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Harmful Algal Blooms



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Cover photograph: Honey Creek's harmful algal blooms in Moravia, IA Credit: Jeff Reutter

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Can Lawsuits Stop Harmful Algal Blooms?

Kristina Alexander

Water is made of much more than H_2O . All sorts of interesting things are wriggling around in it, and hopefully, those things stay at a safe level. But when the balance of water – the temperature, the salinity, the levels of dissolved oxygen, or the quantity of natural nutrients – gets out of whack, those microscopic organisms can surge and cause problems. Life-threatening problems.

2019 HAB Event in Mississippi

The coast of Mississippi experienced that trouble firsthand in the Summer of 2019, when massive amounts of freshwater released from the Bonnet Carré spillway in Louisiana changed the ideal salinity of the water in the Mississippi Sound. The Bonnet Carré (pronounced Bonnie Carry) is a U.S. Army Corps of Engineers (Corps) project upriver of New Orleans. It is designed to shunt flood waters away from the Mississippi River into Lake Pontchartrain and the Mississippi Sound to prevent New Orleans from flooding. Its floodgates were opened February 27 through April 10, 2019, and again May 10 to July 27.¹ It was the first time in history the gates were opened twice in a year. The diversions worked as flood control for New Orleans but led to months-long toxic events in the Mississippi Sound, wiping out the livelihoods of some who depend on the Gulf.

The freshwater insurgence led to a harmful algal bloom (HAB). Two factors caused the HAB of cyanobacteria also known as blue-green algae.² First, the amount of freshwater drastically reduced the salinity of the water in the Mississippi Sound. Second, that water contained nitrogen and phosphorus runoff from the farms along the Upper Mississippi River. When this nutrient-rich "food" was added to water with low salinity in the Sound, a toxic level of blue-green algae grew. As a result, swimming at Mississippi's beaches was barred for over 90 days – all summer – due to the health risks to humans and animals.

The excess freshwater also created environmental havoc for the species in the Sound that depend on salt water to live – such as endangered sea turtles, dolphins, and the commercially vital Mississippi industries of shrimp and oysters, which suffered 60% and 100% losses this summer, respectively.³

Mississippi River Flood Management

Two major Corps' projects built in the first half of the last century protect New Orleans from flooding from the Mississippi River: the Morganza Floodway, 186 river miles northwest of New Orleans; and the Bonnet Carré Spillway, which is just 30 miles from New Orleans. The Morganza Floodway will divert water into the Atchafalaya basin to the south-southwest part of the state when the river gets above a certain level. The Bonnet Carré shifts water to the east, into Lake Pontchartrain and then the Mississippi Sound. The Corps operates both pursuant to operating manuals issued periodically. The Bonnet Carré was open for a total of 123 days in the first seven months of 2019; the Morganza Floodway was not opened. The State of Mississippi does not have jurisdiction over either project.

2018 Red Tide in Alabama and Florida

The toxic blue-green algae was not the only HAB event along the Mississippi-Alabama coast in the past 12 months. In 2018, the so-called Red Tide, a toxic algal bloom of *Karenia brevis*, made its way north along the Gulf Coast of Florida, killing tons of fish and forcing beach closures. It eventually reached Alabama's coast in late November, although it stopped short of Mississippi's waters. The algae forced the closure of shellfish harvesting in Alabama for weeks.

Unlike the blue-green algae bloom in the Gulf, which has a direct link to increased nutrient rich freshwater, the cause of a toxic *K. brevis* bloom is still under investigation. It is believed that increased nitrogen in the water from agricultural runoff helps to feed *K. brevis*. Additionally, warm waters help the toxins. However, unlike blue-green algae, *K. brevis* needs high salinity to live.

While those are the HAB events affecting coastal Alabama and Mississippi in the last 12 months, they are not the only recent HAB events in the United States.⁴ Toledo, Ohio had to shut down drinking water supplies for days when a blue-green algae bloom in Lake Erie contaminated its drinking water in 2014. The St. Lucie River in Florida registered blue-green algae 10 times greater than the point at which it becomes hazardous in 2018. Dogs in North Carolina, Georgia and Texas died after swimming in freshwater lakes in August, 2019. Also in 2019, the toxic algae blooms in Lake Champlain reportedly were "worse than ever."

Lawsuits and HABs

What can be done about these HAB events? Legally, the options are limited. Congress enacted the Clean Water Act (CWA) to "restore and maintain the chemical, physical, and biological integrity of the Nation's waters."⁵ To accomplish these goals, the CWA prohibits dumping or adding pollutants to rivers, lakes, and oceans. However, the act excludes agricultural runoff – a main source for nitrogen and phosphorus pollution in freshwater – from the permit requirements imposed on other sources.

The act requires states to declare specific waterbodies as "impaired" if they do not meet public health or environmental standards necessary for that water's purpose. Before being listed as impaired, a state must adopt water quality standards for the waters within their borders, depending on how that water will be used. As of 2018, only four states and Puerto Rico had taken that first step by identifying nitrogen and phosphorus as water quality standards for two or more waterbodies.⁶ Neither Alabama nor Mississippi have identified nitrogen or phosphorus criteria for any waterbodies. Therefore, until water quality standards are set for those contaminants for specific water bodies, and sources found that add more than the maximum load to those water bodies, the CWA does not appear to establish a legal basis to claim the waters are impaired due to runoff of those contaminants.

