharge, larger ships are still legally permitted to dump thousands of live organisms back into the water, putting humans and the environment at risk. For example, a large tanker capable of carrying 300,000 gallons of ballast water can legally dump over 11,000 organisms into the water.

The USCG also adopted a phase-in approach with the numeric standards, under which it will implement stricter numeric standards for ballast water discharge as BWM system technology advances and becomes readily available.[52] The USCG originally proposed two standards, a phase-one and phase-two standard. The phase-one standard is

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49. The IMO is the agency within the United Nations that is responsible for setting international maritime, vessel safety, and marine pollution standards. The IMO recommends world-wide guidelines and implementation schedules for BWM, which several countries have adopted. The organization was the first to consider discharge standards by recommending the Regulation D-2 standards for implementation in 2008. The standard requires all ballast water discharge to contain: (1) less than ten viable organisms per cubic meter of ballast water that are greater than or equal to fifty micrometers in minimum dimension; (2) less than ten viable organisms per milliliter of ballast water that are less than fifty micrometers in minimum dimension and greater than or equal to ten micrometers in minimum dimension; and (3) discharge of the indicator microbes shall not exceed the following specified concentrations:

> (a) Toxicogenic Vibrio cholerae (serotypes O1 and O139): less than one colony-forming unit (CFU) per 100 milliliters of ballast water, or less than one CFU per one gram (wet weight) of zooplankton samples;
> (b) Escherichia coli: less than 250 CFUs per 100 milliliters of ballast water; and
> (c) Intestinal Enterococci: less than 100 CFUs per 100 milliliters of ballast water.

International Convention for the Control and Management of Ships' Ballast Water and Sediments (BWM), IMO, http://www.imo.org/en/About/Conventions/ListOfConventions/Pages/International-Convention-for-the-Control-and-Management-of-Ships'-Ballast-Water-and-Sediments-(BWM).aspx [https://perma.cc/DQ3B-TKVW] (last visited July 9, 2016).

50. 33 C.F.R. § 151.2030.

51. 33 C.F.R. § 151.1511.

52. 33 C.F.R. § 151.2030.

the current BWM regulation.[53] The phase-two standard, which is significantly more stringent than phase-one, was proposed for adoption as a part of the current 2012 regulation. However, the USCG deemed phase-two economically and technologically infeasible.[54]

By deferring the implementation of a stricter standard, the USCG failed to adequately safeguard U.S. waterways from ballast water AIS invasions and to promote technological advancement in the field. The current numeric standard, which still permits the discharge of organisms, does not protect against AIS invasions; it was only aimed at reducing, rather than eliminating, the amount of organisms introduced into waterways.[55] This clearly does not resolve the issue of invasive species introductions, as a high number of dangerous organisms are still introduced into the waterways. In enacting such regulations, the agency completely failed to understand the unique nature of AIS—namely, the species' ability to rapidly reproduce and to spread. [56] Due to the unique nature of AIS, any result will be all-or-nothing. Thus, it is imperative to enact regulations that deal with the problem entirely. Anything less is simply inadequate. The only numeric discharge standard scientifically proven to defeat AIS invasions is zero.[57]

The EPA's similar actions have also failed to aid the process.[58] Ballast water discharge has been a prevalent issue for over thirty years, which means that BWM regulations have had ample time to progress and adapt accordingly. However, the EPA's refusal to adopt stricter regulations has left U.S. waterways at risk.

Presently, vessel owners and operators must comply with the USCG discharge standards by using one of the following options: (1) install and operate a USCG type-approved BWM system via the implementation schedule; (2) use only water from a U.S. public water system; (3) perform

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53. *Id.*

54. USCG, Standards for Living Organisms in Ships' Ballast Water Discharged in U.S. Waters Notice of Proposed Rulemaking, USCG-2001-10486, 15 (June 2008), http://mercatus.org/sites/default/files/publication/2009_RIA_Standards%20for%20Living%20Organisms%20in%20Ships'%20Ballast%20Water%20Discharged%20in%20U.S.%20Waters%20(USCG-2001-10486)_RIN%201625-AA32_1.pdf [https://perma.cc/BLB2-A2DB].

55. *See* 33 C.F.R. § 151.2030.

56. NOAA Fisheries Serv., *Aquatic Invasive Species Overview*, http://www.habitat.noaa.gov/pdf/best_management_practices/fact_sheets/Aquatic%20Invasive %20Species%20Overview.pdf [https://perma.cc/244J-5YPT].

57. *See* Nat'l Research Council, Assessing the Relationship Between Propagule Pressure and Invasion Risk in Ballast Water 110 (2011), http://www3.epa.gov/npdes/pubs/nas_final_report_prepublication_version.pdf [https://perma.cc/6SVL-3WHF] (defining a numeric discharge standard as the amount of organisms a ship is legally able to discharge within their ballast water).

58. *Infra* Part I(B)(2).

a complete ballast water exchange in an area 200 miles from any shore before discharging ballast water, unless the vessel is required to employ an approved BWM system via the implementation schedule;[59] (4) refrain from discharging ballast water into U.S. waters; or (5) discharge to an onshore facility or another vessel for purposes of treatment.[60]

Under the implementation schedule referenced in option one, new vessels constructed on or after December 1, 2013, must comply with the discharge standards upon delivery.[61] Vessels constructed before December 1, 2013, with a ballast water capacity of less than 1,500 or over 5,000 cubic meters must comply with the discharge standards by their first scheduled dry-docking[62] after January 1, 2016.[63] Finally, vessels with a ballast capacity between 1,500 and 5,000 cubic meters must comply with the discharge standards by their first scheduled dry-docking by January 1, 2014.[64]

A BWM system under the first option includes USCG-approved Ballast Water Treatment Systems (BWTS). A BWTS is installed onboard a vessel and uses various technological methods to rid the water of organisms.[65] The most common forms of BWTS use ultraviolet light, hypochlorite (bleach), chlorine dioxide, or deoxygenation to kill off organisms.[66] Although alternative technologies are available, BWTS technology has been the predominant focus of BWM regulation. Yet, the regulatory focus of installing on-board BWTS has proven unsuccessful. Few vessels are using these systems because they are expensive to install

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59. Option two limits the ballast water exchange method due to its inconsistent effectiveness at reducing the presence of AIS in ballast tanks. *See supra* note 45 and accompanying text.

60. *See* 33 C.F.R. § 151. The first option was the only serious option taken into consideration by the USCG and EPA. Using U.S. water only is not an option for foreign ships under option two. Further, a ballast water exchange does not rid ballast tanks of all organisms and was only enacted as a temporary solution until a more effective BWM method became available. Withholding ballast water under option four is often not feasible for the safety and maneuverability of a vessel once it loads cargo. Lastly, onshore treatment systems, although technologically possible, have not been established in the U.S. for BWM purposes.

