Wasting our Waterways

Toxic pollution and the unfulfilled promise of the Clean Water Act

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Toxic pollution and the unfulfilled promise of the Clean Water Act

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September 2022

Acknowledgments

The authors sincerely thank Eve Gartner, Managing Attorney, Toxic Exposure & Health Program at Earthjustice; Jared Hayes, Policy Analyst at Environmental Working Group; Katie Huffling, Executive Director, Alliance of Nurses for Healthy Environments; and Eric Schaeffer, Executive Director, Environmental Integrity Project, for their review of drafts of this document, as well as their insights and suggestions. Thanks also to Susan Rakov, Elizabeth Ridlington and James Horrox of Frontier Group for their contributions and editorial support.

Environment America Research & Policy Center thanks the Park Foundation and the Sharpe Family Foundation for making this report possible.

The authors bear responsibility for any factual errors. The recommendations are those of Environment America Research & Policy Center and U.S. PIRG Education Fund. The views expressed in this report are those of the authors and do not necessarily reflect the views of our funders or those who provided review.

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Executive summary

Fifty years ago, our nation came together to pass the federal Clean Water Act, with an ambitious goal of making all of America's waterways clean. Heralding a new era for America's rivers, lakes and streams, the Clean Water Act led to dramatic reductions in pollution and to the restoration of several waterways.

But a half-century later, the job of cleaning up America's waterways remains half-done. Many of our waterways still face major pollution threats – including industrial facilities that continue to release large volumes of toxic substances, threatening the health of people and ecosystems.

According to data from the U.S. Environmental Protection Agency's (EPA) Toxics Release Inventory (TRI), industrial facilities released at least **193.6 million pounds of toxic substances into U.S. waterways in 2020,** including chemicals known to cause cancer, reproductive problems and developmental issues in children. These high volumes stand in stark contrast to the Clean Water Act's stated objective of eliminating direct discharges of pollution by 1985.

To end this toxic threat to America's waterways, our nation should systematically reduce the use of toxic chemicals, and the EPA should update pollution control standards to effectively eliminate their direct release into our waterways wherever possible. More broadly, the federal government should ensure that rules and enforcement pursuant to the Clean Water Act are commensurate with its goals.

Industrial facilities dump toxics into waterways nationwide.

- Among major watershed regions nationwide, the Ohio River basin received the largest volume of toxic discharges by weight in 2020, followed by the South Atlantic-Gulf, and Mid-Atlantic watershed regions. (See Figure ES-1, next page.)

- Industrial and government facilities released toxic substances into 844 local watersheds nationwide – representing about one in every three local watersheds in the U.S.[1] The Lower Ohio-Little Pigeon watershed in Indiana and Kentucky, the Upper New River watershed in North Carolina, Tennessee and Virginia, and the Brandywine-Christina watershed in Delaware, Maryland and Pennsylvania received the largest amounts of toxic chemical discharges by weight in 2020. (See Table ES-1, next page.)

- Texas, Indiana and Virginia ranked highest in the nation for toxic chemical discharges to water by weight in 2020. (See Table ES-2, next page.)

- Nitrate compounds accounted for more than 90% of all toxic releases by weight, with animal processing plants and petroleum refiners representing the largest sources of nitrates. Nitrates are not only dangerous to human health, but they also contribute to the formation of oxygen-depleted "dead zones" in waterways such as the Gulf of Mexico that harm wildlife.

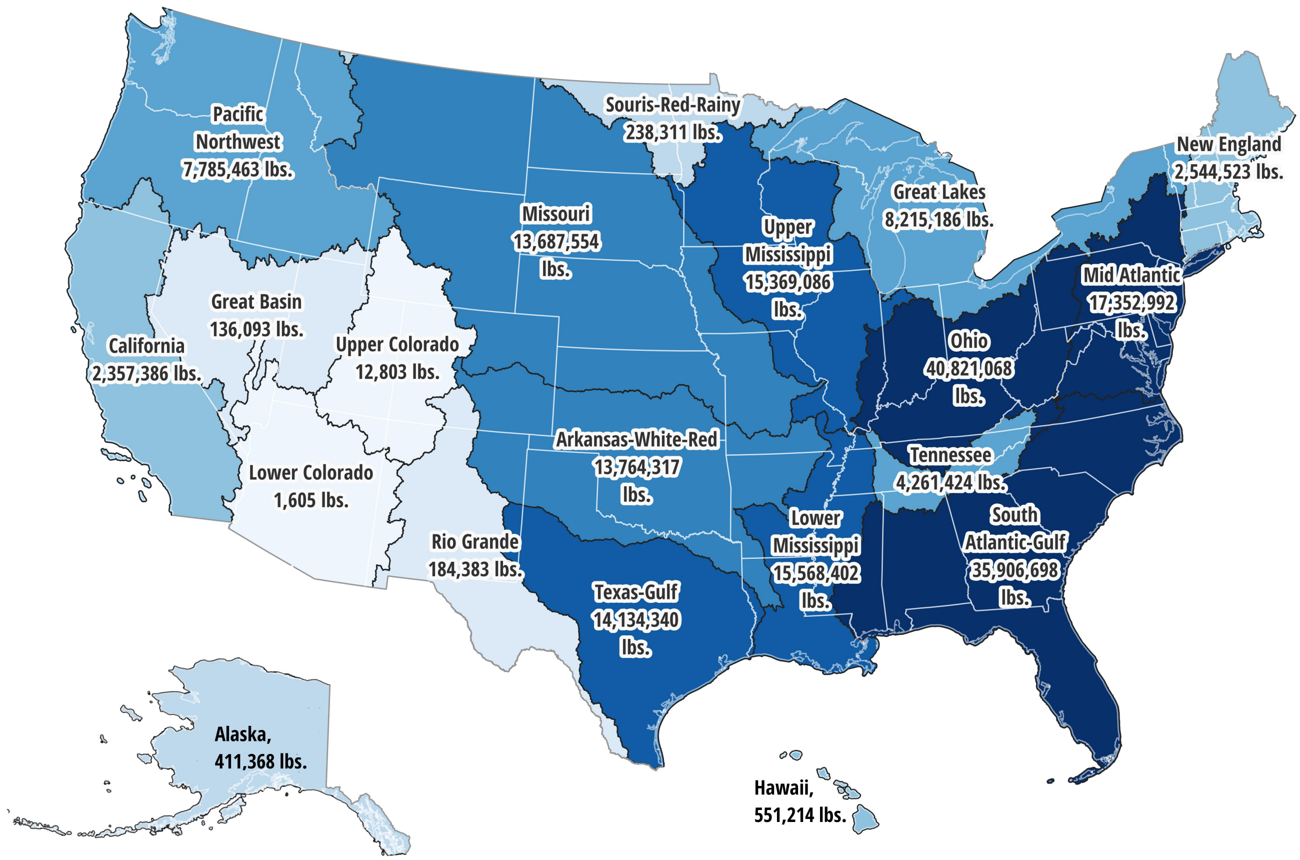

Figure ES-1. Toxic releases to watershed regions nationwide, 2020

TABLE ES-1. TOP FIVE LOCAL WATERSHEDS[2] BY TOXIC SUBSTANCES RELEASED, 2020

Receiving watershed	State(s) containing watershed	Toxics released (lbs.)
Lower Ohio-Little Pigeon	IN, KY	12,008,366
Upper New	NC, TN, VA	10,266,141
Brandywine-Christina	DE, MD, PA	6,191,362
Lower Cape Fear	NC	5,017,810
Muskingum	OH	4,640,523

TABLE ES-2. TOP FIVE STATES BY TOXIC SUBSTANCES RELEASED, 2020

State or territory	Toxics released (lbs.)
Texas	16,778,747
Indiana	14,085,748
Virginia	12,218,174
Louisiana	11,378,399
Alabama	10,173,322

About the data

The EPA's Toxics Release Inventory (TRI) is the nation's most comprehensive source of data on the release of specific toxic substances to waterways. However, TRI data captures only a portion of the toxic pollution released to waterways by industrial facilities, meaning that the amount of toxic substances released to waterways by industrial facilities is likely significantly higher than reported here. Among the releases excluded from TRI reporting are the following:

- Releases from industries exempt from reporting. Oil and gas extraction, for example, have historically been exempt from reporting under TRI (though reporting for natural gas processing facilities will be required starting in 2023).[3]
- Releases of toxic substances that have not yet been added to the list of reportable chemicals. (For example, reporting for releases of some PFAS was only required as recently as 2020, and is still not required for the vast majority of these "forever chemicals.")
- Releases from facilities with fewer than 10 full-time employees or that do not meet minimum thresholds for the amount of a substance manufactured, processed or otherwise used at a facility.[4]
- Releases that fall under various other exemptions in the law, such as the *de minimis* exemption that allows facilities to avoid counting some chemicals present in low concentrations in products when determining whether they are required to report under the law.[5]

Some waterways receive particularly large discharges of chemicals with potent effects on human health.

- Wisconsin, Texas and Virginia were the three states with the largest toxicity-weighted releases of chemicals by industrial and government facilities in 2020.
- The Ohio River, Great Lakes and Texas-Gulf watershed regions had the largest releases of chemicals weighted by toxicity.

Many chemicals discharged into American waterways have been linked to severe health problems.

- **Cancer:** Just over 1 million pounds of toxic chemicals linked to cancer were released to waterways across America in 2020. More cancer-causing chemicals were released into the waters of South Carolina, Texas and Alabama than any other states in 2020, and the Austin-Oyster watershed in Texas, the Cooper watershed in South Carolina, and the Racoon-Symmes watershed in Kentucky, Ohio and West Virginia received the most cancer-causing toxics among local watersheds. The industries that released the most cancer-causing toxics were paper and pulp mills.
- **Reproductive effects:** Over 200,000 pounds of chemicals that potentially cause reproductive problems were released in 2020, with Texas, Indiana and Pennsylvania waterways receiving the greatest amount of reproductive toxics. The Middle Wabash-Little Vermilion watershed in Illinois and Indiana ranked first with more than 13,000 pounds of chemical releases tied to reproductive toxicity, followed by the Lehigh watershed in Pennsylvania and the Upper San Antonio watershed in Texas. The industries that discharged the most reproductive toxics into water were fossil fuel power plants and iron and steel mills.
- **Developmental effects:** Over 4.5 million pounds of chemicals with the potential to affect the healthy development of fetuses and children were released into American waterways in 2020. North Carolina, Wisconsin and Alabama were the states with the

largest releases of developmental toxics, with the Castle Rock watershed in Wisconsin, the Middle Neuse watershed in North Carolina and the Lower Alabama watershed in Alabama receiving the greatest amount of developmental toxic releases. Pulp, paper and paperboard mills were the largest releasers of developmental toxics.

Releases of a small number of "forever chemicals" known as PFAS were reported to the Toxics Release Inventory for the first time in 2020, though the true volume of PFAS releases is likely much higher.

- For the first time in 2020, industrial polluters were required to report their releases of certain per- and polyfluoroalkyl substances (PFAS) – chemicals that have been linked to kidney cancer, thyroid disruption and other health problems. PFAS are toxic at extremely low doses – health advocates have recommended limits on PFAS in drinking water of *1 part per trillion*, equivalent to just one drop of water in 20 Olympic-sized swimming pools – and PFAS chemicals persist in the environment over time.[6]
- Industrial polluters reported releasing at least 440 pounds of PFAS to waterways in 2020. However, given that the 2020 TRI reporting only included 172 out of more than 12,000 types of PFAS, and likely omits many facilities that use or release PFAS, this figure likely dramatically understates the amount of PFAS pollution.[7] The EPA is currently planning to update TRI reporting rules and pollution control standards for at least some industries discharging PFAS to waterways.[8]

To further the promise of the Clean Water Act, and to protect our rivers, lakes, streams and bays from toxic pollution, policymakers should take the following actions:

- The EPA should move quickly to update pollution control standards in order to end or at least dramatically reduce toxic releases into our waterways. This includes standards for meat and poultry processing plants, power plants, and all industrial dischargers of PFAS chemicals.
- Officials should require industrial facilities to remove toxics from the wastewater they send to sewage treatment plants (otherwise known as publicly owned treatment works, or POTWs) that are unable to be removed by those plants and may be discharged into waterways. These "indirect discharges" of industrial toxic chemicals are significant and have the potential to affect the environment and health.
- The EPA should eliminate the *de minimis* exemption for PFAS chemicals, which likely results in PFAS releases being underreported to TRI.[9] Similarly, Congress and the EPA should continue to expand the scope of reporting to TRI and ensure that reports of toxic releases under the program are complete and accurate.
- Federal and state officials, as well as product manufacturers, should dramatically restrict the use of PFAS and other toxic chemicals, especially where safer alternatives already exist.
- EPA and state officials should ensure that facilities that use or store large quantities of toxic material are not permitted near our waterways, reducing the threat of large-scale spills of toxics into waterways that cause immediate and long-term harm.
- Congress should provide the EPA with sufficient funding to ensure rigorous and timely review and vigorous enforcement of water pollution permits.
- State and federal officials should ratchet down toxic pollution limits in clean water permits, especially where a facility is discharging into a waterway already polluted with toxic substances.
- The federal government should confirm that all of America's wetlands, streams and other waters are protected from toxic pollution by the Clean Water Act.
- State and federal officials should move beyond voluntary incentives to dramatically curb the flow of toxic pollutants from non-point sources, especially runoff of nitrates and pesticides from industrial agribusiness operations.

Introduction

The 1972 passage of the federal Clean Water Act marked a watershed moment in American history. No longer, Congress signaled, would polluters be able to use the nation's rivers, streams, lakes and ocean waters as their dumping grounds. Instead, the nation would work toward a goal of making the nation's waterways safe for fishing and swimming within roughly a decade wherever possible.[10] Further, Congress declared that "it is the national policy that the discharge of toxic pollutants in toxic amounts be prohibited."[11]

Fifty years later, the Clean Water Act has played a critical role in restoring America's waterways to health. According to one study, the number of waterways safe for fishing increased by 12% during the law's first three decades.[12]

To limit industrial pollution, the Clean Water Act created the National Pollution Discharge Elimination System (NPDES), through which permits are issued limiting the pollution that facilities can release to waterways. The act also required the EPA to set technology-based limits on pollutant discharges from industrial facilities and to update those limits as technology improves – ensuring that the nation is using every practicable tool in its toolbox to keep industrial pollution out of our waterways.[13]

In the decades that followed passage of the law, state and federal officials also came to realize that stopping pollution at the end of the pipe was not always the best – nor the only – approach to protecting our waterways. Truly protecting the environment and public health – including from accidental releases and spills of toxic chemicals – required that communities be informed about the toxic threats in their midst and that industrial facilities adopt safer alternatives to the most dangerous substances. States such as Massachusetts, New Jersey and Oregon adopted pollution prevention laws that aimed to reduce industrial use of toxic chemicals and encourage safer alternatives.[14] And in 1986, Congress enacted the Emergency Planning and Community Right to Know Act, which, among other things, required many industrial facilities to report their releases of toxic substances to the environment via the Toxics Release Inventory (TRI).[15]

Despite five decades of progress, however, pollution problems continue to threaten our waterways, including the direct release of toxic substances to rivers, streams and lakes. While the nation has reduced industrial pollution since the early 1970s, polluters continue to dump large volumes of toxic substances – including highly toxic chemicals such as PFAS – directly into waterways.

In this report – our fourth such report since 2009 – we review federal data on discharges of toxic chemicals to waterways. This data, from the TRI, does not tell the full story of the impact of toxics on our health and environment, since not all releases of all dangerous chemicals by all facilities are covered under TRI, and a great deal of toxic pollution comes from sources other than industrial facilities. There is still much we do not know.

But what we do know about toxic releases to our waterways is more than enough to conclude that the mission of the Clean Water Act is far from accomplished. At a time when powerful interests are pushing to limit the reach of the law, the data in this report shows that the nation should instead mark the 50th anniversary of the Clean Water Act by recommitting to its goals of swimmable, fishable waters for all and an end to the dumping of toxic chemicals that threaten our health and our environment.

