The Clean Water Act at 50:

Promises Half Kept at the Half-Century Mark

ENVIRONMENTAL INTEGRITY PROJECT

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THE ENVIRONMENTAL INTEGRITY PROJECT

The Environmental Integrity Project (EIP) is a nonpartisan, nonprofit organization established in March of 2002 by former EPA enforcement attorneys to advocate for effective enforcement of environmental laws. EIP has three goals: 1) to provide objective analyses of how the failure to enforce or implement environmental laws increases pollution and affects public health; 2) to hold federal and state agencies, as well as individual corporations, accountable for failing to enforce or comply with environmental laws; and 3) to help local communities obtain the protection of environmental laws.

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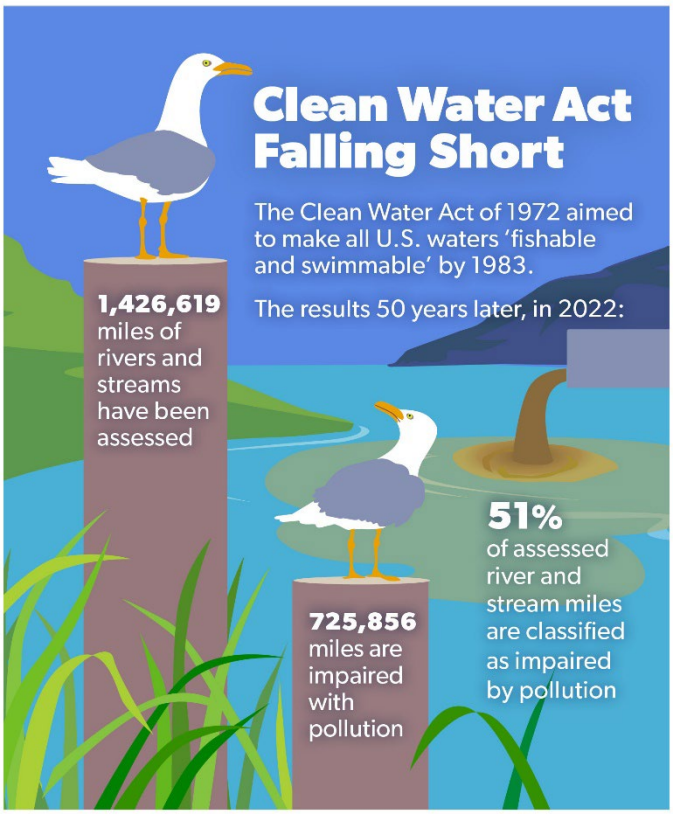
Executive Summary

This year will mark the 50th anniversary of the federal Clean Water Act of 1972.[1] The law was a crowning achievement of the environmental movement, inspired in part by flames on the Cuyahoga River in Ohio, shame over sewage in the reeking Hudson, and rage over record-breaking fish kills in Lake Thonotosassa, Florida.[2] The Act directed more than $1 trillion in investments into wastewater treatment plants and drove substantial improvements in water quality, especially in its first three decades.[3] But the improvements slowed over time, and the landmark law, a half-century later, remains far from its ambitious goals of producing "fishable, swimmable" waters across the U.S. by 1983 and the complete elimination of pollution into America's navigable waters by 1985.[4]

The Clean Water Act requires states to submit periodic reports on the condition of their rivers, streams, lakes, and estuaries to the U.S. Environmental Protection Agency.[5] Based on the latest of those reports, about half of the river and stream miles and lake acres that have been studied across the U.S. are so polluted they are classified as "impaired."[6] That means they are too polluted to meet standards[7] for swimming and recreation, aquatic life, fish consumption, or as drinking water sources. The same is true for a quarter of assessed bay and estuary square miles. These figures do not include many waterways where conditions remain unknown because they have not been examined recently. For example, about 73 percent of river and stream miles have not been studied in the most recent assessment cycle (six to 10 years, depending on the state.)



A half century after the passage of the Clean Water Act, half of assessed river and stream miles in the U.S. are classified as impaired by pollution. That includes the 27 percent of waterways that have been studied in the most recent assessment cycle (six to 10 years, depending on the state) plus impairments listed by states in earlier cycles.

A number of obstacles account for the shortfall in meeting the goals of the Clean Water Act, including limitations in the law itself. The Act includes enforceable regulatory controls for pollution piped directly into waterways from factories and

sewage plants, but weak to nonexistent controls for runoff from farmland and other "nonpoint" sources of pollution that are a major threat to water quality.[8]

Another major problem is that EPA has neglected its duty under the federal Clean Water Act to periodically review and update technology-based limits for water pollution control systems used by industries. By 2022, two-thirds of EPA's industry-specific water pollution standards had not been updated in more than three decades,[9] despite the law's mandate for reviews every five years[10] to keep pace with advances in treatment technologies. These badly outdated standards mean more pollution from oil refineries, chemical plants, slaughterhouses and other industries pouring into waterways than we would have if these standards had been updated on schedule. Other barriers to reaching the Clean Water Act's goals include budget cuts to EPA and state agencies, the failure of government to enforce permit requirements, toothless pollution control plans (called "Total Maximum Daily Loads"),[11] and weak management of water pollution problems in large watersheds that cross the boundaries of two or more states.

The result: Today, almost four decades after the Clean Water Act's deadline for "fishable and swimmable" waters across the U.S., 51 percent of assessed river and stream miles across the U.S. – more than 700,000 miles of waterways -- remain impaired with pollution, as well as 55 percent of lake acres and 26 percent of estuary miles.[12]

TABLE 1: U.S. WATERS CLASSIFIED AS "IMPAIRED" BECAUSE OF TOO MUCH POLLUTION

Waterbody Type (unit)	Total Assessed	Total Impaired	Percent Impaired
Rivers, Streams, and Creeks (miles)	1,426,619	725,856	51%
Lakes, Ponds, and Reservoirs (acres)	20,432,238	11,197,278	55%
Bays, Estuaries, and Harbors (sq. miles)	76,555	19,561	26%

Source: The most recent available state Integrated Water Reports filed with EPA. Note: impairments include of waters assessed in the most recent cycle (six to 10 years, depending on the state), plus those assessed in earlier cycles.

Breaking down the national numbers to a more refined level helps to illustrate how pollution can impair the public's enjoyment of our waterways or threaten their ecological health. Under the EPA's definitions, a "water contact recreation" impairment means that people who splash, swim, or kayak in a waterway are at risk of getting sick from fecal pathogens or other pollutants. A water can be impaired by pollution that causes low oxygen levels or other conditions that make it harder for fish to survive. A river with a drinking water "impairment" means that it is so polluted by nitrates, bacteria, or other contaminants that the local municipality must undertake additional (and more expensive) treatments to make it safe to drink. (For more detailed definitions, see page 17). The same waterway can be identified as impaired for multiple public uses, e.g., because excessive bacteria pollution makes it unsafe for swimming and because low oxygen levels endanger aquatic life. The following table summarizes the total amount of rivers, lakes, and estuaries across the U.S. listed as impaired for certain uses.[13]

TABLE 2: U.S. WATERS DESIGNATED AS IMPAIRED, BY USE

Designated Use	River & Stream		Lake & Reservoir		Bay & Estuary	
	Miles Assessed	% Impaired	Acres Assessed	% Impaired	Sq. Miles Assessed	% Impaired
Aquatic Life	1,174,369	42%	16,712,149	34%	33,026	40%
Drinking Water	337,339	29%	8,831,357	12%	-	-
Water Recreation	653,443	38%	15,373,880	25%	31,369	20%
Fish Consumption	419,403	47%	10,943,113	68%	25,069	43%

Source: Most recent state Integrated Reports filed with EPA. Percentage impaired is of assessed waterways.

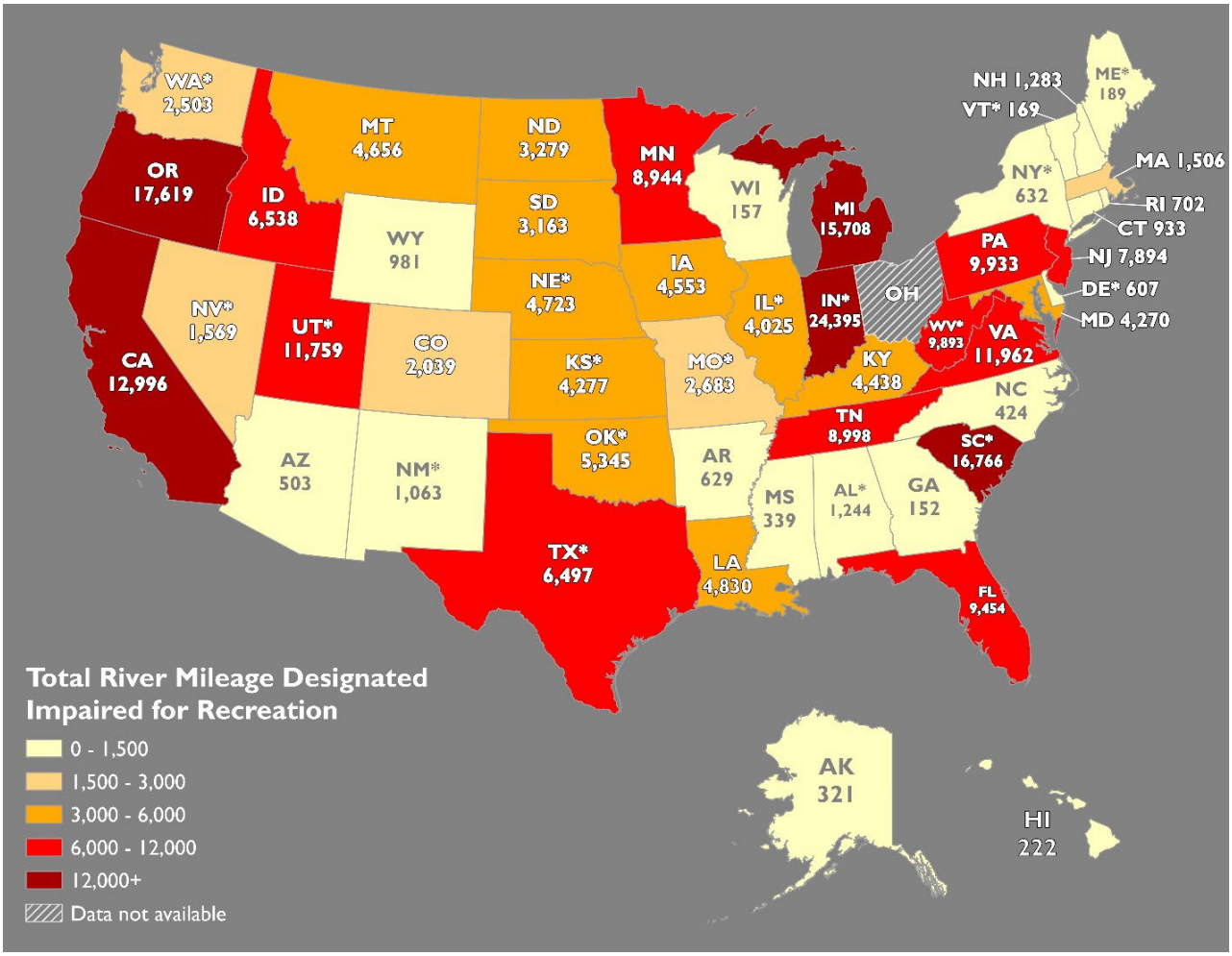
For a state-by-state breakdown of data on rivers, streams, lakes and estuaries that are designated as impaired for each of the public uses listed in Table 2, see Appendix A of this report (or to download a searchable spreadsheet, click here.) It is important to keep in mind that in some cases, states reporting higher levels of impairment may actually be doing a better job of monitoring waterways or are using more stringent criteria to assess water quality.

EPA leaves it up to state agencies to decide many issues surrounding the assessment of waterways, including the interpretation of water quality criteria, the frequency of data collection, and the method of analysis and classification.[14] As a result, it is not surprising that impairment designations for waterways vary widely from state to state, and not only because of differences between clean and polluted areas. Contrasting numbers also arise from the different standards and methods used by states to determine what "impaired" means. For example, many states have fish consumption advisories because of mercury in fish, but not all states count lakes with these advisories as "impaired." Ohio's impairment numbers are not included in the national impairment totals for this report, because it does not quantify impaired waterways like the other states.[15] These variations in how states identify impairments makes it harder to track progress toward achieving the Clean Water Act's goal of making all waterways fishable and swimmable, or to determine what factors are most important in explaining why we are so far from achieving those goals. For more information on limitations of the data, see Appendix B.

According to one important method of assessment used by the states – the safety of rivers and streams for swimming and water-contact recreation, based on levels of fecal bacteria or other contaminants in the water -- Indiana tops the list of states with the most dirty waterways. Indiana has 24,395 total miles of rivers and streams listed as impaired for swimming and recreation.[16] Second is Oregon, with 17,619 miles of rivers and streams classified as impaired for swimming and recreation;[17] and third is South Carolina, with 16,766 miles.[18]

The following map shows which states have the most total miles of rivers and streams impaired for swimming and recreation.

MAP 1: RIVER & STREAM MILES CLASSIFIED AS IMPAIRED FOR SWIMMING AND WATER CONTACT RECREATION[19]



States with asterisks reported useable data only for swimming and other primary water contact recreation impairments, not for secondary water contact recreation, such as kayaking. Ohio is not included because it does not count impairments like the other states.

Using a different method of comparing the states – by *percentages* of assessed river miles categorized as impaired for swimming and recreation, instead of *total miles* – the results are very different, with Hawaii (100 percent) Wyoming (96 percent), and Michigan (95 percent) ranking as the top three. For a list of all the states and their swimming and recreation impairments, click here. For more maps and tables, see pages 19 through 27.

The chronic water pollution problems that persist a half century after the Clean Water Act's passage include toxic algae blooms in Florida fed by fertilizer runoff from farms and suburban lawns; sewage spills closing southern California beaches; toxic chemicals seeping from petrochemical plants in Louisiana; hog manure spills killing fish in Iowa rivers; and slaughterhouses in Delaware dumping huge amounts of chicken refuse. This report includes water pollution data on all states (see Appendix A). But we provide more detailed

discussions of the issues in these five states with significant and representative problems – Florida, California, Louisiana, Indiana, Iowa, and Delaware – on pages 29 to 37 of this report.

Some of the findings include:

- **Florida** ranks first in the U.S. for total acres of lakes classified as impaired for swimming and aquatic life (873,340 acres), and second for total lake acres listed as impaired for any use (935,808 acres).
- **California** ranks first in the U.S. for most river and stream miles listed as impaired for drinking water (37,209 miles) and third for fish consumption (24,934 miles.)
- **Louisiana** ranks first for most estuaries classified as impaired for any use, with 5,574 square miles, or 92 percent of the waters assessed.
- **Indiana** tops all states with the No. 1 most total miles of rivers and streams classified as impaired for swimming and water contact recreation (24,395 miles). (Ranked by *percentage* of miles assessed, Indiana ranks 11th).
- **Delaware** has the highest percentage of its rivers and streams classified as impaired in the U.S., with 97 percent of the state's 1,104 miles of assessed waterways listed as impaired for one or more use.
- **Iowa** is representative of many states with farm runoff problems, having 93 percent of its river and stream miles impaired for swimming and recreation (the fourth most in the U.S.) and 83 percent of its lake acres impaired for this (third most.)

The true extent of the nation's water pollution is unknown because few states monitor all their waterways. Due to limited funding and budget cuts, many state environmental agencies do not have the staff to test all their waters within mandated time periods – usually between six and 10 years, depending on state rules. For example, Missouri and Arkansas assessed only five percent of their river and stream miles in their most recent period.[20] Across the U.S., 73 percent of rivers and stream miles were not assessed during the most recent cycle, and the same is true for 49 percent of lake acres and 24 percent of bay areas.

TABLE 3: PERCENT OF U.S. WATERS UNASSESSED FOR ANY USE

Waterbody Type (unit)	Total Size	Size Assessed	Percent Not Assessed
Rivers, Streams, and Creeks (miles)*	4,936,778	1,331,091	73%
Lakes, Ponds, and Reservoirs (acres)*	38,202,560	19,531,798	49%
Bays, Estuaries, and Harbors (sq. miles)**	28,064	21,371	24%

*Unassessed means not studied in the most recent assessment cycle, usually six to 10 years, depending on the state. *Total does not include acres of lakes and miles of rivers from California because it did not quantify total acres/miles. **Total does not include square miles of estuaries from Alaska, California, Hawaii, and Louisiana, as they did not quantify the total square miles within their boundaries.*

The big picture is that while the federal Clean Water Act should be given credit for substantial improvements to the nation's waterways, as the landmark law approaches its 50th

birthday, the Act has not achieved what it promised. What can be done to close the gaps between the law's lofty goals and reality?

This report, based on an extensive review of state reports, as well as studies by EPA and experts on the federal Clean Water Act, proposes a few potential solutions:

1) EPA needs to do its job and comply with the Clean Water Act's mandate for more frequent updates of technology-based limits for industry water pollution control systems. Despite a legal mandate for reviews of these discharge limits at least every five years, highly-polluting industries like chemical manufacturing have not had their standards updated since the 1970s – back when "modern" technology meant computers with floppy disks.
2) Congress should strengthen the Clean Water Act by closing its loophole for agricultural runoff and other "non-point" sources of pollution, which are by far the largest sources of impairments in waterways across the U.S.[21] Factory-style animal production has become an industry with a massive waste disposal problem and should be regulated like other large industries.
3) EPA or Congress should impose more consistent, universal guidelines for waterway impairment designations for all 50 states, and for gauging unhealthy levels of key pollutants like nitrogen. The clashing patchwork of state methods for monitoring and appraising waterways contributes to an ineffective distribution of funding and cleanup efforts.
4) Congress should make it easier to enforce key requirements of the Clean Water Act, including the cleanup plans -- called "Total Maximum Daily Loads" -- that are supposed to be one the primary mechanisms for reducing pollution.
5) States are set to receive billions of dollars from Congress' recent passage of a $1.2 trillion Bipartisan Infrastructure Bill.[22] Governors and lawmakers should, whenever possible, target this funding to water pollution control efforts, especially in lower-income communities of color that have long suffered disproportionately from pollution.
6) Congress and the states need to boost funding for the EPA and state environmental agency staff required to measure water quality, and to develop and implement the cleanup plans needed to bring impaired waterways back to life.
7) Although achieving the Clean Water Act's goal of 100 percent "fishable and swimmable" waterways will be hard, EPA should keep driving toward this target by setting interim goals by decade and by creating enforceable plans to achieve these pollution reductions.

Although the soaring ambitions of the Clean Water Act remain only partially realized at the half century mark, the law's successes and failures so far suggest the outlines of stepping stones toward a cleaner and healthier future.

Table of Contents:

Strengths and Weaknesses of the Clean Water Act

What became known as the Clean Water Act of 1972 was not the nation's first water pollution control law. After several limited and rarely-enforced laws failed to protect waterways in the early 20th century, Congress in 1948 passed the Federal Water Pollution Control Act. Lawmakers then amended this law five times over the next two decades. But it remained ineffective at slowing the pollution from America's rapidly growing population and multiplying number of outfall pipes, parking lots, and farm fields.[23] The Act's shortfalls grew from the fact that it delegated nearly all authority to the states, granting the federal government virtually no role in halting water pollution.[24] For example, in the nation's capital itself, the Potomac River was so fouled with sewage and algae that it literally sent a reek across the federal government that forced the White House to close doors and windows when hosting foreign dignitaries. President Lyndon Johnson called the Nation's River a "national disgrace" in 1965.[25]

Fires on the Cuyahoga River in Ohio – this one, in 1952 -- helped galvanize public support for the 1972 Clean Water Act.

But the Potomac wasn't the only example of American waterways in crisis. Fish kills in Lake Michigan, Lake Erie, and Lake Thonotosassa in Florida captured the public's attention, as did the notorious 1969 fire on the Cuyahoga River in Ohio. In response, Congress in 1972 passed amendments to the Federal Water Pollution Control Act to assert a stronger federal role in regulating pollution. The amendments – later called the Clean Water Act of 1972 -- made it a *federal* crime to discharge pollution from any pipe or "point source" into navigable waters, unless the company or person responsible first obtained a permit and followed specified limits.[26] The law also provided billions of dollars to local governments across the country for sewage treatment plant upgrades.