Suits against EPA and states for HAB contamination have not succeeded so far. The suits failed not because the waters were clean but because the claims failed to pin a specific duty to a state or EPA. The HAB events were not the result of a standard or permit being violated because there were no established nitrogen and/or phosphorus limits from agricultural runoff. Without a permit or a discharge limitation to enforce, the causes of action to limit HAB events took different approaches.

Plaintiffs in two suits based their claims on a failure to label waters as impaired. One suit brought against EPA for approving Ohio's list claimed the agency's approval violated the Administrative Procedure Act when it had earlier taken the state to task for failing to include certain impaired waters.



U.S. Army Corps of Engineers Flood Control Systems along the Lower Mississippi River.

Another suit brought claims against the Commonwealth of Virginia for failing to list part of a river as impaired in violation of the CWA. A third suit, in Florida in June 2019, has not been heard by a court yet. That complaint argues that the Corps of Engineers' management of discharges from a lake in Florida violates the National Environmental Policy Act and the Endangered Species Act. These cases are discussed in detail below.

Lake Erie, OH

After years of HAB events caused by toxic levels of bluegreen algae in the western part of Lake Erie, including toxic contamination so severe that the drinking water of more than 400,000 people in Toledo became unusable, an environmental group sued EPA. The plaintiffs wanted the state of Ohio to list Lake Erie as "impaired" as a first step under the CWA to limit nitrogen and phosphorus pollution. Two different opinions were issued by the court at separate stages of the suit.

Every two years states must submit lists of impaired waters to EPA for approval. The state found toxic levels of blue-green algae at the drinking water intakes in the open waters of Lake Erie, but did not list that portion of the lake as impaired in either 2014 or 2016. For both years the Ohio submissions listed only the shoreline as impaired, despite finding contaminated waters farther out where the drinking water intakes were located. After 2014, EPA directed the state to assess all of those waters, yet the state's 2016 list did not. EPA approved the state's list of impaired waters anyway. The plaintiffs argued this violated the Administrative Procedure Act for being arbitrary and capricious and not in accordance with law. A day before the court hearing on the issue, EPA withdrew its approval of the 2016 list, finding the state had failed to evaluate the water quality criteria in the open waters of Lake Erie.⁷ The court described the last minute change (which was done without notifying the court) as having "the whiff of bad faith," but since the problem was fixed, the court could not act.

In 2018, Ohio listed the open waters in Lake Erie as impaired for the first time. The court held that the listing was "tardy," but not actionable. After listing a waterbody as impaired, the next step under the CWA is for the state to establish the total maximum daily loads (TMDLs) for the pollutants causing the impairment. The state had not submitted TMDLs, but the court held that it did not violate the law. The court said the state could "sit on its hands" for a long period of time before having to submitt TMDLs for nitrogen and phosphorus.⁸ The TMDLs need to be submitted only "from time to time" under the CWA, 33 U.S.C. § 1313(d)(2). To the extent that this decision provides precedent for other HAB cases, it is not helpful.

Shenandoah River, VA

Another suit based on blue-green algae contamination was against Virginia for its failure to list parts of the Shenandoah River as impaired. This suit, based on violations of the CWA, also failed in its objective. An environmental group argued that the State of Virginia failed to list portions of the Shenandoah River as impaired based on algal growth.⁹ The group claimed that levels of blue-green algae were hurting the recreational use of the river, and the state had violated the Clean Water Act. The court held that the state had a logical rationale for not including those waters – the data submitted by the group did "not meet the state's quality standards." The group submitted more than 1000 photographs, 15 videos, and a table, giving dates and locations of the blooms. It is a fact-specific conclusion that might not be useful to other plaintiffs.

Lake Okeechobee, FL

A suit against the Corps of Engineers for how it manages releases from Lake Okeechobee in central Florida raises HAB issues, among other problems, but does not seek relief under the CWA.¹⁰ The suit is based on the Lake Okeechobee Regulation Schedule (LORS or the Schedule), a system for releasing waters from the lake into canals and rivers to avoid flooding that might occur during hurricane season. The plaintiffs claim the Schedule was designed to be in operation for only three years, until 2010, and that the Corps failed to assess the environmental impacts from ongoing releases continuing for more than a decade. The Corps announced it would continue to use the Schedule until 2022, according to the complaint. These facts are somewhat similar to the facts with the Bonnet Carré, in which floodwaters are released pursuant to a management schedule designed years ago.

The HABs issue arises from the fact that the waters of the Okeechobee are loaded with nutrients from farm runoff. Releasing this water into other freshwater, which eventually pours into the Gulf of Mexico, allege the plaintiffs, contributes to blue-green HAB events, and occurs at the time Red Tides tend to form off the coast.