Toxic releases to waterways threaten public health and the environment

Industrial facilities across America routinely release toxic chemicals into the air, land and water. While chemical pollution is regulated and monitored in a variety of ways, in many cases it is legal, despite posing major threats to people and ecosystems.

Dangers to public health

Industrial facilities across the country release toxic substances to our waterways that have been linked to an array of serious health problems, from cancer, fertility problems and developmental problems to damage to the heart, cardiovascular system, brain, eyes, kidneys, liver and more.[16]

People can be exposed to many of these chemicals when they swim in the water or eat fish that have absorbed the chemicals. Many chemicals pose a threat to drinking water as well.[17]

Damage to the environment

Beyond effects on human health, toxics in water can damage wildlife, and the problem of chemical damage to water ecosystems is widespread in the United States. Among rivers and streams across the country that have been assessed for their health, roughly half still remain too polluted to support fishing, swimming, healthy aquatic habitats or use as drinking water.[18]

Toxic chemicals can shorten the lives of fish and other aquatic lifeforms, interfere with their mating and reproduction, disrupt their hormone systems, change their sex characteristics or kill them outright.[19] In addition, some chemicals that are toxic to humans – such as nitrates – can contribute to environmental problems in other ways. Nitrates contribute to the formation of "dead zones" – areas where nutrient-fueled growth of algae leads to reduced oxygen levels in the water that make it inhospitable to wildlife.[20]

Toxic substances released to U.S. waterways in 2020

This report uses data from the U.S. Environmental Protection Agency's (EPA) Toxics Release Inventory (TRI) to quantify releases of toxic substances from industrial facilities to U.S. waterways in 2020, the most recent year of complete data available. This is the fourth report in a series: previous editions were published in 2009, 2012 and 2014.

TRI tracks the release of more than 800 toxic substances and categories of toxic substances to the environment.[21] TRI does not capture all toxic releases – releases of harmful chemicals that have not been fully studied or tested for their impacts on the environment or human health, for example, are excluded.[22] Additionally, only certain types of facilities are required to report to TRI. Generally, facilities involved in manufacturing, mining, electricity generation, chemical manufacturing or hazardous waste treatment, or federal facilities (such as military facilities) must report.[23] But facilities in other industries that likely produce significant amounts of toxic pollution – such as oil and gas extraction facilities – are exempt from TRI (though releases from natural gas processing facilities are reportable beginning in reporting year 2022).[24] Reporting is also limited to facilities that have over 10 employees and that produce or process TRI-listed chemicals above a certain threshold amount each year.[25]

Toxic chemicals from industrial facilities may also reach waterways either via "direct discharges" (e.g., pollution from a pipe leading directly from a facility to a waterway) or "indirect discharges" to sewage systems. While "indirect discharges" to publicly owned treatment works (POTWs) are reportable to TRI, releases from the receiving POTWs to waterways are not and are therefore excluded from the totals presented in this report.

Because TRI is limited in the scope of the chemicals it covers and the facilities that are required to report, the data presented here is likely a significant undercount of the amount of toxics being released into our waterways. Despite those shortcomings, TRI still represents the most comprehensive, reliable and up-to-date dataset available quantifying releases of specific toxic substances to the environment, and TRI data provides important information about the sources of toxic pollution in our waterways.

In this report, TRI data is broken down in a number of ways:

- By total pounds and "toxicity-weighted pounds equivalent" of chemicals released;
- By links to certain human health effects, namely cancer, reproductive effects and developmental effects; and
- By state, facility, watershed, industry and chemical.

What are watersheds and why do they matter?

The EPA defines a watershed as the "area that drains to a common waterway."[26] Watersheds are defined at many geographic scales, from the area around a small creek to the entire catchment area of continental-scale waterways like the Ohio or Colorado rivers.

When many facilities dump chemicals into smaller waterways that all drain into a major river, the cumulative effect of those releases can be dramatic, as is the case in the Gulf of Mexico, which each year experiences a "dead zone" of thousands of square miles due to pollutants draining from the many rivers and streams that feed the Mississippi River.[27]

Every local watershed is fully encompassed within a greater watershed. These levels of drainage – from large to small – are divided by the United States Geological Survey (USGS) into "hydrologic units," each of which is assigned a numeric "hydrologic unit code" (HUC) of varying length, from two to 16 digits.[28] Large watershed regions are signified by two-digit codes, with each successively smaller level of watershed further defined by the addition of digits to the code. For example, the Ohio River watershed region – the entire area drained by the Ohio River to its confluence with the Mississippi – is signified by HUC2 code "05," while the portion of the watershed region between Pittsburgh and the confluence with West Virginia's Kanawha River is designated as the "Upper Ohio" subregion, with HUC4 code "0503." The Little Kanawha local watershed, located within the "Upper Ohio" subregion, has the HUC8 code "05030203." And so on. (See Figure 1 below.)

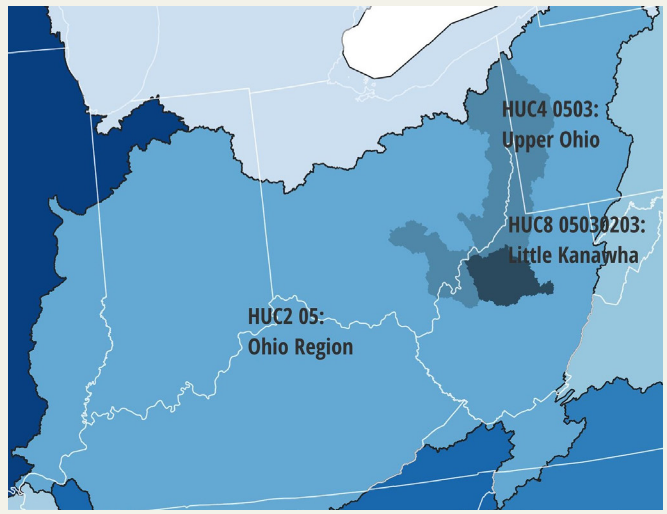

Figure 1. Illustration of watershed levels as described by USGS hydrologic unit codes

HUCs do not always meet the literal definition of "watersheds" (as they don't always include upstream waters in other HUCs that feed into them). In this report, however, we will refer to HUC2 areas as "watershed regions" and HUC8 areas as "local watersheds" or simply "watersheds."[29] By reviewing toxic releases at these two levels, readers can get a sense of the potential impact of toxic releases on local waterways with which they are familiar, as well as the large-scale impact of toxic releases on America's waterways.

Industrial facilities dumped 194 million pounds of toxics into U.S. waterways in 2020

At least 193.6 million pounds of toxic substances were released to 844 local watersheds by industrial and government facilities in 2020.[30] Toxic releases were widespread, affecting more than one out of every three watersheds nationwide, as well as all 50 states, Puerto Rico, Guam, the Virgin Islands and Washington, D.C.[31]

Releases by state

Texas was the state with the greatest amount of toxic substances released by weight in 2020, at nearly 17 million pounds, followed by Indiana and Virginia. (See Table 1.)

TABLE 1. TOP 10 STATES BY TOTAL RELEASES OF TOXIC SUBSTANCES, 2020

State or territory	Toxics released (lbs.)
Texas	16,778,747
Indiana	14,085,748
Virginia	12,218,174
Louisiana	11,378,399
Alabama	10,173,322
North Carolina	9,746,239
Mississippi	9,111,172
Ohio	7,497,207
Kentucky	7,162,639
Illinois	7,140,443

Not every chemical is equally toxic, however. To facilitate comparisons and evaluate the hazards posed by the release of toxic chemicals, the EPA developed the Risk-Screening Environmental Indicators (RSEI) tool, which assigns weights to chemical releases reported under TRI based on their toxicity to humans.[32] The RSEI Hazard metric uses "toxicity-weighted pounds equivalent" (TWPE) as the metric for this comparison. In addition, the EPA calculates a "RSEI Score" for each release based not only on the chemical's toxicity but also on its likely fate in the environment and potential routes of public exposure. Neither the RSEI Hazard nor the RSEI Score metrics reflect a chemical's toxicity to the environment or to wildlife, an important consideration for environmental protection.

In this report, we use the RSEI Hazard metric and TWPE to compare the toxicity to humans of chemical releases reported under TRI. (See text box on next page for comparison of leading facilities by RSEI Score.)

Wisconsin had the largest toxicity-weighted releases of toxic substances (as measured by the RSEI Hazard indicator) in 2020, followed by Texas and Virginia. (See Table 2.)

TABLE 2. TOP 10 STATES BY TOXICITY-WEIGHTED CHEMICALS RELEASED, 2020

State or territory	Toxicity-weighted chemicals released (lbs. eq.)
Wisconsin	45,122,237,956
Texas	39,673,055,922
Virginia	31,982,111,294
Louisiana	10,853,487,483
Indiana	7,319,010,165
West Virginia	4,832,813,087
Ohio	3,441,960,029
South Carolina	1,856,799,384
Pennsylvania	1,670,004,499
Alabama	1,667,496,165

Releases by local watershed

Among watersheds, the Lower Ohio-Little Pigeon watershed in Indiana and Kentucky saw the greatest amount of toxics released into its waters in 2020, at 12 million pounds, followed by the Upper New River watershed in North Carolina, Tennessee and Virginia, and the Brandywine-Christina watershed in Delaware, Maryland and Pennsylvania. (See Table 4, page 11.) Most of the discharges into the Lower Ohio-Little Pigeon watershed were in the form of nitrate releases to the Ohio River from the Cleveland-Cliffs Rockport Works steel plant in Rockport, Indiana, which released nearly 11 million tons of nitrates to the river. Nitrates are a form

Top facilities for toxic discharges as ranked by RSEI Score

This report uses RSEI's toxicity-weighted pounds equivalent (TWPE) measure – known as the **RSEI Hazard** indicator – to compare the toxicity of releases to waterways across the country. Another window on the dangers posed by toxic chemical releases is the **RSEI Score**, which factors in not only the toxicity of the chemicals released, but also their fate in the environment and potential for human exposure.

Table 3 below lists the top 10 facilities in the U.S. for toxic releases to water by RSEI Score. The U.S. Army Radford ammunition plant ranks first in the nation for the likely impact of its toxic releases.

The facility releases nitroglycerin, copper, lead and nitrates into the New River in southwestern Virginia. The New River in the vicinity of the plant is listed as impaired for recreation and fish consumption, in part due to PCB contamination of fish resulting from industrial pollution from sources including the ammunition plant.[33] The facility has frequently been in violation of the Clean Water Act, with violations occurring in five of the 12 calendar quarters between April 2019 and December 2021, and significant non-compliance occurring in one of those quarters.[34] The plant exceeded its permitted levels of toxic discharge during several quarters of that period.[35]

TABLE 3. TOP FACILITIES FOR TOXIC RELEASES TO WATER AS MEASURED BY RSEI SCORE[36]

TRI Facility Name	State	Industry Sector	RSEI Score
U.S. Army Radford Army Ammunition Plant	Virginia	Other	2,363,831
Chemours - Starke Facility	Florida	Metal Mining	1,236,037
Kennecott Utah Copper Mine Concentrators & Power Plant	Utah	Metal Mining	698,753
Holcim (US) Inc. - Whitehall Plant	Pennsylvania	Nonmetallic Mineral Product	520,242
APC Polytech LLC	West Virginia	Chemicals	417,791
Nucor Steel Marion Inc.	Ohio	Primary Metals	412,506
Duke Energy Carolinas LLC - Marshall Steam Station	North Carolina	Electric Utilities	370,563
Arch Wood Protection Inc.	Georgia	Chemicals	224,664
Duke Energy Indiana Inc. - Cayuga Generating Station	Indiana	Electric Utilities	220,327
Calaveras Power Station	Texas	Electric Utilities	169,674

of nutrient pollution blamed for oxygen depletion and toxic algae blooms such as those that have afflicted the Ohio River with increasing frequency in recent years.[37] The state of Indiana also ranks as the third-largest contributor among states of nitrogen to the Mississippi and Atchafalaya river basins, which feed the nutrient-fueled "dead zone" in the Gulf of Mexico.[38]

TABLE 4. TOP 10 WATERSHEDS BY TOTAL RELEASE OF TOXIC SUBSTANCES, 2020

Receiving watershed	State(s) containing watershed	Toxics released (lbs.)
Lower Ohio-Little Pigeon	IN, KY	12,008,366
Upper New	NC, TN, VA	10,266,141
Brandywine-Christina	DE, MD, PA	6,191,362
Lower Cape Fear	NC	5,017,810
Muskingum	OH	4,640,523
Lower Big Sioux	IA, MN, NE, SD	4,507,539
Lake Walcott	ID	3,866,978
Buffalo-San Jacinto	TX	3,784,822
Middle Ohio-Laughery	IN, KY, OH	3,524,720
Lower Rock	IL, WI	3,069,016

When weighted for toxicity, the Manitowoc-Sheboygan watershed in Wisconsin ranked first in the country for toxicity-weighted pounds-equivalent of chemicals released, followed by the Austin-Oyster watershed in Texas and the Upper New watershed in North Carolina, Tennessee and Virginia (see Table 5). NextEra Energy's Point Beach nuclear power plant was responsible for the vast majority of toxicity-weighted releases to water in the Manitowoc-Sheboygan watershed as a result of its releases of hydrazine to Lake Michigan. Hydrazine is a probable human carcinogen.[39]

TABLE 5. TOP 10 WATERSHEDS BY TOXICITY-WEIGHTED CHEMICALS RELEASED, 2020

Receiving watershed	State(s) containing watershed	Toxicity-weighted chemicals released (lbs. eq.)
Manitowoc-Sheboygan	WI	45,021,201,876
Austin-Oyster	TX	38,320,027,272
Upper New	NC, TN, VA	31,725,710,405
Lake Maurepas	LA	8,889,410,342
Middle Wabash-Little Vermilion	IL, IN	6,188,334,032
Raccoon-Symmes	KY, OH, WV	4,442,261,040
Upper Ohio-Wheeling	OH, PA, WV	1,684,294,112
Jordan	UT	1,466,638,353
Cooper	SC	1,463,567,312
Upper Ocmulgee	GA	1,020,772,866

Individual polluters can account for a large share of releases in local waterways

The top three local watersheds by toxicity-weighted chemicals released in 2020 each received more than 99.9% of their toxicity-weighted chemical pollution from a single facility, indicating the outsized impact one polluter can have on a watershed.

The Austin-Oyster watershed in Texas, which had the second largest amount of toxicity-weighted chemical releases in 2020, had nearly all of its toxic pollution come from the Dow Chemical Co. Freeport chemical manufacturing plant, which released 31 different chemicals into the tidal portion of the Brazos River in 2020. These included chemicals that cause cancer, developmental harm, kidney damage, liver damage and respiratory damage, among others, and included well-known and highly toxic pollutants like lead, chloroform and dioxin-like compounds. The Freeport facility has

Nitrate compounds composed the bulk of chemicals released to waterways in 2020

As they have for years, nitrate compounds formed the bulk of the toxics released to water in 2020.[40] In 2020, nitrate compounds made up just under 91% by weight of all the chemicals released to water reported to TRI. And, although nitrates are much less toxic pound-for-pound than many other chemicals TRI tracks, they can cause serious health and environmental problems.[41] Nitrate compounds are known to have developmental effects and effects on the blood, as well as to cause spontaneous abortions and birth defects.[42] One possible effect of nitrate exposure is blood oxygen deprivation, known as "blue baby syndrome" in infants, which can be fatal.[43] A 2021 analysis by Environmental Working Group found that the drinking water supplies serving roughly 60 million Americans were contaminated with elevated levels of nitrates.[44]

When nitrates enter aquatic environments like lakes, rivers and oceans, they can cause algae blooms that can lead to oxygen deprivation in the ecosystem, killing fish and other animals.[45] Nitrates are one of the main drivers of the annual "dead zone" in the Gulf of Mexico and, though much of that nitrate pollution comes from fertilizer runoff and atmospheric deposition of nitrates caused by burning fossil fuels, wastewater treatment plants and animal manure from large livestock operations are also major sources.[46]

Watershed regions including or feeding the Mississippi River received 94.5 million pounds of nitrate releases from facilities reporting to TRI in 2020, accounting for nearly half of all reported toxic releases in the country.[47] Animal slaughterhouses and processing facilities released more than 30 million pounds of nitrate compounds in watersheds feeding the Mississippi – contributing to the nutrient pollution problem in the Mississippi basin and the Gulf.

been a frequent violator of the terms of its Clean Water Act permits. The facility was in significant non-compliance with the Clean Water Act for two of the previous 12 calendar quarters ending March 31, 2022, and was found in violation of the act in four other quarters during that span.[48]

The U.S. Army ammunition plant in Radford, Virginia, was the primary source of toxic releases in the Upper New River watershed in 2020. The facility released nearly 32 billion toxicity-weighted pounds equivalent of nitroglycerin, plus lead and nitrate compounds, into the Upper New River watershed in 2020. That facility accounted for just about all of the toxicity-weighted pollution reported to TRI in the Upper New River watershed, which is spread between North Carolina, Tennessee and Virginia. The facility was in significant non-compliance with the Clean Water Act in two of the 12 quarters ending March 31, 2022, and was found in violation of the act in four other quarters, including two quarters in which the facility exceeded its limits for the total toxicity of its discharges.[49] The state of Virginia has assessed segments of the New River that receive discharges from the plant as too polluted for fishing and recreation due to the presence of toxic PCBs and pathogens.[50]

Releases of toxic chemicals harm already-polluted waterways

Under the Clean Water Act, states, territories and tribes must set water quality standards for all water bodies within their borders based on the designated use of those waterbodies.[51] When those standards are not met, the waterway is called "impaired." For example, when a river has levels of toxic pollution that would make the fish unsafe to eat, that river would be deemed impaired – or too polluted – for fishing.

