

FLORIDA’S HARMFUL ALGAL BLOOMS: TINY ORGANISMS NEEDING MASSIVE LEGISLATION

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I. INTRODUCTION

“World’s Most Famous Beach.”¹ “Voted #1 Beach in the United States.”² “Most Major Freshwater Springs in the World!”³ These phrases are the reality for the state of Florida—driving tourists to visit Florida’s beaches and springs year-round. However, imagine arriving on an anticipated vacation to be met with signs exclaiming, “CLOSED DUE TO TOXIC ALGAE BLOOMS.” Red tide and blue-green algae—although sounding like an elementary school color-wheel lesson—are colorful expressions that belong more in a biology lab than in kindergarten. Red tide and blue-green algae are two of the many harmful algal blooms that are currently affecting Florida’s waters, leaving damaging impacts on Florida’s economy and the health of Florida’s residents and visitors.⁴ This paper will discuss the consequences of harmful algal blooms in Florida, current federal and Florida legislation that may pertain to harmful algal blooms, and how cooperative federalism

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¹ *History of Our City*, WORLD FAMOUS DAYTONA BEACH, <https://www.codb.us/365/History-of-City> (last visited Apr. 27, 2020), [<https://perma.cc/BR3M-8DGN>].

² Madison Roberts, *This Beach Was Just Voted the Best in America – and It’s the Second Year at #1*, PEOPLE (Feb. 27, 2019, 4:46 PM), <https://people.com/travel/best-beaches-america-tripadvisor/> [<https://perma.cc/J5VN-CUTB>].

³ *FAQ – Florida Springs*, FLORIDA’S SPRINGS, <https://floridasprings.org/contact/faq/> [<https://perma.cc/LE2N-43SW>] (last visited Apr. 27, 2020).

⁴ K. A. Steidinger et al., *Harmful Algal Blooms in Florida*, FLORIDA FISH AND WILDLIFE CONSERVATION COMMISSION 1 (Mar. 8, 1999), <https://myfwc.com/media/13114/hab-whitepaper.pdf> [<https://perma.cc/34FY-W52X>].

fails to adequately prevent and mitigate harmful algal blooms on a local level.

Harmful algal blooms are an algae species that produce toxins and bloom to excess, thus creating harm to humans and ecosystems.⁵ Exposure to algal toxins can occur to humans, domestic animals, and wildlife through their food, drinking water, the water in which they swim, or aerosis.⁶ Aerosis is the gas production by bacteria.⁷ Harmful algal blooms are defined by their detrimental effects, which may be evidenced through dead fish on the beach, algae floating on the water, and their nonvisible effects such as the gradual loss of a water's vegetation and water designated as unsafe for drinking.⁸ Algal blooms create hypoxia, a condition characterized by reduced oxygen concentration in the water.⁹ Hypoxic conditions create "dead zones" where fish and other marine organisms cannot survive.¹⁰ Algal blooms are naturally occurring, but scientists believe that algal blooms have increased in frequency and intensity because of the rising amounts of nutrients in coastal waters.¹¹ An increase in algal blooms can also be attributed to higher temperatures resulting from global warming.¹² "Declining flows and warming weather temperatures will pose additional perils by concentrating pollutants, decreasing the oxygen-carrying capacity of water, stimulating excess algal growth..."¹³ However, algal blooms "are thriving because of additional nutrients that human activities have introduced into watersheds."¹⁴

Nutrients, like nitrogen and phosphorus—although naturally occurring in the water and soil—have been significantly increased in

⁵ VLADIMIR BUTEYKO, *Harmful Algal Blooms: Impact and Response*, NOVA SCIENCE PUBLISHERS, INC. (New York 2010) (ebook), at 3.

⁶ *Id.*

⁷ *Aerosis*, THE FREE DICTIONARY, <https://medical-dictionary.thefreedictionary.com/aerosis> [<https://perma.cc/5RGL-7HJR>] (last visited Apr. 27, 2020).

⁸ *Id.*

⁹ *Id.*

¹⁰ Benjamin Bryce & Robert Skousen, *Bloomin' Disaster: Externalities, Commons Tragedies, and the Algal Bloom Problem*, 21 U. DENV. WATER L. REV. 11, 17 (2017).

¹¹ Butkeyo, *supra* note 5, at 3.

¹² MICHAEL B. GERRARD, *GLOBAL CLIMATE CHANGE AND U.S. LAW*, (2d ed. 2007), at 634.

¹³ *Id.*

¹⁴ Bryce & Skousen, *supra* note 10, at 19.

water bodies due to human activities.¹⁵ For example, household products such as detergent, pet waste, and yard fertilizer contain nitrogen and phosphorus, which traverses into the local water systems.¹⁶ However, agricultural runoffs create an even bigger impact on the nutrient levels in bodies of water.¹⁷ Agricultural pollution due to enormous quantities of manure, fertilizer-laden runoff, and soil erosion comprise one of the most significant sources of nutrient pollution in the United States.¹⁸ Agricultural pollution is one of the greatest environmental challenges of our time.¹⁹

On both the federal and state level, legislation has been enacted to protect bodies of water. Cooperative federalism exists between the Clean Water Act under federal legislation, and the implementations the state of Florida has enacted to combat water pollution. However, harmful algal blooms are still detrimentally affecting Florida's water bodies despite these legislative enactments. Federal legislation and regulations, in concurrence with Florida legislation and agency efforts, fail to address the root causes of harmful algal blooms. Rather, they offer ways to attempt to mitigate, but do not successfully prevent future harmful algal bloom outbreaks—therefore, Florida must further state legislation to mimic the Clean Water Act on a local level.

A. FLORIDA'S HARMFUL ALGAL BLOOMS

Florida is home to more than sixty possibly toxic microorganisms in its freshwater, estuarine, and marine waters.²⁰ Two of the major algae blooms that affect Florida are red tide and blue-green algae.²¹ The recurrence of harmful algal blooms in Florida has sparked multiple states of emergencies.²² The legislature has even created harmful algal bloom

¹⁵ *Sources and Solutions*, ENVTL. PROT. AGENCY, <https://www.epa.gov/nutrientpollution/sources-and-solutions> [<https://perma.cc/BW2T-AF5K>] (last visited Apr. 27, 2020).

¹⁶ Bryce, *supra* note 10, at 19.

¹⁷ *Id.*

¹⁸ *Id.*

¹⁹ Mary J. Angelo & Jon Morris, *Maintaining a Healthy Water Supply While Growing a Healthy Food Supply: Legal Tools for Cleaning Up Agricultural Water Pollution*, 62 U. KAN. L. REV. 1003, 1003-04 (2014).

²⁰ Steidinger et al., *supra* note 4, at 7.

²¹ *Id.*

²² *Emergency Authorizations Implement Measures To Address South Florida Algal Blooms* FLA. DEP'T ENVTL. PROTECTION (Oct. 2, 2019, 12:35 PM),

task forces to combat the ever-increasing problems associated with harmful algal blooms.²³ However, the history of environmental enforcement has been weak. Better legislation can lead to cleaner waters, decreased health problems related to harmful algal blooms, and the decrease of destructive major blooms in the future.

Red tide algae are aptly named for coloring the ocean's surface deep red when excessively blooming.²⁴ The occurrence of red tide algae blooms release toxins into the water that can kill marine life and make fish and shellfish dangerous to eat.²⁵ *Karen brevis* is the species of red tide that is responsible for affecting Florida and Texas coasts normally in late summer or early fall months.²⁶ Florida's red tide issue is primarily centralized within the Gulf of Mexico.²⁷

The study of red tide algae in Florida began in the early nineteenth century, and the first occurrence of sickness from consuming shellfish dates back to 1884.²⁸ Humans can become ill from red tide algae by breathing in the algae along the shores or eating infected shellfish.²⁹ Eating shellfish contaminated with red tide algae can cause paralytic shellfish poisoning ("PSP") and can also lead to neurological symptoms such as tingling in the hands and feet, loss of muscle control, and difficulty breathing.³⁰

In 1947, a large outbreak of red tide algae swept over the Florida Gulf Coast and lasted nearly a year and a half—crippling the region's fishing industry.³¹ In 2004, about one hundred dolphins were killed by the red tide in the Gulf of Mexico.³² In 2013, a red tide outbreak killed nearly

<https://floridadep.gov/dear/algal-bloom/content/emergency-authorizations-implement-measures-address-south-florida-algal> [<https://perma.cc/CE2S-XCH2>].