The suit alleges that the Corps failed to comply with the National Environmental Policy Act (NEPA) or the Endangered Species Act (ESA) when it decided to continue operating under the Schedule without performing new assessments under those acts for environmental effects, including impacts on listed species. Similarly, but not related to the Florida litigation, the Secretary of State of Mississippi has sought an updated environmental review of the Bonnet Carré management guidelines in a July 11, 2019 letter to the Corps.¹¹

Corps' Actions in Mississippi

In that July 2019 letter, the Secretary of State of Mississippi asked the Corps to explain how its operating manual considers the environmental impacts of Bonnet Carré releases and when those manuals were put into effect. Those responses could help the state assess whether the Corps needs to perform environmental analyses under NEPA and/or the ESA for future Bonnet Carré releases. The ESA, for example, requires permission of the federal government for actions that "take" (as in harm, injure, or kill) listed species, and similar permission is required under the Marine Mammal Protection Act (MMPA), even when those actions are taken by federal agencies, such as the Corps.

Protected species were killed as a result of the freshwater in the Sound in 2019. Dolphins, for example, are protected under the MMPA and some species are ESA-listed as well. The National Oceanic and Atmospheric Administration reports that three times as many dolphins died in the months following the Bonnet Carré opening compared to normal years showing impacts from freshwater.¹² The article reported more dolphin deaths in Mississippi than following the 2010 oil spill. These deaths may bring into question the Corps' practice of releasing water from the Bonnet Carré for long periods rather than taking other actions, and thus, collaterally, reducing the chances of another blue-green algae HAB event.

Conclusion

If litigation is pursued, a novel cause of action may be needed to prevent freshwater contamination and HABs in the Mississippi Sound. This is because the action causing the impairment is outside of the state's control and the Sound is not continually impaired but becomes problematic only after extended releases of freshwater. It could be argued that the U.S. Supreme Court holding in *South Florida Water Management District v. Miccosukee Tribe of Indians*¹³ provides the best precedent.

In the South Florida Water Management District case, the plaintiffs argued that a pumping district that divvied up water between canals and wetlands was a point source under the CWA. The Court did not resolve the entire question - sending the case back for factual determinations whether pumping occurred between two distinct waterbodies - but it did establish that a point source does not need to be the original source of the pollution. The court held that "objects that do not themselves generate pollutants but merely transport them" can be point sources, and thus subject to enforcement under the CWA. Under this reasoning, it seems possible that the Bonnet Carré could also be considered a point source by pumping freshwater containing nitrogen and phosphorus from the Mississippi River into Lake Pontchartrain, and eventually into the Mississippi Sound. Success would depend on whether a court finds that water was moving between two distinct water bodies, rather than through two parts of the same water body. A court could find that without the spillway, the flooded Mississippi River would take a different route, distinguishing it from the problematic facts in South Florida Water Management District. While this case will not help provide relief for the typical instance of HAB events, it could be useful where there appears to be a discrete action that leads to the contamination.

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Harmful Algal Blooms, Unwelcome Visitors to Our Coast

Melissa Partyka

Fall can be a beautiful time of year in the Northern Gulf of Mexico; the heat of summer has largely dissipated yet it remains warm enough to enjoy the beach and all that the Gulf has to offer. However, these days of failing light are also when harmful algal blooms (HABs), particularly red tides, have historically made their way to our coasts. HAB events can close fisheries and deter tourists, impacting local businesses. They can also make people sick. This means that laws and regulations are in place to protect human health.

Just What Are Harmful Algae?

Algae are plant-like organisms that mostly live in water, both fresh and marine waters. They can range in size from microscopic to macroscopic (e.g., seaweed or giant kelp). Algae species are incredibly diverse and are found all over the planet. Like plants in land-based environments, algae are the base of marine and freshwater food chains and produce much of the world's oxygen supplies. While algae are valuable and necessary members of our coastal ecosystems, some algae can be harmful. "Harmful algae" can cause negative impacts on humans and wildlife, including noxious beach conditions, low oxygen conditions in the water (hypoxia), fish kills, and foodborne illness.¹ When algae populations grow to very large numbers, they form a "bloom." Harmful algal blooms (HABs) are caused by phytoplankton, a diverse group of mostly algae which includes diatoms, dinoflagellates, and cyanobacteria (sometimes called blue-green algae).

In the Gulf of Mexico, one of the most common HABs comes from the dinoflagellate species *Karenia brevis*, or *K. brevis* for short. These blooms, and others around the world caused by different species, are often known as 'red tide' because of the reddish color the water turns when algae concentrations are very high. When a *K. brevis* bloom occurs off the coast of Florida it is called Florida red tide.²

Blooms of Algae Are Natural in Many Aquatic Systems

Less than one percent of algal blooms are considered harmful, in fact, annual algae blooms are periods of great productivity in most of the world's oceans. These blooms can attract huge schools of algae-feeding fish, which in-turn attract larger fish and even migrating whales.³ When blooms of algae die, they sink to the ocean floor. If they are not buried rapidly they may be decomposed by bacteria. But the blooms can cause harm other than toxic events. During very large blooms the decomposition by bacteria uses massive quantities of oxygen, causing low oxygen conditions called hypoxia. The annual "dead zone" in the Gulf of Mexico is created in just this way.⁴