When a waterway is impaired, the Clean Water Act requires states to make a plan for its protection and restoration.[52] These plans involve maximum daily pollution limits (called "total maximum daily loads," or TMDLs) for the pollutants being released into the waterbody.[53] Polluters along the waterway are assigned discharge limits and required to reduce their pollution in order to bring the concentration of pollutants in the waterway down to levels sufficient to allow the waterway to support its designated uses.

TRI data shows that many of these already polluted waterways continue to receive significant discharges of toxics – making it more difficult to restore them to health. For instance, the Wabash River in Indiana is impaired for aquatic life, human health and swimming.[54] A remediation plan for the mainstem of the Wabash River was finalized in 2006 for a variety of pollutants, including nitrates, yet the waterway remains impaired.[55] Despite that, in 2020, eight different facilities released approximately 371,000 pounds of toxics, including nitrate compounds, lead, chromium compounds, arsenic compounds and chlorobenzene into the Wabash River. Continued discharge of toxic pollutants to the Wabash and other waterways hinders long-running efforts to restore those waterways to health.

Major river systems aggregate pollution from smaller waterways

For large waterways, reported discharges directly into the waterway are an incomplete picture of the pollution burden they carry. Rivers collect water – and pollutants – from their smaller tributary rivers and streams. While some pollutants degrade and others settle out of the water or are absorbed by plants or animals, some amount of toxic substances dumped into smaller streams flow into our larger rivers, lakes and bays.

The USGS uses HUC2 codes – two-digit hydrologic unit codes – to describe regions, or major watersheds of the country.[56] These regions can stretch over hundreds of thousands of square miles and can aggregate the water – and pollutants – from many smaller watersheds within them.[57] Examining pollution at the watershed region level provides a view into how toxics in local watersheds can affect people and ecosystems far away.

In 2020, the Ohio River watershed region received the largest amount of toxic substances reported to TRI at just under 41 million pounds, followed by the South Atlantic-Gulf region at just under 36 million pounds and the Mid-Atlantic region at over 17 million pounds. (See Table 6, next page.) When weighting chemical releases for toxicity, the Ohio watershed region still faced the greatest pollution burden, followed by the Great Lakes region, and the Texas-Gulf region.

Industrial facilities release dangerous toxics that persist in the environment

As previously stated, different chemicals pose different levels of threat to human health and the environment. Among the most harmful substances are persistent bioaccumulative toxics (PBTs) which the EPA describes as chemicals that "remain in the environment for long periods of time, are not readily destroyed, and build up or accumulate in body tissue."[58] The persistence of PBTs in the environment also creates a long-term legacy of contamination that will affect people and the environment for years to come.

Sixteen individual PBTs and five PBT chemical categories are covered by TRI reporting requirements as of

TABLE 6. TOTAL AND TOXICITY-WEIGHTED SUBSTANCES RELEASED BY HUC2 WATERSHED REGION, 2020

Region	Toxic substances released (lbs.)	Toxicity-weighted substances released (lbs. eq.)
Ohio	40,821,068	48,459,632,733
Great Lakes	8,215,186	46,538,959,472
Texas-Gulf	14,134,340	39,673,603,357
Lower Mississippi	15,568,402	11,051,008,817
South Atlantic-Gulf	35,906,698	6,395,148,273
Tennessee River	4,261,424	1,991,000,994
Great Basin	136,093	1,576,267,267
Upper Mississippi	15,369,086	1,498,377,115
Mid-Atlantic	17,352,992	1,241,351,404
Pacific Northwest	7,785,463	834,625,739
Arkansas-White-Red	13,764,317	453,066,471
Souris-Red-Rainy	238,311	163,461,852
New England	2,544,523	153,781,238
Alaska	411,368	117,828,559
Missouri River	13,687,554	71,020,769
California	2,357,386	26,970,138
Caribbean	59,744	23,379,681
Lower Colorado River	1,605	9,831,680
Rio Grande	184,383	1,263,193
Hawaii	551,214	881,528
Upper Colorado River	12,803	630,481

mid-2022 – including dioxin, lead and mercury. Because PBTs are particularly harmful even in small amounts, reporting thresholds for PBTs are more stringent than for other toxics covered by TRI.[59] In addition, PFAS chemicals, while not categorized as PBTs for TRI reporting purposes, persist in the environment and many are also bioaccumulative.[60]

The nature of PBTs is such that they accumulate over time and can move through the environment. One example of this is mercury and mercury compounds, which can enter the environment when emitted from coal-fired power plants, waste incinerators, or from factories, mines or water treatment facilities that release mercury to air or water.[61] As it moves through the environment, mercury can combine or be combined with other elements, forming mercury compounds.[62] One particularly toxic form, methylmercury, often builds up in fish and shellfish and can be very dangerous to humans when they consume seafood, in particular damaging the brains and nervous systems of fetuses in the womb.[63]

Releases of PBTs to waterways were common across the U.S. in 2020.[64] TRI data reveals 2,181 reports of 14 different PBTs released to waterways in 49 states (all except South Dakota), Puerto Rico and the Virgin Islands. A total of 66,701 pounds of PBTs were released to water. Across the country, 1,492 different facilities reported releasing PBTs into our waters.

PFAS – the "forever chemicals"

Per- and polyfluoroalkyl substances (PFAS) are a class of over 12,000 chemicals that take a very long time to break down and, because they are widely used, are therefore found all over the world: in the air, water and soil, and in plants and animals – including humans.[65] PFAS are used in many everyday products: non-stick cookware, stain-resistant cloth and carpeting, firefighting foam and even cosmetics.[66] PFAS have been linked to altered metabolism, fertility problems, reduced fetal growth, accelerated puberty, bone changes, behavioral changes, increased risk of weight gain and obesity, cancers, immunosuppression, hormone disruption, diabetes, and reduced immune response to vaccines.[67]

PFAS are dangerous because they are highly toxic and persistent, and many of them accumulate in the environment. In 2022, the EPA issued health advisories for a set of PFAS chemicals, finding that exposure to even miniscule amounts of certain PFAS can pose health risks over the course of a lifetime. For one chemical, the EPA estimated the amount of concentration in drinking water unlikely to cause health effects to be 4 parts per *quadrillion*, in effect finding no safe level of exposure.[68] Public health experts have suggested a cumulative standard for all PFAS in drinking water of 1 part per trillion, equivalent to just one drop of water in 20 Olympic-sized swimming pools.[69] Once released into the environment PFAS chemicals stay there. The National Institute of Environmental Health Sciences (NIEHS) reports that PFAS chemicals are so long-lived in the environment that scientists have been unable to determine their half-lives, or the time it takes for 50% of the material to break down.[70] PFAS contamination is also widespread – the Environmental Working Group has documented more than 2,800 locations in all 50 states where PFAS contamination has been detected and estimates that more than 200 million Americans could have PFAS in their drinking water.[71]

Many PFAS chemicals were exempt from reporting under TRI until 2020, when reporting was first required for releases of 172 PFAS chemicals.[72] However, TRI data for releases of PFAS chemicals into water shows just 440.23 pounds of six PFAS chemicals released by four facilities in 2020.[73] These releases are troubling given the extreme toxicity of PFAS chemicals even in small quantities, but are likely only the tip of the iceberg.

In early 2022, three national advocacy organizations sued to force the EPA to investigate possible non-compliance with PFAS reporting requirements based on unexpectedly low numbers of facilities reporting PFAS use, unexpectedly low numbers of total PFAS chemicals used, and unexpectedly low amounts of PFAS released to the environment.[74] A study of 2020 TRI data on PFAS by the Natural Resources Defense Council (NRDC) found that only a small subset of known and used PFAS chemicals are covered by the TRI reporting requirements or labeled as PFAS under the TRI system, and that the reporting threshold of 100 pounds was high enough that many PFAS polluters don't have to report releases of the chemicals.[75] In addition, because PFAS are not classified by the EPA as PBTs, firms can exploit the *de minimis* loophole (see page 3) to avoid disclosure even if they would otherwise be required to report.[76]

The growing concern over PFAS in the environment reinforces both the importance of the public's right to know about releases of toxic chemicals to our waterways and our environment, and the need to ensure that releases of PFAS and other chemicals are reported under TRI. At the same time, the EPA and other agencies must take stronger action to protect the public from exposure to PFAS in the environment and consumer products.

Releases of toxics that cause human health problems are widespread

The chemicals tracked by the TRI program can cause a wide variety of human health problems. In this report, we focus on three types of health effects: cancer, reproductive harms and developmental damage.

Cancer

Cancer-causing chemicals harm human health when they find their way into the drinking water or food people consume. A 2019 study by researchers at Environmental Working Group estimated that carcinogens present in American tap water could lead to over 100,000 cancer cases following a lifetime of exposure. Investments in water treatment to remove those chemicals can be costly, making it imperative that carcinogens be kept out of waterways in the first place.[77]

In 2020, over 1 million pounds of cancer-causing toxics were released into U.S. waterways. South Carolina, Texas and Alabama were the three states with the largest amounts of cancer-causing chemicals released, each with more than 100,000 pounds of releases. (See Table 7.)

TABLE 7. TOP 10 STATES BY CANCER-CAUSING TOXIC CHEMICAL RELEASES, 2020

State or territory	Cancer-causing chemicals released (lbs.)
South Carolina	130,579
Texas	123,257
Alabama	106,122
Louisiana	71,252
West Virginia	53,861
Indiana	52,207
Georgia	40,777
North Carolina	40,080
Florida	36,992
Tennessee	35,872

The Austin-Oyster watershed in Texas received the most cancer-causing chemicals of any local watershed in the U.S. at over 82,600 pounds, followed by the Cooper watershed in South Carolina at just under 59,000 pounds and the Racoon-Symmes watershed in Kentucky, Ohio and West Virginia at just under 44,600 pounds. (See Table 8.)

TABLE 8. TOP 20 LOCAL WATERSHEDS BY CANCER-CAUSING TOXIC CHEMICAL RELEASES, 2020

Receiving watershed	State(s) containing watershed	Cancer causing chemicals released (lbs.)
Austin-Oyster	TX	82,608
Cooper	SC	58,916
Raccoon-Symmes	KY, OH, WV	44,590
North Fork Edisto	SC	36,626
Wheeler Lake	AL, TN	29,895
Little Calumet-Galien	IL, IN, MI	29,691
Carolina Coastal-Sampit	SC	26,301
St. Marys	FL, GA	20,794
Lower Roanoke	NC	19,601
Lower Tennessee-Beech	MS, TN	19,001
Middle Wabash-Little Vermilion	IL, IN	16,771
East Central Louisiana Coastal	LA	16,374
Lower Alabama	AL	15,470
Lower Calcasieu	LA	15,247
Lake Maurepas	LA	15,051
Manitowoc-Sheboygan	WI	15,036
Lower Columbia-Clatskanie	OR, WA	14,919
Lower Conecuh	AL, FL	14,097
Lake Champlain	Canada, NY, VT	13,926
Castle Rock	WI	13,018

The industries with the largest releases of cancer-causing chemicals in 2020 were paper, pulp and paperboard mills, and the largest releases were of acetaldehyde.

Reproductive effects

Chemicals that have reproductive health effects may interfere with people's ability to have children. In 2020, more than 200,000 pounds of chemicals with reproductive toxicity were released into U.S. waterways. Texas had the largest amount of chemicals with reproductive effects released by facilities within its borders with over 28,000 pounds, followed by Indiana and Pennsylvania. (See Table 9.)

TABLE 9. TOP 10 STATES BY RELEASES OF REPRODUCTIVE TOXICS, 2020

State or territory	Reproductive toxics released (lbs.)
Texas	28,333
Indiana	27,088
Pennsylvania	22,621
Louisiana	18,545
Alabama	12,194
Tennessee	10,723
Illinois	8,888
Kentucky	6,834
West Virginia	6,823
Virginia	6,785

The Middle Wabash-Little Vermilion watershed in Illinois and Indiana ranked first with more than 13,000 pounds of chemical releases tied to reproductive toxicity. Eight facilities in the Middle Wabash-Little Vermilion watershed reported releases of reproductive toxics to waterways in the basin, including compounds of lead, nickel and chromium. The Lehigh River watershed in Pennsylvania and the Upper San Antonio watershed in Texas ranked second and third for reproductive toxic releases. (See Table 10.)

TABLE 10. TOP 20 WATERSHEDS BY RELEASES OF REPRODUCTIVE TOXICS, 2020

Receiving watershed	State(s) containing watershed	Reproductive toxics released (lbs.)
Middle Wabash-Little Vermilion	IL, IN	13,054
Lehigh	PA	9,687
Upper San Antonio	TX	9,219
Lower Monongahela	PA, WV	7,364
Upper Ohio	OH, PA, WV	6,592
Little Calumet-Galien	IL, IN, MI	6,585
Austin-Oyster	TX	6,096
Middle Kansas	KS	6,065
Lake Maurepas	LA	5,904
Lower James	VA	5,060
Middle Ohio-Laughery	IN, KY, OH	4,488
Lower St. Johns	FL	4,192
Buffalo-San Jacinto	TX	4,181
Lower Calcasieu	LA	3,997
Peruque-Piasa	IL, MO	3,532
Lower Cumberland	KY, TN	3,145
Chicago	IL, IN	3,045
South Fork Holston	NC, TN, VA	2,620
Lower Columbia-Clatskanie	OR, WA	2,472
Lower Ohio-Little Pigeon	IN, KY	2,219

The industries that released the most reproductive toxics in 2020 were fossil fuel power generation and iron and steel mills, and the chemicals with the highest releases were nickel compounds.

Developmental effects

Toxics that cause developmental effects interfere with the processes of growth and change of the body, from conception through the end of adolescence.[78] In 2020, over 4.5 million pounds developmental toxics were released by industrial and government facilities into our waterways. Facilities in North Carolina released the most developmental toxics, at just over 600,000 pounds, followed by Wisconsin and Alabama. (See Table 11.)

TABLE 11. TOP 10 STATES BY DEVELOPMENTAL TOXICS RELEASED, 2020

State or territory	Developmental toxics released (lbs.)
North Carolina	602,927
Wisconsin	595,112
Alabama	406,729
Washington	387,509
Mississippi	345,666
South Carolina	325,355
Kentucky	319,661
Texas	298,076
Louisiana	266,377
Georgia	189,610

The Castle Rock watershed in Wisconsin received the greatest amount of developmental toxicants, at 568,000 pounds, followed by the Middle Neuse watershed in North Carolina and the Lower Alabama watershed in Alabama. (See Table 12.) Three facilities reported releasing chemicals linked to developmental effects into the Wisconsin River in the Castle Rock watershed, with the greatest releases by weight in the form of methanol releases from the Verso Corp. (now Billerud) paper mill.[79] Other developmental toxics released in the watershed include compounds of lead and mercury.