Among other requirements, the Clean Water Act of 1972 directed states to sample and assess their waterways and designate lists of "impaired" waters that needed cleanup plans. In addition, the law required that EPA establish technology-based standards and effluent limits for pollution controls systems used by different categories of industries. The law mandates[27] that EPA review these discharge limits every five years and update them as more advanced technologies become available that are superior at controlling pollution.

This combination of technology-based standards and federal funding for modernization created what was the nation's largest public works program in the 1970's and 1980's. In 1978, nearly a third of all sewage treatment plants in the U.S. lacked what is called "secondary treatment." That means they had filters to remove floating debris but no modern systems that use microorganisms to biologically eliminate contaminants from wastewater. By 1996, almost all public wastewater plants in the U.S. had this secondary treatment.[28] The billions of dollars invested in wastewater plants nationally significantly reduced pollution into many rivers, streams, and lakes.[29]

The impact on some waterways was dramatic. An EPA report in 2000 estimated that an additional 16,507 miles of rivers and streams had been made swimmable by the Clean Water Act since 1972, and that 24,713 more miles had been made fishable.[30] The Potomac River, once choked with algae and nearly dead, became clean enough to host bass fishing tournaments, waterfront restaurants, and kayak rentals.[31] The improvements were due not only to increased funding and stronger law, but to the dedicated work of tens of thousands of men and women inside and outside government who dedicated their lives to making America's waters cleaner.

The Cuyahoga River offers a good example of how far we've come, but how far we have yet to go. The Cuyahoga, which flows into Lake Erie, is no longer so slicked with oil and debris that it catches on fire, as it did at least once a decade in the first half of the 20th century. By 2021, the river had improved enough that EPA removed an impairment listing from the Cuyahoga because the river no longer had excessive algae blooms or fish-killing low-oxygen zones fed by nitrogen and phosphorus pollution. However, the river remains seriously polluted today and it is still listed as impaired because of fecal bacteria from sewage overflows that make parts of the waterway unsafe for swimming and water contact recreation.[32]

Barriers to Progress

So why did the Clean Water Act fall short of its goal of making 100 percent of all waters in the U.S. "fishable and swimmable?"

Lack of Controls for Runoff Pollution: One weakness that was built into the Clean Water Act from the beginning was that the law did not include any strong controls for runoff or "non-point source" pollution, including from farm fields, suburban lawns, and parking lots. In this area, Congress wanted to defer to the political power of state governments, which preferred to keep authority over land-use decisions in local hands and in the control of property owners. Lawmakers also avoided regulation of land uses because of the power of the farm lobby, which strongly opposed any such rules, according to an analysis of the issue by Jonathan Z. Cannon, former General Counsel for EPA and Professor of Law at the

University of Virginia.[33] An EPA study in 2011 "reconfirmed the crucial role of non-point sources in the nation's failure to reach the Clean Water Act's goals," Cannon wrote. "As the agency wrote candidly… at the current pace of waterbody remediation, it will take about 700 years to achieve full restoration of currently impaired waterbodies."[34]

A weakness of the Clean Water Act is its lack of controls over runoff pollution, including manure spread on farm fields as fertilizer that rain washes into streams and rivers.

A major source of runoff pollution is agriculture. The spreading of excess fertilizer and manure leads to nitrogen and phosphorus being washed into streams and rivers and feeding algal blooms.[35] A 2021 report by the EPA's Office of Inspector General concluded that harmful algal blooms are a "major problem throughout the United States… that can sicken people and kill animals; create oxygen-poor zones in rivers and lakes, making them unsuited for aquatic life; raise treatment costs for drinking water; cause economic hardship for industries that depend on clean water; and negatively impact recreational activities," the report stated.[36] But EPA "does not have an agencywide strategy for addressing harmful algal blooms."[37]

Weakness of TMDL's: In theory, the required development of cleanup plans with pollution reduction goals – called Total Maximum Daily Loads (TMDL's) – under the Clean Water Act was supposed to help reduce runoff pollution.[38] More than 50,000 of these plans have been written by states across the country over the last half century.[39] However, the TMDL's are often largely paperwork exercises that fail to have much impact.[40] This is because the plans, and the Clean Water Act itself, rely mostly on voluntary efforts to control nonpoint source pollution, rather than giving EPA and states the authority to require that landowners reduce runoff.

A study by the U.S. Government Accountability Office (GAO) examined a sampling of TMDL's across the country and concluded that a majority of them were lacking in substance, saying: "without changes to the Act's approach to nonpoint source pollution, the Act's goals are likely to remain unfulfilled."[41] The GAO investigators examined 25 TMDL's and found that almost half of them (12) "contained vague or no information on actions that need to be taken, or by whom," to clean up waterways.[42] State officials interviewed by GAO said that in the case of at least two thirds of TMDL's, there was not adequate funding or landowner participation to make the cleanup plans effective. About 80 percent of the TMDL's were not meeting their targets for reducing runoff pollution.[43]

The Problem of Interstate Pollution: Among other weaknesses, the Clean Water Act gives state governments little power to stop interstate water pollution, such as flows from Pennsylvania and New York down the Susquehanna River into Maryland, Virginia, and the Chesapeake Bay. While the law allows EPA to step in and set enforceable targets to limit pollution from all sources within a multi-state watershed through a TMDL, the federal agency has been reluctant to exercise that authority. And when EPA does, it usually tries to work through state or local agencies that are sometimes reluctant to take the actions needed.

The cleanup of the Chesapeake Bay has been hampered by EPA's lack of willingness to implement an interstate cleanup plan – called a Total Maximum Daily Load – and Pennsylvania's failure to reduce pollution flowing into Maryland and Virginia.

A high-profile example is the EPA-led Chesapeake Bay TMDL that was launched with much fanfare in 2010, but which is likely to fall short of its goals by 2025. Because of the expected failure of the Bay TMDL, the governments of Maryland, Virginia, Delaware, and the District of Columbia sued the Trump Administration's EPA in September 2020.[44] "We cannot allow the EPA to abdicate its legal duty to ensure states are reducing pollution in the Chesapeake Bay," said District of Columbia Attorney General Karl A. Racine, in announcing the lawsuit.[45] "We filed this lawsuit to force the EPA to do its job."

Another example of unchecked interstate water pollution can be found in the Mississippi River, which flushes vast amounts of nitrogen and phosphorus pollution from Midwestern farms into the Gulf of Mexico, feeding a massive low-oxygen "dead zone." In 2017, scientists determined this dead zone at the mouth of the Mississippi occupied a space the size of New Jersey—the largest since mapping began there in 1985.[46]

A report by the National Academy of Sciences concluded that the Clean Water Act's ability to reduce this pollution into the Mississippi is crippled by a lack of coordination, planning, standards, or even water monitoring among the 10 states that border the river and the 31 states that drain into it.[47] "The lack of a centralized Mississippi River water quality information system and data gathering program hinders effective implementation of the Clean Water Act and acts as a barrier to maintaining and improving water quality," the committee of experts wrote.

Lack of Enforcement: Even for waterways that run entirely within a single state, enforcement is often lacking. EPA relies heavily on state environmental agencies to implement the Clean Water Act, and the law delegates authority to the states to issue permits and monitor and enforce the pollution limits in those permits. EPA is empowered with an oversight role. A 2009 report by the EPA's Office of Inspector General found that the Clean Water Act was falling short in part because EPA "did not provide effective enforcement oversight of major facilities…in long-term significant noncompliance" with their water pollution control permits.[48] This results in tens of millions of pounds of excess pollution pouring into waterways. A major part of this failure is that the EPA and states did not keep complete or accurate records of the discharges from major polluters, inhibiting EPA's ability to protect public health, according to the report.[49]

Failure to Update Technology-Based Standards: As mentioned previously, the federal Clean Water Act enjoyed initial successes in reducing water pollution, especially in the period from 1972 to around the year 2000, because it required the modernization of hundreds of wastewater treatment plants across the country.[50] However, pollution reductions have slowed over time.[51] This decline in the effectiveness of the Act is in part because EPA has not kept up with a key requirement. To reduce pollution from industrial point sources, the Act requires EPA to set pollution standards that keep pace with water treatment technology. As treatment technology improves, pollution standards – called effluent limitation guidelines and effluent limits -- are supposed to get tighter. Technology has advanced, but EPA has let decades pass without updating industry-wide standards for some of the nation's largest polluters. The age of these guidelines is important because grossly outdated technology standards allow more pollution to pour into waterways than the law should allow.

A 2021 review of federal records by the Environmental Integrity Project found that two thirds of EPA's water pollution standards for industries are more than 30 years old, despite a Clean Water Act mandate that they be re-examined every five years to keep pace with improving pollution-control technology.[52] For example, EPA's standards for cement manufacturing plants have not been updated since 1977, even though commercially-available pollution-control systems have advanced dramatically since then. Standards for oil refineries have not been updated since 1985; and for rubber manufacturing, not since they were issued in 1974. EPA last updated limits for 66 percent of industry categories (39 of 59) more than 30 years ago, and 17 of those limits date back to the 1970s.

Here are some examples of industries with outdated water pollution standards:

TABLE 4: AGE OF EPA WATER POLLUTION GUIDELINES FOR SELECT INDUSTRIES

Limits for Industrial Category (years)	Year of Promulgation	Year of Last Revision	Age of Pollution Limit
Rubber Manufacturing	1974	Never Revised	47
Asbestos Production	1974	1974	46
Seafood Processing	1974	1975	46
Dairy Processing	1974	1975	46
Soap Manufacturing	1974	1975	46
Tar & Asphalt	1975	Never Revised	46
Explosives Production	1976	Never Revised	45
Cement Manufacturing	1977	1977	44

Source: Federal Register. Effluent Limitation Guidelines (or ELG's) are technology-based standards that set discharge limits for individual industries, which EPA by law is supposed to review every five years and update to keep pace with improvements in technology. The examples above are only a portion of the 59 guidelines for industries.

For a full list of these guidelines and their ages, click here. On September 22, 2021, the Environmental Integrity Project, Natural Resources Defense Council, Waterkeeper Alliance, Sierra Club and 56 allied organizations sent a letter to EPA demanding that the agency fix its broken system for reviewing and updating these water pollution control standards.[53]

State Monitoring and Listing of Waterways

When technology-based pollution standards for industry are not enough, the Clean Water Act allows states to implement additional pollution controls, based on whether waterways are healthy.

Under the Act,[54] each state is required to monitor waterways and assess if they are clean enough to support designated uses (Table 5). These uses include fishing, swimming and boating; drinking through public water systems; serving as a habitat for aquatic life; irrigating farmland; and other industrial purposes.[55] Typically, states compare several years of water monitoring data to specific criteria that are supposed to indicate whether a river, stream, lake, or estuary is safe for one or more of these uses. For example, if monitoring detects *E coli* bacteria levels in a stream that persist above a specific level[56] established to protect swimmers, that stream would be categorized as impaired for water-contact recreation. The states must report the results of these assessments to EPA every two years.[57] These state Integrated Reports to EPA list of all the waterways that were assessed, whether they met or failed water quality standards, and whether they need clean-up plans.[58] The impaired waterways are catalogued on an impaired waters list that the states are required to maintain under sections 303(d) and 305(b) of the federal Clean Water Act.

Since waterbodies can have multiple uses and be polluted by multiple contaminants, they can also be impaired for multiple uses. For example, if a river is impaired for recreation because of high levels of bacteria, the same river could also be impaired for aquatic life because of low levels of oxygen caused by nitrogen pollution.

TABLE 5: MOST COMMON DESIGNATED USES FOR WATERWAYS[59]

Designated Use	Description
Aquatic Life	The aquatic life use aims to protect and ensure propagation of fish, shellfish, and other aquatic life. This use is sometimes broken up into several specific categories, like cold water fish and warm water fish.
Drinking Water	The drinking water use is designed to protect surface water for the purpose of human consumption. Generally, if a waterway designated as a drinking water source is impaired, it means municipal water treatment plants must subject the water to additional treatment at additional cost to make sure it is safe for drinking.[60]
Recreation	The recreation use is usually divided into primary contact and secondary contact recreation. The primary contact recreation use protects people from illnesses caught during activities that could include the potential ingestion of, or immersion in water, including swimming, water-skiing, and surfing. Secondary contact recreation is used for the protection of people when immersion is unlikely, such as during boating and wading.
Fish Consumption	This use is for the protection of human health from the consumption of contaminated fish. The most common contaminants found in fish-tissue are mercury (from air pollution released by coal-fired power plants) and polychlorinated biphenyls (PCBs). Waters impaired for this use are based on fish-tissue data or from fish-consumption advisories issued by the state or EPA.

The federal Clean Water Act and EPA regulations grant states a lot of latitude to decide how they set water quality standards, monitor water quality, designate waterways for certain uses, make impairment listing decisions, and design clean-up plans. As a result, states often monitor waterways differently than their neighbors and use contrasting methods of assessment to deem a waterway "impaired" or cleaned up.

For example, Minnesota has a statewide advisory for fish consumption because of mercury found in fish tissue. This mercury comes mostly from air pollution from coal-fired power plants that drifts across state and national boundaries. Mercury can cause brain damage in people who consume tainted fish in excessive amounts. This can be an environmental justice problem, because some Native American tribes and other people of color consume more wild-caught fish than the general population.[61] Because Minnesota's mercury advisory is a *statewide* advisory, Minnesota automatically lists all its lakes as "impaired" for fish consumption. However, many other states – including Connecticut – have similar mercury pollution problems and statewide advisories for fish consumption, but they do not automatically list all their lakes as impaired. Because states take such different approaches, comparing impairments state to state requires comes with caveats that are further explained in Appendix B.

Method and Analysis

The data in this report are from the most recent available biennial Integrated Reports and impaired waters lists submitted to EPA by 49 states. We excluded Ohio because it does not track impairments like the other states, by miles of rivers or acres of lakes. Instead, Ohio

classifies the land surrounding rivers and lakes – the watersheds -- as impaired if they drain into polluted rivers, streams, and lakes.

The most recent available Integrated Reports for 29 states were published in 2020. For an additional 13 states, the reports were published in 2018, and for seven states, in 2016. These reports covered over five million miles of rivers and streams, 39 million acres of lakes, ponds, and reservoirs, and 83,000 square miles of bays and harbors. The reports rely on monitoring data typically collected a few years earlier. For example, Virginia's 2020 Integrated Report is based on monitoring data collected between 2013 and 2018.[62]

The Environmental Integrity Project (EIP) reviewed each state report and the lists of waterways assessed and classified as impaired for one or more designated uses. We identified the total length of all rivers and streams in each state, as well as the total area of lakes or estuaries, and compared that number to the size of the waterbodies assessed and those designated as impaired.[63] After EIP compiled this database, we shared results and our methodology with state environmental agency staff for comment and feedback. Overall, we reached out to all 49 states and received feedback from 28, and we made adjustments based on the state comments.

This report evaluates state impairment listings in two ways: the *total* miles and acres of impaired waterways, and the *percentage of assessed*[64] miles and acres that are classified as impaired. It is important to note that some states may have more impairments because they have more waterways, more robust monitoring programs, or they target their most polluted waterways for monitoring.[65] EIP also compiled data on the portion of waterbodies that had not been assessed, which indicates how well states have met their obligations to monitor waterways as required. All of these metrics together provide insight into how well states are implementing the Clean Water Act and protecting the overall health of U.S. waterways. [66]

Overall, we found that states designated 725,856 miles of rivers and streams as impaired for at least one use, or 51 percent of all assessed rivers and streams. The states classified 11.2 million acres of lakes, ponds, and reservoirs as impaired, which was 55 percent of the assessed lake acres. In terms of bays and estuaries, the states categorized 19,561 square miles of bays, estuaries, and harbors as impaired, or 26 percent of the total assessed.[67]

In general, the states that designated the most miles or acres of waterways as impaired tended to be larger states that have more water resources and/or more robust monitoring and assessment programs. We also found that some of the most rural and wooded states – such as Alaska and Vermont – classified the smallest percentage of their monitored waters as impaired, while some of the more urban states – such as New Jersey, Delaware, and Illinois – categorized the highest percentages of their monitored rivers, streams, and lakes as impaired.

Rivers and Streams

Rivers and streams vary in size, length, and flow, and they include both perennial waterways (which flow year-round) and intermittent or ephemeral streams (which flow only after large rain events or during wetter parts of the year). While many states count intermittent and ephemeral streams in their total miles, not all choose to monitor these streams.[68] One reason state regulators say they focus only on year-round waterways is that it is more challenging to sample for water quality in streams that are dry half the year or more. There also tend to be a lot more intermittent streams than year-round waterways in some states, and with limited resources, state agencies prioritize the perennial waterways.

Oregon has the most overall miles of rivers and streams categorized as impaired for any use (122,800 miles), followed by California (83,361 impaired miles), and Michigan (54,687 impaired miles). Changing water temperatures are responsible for impairing three quarters of Oregon's river and stream miles, because many streams have become too warm to provide a healthy habitat for cold water fish or other aquatic life.[69] Stream temperatures can increase when flow rates are reduced by the diversion of waters for irrigation or when agricultural and urban runoff reduce water depth by filling streambeds with sediment. Other causes include the removal of trees and vegetation that help to shade and cool streams. Reversing the loss of forest and vegetative buffers and protecting streams from runoff may become even more important if climate change, which brought such extreme heat to Oregon last summer, continues to drive hotter weather.

The following table breaks down which states have the most river and stream miles categorized as impaired for various designated uses.

TABLE 6: ASSESSED RIVERS AND STREAMS IMPAIRED FOR DIFFERENT USES

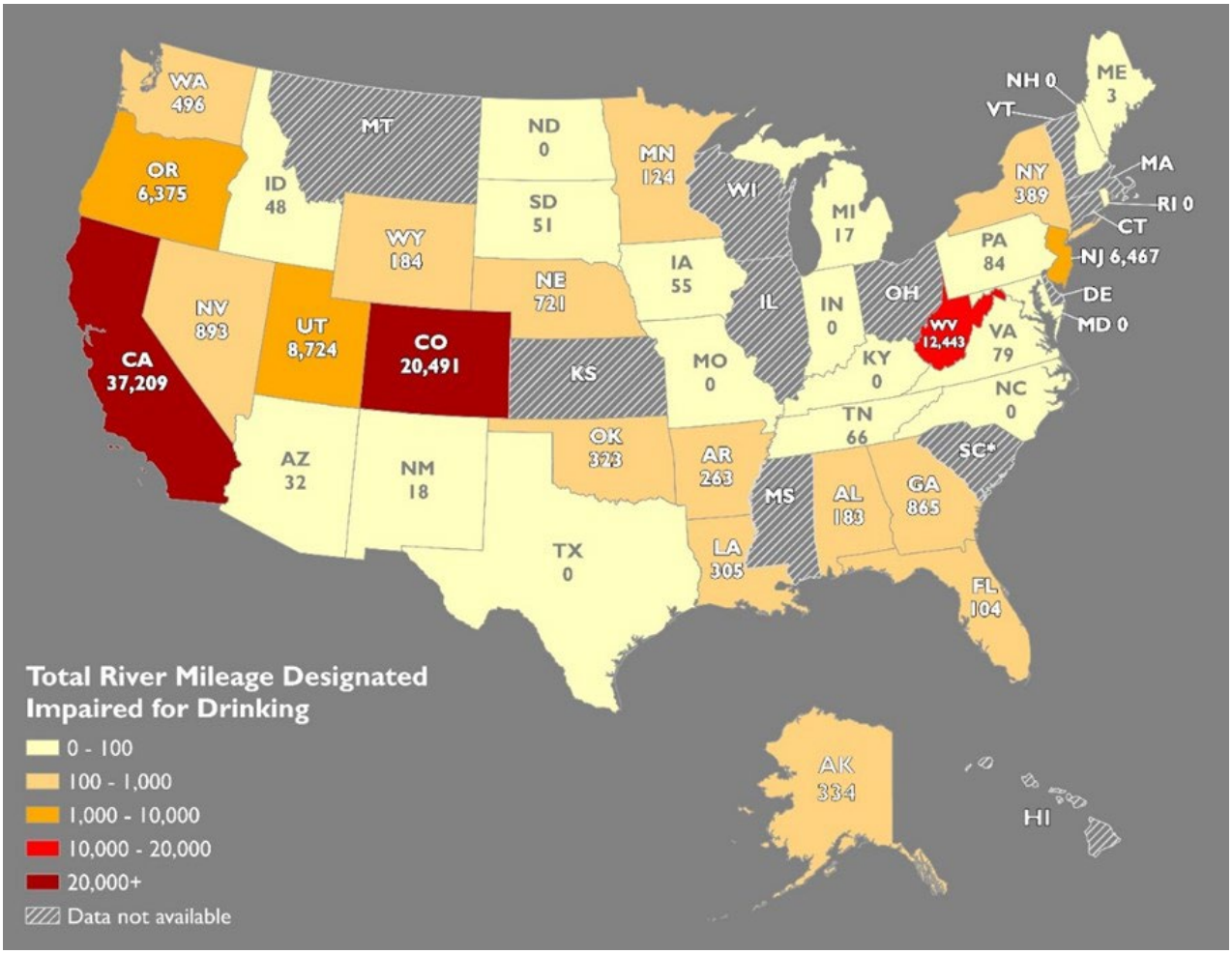
Designated Use	Total Miles Assessed	Total Miles Impaired	Total % Impaired	Top Three States with Most Miles Impaired	% of Assessed Deemed Impaired	State Rank (by %)
Aquatic Life	1,174,369	493,369	42%	Oregon (112,976)	81%	4
				California (61,617)	65%	10
				Utah (34,910)	65%	9
Recreation	653,443	247,764	38%	Indiana (24,395)	73%	11
				Oregon (17,619)	58%	15
				S. Carolina (16,766)	74%	9
Fish Consumption	419,403	195,837	47%	Michigan (51,675)	96%	7
				Maine (35,029)	100%	1
				California (24,934)	33%	21
Drinking Water Supply	337,339	97,345	29%	California (37,209)	56%	4
				Colorado (20,491)	33%	8
				West Virginia (12,443)	58%	3

All figures above are for assessed rivers and streams. Source: Most recent state Integrated Reports filed with EPA. All waters above are assessed rivers and streams.