61. 33 C.F.R. § 151.2035 (2015).

62. Dry docking is the routine process of removing a ship from water onto a dry dock stand to conduct inspections, maintenance, and repairs. For safety reasons, commercial vessels must undergo the procedure twice every five years.

63. 33 C.F.R. § 151.2035.

64. *Id.*

65. Cal. State Lands Comm'n, 2014 Assessment of the Efficacy, Availability, and Environmental Impacts of Ballast Water Treatment Technologies for Use in California Waters ii (Aug. 2014).

66. ABS, *Ballast Water Treatment Advisory*, 26 (2014), http://ww2.eagle.org/content/dam/eagle/publications/2014/BWTAdvisory14312rev3.pdf [https://perma.cc/FE2U-4ECU].

and may not be compliant with future BWM regulations.[67] Further, no type of BWM system has been approved by the USCG,[68] even though the first was expected to be approved by late 2015.[69] This failure has effectively eliminated the first of the aforementioned options as an available route to compliance. In the meantime, the USCG has permitted the use of temporary alternative management systems to allow compliance with the regulation.[70] As a result, the implementation schedule has been deferred until the USCG approves BWM systems, and the USCG has, yet again, failed to enact time-sensitive remedies to the AIS problem.[71]

To date, enforcement is the most crucial element of effective BWM regulation. Enforcement is established through mandated reporting, recordkeeping, and USCG randomized inspection requirements.[72] BWM reports must be in electronic or written form and submitted to the USCG prior to a foreign vessel's arrival in any U.S. port.[73] BWM records must be kept on board the vessel at all times, and must include the vessel specifics (length, cargo capacity); voyage information (location and date of departure and arrival); ballast water information (capacity, number of tanks); BWM information (origin of ballast water, method used, time and location of discharge); and a certificate verifying the accuracy of this information.[74] Inspections grant USCG officials access upon vessels to take ballast water samples and to examine relevant documents.[75] Unlike the previously mentioned options of the USCG regulation, the enforcement plan is effective and reliable. Compliance is essential; noncompliance, whether intentional or accidental, could lead to billions of dollars in economic and environmental harm.[76] Once an invasive species enters a new environment, it is relatively impossible to clean up.

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67. In California only fifty-eight vessels arriving in the state reported using a BWTS from 2012-2014. Only twelve of those fifty-eight managed their ballast water using the treatment system. *See* N. Dobroski et al. *supra* note 27, at 60–61. On average, BWTS installation has been estimated to cost anywhere from $250,000 to OVER $2,000,000 per vessel. 77 Fed. Reg. 17285 (Mar. 23, 2012).

68. *See* S. Rep. No. 114-96, *supra* note 47.

69. Approval is established through the USCG STEP program, where BWM system manufacturers are able to apply for USCG-approval for their products. Several manufacturers are currently going through the process and awaiting results. Although good in theory, the process is time consuming. The program was established in 2004 and has yet to approve a system.

70. 33 C.F.R. § 151.2026 (2014).

71. 33 C.F.R. § 151.2060 (2016).

72. *See* 33 C.F.R. § 151.2025–75.

73. 33 C.F.R. § 151.2060.

74. 33 C.F.R. § 151.2070 (2016).

75. 33 C.F.R. § 151.2075 (2012).

76. 33 C.F.R. § 151.1518 (2008) (noting that non-compliant vessels are required to pay up to a $27,500 fine for each day of a continuing violation).

2. Clean Water Act (CWA)

The CWA sets water quality standards in the U.S. and prohibits pollution discharge from any point source[77] into navigable U.S. waters without an EPA issued National Pollution Discharge Elimination System (NPDES) permit.[78] Although the Act explicitly includes vessels as defined point sources and "biological materials"[79] as pollutants, the EPA exempted ballast water discharge from its permit regulatory authority even though the discharge clearly contains biological materials.[80] The EPA believed that this discharge caused minimal pollution, and that administrative costs could be drastically reduced through vessel exemption.[81] The exemption remained in place for thirty-two years,[82] until the Ninth Circuit, in *Northwest Environmental Advocates v. EPA,* held the EPA to be in clear violation of the CWA. As a result, the court mandated the application of the EPA's permit scheme to ballast water discharge.[83] In response, the EPA implemented the 2008 Vessel General Permit (VGP) to regulate ballast water discharge pursuant to the goals of the CWA; however the regulation did not require any numeric discharge standards and was heavily criticized.[84] The EPA revised the VGP in 2013 to formulate the present regulation.[85]

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77. The term "point source" means any discernible, confined and discrete conveyance, including but not limited to any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, or *vessel or other floating craft,* from which pollutants are or may be discharged. 40 C.F.R. § 401.11 (2015).

78. 33 U.S.C. § 1342 (2014). *See also* EPA, Summary of the Clean Water Act, http://www2.epa.gov/laws-regulations/summary-clean-water-act [https://perma.cc/M3CS-M4EU] (last visited July 5, 2016).

79. Although the CWA does not explicitly state that living organisms are "biological materials," federal courts have held that they are. *See* National Wildlife Fed'n v. Consumers Power Co., 862 F.2d 580 (6th Cir. 1988) (holding that "biological materials" include living organisms such as fish and fish remains).

80. 40 C.F.R. § 122.3(a) (2013).

81. *Id.*

82. *Id.* Ballast water discharge was not originally thought to be a water quality or pollution issue under the CWA; rather, it was thought to present little or no danger or adverse environmental effect. With increased awareness and knowledge of the dangers associated with ballast water discharge and AIS invasions, it has become largely recognized as a pollution issue, mandating its regulation under the CWA.

83. Northwest Envtl. Advocates v. EPA, 537 F.3d 1006, 1020–21 (9th Cir. 2008).

84. *See* Robinson & Cole, LLP, *New EPA Vessel General Permit Includes Numeric Limitations for Ballast Water Discharges* (Apr. 2013), http://www.rc.com/publications/upload/2235.pdf [https://perma.cc/HPK3-8R9P].

85. EPA, Economic and Benefits Analysis of the Final 2013 Vessel General Permit 49 (Mar. 28 2013); Claudia Copeland, Cong. Research Serv., EPA's Vessel General Permit Background and Issues 3 (Apr. 8, 2013).

a. 2013 EPA Vessel General Permit (VGP) for Discharges Incidental to the Normal Operation of Vessels

The 2013 revised VGP is the EPA's current mechanism for regulating ballast water discharge under the CWA and applies to commercial vessels operating beyond the Exclusive Economic Zone.[86] Vessels regulated under the VGP must also comply with USCG regulations, which may confuse vessel owner and operators in regard to which regulations apply to their vessel.[87] The requirements of the permit include: training, BWM plans, mandatory BWM practices, and recordkeeping.[88] In order to comply with the training requirement, the captain and crew of the vessel must be adequately trained to operate and complete BWM procedures specific to the vessel.[89] BWM plans must be vessel specific and must outline the methods used to comply with the discharge standard.[90] The requirement mandates that all vessel operators keep a written record of the *expected* date, location, volume, and salinity of any ballast water discharge.[91] The problem associated with this approach is obvious, as the EPA does not require any *actual* data for ballast water discharge. This failure to require any actual data means that there is no way for the agency to accurately measure vessel compliance under the current regulation.[92]

Similar to the USCG regulations, compliance with the VGP standards may be achieved by: (1) retaining ballast water; (2) using an onboard BWT

86. *See* EPA, *supra* note 16, at 8. These include commercial fishing vessels, freight barges, freight ships, passenger vessels, tank barges, tank ships, and utility vessels.