TABLE 12. TOP 20 WATERSHEDS BY DEVELOPMENTAL TOXICS RELEASED, 2020

Receiving watershed	State(s) containing watershed	Developmental toxics released (lbs.)
Castle Rock	WI	568,103
Middle Neuse	NC	395,424
Lower Alabama	AL	320,140
Bayou De Chien-Mayfield	KY, TN	282,640
Lower Yazoo	LA, MS	265,395
Lower Chehalis	WA	239,724
Carolina Coastal-Sampit	SC	232,234
Buffalo-San Jacinto	TX	178,372
South Fork Holston	NC, TN, VA	113,501
Middle Columbia-Lake Wallula	OR, WA	76,838
Lower Neches	TX	76,050
Lower Columbia-Clatskanie	OR, WA	75,878
Middle Savannah	GA, SC	74,239
Cooper	SC	61,542
Lake Maurepas	LA	61,041
Bayou Pierre	LA, TX	58,493
Lower Chattahoochee	AL, FL, GA	57,055
Lower Cape Fear	NC	56,467
Upper Cape Fear	NC	53,052
Pigeon	NC, TN	47,827

Recommendations

To further the promise of the Clean Water Act, and to protect our rivers, lakes, streams, and bays from toxic pollution, policymakers should take the following actions:

- The EPA should move quickly to update pollution control standards in order to end or at least dramatically reduce toxic releases into our waterways. This includes standards for meat and poultry processing plants, power plants and all industrial dischargers of PFAS chemicals.
- Officials should require industrial facilities to remove toxics from the wastewater they send to sewage treatment plants (otherwise known as publicly owned treatment works, or POTWs) that are unable to be removed by those plants and may be discharged into waterways. These "indirect discharges" of industrial toxic chemicals are significant and have the potential to affect the environment and health.
- The EPA should eliminate the *de minimis* exemption for PFAS chemicals, which likely results in PFAS releases being underreported to TRI.[80] Similarly, Congress and the EPA should continue to expand the scope of reporting to TRI and ensure that reports of toxic releases under the program are complete and accurate, ensuring that the public is fully informed about toxic discharges to our waterways.
- Federal and state officials, as well as product manufacturers, should dramatically restrict the use of PFAS and other toxic chemicals, especially where safer alternatives already exist.
- EPA and state officials should ensure that facilities that use or store large quantities of toxic material are not permitted near our waterways, reducing the threat of large-scale spills of toxics into waterways that cause immediate and long-term harm.
- Congress should provide the EPA with sufficient funding to ensure rigorous and timely review and vigorous enforcement of water pollution permits.
- State and federal officials should ratchet down toxic pollution limits in clean water permits, especially where a facility is discharging into a waterway already polluted with toxic substances.
- The federal government should confirm that all of America's wetlands, streams, and other waters are protected from toxic pollution by the Clean Water Act.
- State and federal officials should move beyond voluntary incentives to dramatically curb the flow of toxic pollutants from non-point sources, especially runoff of nitrates and pesticides from industrial agribusiness operations.

Methodology

This report estimates the discharges of toxic substances to waterways by weight using data from the EPA's Toxics Release Inventory (TRI) and the toxicity-weighted discharges using the EPA's Risk-Screening Environmental Indicators (RSEI) Hazard measure, communicated in toxic-weighted pounds equivalent (TWPE).

TRI is the most detailed and comprehensive source of data available about specific releases of toxics by industrial facilities, but it has several limitations. Not all industrial facilities are required to report to TRI, not all toxic substances are included in the program, and not all releases by facilities in industrial classifications covered by TRI are required to be disclosed. In addition, this report only includes direct releases of toxics to water; many facilities also release toxic chemicals to sewer systems, which then discharge into waterways. As a result, the data included in this report should be understood to reveal only a fraction of what is likely a much larger and more pervasive problem of toxic discharges to waterways.

TRI reported releases and RSEI toxicity weightings

Data on the release of toxics was downloaded from the Environmental Protection Agency's (EPA) Toxics Release Inventory (TRI) EZ Search tool using the "Chemical Discharge to Water" option on 3 May 2022 at https://enviro.epa.gov/enviro/ez_column_v2.list?database_type=TRI&table_name=V_TRI_WATER_EZ.[81] Data was filtered to include only releases during 2020 (the most recent year available) and only releases for which "water" was the environmental medium, and then further filtered after download to include only those entries with a non-zero amount of chemicals released. Note that TRI data is frequently revised by reporting facilities and that revisions submitted after the date of download are generally not reflected in this analysis, with two exceptions, as detailed in notes 85 and 86.

Data on the Risk Screening Environmental Indicators (RSEI) Hazard toxicity-weighted releases was downloaded from the EPA's EasyRSEI Dashboard on 3 May 2022 at https://edap.epa.gov/public/extensions/EasyRSEI/EasyRSEI.html. Data was downloaded using the "Custom Export Table" option on the Analysis tab and selecting only the RSEI data for modeled media and only for submission year 2020.

For reported releases of dioxin and dioxin-like compounds – which are so toxic as to have release amounts reported in grams rather than pounds – the release amount downloaded from TRI EZ Search was converted from grams to pounds to match the units of other chemical releases.

Releases of toxics as reported to TRI were then associated with the toxicity-weighted releases reported in the EasyRSEI dashboard. In cases in which there were multiple reports of the release of a single chemical from a facility, the duplicate records were eliminated, and the values for toxic releases in pounds and TWPE releases were trued up by multiplying the amount of toxic releases in pounds from the TRI EZ Search tool by the toxicity weight for that substance to arrive at the RSEI Hazard value for releases of that substance by that facility.

Health effects

Each toxic substance reported as released by a facility was then evaluated to determine if it was associated with cancer, developmental harm or reproductive toxicity. The health effects of the substances were primarily obtained from two datasets. The first was the EPA's TRI Toxics Tracker tool at https://edap.epa.gov/public/extensions/TRIToxicsTracker/TRIToxicsTracker.html, downloaded on 10 May 2022. We used the "Potential Health Effects" option under the "Chemicals" tab, and selected all reporting years in the filter options. The other dataset was downloaded from California's Proposition 65 list of known harmful chemicals and their effects on 9 May 2022 at https://oehha.ca.gov/proposition-65/proposition-65-list. The Proposition 65 ("Prop 65") list had last been updated 25 February 2022 at the time of download. Health effects for chemicals indicated in the Prop 65 list as having been "delisted" or for which a given health effect was "removed" were excluded from the dataset.

The following rules were followed in assigning health effects to toxic substances:

- Chemicals listed as known to cause cancer, reproductive or developmental toxicity in the Prop 65 list were assigned those health effects.
- Toxic substances not listed as tied to a given health effect on the Prop 65 list, but that were tied to that effect on the EPA list, were evaluated further using the EPA's CompTox Chemicals Dashboard, which aggregates chemical warnings and toxicity determinations by authorities in Europe, Japan, Australia and other jurisdictions across the globe.[82] Chemicals included on the EPA Toxics Tracker for a health effect that at least one other authority found "may cause" that health effect were included in the list used in this report. Substances listed by authorities as "suspected" of causing a health effect were not included.
- Releases of certain chemicals are reported to the EPA by class, instead of, or in addition to, reported releases of the individual substance, thus requiring a determination of whether the class of chemicals is linked to a particular health effect. Because different compounds within a class may have differing levels and forms of toxicity, because there is no way to distinguish among which compounds in a class are being released, and because the EPA and Prop 65 lists are sometimes unclear as to which health effects are associated with particular chemicals, we applied the following rules in assigning health effects to chemicals and related chemical classes:
  - If, in the Prop 65 list or other sources, health effects were associated with a substance *and its compounds*, those health effects were assumed to be associated with releases of the substance and its compounds as reported to TRI.
  - If health effects in the Prop 65 list or other sources were associated with either a type of compounds as a class, or specific compounds of an element (usually a metal), but not specifically with the elemental form of the substance, those health effects were assumed to be associated with the "[ELEMENT] and [ELEMENT] Compounds" category in TRI if the substance and its compounds had the same toxicity weight in RSEI.
  - Reported releases of "Chromium and Chromium Compounds" (TRI class N090) were associated with cancer, developmental harm and reproductive health effects of hexavalent chromium compounds as indicated on the Prop 65 list. TRI reporting of chromium compounds does not distinguish among various types of chromium compound releases; readers should be aware that some releases of trivalent chromium, which is less toxic than hexavalent chromium, may be included in these releases. Reported releases of "Chromium" (Chemical Abstracts Service number 7440-47-3) were not assigned the health effects of chromium compounds as these were assumed to represent releases of the elemental form of chromium, which is not connected with any of the health effects evaluated in this report.
  - In some cases, groups of chemicals or individual chemicals were listed with associated health effects in the Prop 65 list but with no corresponding Chemical Abstracts Service (CAS) number. In these cases, CAS numbers were obtained from the EPA's listing of TRI chemicals or obtained from other sources and assigned as described in the footnote.[83]

Watersheds

TRI allows, but does not require, facilities to supply REACH codes of the waterway segments into which they release toxic substances. Because relatively few facilities report REACH codes – and because the names of waterways as reported by facilities are subject to duplication, inaccuracy, spelling mistakes and other sources of inconsistency – releases to waterways in this report are evaluated by watershed as opposed to waterway.

TRI-reporting facilities were associated with watersheds using a spatial join in QGIS software. Watershed boundaries at the Hydrologic Unit Code 8 (HUC8) level were obtained from the Watershed Boundary Dataset, downloaded from the U.S. Department of Agriculture, Natural Resources Conservation Service, 19 May 2022.[84] Geographic coordinates of facilities were downloaded from the EPA's TRI EZ Search tool using the "Facility Information" option on 18 May 2022 at https://enviro.epa.gov/enviro/ez_column_v2.list?database_type=TRI&table_name=V_TRI_FACILITY_EZ. The geographic coordinate system of the Watershed Boundary Dataset was changed to NAD83 horizontal datum to match that of the TRI facilities dataset before undertaking the spatial join. Note that watersheds are associated with the coordinates of the facility itself as provided in the TRI EZ Search, *not* the coordinates of specific outfalls releasing into waterways. In a limited number of cases in which facilities straddle HUC8 boundaries, this may result in releases erroneously being assigned to an adjacent HUC8, or, in the case of facilities that release toxic chemicals via several outfalls to multiple HUC8s, aggregating all of a facility's releases and assigning them to a single HUC8.

Parent companies

Some facilities that report to TRI do not report having a parent company. Since individual facilities can be major polluters at a level comparable to the total pollution of a parent company with multiple facilities, for calculations involving parent companies, the facility name of those facilities was treated as the parent company name, and is listed as such in Tables C-2 and C-3.

Industries

To provide the industry category of reporting facilities, the North American Industry Classification System (NAICS) codes available in the TRI EZ Search tool were used, with definitions for the codes downloaded 16 May 2022 from https://www.census.gov/naics/?48967. The 2017 definitions were used because the TRI reports analyzed in this report are from before the 2022 definitions took effect.

Calculations

Calculations of the total amount of chemicals released and the total toxicity weighted amount of chemicals released were then made, aggregating entries by state; watershed; facility; parent company; industry; and whether the chemical released had cancer, developmental harm or reproductive health effects. The total amount of cancer-causing, developmental or reproductive toxic chemicals released by state was also calculated, as well as the facility that released the largest amount of chemicals and the largest toxicity weighted amount of chemicals by state.

Appendices

Appendix A: Detailed data on discharges to waterways

TABLE A-1. TOTAL TOXIC RELEASES AND TOXICITY-WEIGHTED RELEASES BY STATE OR TERRITORY, 2020

State or territory	Total toxics released (lbs.)	Rank (of 54, including territories)	Toxicity-weighted releases (lbs. eq.)	Rank
Alabama	10,173,322	5	1,667,496,165	10
Alaska	411,368	37	117,828,559	30
Arizona	1,072	49	8,857,122	42
Arkansas	5,658,179	14	343,911,430	20
California	2,357,386	29	26,970,138	34
Colorado	1,329,328	33	10,175,197	39
Connecticut	15,860	46	10,762,258	37
Delaware	6,592,564	11	9,667,587	40
District of Columbia	978	50	616	54
Florida	1,078,265	34	286,782,495	21
Georgia	5,767,467	13	1,593,432,406	11
Guam	242,762	38	152,940	52
Hawaii	551,214	36	881,528	47
Idaho	4,053,298	19	128,301,255	29
Illinois	7,140,443	10	643,412,777	18
Indiana	14,085,748	2	7,319,010,165	5
Iowa	4,577,376	16	285,581,627	22
Kansas	1,383,822	32	17,397,556	35
Kentucky	7,162,639	9	816,117,907	16
Louisiana	11,378,399	4	10,853,487,483	4
Maine	2,524,447	28	134,643,670	27
Maryland	94,361	43	697,247	48

State or territory	Total toxics released (lbs.)	Rank (of 54, including territories)	Toxicity-weighted releases (lbs. eq.)	Rank
Massachusetts	3,652	48	7,773,078	43
Michigan	3,478,941	22	1,180,953,572	14
Minnesota	1,780,380	31	99,072,817	31
Mississippi	9,111,172	7	646,294,892	17
Missouri	3,450,394	23	252,513,139	23
Montana	30,027	45	593,328	49
Nebraska	5,629,522	15	9,545,975	41
Nevada	895	51	84,365,442	32
New Hampshire	274	54	253,849	51
New Jersey	3,808,145	20	61,723,244	33
New Mexico	185,757	39	2,718,312	45
New York	3,706,827	21	130,805,993	28
North Carolina	9,746,239	6	904,697,337	15
North Dakota	134,894	41	158,990,453	26
Ohio	7,497,207	8	3,441,960,029	7
Oklahoma	4,244,515	18	174,955,123	24
Oregon	1,022,735	35	165,073,848	25
Pennsylvania	5,861,055	12	1,670,004,499	9
Puerto Rico	887	52	12,735,953	36
Rhode Island	286	53	442,223	50
South Carolina	3,032,333	25	1,856,799,384	8
South Dakota	4,569,604	17	2,882,133	44
Tennessee	2,783,123	26	1,485,380,761	13
Texas	16,778,747	1	39,673,055,922	2
Utah	134,988	40	1,486,284,633	12
Vermont	120,767	42	85,643	53
Virgin Islands	58,857	44	10,643,729	38
Virginia	12,218,174	3	31,982,111,294	3
Washington	2,709,630	27	546,792,373	19
West Virginia	1,859,067	30	4,832,813,087	6
Wisconsin	3,061,305	24	45,122,237,956	1
Wyoming	6,025	47	2,115,552	46
Total, U.S.	193,606,724	N/A	160,282,243,700	N/A

TABLE A-2. TOXICS RELEASED BY HEALTH EFFECT AND STATE OR TERRITORY

State or territory	Cancer		Developmental effects		Reproductive effects	
	Pounds released	Rank (of 51)	Pounds released	Rank	Pounds released	Rank
Alabama	106,122	3	406,729	3	12,194	5
Alaska	277	38	177	41	104	43
Arizona	266	39	17	49	11	49
Arkansas	32,975	11	108,133	13	2,162	21
California	1,652	31	1,630	32	1,919	23
Colorado	553	35	540	36	539	34
Connecticut	754	33	1,834	31	334	38
Delaware	163	41	150	42	518	35
Florida	36,992	9	73,213	14	5,178	13
Georgia	40,777	7	189,610	10	3,109	16
Hawaii	39	46	42	45	52	45
Idaho	8,116	26	42,513	18	464	37
Illinois	15,874	19	32,663	20	8,888	7
Indiana	52,207	6	34,195	19	27,088	2
Iowa	19,810	17	23,139	22	1,880	25
Kansas	375	37	6,480	28	6,481	11
Kentucky	31,666	12	319,661	7	6,834	8
Louisiana	71,252	4	266,377	9	18,545	4
Maine	14,325	21	51,643	15	976	30
Maryland	527	36	282	39	324	39
Massachusetts	1,513	32	816	34	815	31
Michigan	11,346	23	48,243	16	2,254	20
Minnesota	11,470	22	531	37	487	36
Mississippi	30,038	14	345,666	5	3,445	15
Missouri	2,843	29	10,271	27	1,948	22
Montana	78	44	39	47	24	48
Nebraska	147	42	411	38	179	41
Nevada	56	45	56	44	-	51
New Hampshire	6	50	4	50	4	50
New Jersey	1,821	30	3,866	30	1,083	29
New Mexico	111	43	109	43	109	42
New York	16,899	18	45,661	17	1,098	28
North Carolina	40,080	8	602,927	1	2,383	18