²³ *Harmful Algal Bloom/Red Tide Task Force*, FLA. FISH & WILDLIFE CONSERVATION COMM'N, <https://myfwc.com/research/redtide/taskforce/> [<https://perma.cc/3RAK-UT3Z>] (last visited Apr. 27, 2020).

²⁴ Danielle Hall, *What Exactly Is a Red Tide?* SMITHSONIAN (Aug. 2018), <https://ocean.si.edu/ocean-life/plants-algae/what-exactly-red-tide> [<https://perma.cc/QS2D-UGKB>].

²⁵ R. Sheposh, *Red Tide*, (2018), <http://search.ebscohost.com/login.aspx?direct=true&db=ers&AN=125600138&site=eds-live>.

²⁶ *Id.*

²⁷ Hall, *supra* note 24.

²⁸ Seposh, *supra* note 25.

²⁹ *Id.*

³⁰ *Id.*

³¹ *Id.*

³² *Id.*

three hundred of Florida's manatees, equaling about five percent of the total state manatee population.³³

Florida's latest major red tide event occurred in 2018, leaving a detrimental impact on the fishing and tourism industries.³⁴ The 2018 red tide algae outbreak sickened many people, killed more than 285 sea turtles, and resulted in the first known death of a whale shark from red tide.³⁵ The governor of Florida declared a state of emergency to bring in extra resources to help with red tide algae cleanup efforts.³⁶ The 2018 outbreak gave rise to over 600 reported job losses within the state.³⁷ The coastal communities affected by red tide algae suffer financially as tourism reduces.³⁸ Conversely, inland laying communities benefit from this change.³⁹

While red tide algae affect Florida's surrounding oceans, blue-green algae pose a threat to Florida's freshwaters.⁴⁰ Blue-green algae, *cyanobacteria*, has existed for at least three and a half billion years.⁴¹ Similar to other harmful algal blooms, blue-green algae are also a threat to human and aquatic life.⁴² Upon contact with blue-green algae, symptoms can manifest in an allergic reaction like eye irritation, asthma, rashes, and/or skin irritation.⁴³ Blue-green algae can also impact the liver and nervous systems.⁴⁴

These harmful algal blooms are caused by nutrient pollution from agricultural and urban runoff and stagnant water resulting from a lack of

³³ *Id.*

³⁴ Seposh, *supra* note 25.

³⁵ *Id.*

³⁶ *Id.*

³⁷ Randy Deshazo, *The Economic Ripple Effects of Florida Red Tide*, TAMPA BAY REGIONAL PLANNING COUNSEL, http://www.tbrpc.org/wp-content/uploads/2019/01/The-Economic-Ripple-Effects-of-Florida-Red-Tide_unsigned.pdf [<https://perma.cc/S3YV-LYPA>] (last visited Apr. 27, 2020).

³⁸ *Id.*

³⁹ *Id.*

⁴⁰ *Freshwater Algal Blooms Frequently Asked Questions*, FLA. DEP'T OF ENVTL. PROT., https://floridadep.gov/sites/default/files/freshwater-algal-bloom-faqs_2019.pdf [<https://perma.cc/7UWE-TUTZ>] (last visited Apr. 27, 2020).

⁴¹ C. Richter, *Cyanobacteria (blue-green algae)*, SALEM PRESS ENCYCLOPEDIA OF SCIENCE, (2018), <https://search-ebSCOhost-com.ezproxy.barry.edu/login.aspx?direct=true&db=ers&AN=87994785&site=eds-live>.

⁴² Florida Department of Environmental Protection, *supra* note 40 at 1.

⁴³ Richter, *supra* note 41.

⁴⁴ *Id.*

natural flushing and land clearing.⁴⁵ Blue-green algae has posed consistent problems within Florida's lakes, rivers, and estuaries.⁴⁶ There have been persistent blue-green algae problems within Lake Okeechobee, the Harris Chain of Lakes, and the St. Johns, St. Lucie and Caloosahatchee rivers and estuaries.⁴⁷ Much like red tide algae and other harmful algal blooms, blue-green algae also affect Florida's economy as tourists are less likely to participate in water activities on the affected lakes and rivers. Blue-green algae has become such a massive problem that Governor Rick Scott declared a state of emergency over the algae blooms in Lake Okeechobee in 2018.⁴⁸

II. WATER QUALITY LEGISLATION AND EFFORTS

A. FEDERAL LEGISLATION

In 1948, the federal government established a comprehensive federal legislative framework for water pollution.⁴⁹ However, it was not until the 1972 amendments to the Clean Water Act that the modern era of water pollution regulation began.⁵⁰ The Clean Water Act ("CWA") is primarily directed at regulating end-of-the-pipe waste emissions and developing water quality standards.⁵¹ The CWA "directed the Environmental Protection Agency ("EPA") to 'develop comprehensive programs for preventing, reducing, or eliminating the pollution of the navigable waters and *groundwaters* and improving the sanitary condition of surface

⁴⁵ *Cyanobacteria in Florida Waters*, FLORIDA FISH AND WILDLIFE RESEARCH INSTITUTE, <https://myfwc.com/research/redtide/general/cyanobacteria/> [<https://perma.cc/V79A-QHYU>] (last visited Apr. 27, 2020).

⁴⁶ Karl Havens & Edward Philips, *Toxic Blue-Green Algae Blooms in Florida Waters*, WATER WORKS (Dec. 2005), <http://sfrc.ufl.edu/pdf/newsletters/WaterWorksDec05.pdf> [<https://perma.cc/3P4Z-D5XA>].

⁴⁷ *Cyanobacteria in Florida Waters*, *supra* note 45.

⁴⁸ Victoria Ballard, *Gov. Scott declares state of emergency over algae bloom*, SUN SENTINEL (July 9, 2018), <https://www.sun-sentinel.com/news/florida/fl-reg-scott-algae-emergency-20180709-story.html> [<https://perma.cc/W79T-49YY>].

⁴⁹ Water Pollution Control Act of 1948, Pub. L. No. 80-845, Ch. 758, 62 Stat. 758 (1948).

⁵⁰ Laura Kerr, *Compelling A Nutrient Pollution Solution: How Nutrient Pollution Litigation Is Redefining Cooperative Federalism Under the Clean Water Act*, 44 ENVTL. L. 1219, 1223 (2014).

⁵¹ Thomas D. Marks, *Toward A National Groundwater Act: Current and Future Courses of Action*, 61 FLA. B.J. 10, 11 (1987).

and *underground* waters [emphasis added].”⁵² The CWA requires federal and state pollution-control agencies to find pollution problems and solve them.⁵³

Section 303 of the CWA sets forth the federal requirements and implementation of water quality standards.⁵⁴ The 1972 amendments of the CWA kept water quality standards as a measure of program effectiveness and performance.⁵⁵ The modern-day CWA employs a two-step approach to achieve its goal to “restore and maintain the chemical, physical, and biological integrity of the Nation’s waters.”⁵⁶

First, the CWA utilizes a technology-based approach to pollution control.⁵⁷ Technology-based effluent limitations are specific numerical limitations established by the EPA and placed on certain pollutants from certain sources.⁵⁸ Effluent guidelines are national wastewater discharge standards that are developed by the EPA on an industry-by-industry basis.⁵⁹ These effluent guidelines are technology-based regulations and are intended to represent the greatest pollutant reductions that are economically achievable for an industry.⁶⁰ The guidelines are developed by the EPA based on information from industry practices, the characteristics of discharges, technologies or practices used to prevent or treat the discharge, and economic characteristics.⁶¹ The EPA identifies the best available technology that is economically achievable for that industry

⁵² *Id.*

⁵³ Lawrence S. Bazel, *Water-Quality Standards, Maximum Loads, and the Clean Water Act: The Need for Judicial Enforcement*, 34 HASTINGS L.J. 1245 (1983).

⁵⁴ 33 U.S.C. § 1313(c) (2012).

⁵⁵ S. REP. No. 92-414, at 8 (1971).

⁵⁶ 33 U.S.C. § 1251(a) (2012).

⁵⁷ See Claudia Copeland, *Clean Water Act: A Summary of the Law*, CONGRESSIONAL RESEARCH SERVICE, Oct. 18, 2016, <https://fas.org/sgp/crs/misc/RL30030.pdf> [<https://perma.cc/6X4V-LYE7>] (explaining that the CWA, state, and EPA attention focused on technology-based effluent limitations until the late 1970s and early 1980s before the water quality standards program became a priority).