87. *See id*. at 30. Non-uniform ballast water regulations have caused problems for those tasked with compliance of all of the overlapping regulations. In some instances, the EPA and USCG regulations directly conflict. For example, the EPA VGP requires vessels using a BWM that "has shown to be effective by testing conducted by an independent third party laboratory, test facility, or test organization." Whereas, the USCG BWM regulation specifically requires USCG type-approval. Thus, a vessel may be in compliance with the EPA VGP but not the USCG Regulations. *See* 46 C.F.R. § 162.060 (2015); 33 C.F.R. § 151.2026 (2014). In an effort to decrease regulatory redundancy and confusion at the federal level, the USCG and EPA entered into a Memorandum of Understanding (MOU) in 2011. The MOU facilitates coordination, information sharing, training, and monitoring between the two agencies while clarifying each agency's individual responsibilities. While the MOU is a helpful tool, it does not entirely prevent regulatory confusion. Memorandum of Understanding Between the U.S. EPA and U.S. Coast Guard for Collaboration on Compliance Assistance, Compliance Monitoring, and Enforcement of Vessel General Permit Requirements on Vessels (Feb. 11, 2011).

88. *See* EPA, *supra* note 16, at 26–38.

89. *See id*. at 27.

90. *See id*. at 26–38.

91. *See id*. at 72 (emphasis added).

92. *See* Nat. Res. Def. Council v. U.S. Envtl. Prot. Agency, 808 F.3d 556 (2d Cir. 2015) (emphasis added).

system; (3) using U.S. water only; or (4) using onshore treatment facilities.[93] Mandatory BWM practices involve tasks including the regular cleaning of ballast tanks, the avoidance of discharging near sensitive ecosystems, and the avoidance of uptake in areas known for harmful organism infestations or in close proximity to sewage outfalls.[94]

In addition to the alternative methods mentioned above, the EPA regulations heavily rely on the installation of on-board BWT systems. However, with the current lax discharge standards, BWTS manufacturers have no incentive to promote the technological advancement of their products. Thus, vessel owners continue to avoid installing these expensive systems, knowing that the current systems will likely not comply with the stricter regulations in the future. This hinders technological advancement; if shipping companies are not buying the products, then BWTS manufacturers have fewer incentives to push the development of their products in such a regulated environment. Therefore, it is unlikely that manufacturers will develop and produce products that surpass current standards.[95] The CWA is intended to be a technology-forcing regulation. This means that the current regulations are not capable of or are not economically feasible for complying with the law in order to promote technological advancement at an increased pace.[96] Deferring more stringent regulations simply because compliant technology is not readily available or economically feasible completely contradicts the technology-forcing purpose of the CWA. In doing so, the EPA is permitting BWM manufacturers to remain idle, rather than incentivizing further development or engineering of products capable of complying with a zero organism standard.

Unlike its predecessor, the 2013 VGP incorporates numeric discharge limits.[97] Like the USCG, the VGP adopts the 2008 IMO Regulation D-2 performance standards.[98] While the EPA estimates that this standard will greatly decrease the introduction of invasive species through ballast water discharge, it admits that it does not eliminate the risk altogether.[99] In fact,

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93. *See* EPA, *supra* note 16, at 26–38.

94. *See id*. at 27–28. A sewage outfall is the point of sewage discharge, often from a pipe into a body of water. "*Sewage outfall*," ECOLOGYDISCTIONARY.ORG (2008), http://www.ecologydictionary.org/sewage_outfall [https://perma.cc/JL3S-K54K] (Sept. 22, 2016).

95. *See* M. Falkner et. al, *supra* note 6, at iv–v.

96. Claudia Copeland, Cong. Research Serv., Clean Water Act: A Summary of the Law 2 (Oct. 30, 2014).

97. *See* EPA, *supra* note 16, at 29.

98. *See id*. at 29.

99. EPA, 2013 Final Issuance of National Pollutant Discharge Elimination System (NPDES) Vessel General Permit (VGP) for Discharges Incidental to the Normal Operation of Vessels Fact Sheet 74 (2012).

the National Academy of Sciences (NAS) Committee, whose reports are heavily relied upon by the EPA in its decision-making, admits that it is unable to establish a reliable numeric discharge limit, other than zero, that would guarantee protection against invasive species.[100] Despite this admission, the EPA insisted that the D-2 standards were the "most stringent treatment standards scientifically proven to be achievable and detectable today."[101] Various critics, such as the Second Circuit Federal Court of Appeals, have disagreed.[102]

b. Natural Resources Defense Council v. United States EPA (2015)

In order to further the goal of eliminating all pollution discharges in the United States, Congress explicitly designed the CWA so that pollution standards would require the best available technology, and thus be technology-forcing.[103] Best available technology requires the "application of the best available technology economically achievable . . . which will result in reasonable further progress toward the national goal of eliminating the discharge of all pollutants."[104] Ultimately, the standard forces agencies, including the EPA, to permit applicants to adopt and develop technology capable of achieving the greatest pollution reductions.[105] However, the EPA's current standard fails to do just that. In *Natural Resources Defense Council v. EPA*,[106] the Second Circuit Court of Appeals held that the EPA acted arbitrarily and capriciously[107] in

100. Nat. Res. Def. Council v. U.S. Envtl. Prot. Agency, 808 F.3d 556 (2d Cir. 2015).
101. *See* S. Rep. No. 114-96, *supra* note 47.
102. *See Nat. Res. Def. Council*, 808 F.3d 556.
103. *See* Claudia Copeland, *supra* note 96, at 2–3. Technology forcing is a strategy where a regulator sets a standard that is unattainable with existing technology, at least at an acceptable cost. *See* David Gerard & Lester B. Lave, Ctr. for the Study & Improvement of Regulation, Implementing Technology-Forcing Policies: The 1970 Clean Air Act Amendments and the Introduction of Advanced Automotive Emissions Controls 1 (May 2003), http://www.cmu.edu/gdi/docs/implementing-technology.pdf [https://perma.cc/B522-XXPP].
104. Clean Water Act, 33 U.S.C. § 1311(b)(2)(A).
105. *See Nat. Res. Def. Council v. U.S. Envtl. Prot. Agency*, 808 F.3d 556.
106. 808 F.3d 556.
107. Meaning the EPA:

> [R]elied on factors which Congress had not intended to consider, entirely failed to consider an important aspect of the problem, offered an explanation for its decision that runs counter to the evidence before the agency, or is so implausible that it could not be ascribed to a difference in view or the product of agency expertise.