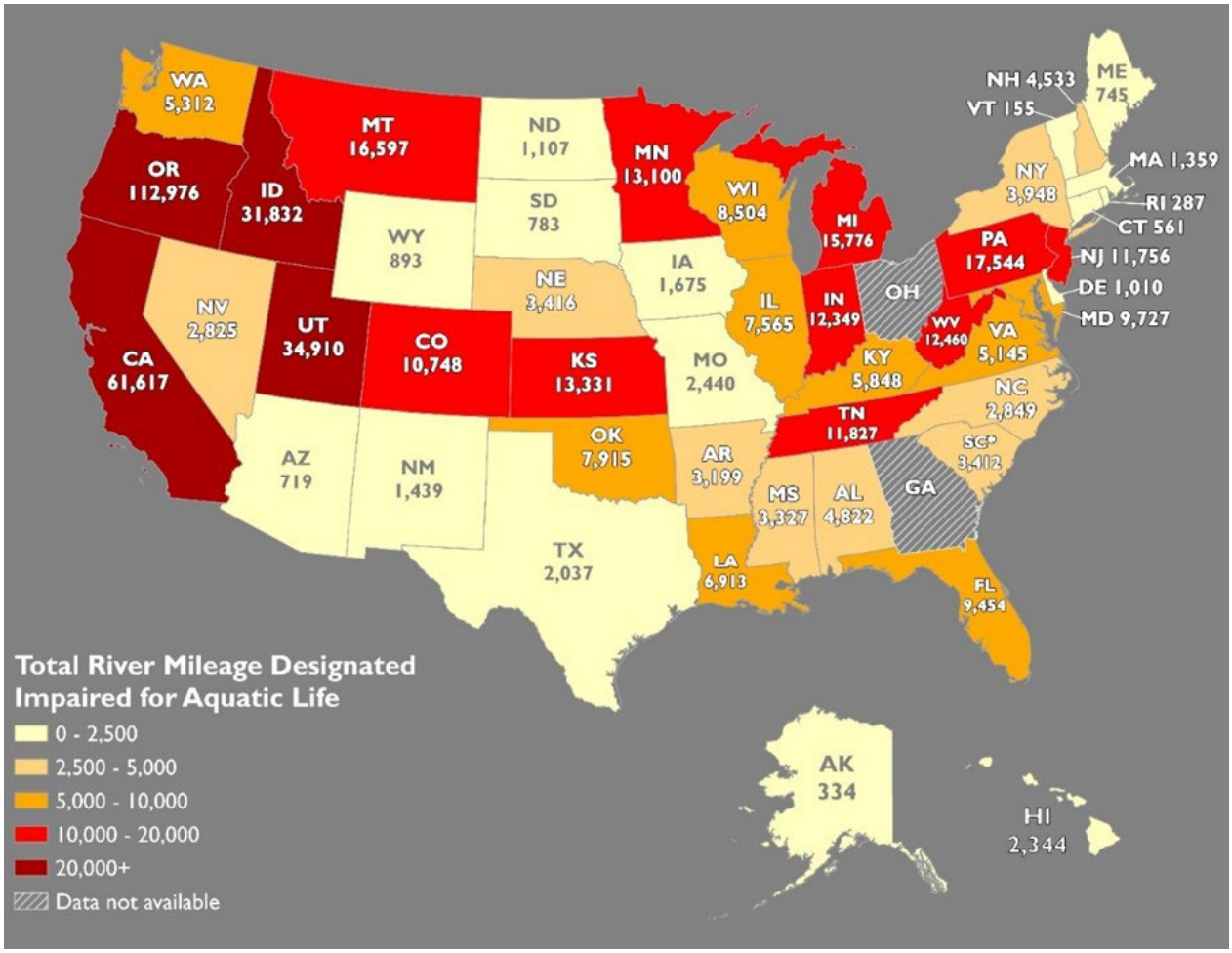
At the healthier end of the clean-water spectrum, Colorado, Vermont, and Maine report that only two or three percent of their assessed river and stream miles are impaired for swimming or other forms of water-contact recreation. At the dirtier end of the scale are states including Iowa, which classifies 93 percent of its assessed rivers and streams as impaired for swimming and recreation, and Michigan (95 percent impaired).[70]

Looking at the category of drinking water impairments, the states with the most total miles of rivers and streams listed as impaired as sources of drinking water are California (37,209 miles), Colorado (20,491 miles), and West Virginia (12,443 miles). This means that municipalities in these states that draw drinking water from rivers and streams must subject that water to more extensive (and expensive) treatment to make it safe for human consumption.

MAP 2: RIVER & STREAM MILES IMPAIRED FOR DRINKING WATER



MAP 3: RIVER & STREAM MILES IMPAIRED FOR AQUATIC LIFE



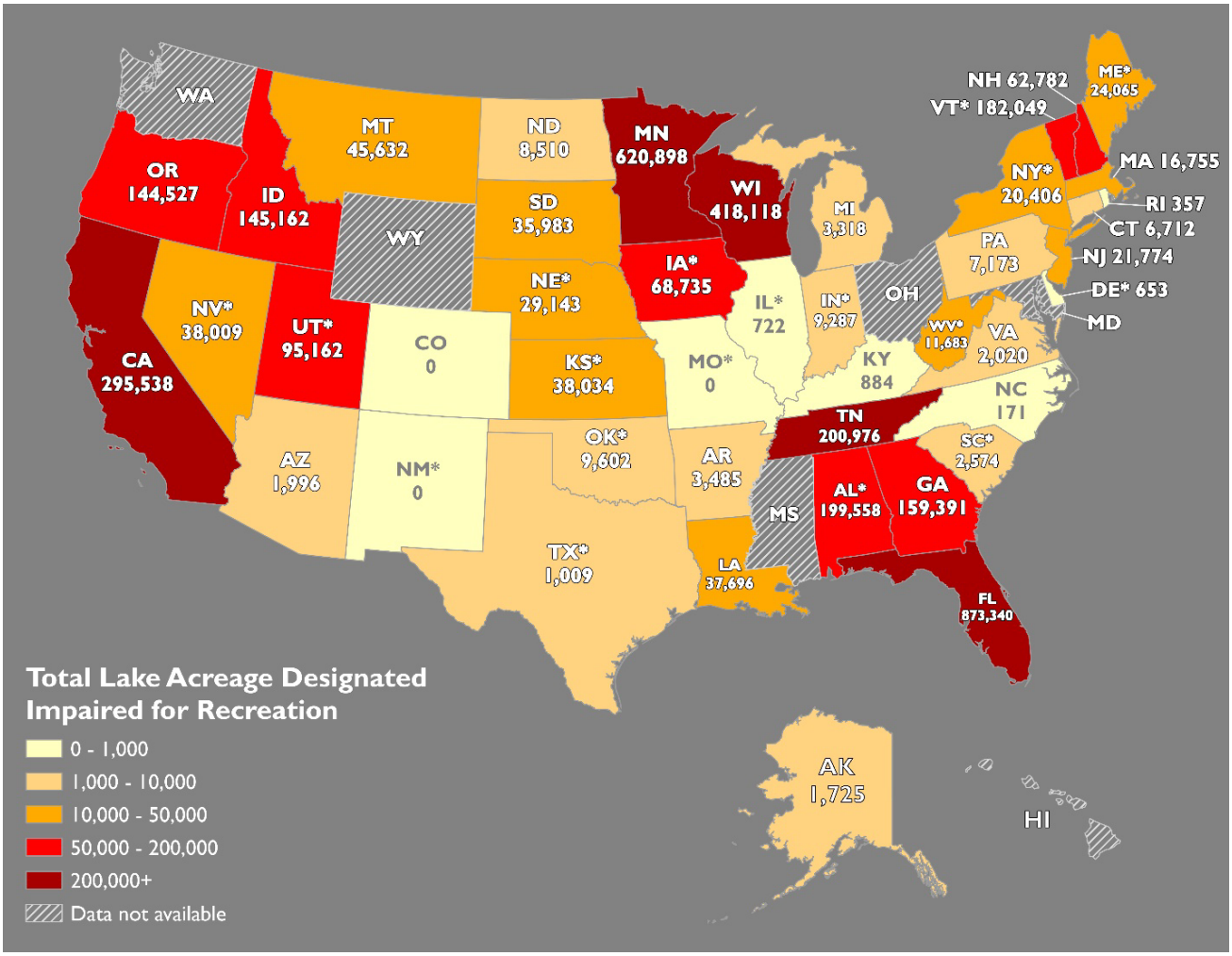
The states with the most total miles of rivers and streams listed as impaired for aquatic life tend to be in the West, including Oregon, California, and Utah. The states with the fewest are Vermont, which has only 155 miles of waterways impaired for aquatic life, and Alaska (334 miles.)

Lakes and Reservoirs:

This category includes lakes, ponds, and reservoir acres reported by states, but it does not include the Great Lakes, which the states and EPA classify separately. A few states, like Massachusetts and Mississippi, choose to include only lakes of a certain size in their assessments. As mentioned earlier, more than half – 55 percent – of assessed lake acres nationally have been designated as impaired for at least one use.

The map below shows which states have the highest total number of acres listed as impaired for swimming and other forms of water contact recreation, including Florida, (873,340 acres), Minnesota (620,898 acres), and Wisconsin (418,118 acres).

MAP 4: LAKE ACRES IMPAIRED FOR SWIMMING AND WATER CONTACT RECREATION[71]



Note: Lake acre figures above do not include the Great Lakes, which EPA classifies separately. States with asterisks reported useable data only for swimming and other primary water contact recreation impairments, not secondary water contact recreation impairments

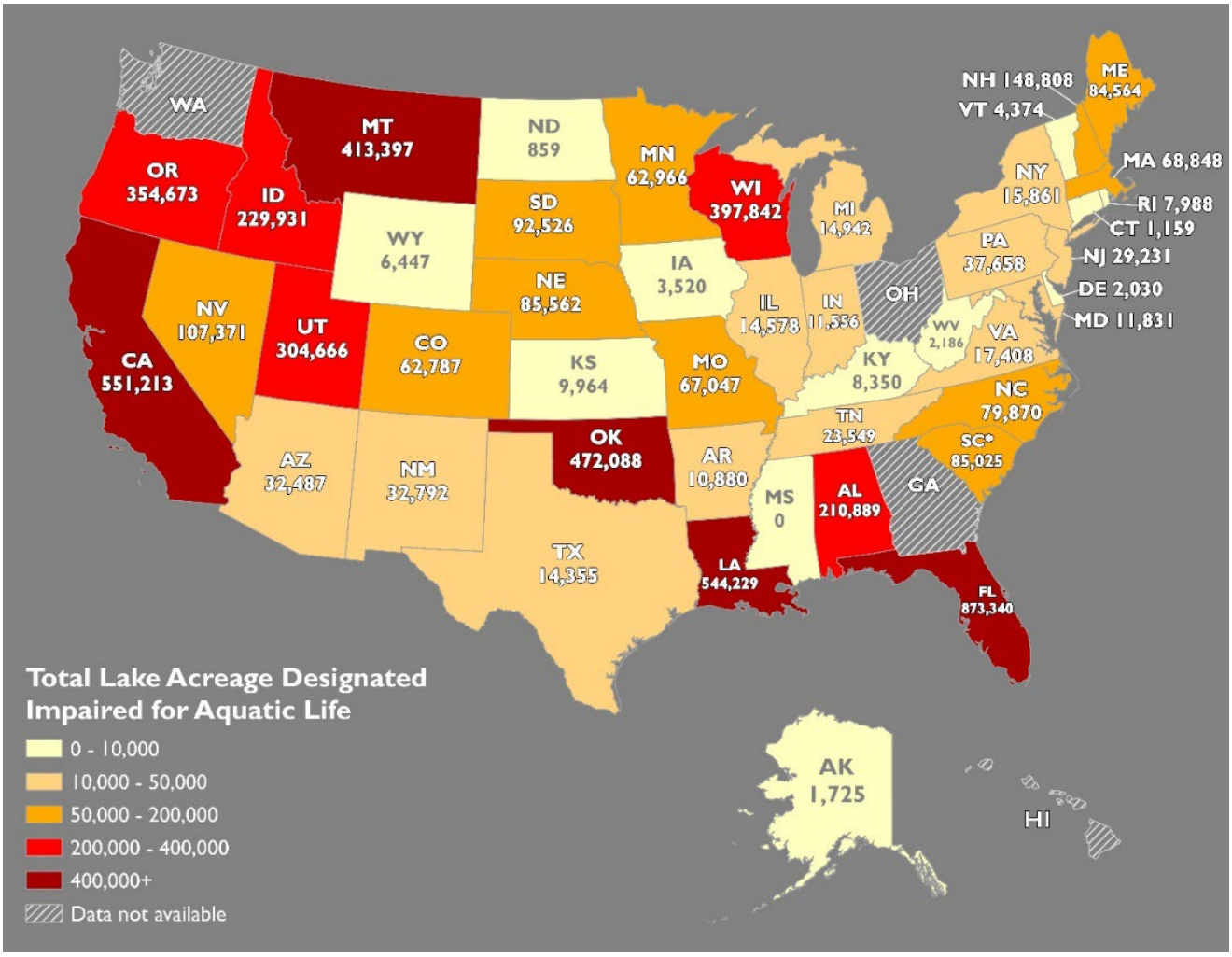
Examining lake impairment numbers by other designated uses, more than two thirds of the acres assessed for fish consumption in the U.S. are classified as impaired (many because of mercury), as are one third of the acres assessed for aquatic life. The following table lists the states with the largest areas of impaired lakes.

TABLE 7: ASSESSED U.S. LAKES IMPAIRED FOR DIFFERENT USES

Designated Use	Acres Assessed	Acres Impaired	% Impaired	Top Three States with Most Acres Impaired	% of Assessed Deemed Impaired	State Rank (by %)
Aquatic Life	16,712,149	5,613,369	34%	Florida (873,340)	80%	9
				California (551,213)	66%	17
				Louisiana (544,229)	95%	4
Recreation	15,373,880	3,845,611	25%	Florida (873,340)	80%	4
				Minnesota (620,898)	28%	20
				Wisconsin (418,118)	70%	7
Fish Consumption	10,943,113	7,397,511	68%	Minnesota (1,687,240)	97%	6
				Maine (986,952)	100%	1
				Florida (766,841)	92%	11
Drinking Water Supply	8,831,357	1,028,193	12%	Oregon (362,189)	95%	2
				Georgia (128,398)	46%	8
				Kansas (111,487)	59%	5

All numbers above are for assessed lakes, not including the Great Lakes. Source: Most recent state Integrated Reports filed with EPA.

MAP 5: LAKE ACRES IMPAIRED FOR AQUATIC LIFE



Note: the numbers on this map do not include the Great Lakes. Data from most recent available state Integrated Reports submitted to EPA.

Great Lakes:

EPA categorizes the Great Lakes differently than other inland lakes. Some parts of the Great Lakes are international waters, shared with Canada, making responsibility for them more complex. And the states bordering the Great Lakes also use different methods for evaluating and classifying these water bodies. There are some states, like Michigan, Illinois, Indiana, Ohio, and Minnesota, that assess the open waters of their neighboring Great Lakes. But other states, like Wisconsin, New York, and Pennsylvania do not assess open waters, and instead only evaluate shores and beaches. Here are some examples of what the states have reported to EPA about impairments in the Great Lakes:

Wisconsin: As mentioned earlier, Wisconsin does not assess the open waters of either Lake Michigan or Lake Superior. However, the Badger State has about 1,000 miles of Great Lakes shorelines, and Wisconsin told EPA in its most recent report that the state had assessed 578 of these miles for fish consumption and concluded that all of them were impaired. Wisconsin has 192 miles of beaches, but it assessed only 105 of them for recreation. The state concluded that only 10 percent (or 11 miles total) of these beaches were impaired for swimming or other forms of recreation.

Illinois: Wisconsin's southern neighbor handles the same lake (Lake Michigan) differently. Unlike Wisconsin, Illinois does assess the open waters of Lake Michigan. The Land of Lincoln assessed 196 square miles of open lake, and it classified 100 percent of those miles as impaired for fish consumption but clean enough for swimming and water-contact recreation. The state also has 64 linear miles of shoreline, and Illinois has designated all those linear miles as impaired for water-contact recreation. In other words, Illinois has concluded that its Lake Michigan beaches (including those along Chicago's "Gold Coast" on the North Side) are often unsafe for swimming and water-contact recreation because of high bacteria levels, but that – farther out, into the lake – the lake is safe for both swimming and boating.

Michigan: The state of Michigan, which borders four of the five Great Lakes, assesses both the open water of these lakes and the health of their shorelines. Michigan designated 100 percent of the 18,267 square miles of assessed open water in its portions of the Great Lakes as impaired for fish consumption. But the state either had insufficient information or did not sample enough to determine the impairment status of other uses of open water, such as to support aquatic life. Michigan has more than 3,000 miles of Great Lakes shorelines, but it only assessed 240 of these miles for water contact recreation, concluding that only two percent of these (or 5.8 miles) were impaired for swimming and recreation.

Minnesota: Minnesota's portion of Lake Superior, the largest freshwater lake in the world (by surface area), includes about 1.6 million acres of open water. The state has classified all of these acres as impaired for fish consumption. The Gopher State also has 208 miles of shoreline along Lake Superior. But in its most recent report to EPA, Minnesota reported that it has assessed only 10 of these miles for swimming and other water-contact recreation. The state concluded that 10 percent of those miles (or one mile, total) are impaired for recreation.

Ohio: This state borders Lake Erie and has concluded that 23 percent of the lake's open waters, or 662 square miles, are impaired for swimming or other water-contact recreation. The picture is worse, however, for drinking water and fishing. One hundred percent of Lake Erie's surface waters in Ohio are impaired for fish consumption. And although many Ohio cities draw their drinking water from Lake Erie, 99.6 percent of the lake that has been assessed (3,555 out of 3,568 square miles) has been designated by the state as impaired for drinking water. This means cities, including Toledo, must expend additional effort and funds to treat the water and try to make it safe enough for human consumption. Those water purification efforts do not always work, however. In August 2014, Ohio declared a state of emergency when toxic algae blooms in Lake Eric contaminated Toledo's drinking

water system, sickening more than 100 people and forcing a temporary ban on the drinking of tap water for almost half a million people.[72]

For information on Great Lakes assessments by the states of New York, Pennsylvania, and Indiana, see the data resources and links listed for each state in Appendix C.