⁵⁸ *Id.*

⁵⁹ *Learn about Effluent Guidelines*, U. S. ENVTL. PROT. AGENCY, <https://www.epa.gov/eg/learn-about-effluent-guidelines> [<https://perma.cc/5FF4-U25C>] (last visited Apr. 27, 2020).

⁶⁰ *Id.*

⁶¹ *Development of Effluent Guidelines*, U. S. ENVTL. PROT. AGENCY, <https://www.epa.gov/eg/learn-about-effluent-guidelines#development> [<https://perma.cc/C3P6-Y2NG>] (last visited Apr. 27, 2020).

and sets regulatory requirements based on the performance of that technology.⁶²

The CWA also utilizes water quality standards—standards for the overall quality of the water.⁶³ Water quality standards define “the water quality goals of a water body ... by designating the use or uses to be made of the water and by setting criteria necessary to protect the uses” while also establishing provisions such as antidegradation policies to protect water bodies from pollutants.⁶⁴ The water quality standard program is to ensure the water quality protects public health, the aquatic environment, and water-based recreation.⁶⁵ Water quality standards serve as a backup to federally set technology-based requirements by indicating where additional pollutant controls are needed to achieve the overall goals of the act.⁶⁶

The CWA requires each state to establish water quality standards for all bodies of water in the states.⁶⁷ A state must specify the appropriate water uses to be achieved and protected for waters within its borders—taking into account “the use and value of water for public water supplies, protection and propagation of fish, shellfish and wildlife, recreation in and on the water, agricultural, industrial, and other purposes including navigation.”⁶⁸ The primary authority of setting, reviewing, and revising water quality standards rests with the states.⁶⁹ States must hold hearings every three years to review the water quality standards.⁷⁰

After a state establishes water quality standards for the waters within the state’s borders, the EPA must approve and review the water quality standards before they can be used as the basis for actions.⁷¹ The EPA has sixty days to approve or ninety days to disapprove of such water quality

⁶² *Id.*

⁶³ Copeland, *supra* note 57, at 2.

⁶⁴ 40 C.F.R. §§ 131.2, 131.12. (2015).

⁶⁵ *Id.* § 131.2.

⁶⁶ Copeland, *supra* note 57, at 3.

⁶⁷ *Id.*

⁶⁸ 40 C.F.R. § 131.10(a) (The designated use of a water body must be set so it is protective of fish habitat and recreation unless a state can show it is unattainable due to naturally occurring pollutant concentrations, low flow conditions or water levels, or other factors).

⁶⁹ 33 U.S.C. § 1313(a)-(c) (2012).

⁷⁰ 33 U.S.C. § 1313(c)(1) (2012).

⁷¹ *Review and Approval of State and Tribal Water Quality Standards – Alaska Rule*, U. S. ENVTL. PROT. AGENCY, <https://www.epa.gov/wqs-tech/review-and-approval-state-and-tribal-water-quality-standards-alaska-rule> [<https://perma.cc/6WEQ-6LSB>] (last visited Apr. 27, 2020).

standards.⁷² If the EPA deems that a state's water quality standards are inconsistent with the CWA, the EPA must notify the state and instruct it to make those changes that are necessary to come into compliance with the CWA.⁷³ If a state does not make the required changes within the EPA's given timeframe, the EPA must promulgate federal water quality criteria.⁷⁴

Water quality standards are difficult to set for those water bodies affected by harmful algal blooms. Suitable nutrient levels for a particular water body depend on many site-specific environmental factors such as a water body's size, depth, flow rate, shade cover, and circulation.⁷⁵ Therefore, development for appropriate numeric nutrient criteria must be completed for each water body individually.⁷⁶ Numeric nutrient criteria are a critical tool for protecting and restoring a waterbody's designated uses related to nitrogen and phosphorus pollution.⁷⁷ In 1998, the EPA published a National Nutrient Strategy for addressing nutrient pollution.⁷⁸ The EPA explained that the failure to utilize numeric nutrient criteria at an earlier date was one of the primary causes of nutrient over-enrichment problems.⁷⁹

Additionally, the Safe Drinking Water Act ("SDWA") was enacted in 1974.⁸⁰ The SDWA was originally passed to ensure that public water

⁷² *Policy & Guidance: EPA Review and Approval of State and Tribal Water Quality Standards*, U. S. ENVTL. PROT. AGENCY, <https://www.epa.gov/sites/production/files/2018-10/documents/epa-review-approval-state-tribal-wqs-factsheet.pdf> [<https://perma.cc/K2TS-M2MA>] (last visited Apr. 27, 2020).

⁷³ 33 U.S.C. § 1313(c)(3) (2012).

⁷⁴ 33 U.S.C. § 1313(c)(3)-(4)(A) (2012).

⁷⁵ *Nutrient Criteria Technical Guidance Manual: Rivers and Streams*, U.S. ENVTL. PROT. AGENCY 17 (July 2000), <https://www.epa.gov/sites/production/files/2018-10/documents/nutrient-criteria-manual-rivers-streams.pdf> [<https://perma.cc/577N-5DJH>].

⁷⁶ *Id.* at 18.

⁷⁷ *State Progress Toward Developing Numeric Nutrient Water Quality Criteria for Nitrogen and Phosphorus*, U.S. ENVTL. PROT. AGENCY, <https://www.epa.gov/nutrient-policy-data/state-progress-toward-developing-numeric-nutrient-water-quality-criteria> [<https://perma.cc/H2DS-NBP3>] (last visited Apr. 27, 2020).

⁷⁸ Notice of National Strategy for the Development of Regional Nutrient Criteria, 63 Fed. Reg. 34,648, 34,648-50 (June 25, 1998).

⁷⁹ *Id.*

⁸⁰ *Overview of Safe Drinking Water Act*, U. S. ENVTL. PROT. AGENCY, <https://www.epa.gov/sdwa/overview-safe-drinking-water-act> [<https://perma.cc/7CT3-7CPE>] (last visited Apr. 27, 2020).

systems meet the minimum national standards for the protection of public health.⁸¹ The Act regulates contaminants in drinking water supplied by public water systems, establishes a program for the protection of underground sources of drinking water from subsurface injection of fluids, and allows for the provision of chemicals and substances necessary to treat public drinking water when the supply of such chemicals is inadequate to meet the needs of a particular facility.⁸² The law was amended in 1986 and 1996 and requires many actions to protect drinking waters and its sources—rivers, lakes, reservoirs, springs, and groundwater wells.⁸³ The SDWA authorizes the EPA to set national health-based standards for drinking water to protect against both naturally occurring and man-made contaminants that may be found in drinking water.⁸⁴ The EPA must publish a list of contaminants every five years that are known or anticipated to occur in public water systems and which may require regulation under the SDWA.⁸⁵ The EPA’s list of contaminants, the Contaminate Candidate List (“CCL”), lists cyanobacteria, other freshwater algae, and their associated toxins.⁸⁶ The 1996 SDWA amendments require that no more than thirty unregulated contaminants be on the CCL.⁸⁷ The Fourth Unregulated Contaminant Monitoring Rule (“UCMR 4”) was published in the Federal Register on December 20, 2016, and requires monitoring for the thirty chemical contaminants between 2018 and 2020 using analytical methods backed by the EPA and consensus organizations.⁸⁸

⁸¹ *Understanding the Safe Drinking Water Act*, U. S. ENVTL. PROT. AGENCY (Feb. 2004), <https://www.epa.gov/sites/production/files/2015-04/documents/epa816f04030.pdf> [<https://perma.cc/S75F-VPLX>].

⁸² 42 U.S.C.A. § 300(f)(1) (2016).

⁸³ U. S. ENVTL. PROT. AGENCY, *supra* note 80.

⁸⁴ *Id.*

⁸⁵ *Cyanotoxins and the Safe Drinking Water Act: Drinking Water Protection Act, Contaminate Candidate List and the Unregulated Contaminate Monitoring Rule*, U. S. ENVTL. PROT. AGENCY, <https://www.epa.gov/cyanohabs/cyanotoxins-and-safe-drinking-water-act-drinking-water-protection-act-contaminant> [<https://perma.cc/C93T-87LE>] (last visited Apr. 27, 2020).