Islander E. Pipeline Co. v. McCarthy, 525 F.3d 141, 150–51 (2d Cir. 2008).

enacting the 2013 VGP when it failed to set performance standards that reflected the best available technology achievable under the CWA.[108]

First, the Second Circuit held that by enacting the Performance D-2 standards, the EPA failed to adequately explain why higher standards were not achievable with current technology.[109] The EPA claimed that the Science Advisory Board (SAB) report concluded that no system could meet standards more stringent than the D-2 standards.[110] Yet, the report identified a number of future systems that would be capable of exceeding the current D-2 standards, with reasonable and feasible modifications. The EPA failed to consider this essential information.[111] Thus, a more stringent standard would be possible under the CWA's best available technology requirement.

Next, the court declared that the EPA failed to consider onshore systems entirely because the agency believed the technology was not "available."[112] Although there are currently no onshore treatment systems existing in the United States, these systems have been technologically possible for many years.[113] Therefore, the court concluded onshore treatment systems were consequently "available" under the CWA.[114] In fact, this technology may be easier to implement and more effective than onboard treatment systems.[115] The EPA's final decision to enact the D-2 standards contradicts the evidence that proves the availability of technology capable of exceeding that standard. As a result, the court directed the EPA to revise the VGP to accurately reflect and to comply with the technology-forcing requirements of the CWA.[116] Although this may present a positive outlook on near-future BWM regulation, with the slow progression of the enactment of stricter BWM standards, the future standard is still likely to be inadequate. Several states have taken notice of this problem and, as a result, have enacted their own BWM regulations.

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108. *See Nat. Res. Def. Council*, 808 F.3d 556.
109. *See id.*
110. *See id.*
111. *Id. See also* EPA, Efficacy of Ballast Water Treatment Systems: A Report by the EPA Science Advisory Board, EPA-SAB-11-009, 39 (July 12, 2011) (hereinafter referred to as EPA SAB report).
112. *See Nat. Res. Def. Council*, 808 F.3d 556.
113. *See id.*
114. *See id.*
115. *Id.*
116. *Id.*

C. State Ballast Water Regulations

This section will discuss federal preemption issues relative to BWM regulation within the states. This section will also present California's exemplary BWM regulatory scheme.

1. Federal Preemption Issues

Due to the inadequacies caused by the USCG and EPA BWM regulations, several states have attempted to remedy the issue by implementing their own regulations. Although the USCG and EPA take primary responsibility for BWM, federal courts have held that states are not completely preempted by federal legislation on the regulation of AIS.[117] In *Fednav v. Chester*,[118] the Sixth Circuit Court of Appeals upheld Michigan's ballast water statute, which requires all oceangoing vessels equipped with ballast tanks and engaging in port operations in Michigan to obtain a permit from the state and submit notification reports to the Michigan Department of Environmental Quality at least twenty-four hours prior to port operations.[119] The regulation further requires vessels discharging ballast water to first treat the water using: (1) hypochlorite treatment, (2) chlorine dioxide treatment, (3) ultraviolet light radiation treatment preceded by suspended solids removal, or (4) deoxygenated treatment.[120] This statute was substantially more stringent than federal regulations at the time.

The *Fednav* court held that Michigan's statute is not preempted because states are permitted to implement more stringent regulation for the legitimate interest of preventing the introduction of invasive species, which is a serious environmental threat within their waters.[121] The court based this conclusion on the notion that individual states are more familiar with, and therefore are better situated to deal with, threats to their own waterways.[122] Thus, as long as it is possible to comply with both federal and state laws, individual states are permitted to enact their own ballast

117. *See* Fednav, Ltd. v. Chester, 547 F.3d 607 (6th Cir. 2008).
118. 547 F.3d 607.
119. *Fednav*, 547 F.3d at 613.
120. *Id*.
121. *Id*. at 625. In determining whether a state statute violates the Dormant Commerce Clause, the court must balance the burden on interstate commerce against the putative local benefits. As long as the burden on interstate commerce is not clearly excessive in comparison to the local benefits, the regulation will be upheld. *See* Pike v. Bruce, 397 U.S. 137, 142 (1970).
122. *Fednav*, 547 F.3d at 625–25.

water regulations.[123] California has taken advantage of the states' ability to enact stricter ballast water regulation.

2. California

After experiencing firsthand environmental and economic effects of ballast water AIS introductions,[124] California was the first state to implement its own BWM regulations and to propose numeric discharge limits in its regulations.[125] The state currently enforces the nation's most stringent BWM regulations.[126] The California regulations are partially modeled after the USCG's regulations and the EPA's VGP regulations. Yet, unlike these federal regulations, California's regulations include necessary requirements including reporting, monitoring, and research.[127] Further, to ensure regulatory enforcement, California requires the inspection of at least 25% of arriving voyages.[128] During the inspections, state officials review BWM paperwork and take ballast water samples to ensure compliance with the discharge standards.[129] The BWM paperwork includes USCG Ballast Water Reporting Forms, which are required upon departure from any state port and must describe the method used to comply with the discharge standards, along with the location and time the method was conducted.[130]

California also conducts extensive monitoring to determine when, where, and how AIS invasions occur.[131] Large-scale surveys are conducted in bays, harbors, marinas, and the open coast to determine the presence, distribution, and abundance of AIS in the surveyed areas.[132] Remote area

123. *See* EPA *supra* note 16. California, Michigan, Minnesota, and New York have enacted more stringent ballast water regulations. Louisiana has not.

124. Over the past ten years, California has spent well over $50 million eradicating and invasive aquatic plants from various state ports. *See* N. Dobroski et al., *supra* note 27, at 3. The high density of plants in the waterways had resulted in shipping traffic delays, recreational boating restrictions, and tourism decline. *Id.* at 2.

125. Cal. Marine Invasive Species Program, Performance Standards for Ballast Water Discharge, http://www.slc.ca.gov/Programs/MISP/InfoShts/BWMngmnt.pdf [https://perma.cc/5AMA-6VGB] (revised Aug. 3, 2015).

126. ABS, *Ballast Water Treatment Advisory*, 20 (2014), http://ww2.eagle.org/content/dam/eagle/publications/2014/BWTAdvisory14312rev3.pdf [https://perma.cc/3W4X-X3RR].

127. *See infra* Part I(C)(2).

128. *See* N. Dobroski et al., *supra* note 27, at 14. Although the USCG has the right to inspect any vessel, the inspections are discretionary. The agency does not mandate a certain percentage or number requirement.