Estuaries:

The estuary category includes bays, harbors, and estuaries in coastal states. Overall, about a quarter of the 76,555 square miles of estuaries assessed in the U.S. are classified by the states as impaired for at least one public use, with Louisiana, Florida, Maryland, and Virginia having the largest areas of impaired waters. Maryland and Virginia make the list because they surround the Chesapeake Bay, the largest single estuary in the U.S., all of which is impaired because of low oxygen levels and algae growth fueled by excessive amounts of nitrogen and phosphorus pollution.[73]

TABLE 8: STATES WITH MOST SQUARE MILES OF IMPAIRED ESTUARIES

State	Assessed (Sq. Miles)	Impaired (Sq. Miles)	% Impaired
Louisiana	6,079	5,574	91.7%
Florida	2,544	2,533	99.6%
Maryland	2,403	2,404	100.0%
Virginia	2,449	2,137	87.3%
Texas	2,610	1,248	47.8%
North Carolina	3,210	949	29.6%
California	834	832	99.8%
Delaware	775	775	100.0%
Alabama	784	634	81.0%
New Jersey	650	630	97.0%

Source: Most recent state Integrated Reports filed with EPA.

Of the 31,000 square miles of estuarine waters across the U.S. assessed for swimming or water contact recreation, 20 percent were deemed impaired for this use. About 40 percent of estuary miles are classified as impaired for aquatic life, 38 percent for shellfish consumption, and 43 percent for fish consumption. The table below details the numbers for the states with the highest totals and percentages, broken down by use.

TABLE 9: ASSESSED ESTUARIES LISTED AS IMPAIRED FOR DIFFERENT USES

Designated Use	Assessed (Sq. Miles)	Impaired (Sq. Miles)	% Impaired	Top Three States with Most Square Miles Impaired	% of Assessed Deemed Impaired	State Rank (by %)
Aquatic Life	33,026	13,367	40%	Louisiana (3,861) Virginia (2,128) Maryland (1,348)	64% 88% 60%	10 6 11
Recreation	31,369	6,235	20%	Louisiana (3,880) Florida (853) California (513)	64% 33% 92%	7 9 1
Fish Consumption	25,069	10,766	43%	Maine (2,875) Florida (2,506) Virginia (2,056)	100% 99% 99%	1 3 5
Shellfish Consumption / Harvesting	22,824	8,617	38%	Maine (2,875) Louisiana (2,239) Florida (1,029)	100% 42% 61%	1 9 8

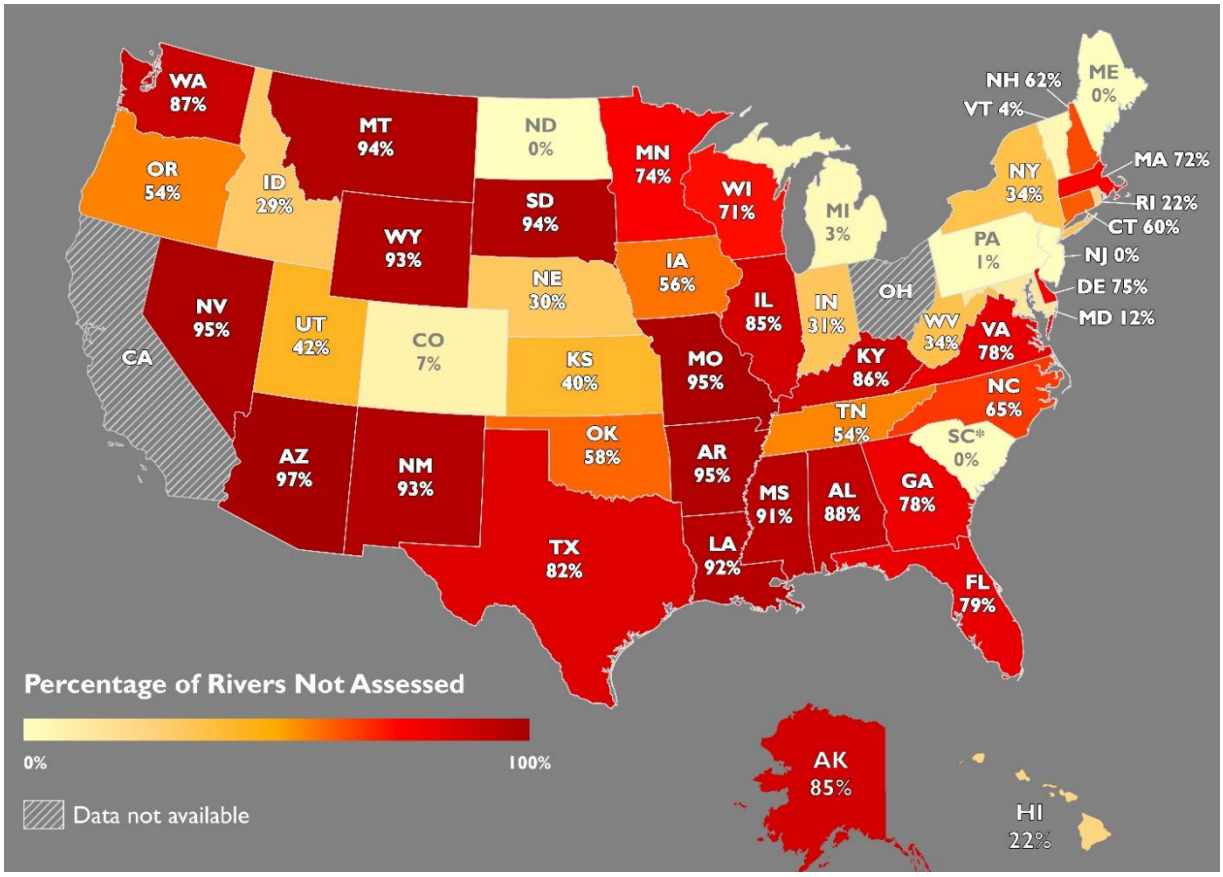
Note: All numbers above are for assessed estuaries. Source: Most recent state Integrated Reports filed with EPA.

Unassessed Waterways

States need to regularly monitor waterways to determine if they meet water quality standards. While states are required to use all relevant data to make their listing and de-listing decisions, recently collected data are better for making decisions based on current water quality conditions. For this reason, the states generally require the use of sampling data no older than six to 10 years, depending on the state. However, very few states manage to assess all their waterways within the time frames established by state requirements. This lack of monitoring is in part because state environmental agencies often lack enough funding to sample all rivers, streams, and lakes on a regular basis, and many state agencies have experienced severe budget cuts in recent years that have caused staffing shortages.[74] Some states, as previously mentioned, like Tennessee and Connecticut, indicate that they prioritize monitoring and assessment in their most polluted waterways.[75] Some arid states, such as Arizona, find it difficult to assess waterways that often run dry. The result of all these factors is that only about a quarter of all river and stream miles across the U.S. have been assessed by state agencies within the required time frames in the most recent assessment cycle, and only about half of lake acres.[76]

Some states have been more diligent than others in sampling and classifying all their waterways within the mandated time periods. For example, New Jersey and North Dakota have assessed 100 percent of their states' rivers and streams.[77] By contrast, Missouri has assessed only five percent of its rivers and streams as required in the most recent assessment cycle.

MAP 6: PERCENT OF RIVER & STREAM MILES NOT ASSESSED IN LAST SIX TO TEN YEARS



Percentages are of river and stream miles not assessed as required during the most recent cycle of 6 to 10 years, depending on the state.

TABLE 10: PERCENT OF U.S. WATERS UNASSESSED FOR ANY USE

Waterbody Type (unit)	States with Highest % of Unassessed Waters	States with Most Unassessed Waters
Rivers, Streams, and Creeks (miles)[78]	Arizona (97) Missouri (95) Nevada (95)	Alaska (609,704) Montana (345,568) Wyoming (249,434)
Lakes, Ponds, and Reservoirs (acres)	Wyoming (96) Alaska (83) Arkansas (81)	Alaska (10,596,310) Arkansas (1,221,474) Louisiana (914,420)
Bays, Estuaries, and Harbors (sq. miles)	Massachusetts (91) Georgia (90) Texas (38)	Massachusetts (2,482) Texas (1,567) Florida (1,081)

Source: Most recent state Integrated Reports filed with EPA.

State Profiles:

The following are profiles of five states with significant water pollution problems – Florida, California, Louisiana, Iowa, and Delaware – and a discussion of their impairments and major sources of pollution.

Florida

Florida is renowned as a vacation destination, but just beyond the beautiful beaches, pollution looms large in the background of the postcard picture.

A pond with water lilies and swamp grass on the Anhinga trail in Everglades National Park, Florida.

The Sunshine State ranks first in the U.S. for total acres of lakes classified by states as impaired for swimming and aquatic life (873,340 acres), and second for total lake acres listed as impaired for any use (935,808 acres). Florida also has the second most total square miles of impaired estuaries (2,533 square miles), behind only Louisiana.

Not only does water pollution threaten Florida's reputation as a holiday getaway, but it also jeopardizes the health of the Everglades, which are home to numerous rare and endangered species, including crocodiles, panthers, and manatees. In the Everglades and throughout Florida's lakes, harmful toxic algae blooms have become an almost annual event fed by fertilizer runoff from farms and subdivisions.

In May 2021, the National Oceanic and Atmospheric Administration (NOAA) reported that nearly two-thirds of Lake Okeechobee, a 730-square-mile freshwater body in south Florida that is sometimes referred to as the liquid heart of the state, was blanketed in blue-green algae. After expanding rapidly over a few weeks, the extensive bloom fueled heated debate between state and federal authorities over how to better manage South Florida's water pollution crisis.[79]

Throughout much of the 20th Century, the lake's natural inflows and outflows were disrupted to encourage agricultural and urban development across the central and southern parts of the state.[80] In the wet season, water in Lake Okeechobee is sent downriver to the Caloosahatchee and St. Lucie estuaries. This results in massive amounts of nutrient-laden water entering these ecologically delicate waterbodies and feeding excessive algal blooms.[81]

These blue-green algae blooms can be toxic not only to local wildlife, but to people drinking the water or even breathing the air nearby. A 2018 study led by scientists at Florida Atlantic University found public health problems, including irritation of the lungs and eyes, correlated to large algae blooms in the St. Lucie River in the summer of 2018. [82] As the toxicity of the river samples increased, so did the concentration of microcystins found in nasal swabs of nearby residents and workers. Microcystins are the most widespread cyanobacterial toxins produced by blue-green algae. Exposure to this algae (also known as cyanobacteria) can produce allergic reactions such as skin rashes, eye irritations, and respiratory symptoms.[83]

Mercury pollution is also a cause for concern in the Everglades. A 2020 report published by the South Florida Water Management District revealed levels of mercury in different species of fish and wildlife that were in certain cases far higher than EPA standards for aquatic life.[84] Another recent study found that an iconic bird of the Everglades -- great egrets -- could face population declines because they are losing sexual motivation because of mercury in the fish they eat.[85]

FACTS ABOUT IMPAIRED WATERS IN FLORIDA

Category	Size Impaired	% Impaired of Assessed	Rank in U.S.
Lake acres impaired swimming & recreation	873,340 acres	80%	1st (for total acres)
Lake acres impaired for aquatic life	873,340 acres	80%	1st (for total acres)
Lake acres impaired (for any use)	935,808 acres	89%	2nd (for total acres)
Estuary miles impaired (for any use)	2,533 sq. miles	99.6%	2nd (for total acres)

Source: Most recent state Integrated Report filed with EPA. Percentage impaired is of assessed waters, not total waters. See Appendix B for limitations involved with ranking.

California

California is a big state with water quality issues equal to its size. While drought is the water challenge that gets the most media attention, the state's rivers, lakes, and estuaries also have some of the highest pollution impairment numbers in the country.

In fact, drought is a major driver of downstream pollution problems in the state. Regular river flows and reservoir releases are important in maintaining water quality for aquatic species. During drought, low flows and elevated water temperatures reduce oxygen levels in water bodies throughout California. These dire conditions can lead to damaging algal blooms and increased water salinity.[86]

California spends around $10 billion to control water pollution each year, most of which goes towards improving wastewater treatment facilities and other direct sources of pollution. The build-up of salt in many streams and basins, which can also be drought-driven, increases water-treatment costs. Not only does salt from the ocean infiltrate over-used groundwater basins, but salt is also introduced via fertilizers, animal waste and urban runoff.[87]

The Hyperion Water Reclamation Plant, which has been operating since 1894, is Los Angeles' oldest and largest wastewater treatment facility. In July 2021, it spilled 17 million gallons of partially treated sewage into Santa Monica Bay.

"One thing that unites California is that runoff is the largest source of pollution to our rivers, creeks, bays and coastline," said Bruce Reznik, Executive Director, Los Angeles Waterkeeper and President, California Coastkeeper Alliance. "From the combined stormwater and sewage infrastructure in the San Francisco Bay Area that results in chronic sewage spills during storm events, to the agricultural runoff from massive farms that contaminates our central valley and coast, to the heavily concretized and channelized cities in Southern California whose infrastructure acts as a superhighway sending a toxic soup untreated urban runoff into local waters, it's major problem."

Sewage overflows are also a chronic problem. In late December 2021, at least 8.5 million gallons of untreated sewage spilled into a flood-control waterway in Los Angeles County called the Dominquez Channel from a 1960s-era pipe, causing at least five beaches to close.[88]

In another example, flooding at the Hyperion Water Reclamation Plant in El Segundo in July 2021 spilled 17 million gallons of partially treated sewage into Santa Monica Bay,

contaminating beaches.[89] At least 29 million gallons of sanitary sewage overflows occurred across the state in 2021, which was above the average for the previous four years.[90]

"As the two massive sewage spills in the LA region over the past year demonstrate, we need the federal government to dramatically increase our investment in our wastewater infrastructure as happened in the years after the passage of the Clean Water Act," said Reznik. "We need this not only to reduce spills and safeguard public health, but also to modernize our entire system so we can purify and reuse wastewater to droughtproof the region's water supplies and reduce water imports."

FACTS ABOUT IMPAIRED WATERS IN CALIFORNIA

Category	Size Impaired	% Impaired of Assessed	Rank in U.S.
Percent estuaries impaired for fish consumption	816 square miles	100%	1st (for %, tied)
River miles impaired for drinking water	37,209 miles	56%	1st (for total miles)
River miles impaired for fish consumption	24,934 miles	33%	3rd (for total miles)
Lake acres impaired (for any use)	828,564 acres	92%	3rd (for total acres)
Percent of estuaries impaired (for any use)	832 square miles	99.8%	4th (for %)
Percent of rivers impaired (for any use)	83,361 miles	87%	4th (for %)

Source: Most recent state Integrated Report filed with EPA. Percentage impaired is of assessed waters, not total waters. See Appendix B for limitations involved with ranking.

Louisiana

The Mississippi River near Oak Valley Plantation, LA. Many industrial facilities line the Mississippi River as it runs through Louisiana, especially between Baton Rouge and New Orleans.

Louisiana is a low-lying state home to bayous and the terminus of the mighty Mississippi River. In large part due to the connectivity of its waterways, Louisiana has developed over the last century into an industrial hub – especially along the state's river corridor between Baton Rouge and New Orleans, which is sometimes referred to as Cancer Alley. Toxic water pollution from the petroleum and chemical industries taints the state's abundant waterways and dampens the state's tourism and outdoor recreation industries.

Louisiana has the largest expanse of estuaries classified as impaired than any other state in the U.S., with 5,574 square miles, or 92 percent of those assessed, listed as impaired for any use, according to the most recent state report to EPA. A report from Environment America found Louisiana to be the third worst state in America for toxic releases into waterways, after Indiana and Texas.[91]

Cheap natural gas produced by hydraulic fracturing over the last decade has fueled an explosive growth of industry along Louisiana's waterways. This has only increased the challenges the state faces when it comes to cleaning up its bayous and rivers and meeting the demands of the Clean Water Act. After decades of polluting the state's waterways, in April 2021, nine Lake Charles chemical companies and oil refineries agreed to pay $5.5 million to the federal government for improper disposal of pollution into waterways. The settlement is just one in a series of legal actions by state and federal officials recently against more than a dozen Lake Charles-area industrial facilities for polluting the river basin with toxic chemicals and heavy metals, including dioxin and mercury.[92]

Small septic tanks[93] that serve individual homes and businesses and are unconnected to sewage treatment plants are also a major source of water pollution in the state, including in Lake Pontchartrain, located just north of New Orleans. In some parishes surrounding the lake, up to two-thirds of homes are served by individual septic systems that often flush their waste directly into ditches behind houses.[94]

In addition, the Midwestern states upstream from Louisiana contribute large amounts of nitrogen and phosphorus pollution from farm fertilizer into the Mississippi River, which flows south into Louisiana's waters. This feeds a large "dead zone" off the mouth of the Mississippi that deprives fish, crabs, shrimp, and oysters of the oxygen they need to live. And increasingly, this dead zone starves fishermen of their livelihoods.

FACTS ABOUT IMPAIRED WATERS IN LOUISIANA

Category	Size Impaired	% Impaired of Assessed	Rank in U.S.
Estuary area impaired (for any use)	5,574 square miles	92%	1st (for total)
Percent of lakes impaired (for any use)	552,398 acres	97%	4th (for %)
Percent rivers & streams impaired (for any use)	8,295 miles	86%	6th (for %)
Percent lakes impaired for aquatic life	544,229 acres	95%	4th (for %)

Source: Most recent state Integrated Report filed with EPA. Percentage impaired is of assessed waters, not total waters. See Appendix B for limitations involved with ranking.

Indiana

Mention the Hoosier State and several things come to mind. The roar and boom of Notre Dame football, perhaps the blur of Indy cars speeding around the track. Maybe visions of picturesque farmland and swimming holes with rope swings.

Behind that beautiful image, however, all that farmland contributes to tens of thousands of miles of polluted rivers in Indiana.

Based on the most recent reports provided by the state to EPA, Indiana ranks first in the U.S. in the total number of river and stream miles classified as impaired for swimming and water-contact recreation. Of 33,559 assessed river and stream miles in the state, 24,395 (or 73 percent) are listed as impaired for recreation, meaning they have so much fecal bacteria and other contaminants that they are not safe for swimming, tubing, or other water contact activities. (Ranked by *percentage* of river miles assessed, Indiana ranks 11th.) In other words, do your research before cooling off in Indiana rivers.

The West Fork White River, Indiana. One of many rivers impacted by excess nutrient loads and E. Coli.

Farm runoff is a main driver of water pollution in Indiana and many other states. More than half (58 percent) of Indiana's land area is dedicated to agriculture.[95] Livestock waste and excessive fertilizer applications are the main source of non-point water pollution in Indiana rivers, according to the Hoosier Environmental Council.[96] During periods of rain or melting snow, sediment and nutrients from manure or chemical fertilizer are washed off of crop fields into the state's waterways. This runoff has two major consequences: high concentrations of *E. coli* bacteria and the growth of harmful algae, including cyanobacteria.

The Indiana Department of Environmental Management (IDEM) lists *E. coli* as the top cause of impairment of Indiana rivers and streams. Industrial-style animal production, including in concentrated animal feeding operations (CAFOs), is largely to blame, according to IDEM.[97] Indiana has 855 CAFOs.[98]

"Indiana's waters have benefited from the Clean Water Act, but unfortunately, they also illustrate some of the gaps in the law," said Dr. Indra Frank, Environmental Health & Water Policy Director for the Hoosier Environmental Council. "We have seen persistent, unresolved impairments, especially for *E coli* bacteria in our rivers and streams, in part from industrial agricultural runoff. And unfortunately, we have also seen examples of Clean Water Act permits used to send water contaminated with coal ash into our rivers. We need to halt pollution like this."

As excess nutrients from animal waste and chemical fertilizers accumulate in Indiana waters, blue green algae, also known as cyanobacteria, is also a growing problem. Agricultural runoff contains high amounts of nitrogen and phosphorus, two key nutrients for cyanobacteria growth.

In 2019, Indiana issued 44 alerts for harmful algal blooms at 16 beaches.[99] By 2020, that increased to 80 alerts for 18 beaches.