The Causes of HABs Are Complex

Algae, like plants, need sunlight and nutrients such as nitrogen and phosphorus to grow. While the reasons for individual HAB events vary across years and locations, nutrients from lawns, sewage, and agricultural operations can run off into nearby waterways and travel to the coast. Some algae can use these abundant nutrients to grow rapidly. Under normal conditions, it is unlikely that algae will bloom in marine waters solely as a result of nutrients from inland sources. For example, scientists believe marine HAB events in Florida begin offshore in deep water⁵ and only meet nutrients from runoff if the tides, currents, and winds carry the algae toward shore.

In freshwater environments like lakes and streams, nutrient pollution can cause cyanobacteria blooms.⁶ Although cyanobacteria blooms are rare in marine waters, after extreme rain events, large amounts of stormwater may flow downstream into bays and estuaries making them less salty. This can allow cyanobacteria to bloom, as happened in the Mississippi Sound this past summer.

Sea surface temperature and underwater mixing can also contribute to HAB events. Multiple studies have found that the position of the Loop Current within the Gulf of Mexico plays a role in the occurrence and severity of red tide events along Florida's west coast.⁷ For example, more major red tides (those with *K. brevis* cell concentrations at one million cells per liter of seawater) occur when the Loop Current extends further to the north (Figure 1). Some scientists hypothesize that this may be because when the Loop Current is further south, upwelling of cold, nutrient-rich, deep ocean waters favor competing types of algae over *K. brevis*.⁸ Scientists hope

to use the location of the Loop Current to help predict the occurrence of major blooms in the future.

Currently, NOAA's HAB Operational Forecast System gives advanced warning of potential red tides to officials in Texas and Florida, two states that regularly experience HABs. New tools are being developed to help researchers forecast HABs in places where they are less common and to understand additional risks they may pose.⁹

Seafood Safety and Impacts to Human Health

Karenia brevis can produce a group of toxins called brevetoxins.¹⁰ Brevetoxins can cause respiratory irritation, contaminate some shellfish, and affect the central nervous system of fish, marine mammals, and birds, potentially causing fish kills and marine

mammal death.¹¹ Different types of HABs produce other types of toxins, each with their own characteristics and impacts on sea life and humans. Toxins produced during HABs can affect the quality and safety of many types of seafood if it is harvested from impacted areas. HAB events usually cause immediate effects when individuals are exposed to high concentrations of toxin, but toxins can also bioaccumulate in the flesh of fish and shellfish during periods of regular exposure. Consumption of HAB toxins from contaminated seafood primarily oysters, clams, and mussels—can cause a variety of illnesses (Table 1). The type, duration, and severity of symptoms depends on the type of harmful algae and the toxins they produce, along with the overall health of the individual and how much contaminated seafood was consumed.

Harmful Algae	Potential Health Impacts	Symptoms	
<i>Karenia brevis</i> "Florida Red Tide"	Neurotoxic shellfish poisoning	Numbness, tingling in mouth/arms/hands, vomiting, diarrhea, loss of coordination, cold/heat sensitivity	
	Brevetoxin exposure (not from eating seafood)	Throat irritation, watery eyes, respiratory distress	
Pseudo-nitzschia	Amnesic shellfish poisoning	Nausea, vomiting, diarrhea, headaches, confusion, seizures, possibility of coma and death	
Dinophysis and Prorocentrum	Diarrhetic shellfish poisoning	Nausea, vomiting, abdominal pain, diarrhea	
Gambierdiscus	Ciguatera poisoning (reef fish consumption)	Nausea, vomiting, abdominal pain, diarrhea Intestinal symptoms may be followed by numbness, dizziness, muscle pain, weakness, cold/heat sensitivity	
Gymnodinium, Alexandrium, and Pyrodinium	Paralytic shellfish poisoning	Numbness, tingling in face/arms/legs, headache, dizziness, nausea, loss of coordination, sensation of floating, muscle paralysis and respiratory failure in severe cases only	

Table 1. Many harmful algae species that are found in marine waters of the United States are capable for causing illness in humans. Depending on the type of HAB, the toxins produced, and the route of exposure, people may experience a variety of symptoms. Source: Centers for Disease Control, https://www.cdc.gov/habs/illness-symptoms-marine.html.

Toxins from any type of HAB are odorless, tasteless, and cannot be destroyed by cooking, freezing, or washing seafood. To prevent these toxins from making their way into our food supplies, the U.S. Food and Drug Administration has set up seafood harvesting and testing guidelines.¹² In the Gulf of Mexico, government scientists regularly monitor shellfish growing waters for the presence of harmful algae species like *K. brevis* and *Pseudo-nitzschia*.