⁸⁶ *Id.*

⁸⁷ *Fourth Unregulated Contaminant Monitoring Rule*, U. S. ENVTL. PROT. AGENCY, <https://www.epa.gov/dwucmr/fourth-unregulated-contaminant-monitoring-rule> [<https://perma.cc/BV48-XNR4>] (last visited Apr. 27, 2020).

⁸⁸ *Id.*

In 2015, the Drinking Water Protection Act (“DWPA”) was passed by the House.⁸⁹ The DWPA amends the SDWA to direct the EPA to develop and submit to Congress a strategic plan for assessing and managing risks associated with algal toxins in drinking water provided by public water systems.⁹⁰ The plan must include steps and timelines to: evaluate the risk to human health from drinking water contaminated with algal toxins; establish, publish, and update a comprehensive list of algal toxins that may have an adverse effect on human health, taking into account likely exposure levels; summarize the known adverse human health effects of algal toxins and the factors that cause toxin-producing cyanobacteria and algae to grow rapidly and make toxins; determine whether to publish health advisories for algal toxins; recommend feasible treatment options; and enter into cooperative agreements with, and provide technical assistance to, affected states and public water systems to manage risk associated with algal toxins.⁹¹ The strategic plan developed by the EPA also includes ongoing activities of multi-agency efforts.⁹² Legislative mandates in the CWA and the SDWA require acknowledgement of the presence of contaminants in recreational and drinking waters; however, no specific U.S. guidelines or regulations for cyanotoxins currently exist.⁹³

Around the same time as the passage of DWPA, the Harmful Algal Bloom and Hypoxia Research and Control Amendments Act of 2014 (“HABHRCA”) was approved.⁹⁴ HABHRCA requires the National Oceanic and Atmospheric Administration (“NOAA”) and EPA to advance the scientific understanding and ability to detect, monitor, assess, and predict harmful algal bloom and hypoxia events in marine and

⁸⁹ *Algal Toxin Risk Assessment and Management Strategic Plan for Drinking Water*, U. S. ENVTL. PROT. AGENCY (Nov. 2015), <https://www.epa.gov/sites/production/files/2015-11/documents/algal-risk-assessment-strategic-plan-2015.pdf> [<https://perma.cc/9PDS-8B4H>].

⁹⁰ H.R. 212, 114th Cong. (2016).

⁹¹ *Id.*

⁹² U. S. ENVTL. PROT. AGENCY, *supra* note 89, at 3.

⁹³ JEWETT, E.B., LOPEZ, C.B., DORTCH, Q., ETHERIDGE, S.M, BACKER, L.C., HARMFUL ALGAL BLOOM MANAGEMENT AND RESPONSE: ASSESSMENT AND PLAN, INTERAGENCY WORKING GROUP ON HARMFUL ALGAL BLOOMS, HYPOXIA, AND HUM. HEALTH OF THE JOINT SUBCOMMITTEE ON OCEAN SCIENCE AND TECH (2008).

⁹⁴ *The Harmful Algal Bloom and Hypoxia Research and Control Amendments Act (HABHRCA)*, U. S. ENVTL. PROT. AGENCY, <https://www.epa.gov/cyanohabs/harmful-algal-bloom-and-hypoxia-research-and-control-amendments-act-habhrca> [<https://perma.cc/6GCC-JFW9>] (last visited Apr. 27, 2020).

freshwater in the United States.⁹⁵ A recent amendment of the HABHRCA in 2017 provides the EPA with the statutory authority to determine if a harmful algal bloom or hypoxia event in freshwater is an “event of national significance.”⁹⁶ The authorization of HABHRCA is unique because it calls for federal agencies to consult with stakeholders to obtain their input on actions that directly address their needs and concerns related to mitigating and preventing harmful algal blooms and hypoxia.⁹⁷ The legislation also calls for federal agencies to provide integrated assessments identifying causes, consequences, and approaches to reducing harmful algal blooms and hypoxia nationally.⁹⁸

B. FEDERAL MULTI-AGENCY EFFORTS

Under the HABHRCA of 2014, a provision was included for a Task Force, the Interagency Working Group (“IWG-HABHRCA”), to develop and submit a comprehensive research plan and action strategy to address marine and freshwater harmful algal blooms and hypoxia.⁹⁹ The IWG-HABHRCA is co-chaired by representatives from NOAA and the EPA.¹⁰⁰ The Task Force is also comprised of members from the Centers for Disease Control (“CDC”), the Food and Drug Administration (“FDA”), the National Institute of Environmental Health Services (“NIEHS”), the United States Army Corps of Engineers (“USACE”), the Department of the Navy, the Fish and Wildlife Service, the National Aeronautics and Space Administration (“NASA”), and the United States Department of Agriculture (“USDA”).¹⁰¹

Authorized under HABHRCA, the Ecology and Oceanography of Harmful Algal Blooms (“ECOHAB”) funds research to understand the causes and impacts of harmful algal blooms and their toxins, which is

⁹⁵ *Id.*

⁹⁶ *Id.*

⁹⁷ HARMFUL ALGAL BLOOMS AND HYPOXIA IN THE UNITED STATES, NAT’L OCEANIC ATMOSPHERIC ADMIN. (2008), https://cdn.coastalscience.noaa.gov/page-attachments/research/FINAL_USEC%20signed%20-%20Progress%20and%20Implementation%20Report_HABHRCA.pdf [<https://perma.cc/UHX9-VMPJ>].

⁹⁸ *Id.*

⁹⁹ *Id.*

¹⁰⁰ *Id.*

¹⁰¹ *Id.* at 12.

fundamental to successful management and mitigation.¹⁰² ECOHAB is a national, competitive research funding program with two broad goals: develop information and tools, predictive models and forecasts, and prevention strategies; and learn how toxins are transferred across and up the food chain, including biosynthesis and metabolism of toxins, and assess the impacts of toxins on higher trophic levels.¹⁰³ The ECOHAB Program is a multi-agency program that includes NOAA, EPA, and NASA.¹⁰⁴ Projects under ECOHAB have included studies to explore the use of clay and naturally occurring harmful-algal-bloom-specific pathogens, such as bacteria, viruses, and parasites, to control harmful algal blooms after they bloom.¹⁰⁵ Also, ECOHAB has explored the economic impact of *Karen brevis* along the coast of Florida, developed technology for rapid detection of harmful algal bloom species off the coasts of Maryland and Delaware, and conducted a study to assess the risk of introducing harmful algal bloom species to new regions via shellfish transport.¹⁰⁶ ECOHAB has focused primarily on long-term studies that will lead to improved monitoring, prediction, and prevention.¹⁰⁷

1. U.S. Department of Health and Human Services

Working under the United States Department of Health and Human Services, the CDC works to protect the United States from health, safety, and security threats, both foreign and in the United States.¹⁰⁸ To accomplish this mission, CDC conducts critical science and provides health information that protects the United States against expensive and

¹⁰² *Ecology and Oceanography of HABs (ECOHAB)*, NAT'L OCEANIC ATMOSPHERIC ADMIN., <https://coastalscience.noaa.gov/research/stressor-impacts-mitigation/ecohab/> [<https://perma.cc/NLE9-U3DD>] (last visited Apr. 27, 2020).

¹⁰³ *Id.*

¹⁰⁴ Butkeyo, *supra* note 5, at 67.

¹⁰⁵ *Id.* (ECOHAB Program project lead by NOAA Center for Sponsored Coastal Ocean Research (“CSCOR”). CSCOR has also funded economic assessments and studies of newly emerging toxins, such as saxitoxin in puffer fish.)

¹⁰⁶ *Id.* (ECOHAB Program project led by EPA Science to Achieve Results (“STAR”) program).

¹⁰⁷ *Id.*

¹⁰⁸ *Mission, Role, and Pledge*, CENTER FOR DISEASE CONTROL, <https://www.cdc.gov/about/organization/mission.htm> [<https://perma.cc/68ED-WUNC>] (last visited Apr. 27, 2020).

dangerous health threats and responds when these arise.¹⁰⁹ In 2016, the CDC launched the One Health Harmful Algal Bloom System (“OHHABS”).¹¹⁰ The OHHABS is a voluntary reporting system available to state and territorial public health departments and their designated environmental health or animal health partners.¹¹¹ OHHABS collects data on individual human and animal cases of illnesses from harmful algal bloom associated exposure as well as environmental data about harmful algal blooms.¹¹² The goal of OHHABS is to collect information to support the understanding and prevention of harmful algal blooms and illnesses associated with harmful algal blooms.