TABLE A-2. TOXICS RELEASED BY HEALTH EFFECT AND STATE OR TERRITORY

State or territory	Cancer		Developmental effects		Reproductive effects	
	Pounds released	Rank (of 51)	Pounds released	Rank	Pounds released	Rank
North Dakota	230	40	179	40	181	40
Ohio	10,056	25	12,840	26	6,097	12
Oklahoma	5,341	27	13,442	25	1,145	27
Oregon	15,707	20	130,526	12	1,911	24
Pennsylvania	19,944	16	21,079	23	22,621	3
Puerto Rico	681	34	680	35	678	32
Rhode Island	19	49	41	46	28	47
South Carolina	130,579	1	325,355	6	2,738	17
Tennessee	35,872	10	133,677	11	10,723	6
Texas	123,257	2	298,076	8	28,333	1
Utah	3,042	28	4,435	29	2,292	19
Vermont	0	51	1,029	33	611	33
Virgin Islands	19	48	3	51	85	44
Virginia	10,906	24	16,930	24	6,785	10
Washington	28,918	15	387,509	4	4,411	14
West Virginia	53,861	5	24,206	21	6,823	9
Wisconsin	31,396	13	595,112	2	1,452	26
Wyoming	29	47	29	48	29	46
Total, U.S.	1,020,987		4,582,780		208,374	

TABLE A-3. TOP 50 LOCAL WATERSHEDS BY TOTAL TOXICS RELEASED, 2020

Rank	Receiving watershed	State(s) containing watershed	Total toxics released (lbs.)
1	Lower Ohio-Little Pigeon	IN, KY	12,008,366
2	Upper New	NC, TN, VA	10,266,141
3	Brandywine-Christina	DE, MD, PA	6,191,362
4	Lower Cape Fear	NC	5,017,810
5	Muskingum	OH	4,640,523
6	Lower Big Sioux	IA, MN, NE, SD	4,507,539
7	Lake Walcott	ID	3,866,978
8	Buffalo-San Jacinto	TX	3,784,822
9	Middle Ohio-Laughery	IN, KY, OH	3,524,720
10	Lower Rock	IL, WI	3,069,016
11	Upper Pearl	MS	2,879,674
12	Kalamazoo	MI	2,780,868
13	Lake O' the Pines	TX	2,707,206
14	Middle Platte-Buffalo	NE	2,660,029
15	Sandy Hook-Staten Island	NJ, NY	2,630,054
16	Lower Roanoke	NC	2,504,091
17	Lower Neosho	AR, OK	2,351,389
18	Schuylkill	PA	2,248,721
19	East Central Louisiana Coastal	LA	2,220,834
20	Lake Maurepas	LA	2,177,646
21	Lower Monongahela	PA, WV	2,153,250
22	Becaguimec Stream-Saint John River	Canada, ME	2,031,077
23	Upper Leaf	MS	2,030,823
24	West Galveston Bay	TX	1,918,283
25	Middle Green	KY	1,905,073
26	Peruque-Piasa	IL, MO	1,794,253
27	Middle Coosa	AL	1,711,757
28	Lower Calcasieu	LA	1,651,237
29	Castle Rock	WI	1,649,881
30	Lower Platte-Shell	NE	1,604,795
31	Upper Ohio-Shade	OH, WV	1,589,754
32	South Corpus Christi Bay	TX	1,540,943
33	Upper Columbia-Priest Rapids	WA	1,510,660
34	Lower Ochlockonee	FL, GA	1,475,102
35	Lower Tombigbee	AL	1,467,069
36	Lower Sangamon	IL	1,433,193
37	Amite	LA, MS	1,412,102
38	Lower Neches	TX	1,403,526
39	Lower Iowa	IA	1,304,962
40	Suisun Bay	CA	1,291,366
41	Lower Brazos-Little Brazos	TX	1,263,160
42	Lower Little Arkansas, Oklahoma	AR, OK	1,259,081
43	Lower Des Moines	IA, MO	1,229,495
44	Little River Ditches	AR, MO	1,185,996
45	Middle Big Blue	NE	1,169,499
46	Upper Little	OK	1,169,229
47	Wheeler Lake	AL, TN	1,161,657
48	Oswego	NY	1,151,719
49	Lower Walnut River	KS	1,137,220
50	Middle Savannah	GA, SC	1,114,110

TABLE A-4. TOP 50 WATERSHEDS BY TOXICITY-WEIGHTED RELEASES, 2020

Rank	Receiving watershed	State(s) containing watershed	Toxicity-weighted releases (lbs. eq.)
1	Manitowoc-Sheboygan	WI	45,021,201,876
2	Austin-Oyster	TX	38,320,027,272
3	Upper New (River)	NC, TN, VA	31,725,710,405
4	Lake Maurepas	LA	8,889,410,342
5	Middle Wabash-Little Vermilion	IL, IN	6,188,334,032
6	Raccoon-Symmes	KY, OH, WV	4,442,261,040
7	Upper Ohio-Wheeling	OH, PA, WV	1,684,294,112
8	Jordan	UT	1,466,638,353
9	Cooper	SC	1,463,567,312
10	Upper Ocmulgee	GA	1,020,772,866
11	South Fork Holston	NC, TN, VA	971,438,874
12	Ottawa-Stony	MI, OH	872,174,374
13	Lehigh	PA	761,592,816
14	Middle Ohio-Laughery	IN, KY, OH	740,843,456
15	Lower Calcasieu	LA	694,348,147
16	East Central Louisiana Coastal	LA	636,319,179
17	Middle Allegheny-Redbank	PA	617,004,602
18	Muskingum	OH	611,333,751
19	Upper San Antonio	TX	521,615,474
20	Lower Ohio-Little Pigeon	IN, KY	509,927,411
21	Wheeler Lake	AL, TN	505,409,365
22	Lower Columbia-Clatskanie	OR, WA	385,306,271
23	Peruque-Piasa	IL, MO	341,294,168
24	Upper Ohio-Shade	OH, WV	338,954,147
25	Lower Tennessee-Beech	MS, TN	275,902,448
26	Tittabawassee	MI	254,847,991
27	Kankakee	IL, IN, MI	251,563,683
28	Salt	KY	244,755,734
29	Ohio Brush-Whiteoak	KY, OH	241,387,002
30	Mississippi Coastal	AL, LA, MS	231,065,868
31	Buffalo-San Jacinto	TX	220,583,314
32	Upper Catawba	NC, SC	209,420,848
33	Meramec	MO	196,224,274
34	Silver-Little Kentucky	IN, KY	194,589,747
35	Upper Cape Fear	NC	191,260,017
36	Lower Alabama	AL	188,702,060
37	Lower Grand	LA	185,973,263
38	Bayou Sara-Thompson	LA, MS	183,704,023
39	Cahaba	AL	183,021,397
40	Little Calumet-Galien	IL, IN, MI	172,048,483
41	Tyger	SC	163,677,985
42	South Corpus Christi Bay	TX	160,879,702
43	Lower Roanoke	NC	157,556,929
44	Carolina Coastal-Sampit	SC	155,605,229
45	Chicago	IL, IN	154,555,218
46	West Fork	WV	139,105,744
47	Lower Dan	NC, VA	138,166,827
48	Lower Chattahoochee	AL, FL, GA	138,124,386
49	Lower Coosa	AL	132,413,276
50	Mattaponi	VA	131,143,708

TABLE A-5. TOP 50 LOCAL WATERSHEDS BY TOTAL CANCER-CAUSING CHEMICALS RELEASED, 2020

Rank	Receiving watershed	State(s) containing watershed	Cancer causing chemicals released (lbs.)
1	Austin-Oyster	TX	82,608
2	Cooper	SC	58,916
3	Raccoon-Symmes	KY, OH, WV	44,590
4	North Fork Edisto	SC	36,626
5	Wheeler Lake	AL, TN	29,895
6	Little Calumet-Galien	IL, IN, MI	29,691
7	Carolina Coastal-Sampit	SC	26,301
8	St. Marys	FL, GA	20,794
9	Lower Roanoke	NC	19,601
10	Lower Tennessee-Beech	MS, TN	19,001
11	Middle Wabash-Little Vermilion	IL, IN	16,771
12	East Central Louisiana Coastal	LA	16,374
13	Lower Alabama	AL	15,470
14	Lower Calcasieu	LA	15,247
15	Lake Maurepas	LA	15,051
16	Manitowoc-Sheboygan	WI	15,036
17	Lower Columbia-Clatskanie	OR, WA	14,919
18	Lower Conecuh	AL, FL	14,097
19	Lake Champlain	Canada, NY, VT	13,926
20	Castle Rock	WI	13,018
21	Upper Alabama	AL	12,443
22	Copperas-Duck	IA, IL	12,393
23	Lower Little Arkansas, Oklahoma	AR, OK	11,676
24	Silver-Little Kentucky	IN, KY	11,169
25	Middle Tombigbee-Lubbub	AL, MS	10,657
26	Lower Chattahoochee	AL, FL, GA	10,570
27	Lower Tennessee	KY, TN	9,889
28	Middle Pearl-Silver	MS	9,869
29	Middle Tombigbee-Chickasaw	AL, MS	9,735
30	Lehigh	PA	9,687
31	Lower Ouachita	LA	9,326
32	Upper San Antonio	TX	9,218
33	Pigeon	NC, TN	8,667
34	Siletz-Yaquina	OR	8,550
35	Puget Sound	WA	8,114
36	Clearwater	ID, WA	8,052
37	Bayou Macon	AR, LA	8,007
38	South Fork Holston	NC, TN, VA	7,552
39	Saint Croix River	Canada, ME	7,274
40	Lower Savannah	GA, SC	7,261
41	Cumberland-St. Simons	FL, GA	6,771
42	Lower Neches	TX	6,691
43	Buffalo-San Jacinto	TX	6,349
44	Middle Columbia-Lake Wallula	OR, WA	6,239
45	Lower Rainy	Canada, MN	6,217
46	Bayou Bartholomew	AR, LA	6,167
47	Mobile-Tensaw	AL	5,956
48	Flint-Henderson	IA, IL, MO	5,915
49	Lower Ohio-Little Pigeon	IN, KY	5,628
50	Lower St. Johns	FL	5,351

TABLE A-6. TOP 50 LOCAL WATERSHEDS BY REPRODUCTIVE TOXICS RELEASED, 2020

Rank	Receiving watershed	State(s) containing watershed	Reproductive toxics released (lbs.)
1	Middle Wabash-Little Vermilion	IL, IN	13,054
2	Lehigh	PA	9,687
3	Upper San Antonio	TX	9,219
4	Lower Monongahela	PA, WV	7,364
5	Upper Ohio	OH, PA, WV	6,592
6	Little Calumet-Galien	IL, IN, MI	6,585
7	Austin-Oyster	TX	6,096
8	Middle Kansas	KS	6,065
9	Lake Maurepas	LA	5,904
10	Lower James	VA	5,060
11	Middle Ohio-Laughery	IN, KY, OH	4,488
12	Lower St. Johns	FL	4,192
13	Buffalo-San Jacinto	TX	4,181
14	Lower Calcasieu	LA	3,997
15	Peruque-Piasa	IL, MO	3,532
16	Lower Cumberland	KY, TN	3,145
17	Chicago	IL, IN	3,045
18	South Fork Holston	NC, TN, VA	2,620
19	Lower Columbia-Clatskanie	OR, WA	2,472
20	Lower Ohio-Little Pigeon	IN, KY	2,219
21	Lower Tennessee-Beech	MS, TN	2,060
22	Locust	AL	2,019
23	Jordan	UT	2,012
24	Kentucky Lake	KY, TN	1,983
25	Siletz-Yaquina	OR	1,810
26	Middle Chattahoochee-Walter F. George Reservoir	AL, GA	1,710
27	Silver-Little Kentucky	IN, KY	1,653
28	Cooper	SC	1,586
29	Salt	KY	1,581
30	Lower Grand	LA	1,577
31	Mobile-Tensaw	AL	1,532
32	Etowah	GA	1,511
33	South Corpus Christi Bay	TX	1,509
34	East Central Louisiana Coastal	LA	1,462
35	St. Marys	IN, OH	1,423
36	Wheeler Lake	AL, TN	1,356
37	Bayou Sara-Thompson	LA, MS	1,339
38	Lower Tombigbee	AL	1,283
39	Ottawa-Stony	MI, OH	1,235
40	Strait of Georgia	Canada, WA	1,210
41	Eastern Louisiana Coastal	LA, MS	1,178
42	Highland-Pigeon	IL, IN, KY	1,172
43	Lower Ouachita	LA	1,107
44	Lower Neches	TX	1,080
45	East Matagorda Bay	TX	1,016
46	Suisun Bay	CA	1,013
47	Muskingum	OH	1,010
48	Sandy Hook-Staten Island	NJ, NY	931
49	Tuscarawas	OH	915
50	Upper Coosa	AL, GA	905

TABLE A-7. TOP 50 LOCAL WATERSHEDS BY DEVELOPMENTAL TOXICS RELEASED, 2020

Rank	Receiving watershed	State(s) containing watershed	Developmental toxics released (lbs.)
1	Castle Rock	WI	568,103
2	Middle Neuse	NC	395,424
3	Lower Alabama	AL	320,140
4	Bayou De Chien-Mayfield	KY, TN	282,640
5	Lower Yazoo	LA, MS	265,395
6	Lower Chehalis	WA	239,724
7	Carolina Coastal-Sampit	SC	232,234
8	Buffalo-San Jacinto	TX	178,372
9	South Fork Holston	NC, TN, VA	113,501
10	Middle Columbia-Lake Wallula	OR, WA	76,838
11	Lower Neches	TX	76,050
12	Lower Columbia-Clatskanie	OR, WA	75,878
13	Middle Savannah	GA, SC	74,239
14	Cooper	SC	61,542
15	Lake Maurepas	LA	61,041
16	Bayou Pierre	LA, TX	58,493
17	Lower Chattahoochee	AL, FL, GA	57,055
18	Lower Cape Fear	NC	56,467
19	Upper Cape Fear	NC	53,052
20	Pigeon	NC, TN	47,827
21	Cumberland-St. Simons	FL, GA	46,048
22	Lower Roanoke	NC	44,324
23	Menominee	MI, WI	44,035
24	Siletz-Yaquina	OR	43,810
25	Puget Sound	WA	43,541
26	Clearwater	ID, WA	42,449
27	Lower Arkansas-Maumelle	AR	40,712
28	Econfina-Steinhatchee	FL	38,519
29	Bayou Sara-Thompson	LA, MS	37,376
30	Lower Conecuh	AL, FL	36,845
31	Lower Little Arkansas, Oklahoma	AR, OK	35,133
32	East Central Louisiana Coastal	LA	30,748
33	Mckenzie	OR	28,623
34	Lower Pearl	LA, MS	27,651
35	Middle Pearl-Silver	MS	27,607
36	Silver-Little Kentucky	IN, KY	23,116
37	Mississippi Coastal	AL, LA, MS	22,125
38	Middle Wabash-Busseron	IL, IN	21,013
39	Lower Androscoggin River	ME, NH	20,917
40	Lower Ouachita	LA	19,705
41	Lower Genesee	NY	17,887
42	North Fork Edisto	SC	17,739
43	Middle Wabash-Little Vermilion	IL, IN	16,668
44	Lower Fox	WI	16,180
45	Saint Croix River	Canada, ME	16,073
46	Little Muskingum-Middle Island	OH, WV	15,953
47	Hudson-Hoosic	MA, NY, VT	15,094
48	St. Marys	FL, GA	14,945
49	Copperas-Duck	IA, IL	14,793
50	Lower Kennebec River	ME	14,501