129. *See id.*

130. *See id.* at 13.

131. Cal. Dep't of Fish & Wildlife, 2014 Triennial Report on the California Department of Fish and Wildlife's Marine Invasive Species Program 3 (Nov. 2014).

132. *Id.* at 5.

surveys are then compared to high vessel traffic areas to establish high-risk areas. This requires continuous sampling.[133] All samples are DNA tested for species verification.[134] Any resulting data is then entered into the National Exotic Marine and Estuarine Species Information System (NEMESIS) database.[135] The NEMESIS database displays records of AIS found in the United States and descriptions and photographs of each species along with their geographic distributions.[136] NEMESIS is available to the public and provides an excellent educational tool aimed toward preventing AIS introduction.[137]

California's research requirement focuses on preventative and alternative BWM technology. It prioritizes the use of shore-based treatment facilities and compliance measurement technology.[138] However, the California regulation does not provide adequate protection against the introduction of invasive species through ballast water, and the EPA and USCG are to blame. California has continually attempted to implement more stringent discharge standards than the Federal government since 2009.[139] The standard was initially intended to apply to the majority of vessels beginning January 1, 2016, and to the remaining vessels beginning January 1, 2018.[140] The regulation further required all vessels to operate under a "zero organism" standard by 2020, meaning that vessels cannot discharge ballast water containing any living organisms.[141] Unfortunately, due to the current lack of compliant technology, California has been forced to defer implementation.[142] The predominant cause for deficient technology is the federal agencies' failure to enact specific performance standards for both vessel owners and manufacturers.[143] As federal agencies defer stricter discharge standards, vessel owners are unwilling to install expensive treatment systems, encouraging manufacturers to push back

133. *See* N. Dobroski et al., *supra* note 27, at 73.
134. *See* Cal. Dep't of Fish & Wildlife *supra* note 131, at 16–17.
135. *See id*. at 19–20.
136. *Id*.
137. *Id*.
138. Cal. State Lands Comm'n, 2014 Assessment of the Efficacy, Availability, and Environmental Impacts of Ballast Water Treatment Technologies for Use in California Waters, at v (Aug. 2014) (including technology such as handheld instruments used by vessel operators to detect the level of organisms present in the ballast water).
139. M. Falkner et al., Cal. State Lands Comm'n, 2007 Biennial Report on the California Marine Invasive Species Program, at 4 (Feb. 2007) (establishing California's first ballast water discharge standard implementation date beginning January 1, 2009).
140. *See* Cal. Marine Invasive Species Program, *supra* note 125.
141. *See id.* (emphasis added).
142. *See* N. Dobroski et al., *supra* note 27, at v.
143. *See id*. at 96.

technological advancement. The USCG's continued failure to approve treatment systems is not helping the situation.[144]

A stricter discharge standard in a single state is not going to provide a manufacturing incentive. Thus, inadequacies at the federal level are not only opening the U.S. as a whole to serious potential harm, but also inhibiting the states from being able to protect their own waterways from that same harm.

II. LOUISIANA

Louisiana is home to over 1,000 invasive species, which have damaged the state.[145] Additionally, AIS are partly to blame for the rapid deterioration of wetlands in Louisiana.[146] Invasive aquatic vegetation in Louisiana wetlands has caused structural changes in the vegetation community, nutrient cycling, habitat changes, and caused a loss of species diversity.[147] Alligator and dotted duck weed, a pair of invasive aquatic plants introduced into Louisiana through ballast water, heavily impact Louisiana wetlands and waterways.[148] For instance, these species each spread quickly and absorb the limited nutrients found in these waters, crowding out native species and increasing the risk of flooding.[149] In some areas, these plants have grown to be so dense that many species and humans, such as recreational boaters, vacationers, and tourists, are unable to traverse or make use of the areas.[150] To make the infected areas accessible, the invasive plant species must be chemically removed at a cost of $200 to $1,000 per acre, depending on the chemical used.[151]

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144. *See id*. at 96.

145. Stephanie Showalter, *Aquatic Nuisance Species in the Gulf of Mexico: A Guide for Future Action by the Gulf of Mexico Regional Panel and the Gulf States*, Sea Grant Law Ctr., at 16 (2003).

146. EPA, *Coastal Wetlands Initiative: Gulf of Mexico Review*, 19, http://www.epa.gov/sites/production/files/2015-04/documents/gulf-of-mexico-review.pdf [https://perma.cc/7PKG-9Y94] (last visited July 6, 2016).

147. *Id*.

148. Rob Richardson et al., US Dep't Agric., Southeastern US Aquatic Weeds Crop Profile 6, 10 (July 2013), http://www.ipmcenters.org/cropprofiles/docs/US-SEAquaticWeeds.pdf [https://perma.cc/GL4Y-ZR29].

149. *Id*.

150. *See* William Kelso, *Invasive Aquatic Plants in the Atchafalaya Basin*, La. Agric. Magazine (2002), http://www.lsuagcenter.com/en/communications/publications/agmag/Archive/2002/Spring/Invasive+Aquatic+Plants+in+the+Atchafalaya+Basin.htm [https://perma.cc/R5NG-T74L].

151. *See generally* Meredith Small & Sylvia Broude, *Clear As A Lake A Resource Guide to Invasive Aquatic Plants and Non-Toxic Treatment Alternatives*, Toxics Action Ctr. (June 2008), http://www.toxicsaction.org/sites/default/files/tac/information/clear-as-a-lake.pdf [https://perma.cc/8FXN-79QP].

Furthermore, Louisiana ports encounter the most vessel traffic per tonnage in the United States, which means they also encounter substantial amounts of ballast water discharge.[152] In 1996, 7 billion gallons of ballast water was discharged from ocean-going vessels, a number that has unquestionably increased with the exponential growth of the international shipping industry.[153] Further, many of the vessels traveling to Louisiana ports are large oil tankers, capable of holding millions of gallons of ballast water.[154] Under current regulations, these vessels are legally able to dump hundreds of thousands of organisms into the water during a single voyage.[155] Complicating matters more, a significant portion of vessels traveling to Louisiana ports come from subtropical or tropical regions, which have similar climates to Louisiana.[156] This is problematic, as AIS are much more likely to thrive in new regions with similar climates to their own.[157] Consequently, their chances of survival, and their potential to cause harm, are greatly increased.[158]

Moreover, global climate change serves only to exacerbate this problem, as an increase in ocean temperature of just two degrees Celsius has permitted AIS to expand their livable habitats considerably.[159] Due to such increase, species from areas that historically would have been incapable of surviving in Louisiana waters are now able to survive. Once an AIS establishes itself in Louisiana, the state's extensively interconnected waterways provide a dangerous avenue for the rapid

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152. *See* AAPA, *Port Industry Statistics: World Port Rankings 2013*, http://www.aapa-ports.org/unifying/content.aspx?ItemNumber=21048#Statistics [https://perma.cc/E2YS-SG9B]. The Port of South Louisiana was ranked as the world's 13th largest port in 2013, transporting 216,445 metric tons of cargo that year. It is the largest port, per tonnage, in the Western Hemisphere; additionally, the Port of New Orleans was ranked 56th, the Port of Baton Rouge 71st, the Plaquemines Port 79th, and the Port of Lake Charles 80th.