These species occur naturally in the environment, so closures only occur when concentrations are above certain levels. For example, shellfish growing waters are closed to harvest when *K. brevis* cells exceed 5,000 algal cells in one liter of sampled water (cells/L). Once closed, shellfish cannot be harvested until testing on shellfish meat is done to show concentrations of toxins are below recommended exposure levels.¹³

Influence of Storms and Hurricanes on HABs

Algae are readily transported by winds, currents, tides, and storms. Depending on the track of a storm, algae blooming in one area of the Gulf could be transported to another. For example, one Florida red tide event spread from the southwest coast of Florida to the Panhandle following Hurricane Katrina.¹⁴ However, even though wind and currents are capable of transporting algae that cause red tide to the Alabama and Mississippi coasts, it does not mean that a bloom will form here. A recent study of two historical events in the Mississippi Sound found that the bloom was only able to intensify during one of them, when water conditions were favorable (e.g. optimal nutrient input levels, relatively warmer winter months, currents that support HABs).¹⁵ Mobile Bay's normally low-salinity waters are not favorable to support a red tide event.



Figure 1. Graphical depiction of the Gulf of Mexico Loop Current in a (1) more southern position, (2) northern position, and (3) a typical Loop Current eddy. The retraction of the Loop Current into the southern position (1) is associated with a decrease in major HABs along Florida's west coast and was also responsible for a lack of oil on those same beaches following the Deepwater Horizon Oil Spill. (Modified by the National Academies Press from the original by UCAR.)

HABs Have Occurred throughout History but May Be Increasing in Frequency

Red tides have been occurring in the Gulf of Mexico for nearly 200 years. The first documented case of red tide off the coast of Florida was in 1844, according to the Florida Fish and Wildlife Conservation Commission. Although these blooms have occurred naturally for centuries, scientists believe that they could increase in frequency as the effects of climate change begin to be felt.¹⁶ Experiments are ongoing to help predict how sea level rise, increased rainfall, and warming ocean temperatures might affect algae growth in the future.¹⁷

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Introduction

February 27, 2019, marked the fourth time in the last eight years that the Bonnet Carré Spillway was opened by the United States Army Corps of Engineers (USACE) for the purpose of relieving pressure from the Mississippi River waterway system. The spillway closed in April, but reopened in May which marked the first time that it ever needed to be opened twice in one year.¹ Previous documentation has shown that dumping all of this fresh water from the spillway hurts the Mississippi Sound, damaging the environment and the marine life within the Sound. Populations of oysters, crab, shrimp, and finfish will be and have been negatively affected by the opening of the Bonnet Carré, to the point where there is a current 33% cumulative loss in commercial shrimp landings, and the expected oyster landings are zero for the 2019 year.² This prompted Mississippi Governor Phil Bryant to request a determination of a federal fisheries disaster under the Magnuson-Stevens Fishery Conservation and Management Act (MSA).2 An in-depth look at how the Bonnet Carré operates, coupled with analyzing Governor Bryant's request, will reveal what is being disturbed in these ecosystems and what federal relief is available to Mississippi.

The Opening of the Bonnet Carré Spillway

According to the USACE, the Bonnet Carré Spillway was opened in February to keep the volume of the Mississippi River flows at New Orleans from exceeding 1.25 million cubic feet per second. While the spillway is in operation, according to the USACE, "materials suspended in the Mississippi River's water are deposited in the floodways and Lake Pontchartrain and Lake Borgne... the vast input of fresh water into these brackish and saline lakes has an immediate, short-term, adverse environmental impact."³ The February 2019 opening was seen as a short-term opening, but heavy rains prompted a second opening of the spillway on May 10, 2019. The spillway was closed on July 27, 2019, and the 123-day total openings marks an unprecedented period in the history of the spillway's operation.

Although the USACE admits that there are adverse effects of opening the spillway, it expects long-range benefits to outweigh the initial shortcomings. As the USACE explains, the long-range effect "is extremely favorable because it stimulates the natural flooding cycle of the river and provides a replenishment of valuable nutrients to the ecosystem."⁴ Accordingly, the USACE says there have been long-term increased oyster, crab and other fisheries production associated with the opening of the spillway. However beneficial these long-term effects will be, it still does not deal with the issue of the initial impacts from the opening of the Bonnet Carré Spillway.

The initial shortcomings of opening the spillway will drive down commercial and recreational fishing landings, but besides the damage that will occur to the fishery businesses, the opening of the spillway allows for nutrient loading that has other harmful effects. The opening of the spillway caused trillions of gallons of freshwater to be dumped into the Mississippi Sound, and in those trillions of gallons are a lot of fertilizer and nutrients. This influx of nutrients combined with the changed salinity of the Sound caused bacteria in the water to bloom; when the blooms reach toxic levels, they are called harmful algal blooms, and they produce fatal toxins for both humans and animals which severely impacts the surrounding environment.5 These algal blooms highlight the negative impacts that the opening of the spillway causes in areas that do not necessarily pertain directly to fishing. Looking at past and current economic hardships that the opening of this spillway imposed will highlight why Governor Bryant requested federal aid and help explain why this aid was eventually granted.