Toxins released by an increasing frequency of cyanobacteria blooms is forcing Indiana communities to spend additional funds on treating public drinking water, according to IDEM.[100] A 2015 Indiana Finance Authority report notes that 80 percent of surveyed drinking water utilities said they experienced limitations of water yields due to poor water quality, partially due to excess nutrients in runoff.[101]

Indiana's water quality issues are not unique, many states dominated by agricultural land face similar obstacles. Unfortunately, Indiana's water pollution extends beyond state borders, with 90 percent of rivers and streams in Indiana's 92 counties draining into the Mississippi and then downstream to the Gulf of Mexico.[102]

FACTS ABOUT IMPAIRED WATERS IN INDIANA

Category	Unit Impaired	% Impaired of Assessed	Rank in U.S.
Total river & stream miles impaired for swimming and recreation	24,395 miles		1st (for total miles)
Percentage of assessed river & stream miles impaired for swimming and recreation	24,395 out of 33,599 assessed	73%	11th (for %)
River & stream miles impaired for fish consumption	5,565 miles out of 8,891 assessed	63%	14th (for %)
Percent river miles impaired (for any use)	29,697 miles out of 43,656 assessed	68%	19th (for %)

The above table shows Indiana's waterway impairment designations, as reflected in the most recent available semi-annual state Integrated Reports submitted to EPA. Percentage impaired is of assessed waters, not total waters.

Iowa

Iowa is America's hog capital – and also one of the most unhealthy areas in America to swim in rivers and streams. That's in part because of the vast amounts of hog waste and farm runoff polluting the state's waterways.

According to the most recent state data, Iowa has the fourth highest percentage in the U.S. of assessed river and stream miles and lake acres classified as impaired for water contact recreation. The state reports that 93 percent of its 4,921 miles of assessed waterways are impaired for swimming and recreation. Eighty three percent of Iowa's 83,233 assessed acres of lakes are also listed by the state as impaired for water contact recreation.

Agriculture is the main driver of water pollution in Iowa. More than 30 million acres of Iowa's land, or over 85 percent, is farmland.[103] The Hawkeye State is the leading pork-producing state in the nation, with nearly one-third of the country's hogs raised there.[104] The state's 23 million pigs produce as much feces as 83 million people.[105]

Manure spills at Iowa's hog farms are very damaging. The state has suffered nearly 500 manure and fertilizer spills and releases since 2011, killing nearly two million fish.[106] For example, in April 2021, state environmental officials investigated a pair of liquid manure spills totaling hundreds of thousands of gallons that killed a large number of fish in Kossuth and Lyon counties in the northern part of the state.[107] In July 2018, state environmental officials said a hog manure tank leak likely caused a fish kill along four miles of a tributary to the North Raccoon River in northwestern Iowa.[108]

The Raccoon River in West Des Moines, Iowa, was named one of America's "most endangered rivers" in 2021 due to farm runoff.

"The whole system is very lax and a safe haven for industry," said Alicia Vasto, Water Program Associate Director with the non-profit Iowa Environmental Council. "The Clean Water Act is missing in action for many Midwestern states like Iowa due to the agricultural exemption" in the law for most runoff pollution.

Many residents of Des Moines, Iowa's largest city, live under constant threat of their drinking water being contaminated with nitrates from upstream farm fertilizer runoff. Over the summer of 2020, the Des Moines Water Works, which serves more than 500,000 people, was forced to start planning emergency measures due to high nitrate levels in the utility's two main water sources, the Raccoon and Des Moines rivers. After failing for years to convince farmers upstream to reduce fertilizer runoff, the utility is now planning to spend up to $30 million to drill new drinking water wells and mix in purer water from these wells when the rivers have especially high nitrate levels.[109]

In 2020, blue-green algae blooms and low flows on the Raccoon and Des Moines rivers forced Des Moines Water to use water from emergency reservoirs and storage wells. The Raccoon River, which runs from northern Iowa down to Des Moines, was named one of America's Most Endangered Rivers in 2021 by American Rivers due to the pollution from the more than 750 factory farms in its watershed.[110]

FACTS ABOUT IMPAIRED WATERS IN IOWA

Category	Size Impaired	% Impaired of Assessed	Rank in U.S. for %
River & stream miles impaired for swimming & recreation	4,553 miles	93%	4th
Percent lakes impaired for swimming & recreation	68,735 acres	83%	3rd
Percent river miles impaired (for any use)	6,919 miles	83.6%	7th

Source: Most recent state Integrated Report filed with EPA. Percentage impaired is of assessed waters, not total waters. See Appendix B for limitations involved with ranking.

Delaware

Delaware is well known for its Atlantic beaches and wildlife refuges. But it's also a home to the chemical industry, factory farms, slaughterhouses, and suburban sprawl that contribute to significant amounts of water pollution.

Delaware classified as impaired the highest percentage of its rivers and streams of any state in the U.S., according to its most state recent reports filed with EPA, with 97 percent of the state's 1,104 miles of assessed waterways listed as impaired for one or more use. Delaware also reports that 100 percent of its 775 square miles of assessed estuaries are impaired.

Delaware River near New Castle, DE. The Delaware River watershed drains an area of 14,119 square miles in five U.S. states—New York, New Jersey, Pennsylvania, Maryland and Delaware.

Pollutants in Delaware's rivers and streams include fecal bacteria, excess nutrients (nitrogen and phosphorus), as well as pesticides, PCBs, and dioxins.[111] According to the EPA, most impairments in the state's waters come from polluted runoff from farms and suburban and urban areas. One problem is that Delaware's water and sewage infrastructure has

failed to keep up with a boom in residential and commercial real estate growth during the late 1990s and early 2000s.[112]

The state is also home to a large number of slaughterhouses and factory farms. Sussex County, Del., has one of the highest concentrations of slaughterhouses in the U.S.[113] Pollution caused by the meat plants includes wastewater with high levels of fecal bacteria that is sprayed onto corn fields. This odorous fluid seeps into the ground where it contaminates the drinking water wells of nearby homeowners.[114] More than 600 Millsboro, Del., residents alleged that a Mountaire Farms slaughterhouse contaminated their drinking water with nitrates.[115] In April 2021 a judge approved a $65 million payout to residents living near the plant.[116]

"Too many people here have no access to clean water coming out of the tap, especially in our poor and minority communities," said Maria Payan, an activist with the Socially Responsible Agriculture Project. "The fact that Delaware has the highest percentage of impaired rivers and streams in all of the U.S. shows there is a clear failure to protect public health here."

FACTS ABOUT IMPAIRED WATERS IN DELAWARE

Category	Size Impaired	% Impaired of Assessed	Rank in U.S. for %
Percent of rivers and streams impaired (for any use)	1,073 miles	97%	1st
Percent of estuaries impaired (for any use)	775 square miles	100%	1st (tied)
Percent of estuaries impaired for aquatic life	774 square miles	100%	1st (tied)
Percent of rivers and streams impaired for aquatic life	1,010 miles	94%	1st

Source: Most recent state Integrated Report filed with EPA. Percentage impaired is of assessed waters, not total waters. See Appendix B for limitations involved with ranking.

Conclusion and Recommendations:

There is no question that the federal Clean Water Act should be celebrated in its 50th year as a milestone in American environmental history. The law provided funding for thousands of upgrades to wastewater treatment plants and a significant reduction in raw human waste and industrial discharges pouring into rivers and streams.

To cite one high-profile example, the Potomac River flowing through the nation's capital was transformed by more than a billion dollars in improvements to the Blue Plains Wastewater Treatment Plant that were required by the Clean Water Act. Today, fishing tournaments, kayak rentals, and waterfront restaurants are now common along Washington's waterfront where a half century ago there were fetid algae blooms and lifeless waters. Another obvious example is that Cuyahoga River in Ohio. But that river – while no longer flammable – is still impaired because of fecal bacteria from sewage spills that often makes the river unsafe for swimming and water-contact recreation.[117] Downstream from the Cuyahoga is Lake Erie, which – a half century after the Clean Water Act – is still blanketed many summers by hundreds of square miles of toxic algal blooms.[118] This latter problem reflects a weakness in the Clean Water Act, which provides no controls on fertilizers or manure spread on crop fields in the Ohio countryside.

It is not just Lake Erie that's still struggling a half century after the Clean Water Act. Across the U.S., streams and rivers are burdened with excessive amounts of toxic algae and pollution. Some of this flows from industries, such as oil refineries, chemical plants, and slaughterhouses, which are allowed to discharge too much because EPA has failed to update technology-based standards for their pollution control systems for decades.

As described in this report, half of America's assessed river and stream miles – a total of 703,417 miles – are classified as impaired, as are 55 percent of lake acres that have been studied. And these numbers, while staggering on their own, understate the scale of the remaining problems. This is because 73 percent of rivers and streams miles across the U.S. have not been assessed in recent years, and the same is true for almost half of lakes.

So what should be done to solve this problem? What can we do to help the Clean Water Act fulfill its promise of "fishable, swimmable" waters for all Americans – especially communities of color and lower income people, who are often disproportionately burdened with sewage spills and water pollution?

1) EPA needs to do its job and comply with the Clean Water Act's mandate for more frequent updates of technology-based limits for industry water pollution control systems. Despite a legal mandate for reviews at least every five years and technological advances in wastewater treatment systems, highly-polluting industries like cement manufacturing have not had their standards updated since the 1970s – back when "modern" technology meant Apple II computers with floppy disks.
2) Congress should strengthen the Clean Water Act by closing its loophole for agricultural runoff and other "non-point" sources of pollution, which are by far the

largest sources of impairments in waterways across the U.S.[119] Factory-style animal production, in particular, has become an industry with a massive waste disposal problem, and should be regulated like other large industries.

3) EPA or Congress should impose more consistent, universal guidelines for waterway impairment designations for all 50 states, and for gauging unhealthy levels of key pollutants like nitrogen. The clashing patchwork of state methods for monitoring and appraising waterways used today contributes to an ineffective distribution of funding and cleanup efforts.
4) Congress should make it easier to enforce key requirements of the Clean Water Act, including the cleanup plans -- called "Total Maximum Daily Loads" -- that are supposed to be one the primary mechanisms for reducing the amount of pollution until impaired waterways are restored to health.
5) States are set to receive billions of dollars from Congress' recent passage of a $1.2 trillion Bipartisan Infrastructure Bill.[120] Governors and lawmakers should, whenever possible, target this funding to water pollution control efforts, especially in lower-income communities of color that have long suffered disproportionately from the dumping of pollution.
6) Congress and the states need to boost funding for the expert EPA and state environmental agency staff required to measure water quality, and to develop and implement the cleanup plans needed to bring impaired waterways back to life.
7) Although achieving the Clean Water Act's goal of 100 percent "fishable and swimmable" waterways will be challenging, EPA should keep driving toward this target by setting interim goals by decade and by creating specific, enforceable plans to achieve pollution reductions.

Given the gridlock paralyzing Congress, some of these proposed fixes will be an uphill battle. But other important solutions do not require Congressional action – such as by having EPA use its existing authority to update industry-specific technology standards that, by law, should have been modernized decades ago. And there is no good reason that EPA also can't impose more uniformity and consistency to the waterway impairment listing practices of the states, which today are disparate and chaotic. This common-sense move toward standardization would make it easier to target federal and state infrastructure improvement funds to cleanup projects where they are most needed.

The Clean Water Act's promises may still be only half-kept at the half-century mark, but there is no reason we can't learn from its shortfalls to finally provide clean water to all Americans, as Congress promised five decades ago.

River and Stream Miles by State

State	For Any Designated Use				Specific Designated Uses		
	Total Miles	Miles Assessed for Any Use	% Assessed for Any Use	% Impaired for Any Use	Designated Use	Miles Assessed	% Impaired
Alabama	129,700	14,984	12%	33%	Water Contact Recreation	3,102	40%
					Public Drinking Water	893	21%
					Aquatic Life	14,561	33%
Alaska	714,004	104,300	15%	0%	Water Contact Recreation	3,820	8%
					Public Drinking Water	3,890	9%
					Aquatic Life	3,922	7%
Arizona	100,000	3,005	3%	33%	Water Contact Recreation	1,476	34%
					Public Drinking Water	276	12%
					Aquatic Life	1,160	62%
					Fish Consumption	1,607	8%
Arkansas	223,600	11,430	5%	35%	Water Contact Recreation	11,430	6%
					Public Drinking Water	11,430	2%
					Aquatic Life	11,430	28%
California*	Unk.	70,228	Unk.	87%	Water Contact Recreation	35,308	37%
					Public Drinking Water	66,075	56%
					Aquatic Life	94,200	65%
					Fish Consumption	75,277	33%
Colorado	91,382	85,210	93%	34%	Water Contact Recreation	85,028	2%
					Public Drinking Water	62,326	33%
					Aquatic Life	84,393	13%
Connecticut	7,772	3,116	40%	38%	Water Contact Recreation	1,612	58%
					Aquatic Life	2,691	21%
					Fish Consumption	3,116	4%

River and Stream Miles by State

State	For Any Designated Use			Specific Designated Uses		
	Total Miles	Miles Assessed for Any Use	% Assessed for Any Use	% Impaired for Any Use	Designated Use	Miles Assessed	% Impaired
Delaware	4,470	1,104	25%	97%	Water Contact Recreation	827	73%
					Aquatic Life	1,074	94%
Florida	103,964	22,200	21%	48%	Water Contact Recreation	21,962	43%
					Public Drinking Water	490	21%
					Aquatic Life	21,962	43%
					Fish Consumption	4,841	73%
Georgia	70,150	15,724	22%	58%	Water Contact Recreation	235	65%
					Public Drinking Water	1,404	62%
					Fish Consumption	15,696	58%
Hawaii	3,326	2,580	78%	91%	Water Contact Recreation	222	100%
					Aquatic Life	2,580	91%
Idaho	92,059	64,944	71%	51%	Water Contact Recreation	44,873	15%
					Public Drinking Water	3,938	1%
					Aquatic Life	62,061	51%
Illinois	119,244	18,228	15%	64%	Water Contact Recreation	4,523	89%
					Aquatic Life	18,038	42%
					Fish Consumption	4,582	100%
Indiana	63,511	43,656	69%	68%	Water Contact Recreation	33,599	73%
					Public Drinking Water	23	0%
					Aquatic Life	36,814	34%
					Fish Consumption	8,891	63%
Iowa	18,990	8,274	44%	84%	Water Contact Recreation	4,921	93%
					Public Drinking Water	224	24%
					Aquatic Life	3,419	49%

River and Stream Miles by State

State	For Any Designated Use				Specific Designated Uses		
	Total Miles	Miles Assessed for Any Use	% Assessed for Any Use	% Impaired for Any Use	Designated Use	Miles Assessed	% Impaired
Kansas	30,278	18,031	60%	79%	Water Contact Recreation	18,031	24%
					Aquatic Life	18,031	74%
					Fish Consumption	15,115	41%
Kentucky	90,961	12,753	14%	67%	Water Contact Recreation	6,448	69%
					Public Drinking Water	944	0%
					Aquatic Life	11,503	51%
					Fish Consumption	1,791	62%
Louisiana	126,000	9,644	8%	86%	Water Contact Recreation	9,651	50%
					Public Drinking Water	1,042	29%
					Aquatic Life	9,557	72%
Maine*	35,029	35,029	100%	4%	Water Contact Recreation	7,401	3%
					Public Drinking Water	7,403	0%
					Aquatic Life	34,531	2%
					Fish Consumption	35,029	100%
Maryland	19,185	16,861	88%	61%	Water Contact Recreation	5,331	80%
					Public Drinking Water	8,154	0%
					Aquatic Life	17,001	57%
					Fish Consumption	516	58%
Massachusetts	13,919	3,830	28%	57%	Water Contact Recreation	2,895	52%
					Aquatic Life	3,125	43%
					Fish Consumption	628	92%
Michigan	76,439	74,278	97%	74%	Water Contact Recreation	16,497	95%
					Public Drinking Water	116	15%
					Aquatic Life	60,258	26%
					Fish Consumption	53,587	96%

River and Stream Miles by State

State	For Any Designated Use			Specific Designated Uses		
	Total Miles	Miles Assessed for Any Use	% Assessed for Any Use	% Impaired for Any Use	Designated Use	Miles Assessed	% Impaired
Minnesota	105,000	27,329	26%	65%	Water Contact Recreation	15,692	57%
					Public Drinking Water	3,399	4%
					Aquatic Life	26,521	49%
					Fish Consumption	7,307	88%
Mississippi	82,154	7,167	9%	56%	Water Contact Recreation	784	43%
					Aquatic Life	6,485	51%
					Fish Consumption	424	100%
Missouri	251,937	11,673	5%	48%	Water Contact Recreation	5,243	51%
					Public Drinking Water	1,818	0%
					Aquatic Life	10,994	22%
					Fish Consumption	3,063	31%
Montana	366,400	20,832	6%	72%	Water Contact Recreation	13,353	35%
					Aquatic Life	19,509	85%
Nebraska	16,670	11,596	70%	61%	Water Contact Recreation	6,013	79%
					Public Drinking Water	739	98%
					Aquatic Life	11,098	31%
Nevada	141,806	6,678	5%	47%	Water Contact Recreation	4,985	31%
					Public Drinking Water	4,951	18%
					Aquatic Life	5,660	50%
					Fish Consumption	629	97%
New Hampshire*	16,988	6,483	38%	75%	Water Contact Recreation	2,865	45%
					Public Drinking Water	6,541	0%
					Aquatic Life	6,247	73%
					Fish Consumption	16,980	100%

River and Stream Miles by State

State	For Any Designated Use			Specific Designated Uses		
	Total Miles	Miles Assessed for Any Use	% Assessed for Any Use	% Impaired for Any Use	Designated Use	Miles Assessed	% Impaired
New Jersey	19,425	19,425	100%	95%	Water Contact Recreation	19,426	41%
					Public Drinking Water	14,693	44%
					Aquatic Life	19,426	61%
					Fish Consumption	19,426	42%
New Mexico	95,172	6,250	7%	65%	Water Contact Recreation	4,529	23%
					Public Drinking Water	2,220	1%
					Aquatic Life	2,309	62%
New York	87,126	57,186	66%	11%	Water Contact Recreation	15,197	4%
					Public Drinking Water	7,157	5%
					Aquatic Life	57,186	7%
					Fish Consumption	57,186	2%
North Carolina	40,278	14,160	35%	22%	Water Contact Recreation	3,168	13%
					Public Drinking Water	875	0%
					Aquatic Life	10,921	26%
					Fish Consumption	1,785	4%
North Dakota	56,680	56,680	100%	15%	Water Contact Recreation	8,339	39%
					Public Drinking Water	2,711	0%
					Aquatic Life	8,942	12%
					Fish Consumption	489	81%
Oklahoma*	78,778	33,050	42%	32%	Water Contact Recreation	9,402	57%
					Public Drinking Water	2,025	16%
					Aquatic Life	11,069	72%
					Fish Consumption	3,448	15%

River and Stream Miles by State

State	For Any Designated Use				Specific Designated Uses		
	Total Miles	Miles Assessed for Any Use	% Assessed for Any Use	% Impaired for Any Use	Designated Use	Miles Assessed	% Impaired
Oregon	310,500	142,400	46%	86%	Water Contact Recreation	30,427	58%
					Public Drinking Water	22,162	29%
					Aquatic Life	138,691	81%
					Fish Consumption	23,219	33%
Pennsylvania	85,379	84,903	99%	30%	Water Contact Recreation	26,520	37%
					Public Drinking Water	3,521	2%
					Aquatic Life	83,573	21%
					Fish Consumption	13,186	21%
Rhode Island	1,420	1,101	78%	68%	Water Contact Recreation	998	70%
					Public Drinking Water	6	0%
					Aquatic Life	1,072	27%
					Fish Consumption	44	100%
South Carolina	22,509	22,509	100%	81%	Water Contact Recreation	22,509	74%
					Aquatic Life	22,509	15%
South Dakota	97,568	5,875	6%	78%	Water Contact Recreation	5,615	56%
					Public Drinking Water	927	6%
					Aquatic Life	5,549	14%
Tennessee	60,393	28,004	46%	55%	Water Contact Recreation	16,131	56%
					Public Drinking Water	3,487	2%
					Aquatic Life	26,630	44%
Texas	191,228	34,603	18%	28%	Water Contact Recreation	34,603	19%
					Public Drinking Water	34,603	0%
					Aquatic Life	34,603	6%
					Fish Consumption	34,603	2%

River and Stream Miles by State

State	For Any Designated Use				Specific Designated Uses		
	Total Miles	Miles Assessed for Any Use	% Assessed for Any Use	% Impaired for Any Use	Designated Use	Miles Assessed	% Impaired
Utah	106,914	61,850	58%	72%	Water Contact Recreation	41,492	28%
					Public Drinking Water	32,678	27%
					Aquatic Life	54,029	65%
Vermont	7,100	6,794	96%	5%	Water Contact Recreation	5,528	3%
					Aquatic Life	5,783	3%
					Fish Consumption	6,795	1%
Virginia	100,953	21,834	22%	73%	Water Contact Recreation	15,538	77%
					Public Drinking Water	1,032	8%
					Aquatic Life	17,782	29%
					Fish Consumption	7,217	51%
Washington	74,000	9,327	13%	68%	Water Contact Recreation	4,345	58%
					Public Drinking Water	1,378	36%
					Aquatic Life	8,506	62%
					Fish Consumption	765	81%
West Virginia	31,123	20,633	66%	73%	Water Contact Recreation	20,212	49%
					Public Drinking Water	21,274	58%
					Aquatic Life	21,547	58%
Wisconsin	88,000	25,710	29%	36%	Water Contact Recreation	318	49%
					Aquatic Life	27,583	31%
					Fish Consumption	1,872	73%
Wyoming	267,294	17,860	7%	10%	Water Contact Recreation	1,018	96%
					Public Drinking Water	513	36%
					Aquatic Life	17,833	5%
					Fish Consumption	288	0%

River and Stream Miles by State

* Maine and New Hampshire waterways are 100% impaired because of a statewide fish consumption advisory due to atmospheric deposition of mercury. The % impaired for any use in these states exclude impairments based on mercury deposition, as that's how each state reports them.