153. Kravitz et al., *supra* note 1, at 24.

154. *See* Waterways Council, *Louisiana State Profile* (2012), http://waterwayscouncil.org/wp-content/uploads/2012/11/Louisiana2012.pdf.

155. Nat'l Research Council, Stemming the Tide: Controlling Introductions of Nonindigenous Species by Ships' Ballast Water 23 (1996) (noting that large tankers can carry over 50 million gallons of ballast water).

156. *See* Kravitz et al., *supra* note 1, at 6. *See also* Eugene H. Buck, Cong. Research Serv., RL32344, Ballast Water Management to Combat Invasive Species 2 (Apr. 10, 2012).

157. Univ. of British Columbia, *Adaptability to local climate helps invasive species thrive*, ScienceDaily (Oct. 17, 2013), www.sciencedaily.com/releases/2013/10/131017144626.htm [https://perma.cc/Q9G4-WR97].

158. *Id*.

159. Stanley W. Burgiel & Adrianna A. Muir, *Invasive Species, Climate Change and Ecosystem-Based Adaption: Addressing Multiple Drivers of Global Change*, Global Invasive Species Programme 15 (Sept. 2010), https://portals.iucn.org/library/efiles/documents/2010-054.pdf [https://perma.cc/S5EG-PWY7].

distribution of these unwanted species. Yet, despite all the damage ballast water discharge has caused, Louisiana has taken little action to protect itself.

A. Louisiana Ballast Water Management Regulation

The threat of an AIS invasion through ballast water discharge is of grave concern to this state. Nonetheless, Louisiana has played a passive role in combating this problem, leaving the regulation of ballast water discharge entirely to the federal agencies.[160] Although, the Louisiana Department of Environmental Quality (DEQ) requires permits for certain types of water discharges, ballast water discharge is explicitly excluded from these permitting schemes.[161] The exclusion is a result of the state's AIS Management Plan, in which Louisiana gave low priority to the monitoring, detection, early eradication, and legislative prevention of ballast water AIS introductions.[162] This lack of emphasis was a response to shipping industry officials' concerns regarding compliance with differing state and federal regulations.[163] However, stringent regulations enacted by several states have barely impacted the shipping industry.[164] As these other states have shown, Louisiana's purported concern over burdening industry with additional regulations has little merit.

Under NISA, all states are required to develop and implement management plans directed at preventing and controlling AIS.[165] The Louisiana Department of Wildlife and Fisheries enacted the Louisiana State Management Plan for Aquatic Invasive Species in 2005, which details methods for the management and prevention of AIS within the state.[166] In the plan, a member of the Louisiana AIS Task Force admits that the task force has "no idea how many or what species come into this region every day."[167] Yet, Louisiana has not enacted laws specifically requiring the identification and mitigation of future threats through research, data

160. *See* Final Water Discharge Permit, La. Dep't of Envtl. Quality (Dec. 10, 2013), http://www.deq.louisiana.gov/portal/Portals/0/permits/lpdes/General%20Permits%20Word/General%20Permits%20Word/final%20permit%20package.pdf [https://perma.cc/7RNQ-V8SK].

161. *Id.* at Part I, p. 6.

162. *See* Kravitz et al., *supra* note 1, at 95–97.

163. *See id*. at 82.

164. *See, e.g.*, *Shipping*, Pacific Envtl., http://pacificenvironment.org/oceans-shipping [https://perma.cc/W446-BKW6] (last visited Oct. 14, 2015). Since California has enacted more stringent standards, the state's commercial shipping traffic has increased dramatically; thus, it appears the more stringent regulations are not causing detriment to the industry.

165. 16 U.S.C. § 4724(a) (1996).

166. *See generally* Kravitz et al., *supra* note 1 at 23.

167. *See id.* at 23.

collection, or pathway identification.[168] As a result, Louisiana has conducted little AIS research. A member of the AIS task force naively stated that no "*known*" AIS invasions have occurred within the state as a direct result of ballast water discharge;[169] however, this may no longer be the case if Louisiana fails to act promptly. The potential effects of failing to timely enact state ballast water regulation could be drastic.

B. AIS Environmental and Economic Impacts in Louisiana

A considerable portion of Louisiana's economy thrives on both, the fresh and saltwater fishing industries. Louisiana provides 25% of the nation's seafood and ranks second in the nation in volume of fish caught (1.2 billion pounds), and fourth in value of those fish caught (402.2 million).[170] A potential AIS invasion of Louisiana's commercial fishing areas is a major threat to the biological resources that currently form the backbone of Louisiana's fishing industry.[171] A sufficiently significant interference will cause native fish populations to drop, which will also affect the associated revenues and nearly 33,000 Louisiana seafood industry-related jobs.[172]

Furthermore, nearby AIS invasions also pose a risk to the State. Illustrating this threat, the green mussel (*Perna viridis*), introduced via ballast water into the Gulf of Mexico near Tampa Bay, Florida around 1990,[173] has since been spotted as far west as Pensacola.[174] The green mussel depletes plankton, which is a major food source for native species.[175] Green mussels can also cause major damage to industrial and power facilities by clogging water in-take and out-take pipes.[176] If the green mussel were to continue its expansion and travel the short distance

168. Envtl. Law Inst., *Status and Trends in State Invasive Species Policy: 2002-2009* (May 2010), https://www.eli.org/sites/default/files/docs/research/invasives/Status%20and%20Trends%20Appendix.pdf [https://perma.cc/BJ7Q-QFRX].

169. *See* Kravitz et al., *supra* note 1, at 22.

170. NOAA, *Fisheries of the United States 2013*, vii (2013), https://www.st.nmfs.noaa.gov/Assets/commercial/fus/fus13/FUS2013.pdf [https://perma.cc/2VCT-J2P9].

171. J. Tamelander et al., *Guidelines for Development of a National Ballast Water Management Strategy*, GloBallast Monograph Series No. 18, 3 (2010), http://globallast.imo.org/wp-content/uploads/2015/01/Monograph_18_web.pdf [https://perma.cc/98LB-QG7L].

172. U.S. Dept. Commerce, *Fisheries Economics of the United States 2012* 129 (2014), https://www.st.nmfs.noaa.gov/Assets/economics/documents/feus/2012/FEUS2012.pdf [https://perma.cc/2A83-EUQM].

173. *See* Kravitz et al., *supra* note 1, at 55.