Request for Relief

Governor Bryant formally sought federal assistance from the Secretary of the Department of Commerce under the MSA on May 31, 2019, seeking a "federal fisheries disaster declaration." Two different parts of the MSA apply to fishery disasters. The first applies to "commercial fishery failure due to a fishery resource disaster as a result of … man-made causes beyond the control of fishery managers to mitigate."⁶ This is frequently referred to as a fishery resource disaster. The MSA also provides for federal assistance in the case of a "catastrophic regional fishery disaster," which is defined as a "natural disaster ... or a regulatory closure," or could be made once a fishery resource disaster is determined.⁷ The Governor does not specify the relief sought.

The Governor began his request for relief by stating that the Bonnet Carré Spillway opening will have severe economic and environmental impacts. He stated that the State of Mississippi is having the most issues with oysters, but that the negative impacts span across a range of different species including shrimp, crabs and finfish. The Governor stated that, at the time he submitted his declaration request, the mortality rate of oysters was 70%, crab landings were estimated at a 35% loss, and that the opening of the 2019 shrimp season had to be pushed back due to the opening of the spillway. Due to these impacts, the Governor requested a federal fisheries disaster determination to "assist in obtaining financial assistance for all negatively impacted ecosystems, fisherman and related businesses in a timely manner."

Since Governor Bryant made his request, studies have shown that the numbers he used were low, which illustrates the severe impact that is negatively affecting Mississippi's economy. Following the closure of the spillway, Dr. Benedict C. Posadas, in his work for the Mississippi-Alabama Sea Grant Consortium, examined the economic impact to Mississippi's commercial shrimp and oyster fisheries from the opening of the Bonnet Carré Spillway, and the numbers are worse than the ones used by Governor Bryant. While the Governor indicated that the oyster mortality rate was 70%, "recent state sampling results indicated that almost all the oyster resources were totally devastated (~100% mortality)."⁸ This means that the expected landings of oysters in 2019 will be zero, and in 2020, according to Dr. Posadas, landings will be "insignificant if not zero without immediate management intervention."

A look at past economic data for the state can indicate just how much of Mississippi's fisheries have been impacted. In 2015, the entire blue crab and oyster fishery industry created a total of \$35 million in economic contribution to the State of Mississippi, and in 2009, when separate data for this industry was available, the oyster industry created more than 350 jobs and \$13 million in economic contribution.⁹ To add further insult to injury, those are just the numbers for the commercial oyster fisheries. Preliminary state reports indicate that in May commercial shrimp landings declined 19%, with June seeing a 58% decline, and July seeing a 60% decline.¹⁰ Data for subsequent months were not available. The shrimp industry as a whole contributed \$215 million to the Mississippi economy in 2015, to go along with 4,200 jobs added to the state.¹¹

This is not the first instance in which a federal fisheries disaster determination has been requested following the opening¹² of the Bonnet Carré Spillway, as one was sought following the 2011 spillway opening. The opening of the Bonnet Carré Spillway in 2011 resulted in 85% oyster mortalities and the halting of the recovery process to its baseline levels in 2002-2004.¹³ This severe setback caused Mississippi to request a federal fishery disaster determination under the MSA, which was granted in September 2012. Under three different models used by Dr. Posadas to assess direct economic losses for the 2011 spillway opening, the lowest direct loss attributed to the Mississippi commercial oyster landings was \$6 million, with the highest going up to \$46 million.¹⁴

Statutory Relief

As described above, the MSA provides regional fishery disaster assistance. A governor of an affected state can take the first step in getting federal assistance for a fishery disaster under either a "fishery resource disaster" or a "catastrophic regional fishery disaster." The relief could extend to different parties depending on the statutory basis for the determination. A copy of the Secretary of Commerce's determination was not available as of this writing. However, the website from the Department of Commerce indicates the Secretary made the determination under both Section 312(a), which is the fishery resource disaster, and Section 315, which is the catastrophic regional fishery disaster.¹⁵

Upon a determination by the Secretary that a fishery resource disaster exists, "the Secretary is authorized to make sums available to be used by the affected State, fishing community, or by the Secretary in cooperation with the affected State or fishing community for assessing the economic and social effects of the commercial fishery failure."¹⁶ This part of the statute prescribes that the Secretary may make a finding of a commercial fishery disaster, and to make funds available to "restore the fishery or prevent a similar failure and to assist a fishing community affected by such a failure." Once a determination has been made that there is a fishery disaster, the relief may be handed out and used by certain fishing communities, or by the affected state.

Mississippi's May 31 request was followed by Louisiana on June 13, 2019, and Alabama on July 10, 2019.

On September 25, 2019, in a press release, Secretary Wilbur Ross announced a finding of a catastrophic regional fishery disaster in Louisiana, Alabama, and Mississippi due to extreme flooding events in the Gulf of Mexico caused by the opening of the Bonnet Carré Spillway.¹⁷

Following a determination that a fishery disaster exists, funds for relief must be authorized by Congress, and then allocated to the selected parties. According to the press release from the Department of Commerce, Congress set aside \$165 million for such assistance.¹⁸ How the \$165 million will be disbursed has not yet been stated, but the aid has been granted and help is on the way for the declared fishery disaster areas.