Additionally, the CDC has a cooperative agreement in place with numerous Atlantic Coast States (Florida, Virginia, South Carolina, Maryland, and North Carolina) that mitigate human exposures to and illnesses from harmful algal blooms.¹¹³ The response plans include toll-free telephone hotlines, poison information centers to collect data on harmful algal bloom related illnesses, publicly accessible websites, environmental and fish sample collection and analysis plans, and a human illness surveillance system.¹¹⁴

The United States FDA is responsible for protecting the public health by ensuring the safety, efficacy, and security of human and veterinary drugs, biological products, and medical devices, food supply, cosmetics, and products that emit radiation.¹¹⁵ The FDA performs research to identify emerging toxin sources and vector that may potentially affect food safety—taking measures to both prevent and rapidly respond to potential foodborne illnesses from marine biotoxins.¹¹⁶ The FDA also conducts an annual review of State Shellfish Control Programs to determine the degree of conformity with the National Shellfish Sanitation Program, a program in which state shellfish control agencies, the shellfish

¹⁰⁹ *Id.*

¹¹⁰ *Harmful Algal Bloom (HAB)-Associated Illness General Information*, CENTER FOR DISEASE CONTROL, <https://www.cdc.gov/habs/general.html> [<https://perma.cc/WGA4-TRDR>] (last visited Apr. 27, 2020).

¹¹¹ *One Health Harmful Algal Bloom System (OHHABS)*, CENTER FOR DISEASE CONTROL, <https://www.cdc.gov/habs/ohhabs.html> [<https://perma.cc/E8NT-FZ69>] (last visited Apr. 27, 2020).

¹¹² *Id.*

¹¹³ Butkeyo, *supra* note 5, at 77.

¹¹⁴ *Id.*

¹¹⁵ *What We Do*, U.S. FOOD & DRUG ADMIN., <https://www.fda.gov/about-fda/what-we-do> [<https://perma.cc/Z6G4-HG7F>] (last visited Apr. 27, 2020).

¹¹⁶ Butkeyo, *supra* note 5, at 78.

industry, FDA, and other Federal agencies participate to promote controls over shellfish safety.¹¹⁷ The FDA has established action levels for poisonous or deleterious substances, such as natural toxins from harmful algal blooms, to control the levels of contaminants in human food, including seafood.¹¹⁸

The NIEHS's mission, operating under the U.S. Department of Health and Human Services, is to discover how the environment affects people in order to promote healthier lives.¹¹⁹ In relation to harmful algal blooms, the NIEHS is studying health effects from low doses over time, developing better detection, and improving prediction.¹²⁰ NIEHS-funded scientists are investigating long term effects of harmful algal blooms.¹²¹ The NIEHS's scientists are also studying the ability of water treatment plants to detect harmful algal blooms and are developing new methods to aid in detection.¹²² NIEHS-funded research, using controlled studies, has investigated the health effects of aerosolized brevetoxin (a toxin that occurs in Florida red tide, *Karenia brevis*).¹²³ NIEHS supported programs are identifying potential chemical control agents or therapies for people with toxin exposure, such as for use as therapy for cystic fibrosis.¹²⁴

2. U.S. Department of Agriculture

The USDA provides leadership on food, agriculture, natural resources, rural development, nutrition, and related issues based on public policy, the best available science, and effective management.¹²⁵ The

¹¹⁷ *Id.*

¹¹⁸ *Id.*

¹¹⁹ *National Institute of Environmental Health Sciences (NIEHS) Mission*, NAT'L INST. OF ENVTL. HEALTH SCI., <https://www.nih.gov/about-nih/what-we-do/nih-almanac/national-institute-environmental-health-sciences-niehs> [<https://perma.cc/65BT-GTX7>] (last visited Apr. 27, 2020).

¹²⁰ *Harmful Algal Blooms*, NAT'L INST. OF ENVTL. HEALTH SCI., <https://www.niehs.nih.gov/health/topics/agents/algal-blooms/index.cfm> [<https://perma.cc/397W-3CN5>] (last visited Apr. 27, 2020).

¹²¹ *Id.* (Researchers are studying whether consuming trace amounts of neurotoxic domoic acid over time damages brain function, especially among children or the elderly.)

¹²² *Id.*

¹²³ Butkeyo, *supra* note 5, at 79.

¹²⁴ *Id.*

¹²⁵ *About the U.S. Department of Agriculture*, U.S. DEPT. OF AGRIC., <https://www.usda.gov/our-agency/about-usda> [<https://perma.cc/YDG2-WAL9>] (last visited Apr. 27, 2020).

USDA has a vision to preserve the United States' natural resources through conservation, restored forests, improved watersheds, and healthy private working lands.¹²⁶ The USDA is made up of twenty-nine agencies, one of which is the Agricultural Research Service ("ARS") National Program #201 (Water Resource Management), whose mission is "A Safe, More Water-Efficient Society."¹²⁷ ARS National Program #201 directly addresses prevention of harmful algal blooms caused by excessive nutrients, with two main goals: to develop innovative concepts for determining the movement of water and its associated constituents in agricultural landscapes and watersheds; and to develop new and improved practices, technologies, and strategies to manage the United States' agricultural water resources.¹²⁸ Monitoring, research, and assessment efforts have been increased to develop tools for implementing total maximum daily load guidelines for nonpoint source water improvements to protect fresh and coastal water ecosystems.¹²⁹

3. U.S. Department of Commerce

The United States Department of Commerce has one overarching goal: helping the American economy grow.¹³⁰ The Department of Commerce promotes job creation and economic growth by ensuring fair and reciprocal trade, providing the data necessary to support commerce and constitutional democracy, and fostering innovation by setting standards and conducting foundational research and development.¹³¹ Within the United States Department of Commerce, NOAA is a bureau that operates to understand and predict changes in climate, weather, oceans, and coasts; to share that knowledge and information with others; and to conserve and manage coastal and marine ecosystems and resources.¹³² NOAA is at the forefront of harmful algal bloom research to better understand how and why harmful algal blooms form, and to improve detection and forecasting of the seasonal harmful algal bloom

¹²⁶ *Id.*

¹²⁷ Butkeyo, *supra* note 5, at 69.

¹²⁸ *Id.*

¹²⁹ *Id.*

¹³⁰ *About Commerce*, U.S. DEPT. OF COM., <https://www.commerce.gov/about> [<https://perma.cc/JM25-JYSS>] (last visited Apr. 27, 2020).

¹³¹ *Id.*

¹³² *Our Mission and Vision*, NAT'L OCEANIC ATMOSPHERIC ADMIN., <https://www.noaa.gov/our-mission-and-vision> [<https://perma.cc/7GLG-7LZG>] (last visited Apr. 27, 2020).

events.¹³³ One of NOAA's primary focus is to provide communities with an advance warning so they can adequately plan for and deal with the adverse environmental, economic, and health effects associated with harmful algal blooms.¹³⁴ NOAA's HAB Operational Forecast System encompasses Florida and Texas—this forecast system identifies whether a bloom of algae is likely to contain a toxic species, where it is, how big it is, where it's headed, and if it could become more severe in the near future.¹³⁵ In 1997, a partnership between NOAA and the University of New Hampshire created the Cooperative Institute for Coastal and Estuarine Environmental Technology ("CICEET").¹³⁶ CICEET uses the capabilities of the University, the private sector, and academic and public research institutions throughout the United States.¹³⁷ The projects funded through CICEET in NOAA labs have developed quick, portable, and accurate detection methods for harmful algal bloom cells or toxins.¹³⁸

Operating under NOAA, the National Ocean Service ("NOS") provides data, tools, and services that support coastal economies and their contribution to the national economy.¹³⁹ NOS's mission is to provide science-based solutions through collaborative partnerships to address evolving economic, environmental, and social pressures on the Nation's oceans and coasts.¹⁴⁰ In partnership with NOS, NOAA has developed the Ocean and Human Health Initiative ("OHHI") to investigate the relationship between environmental stressors, coastal condition, and human health to maximize health benefits from the ocean, and improve the safety of seafood and drinking waters, reduce beach closures, and detect emerging health threats.¹⁴¹ OHHI's goal is to lead the development of early warning systems to forecast threats and predict long-term risks to

¹³³ *What is a Harmful Algal Bloom*, NAT'L OCEANIC ATMOSPHERIC ADMIN. (April 27, 2016), <https://www.noaa.gov/what-is-harmful-algal-bloom> [<https://perma.cc/7PEC-F4TF>].