174. *See id.* at 23.

175. *See id.*

176. *See id.*

to Louisiana, it could cause serious and irreparable damage to the State's vital fishing and seafood industry.[177]

Another salient example of AIS's ability to rapidly expand its territory is shown through the case of the Green Crab (*Carcinus maenas*), which was introduced into the San Francisco Bay area via ballast water in 1998.[178] The species has a high salinity and temperature tolerance, allowing it to thrive in a variety of regions.[179] The species has since spread along the entire Pacific coast. Green crabs are known for preying on clams, oysters, and mussels.[180] If introduced into Louisiana waters, the species would likely thrive and could seriously threaten the lucrative oyster, shrimp, and crab fisheries.[181] The state of Louisiana is at serious risk of an AIS invasion unless it acts quickly to take appropriate preventative measures.

III. PROPOSED SOLUTION

Under current regulation, AIS invasions caused by ballast water discharge are a continuing threat. With the international shipping industry on a steady rise, AIS may have yet to reach its peak in U.S. waters.[182] BWM regulation is a complicated issue—there is not one simple solution to the problem. Thus, multiple solutions that support each other should be used to successfully combat the problem. The overall goal of preventing the introduction of invasive species through ballast water can be achieved by enacting a strictly-implemented zero organism standard at the federal level, with the incorporation of multiple technological avenues for compliance. Further, Louisiana must enact appropriate legislation and regulations to safeguard its high-risk waterways.

177. *See id.*
178. *See* Kravitz et al., *supra* note 1, at 64.
179. *See id.*
180. *See* Sabrina J. Lovell et al., 35 Agric. & Res. Econ. Review 195, 204 (Apr. 2006) (estimating that the invasive Green Crab causes $22.8 million in damages annually to the commercial crab, mussel, and oyster fisheries along the California coast).
181. *See* Kravitz *et al.*, *supra* note 1, at 64. Vessel traffic between California and Louisiana has the possibility to introduce this harmful species into Louisiana waterways.
182. *See* N. Dobroski *et al*., *supra* note 27, at 40–41 (noting that the industry trend to build and operate vessels of larger sizes and ballast capacities is a significant contributing factor to this increase).

A. Federal BWM Regulation Solutions

At the federal level, both the USCG and EPA need to enact identical, strictly-implemented zero organisms standards that utilize multiple technological avenues for compliance. This can be achieved through the mixed use of onboard treatment systems, onshore treatment systems, and new vessel engineering designs.

1. Strict Implementation of a Technology-Forcing Zero Organism Standard

The current regulations are clearly not able to effectively prevent AIS invasions through ballast water discharge.[183] The current discharge standards still permit the discharge of organisms into U.S. waters, just at a regulated quantity.[184] These efforts to reduce the amount of organisms discharged into the environment will not protect against future invasions. The amount of organisms discharged is usually not the problem—AIS possess particular characteristics that allow them to multiply and spread rapidly.[185] Limiting the amount of organisms exposed to a new environment does not stop reproduction. However, efforts to eliminate will only be achieved through a technology-forcing, strictly-implemented zero organism standard.

The only way to guarantee complete protection against AIS invasions introduced through ballast water discharge is through a strictly-implemented zero organism standard, prohibiting the discharge of ballast water containing *any* living organisms. Due to the nature of AIS, preventative regulation should be an "all-or-nothing" approach. Anything less will be inadequate in solving this problem.

BWTS technology has advanced since the 1990s. Of the more than 100 treatment systems available for onboard vessel installation, a vast majority of them are incapable of complying with a zero organism performance standard.[186] The adoption of a zero organism standard would serve as strong motivation for BWTS manufacturers to engineer and develop regulatory-compliant products to sell in the market.

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183. *See supra* Part I.

184. For example, under the current D-2 discharge standards, a vessel with a ballast water capacity of 3 million gallons is permitted to dump over 100,000 organisms through ballast water discharge.

185. *See* SeaWeb, *supra* note 3.

186. *See Guide to Ballast Water Treatment Systems 2014*, IHS Maritime (2014), http://globallast.imo.org/wp-content/uploads/2015/01/IHS-BALLAST-WATER-SUPPLEMENT-2014.pdf [https://perma.cc/EF2X-62YD].

Technology-forcing regulation has been proven successful in the EPA's administration of the Clean Air Act, where the EPA demanded a 90% reduction in tailpipe emissions, despite knowing that existing technology was incapable of satisfying the required reductions.[187] Spurred by the technology-forcing nature of these regulations, both the catalytic converter and three-way catalyst were developed within five years.[188] By applying these same principles to the AIS issue, a zero organism standard can also be achieved in a timely manner. However, this would require both the USCG and the EPA to uniformly implement the standards on a set date that will *not* be deferred. Under this proposed standard, all vessels will be required to comply with a zero organism standard by 2020. Both stricter standards and unwavering compliance schedules are necessary to incentivize technological advancement for onboard treatment systems, onshore treatment systems, and alternative methods capable of complying with the law. In turn, these strict regulations will ensure the protection of U.S. waters from AIS.

2. Federal Agency Collaboration and Coordination

To promote the success of both sets of regulations, the USCG and EPA must collaborate to establish identical BWM regulations. Substantially differing regulations will likely spur confusion and lead to non-compliance. Uniform federal regulations are easier to understand and therefore easier with which to comply.

The current EPA reporting requirements provide no avenue for compliance assurance. To ensure collaboration and coordination, the EPA should adopt the USCG reporting and monitoring requirements. Thus, the EPA should mandate written records upon all foreign vessels that include vessel specifics, voyage information, ballast water information, and BWM information.[189] Doing so will not only provide a reliable method for determining vessel compliance on the EPA's end, but will also resolve any regulatory confusion between the two agencies.

In addition, when the EPA finally revises the permit system to adequately protect U.S. waterways, the USCG, who has not been mandated by the courts to enact more stringent standards, shall also

187. David Gerard & Lester B. Lave, *Implementing Technology-Forcing Policies: The 1970 Clean Air Act Amendments and the Introduction of Advanced Automotive Emissions Controls*, 72 Technological Forecasting & Soc. Change 761 (May 2013).

188. *Id.* A catalytic converter creates a chemical reaction that results in a 90% conversion of bad gases into less harmful gases that flow through the mufflers and out the exhaust tips of a vehicle. The invention was created to comply with new Clean Air Act emission regulations. *Id.*

189. *See supra*, Part I(B)(1).

implement those discharge standards. Otherwise, the difference in regulations will confuse vessel owners and operators, who must comply with both agency regulations. Confusion results in non-compliance, whether it is accidental or intentional. Non-compliance resulting in an AIS invasion has the potential to cause years of irreparable damage at an extremely high cost. Therefore, a high compliance rate is essential for the protection of the nation's waterways.