Appendix B: Facilities and companies releasing toxics to waterways

TABLE B-1. TOP 50 FACILITIES BY TOTAL TOXICS RELEASED (BY WEIGHT), 2020

Rank	Facility	Industry	City	State	Receiving watershed	Total toxics released (lbs.)
1	Cleveland-Cliffs Steel Corp. (Rockport Works)	Iron and Steel Mills and Ferroalloy Manufacturing	Rockport	IN	Lower Ohio-Little Pigeon	11,929,737
2	U.S. Army Radford Army Ammunition Plant	National Security	Radford	VA	Upper New	10,266,136
3	Delaware City Refinery	Petroleum Refineries	Delaware City	DE	Brandywine-Christina	6,190,936
4	Smithfield-Tar Heel	Animal (except Poultry) Slaughtering	Tar Heel	NC	Lower Cape Fear	4,766,415
5	Cleveland-Cliffs Steel Corp.	Iron and Steel Mills and Ferroalloy Manufacturing	Coshocton	OH	Muskingum	4,636,828
6	Smithfield Packaged Meats Corp. - Sioux Falls	Animal (except Poultry) Slaughtering	Sioux Falls	SD	Lower Big Sioux	4,507,529
7	McCain Foods USA Inc.	Frozen Fruit, Juice, and Vegetable Manufacturing	Burley	ID	Lake Walcott	3,866,978
8	North American Stainless	Iron and Steel Mills and Ferroalloy Manufacturing	Ghent	KY	Middle Ohio-Laughery	3,363,350
9	Tyson Fresh Meats Inc. - Joslin II	Animal (except Poultry) Slaughtering	Hillsdale	IL	Lower Rock	3,068,370
10	Pilgrim's Pride Corp. Mt. Pleasant Complex	Poultry Processing	Mount Pleasant	TX	Lake O' the Pines	2,694,056
11	Tyson Fresh Meats Inc.	Animal (except Poultry) Slaughtering	Lexington	NE	Middle Platte-Buffalo	2,660,028
12	Phillips 66 Co-Bayway Refinery	Petroleum Refineries	Linden	NJ	Sandy Hook-Staten Island	2,624,639
13	JBS Plainwell	Animal (except Poultry) Slaughtering	Plainwell	MI	Kalamazoo	2,515,483
14	Lewiston Processing Plant	Rendering and Meat Byproduct Processing	Lewiston Woodville	NC	Lower Roanoke	2,346,980
15	Pryor Solae	Soybean and Other Oilseed Processing	Pryor	OK	Lower Neosho	2,248,189
16	Tyson Farms Inc. - Carthage MS Processing Plant	Poultry Processing	Carthage	MS	Upper Pearl	2,224,631
17	USS-Clairton Plant	All Other Petroleum and Coal Products Manufacturing	Clairton	PA	Lower Monongahela	2,135,786
18	McCain Foods USA Inc.	Frozen Fruit, Juice, and Vegetable Manufacturing	Easton	ME	Becaguimec Stream-Saint John River	2,031,077
19	Perdue Cromwell Processing Plant	Poultry Processing	Beaver Dam	KY	Middle Green	1,893,057
20	Wood River Refinery	Petroleum Refineries	Roxana	IL	Peruque-Piasa	1,777,166
21	Valero Refining - Texas LP Houston Refinery	Petroleum Refineries	Houston	TX	Buffalo-San Jacinto	1,755,018
22	Cargill Meat Solutions Corp.	Animal (except Poultry) Slaughtering	Schuyler	NE	Lower Platte-Shell	1,603,968
23	CF Industries Nitrogen LLC	Nitrogenous Fertilizer Manufacturing	Donaldsonville	LA	East Central Louisiana Coastal	1,576,607

Rank	Facility	Industry	City	State	Receiving watershed	Total toxics released (lbs.)
24	Valero Refining-Texas LP	Petroleum Refineries	Texas City	TX	West Galveston Bay	1,511,335
25	Lamb Weston Inc. Richland Facility	Frozen Fruit, Juice, and Vegetable Manufacturing	Richland	WA	Upper Columbia-Priest Rapids	1,510,660
26	BASF Corp. Attapulgus Ops	Ground or Treated Mineral and Earth Manufacturing	Attapulgus	GA	Lower Ochlockonee	1,475,100
27	Koch Foods Of Gadsden	Poultry Processing	Gadsden	AL	Middle Coosa	1,437,107
28	JBS/Swift Pork Co.	Meat Processed from Carcasses	Beardstown	IL	Lower Sangamon	1,433,193
29	Tyson Fresh Meats Inc.-Louisa County	Animal (except Poultry) Slaughtering	Columbus Junction	IA	Lower Iowa	1,304,961
30	Sanderson Farms Inc.	Poultry Processing	Bryan	TX	Lower Brazos-Little Brazos	1,259,743
31	JBS Souderton Inc. - Rendering Div.	Rendering and Meat Byproduct Processing	Souderton	PA	Schuylkill	1,239,724
32	Kraton Polymers US LLC	Synthetic Rubber Manufacturing	Belpre	OH	Upper Ohio-Shade	1,200,951
33	Biokyowa Inc.	Other Animal Food Manufacturing	Cape Girardeau	MO	Little River Ditches	1,170,777
34	Tyson Poultry Inc.- Broken Bow Processing Plant	Poultry Processing	Broken Bow	OK	Upper Little	1,169,229
35	Anheuser-Busch LLC	Breweries	Baldwinsville	NY	Oswego	1,151,719
36	Creekstone Farms Premium Beef LLC	Animal (except Poultry) Slaughtering	Arkansas City	KS	Lower Walnut River	1,137,220
37	Smithfield Fresh Meats Corp.-Crete	Animal (except Poultry) Slaughtering	Crete	NE	Middle Big Blue	1,134,584
38	Outokumpu Stainless USA LLC	Iron and Steel Mills and Ferroalloy Manufacturing	Calvert	AL	Lower Tombigbee	1,119,523
39	Sanderson Farms Inc.	Poultry Processing	Collins	MS	Upper Leaf	1,094,712
40	LNVA-North Regional Treatment Plant	Sewage Treatment Facilities	Beaumont	TX	Lower Neches	1,052,835
41	Eastman Chemical Co. Tennessee Operations	Plastics Material and Resin Manufacturing	Kingsport	TN	South Fork Holston	1,038,266
42	Tyson Farms Inc. River Valley Ingredients – Hanceville	Rendering and Meat Byproduct Processing	Hanceville	AL	Mulberry	1,030,304
43	Tyson Poultry Inc. - Processing Plant	Poultry Processing	Sedalia	MO	Lamine	1,022,768
44	McCain Foods USA Inc.	Frozen Fruit, Juice, and Vegetable Manufacturing	Wisconsin Rapids	WI	Castle Rock	1,019,567
45	Citgo Petroleum Corp.	Petroleum Refineries	Sulphur	LA	Lower Calcasieu	1,011,914
46	Sanderson Farms Inc.	Poultry Processing	Summit	MS	Bogue Chitto	976,461
47	Angus Chemical Co.	All Other Basic Organic Chemical Manufacturing	Sterlington	LA	Lower Ouachita	953,439
48	Southern Hens Inc.	Poultry Processing	Moselle	MS	Upper Leaf	935,967
49	Carpenter Technology Corp.	Iron and Steel Mills and Ferroalloy Manufacturing	Reading	PA	Schuylkill	904,010
50	Tyson Chicken Inc. - Hope Processing Plant	Poultry Processing	Hope	AR	McKinney-Posten Bayous	894,224

TABLE B-2. TOP 50 FACILITIES BY TOXICITY-WEIGHTED RELEASES, 2020

Rank	Facility	Industry	City	State	Receiving watershed	Toxicity-weighted releases (TWPE)
1	NextEra Energy Point Beach LLC	Nuclear Electric Power Generation	Two Rivers	WI	Manitowoc-Sheboygan	45,021,000,000
2	Dow Chemical Co. Freeport Facility	All Other Basic Organic Chemical Manufacturing	Freeport	TX	Austin-Oyster	38,309,002,758
3	US Army Radford Army Ammunition Plant	National Security	Radford	VA	Upper New	31,725,710,403
4	Duke Energy Indiana Inc. - Cayuga Generating Station	Fossil Fuel Electric Power Generation	Cayuga	IN	Middle Wabash-Little Vermilion	6,183,336,100
5	Honeywell International Inc. Geismar Plant	Industrial Gas Manufacturing	Carville	LA	Lake Maurepas	5,962,610,293
6	APG Polytech LLC	Plastics Material and Resin Manufacturing	Apple Grove	WV	Raccoon-Symmes	4,442,086,541
7	BASF Corp.	Cyclic Crude, Intermediate, and Gum and Wood Chemical Manufacturing	Geismar	LA	Lake Maurepas	1,941,011,721
8	Cardinal Plant	Fossil Fuel Electric Power Generation	Brilliant	OH	Upper Ohio-Wheeling	1,682,024,696
9	DAK Americas LLC Cooper River Plant	Plastics Material and Resin Manufacturing	Moncks Corner	SC	Cooper	1,372,652,836
10	Kennecott Utah Copper Smelter & Refinery	Nonferrous Metal (except Aluminum) Smelting and Refining	Magna	UT	Jordan	1,049,112,845
11	Arch Wood Protection Inc.	Pesticide and Other Agricultural Chemical Manufacturing	Conley	GA	Upper Ocmulgee	1,019,990,697
12	Eastman Chemical Co. Tennessee Operations	Plastics Material and Resin Manufacturing	Kingsport	TN	South Fork Holston	967,805,244
13	Denka Performance Elastomer LLC	Synthetic Rubber Manufacturing	La Place	LA	Lake Maurepas	892,889,233
14	DTE Electric Co. - Monroe Power Plant	Fossil Fuel Electric Power Generation	Monroe	MI	Ottawa-Stony	871,987,528
15	Holcim (US) Inc. - Whitehall Plant	Cement Manufacturing	Whitehall	PA	Lehigh	756,592,400
16	Eagle US 2 LLC	Other Basic Inorganic Chemical Manufacturing	Westlake	LA	Lower Calcasieu	665,506,153
17	Keystone Power Plant	Fossil Fuel Electric Power Generation	Shelocta	PA	Middle Allegheny-Redbank	616,037,719
18	American Electric Power Conesville Plant	Fossil Fuel Electric Power Generation	Conesville	OH	Muskingum	603,081,420
19	Miami Fort Power Co. LLC	Fossil Fuel Electric Power Generation	North Bend	OH	Middle Ohio-Laughery	545,821,840
20	Calaveras Power Station	Fossil Fuel Electric Power Generation	San Antonio	TX	Upper San Antonio	521,380,934
21	Ascend Performance Materials Operations LLC - Decatur Plant	All Other Basic Organic Chemical Manufacturing	Decatur	AL	Wheeler Lake	480,395,930
22	Kennecott Utah Copper Mine Concentrators & Power Plant	Copper, Nickel, Lead, and Zinc Mining	Bingham Canyon	UT	Jordan	406,090,680
23	Cornerstone Chemical Co.	All Other Basic Organic Chemical Manufacturing	Westwego	LA	East Central Louisiana Coastal	382,921,993
24	Nippon Dynawave Packaging Co.	Pulp Mills	Longview	WA	Lower Columbia-Clatskanie	357,390,574
25	Packaging Corp. of America Counce Mill	Paperboard Mills	Counce	TN	Lower Tennessee-Beech	275,902,448

Rank	Facility	Industry	City	State	Receiving watershed	Toxicity-weighted releases (TWPE)
26	Olin Winchester LLC Main Plant	Small Arms Ammunition Manufacturing	East Alton	IL	Peruque-Piasa	259,111,365
27	The Dow Chemical Co.	Plastics Material and Resin Manufacturing	Midland	MI	Tittabawassee	254,846,704
28	NIPSCO R.M. Schahfer Generating Station	Fossil Fuel Electric Power Generation	Wheatfield	IN	Kankakee	251,373,061
29	Alcoa Warrick LLC	Alumina Refining and Primary Aluminum Production	Newburgh	IN	Lower Ohio-Little Pigeon	250,304,450
30	Louisville Gas & Electric Co. - Mill Creek Station	Fossil Fuel Electric Power Generation	Louisville	KY	Salt	244,535,847
31	St. Charles Operations (Taft/Star) Union Carbide Corp.	All Other Basic Organic Chemical Manufacturing	Hahnville	LA	East Central Louisiana Coastal	241,231,017
32	Gavin Power LLC	Fossil Fuel Electric Power Generation	Cheshire	OH	Upper Ohio-Shade	229,663,294
33	Rockport Plant	Fossil Fuel Electric Power Generation	Rockport	IN	Lower Ohio-Little Pigeon	204,668,477
34	Duke Energy Carolinas LLC - Marshall Steam Station	Fossil Fuel Electric Power Generation	Terrell	NC	Upper Catawba	196,651,502
35	Buick Resource Recycling Facility LLC	Secondary Smelting, Refining, and Alloying of Nonferrous Metal (except Copper and Aluminum)	Boss	MO	Meramec	196,222,513
36	DAK Americas LLC	Plastics Material and Resin Manufacturing	Fayetteville	NC	Upper Cape Fear	190,727,130
37	Alabama River Cellulose LLC	Pulp Mills	Perdue Hill	AL	Lower Alabama	188,702,060
38	Chevron Products Co. Pascagoula Refinery	Petroleum Refineries	Pascagoula	MS	Mississippi Coastal	173,616,805
39	Cox Wood of Alabama	Wood Preservation	Woodstock	AL	Cahaba	167,505,876
40	Stella-Jones Corp.	Wood Preservation	Whitmire	SC	Tyger	163,465,200
41	Envirite of Illinois Inc.	Hazardous Waste Treatment and Disposal	Harvey	IL	Chicago	154,093,908
42	International Paper Georgetown Mill	Pulp Mills	Georgetown	SC	Carolina Coastal-Sampit	148,037,860
43	USS Gary Works	Iron and Steel Mills and Ferroalloy Manufacturing	Gary	IN	Little Calumet-Galien	138,195,324
44	Harrison Power Station	Fossil Fuel Electric Power Generation	Haywood	WV	West Fork	138,015,744
45	Duke Energy Progress LLC - Roxboro Steam Electric Plant	Fossil Fuel Electric Power Generation	Semora	NC	Lower Dan	137,975,790
46	Georgia-Pacific Cedar Springs	Paperboard Mills	Cedar Springs	GA	Lower Chattahoochee	136,157,450
47	Clean Harbors Deer Park LLC	Hazardous Waste Treatment and Disposal	La Porte	TX	Buffalo-San Jacinto	133,513,216
48	E. C. Gaston Electric Generating Plant	Fossil Fuel Electric Power Generation	Wilsonville	AL	Lower Coosa	131,473,298
49	Kentucky Utilities Co. Ghent Station	Fossil Fuel Electric Power Generation	Ghent	KY	Middle Ohio-Laughery	130,241,882
50	Barry Steam Plant	Fossil Fuel Electric Power Generation	Bucks	AL	Mobile-Tensaw	126,331,439