¹³⁴ *Id.*

¹³⁵ *Id.*

¹³⁶ Butkeyo, *supra* note 5, at 69.

¹³⁷ *Id.*

¹³⁸ *Id.*

¹³⁹ *National Ocean Service About Us*, NAT'L OCEANIC ATMOSPHERIC ADMIN., <https://oceanservice.noaa.gov/about/> [<https://perma.cc/3GXQ-XK6K>] (last visited Apr. 27, 2020).

¹⁴⁰ *Id.*

¹⁴¹ *OCCI Vision*, OCEANS & HUM. HEALTH INITIATIVE, https://archive.eol.ucar.edu/projects/ohhi2/about/documents/OHHI_Vision_Mission_Goals_Objectives.pdf [<https://perma.cc/N3KM-TB44>] (last visited Apr. 27, 2020).

human health throughout the United States coastal and Great Lakes waters.¹⁴²

NOAA, under HABHRCA, has also developed the Monitoring and Event Response for Harmful Algal Blooms (“MERHAB”) Research Program.¹⁴³ The MERHAB Research Program builds capacity along our coasts for enhanced harmful algal bloom monitoring and response—this helps NOAA and state partners identify when beaches, shellfisheries, and marine animals are at risk from harmful algae, and to make informed decisions that protect public health and safeguard our coastal economies.¹⁴⁴ MERHAB helps partners keep pace with the growing national harmful algal bloom problem by providing access to proven detection technologies, helping validate these technologies, and assess the benefits of incorporating existing methods.¹⁴⁵

Finally, under NOAA, the National Center for Environmental Information (“NCEI”), formally known as the National Oceanographic Data Center, hosts and provides access to one of the most significant archives on earth, with comprehensive oceanic, atmospheric, and geophysical data.¹⁴⁶ NCEI receives harmful algal bloom data from partner state agencies and maintains the Harmful Algal Blooms Observing System (“HABSOS”).¹⁴⁷ HABSOS is a data collection and distribution system for harmful algal information in the Gulf of Mexico.¹⁴⁸ The goal of HABSOS is to provide environmental managers, scientists, and the public with data-driven resources of harmful algal bloom events.¹⁴⁹ Cell counts and environmental information are combined into a single product and distributed on a map.¹⁵⁰

¹⁴² *Id.*

¹⁴³ *Monitoring and Event Response (MERHAB)*, NAT’L OCEANIC ATMOSPHERIC ADMIN., <https://coastalscience.noaa.gov/research/stressor-impacts-mitigation/merhab/> [<https://perma.cc/LMW6-RCEE>] (last visited Apr. 27, 2020).

¹⁴⁴ *Id.*

¹⁴⁵ *Id.*

¹⁴⁶ *About the National Centers for Environmental Information*, NAT’L OCEANIC ATMOSPHERIC ADMIN., <https://www.ncei.noaa.gov/about> [<https://perma.cc/CNZ2-QXKF>] (last visited Apr. 27, 2020).

¹⁴⁷ *Monitoring and Studying Harmful Algae*, NAT’L OCEANIC ATMOSPHERIC ADMIN. (Sept. 24, 2018), <https://www.ncei.noaa.gov/news/monitoring-and-studying-harmful-algae> [<https://perma.cc/EQ7N-2J7B>].

¹⁴⁸ *Harmful Algal Blooms Observing System*, NAT’L OCEANIC ATMOSPHERIC ADMIN., <https://habsos.noaa.gov/> [<https://perma.cc/SV3S-WQWD>] (last visited Apr. 27, 2020).

¹⁴⁹ *Id.*

¹⁵⁰ *Id.*

4. U.S. Department of the Interior

Operating as a bureau within the United States Department of the Interior, the United States Fish and Wildlife Service (“USFWS”) is the oldest federal conservation agency.¹⁵¹ The FWS assists in the development and application of an environmental stewardship ethic for society, based on ecological principles and the scientific knowledge of fish and wildlife, guides in the conservation, development, and management of the Nation’s fish and wildlife resources, and administers a national program to provide the public to understand, appreciate, and wisely use fish and wildlife resources.¹⁵² USFWS harmful algal bloom response activities involve field response to bird die-offs, including the collection of carcasses and water samples for toxic analysis.¹⁵³

5. U.S. Environmental Protection Agency

The mission of the EPA is to protect human health and the environment by developing and enforcing regulations, giving grants, studying environmental issues, sponsoring partnerships, and teaching people about the environment.¹⁵⁴ Congress writes environmental laws, and then the EPA implements it by writing regulations and setting national standards that states and tribes enforce through their own regulations.¹⁵⁵

Under the CWA, the EPA has implemented pollution control programs such as setting wastewater standards for the industry, as well as developing national water quality criteria recommendations for pollutants in surface waters.¹⁵⁶ The EPA’s National Pollutant Discharge Elimination System (“NPDES”) permit program controls discharges.¹⁵⁷

¹⁵¹ *About the U.S. Fish and Wildlife Service*, U.S. FISH & WILDLIFE SERV. (Feb. 10, 2020), https://www.fws.gov/help/about_us.html [<https://perma.cc/7ELZ-QWNS>].

¹⁵² *Id.*

¹⁵³ Butkeyo, *supra* note 5, at 79.

¹⁵⁴ *Our Mission and What We Do*, U. S. ENVTL. PROT. AGENCY, <https://www.epa.gov/aboutepa/our-mission-and-what-we-do> [<https://perma.cc/85ND-XMWG>] (last visited Apr. 27, 2020).

¹⁵⁵ *Id.*

¹⁵⁶ *Summary of the Clean Water Act*, U. S. ENVTL. PROT. AGENCY, <https://www.epa.gov/laws-regulations/summary-clean-water-act> [<https://perma.cc/2J78-799T>] (last visited Apr. 27, 2020).

¹⁵⁷ *Id.*

The National Estuary Program (“NEP”) is an EPA place-based program to protect and restore the water quality and ecological integrity of estuaries of national significance.¹⁵⁸ There are twenty-eight NEPs along the continental United States coast and in Puerto Rico.¹⁵⁹ A few of these NEPs list harmful algal blooms, and many list nutrients as a priority management issue.¹⁶⁰ Through NEPs, EPA has funded projects that have successfully led to more effective management of nutrient inputs.¹⁶¹

C. FLORIDA

1. Agency Efforts

The Florida Department of Environmental Protection is the state’s lead agency for environmental management and stewardship, protecting our air, water, and land.¹⁶² In response to the EPA’s National Nutrient Strategy, in 2011, FDEP adopted the first set of statewide numeric nutrient standards for Florida’s waters.¹⁶³ Now that Florida has adopted—and the EPA has approved—relevant numeric nutrient criteria for Florida’s waters, the EPA is withdrawing the once required federal water quality standards applicable to Florida’s waters.¹⁶⁴ In 2009, the EPA determined under the CWA section 303(c)(4)(B) that new or revised water quality standards in the form of numeric nutrient criteria were necessary to meet the requirements of the CWA in the state of Florida.¹⁶⁵ In 2013, FDEP adopted into rule the document entitled “Implementation of Florida’s Numeric Nutrient Standards” and submitted numeric nutrient

¹⁵⁸ *Overview of the National Estuary Program*, U. S. ENVTL. PROT. AGENCY, <https://www.epa.gov/nep/overview-national-estuary-program> [https://perma.cc/59DC-9UX9] (last visited Apr. 27, 2020).

¹⁵⁹ *Id.*

¹⁶⁰ Butkeyo, *supra* note 5, at 81.

¹⁶¹ *Id.* (Projects include a demonstration in Long Island Sound that employed biological nutrient reduction to cost-effectively reduce nitrogen in treatment plants.)

¹⁶² *About DEP*, FLA. DEP’T ENVTL. PROTECTION, <https://floridadep.gov/about-dep> [https://perma.cc/7GCE-8HEF] (last visited Apr. 27, 2020).

¹⁶³ *Numeric Nutrient Criteria Development*, FLA. DEP’T ENVTL. PROTECTION, <https://floridadep.gov/dear/water-quality-standards/content/numeric-nutrient-criteria-development> [https://perma.cc/K6SN-SNTW] (last visited Apr. 27, 2020).