*Due to varying methods of measurements, California doesn't have total miles of rivers.

*Either because the state doesn't report secondary contact recreation impairments, or because we were unable to remove potential duplicates when combing primary and secondary contact recreation impairments, these states are only reporting primary contact recreation impairments: AL, DE, IL, IN, KS, ME, MO, NE, NV, NM, NY, TX, UT, VT, WV

*For Oklahoma, the miles of impaired rivers don't include the 100% of assessed waters impaired by mercury deposition. This is how it was reported in their integrated report.

Lake and Reservoir Acres by State

State	For Any Designated Use			Specific Designated Uses		
	Total Acres	Acres Assessed for Any Use	% Assessed for Any Use	% Impaired for Any Use	Designated Use	Acres Assessed	% Impaired
Alabama	490,472	433,917	88%	50%	Water Contact Recreation	383,564	52%
					Public Drinking Water	172,572	61%
					Aquatic Life	422,202	50%
Alaska	12,787,200	2,190,890	17%	0%	Water Contact Recreation	976,367	0%
					Public Drinking Water	975,535	0%
					Aquatic Life	976,557	0%
Arizona	280,000	97,658	35%	76%	Water Contact Recreation	2,125	94%
					Aquatic Life	32,487	100%
					Fish Consumption	47,750	96%
Arkansas	1,500,210	278,736	19%	9%	Water Contact Recreation	253,432	1%
					Public Drinking Water	253,432	0%
					Aquatic Life	253,432	4%
					Fish Consumption	253,432	3%
California*	Unk.	871,223	Unk.	92%	Water Contact Recreation	430,721	69%
					Public Drinking Water	181,605	30%
					Fish Consumption	727,485	75%
Colorado	271,446	170,596	63%	41%	Water Contact Recreation	164,882	0%
					Public Drinking Water	151,016	28%
					Aquatic Life	170,487	37%
Connecticut	72,509	30,437	42%	26%	Water Contact Recreation	24,906	27%
					Aquatic Life	26,953	4%
					Fish Consumption	30,437	12%

Lake and Reservoir Acres by State

State	For Any Designated Use			Specific Designated Uses		
	Total Acres	Acres Assessed for Any Use	% Assessed for Any Use	% Impaired for Any Use	Designated Use	Acres Assessed	% Impaired
Delaware	11,491	2,983	26%	70%	Water Contact Recreation	2,537	26%
					Aquatic Life	2,751	74%
Florida	1,529,600	1,047,443	68%	89%	Water Contact Recreation	1,093,265	80%
					Public Drinking Water	378,201	0%
					Fish Consumption	829,187	92%
Georgia	425,382	391,645	92%	41%	Water Contact Recreation	380,249	42%
					Public Drinking Water	277,750	46%
					Fish Consumption	391,645	41%
Idaho	432,390	256,661	59%	90%	Water Contact Recreation	200,847	72%
					Public Drinking Water	466	0%
					Aquatic Life	254,156	90%
Illinois	318,477	153,278	48%	98%	Water Contact Recreation	1,814	40%
					Aquatic Life	148,157	10%
					Fish Consumption	125,197	97%
Indiana	130,500	89,024	68%	63%	Water Contact Recreation	39,790	23%
					Public Drinking Water	16,871	99%
					Aquatic Life	17,475	66%
					Fish Consumption	80,300	49%
Iowa*	93,750	87,579	93%	81%	Water Contact Recreation	83,233	83%
					Public Drinking Water	2,473	2%
					Aquatic Life	21,400	16%

Lake and Reservoir Acres by State

State	For Any Designated Use			Specific Designated Uses		
	Total Acres	Acres Assessed for Any Use	% Assessed for Any Use	% Impaired for Any Use	Designated Use	Acres Assessed	% Impaired
Kansas	190,445	190,445	100%	97%	Water Contact Recreation	190,418	20%
					Public Drinking Water	189,072	59.0%
					Aquatic Life	190,445	5%
					Fish Consumption	190,445	0%
Kentucky	229,500	180,366	79%	48%	Water Contact Recreation	215,918	0%
					Public Drinking Water	180,441	0%
					Aquatic Life	217,957	4%
					Fish Consumption	207,448	39%
Louisiana	1,486,650	572,230	38%	97%	Water Contact Recreation	572,230	7%
					Public Drinking Water	227,295	13%
Maine*	986,952	986,952	100%	9%	Water Contact Recreation	986,952	2%
					Public Drinking Water	986,952	0%
					Aquatic Life	986,952	9%
					Fish Consumption	986,952	100%
Maryland	21,876	19,294	88%	94%	Public Drinking Water	16,108	71%
					Aquatic Life	16,805	70%
					Fish Consumption	18,976	69%
Massachusetts	153,514	118,338	77%	72%	Water Contact Recreation	23,925	70%
					Aquatic Life	76,678	90%
					Fish Consumption	56,332	99%

Lake and Reservoir Acres by State

State	For Any Designated Use			Specific Designated Uses		
	Total Acres	Acres Assessed for Any Use	% Assessed for Any Use	% Impaired for Any Use	Designated Use	Acres Assessed	% Impaired
Michigan	872,109	814,808	93%	43%	Water Contact Recreation	3,664	91%
					Public Drinking Water	203	0%
					Aquatic Life	517,131	3%
					Fish Consumption	378,168	91%
Minnesota	2,800,000	2,239,235	80%	83%	Water Contact Recreation	2,186,570	28%
					Public Drinking Water	490,402	0%
					Aquatic Life	1,186,304	5%
					Fish Consumption	1,736,851	97%
Mississippi	259,533	145,835	56%	30%	Aquatic Life	2,856	0%
					Fish Consumption	36,956	100%
Missouri	704,165	266,936	38%	35%	Water Contact Recreation	223,660	0%
					Public Drinking Water	25,157	1%
					Aquatic Life	230,570	29%
					Fish Consumption	195,590	14%
Montana	730,000	493,343	68%	85%	Water Contact Recreation	457,671	10%
Nebraska	134,980	125,248	93%	69%	Water Contact Recreation	105,414	28%
					Aquatic Life	124,606	69%
Nevada	553,239	383,166	69%	60%	Water Contact Recreation	382,497	10%
					Public Drinking Water	346,906	7%
					Aquatic Life	382,789	28%
					Fish Consumption	43,654	100%

Lake and Reservoir Acres by State

State	For Any Designated Use			Specific Designated Uses		
	Total Acres	Acres Assessed for Any Use	% Assessed for Any Use	% Impaired for Any Use	Designated Use	Acres Assessed	% Impaired
New Hampshire*	188,545	167,462	89%	90%	Water Contact Recreation	148,175	42%
					Public Drinking Water	170,179	0%
					Aquatic Life	166,521	89%
					Fish Consumption	185,081	100%
New Jersey	47,620	47,620	100%	97%	Water Contact Recreation	47,619	46%
					Public Drinking Water	46,578	43%
					Aquatic Life	47,619	61%
					Fish Consumption	47,619	63%
New Mexico	89,042	68,381	77%	86%	Water Contact Recreation	61,054	0%
					Public Drinking Water	2,236	0%
					Aquatic Life	47,417	69%
New York	687,102	578,426	84%	55%	Water Contact Recreation	522,188	4%
					Public Drinking Water	393,039	5%
					Aquatic Life	578,426	3%
					Fish Consumption	578,426	39%
North Carolina	268,590	193,775	72%	60%	Water Contact Recreation	36,957	0%
					Public Drinking Water	44,753	0%
					Aquatic Life	156,484	51%
					Fish Consumption	80,719	96%
North Dakota	715,946	622,382	87%	77%	Water Contact Recreation	608,223	1%
					Public Drinking Water	342,071	0%
					Aquatic Life	607,869	0%
					Fish Consumption	519,553	86%

Lake and Reservoir Acres by State

State	For Any Designated Use			Specific Designated Uses		
	Total Acres	Acres Assessed for Any Use	% Assessed for Any Use	% Impaired for Any Use	Designated Use	Acres Assessed	% Impaired
Oklahoma*	1,041,884	621,049	60%	84%	Water Contact Recreation	315,957	3%
					Public Drinking Water	148,269	55%
					Fish Consumption	362,974	81%
Oregon	910,200	406,700	45%	97%	Water Contact Recreation	257,870	56%
					Public Drinking Water	380,011	95%
					Fish Consumption	361,174	93%
Pennsylvania	149,014	147,137	99%	54%	Water Contact Recreation	118,042	6%
					Public Drinking Water	99,211	1%
					Aquatic Life	106,314	35%
					Fish Consumption	102,824	45%
Rhode Island	20,749	15,328	74%	72%	Water Contact Recreation	8,151	4%
					Public Drinking Water	5,519	23%
					Aquatic Life	11,227	71%
					Fish Consumption	7,450	15%
South Carolina	393,430	393,430	100%	22%	Water Contact Recreation	393,430	1%
					Aquatic Life	393,430	22%
South Dakota	213,265	134,360	63%	91%	Water Contact Recreation	80,633	45%
					Public Drinking Water	2,825	28%
					Aquatic Life	128,048	72%
Tennessee	586,774	580,165	99%	37%	Water Contact Recreation	563,098	36%
					Public Drinking Water	528,463	1%
					Aquatic Life	574,962	4%

Lake and Reservoir Acres by State

State	For Any Designated Use			Specific Designated Uses		
	Total Acres	Acres Assessed for Any Use	% Assessed for Any Use	% Impaired for Any Use	Designated Use	Acres Assessed	% Impaired
Texas	1,994,600	1,554,292	78%	38%	Water Contact Recreation	1,554,292	0%
					Public Drinking Water	1,554,292	0%
					Aquatic Life	1,554,292	1%
					Fish Consumption	1,554,292	26%
Utah	1,460,000	935,395	64%	33%	Water Contact Recreation	295,496	32%
					Public Drinking Water	212,061	0%
Vermont	242,219	229,751	95%	83%	Water Contact Recreation	252,012	72%
					Aquatic Life	231,580	2%
					Fish Consumption	229,713	79%
Virginia	117,752	113,764	97%	83%	Water Contact Recreation	109,224	2%
					Public Drinking Water	9,237	0%
					Aquatic Life	113,246	15%
					Fish Consumption	102,982	85%
West Virginia	22,490	18,549	82%	64%	Water Contact Recreation	20,580	57%
					Public Drinking Water	20,157	50%
					Aquatic Life	12,576	17%
Wisconsin	1,200,000	917,867	76%	52%	Water Contact Recreation	594,229	70%
					Fish Consumption	461,453	25%
Wyoming	487,948	18,922	4%	34%	Aquatic Life	18,922	34%
					Fish Consumption	12,050	0%

Lake and Reservoir Acres by State

* Maine and New Hampshire waterways are 100% impaired because of a statewide fish consumption advisory due to atmospheric deposition of mercury. The % impaired for any use in these states exclude impairments based on mercury deposition, as that's how each state reports them.

*Due to varying methods of measurement, California doesn't have total acres of lakes.

*Washington doesn't report lake impairments in a way that matches up with how other states report lake impairments, for that reason we have excluded their lake impairment data.

*Due to some discovered data inconsistencies, we've excluded Hawaii's lake impairment data.

*Either because the state doesn't report secondary contact recreation impairments, or because we were unable to remove potential duplicates when combing primary and secondary contact recreation impairments, these states are only reporting primary contact recreation impairments: AL, DE, IL, IN, KS, ME, MO, NE, NV, NM, NY, TX, UT, VT, WV

*Oklahoma and Iowa have the secondary contact designated use, but they don't report any secondary contact recreation impairments for lakes in their most recent reports.

Estuary, Bay, and Harbor Square Miles by State

State	For Any Designated Use				Specific Designated Uses		
	Total Square Miles	Square Miles Assessed for Any Use	% Assessed for Any Use	% Impaired for Any Use	Designated Use	Square Miles Assessed	% Impaired
Alabama	947	784	83%	81%	Water Contact Recreation	579	80%
					Aquatic Life	784	81%
					Fish Consumption	2,508	100%
Alaska	Unk.	48,271	Unk.	0%	Water Contact Recreation	10,050	0%
					Aquatic Life	10,050	0%
California	Unk.	836	Unk.	100%	Water Contact Recreation	558	92%
					Aquatic Life	833	98%
					Fish Consumption	819	100%
Connecticut	612	612	100%	70%	Water Contact Recreation	45	35%
					Aquatic Life	562	55%
					Fish Consumption	70	95%
Delaware	841	775	92%	100%	Water Contact Recreation	762	0%
					Aquatic Life	774	100%
Florida	3,625	2,544	70%	100%	Water Contact Recreation	2,554	33%
					Aquatic Life	2,554	33%
					Fish Consumption	987	93%
Georgia	854	89	10%	12%	Water Contact Recreation	16	0%
Hawaii	Unk.	Unk.	Unk.	0%	Water Contact Recreation	77	83%
					Aquatic Life	93	99%
Louisiana	Unk.	6,079	Unk.	92%	Water Contact Recreation	6,080	64%
					Aquatic Life	6,079	64%
					Fish Consumption	650	67%

Estuary, Bay, and Harbor Square Miles by State

State	For Any Designated Use				Specific Designated Uses		
	Total Square Miles	Square Miles Assessed for Any Use	% Assessed for Any Use	% Impaired for Any Use	Designated Use	Square Miles Assessed	% Impaired
Maine*	2,875	2,875	100%	15%	Water Contact Recreation	2,875	0%
					Aquatic Life	28	39%
					Fish Consumption	2,875	100%
Maryland	2,451	2,403	98%	100%	Water Contact Recreation	6	78%
					Aquatic Life	2,260	60%
					Fish Consumption	612	1%
Massachusetts	2,726	244	9%	87%	Water Contact Recreation	229	27%
					Aquatic Life	198	45%
					Fish Consumption	120	96%
New Hampshire*	18	18	100%	100%	Water Contact Recreation	17	69%
					Aquatic Life	17	100%
					Fish Consumption	18	100%
New Jersey	650	650	100%	97%	Water Contact Recreation	650	2%
					Aquatic Life	650	90%
					Fish Consumption	2,074	99%
New York	1,538	1,537	100%	27%	Water Contact Recreation	1,455	4%
					Aquatic Life	1,539	8%
					Fish Consumption	2,610	22%
North Carolina	3,332	3,210	96%	30%	Water Contact Recreation	1,492	1%
					Aquatic Life	1,063	79%
					Fish Consumption	89	12%
Oregon	128	126	99%	99%	Water Contact Recreation	96	66%
					Aquatic Life	121	87%

Estuary, Bay, and Harbor Square Miles by State

State	For Any Designated Use				Specific Designated Uses		
	Total Square Miles	Square Miles Assessed for Any Use	% Assessed for Any Use	% Impaired for Any Use	Designated Use	Square Miles Assessed	% Impaired
Rhode Island	159	156	98%	37%	Water Contact Recreation	155	11%
					Aquatic Life	105	48%
					Fish Consumption	1,538	23%
South Carolina	289	289	100%	19%	Water Contact Recreation	289	4%
					Aquatic Life	289	25%
Texas	4,177	2,610	62%	48%	Water Contact Recreation	2,610	4%
					Aquatic Life	2,610	25%
					Fish Consumption	10,045	0%
Virginia	2,842	2,449	86%	87%	Water Contact Recreation	774	11%
					Aquatic Life	2,417	88%
					Fish Consumption	54	1%

*Due to varying methods of measurements, California doesn't have total square miles of estuaries.

*Either because the state doesn't report secondary contact recreation impairments, or because we were unable to remove potential duplicates when combing primary and secondary contact recreation impairments, these states are only reporting primary contact recreation impairments: AL, DE, ME, NY, TX

*Due to differences between Louisiana's methods of measuring estuary sizes and methods used by USGS, we have excluded the total estuary size for Louisiana.

Appendix B:

Challenges with Historical Comparisons:

Historical comparisons of water quality assessment data within a particular state are challenging, if not impossible. For starters, sometimes the older data is erroneous, and the state fixed those errors over several subsequent integrated reports, as was the case with historical data from North Carolina. States also change their assessment methodologies based on new research, meaning a river or lake impaired under old criteria may not be impaired under new criteria. For example, in October 2019, Virginia's Department of Environmental Quality (DEQ) changed their assessment methodology for *E. coli* in freshwater rivers and lakes. Under the old standards, 68 percent of the monitoring locations that sampled for *E. coli* during Virginia's assessment window period were designated as impaired, while only 51 percent of those same locations would be designated as impaired under the new standards.[121] On a similar note, improved lab analysis methods have allowed for lower detection limits, potentially designating more waters as impaired due to being able to measure the quantity of contaminants more precisely.

Another problem with historical comparisons is changing technology in mapping waterways. In the early 2000s, most states were using satellite imagery with medium resolution at 1:100,000 scale. Now, most states are using high resolution imagery at 1:24,000 scale or better, which allows them to map their waterbodies more accurately. This has led to drastic changes in the total size of waterbodies in states over time. For example, in 2002, Wyoming reported 116,398 miles of perennial, intermittent, and ephemeral rivers and streams, but in 2020, Wyoming reported 267,294 miles of perennial, intermittent, and ephemeral rivers and streams. When waterbody sizes can change so drastically, largely by the implementation of improved mapping technology[122], it makes trying to compare impairments over time impossible. States are also assessing more waterways than they did previously, and assessing more waterways leads to more impairments.

And finally, the changing definition of what types of waters are protected under the Clean Water Act affects how states assess their waters. Under the Clean Water Act, navigable waters, defined as "waters of the United States," are protected from pollution, but what types of waters are considered a "water of the U.S." has been up for debate, especially concerning intermittent and ephemeral streams. For example, in 2004, South Dakota did not include over 85,000 miles of intermittent and ephemeral streams in their state total, but they did in 2020, stating their recognition of the ecological importance of these types of waterways, "as many contribute greatly to downstream water quality, habitat condition, and biotic integrity."[123]

Limitations of Making State-to-State Comparisons:

For the reasons stated above and more, it is equally challenging to compare impairment data across states in a way that avoids comparing apples to oranges. Under the Clean Water

Act, states set their own water quality standards, determine what parameters to monitor, and how they report their findings, which differs from state to state. This means we cannot use the data to reliably compare water quality conditions among states.[124]

The definitions that states use to determine which water bodies get assessed vary widely from state to state. For example, there are states (like Arizona) that count and assess for impairments in both year-round and intermittent streams.[125] Other states include ephemeral and intermittent stream miles in their waterbody totals, but only perform assessments in perennial waterways, while others still, like Nevada, don't even include ephemeral and intermittent streams in their state waterbody totals.[126] As far as lakes are concerned, some states like Pennsylvania only choose to assess "significantly, publicly-owned lakes,"[127] others like Massachusetts, Mississippi, and Montana exclude various lakes from assessment based on size.[128] Most states monitor all their lakes and ponds, regardless of size. Some states like Maine and California use a mix of current and old resolution imagery when determining waterbody size in current reports, meaning not all states are using the same method to measure waterbody size.