TABLE B-3. TOP FACILITY IN EACH STATE AND TERRITORY BY TOTAL TOXICS RELEASED, 2020

State or territory	Facility	Industry	City	Receiving watershed	Total toxics released (lbs.)
Alabama	Koch Foods of Gadsden	Poultry Processing	Gadsden	Middle Coosa	1,437,107
Alaska	Coeur Alaska Inc. Kensington Gold Project	Gold Ore Mining	Juneau	Lynn Canal	405,060
Arizona	Freeport-McMoRan Miami Inc.	Nonferrous Metal (except Aluminum) Smelting and Refining	Claypool	Upper Salt	781
Arkansas	Tyson Chicken Inc. - Hope Processing Plant	Poultry Processing	Hope	McKinney-Posten Bayous	894,224
California	Martinez Refining Co. LLC	Petroleum Refineries	Martinez	Suisun Bay	812,278
Colorado	Cargill Meat Solutions Corp.	Animal (except Poultry) Slaughtering	Fort Morgan	Middle South Platte-Sterling	576,957
Connecticut	Allnex USA Inc. Wallingford CT Site	Plastics Material and Resin Manufacturing	Wallingford	Quinnipiac	8,797
Delaware	Delaware City Refinery	Petroleum Refineries	Delaware City	Brandywine-Christina	6,190,936
District of Columbia	Fort Totten Ready Mix Concrete	Ready-Mix Concrete Manufacturing	Washington	Middle Potomac-Anacostia-Occoquan	978
Florida[85]	Foley Cellulose LLC	Pulp Mills	Perry	Econfina-Steinhatchee	281,610
Georgia	BASF Corp. Attapulgus Ops	Ground or Treated Mineral and Earth Manufacturing	Attapulgus	Lower Ochlockonee	1,475,100
Guam	Naval Base Guam-Apra Harbor WWTP	National Security	Santa Rita	Guam	242,762
Hawaii	Joint Base Pearl Harbor-Hickam Hawaii	National Security	Pearl Harbor	Oahu	450,000
Idaho	McCain Foods USA Inc.	Frozen Fruit, Juice, and Vegetable Manufacturing	Burley	Lake Walcott	3,866,978
Illinois	Tyson Fresh Meats Inc. - Joslin II	Animal (except Poultry) Slaughtering	Hillsdale	Lower Rock	3,068,370
Indiana	Cleveland-Cliffs Steel Corp. (Rockport Works)	Iron and Steel Mills and Ferroalloy Manufacturing	Rockport	Lower Ohio-Little Pigeon	11,929,737
Iowa	Tyson Fresh Meats Inc.-Louisa County	Animal (except Poultry) Slaughtering	Columbus Junction	Lower Iowa	1,304,961
Kansas	Creekstone Farms Premium Beef LLC	Animal (except Poultry) Slaughtering	Arkansas City	Lower Walnut River	1,137,220
Kentucky	North American Stainless	Iron and Steel Mills and Ferroalloy Manufacturing	Ghent	Middle Ohio-Laughery	3,363,350
Louisiana	CF Industries Nitrogen LLC	Nitrogenous Fertilizer Manufacturing	Donaldsonville	East Central Louisiana Coastal	1,576,607
Maine	McCain Foods USA Inc.	Frozen Fruit, Juice, and Vegetable Manufacturing	Easton	Becaguimec Stream-Saint John River	2,031,077
Maryland	Grace Davison-Curtis Bay Works	Other Basic Inorganic Chemical Manufacturing	Baltimore	Gunpowder-Patapsco	79,059

State or territory	Facility	Industry	City	Receiving watershed	Total toxics released (lbs.)
Massachusetts	Hollingsworth & Vose Co. West Groton	Paper (except Newsprint) Mills	West Groton	Nashua River	1,552
Michigan	JBS Plainwell	Animal (except Poultry) Slaughtering	Plainwell	Kalamazoo	2,515,483
Minnesota	3M Cottage Grove Center	All Other Miscellaneous Chemical Product and Preparation Manufacturing	Cottage Grove	Twin Cities	744,103
Mississippi	Tyson Farms Inc. - Carthage MS Processing Plant	Poultry Processing	Carthage	Upper Pearl	2,224,631
Missouri	Biokyowa Inc.	Other Animal Food Manufacturing	Cape Girardeau	Little River Ditches	1,170,777
Montana	CHS Inc. Laurel Refinery	Petroleum Refineries	Laurel	Upper Yellowstone-Lake Basin	21,147
Nebraska	Tyson Fresh Meats Inc.	Animal (except Poultry) Slaughtering	Lexington	Middle Platte-Buffalo	2,660,028
Nevada	Nevada Gold Mines LLC - Turquoise Ridge	Gold Ore Mining	Golconda	Middle Humboldt	895
New Hampshire	Merrimack Station	Fossil Fuel Electric Power Generation	Bow	Merrimack River	192
New Jersey	Phillips 66 Co.-Bayway Refinery	Petroleum Refineries	Linden	Sandy Hook-Staten Island	2,624,639
New Mexico	US DOD USAF Holloman AFB	National Security	Holloman AFB	Tularosa Valley	184,284
New York	Anheuser-Busch LLC	Breweries	Baldwinsville	Oswego	1,151,719
North Carolina	Smithfield-Tar Heel	Animal (except Poultry) Slaughtering	Tar Heel	Lower Cape Fear	4,766,415
North Dakota	Cargill Inc. Wet Corn Milling – Wahpeton	Wet Corn Milling	Wahpeton	Upper Red	68,155
Ohio	Cleveland-Cliffs Steel Corp.	Iron and Steel Mills and Ferroalloy Manufacturing	Coshocton	Muskingum	4,636,828
Oklahoma	Pryor Solae	Soybean and Other Oilseed Processing	Pryor	Lower Neosho	2,248,189
Oregon	Siltronic Corp.	Semiconductor and Related Device Manufacturing	Portland	Lower Willamette	430,930
Pennsylvania	USS-Clairton Plant	All Other Petroleum and Coal Products Manufacturing	Clairton	Lower Monongahela	2,135,786
Puerto Rico	PREPA - Aguirre Power Generation Complex	Fossil Fuel Electric Power Generation	Aguirre	Southern Puerto Rico	696
Rhode Island	Toray Plastics (America) Inc.	Unlaminated Plastics Film and Sheet (except Packaging) Manufacturing	North Kingstown	Narragansett	101
South Carolina	Invista Camden Plant	Artificial and Synthetic Fibers and Filaments Manufacturing	Lugoff	Wateree	660,310

State or territory	Facility	Industry	City	Receiving watershed	Total toxics released (lbs.)
South Dakota	Smithfield Packaged Meats Corp. - Sioux Falls	Animal (except Poultry) Slaughtering	Sioux Falls	Lower Big Sioux	4,507,529
Tennessee	Eastman Chemical Co. Tennessee Operations	Plastics Material and Resin Manufacturing	Kingsport	South Fork Holston	1,038,266
Texas	Pilgrim's Pride Corp. Mt. Pleasant Complex	Poultry Processing	Mount Pleasant	Lake O' the Pines	2,694,056
Utah	Chevron Products Co. - Salt Lake Refinery	Petroleum Refineries	Salt Lake City	Jordan	122,669
Vermont	GlobalFoundries US 2 LLC - Vermont Facility	Semiconductor and Related Device Manufacturing	Essex Junction	Winooski River	119,956
Virgin Islands	Limetree Bay Refining & Terminals LLC	Petroleum Refineries	Christiansted	St. Croix	58,675
Virginia	US Army Radford Army Ammunition Plant	National Security	Radford	Upper New	10,266,136
Washington	Lamb Weston Inc. Richland Facility	Frozen Fruit, Juice, and Vegetable Manufacturing	Richland	Upper Columbia-Priest Rapids	1,510,660
West Virginia	Cytec Industries Inc.	All Other Basic Organic Chemical Manufacturing	Willow Island	Little Muskingum-Middle Island	503,460
Wisconsin	McCain Foods USA Inc.	Frozen Fruit, Juice, and Vegetable Manufacturing	Wisconsin Rapids	Castle Rock	1,019,567
Wyoming	Western Sugar Cooperative Lovell Factory	Beet Sugar Manufacturing	Lovell	Shoshone	4,636

TABLE B-4. TOP FACILITY IN EACH STATE AND TERRITORY BY TOXICITY-WEIGHTED RELEASES, 2020

State or territory	Facility	Industry	City	Receiving watershed	Toxicity-weighted releases (lbs eq.)
Alabama	Ascend Performance Materials Operations LLC-Decatur Plant	All Other Basic Organic Chemical Manufacturing	Decatur	Wheeler Lake	480,395,930
Alaska	Pogo Mine	Gold Ore Mining	Delta Junction	Healy Lake-Tanana River	115,777,491
Arizona	Freeport-McMoRan Miami Inc.	Nonferrous Metal (except Aluminum) Smelting and Refining	Claypool	Upper Salt	8,382,655
Arkansas	Domtar AW LLC Ashdown Mill	Paper (except Newsprint) Mills	Ashdown	Lower Little Arkansas, Oklahoma	83,204,021
California	Chevron Products Co. Div. of Chevron USA Inc	Petroleum Refineries	El Segundo	San Gabriel	9,942,703
Colorado	EVRAZ Rocky Mountain Steel	Iron and Steel Mills and Ferroalloy Manufacturing	Pueblo	Upper Arkansas	3,350,271
Connecticut	Colt's Manufacturing Co. LLC	Small Arms, Ordnance, and Ordnance Accessories Manufacturing	West Hartford	Outlet Connecticut River	3,495,060
Delaware	Delaware City Refinery	Petroleum Refineries	Delaware City	Brandywine-Christina	7,838,957
District of Columbia	Fort Totten Ready Mix Concrete	Ready-Mix Concrete Manufacturing	Washington	Middle Potomac-Anacostia-Occoquan	616
Florida	Foley Cellulose LLC[86]	Pulp Mills	Perry	Econfina-Steinhatchee	85,341,045
Georgia	Arch Wood Protection Inc.	Pesticide and Other Agricultural Chemical Manufacturing	Conley	Upper Ocmulgee	1,019,990,697
Guam	Naval Base Guam - Apra Harbor WWTP	National Security	Santa Rita	Guam	152,940
Hawaii	Par West Refinery	Petroleum Refineries	Kapolei	Oahu	443,079
Idaho	Clearwater Paper Corp.-PPD & CPD Idaho	Pulp Mills	Lewiston	Clearwater	119,178,999
Illinois	Olin Winchester LLC Main Plant	Small Arms Ammunition Manufacturing	East Alton	Peruque-Piasa	259,111,365
Indiana	Duke Energy Indiana Inc. - Cayuga Generating Station	Fossil Fuel Electric Power Generation	Cayuga	Middle Wabash-Little Vermilion	6,183,336,100
Iowa	Modernfold Inc.	Showcase, Partition, Shelving, and Locker Manufacturing	Dyersville	Maquoketa	87,552,200
Kansas	Coffeyville Resources Refining & Marketing	Petroleum Refineries	Coffeyville	Middle Verdigris	9,328,159
Kentucky	Louisville Gas & Electric Co. - Mill Creek Station	Fossil Fuel Electric Power Generation	Louisville	Salt	244,535,847

State or territory	Facility	Industry	City	Receiving watershed	Toxicity-weighted releases (lbs eq.)
Louisiana	Honeywell International Inc. Geismar Plant	Industrial Gas Manufacturing	Carville	Lake Maurepas	5,962,610,293
Maine	Sappi NA Inc. - Somerset Operations	Paper (except Newsprint) Mills	Skowhegan	Lower Kennebec River	52,462,371
Maryland	US Gypsum Co.	Gypsum Product Manufacturing	Baltimore	Gunpowder-Patapsco	241,340
Massachusetts	Wyman-Gordon Co.	Nonferrous Forging	North Grafton	Blackstone River	5,870,434
Michigan	DTE Electric Co. - Monroe Power Plant	Fossil Fuel Electric Power Generation	Monroe	Ottawa-Stony	871,987,528
Minnesota	Boise White Paper LLC	Paper (except Newsprint) Mills	International Falls	Lower Rainy	41,514,817
Mississippi	Chevron Products Co. Pascagoula Refinery	Petroleum Refineries	Pascagoula	Mississippi Coastal	173,616,805
Missouri	Buick Resource Recycling Facility LLC	Secondary Smelting, Refining, and Alloying of Nonferrous Metal (except Copper and Aluminum)	Boss	Meramec	196,222,513
Montana	ExxonMobil Billings Refinery	Petroleum Refineries	Billings	Upper Yellowstone-Pompeys Pillar	334,952
Nebraska	City of Fremont Department of Utilities Lon D. Wright Power	Fossil Fuel Electric Power Generation	Fremont	Lower Elkhorn	1,819,125
Nevada	Nevada Gold Mines LLC - Turquoise Ridge	Gold Ore Mining	Golconda	Middle Humboldt	84,365,442
New Hampshire	Sturm Ruger & Co. Inc.	Small Arms, Ordnance, and Ordnance Accessories Manufacturing	Newport	Black River-Connecticut River	126,591
New Jersey	Phillips 66 Co. - Bayway Refinery	Petroleum Refineries	Linden	Sandy Hook-Staten Island	29,319,243
New Mexico	US DOD USAF Kirtland Air Force Base	National Security	Kirtland Afb	Rio Grande-Albuquerque	1,101,600
New York	International Paper	Paper (except Newsprint) Mills	Ticonderoga	Lake Champlain	68,527,804
North Carolina	Duke Energy Carolinas LLC - Marshall Steam Station	Fossil Fuel Electric Power Generation	Terrell	Upper Catawba	196,651,502
North Dakota	Cargill Inc. Wet Corn Milling - Wahpeton	Wet Corn Milling	Wahpeton	Upper Red	121,357,620
Ohio	Cardinal Plant	Fossil Fuel Electric Power Generation	Brilliant	Upper Ohio-Wheeling	1,682,024,696
Oklahoma	OGE Energy Corp. River Valley Generating Station	Fossil Fuel Electric Power Generation	Panama	Poteau	119,657,533
Oregon	Georgia-Pacific Toledo LLC	Paperboard Mills	Toledo	Siletz-Yaquina	89,617,610
Pennsylvania	Holcim (US) Inc. - Whitehall Plant	Cement Manufacturing	Whitehall	Lehigh	756,592,400
Puerto Rico	PREPA - Aguirre Power Generation Complex	Fossil Fuel Electric Power Generation	Aguirre	Southern Puerto Rico	12,230,303

State or territory	Facility	Industry	City	Receiving watershed	Toxicity-weighted releases (lbs eq.)
Rhode Island	ExxonMobil Oil Corp. East Providence Terminal	Petroleum Bulk Stations and Terminals	East Providence	Narragansett	225,063
South Carolina	DAK Americas LLC Cooper River Plant	Plastics Material and Resin Manufacturing	Moncks Corner	Cooper	1,372,652,836
South Dakota	Smithfield Packaged Meats Corp. - Sioux Falls	Animal (except Poultry) Slaughtering	Sioux Falls	Lower Big Sioux	2,842,765
Tennessee	Eastman Chemical Co. Tennessee Operations	Plastics Material and Resin Manufacturing	Kingsport	South Fork Holston	967,805,244
Texas	Dow Chemical Co. Freeport Facility	All Other Basic Organic Chemical Manufacturing	Freeport	Austin-Oyster	38,309,002,758
Utah	Kennecott Utah Copper Smelter & Refinery	Nonferrous Metal (except Aluminum) Smelting and Refining	Magna	Jordan	1,049,112,845
Vermont	GlobalFoundries US 2 LLC - Vermont Facility	Semiconductor and Related Device Manufacturing	Essex Junction	Winooski River	71,951
Virgin Islands	Limetree Bay Refining & Terminals LLC	Petroleum Refineries	Christiansted	St. Croix	10,617,900
Virginia	US Army Radford Army Ammunition Plant	National Security	Radford	Upper New	31,725,710,403
Washington	Nippon Dynawave Packaging Co.	Pulp Mills	Longview	Lower Columbia-Clatskanie	357,390,574
West Virginia	APG Polytech LLC	Plastics Material and Resin Manufacturing	Apple Grove	Raccoon-Symmes	4,442,086,541
Wisconsin	NextEra Energy Point Beach LLC	Nuclear Electric Power Generation	Two Rivers	Manitowoc-Sheboygan	45,021,000,000
Wyoming	Black Hills Corp. - Neil Simpson Complex	Fossil Fuel Electric Power Generation	Gillette	Upper Belle Fourche	2,069,634