¹⁶⁴ *Numeric Nutrient Criteria for the St. of FL.: Withdrawing the Fed. Actions*, U. S. ENVTL. PROT. AGENCY, <https://www.epa.gov/sites/production/files/2015-07/documents/factsheet-withdrawl-2014.pdf> [https://perma.cc/2Z4F-CHQC] (last visited Apr. 27, 2020).

¹⁶⁵ *Id.*

criteria for all remaining estuaries and coastal waters in the state for review by EPA pursuant to section 303(c) of the CWA.¹⁶⁶ By 2015, almost all the remaining waters in Florida have numeric nutrient standards.¹⁶⁷

FDEP maintains an interactive dashboard featuring information and real-time sampling updates for harmful algal blooms in Florida.¹⁶⁸ FDEP reviews citizen reports of algal blooms and coordinates with other agencies who are also sampling algal bloom toxins and lists these real-time samples on the interactive map.¹⁶⁹

Florida's Fish and Wildlife Conservation Commission ("FWC") has the mission of managing fish and wildlife resources for their long-term wellbeing and the benefit of people.¹⁷⁰ Operating under the FWC, the FWC Fish and Wildlife Research Institute ("FWRI") tracks the occurrence of Florida's red tide (*Karenia brevis*).¹⁷¹ FWRI provides a harmful algal bloom monitoring database—one of the longest continually recorded dataset of red tide.¹⁷² The database contains more than 125,000 records provided by more than 190 state and county agencies, private research institutions, universities, and FWC staff.¹⁷³

Additionally, Florida's Department of Health operates an Aquatic Toxins Program to educate and report on current red tide, blue-green

¹⁶⁶ *Id.*

¹⁶⁷ *Numeric Nutrient Criteria Development*, FLA. DEP'T ENVTL. PROTECTION, <https://floridadep.gov/dear/water-quality-standards/content/numeric-nutrient-criteria-development> [<https://perma.cc/7XLD-DSEK>] (last visited Apr. 27, 2020).

¹⁶⁸ *Algal Bloom Sampling Status Dashboard*, FLA. DEP'T ENVTL. PROTECTION (Oct. 2019), <https://fdep.maps.arcgis.com/home/item.html?id=d62c3487e8de49f6b3a6559cdf059e14> [<https://perma.cc/JW7W-Z5EW>].

¹⁶⁹ *Id.*

¹⁷⁰ *FWC Overview Our Mission*, FLA. FISH & WILDLIFE CONSERVATION COMMISSION, <https://myfwc.com/about/overview/> [<https://perma.cc/9ZR8-ZUNB>] (last visited Apr. 27, 2020).

¹⁷¹ *Redtide*, FLA. FISH & WILDLIFE CONSERVATION COMMISSION, <https://myfwc.com/research/redtide/> [<https://perma.cc/Z7JK-8HB8>] (last visited Apr. 27, 2020).

¹⁷² *HAB Monitoring Database*, FLA. FISH & WILDLIFE CONSERVATION COMMISSION, <https://myfwc.com/research/redtide/monitoring/database/> [<https://perma.cc/8FSL-WULX>] (last visited Apr. 27, 2020).

¹⁷³ *Id.*

algae, and shellfish safety.¹⁷⁴ The Florida Department of Health also maintains the Searchable Database of Bloom Records (“SDBR”) to capture a harmful algal bloom at a certain time and stage.¹⁷⁵

2. Task Forces

In addition to Florida’s numeric nutrient standards, in 1999, Florida also implemented legislation developing a Harmful Algal Bloom Task Force.¹⁷⁶ The establishment of the Harmful Algal Bloom Task Force serves the purpose of determining research, monitoring, control, and mitigation strategies for red tide and other harmful algal blooms in Florida waters.¹⁷⁷ Under Florida Governor DeSantis, in 2019, the Harmful Algal bloom Task Force was reactivated with the focus on issues associated with the red tide as their top priority.¹⁷⁸ Governor DeSantis directed FDEP and FWC to convene meetings of two task forces focused on freshwater and saltwater algal blooms, respectively, to immediately address these water quality issues.¹⁷⁹

The blue-green algae task force is an advisory board, appointed by Governor DeSantis, to aid FDEP in fulfilling its mission to protect, conserve, and manage the state’s natural resources and enforce its environmental laws.¹⁸⁰ The task force, through its discussion and deliberations, provides guidance and specific, science-based recommendations with the goal of expediting improvements and restoration of Florida’s water bodies that have been adversely affected by blue-green algae blooms.¹⁸¹

¹⁷⁴ *Harmful Algae Blooms (HABS): Red Tide and Blue-Green Algae*, FLA. DEPT. OF HEALTH, <http://www.floridahealth.gov/environmental-health/aquatic-toxins/index.html> [https://perma.cc/8H9Z-GGHF] (last visited Apr. 27, 2020).

¹⁷⁵ *HAB Updates*, FLA. DEPT. OF HEALTH, <http://www.floridahealth.gov/environmental-health/aquatic-toxins/updates-report-and-contact/index.html> [https://perma.cc/4NNX-DY3W] (last visited Apr. 27, 2020).

¹⁷⁶ FLA. STAT. § 379.2271.

¹⁷⁷ *Id.*

¹⁷⁸ FLA. FISH & WILDLIFE CONSERVATION COMM’N., *supra* note 23.

¹⁷⁹ *Protecting Together*, FLA. DEP’T ENVTL. PROTECTION, <https://protectingfloridatogether.gov/> [https://perma.cc/WCD2-F9L3] (last visited Apr. 27, 2020).

¹⁸⁰ *Blue-Green Algae Task Force Consensus Document #1*, FLA. DEP’T ENVTL. PROTECTION, https://floridadep.gov/sites/default/files/Final%20Consensus%20%231_0.pdf [https://perma.cc/5M9L-QAW7] (last visited Apr. 27, 2020).

¹⁸¹ *Id.*

The Harmful Algal Bloom Task Force, as mentioned above, currently focuses on issues associated with red tide as their top priority.¹⁸² Operating under FWC, the Harmful Algal Bloom Task Force has adopted broad, long-term focal areas within which it will evaluate existing approaches or knowledge; pinpoint gaps in efforts and understanding; and built a prioritized portfolio of strategies and actions to fill those gaps by assessing their benefits and feasibility.¹⁸³ The Harmful Algal Bloom Task Force will prioritize and recommend: (1) actions to reduce excess loads of nutrients entering our freshwater and coastal systems developed in collaboration with the Blue-Green Algae Task Force, relevant entities identified in EO 19-12 and other stakeholders; (2) improvements to current policies and procedures that prevent or mitigate the impacts of harmful algal blooms on public health, ecosystem sustainability, economic viability, and other valued facets of society; (3) enhancements to communication, coordination, cooperation, and collaboration among stakeholders charged with responding to harmful algal blooms and their effects; and (4) strategic research into the biology and ecology of species creating harmful algal blooms; detection, tracking, modeling, and prediction of blooms; fate of algal toxins; impacts of blooms on valued facets of society; prevention, control and mitigation of blooms; and other key issues.¹⁸⁴

III. ANALYSIS

The federal government “often regulates in many areas where there is no clear analytical basis for federal regulation, and at the same time, the federal government is relatively absent where a stronger federal presence could be justified.”¹⁸⁵ On the other hand, existing federal statutes and regulations often preclude, discourage, or otherwise inhibit state and local governments from adopting environmental protections where state efforts would be worthwhile.¹⁸⁶ Federalism principles suggest a general presumption in favor of state responsibility for various policy concerns,

¹⁸² *Harmful Algal Bloom/Red Tide Task Force*, FLA. FISH & WILDLIFE CONSERVATION COMMISSION, <https://myfwc.com/research/redtide/taskforce/> [<https://perma.cc/6ZRR-L2WK>] (last visited Apr. 27, 2020).

¹⁸³ *Id.*

¹⁸⁴ *Id.*

¹⁸⁵ Jonathan H. Adler, *Jurisdictional Mismatch in Environmental Federalism*, 14 N.Y.U. ENVTL. L.J. 130, 132 (2005).