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A Summation of the Facts and Figures of Interest in this Edition

k	Number of days Bonnet Carré Spillway was open 2016 – 2018:	46
k	Number of days the Spillway was open Feb. thru July 2019:	123
k	Estimated decrease in July commercial wild shrimp in Mississippi:	60%
k	Estimated decrease in oysters in Mississippi:	100%
k	Amount of federal fishery disaster assistance for AL, LA, and MS:	\$165 million

The Relationship Between Public Health and City Planning

Stephen Deal -

A thriving city derives strength from the physical health of its people. Long before the rise of modern medicine, city planning was perceived to be at the forefront of public health policy. Today, city planning and public health are far less intertwined than they were in the past, but that does not mean that planning professionals have no role to play in public health. While urban residents now enjoy greater access to quality healthcare than before, there are still many health problems that may be exacerbated by the crowded conditions cities give rise to. When these health issues reach a critical threshold where they may upset the quality of life for a city, they are now not only a problem for doctors and medical professionals; they become a problem for planners as well.

The Historic Link Between Public Health and Planning

In many respects, the modern planning profession began as a public health crusade. The rapid industrialization urban areas experienced during the 19th century often resulted in overcrowding. Overcrowding, coupled with poor sanitation and infrastructure, often meant that the cities of the industrial revolution were rife with disease and substandard living conditions. Many health experts of the time theorized that cities themselves, with their poor atmosphere and large accumulations of filth and foul smells, were a leading cause of epidemic outbreaks.¹

Of the many health concerns affecting urban dwellers during the 19th century, arguably the greatest of them was cholera. Cholera, a deadly disease spread through contaminated water, was a pandemic in Europe throughout the 19th century and a real source of fear for residents of London during the industrial revolution.2 The anesthetist John Snow was the first to discover the correlation between cholera and impure water when he discovered that the highest mortality rates for cholera in London centered on a pump within a Soho neighborhood. John Snow's seminal research led many public reformers to the conclusion that improved public sanitation would result in better public health outcomes. In 1858, parliament sanctioned the construction of a comprehensive sewerage system. Though the system was not fully completed until 1875, many public officials discovered that neighborhoods where the new sewer system was in place were not experiencing cholera outbreaks. This prompted Joseph Bazalgette to note in an 1864 paper that: "However occult might be the connection between death and defective drainage, the places most formerly favourable to the spread of diseases become quite free from it, when afterwards properly drained."³

Throughout the latter half of the 19th century, other cities would soon discern the correlation between urban infrastructure investment and improved public health outcomes. In 1878, the city of Memphis, Tennessee was crippled by a yellow fever outbreak, which claimed the lives of over 5,000 people in a city of 48,000.4 The considerable human toll the outbreak inflicted upon Memphis prompted a total overhaul of the city's streets and neighborhoods. Wood block sidewalks in the city were replaced with hard pavement, water closets replaced outdoor privies, and cisterns were phased out in favor of a comprehensive waterworks system, which drew water from artesian wells that were 400 feet deep.5 Once the new infrastructure was completed, Memphis experienced marked reductions in yellow fever deaths, and the mortality rate fell from 46.6 per thousand in 1872 to 21.5 per thousand as early as 1889.

By the turn of the 20th century, municipal governments expanded the scope of their public health efforts beyond basic infrastructure and sanitation improvements. With the relationship between urban blight and infectious disease now firmly established, cities moved to enact comprehensive regulatory standards aimed at ensuring that new development was built to a minimum standard to maintain health and safety. In 1901, the City of New York passed the Tenement House Act.⁶ The Tenement House Act set basic standards for housing, such as the construction and maintenance of buildings and the provision of light and air. Other cities would soon follow suit with similar laws aimed at establishing minimum standards for urban structures and dwellings.

Yet as cities continued to grow, the number of land uses deemed noxious to public health grew as well. In 1916, New York City enacted the first comprehensive zoning ordinance, giving it the power to declare which land uses would be permissible within any given area. The 1924 Standard Zoning Enabling Act, developed by the U.S. Commerce Department, promoted zoning for use all across the country, and it wasn't long before zoning became an established practice across much of the United States. What had begun as a modest series of public reforms aimed at improving health outcomes had fully matured into a rational policy framework aimed at resolving land use conflicts within a city. The public health crises afflicting cities in the 19th century and the subsequent reforms, which improved quality of life outcomes, not only brought public health to the forefront of government policy, they also gave birth to a new professional discipline: city planning.

Health Impact Assessments: Bringing Public Health to Bear in the Planning Process

When it comes to urban growth and development, every real estate project has the potential to have some bearing upon the physical health of a community. Accordingly, planners should incorporate public health measures into their daily work, such as by conducting a health impact assessment (HIA) for key projects and plans.

Davidson, North Carolina received a grant from the Centers for Disease Control and Prevention (CDC): Healthy Community Design Initiative to develop a new program known as Davidson Design for Life.⁷ Davidson studied the potential impacts of new street design standards by evaluating four health variables: injuries and fatalities from vehicle accidents, physical activity rates, asthma rates and air quality levels, and health equity issues associated with individuals who can't drive. Once the variables were selected, planners proceeded to assemble statistics and data for each of the four variables.