3. Expansion of BWM Regulation Vessel Compliance Options: Onshore Treatment Systems and Vessel Design

Focusing entirely on one BWM technology is inefficient and hinders the regulatory process. There are many different types of vessels; what may be the most efficient and cost effective technology for one may not be for the other. Although both USCG and EPA regulations push for on-board BWTS, the agencies admit that BWTS technologies are currently incapable of complying with more stringent discharge standards.[190] Very few ships have installed the systems due to high costs and the risk of future noncompliance upon implementation of stricter regulations.[191] Also complicating the issue are certain systems that are only effective on certain types of vessels.[192] Thus, there is not a one-size-fits all remedy to BWM. Other options may very well be capable of compliance with stricter standards, but are brushed over in the EPA's and USCG's analysis and implementation of BWM regulation.

Onshore treatments systems, although not currently present in the U.S., will provide a more accessible avenue to comply with more stringent standards. These systems would use technology similar to drinking water treatment systems already in place and would be highly effective at removing organisms from ballast water of *all* vessel types.[193] Vessels would not be required to install any new equipment on board, and in some instances, would be able to configure current treatment plants to treat ballast water as well.[194] As long as the treatment process does not delay vessel loading and unloading procedures, this alternative may be the easiest and most effective BWM method to implement. Further, these

190. 33 C.F.R. § 151; *see also* EPA SAB Report, *supra* note 111, at 39.
191. N. Dobroski *et al*., *supra* note 27, at 24.
192. ABS, *Ballast Water Treatment Advisory* 11 (2011), http://ww2.eagle.org/content/dam/eagle/publications/2011/BallastAdvisory_April2011.pdf [https://perma.cc/9R3V-9T8Y].
193. Newton Narciso Pereira & Hernani Luiz Brinati, *Onshore Ballast Water Treatment: A Viable Option for Major Ports*, 64 Marine Pollution Bulletin 2296 (2012).
194. *Id.*

systems could be constructed and put into regulatory force within three years, compared to the phase-in approach of BWTS which would take at least eight years to become effective at a less stringent standard.[195]

Lastly, the IMO, as an influential global organization, should promote development of cost-efficient alternative BWM options, such as vessel engineering designs that do not require ballast water. The "ballast-free ship" concept uses a flow-through method, where ballast water is taken in and discharged simultaneously while the vessel is traveling.[196] So long as the vessel maintains average speed, it takes no more than a couple of hours to completely replete new ballast water.[197] Thus, the same ballast water and accompanying organisms are only held in the tank for a short period of time before discharged, thereby drastically reducing the distance by which these organisms are transported.[198] This "ballast-free ship" design provides another cost-effective method of eliminating ballast water discharge AIS invasions.[199]

Ultimately, federal implementation of a unified and comprehensive zero organism discharge standard—applying equally to all states—is the most effective prevention for AIS invasions.

B. Louisiana-Specific BWM Regulation

Federal regulations are rarely implemented quickly. Thus, it is imperative that Louisiana take action to protect its waterways now. With Louisiana being home to dense shipping traffic, extensive interconnected waterway systems, and a warm, inviting climate, an AIS invasion in Louisiana is a disaster waiting to happen. However, the risk of such a disaster can be prevented if Louisiana acts quickly to implement more stringent ballast water regulations. These would ideally be modeled after California's BWM regulation until federal regulations provide adequate protection.

California's ballast water regulations are modeled after both federal regulations and contain much more stringent, yet feasible, mitigation components to aid in protecting its waterways.[200] Thus, Louisiana should enact regulation modeled after California. This regulation should focus on identifying the areas most at risk for invasion, such as large shipping ports, and provide for continued monitoring of these areas. All data should be

195. *See* EPA SAB Report, *supra* note 111, at 86.
196. *See* Michael G. Parsons & Miltiadis Kotinis, *Hydrodynamic Optimization Testing of Ballast-Free Ship Design*, Great Lakes Mar. Research Inst. (Oct. 30, 2008).
197. *Id.*
198. *Id.*
199. *Id.*
200. *See* Cal. Marine Invasive Species Program, *supra* note 125.

entered into the NEMESIS database for public access. Further, Louisiana should require the inspection of at least 25% of arriving voyages, along with BWM reporting forms describing the method used, time, and location of any BWM practice. In enacting such regulation, Louisiana can set an example for neighboring states[201] and encourage their implementation of similar regulations. Yet, with shared waterways, stringent regulation in one state is easily undermined by lax standards in a neighboring state. Therefore, interstate coordination with the states that border the Gulf of Mexico with Louisiana is essential.

It is likely that federal regulations will impose a zero organism standard, but this may not happen until the distant future. However, this is no reason to delay more stringent state-level regulations. Triggering the process at the state level will only assist in the future transition to a zero organism standard. Because ballast water discharge concerns have been present since the 1980s, more stringent regulations will not surprise shipping companies. Further, complying with individual state regulation, on top of federal regulation, will foster regulatory confusion; however this is a necessary evil required to safeguard Louisiana's waterways.

IV. CONCLUSION

Ultimately, the USCG and EPA need to work together in enacting technology-forcing BWM regulations utilizing a zero organism discharge standard. Both agencies' regulatory schemes must set a final, no-exceptions implementation date for that standard, and must demand timely compliance. Under current regulations, the numeric discharge limits are not adequate, and as a result, cannot protect U.S. waters against future AIS invasions.

With some of the nation's busiest ports, an inviting climate, and extensive, interconnected waterways, Louisiana cannot afford to wait for the federal agencies to formulate a remedy. Louisiana is at high risk for ballast water AIS invasions, which requires the State to take the initiative to protect its own waterways, economy, and citizens' safety. Louisiana must enact a mitigating BWM regulatory scheme modeled after California. This will allow the state to mitigate and protect Louisiana waterways from the risk of AIS invasion. Further, enacting such regulation will provide an influential example to both neighboring states and the federal agencies, which have repeatedly failed to acknowledge and to address the severity of the threat posed by AIS.

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201. Louisiana's bordering states, including Texas, Mississippi, and Arkansas, have not enacted state-specific BWM regulations. *See* EPA: Vessel General Permit, *supra* note 16, at 91–139.

At some point, federal regulations will require a zero organism standard. However, the imperative question is not if, but when. The longer it takes, the wider Louisiana opens its gates and welcomes AIS intruders. Louisiana holds the ability to close its gate, and the time is now. The next zebra mussel catastrophe could only be one ship's voyage away. In the words of Benjamin Franklin, "an ounce of prevention is worth a pound of cure."[202]

Sara E. Richard[*]

202. Benjamin Franklin, *On Protection of Towns from Fire*, Pa. Gazette, Feb. 4, 1735, http://founders.archives.gov/documents/Franklin/01-02-02-0002 [https://perma.cc/EZK4-L5ES] (last visited Aug. 20, 2016).

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