In addition to the differences in how states define their waterbodies, how they set their water quality standards and monitor for those standards varies too. For example, when measuring for bacteria to determine recreation use support, both Maryland and Virginia use the same geometric mean threshold of 126 cfu/100mL and the same statistical threshold value (STV) of 410 cfu/100 mL, but the way they determine whether the waterbody is impaired or not differs. The waterway is impaired in Virginia if one or more 90-day periods within a six-year timeframe exhibit an exceedance of either the geometric mean or the STV. In Maryland, the requirement is an exceedance of the STV or geometric mean for two consecutive years of data to be designated as impaired. States also use different assessment windows when gathering data for writing their reports. In Virginia, their Department of Environmental Quality used six years of data from 2018 back to 2012 to write their 2020 integrated report, while Maryland's Department of Environment used ten years of data.[129]

Due to limited financial resources (or an overwhelming number of waterbodies) within a particular state, some state monitoring programs target impaired waterways and higher risk waterways for assessments. By choosing this approach, states can focus resources on those waterways that will have a higher impact when cleaned. However, when trying to compare the number of impaired waters in one state to another, this could make it seem like one state has a higher percentage of impaired waters, when instead they just focus on assessing their impaired waters to make more of impact when developing TMDLs.

Other Limitations of Impairment Data

Waterways can be designated impaired due to naturally occurring conditions, like elevated concentrations of bacteria within wildlife refuges due to migrating waterfowl. States must report these waters as impaired to EPA, but they likely won't be cleaned up due to the natural causes of the impairment.

When a waterway is impaired, it means it's not meeting specific water quality standards that are tied to a specific designated use (see Table 5). What we don't know from impairment designations is how severe the impairment is, especially when just looking at "impaired for any use." For example, a waterway may be impaired for aquatic life due to increased levels of suspended solids, but it may not be a threat to swimmers who don't mind muddy water. One way to help put the severity of impairments into context is by looking at them by designated use and where possible, the source of the impairment designation, like what contaminants caused the water quality to fail the standards for that use. However, this still doesn't indicate how far over the threshold contaminants in the water were, and for that you need the actual water quality data.

Finally, it much easier to add a waterbody to the impairment list than it is to take it off. In some states, like Virginia, more monitoring is required to remove a waterbody from the impairment list than it is to put it there in the first place. This leaves states that lack resources for adequate monitoring unable to "delist" impaired waters from their impaired waters list. Data in this report is current as of December 31, 2021.

Appendix C:

Sources of state water quality data (with hyperlinks to documents):

Alabama (2020): 2020 Integrated Water Quality Monitoring and Assessment Report, Email correspondence with Alabama Department of Environmental Management

Alaska (2018): State of Alaska 2014/2016 FINAL Integrated Water Quality Monitoring and Assessment Report (used for total waterways); Data downloaded from EPA ATTAINS Webservices; Email correspondence with Alaska Department of Environmental Conservation

Arizona (2016): 2016 Clean Water Act Assessment; Email correspondence with Arizona Department of Environmental Quality

Arkansas (2018): 2018 Integrated Water Quality Monitoring Assessment Report

California (2018): Email correspondence with California Water Boards; Data downloaded from EPA ATTAINS Webservices

Colorado (2020): Integrated Water Quality Monitoring & Assessment Report 2020; Email correspondence with Colorado Department of Public Health and Environment

Connecticut (2020): State of Connecticut, Department of Energy and Environmental Protection 2020 Integrated Water Quality Report; GIS data downloaded from CT DEEP GIS Open Data Website

Delaware (2020): State of Delaware 2020 Combined Watershed Assessment Report (305(b)) and Determination of for the Clean Water Act Section 303(d) List of Waters Needing TMDLs; Data downloaded from EPA ATTAINS Webservices; Email correspondence with Delaware Department of Natural Resources and Environmental Control

Florida (2018): Integrated Water Quality Assessment for Florida: 2014 Sections 303(d), 305(b), and 314 Report and Listing Update (used for total waterways); Data downloaded from EPA ATTAINS Webservices; Email correspondence with Florida Department of Environmental Protection

Georgia (2020): Water Quality in Georgia 2018-2019 (2020 Integrated 305b/303d Report); 2020 305(b)/303(d) List of Waters (In Excel Format); Email correspondence with Georgia Environmental Protection Division

Hawaii (2020): 2020 State of Hawaii Water Quality Monitoring and Assessment Report; Data downloaded from EPA ATTAINS Webservices

Idaho (2018/2020): Idaho's 2018/2020 Integrated Report: Final; Data downloaded from EPA ATTAINS Webservices

Illinois (2018): Illinois Integrated Water Quality Report and Section 303(d) List, 2018; Email correspondence with Illinois Environmental Protection Agency

Indiana (2020): IDEM's 2020 Integrated Water Monitoring and Assessment Report, Appendix A: Integrated Report Tables; Email correspondence with Indiana Department of Environmental Management

Iowa (2020): Email correspondence with Iowa Department of Natural Resources; Data downloaded from EPA ATTAINS Webservices

Kansas (2020): 2020 Kansas Integrated Water Quality Assessment

Kentucky (2016): Integrated Report to Congress on the Condition of Water Resources in Kentucky, 2016; 2016 IR 305(b) List – Excel Format

Louisiana (2020): 2020 Louisiana Water Quality Inventory: Integrated Report; Email correspondence with Louisiana Department of Environmental Quality; Data downloaded from EPA ATTAINS Webservices

Maine (2016): 2016 Integrated Water Quality Monitoring and Assessment Report; Correspondence with Maine Department of Environmental Protection

Maryland (2018): Maryland's Final 2018 Integrated Report of Surface Water Quality

Massachusetts (2016): Massachusetts Year 2016 Integrated List of Waters; Email correspondence with Massachusetts Department of Environmental Protection; Data downloaded from EPA ATTAINS Webservices

Michigan (2020): Water Quality and Pollution Control in Michigan, 2020 Sections 303(d), 305(b), and 314 Integrated Report; Email correspondence with Michigan Department of Environment, Great Lakes, and Energy; Data downloaded from EPA ATTAINS Webservices

Minnesota (2020): 2020 Minnesota Water Quality: Surface Water Section; Email correspondence with Minnesota Pollution Control Agency

Mississippi (2020): State of Mississippi Water Quality Assessment 2020 Section 305(b) Report; Data downloaded from EPA ATTAINS Webservices

Missouri (2020): Missouri Integrated Water Quality Report and Section 303(d) List, 2020

Montana (2020): Montana 2020, Final Water Quality Integrated Report; Email correspondence with Montana Department of Environmental Quality

Nebraska (2020): 2020 Nebraska Water Quality Integrated Report; Data downloaded from EPA ATTAINS Webservices

Nevada (2016/2018): Nevada 2016-2018 Water Quality Integrated Report

New Hampshire (2018): Email correspondence with New Hampshire Department of Environmental Services

New Jersey (2016): 2016 New Jersey Integrated Water Quality Assessment Report; Email correspondence with New Jersey Department of Environmental Protection

New Mexico (2018/2020): 2018-2020 State of New Mexico Clean Water Act Section 303(d)/Section 305(b) Integrated Report; Email correspondence with New Mexico Environment Department

New York (2016): 2016 Section 305(b) Water Quality Report

North Carolina (2020): Email correspondence with North Carolina Department of Environmental Quality; Data downloaded from EPA ATTAINS Webservices

North Dakota (2018): North Dakota 2018 Integrated Section 305(b) Water Quality Assessment Report and Section 303(d) List of Waters Needing Total Maximum Daily Loads

Ohio (2020): Ohio 2020 Integrated Water Quality Monitoring and Assessment Report (for Great Lakes data)

Oklahoma (2020): Water Quality in Oklahoma, 2020 Integrated Report

Oregon (2018/2020): Email correspondence with Oregon Department of Environmental Quality; Data downloaded from EPA ATTAINS Webservices

Pennsylvania (2020): Data downloaded from GIS files referenced in 2020 Pennsylvania Integrated Water Quality Monitoring and Assessment Report

Rhode Island (2018/2020): 2018-2020 Integrated Water Quality Monitoring and Assessment Report

South Carolina (2018): State of South Carolina Integrated Report for 2018

South Dakota (2020): The 2020 South Dakota Integrated Report for Surface Water Quality Assessment; Data downloaded from EPA ATTAINS Webservices

Tennessee (2020): Email correspondence with Tennessee Department of Environment & Conservation; Data downloaded from EPA ATTAINS Webservices

Texas (2018): Data downloaded from GIS files found on Texas Commission on Environmental Quality (TCEQ) website: Assessment Units – Line, Assessment Units - Poly

Utah (2018/2020): Combined 2018/2020 Integrated Report; Data downloaded from EPA ATTAINS Webservices

Vermont (2018): State of Vermont Water Quality Integrated Assessment Report, 2018; Email correspondence with Vermont Agency of Natural Resources, Department of Environmental Conservation

Virginia (2020): Final 2020 305(b)/303(d) Water Quality Assessment Integrated Report (Chapter 4)

Washington (2014): Email correspondence with Washington Department of Ecology; Data downloaded from EPA ATTAINS Webservices

West Virginia (2016): 2016 West Virginia Integrated Water Quality Monitoring and Assessment Report; Email correspondence with West Virginia Department of Environmental Protection

Wisconsin (2020): Wisconsin Water Quality Report to Congress 2020; Email correspondence with Wisconsin Department of Natural Resources; Data downloaded from EPA ATTAINS Webservices

Wyoming (2020): Wyoming's 2020 Integrated 305(b) and 303(d) Report; Data downloaded from EPA ATTAINS Webservices

END NOTES:

[1] The Federal Clean Water, also known as the Federal Water Pollution Control Act Amendments of 1972, was introduced by Maine Senator Edmund Muskie on October 28, 1971. The bill was passed by the Senate on November 2, 1971, and by the House on March 29, 1972. After a second round of votes following a joint conference committee, the conference committee's version of the bill passed the House on October 4, 1972 (by a vote of 366-11) and passed the Senate on October 4, 1972 (by a vote of 74-0). After being vetoed by President Richard Nixon on October 17, 1972, the veto was overridden by the Senate on October 17, 1972 and by the House on October 18, 1972.

[2] James L. Oberstar, "The Clean Water Act: 30 Years of Success in Peril," report submitted to the U.S. House, Committee on Transportation, October 18, 2002. Link: http://fbaum.unc.edu/lobby/_107th/116_WI_SRF/Congressional_Statements/House/H_Dem_Trans_Inf_101802.pdf

[3] David A. Keiser & Joseph S. Shapiro, "Consequences of the Clean Water Act and the Demand for Water Quality," National Bureau of Economic Research, January 2017. Link: https://www.nber.org/system/files/working_papers/w23070/w23070.pdf

[4] Text of the 1972 Federal Clean Water Act, U.S. Code Title 33, Chapter 26, WATER POLLUTION PREVENTION AND CONTROL. Link: https://www.govinfo.gov/content/pkg/USCODE-2018-title33/pdf/USCODE-2018-title33-chap26.pdf

[5] Federal Clean Water Act, 33 U.S. Code § 1251. Link: https://www.law.cornell.edu/uscode/text/33/1251

[6] 55 percent of assessed lake acres across the U.S. are listed as impaired, along with 50 percent of assessed river and stream miles. For this report, the Environmental Integrity Project (EIP) examined the most recent available Integrated Reports, filed by U.S. states with EPA. These reports are filed every two years under sections 305(b) and 303(d) of the federal Clean Water Act. Ohio was not included, because it uses different standards and measurements than the other states. The most recent data are from 2020 (59% of 49 states) and 2018 (27%), but data from 14% of the states is from 2016.In some cases, where the information sought was not available in these reports, EIP obtained the data either through communications with a state agency, or downloaded the data from EPA's Assessment, Total Maximum Daily Load Tracking and Implementation System (ATTAINS) Web Services. Impairments include from assessments performed in the most recycle cycle (six to 10 years, depending on the state), plus listings from earlier assessment cycles. Data current as of December 31, 2021.

[7] Impaired in this discussion means unable to meet *one or more* of the standards for a designated use, like swimming and recreation or fish consumption.

[8] Jim Barnes, John Graham, and David Konisky, *Fifty Years at the USEPA: Progress, Retrenchment, and Opportunities,* published by Rowman and Littlefield in 2021. Chapter on the federal Clean Water Act by Jonathan Z. Cannon, former General Counsel for EPA and law professor at the University of Virginia.

[9] Letter from EIP and allies to EPA Administrator Michael Regan, "Re: EPA's Annual Review of Effluent Limitation Guidelines Under the Clean Water Act," Sept. 22, 2021. Link: https://environmentalintegrity.org/wp-content/uploads/2021/09/2021.09.22-EPA-ELG-letter-FINAL.pdf

[10] Federal Clean Water Act, 33 U.S. Code § 1311 - Effluent limitations. Link: https://www.law.cornell.edu/uscode/text/33/1311

[11] Total Maximum Daily Loads, or TMDL's, are one of the Clean Water Act's main mechanisms for reducing pollution, but these plans and limits are largely voluntary and unenforceable with regard to runoff pollution in many areas.

[12] See note 5. For this report, the Environmental Integrity Project (EIP) examined the most recent available Integrated Reports, filed by U.S. states under sections 305(b) and 303(d) of the federal Clean Water Act every two years. The total number of impaired lake acres is significantly affected by the fact that some states do not classify waters subject to "fish consumption advisories" as impaired. While this discrepancy also affects impairment totals for stream miles and estuaries, the impact is not as significant.

[13] Please note that some waterways can be impaired for multiple uses, e.g., a river or stream segment may be too dirty to support certain aquatic life and also unsafe for swimming. This overlap helps to explain why the percentage of waterways impaired for one or more use in Table 1 may be higher than the more specific values that appear in Table 2.

[14] Arturo A. Keller and Lindsey Cavallaro, "Assessing the US Clean Water Act 303(d) Listing Process for Determining Impairment of a Waterbody," Journal of Environmental Management, 2008. Link: https://pubmed.ncbi.nlm.nih.gov/17270339/
[15] Ohio classifies the land surrounding a river or lake – the watershed – as impaired if it drains into a polluted river or lake. Other states classify the miles of rivers or acres of lakes themselves as impaired if they have so much pollution they cannot be used for fishing, swimming or other purposes.
[16] Indiana assessed 33,599 miles of rivers and streams, and determined that 73 percent (or 24,395 miles) are impaired for swimming and recreation. That would place Indiana 11th nationally, when comparing *percentages* of assessed miles, as opposed to total mileage of impaired waters.
[17] Oregon assessed 30,427 miles of rivers and streams and determined that 57 percent of them (or 17,619 miles) were impaired for swimming and recreation. That would place Oregon in 15th place nationally, in terms of percentage of river and stream miles impaired, as opposed to total mileage impaired.
[18] South Carolina assessed 22,509 miles of rivers and streams, determined that 74 percent of them (or 16,766 miles) of them were impaired for swimming and recreation. That would place South Carolina in 9th place nationally, in terms of highest percentage of miles impaired, as opposed to total miles impaired.
[19] The map shows impairments for primary contact recreation (such as swimming) and secondary water contact recreation (such as kayaking). States with asterisks reported data for only primary water contact recreation impairments, or only had useable data on primary contact recreation. Alabama, Delaware, Illinois, Indiana, Kansas, Nebraska, Texas, Utah, Washington, and West Virginia only reported impairments for primary contact recreation. Maine, Missouri, Nevada, New Mexico, New York, Oklahoma, and Vermont reported impairments for both primary and secondary water contact recreation, but EIP was only able to use the primary contact recreation impairment numbers because we were unable to combine the two categories without removing potential duplicates.
[20] See page 23 for a map showing assessment rates of all states. Arizona assessed only three precent of its river and stream miles in the most recent assessment cycle, and Nevada assessed only five percent. However, the two desert states have a large number of ephemeral streams that only appear after rains, which could contribute to the difficulty in assessing them.
[21] Jim Barnes, John Graham, and David Konisky, *Fifty Years at the USEPA: Progress, Retrenchment, and Opportunities,* published by Rowman and Littlefield in 2021. Chapter on the federal Clean Water Act by Jonathan Z. Cannon, former General Counsel for EPA and law professor at the University of Virginia.
[22] White House website, "President Biden's Bipartisan Infrastructure Law," accessed December 3, 2021. Link: https://www.whitehouse.gov/bipartisan-infrastructure-law
[23] Jim Barnes, John Graham, and David Konisky, *Fifty Years at the USEPA: Progress, Retrenchment, and Opportunities,* published by Rowman and Littlefield in 2021. Chapter on the federal Clean Water Act by Jonathan Z. Cannon, former General Counsel for EPA and law professor at the University of Virginia.
[24] Ibid.
[25] The Washington Post, "The Health of the Nation's River," July 16, 2006. Link: https://www.washingtonpost.com/archive/2006/07/16/the-health-of-the-nations-river/a1382da5-90bb-44bf-9a69-20afa5808b05/
[26] EPA web page, "History of the Clean Water Act," accessed December 3, 2021. Link: https://www.epa.gov/laws-regulations/history-clean-water-act
[27] Federal Clean Water Act, 33 U.S. Code § 1311 - Effluent limitations. Link: https://www.law.cornell.edu/uscode/text/33/1311
[28] David A. Keiser & Joseph S. Shapiro, "Consequences of the Clean Water Act and the Demand for Water Quality," National Bureau of Economic Research, January 2017. Link: https://www.nber.org/system/files/working_papers/w23070/w23070.pdf
[29] Jim Barnes, John Graham, and David Konisky, Fifty Years at the USEPA: Progress, Retrenchment, and Opportunities, published by Rowman and Littlefield in 2021. Chapter on the federal Clean Water Act by Jonathan Z. Cannon, former General Counsel for EPA and law professor at the University of Virginia.
[30] EPA Report, "A Benefits Assessment of Water Pollution Control Programs Since 1972: Part 1, The Benefits of Point Source Controls for Conventional Pollutants in Rivers and Streams," January 2000. Link: https://archive.epa.gov/aed/lakesecoservices/web/pdf/ee-0429-01.pdf

[31] Interstate Commission on the Potomac River," Potomac Timeline, accessed February 2, 2022. Link: https://www.potomacriver.org/potomac-basin-facts/potomac-timeline/
[32] EPA web page, "Cuyahoga River Area of Concern," accessed December 3, 2012. Link: https://www.epa.gov/great-lakes-aocs/cuyahoga-river-aoc
[33] Jim Barnes, John Graham, and David Konisky, *Fifty Years at the USEPA: Progress, Retrenchment, and Opportunities*, published by Rowman and Littlefield in 2021. Chapter on the federal Clean Water Act by Jonathan Z. Cannon, former General Counsel for EPA and law professor at the University of Virginia.
[34] Ibid.
[35] EPA Office of Inspector General report, "EPA Needs an Agencywide Strategic Action Plan to Address Harmful Algal Blooms," Sept. 29, 2021. Link: https://www.epa.gov/system/files/documents/2021-09/_epaoig_20210929-21-e-0264_glance.pdf
[36] Ibid.
[37] Ibid.
[38] Jim Barnes, John Graham, and David Konisky, Fifty Years at the USEPA: Progress, Retrenchment, and Opportunities, published by Rowman and Littlefield in 2021. Chapter on the federal Clean Water Act by Jonathan Z. Cannon, former General Counsel for EPA and law professor at the University of Virginia.
[39] Government Accountability Office, "Changes Needed If Key EPA Program Is to Help Fulfill the Nation's Water Quality Goals," December 2013. Link: https://www.gao.gov/assets/gao-14-80.pdf
[40] Ibid.
[41] U.S. Government Accountability Office, "Clean Water Act: Changes Needed If Key EPA Program Is to Help Fulfill the Nation's Water Quality Goals," December 2013. Link: https://www.gao.gov/products/gao-14-80
[42] Ibid.
[43] Ibid.
[44] UNITED STATES DISTRICT COURT FOR THE DISTRICT OF COLUMBIA complaint, "State Maryland, District of Columbia, Commonwealth of Virginia and State of Delaware vs. Environmental Protection Agency," lawsuit filed on Sept. 10, 2020. Link: https://www.marylandattorneygeneral.gov/news%20documents/091020_Complaint_MD_v_EPA.pdf
[45] Press release by Maryland Attorney General Brian Frosh, "Attorneys General Frosh, Herring, Jennings, and Racine File Suit Against EPA," September 10, 2020. Link: https://www.marylandattorneygeneral.gov/press/2020/091020.pdf
[46] Mark Schleifstein, "2017 Gulf dead zone is largest ever, size of New Jersey, researchers say," New Orleans Times Picayune, August 2, 2017. Link: https://www.nola.com/news/environment/article_6025ee25-1a39-516c-a43f-aadd206e05e1.html
[47] National Research Council of the National Academies of Science Committee on the Mississippi River and the Clean Water Act, "Mississippi River Water Quality and the Clean Water Act," National Academies Press, 2008. Link: https://www.nap.edu/catalog/12051/mississippi-river-water-quality-and-the-clean-water-act-progress
[48] EPA Office of Inspector General report, "The Clean Water Act after 37 Years: Recommitting to the Protection of the Nation's Waters," Oct. 15, 2009. Link: file:///C:/Users/tpelton/OneDrive%20-%20Environmental%20Integrity%20Project/Desktop/OIG%20report.pdf
[49] Ibid.
[50] David A. Keiser & Joseph S. Shapiro, "Consequences of the Clean Water Act and the Demand for Water Quality," National Bureau of Economic Research, January 2017. Link: https://www.nber.org/system/files/working_papers/w23070/w23070.pdf
[51] Ibid.
[52] Environmental Integrity Project, "61 Groups Demand That EPA Update Industry Water Pollution Technology Standards, Many Dating to 1970s," Sept. 22, 2021. Link: https://environmentalintegrity.org/news/61-groups-demand-that-epa-update-industry-water-pollution-technology-standards-many-dating-to-1970s/
[53] Letter from the Environmental Integrity Project and allies to EPA Administrator Michael Regan, "Re: EPA's Annual Review of Effluent Limitation Guidelines Under the Clean Water Act," Sept. 22, 2021. Link:

40https://environmentalintegrity.org/wp-content/uploads/2021/09/2021.09.22-EPA-ELG-letter-FINAL.pdf C.F.R. §131.10
[54] Federal Clean Water Act, 33 U.S. Code § 1251. Link: https://www.law.cornell.edu/uscode/text/33/1251
[55] Standards for irrigation and industrial uses tend to be less stringent as they are not designed to protect the general public or preserve environmental habitat.
[56]Standards vary by state. In Virginia, for example, the standard for impairment for swimming and water contact recreation is if more than 10 percent of tests within a 90-day exceed 410 counts of E. coli per 100 ml of water, or if the geometric mean of 126 counts of E. coli is exceeded for all tests taken during a 90-day period.
[57] 40 C.F.R. §130.10
[58] Addition information required in the reports can be found in 40 C.F.R. §130.
[59] Specific states might have more or less detailed descriptions for the uses given above, but what's presented here are uses as defined by EPA. Link: https://www.epa.gov/sites/default/files/2014-10/documents/handbook-chapter2.pdf
[60] "Maryland's Final 2018 Integrated Report of Surface Water Quality", Maryland Department of Environment, p. 107, Link: https://bit.ly/3F0xFRJ
[61] U.S. Environmental Protection Agency National Environmental Justice Advisory Council, "Fish Consumption and Environmental Justice," November 2002. Link: https://www.epa.gov/sites/default/files/2015-02/documents/fish-consump-report_1102.pdf
[62] "Integrated Report," Virginia Department of Environmental Quality. https://www.deq.virginia.gov/water/water-quality/assessments/integrated-report. Other states may use data from longer time periods.
[63] When this information was not available from the state integrated reports, we obtained it from state agencies or EPA's Assessment, Total Maximum Daily Load Tracking, and Implementation System (ATTAINS). It is worth mentioning here that various states expressed challenges and difficulty when uploading data to ATTAINS, so whenever EIP needed to use ATTAINS for this project, we sent our findings to state agencies for verification.
[64] The percentage of assessed waters helps control for differences in assessment rates from state to state, but it still doesn't account for differences in how states designate uses for their waterways. For example, Wyoming has over 260,000 miles of rivers within the state, but only assessed 1,018 of those miles for recreation. Of those 1,018 miles assessed, 981 were designated impaired (or 96 percent). When looking at just the percent of assessed waters impaired for recreation, this makes Wyoming look like one of the worst places to swim. On the other side, West Virginia has 31,000 miles of rivers and assessed 20,000 miles for recreation. Of those 20,000, they designated 9,900 miles as impaired (or 49 percent). When comparing the percent off waterways impaired for recreation, Wyoming looks way worse, even though West Virginia has over 10 times the number of miles impaired.
[65] Both Tennessee and Connecticut say they focus more resources on monitoring impaired and at-risk waterways than trying to assess all the waterbodies within their states.
[66] See Appendix B for additional information about data limitations and caveats.
[67] It is important to note that not all 49 states have every waterbody type (for example, Kansas has no estuaries).
[68] For example, Nevada has 126,257 miles of intermittent and ephemeral stream miles within the state, but they only assess the 15,549 miles of perennial river and stream miles.
[69] Oregon Department of Environmental Quality, "Temperature Water Quality Standard Implementation – A DEQ Internal Management Directive," April 2008, available at: https://www.oregon.gov/deq/Filtered%20Library/IMDTemperature.pdf. See pages 35, 36, 46 and 73. See also, the USDA publication, "Conservation Buffers," noting the importance of forest and vegetative buffers in cooling streams and protecting vegetative life. Link: https://www.fs.usda.gov/nac/buffers/guidelines/2_biodiversity/12.html
For additional information, see Northwest Environmental Advocates webpage at https://www.northwestenvironmentaladvocates.org/ Oregon is currently revising its guidance for addressing waters impaired by high temperatures, which should more detail about how to address these and other root causes of warming rivers and streams.

[70] Iowa and Michigan base their impairment percentage on both primary and secondary water contact recreation, meaning both sports like swimming and water skiing (in which a person is likely to be totally immersed in the water) and boating in which a person has contact with the water but is not likely to become immersed in the water. Hawaii and Wyoming had even higher percentage of assessed river and stream miles designated at impaired for swimming or water contact recreation, with Hawaii having 100 percent of its 222 assessed miles listed as impaired and Wyoming having 96 percent of its 1,018 assessed miles. However, because Hawaii has so few miles of rivers, and because Wyoming assessed such a small percentage of its rivers and streams, only 6.7 percent, it is difficult to compare them to states like Illinois, Iowa, and Michigan.
[71] States with asterisks only reported data for primary water contact recreation impairments, or only had useable data on primary contact recreation. Alabama, Delaware, Illinois, Indiana, Iowa, Kansas, Nebraska, Texas, Utah, and West Virginia only reported impairments for primary contact recreation. Maine, Missouri, Nevada, New Mexico, New York, Oklahoma, and Vermont reported impairments for both primary and secondary water contact recreation, but EIP was only able to use the primary contact recreation impairment numbers because we were unable to combine the two categories without removing potential duplicates.
[72] Tony Briscoe, "The shallowest Great Lake provides drinking water for more people than any other. Algae blooms are making it toxic — and it's getting worse," Chicago Tribune, November 14, 2019. Link: https://www.chicagotribune.com/news/environment/great-lakes/ct-lake-erie-climate-change-algae-blooms-20191114-bjkteorf5vg2hfu3cgqxe2ncru-story.html
[73] EPA, "Chesapeake Bay Total Maximum Daily Load," approved by EPA in 2010, available online at: https://www.epa.gov/sites/default/files/2014-12/documents/bay_tmdl_executive_summary_final_12.29.10_final_1.pdf
[74] Environmental Integrity Project, "The Thin Green Line: Cuts to State Environmental Agencies Threaten Public Health," released Dec. 5, 2019. Link: https://environmentalintegrity.org/wp-content/uploads/2019/12/The-Thin-Green-Line-report-12.5.19.pdf
[75] Both Tennessee and Connecticut say they focus more resources on monitoring impaired and at-risk waterways than trying to assess all the waterbodies within their states.
[76] This does not include waterways that have been listed as impaired in past assessment cycles but have not been assessed in the past 6-10 years. Once waterways are added to an impairment list, states cannot remove them until they are assessed and the assessment shows that water quality standards have been met.
[77] One reason why some states do better at assessing larger percentages of their waterways is that they don't have as many as other states. For example, New Jersey only has 19,425 miles of rivers within the state, which is only ten percent of the total waters within the state of Missouri. Another reason, and this is special to South Carolina, is the use of a probabilistic monitoring program, which allows states to conduct statistically based water monitoring to determine the general water quality across the whole state without having to monitor every waterbody.
[78] All of these states have large numbers of intermittent and ephemeral streams, which is why their miles of unassessed rivers is so high. Nevada, for example, has about a 50 percent assessment rate when looking at just perennial river miles.
[79] "Worsening algae bloom on Florida's Lake Okeechobee threatens coasts again" The Miami Herald, Adrianna Brasileiro, 05/17/2021. https://phys.org/news/2021-05-worsening-algae-bloom-florida-lake.html
[80] "Florida Estuaries in Crisis," Florida Oceanographic Society. https://www.floridaocean.org/florida-estuaries-crisis
[81] "Lake Okeechobee Discharges," Calusa Waterkeeper. https://calusawaterkeeper.org/issues/lake-okeechobee-discharges/
[82] "'It smells like death.' Toxic algae blooms, new health hazards — and what's being done," Rochester Democrat and Chronicle, Julie Sherwood, 11/15/2021. https://www.democratandchronicle.com/story/news/2021/11/15/toxic-algae-blooms-new-health-hazards-and-whats-being-done/6235805001/
[83] "Indicators: Algal Toxins," U.S. Environmental Protection Agency. https://www.epa.gov/national-aquatic-resource-surveys/indicators-algal-toxins-microcystin

[84] "Lethal Mercury in Everglades Exceeds EPA Standards," South Florida Media Network, Laura Antunez, 02/05/2020. http://sfmn.fiu.edu/mercury-in-the-everglades-lethal-and-increasing/
[85] "Toxins are turning off great egrets mating in the Everglades," The Miami Herald, Adrianna Brasileiro, 10/27/2020. https://phys.org/news/2020-10-toxins-great-egrets-everglades.html
[86] "California's Water Quality Challenges," Public Policy Institute of California. Accessed 12/21/2021. https://www.ppic.org/publication/californias-water-quality-challenges/
[87] Ibid.
[88] "Beaches Closed After 8.5 Million Gallons of Sewage Spill in Los Angeles County," Eduardo Medina, The New York Times, 01/01/2022. https://www.nytimes.com/2022/01/01/us/sewage-spill-los-angeles.html
[89] "Regulators Order Testing at Damaged Hyperion Sewage Plant," The Los Angeles Times, 07/30/2021. https://www.latimes.com/california/story/2021-07-30/regulators-order-testing-at-damaged-hyperion-sewage-plant
[90] "Danger in Droughtsville: California's urban water at risk," CalMatters, Erica Yee, 12/21/2022. https://calmatters.org/explainers/danger-in-droughtsville-california-urban-water-at-risk/
[91] "Wasting Our Waterways," Environment America Research and Policy Center, Jeff Inglis and Tony Dutzik, Frontier Group, John Rumpler. June 2014. https://environmentamericacenter.org/sites/environment/files/reports/US_wastingwaterways_scrn%20061814_0.pdf
[92] "Lake Charles industry to pay $5.5 million over contaminating Calcasieu River estuary," The New Orleans Advocate, Mark Schleifstein. 04/26/2021. https://www.nola.com/news/environment/article_6272451c-a14a-11eb-bf01-130206b64851.html
[93] These small tanks are sometimes known as aerated treatment units.
[94] "That's a lot of money': $53 million for Lake Pontchartrain Basin in infrastructure bill," The New Orleans Advocate, Mark Schleifstein, 11/13/2021. https://www.nola.com/news/environment/article_49dc88a2-43d2-11ec-a23f-df7f482fecb5.html
[95] USDA Indiana, Land Use, "cropland" and "Range & Pasture" webpage, accessed March 8, 2022. Link: https://www.nrcs.usda.gov/wps/portal/nrcs/in/technical/landuse/ United States Census Bureau, QuickFacts Indiana, Geography. Accessed March 8, 2022. Link: https://www.census.gov/quickfacts/IN
[96] Hoosier Environmental Council, "The Issues: Drinking Water, River & Lake Protection" web page, accessed March 8, 2022. Link: https://www.hecweb.org/issues/water-wilderness/water-protection/
[97] Indiana Department of Environmental Management, Integrated Water Monitoring and Assessment Report. 2020. Appendix A, Tables 10 and 11. Accessed March 8, 2022. Link: https://www.in.gov/idem/nps/files/ir_2020_apndx_a_tables.pdf
[98] Indiana Department of Environmental Management, Office of Land Quality, Confined Feeding Operation Facilities in Indiana, April 2, 2020. Geospatial Data Presentation. Accessed March 8, 2022. Link: https://maps.indiana.edu/previewMaps/Environment/Agribusiness_Confined_Feeding_Operations.html
[99] Indiana Department of Agriculture, Indiana's State Nutrient Reduction Strategy, A frame work to reduce nutrients entering Indiana's waters. February 2021. "Nutrient Load Concerns on Indiana's Waters". Accessed March 8, 2022. Link: https://www.in.gov/isda/files/Indiana-State-Nutrient-Reduction-Strategy_final-Version-6_small.pdf
[100] Indiana Department of Agriculture, Indiana's State Nutrient Reduction Strategy, *A frame work to reduce nutrients entering Indiana's waters.* February 2021. "Nutrient Load Concerns on Indiana's Waters", page 15. Accessed March 8, 2022. Link: https://www.in.gov/isda/files/Indiana-State-Nutrient-Reduction-Strategy_final-Version-6_small.pdf
[101] Indiana Finance Authority, Utility Planning in Indiana, A survey of best practices challenges and needs, October 2015. Page 13. Accessed March 8, 2022. Link: https://www.in.gov/iurc/files/IFA-Report-October-2015-Evaluation-of-Water-Utility-Planning-in-IN.pdf
[102] Indiana Department of Agriculture, Indiana's State Nutrient Reduction Strategy, *A frame work to reduce nutrients entering Indiana's waters.* February 2021. "Indiana Drainage Overview", page 16. Accessed March 8, 2022. Link https://www.in.gov/isda/files/Indiana-State-Nutrient-Reduction-Strategy_final-Version-6_small.pdf
[103] "2020 State Agriculture Overview," U.S. Department of Agriculture. https://www.nass.usda.gov/Quick_Stats/Ag_Overview/stateOverview.php?state=IOWA

[104] "Iowa Pork Facts," Iowa Pork Producers Association. https://www.iowapork.org/news-from-the-iowa-pork-producers-association/iowa-pork-facts/
[105] "Des Moines Faces Extreme Measures to Find Clean Water," The Associated Press, Scott McFetridge. 07/04/2021. https://apnews.com/article/des-moines-business-environment-and-nature-b7f1e431a601dfb6536452d743012948
[106] "Large Fertilizer Spill Reveals Lack of Regulation," Iowa Environmental Council, 11/15/2021. https://www.iaenvironment.org/newsroom/water-and-land-news/iec-reacts-to-largescale-fertilizer-release-penalty
[107] "Iowa DNR Investigating Liquid Manure Spills," K92.3, Johnny Marks, 04/15/2021. https://k923.fm/dnr-investigating-manure-spill/ "Hundreds of thousands of gallons of manure spill into a pair of northwest Iowa creeks, DNR officials report," Des Moines Register, Andrea Mai Sahouri, 04/14/2021. https://www.desmoinesregister.com/story/money/agriculture/2021/04/14/dnr-responds-manure-spills-into-northwest-iowa-creeks-department-natural-resources/7230984002/
[108] "Hog farm manure tank leak causes fish kill in northwest Iowa," Associated Press, https://www.kwwl.com/news/hog-farm-manure-tank-leak-causes-fish-kill-in-northwest-iowa/article_1389e591-6074-5a01-a0f0-c73f0a9b10ab.html
[109] "Des Moines Faces Extreme Measures to Find Clean Water," The Associated Press, Scott McFetridge. 07/04/2021. https://apnews.com/article/des-moines-business-environment-and-nature-b7f1e431a601dfb6536452d743012948
[110] "Profit vs the people: The clean water fight over the Raccoon River," American Rivers, Emma Schmit and Adam Mason. 08/31/2021. https://www.americanrivers.org/2021/08/profit-vs-the-people-the-clean-water-fight-over-the-raccoon-river/
[111] "Citizen's Engagement Guide for Delaware's Phase III Watershed Implementation Plan," Delaware Nature Society. https://www.chesapeakebay.net/channel_files/33122/choose_clean_water_delaware_citizens_engagement_guide.pdf
[112] Ibid.
[113] "Water Pollution from Slaughterhouses," The Environmental Integrity Project. 11/11/2018. https://environmentalintegrity.org/wp-content/uploads/2018/10/Slaughterhouse-report-2.14.2019.pdf
[114] Ibid.
[115] "A poultry plant, years of groundwater contamination and, finally, a court settlement," The Washington Post, Darryl Fears. 04/12/2021. https://www.washingtonpost.com/climate-environment/2021/04/13/poultry-plant-years-groundwater-contamination-finally-court-settlement/
[116] "Mountaire to pay $205M in water contamination settlement," Delaware Public Media. 04/12/2021. https://www.delawarepublic.org/delaware-headlines/2021-04-12/mountaire-to-pay-205m-in-water-contamination-settlement
[117] National Park Service, "Cuyahoga Valley: Water Quality," accessed December 10, 2021. Link: https://www.nps.gov/cuva/learn/nature/waterquality.htm
[118] National Oceanic and Atmospheric Administration, "2021 Lake Erie Algal Bloom was More Severe than Predicted by Seasonal Forecast," November 1, 2021. Link: https://coastalscience.noaa.gov/news/2021-lake-erie-algal-bloom-was-more-severe-than-predicted-by-seasonal-forecast/
[119] Jim Barnes, John Graham, and David Konisky, *Fifty Years at the USEPA: Progress, Retrenchment, and Opportunities,* published by Rowman and Littlefield in 2021. Chapter on the federal Clean Water Act by Jonathan Z. Cannon, former General Counsel for EPA and law professor at the University of Virginia.
[120] White House website, "President Biden's Bipartisan Infrastructure Law," accessed December 3, 2021. Link: https://www.whitehouse.gov/bipartisan-infrastructure-law
[121] Fortunately, in this case, all of those sites no longer designated as impaired under the new standard would still be labeled impaired until DEQ had the opportunity to perform adequate monitoring at those locations in order to compare them to the new standard. However, this might not always be the case across the country when states change methodology.
[122] Waterbodies also physically change over time, increasing or decreasing in size. Any flood events can change the stream morphology, slowly changing the length of river over time. Lake sizes can differ based on wet and dry years.

[123] "The 2020 South Dakota Integrated Report for Surface Water Quality Assessment," South Dakota Department of Environmental and Natural Resources. Page 12. Link: https://danr.sd.gov/OfficeOfWater/SurfaceWaterQuality/docs/DANR_2020_IR_final.pdf
[124] "National Water Quality Report to Congress," U.S. Environmental Protection Agency, August 2017. Link: https://www.epa.gov/sites/default/files/2017-12/documents/305brtc_finalowow_08302017.pdf
[125] In Arizona, the monitoring of ephemeral and intermittent waters is limited to special investigations, such as TMDL development. "Arizona 2016 Clean Water Act Assessment," Arizona Department of Environmental Quality. August 2017. Chapter 2, Page 42. Link: https://static.azdeq.gov/wqd/wqa/2016_cwaa_final.pdf
[126] "Nevada 2016-2018 Water Quality Integrated Report," Nevada Division of Environmental Protection: Bureau of Water Quality Planning. August 2020. Page 38. Link: https://ndep.nv.gov/uploads/water-wqm-docs/IR2018_FinalEPA_Approved.pdf
[127] This excludes 318,000 acres of lakes from assessment because they don't fall into that category.
[128] Massachusetts and Montana both only assess lakes above 5 acres in size, while Mississippi only assesses lakes above 25 acres in size.
[129] Other states use a combination of monitored waterways (where monitoring has occurred within a certain amount of time based on the report release) and evaluated waterways (where monitoring has occurred outside that timeline). For example, Missouri used both monitored waterways (waterways monitored since 2009) and evaluated waterways (waterways monitored prior to 2009) to determine support designations for the 2018 integrated report.