Once data for all four variables were compiled, the report established that there was a positive correlation between improved street standards and better public health outcomes. The authors examined new street design standards for the town, suggesting that greater detail be provided on what type of materials were acceptable for use in crosswalks to be safer for pedestrian use and reducing pedestrian injuries.

Mississippi Coastal Communities Tackle Public Health Challenges

One area of common interest that city planners and public health officials have is the need for timely data and statistics that provide critical insight into local issues and policy challenges as they come into being. Recognizing this, the Gulf Coast Community Design Studio, an outreach program of Mississippi State University, has partnered with local government officials and non-profits across the Mississippi coast to form the Gulf Coast Healthy Communities Collaborative (HCC). The HCC is the product of additional funding from the Community Design Studio to the Gulf Coast Community Exchange to provide up-to-date community health data and serve as a local resource library.⁸

With the data resources of the Community Exchange at its disposal, the HCC is able to devote time and personnel to the continued acquisition of unique public health datasets, which are able to provide greater insight into coastal Mississippi's health problems. Visitors to the website can gain access to comprehensive datasets such as Robert Wood Johnson Foundation's 500 Cities Project, which reports city and census tract-level data for 27 chronic disease measures within America's largest cities.9 In addition to the comprehensive health data, website users can also access basic demographics profiles of coastal cities and counties and sort data to as discrete a geographic level as local zip codes. While many city planning departments can offer a similar level of geographic precision, the key difference is that planners aggregate data primarily to inform city zoning and land use policies, so they are not as able to engage in cross-cutting initiatives that move across multiple disciplines. By comparison, the HCC is organized primarily for the purpose of promoting crosssector collaboration.

Although the HCC has only been in place since 2018, the presence of the organization is already making an impact within Mississippi's coastal communities. In 2019, a \$3.4 million grant was awarded to the HCC, Coastal Family Health Center, and the Mississippi Public Health Institute.¹⁰ The grant funds, which were provided by the CDC's Racial and Ethnic Approaches to Community Health (REACH) program, will go towards developing new outreach methods to teach families about nutrition. One specific outreach opportunity being developed in conjunction with the grant funding will be organizing and setting up "baby cafes" at Merit Health in Biloxi and Singing River Hospital in Pascagoula. These baby cafes will serve as a support system for breastfeeding mothers. In addition to the baby cafes, the HCC and the Coastal Family Health Center will consult with the REACH program to identify additional goals and benchmarks for the grant initiative. By stepping in to serve as a local clearinghouse for the Mississippi coast's data, the Healthy Communities Collaborative is able to set the foundation for unique projects that cut across multiple disciplines to address common areas of need.

Conclusion

While public health may no longer be a dominant concern within the city planning profession, that should not imply that health is something to be relegated entirely to doctors and nurses. New data gathering tools and techniques means that planners can quickly compile reports to substantiate public health research. Health Impact Assessments, such as the one employed in Davidson, provide a useful template for integrating local health data into city regulations. Also, data clearinghouses, such as the Gulf Coast Community Exchange, can serve as a critical go-between for both public officials and medical professionals. A city is fundamentally a human undertaking and in order to have livable communities planners must have a vested interest in seeing that new urban activities and partnerships result in healthier living habits for city dwellers.

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Court Rejects Move to Yank Alabama's Permitting Authority

Kristina Alexander

Alabama environmental groups claimed that the Alabama Department of Environmental Management (ADEM) failed to live up to its duties as a permitting authority under the Clean Water Act (CWA). It petitioned the federal Environmental Protection Agency (EPA) to revoke that permitting authority, and when EPA did not, the group sued. The Eleventh Circuit Court of Appeals upheld the agency's decision.¹

Cahaba Riverkeeper (Riverkeeper) and others argued that EPA needed to revoke ADEM's authority for issuing National Pollutant Discharge Elimination System (NPDES) permits because the state did not comply with the CWA. Riverkeeper claimed that ADEM did several things wrong regarding the discharge permits, for example, by not indicating where the unpermitted spills were occurring, and by not inspecting as often as the law requires. Other shortcomings alleged by the plaintiffs included having regulatory board members with conflicts of interest, and being unable to bring suit against state agencies that violated their permits.

The standard, according to the court, is whether the EPA "acted within the bounds of permissible discretion" in denying Riverkeeper's petition to revoke ADEM's permitting authority. The court found that the alleged problems occurred, but held that despite the fact that ADEM did not do everything right, EPA did nothing wrong in continuing the state's permitting authority. The court quoted precedent from a 1977 case in which environmental groups tried to get Mississippi's permitting authority revoked for making concessions to a large chemical company.² The court in that case stated that only the "most egregious flouting of federal requirements" by a state would justify revoking a state's permitting authority. In both cases, the courts did not find that the drastic step was warranted. Neither the laws nor the regulations of the CWA provided a procedure or method for revoking permitting authority, according to the court; therefore, EPA appropriately used its discretion.

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