¹⁸⁶ *Id.*

but this presumption may be overcome where there is a distinct and readily identifiable federal interest. Without these considerations, however, most environmental matters are best left in state and local hands.¹⁸⁷

Harmful algal blooms, while naturally occurring, are exacerbated by excessive nutrient runoff stemming from local areas.¹⁸⁸ Therefore, there is a strong argument that most (though not all) environmental problems should be addressed at the state or local level. Under this approach, combined with the United States' federalist system, allocation of responsibility for most environmental problems to state governments would hopefully result in state governments leaving many of the concerns to local authorities.¹⁸⁹

Additionally, by allowing local agencies to be at the forefront of developing new and improved ways of addressing environmental concerns, specific particularized issues of a local ecosystem would be at the center of solving such concerns. The ecological and economic diversity of the nation requires local knowledge and expertise that is often unavailable at the federal level.¹⁹⁰

The cooperative federalism approach of the CWA may be sufficient to address the algal bloom problem where watersheds are completely contained within a state.¹⁹¹ However, in cases where harmful algal blooms are present within interstate watersheds, current federal legislation is ineffective and requires more legislation than currently exists. Some polluting states may not have the incentives needed for cooperative federalism to effectively reduce nutrient pollution in interstate watersheds if the costs of algal blooms are not borne by them.¹⁹² For example, the Gulf of Mexico's hypoxic dead zone is bordered by states like Louisiana, Texas, Mississippi, and Florida. These states could strengthen their nutrient pollution regulations as the harmful algal blooms affect their water quality, health, economy, etc., but other upriver states like Iowa will not perceive the risks from algal blooms and hypoxia in the same way.¹⁹³ This is the weakness of the CWA's cooperative federalism approach. By

¹⁸⁷ *Id.*

¹⁸⁸ Bryce, *supra* note 10, at 19.

¹⁸⁹ Adler, *supra* note 185.

¹⁹⁰ *Id.* at 137.

¹⁹¹ Bryce, *supra* note 10, at 32.

¹⁹² *Id.* at 33.

¹⁹³ *Id.*

leaving regulation of nonpoint source nutrient pollution to the states, interstate watersheds are set up to fail.¹⁹⁴

A. ECONOMIC NEED FACTORS

Florida is a major agricultural state, ranking seventh among agricultural exporting states in 2011.¹⁹⁵ Fertilizers used by agricultural crops are one of the largest contributors to algal bloom growth due to the use of nutrients, such as nitrogen and phosphorus, within the makeup of the fertilizers. In 2011, agricultural exports from Florida valued above \$4 billion.¹⁹⁶ However, Florida's tourism industry, in 2011, was valued at \$76 billion dollars, and a significant portion of this amount is tied to water recreation such as sport-fishing and other tourism.¹⁹⁷ Florida's state and local agencies must assess the economic impact that prevention of harmful algal blooms, rather than their mitigation, would have on Florida's tourism industry. It is estimated that for a three-month red tide event in Florida, the total direct impact would be a loss of \$19.5 million to Florida's restaurant and lodging sectors.¹⁹⁸

B. EFFECTIVENESS OF CURRENT LEGISLATION

The current Florida Harmful Algal Bloom Task Forces, both the blue-green algae and red tide task forces, focus on developing ways to combat the harmful algal blooms once they already exist in enormous numbers within our state's waters. Although recent efforts by Governor Ron DeSantis have provided for additional funding for Harmful Algal Bloom Task Forces, the problem still lies in the effectiveness of legislation to stop the development of harmful algal blooms prior to

¹⁹⁴ *Id.*

¹⁹⁵ See Robin K. Craig & Anna M. Roberts, *When Will Governments Regulate Nonpoint Source Pollution? A Comparative Perspective*, 42 B.C. ENVTL. AFF. L. REV. 1, 12 (2015).

¹⁹⁶ *Id.*

¹⁹⁷ *Id.*

¹⁹⁸ Sherry L. Larkin & Charles M. Adams, *Harmful Algal Blooms and Coastal Business: Economic Consequences in Florida*, SOCIETY & NAT. RESOURCES, [https://www.sarasota.wateratlas.usf.edu/upload/documents/HABs%20Economic%20Consequences%20in%20Florida\[1\].pdf](https://www.sarasota.wateratlas.usf.edu/upload/documents/HABs%20Economic%20Consequences%20in%20Florida[1].pdf) [<https://perma.cc/2LT9-CMR2>].

needing federal or state resources to mitigate and clean up the harmful algal blooms.

The CWA requires states to set appropriate water quality standards for their various bodies of water. Florida has done this, and, has done it well. Almost all of Florida's bodies of water have a numeric nutrient standard set—something Florida can be proud of, as it is the first state to do so. The CWA, on a federal level, should realistically be successful for these bodies of water that lie solely within the state of Florida. However, that success cannot be transferred to bodies of water such as the Gulf of Mexico or the Atlantic Ocean, both of which have had numerous occurrences of red tide affecting local coastal community's economies.

The first issue Florida's legislation should be concerned about is harmful algal blooms within bodies of water that are solely encompassed within the state. For example, the harmful algal blooms within Lake Okeechobee. The CWA, in its full effect, should be able to regulate the point sources in which pollute the bodies of water such, as Lake Okeechobee. However, Lake Okeechobee has one of the highest and reoccurring problems of harmful algal blooms. Additionally, Florida's blue green algae task force, by and through FDEP, does necessary research and data collection of the harmful algal bloom problems within freshwater, such as Lake Okeechobee, but only after the harmful algal bloom problem has arisen.

Second, federal or Florida-specific legislation relating to water quality standards do not address the issue of interstate nutrient pollution. The Gulf of Mexico, which provides Florida's northern and western coastal communities with large amounts of tourism income, has nutrient pollution run-off from neighboring states. Between the numerous federal and Florida agencies that work towards researching harmful algal blooms, data collection, sampling, and crisis response, it would seem that the common goal would be harmful algal bloom prevention. Unfortunately, because harmful algal blooms are naturally occurring, the only prevention is to propose legislation that effectively eliminates the excess nutrient run-off.

Future legislation in the form of harmful algal bloom prevention, at the state level, needs to effectively reduce the excess nutrient run-off from urban cities or agricultural lands. Instead of focusing on numeric nutrient standards within bodies of water, future legislation should focus on successfully capturing or mitigating the day-to-day nutrient run-off that Florida produces. For example, Florida could propose a bill to install better storm drainage, which would capture rainwater tainted with nutrient pollution. Additionally, because agricultural run-off is a primary

contributor of nutrient pollution within Florida, farmers and producers should pay a “fertilizer fee” to offset the costs of harmful algal bloom cleanup. This “fertilizer fee” could also allocate a fund to offset the economic loss a coastal community endures when harmful algal blooms affect tourism. By creating legislation with the motive to prevent future excessive harmful algal blooms, caused by nutrient pollution run-off, local agencies would be more mindful of the waste that is currently being produced.

IV. CONCLUSION

Red tide and blue-green algae can be found state-wide in Florida. The economic and health hazards associated with such harmful algal blooms leave a lasting effect on our coastal or water-surrounding communities. Florida's successful tourism industry fuels many coastal towns that rely on individuals coming to the beaches, eating at restaurants, and staying in local lodging facilities. Additionally, Florida's shellfish and fishing industry suffers when harmful algal bloom outbreaks occur, resulting in loss of employment and a revenue fund for local businesses.

On the federal level, acts such as the CWA and SDWA prevail. On the surface, the CWA looks like it could solve the issue of harmful algal blooms. The CWA requires a state to create water quality standards for each individual body of water, and then strive to maintain it. Legislative mandates in the CWA and the SDWA requires acknowledgement of the presence of contaminants in recreational and drinking waters; however, no specific U.S. guidelines or regulations for cyanotoxins exist. The existence of federal programs that address harmful algal blooms, such as through the Department of Commerce, Department of the Interior, and the Environmental Protection Agency, all work together to combat the mitigation of harmful algal blooms, but their prevention goals are still lacking.

Florida, a front-runner on the state-scale harmful algal bloom prevention, has created legislation for the enactments of Harmful Algal Bloom Task Forces, where scientists will develop ways to, once again, mitigate and research the frequent occurrences of harmful algal blooms.

The reoccurring common theme: mitigation. New legislation is needed to combat the excessive nutrient pollution run-off that is making its way into Florida's waters. By creating a “fertilizer fee” and creating local laws to develop better ways to deal with urban run-off, the

occurrence of harmful algal blooms within Florida would significantly decrease.