Appendix C: Toxic releases to waterways by industry and parent company

TABLE C-1. TOP 20 INDUSTRIES FOR TOXIC RELEASES (RANKED BY WEIGHT), 2020

Total Rank	Industry	2017 NAICS Code	Total toxics released (lbs.)	Toxicity-weighted releases (lbs. eq.)
1	Poultry Processing	311615	28,782,512	25,341,823
2	Petroleum Refineries	324110	26,691,990	962,756,698
3	Animal (except Poultry) Slaughtering	311611	24,579,860	18,730,255
4	Iron and Steel Mills and Ferroalloy Manufacturing	331110	23,189,166	342,222,897
5	National Security	928110	12,464,065	31,758,472,374
6	Frozen Fruit, Juice, and Vegetable Manufacturing	311411	8,462,807	5,310,587
7	Paper (except Newsprint) Mills	322121	7,546,807	1,094,695,527
8	All Other Basic Organic Chemical Manufacturing	325199	6,814,680	39,781,206,974
9	Rendering and Meat Byproduct Processing	311613	6,398,898	5,089,643
10	Nitrogenous Fertilizer Manufacturing	325311	5,718,865	11,182,780
11	Pulp Mills	322110	4,352,753	1,606,464,236
12	Paperboard Mills	322130	3,600,214	1,208,096,597
13	All Other Petroleum and Coal Products Manufacturing	324199	2,572,232	16,571,409
14	Plastics Material and Resin Manufacturing	325211	2,514,162	7,459,931,978
15	Fossil Fuel Electric Power Generation	221112	2,315,358	14,175,054,418
16	Soybean and Other Oilseed Processing	311224	2,250,316	1,987,167
17	Meat Processed from Carcasses	311612	1,718,992	1,093,644
18	Ground or Treated Mineral and Earth Manufacturing	327992	1,638,644	2,118,545
19	Cheese Manufacturing	311513	1,632,564	73,532,836
20	Other Basic Inorganic Chemical Manufacturing	325180	1,457,177	757,874,788

TABLE C-2. TOP 20 PARENT COMPANIES BY TOTAL TOXIC CHEMICALS RELEASED, 2020[87]

Parent company or facility name	Total chemicals released (lbs.)
Tyson Foods Inc.	18,414,255
Cleveland-Cliffs Inc.	17,312,275
US Department of Defense	12,388,453
United Global Foods US Holdings Inc.	10,976,028
JBS USA Food Co.	10,467,626
PBF Energy Inc.	7,693,111
McCain Foods USA Inc.	6,917,622
Sanderson Farms Inc.	5,893,825
Koch Industries Inc.	5,716,541
Perdue Farms Inc.	5,268,456
Phillips 66 Co.	4,718,943
Valero Energy Corp.	4,272,591
BASF Corp.	3,454,722
North American Stainless	3,363,350
CF Industries Holdings Inc.	3,319,532
International Paper Co.	3,214,543
Cargill Inc.	3,040,374
US Steel Corp.	2,609,527
Dupont De Nemours Inc.	2,392,256
Exxon Mobil Corp.	2,351,642

TABLE C-3. TOP 20 PARENT COMPANIES BY TOXICITY-WEIGHTED CHEMICALS RELEASED, 2020[88]

Parent company or facility name	Toxicity-weighted chemicals released (lbs. eq.)
NextEra Energy Inc.	45,021,037,511
Dow Inc.	38,969,647,526
US Department of Defense	31,758,499,191
Duke Energy Corp.	6,603,750,310
Honeywell International Inc.	5,970,249,475
APG Polytech Holding	4,442,086,541
BASF Corp	1,959,869,801
Buckeye Power Inc.	1,682,024,696
Dak Americas LLC	1,564,680,481
Rio Tinto America Inc.	1,455,203,627
Koch Industries Inc.	1,097,730,299
Lonza America Inc.	1,019,990,697
Eastman Chemical Co.	983,749,433
Denka Performance Elastomer LLC	892,889,233
DTE Energy Co.	881,803,527
American Electric Power	871,418,001
Holcim (US) Inc.	756,772,048
Westlake Chemical Corp.	711,514,339
Vistra Corp.	693,041,673
Keystone-Conemaugh Projects LLC	679,614,057

Appendix D: Toxic chemicals and human health effects

TABLE D-1. TOXIC CHEMICALS BY TOTAL RELEASES, TOXICITY-WEIGHTED RELEASES, TOXICITY WEIGHT AND CERTAIN HEALTH EFFECTS, 2020[89]

Chemical	CAS number	Total chemicals released (lbs.)	Toxicity-weighted chemicals released (lbs. eq.)	Toxicity weight	Cancer effects	Developmental effects	Reproductive effects
1-Chloro-1,1-difluoroethane	75-68-3	3,276.9	229.4	0.1			
1-Propanesulfonic acid, 2-methyl-, 2-[[1-oxo-3-[(γ-ω-perfluoro-C4-16-alkyl) thio]propyl]amino] derivs., sodium salts	68187-47-3	6.0	0.0	0.0			
1,1-Dichloro-1-fluoroethane	1717-00-6	169.0	0.0	0.0			
1,1,1-Trichloroethane	71-55-6	3,619.0	1,809.5	0.5			
1,1,1,2-Tetrachloroethane	630-20-6	66.0	171,600.0	2,600.0	x		
1,1,2-Trichloroethane	79-00-5	8.3	47,481.0	5,700.0	x		
1,2-Butylene oxide	106-88-7	1.0	180.0	180.0			
1,2-Dibromoethane	106-93-4	70.0	140,000,000.0	2,000,000.0	x	x	x
1,2-Dichloro-1,1-difluoroethane	1649-08-07	15.0	0.0	0.0			
1,2-Dichlorobenzene	95-50-1	1.0	11.0	11.0			
1,2-Dichloroethane	107-06-02	6,789.4	617,835,400.0	91,000.0	x		
1,2-Dichloroethylene	540-59-0	33.0	3,630.0	110.0			
1,2-Dichloropropane	78-87-5	124.2	4,596,881.0	37,000.0	x		
1,2,3-Trichloropropane	96-18-4	1,127.0	33,810,000,000.0	30,000,000.0	x		
1,2,4-Trimethylbenzene	95-63-6	1,432.4	143,240.8	100.0			
1,3-Butadiene	106-99-0	1,131.5	124,465,000.0	110,000.0	x	x	x
1,3-Dichloropropylene	542-75-6	1,061.0	106,100,000.0	100,000.0	x		
1,4-Dichloro-2-butene	764-41-0	96.0	892,800,000.0	9,300,000.0	x		
1,4-Dichlorobenzene	106-46-7	5.0	12,000.0	2,400.0	x		
2-Chloro-1,1,1-trifluoroethane	75-88-7	40.0	0.0	0.0			
2-Mercaptobenzothiazole	149-30-4	2,794.0	30,734,000.0	11,000.0	x		
2-Nitrophenol	88-75-5	65.0	0.0	0.0			
2,4-D ((2,4-dichlorophenoxy)acetic acid)	94-75-7	225.8	45,154.0	200.0			
2,4-Dimethylphenol	105-67-9	351.8	17,589.1	50.0			
4,4'-Diaminodiphenylether	101-80-4	293.0	41,020,000.0	140,000.0	x		
4,4'-Isopropylidenediphenol	80-05-7	1,380.4	27,608.0	20.0		x	x
4,4'-Methylenedianiline	101-77-9	3,300.0	5,280,000,000.0	1,600,000.0	x		

Chemical	CAS number	Total chemicals released (lbs.)	Toxicity-weighted chemicals released (lbs. eq.)	Toxicity weight	Cancer effects	Developmental effects	Reproductive effects
Acetaldehyde	75-07-0	304,754.6	2,407,561,342.6	7,900.0	x		
Acetamide	60-35-5	255.0	1,810,500.0	7,100.0	x		
Acetonitrile	75-05-8	1,909.6	110,756.8	58.0			
Acetophenone	98-86-2	779.1	7,791.0	10.0			
Acrolein	107-02-08	581.0	1,162,000.0	2,000.0			
Acrylamide	79-06-1	754.0	377,000,000.0	500,000.0	x	x	x
Acrylic acid	79-10-7	5,164.0	10,328.0	2.0			
Acrylonitrile	107-13-1	292.3	157,858,200.0	540,000.0	x		
Allyl alcohol	107-18-6	22,944.0	4,588,800.0	200.0			
Allyl chloride	0107-05-01	3.0	10,500.0	3,500.0			
Aluminum oxide (fibrous forms)	1344-28-1	170.4	0.0	0.0			
Ammonia	7664-41-7	3,712,937.2	0.0	0.0			
Aniline	62-53-3	455.1	2,594,070.0	5,700.0	x		
Anthracene	0120-12-7	272.3	898.5	3.3			
Antimony	7440-36-0	148.6	371,425.0	2,500.0			
Antimony and antimony compounds	N010	5,031.6	12,578,964.3	2,500.0			
Arsenic	7440-38-2	4,222.2	6,333,285,000.0	1,500,000.0	x	x	
Arsenic and arsenic compounds	N020	11,446.1	17,169,220,545.0	1,500,000.0	x	x	
Atrazine	1912-24-9	85.6	4,791.4	56.0		x	x
Barium	7440-39-3	1,500.0	7,499.8	5.0			
Barium and barium compounds	N040	490,927.7	2,454,639.1	5.0			
Benzene	71-43-2	3,678.0	202,287,335.9	55,000.0	x	x	x
Benzo(g,h,i)perylene	191-24-2	196.9	3,938,444.1	20,000.0			
Benzoyl chloride	98-88-4	5.0	0.0	0.0			
Benzyl chloride	100-44-7	7.0	1,190,000.0	170,000.0	x		
Beryllium	7440-41-7	2.7	1,325.0	500.0	x		
Beryllium and beryllium compounds	N050	261.9	130,930.0	500.0	x		
Bifenthrin	82657-04-03	3.3	820.0	250.0			
Biphenyl	92-52-4	661.7	529,338.4	800.0			
Bis(2-chloro-1-methethyl)ether	108-60-1	150.0	0.0	0.0	x		
Bis(2-chloroethyl)ether	111-44-4	3.1	3,355,000.0	1,100,000.0	x		
Bromomethane (Methyl bromide)	74-83-9	191.0	9,550.0	50.0		x	
Butyl acrylate	141-32-2	6.9	13.7	2.0			

Chemical	CAS number	Total chemicals released (lbs.)	Toxicity-weighted chemicals released (lbs. eq.)	Toxicity weight	Cancer effects	Developmental effects	Reproductive effects
Butyraldehyde	123-72-8	48,495.0	0.0	0.0			
C.I. Direct Blue 218	28407-37-6	3,330.0	0.0	0.0	x		
Cadmium	7440-43-9	91.2	182,380.0	2,000.0	x	x	x
Cadmium and cadmium compounds	N078	1,143.9	2,287,850.8	2,000.0	x	x	x
Captan	133-06-02	5.0	6,000.0	1,200.0	x		
Carbaryl	63-25-2	11.0	9,680.0	880.0	x	x	x
Carbon disulfide	75-15-0	7,426.8	74,268.4	10.0		x	x
Carbon tetrachloride	56-23-5	108.0	7,560,000.0	70,000.0	x		
Carbonyl sulfide	463-58-1	356.0	124,600.0	350.0			
Catechol	120-80-9	6,152.1	55,368,451.0	9,000.0	x		
CFC-11 (trichlorofluoromethane)	75-69-4	30.0	99.0	3.3			
Chlorine	7782-50-5	114,480.3	1,144,803.1	10.0			
Chloroacetic acid	79-11-8	482.0	241,000.0	500.0			
Chlorobenzene	108-90-7	135.3	6,763.5	50.0			
Chloroethane (Ethyl chloride)	75-00-3	232.0	81.2	0.4	x		
Chloroform	67-66-3	4,812.4	29,355,457.0	6,100.0	x	x	
Chloromethane	74-87-3	232.1	301,730.0	1,300.0		x	x
Chloroprene	126-99-8	187.0	9,350.0	50.0	x		
Chlorothalonil	1897-45-6	36.1	277,970.0	7,700.0	x		
Chromium	7440-47-3	18,593.1	930,612,205.4	50,051.4			
Chromium and chromium compounds	N090	37,681.8	3,380,599,952.7	89,714.4	x	x	x
Cobalt	7440-48-4	441.1	0.0	0.0	x		
Cobalt and cobalt compounds	N096	82,580.3	0.0	0.0	x		
Copper	7440-50-8	15,321.0	22,981,519.6	1,500.0			
Copper and copper compounds	N100	137,789.8	206,684,737.2	1,500.0			
Creosote, coal tar	8001-58-9	279.0	0.0	0.0	x		
Cresol (mixed isomers)	1319-77-3	2,135.6	42,711.3	20.0			
Cumene	98-82-8	2,423.0	24,230.3	10.0	x		
Cumene hydroperoxide	80-15-9	3,004.0	1,922,560.0	640.0			
Cyanide compounds	N106	16,954.2	3,390,830.0	200.0			x
Cyclohexane	110-82-7	3,508.5	2,034.9	0.6			
Cyclohexanol	108-93-0	55,652.0	0.0	0.0			
Dazomet	533-74-4	8.0	2,320.0	290.0			

Chemical	CAS number	Total chemicals released (lbs.)	Toxicity-weighted chemicals released (lbs. eq.)	Toxicity weight	Cancer effects	Developmental effects	Reproductive effects
Di(2-ethylhexyl) phthalate	117-81-7	406.4	5,689,740.0	14,000.0	x	x	x
Diaminotoluene (mixed isomers)	25376-45-8	110.0	352,000,000.0	3,200,000.0	x		
Diazinon	333-41-5	5.0	25,000.0	5,000.0			
Dibenzofuran	132-64-9	25.0	0.0	0.0			
Dicamba	1918-00-9	18.0	39.6	2.2			
Dichloromethane	75-09-2	1,228.5	2,457,058.0	2,000.0	x		
Dicyclopentadiene	77-73-6	7.0	232.0	33.0			
Diethanolamine	111-42-2	26,833.7	19,051,928.6	710.0	x		
Diisocyanates	N120	266.0	93,100,000.0	350,000.0			
Dimethoate	60-51-5	5.0	2,250.0	450.0			
Dimethyl phthalate	131-11-3	95.0	0.0	0.0			
Dimethylamine	124-40-3	23,990.0	0.0	0.0			
Dinitrotoluene (mixed isomers)	25321-14-6	46.0	0.0	0.0	x		x
Dioxane	123-91-1	62,191.0	6,219,100,000.0	100,000.0	x		
Dioxin and dioxin-like compounds	N150	2.7	11,717,448.6	4,406,743.3	x		
Diphenylamine	122-39-4	293.3	9,679.2	33.0			
Dipotassium endothall	2164-07-0	12,275.0	1,718,500.0	140.0			
Diuron	330-54-1	10.7	203,300.0	19,000.0	x		
Epichlorohydrin	106-89-8	5,149.0	50,975,100.0	9,900.0	x		x
Ethyl acrylate	140-88-5	9.7	464,640.0	48,000.0	x		
Ethylbenzene	100-41-4	3,148.2	3,463,055.1	1,100.0	x	x	
Ethylene	74-85-1	13.0	7.3	0.6			
Ethylene glycol	107-21-1	318,589.2	159,294.5	0.5		x	
Ethylene oxide	75-21-8	1,385.0	304,700,000.0	220,000.0	x	x	x
Ethylidene dichloride	75-34-3	1,000.0	5,000.0	5.0	x		
Fomesafen	72178-02-0	0.2	3,420.0	19,000.0			
Formaldehyde	50-00-0	222,700.6	1,113,503.4	5.0	x		
Formic acid	64-18-6	357,927.4	178,963.8	0.5			
Glycidol	556-52-5	16,756.0	0.0	0.0	x		
Glycol ethers	N230	92,430.2	16,637,441.5	180.0			
Hexachloro-1,3-butadiene	87-68-3	27.0	210,600.0	7,800.0	x		
Hexachlorobenzene	118-74-1	110.4	176,698,080.0	1,600,000.0	x	x	x
Hexachlorocyclopentadiene	77-47-4	0.0	5.1	170.0			

Chemical	CAS number	Total chemicals released (lbs.)	Toxicity-weighted chemicals released (lbs. eq.)	Toxicity weight	Cancer effects	Developmental effects	Reproductive effects
Hexachloroethane	67-72-1	14.0	560,000.0	40,000.0	x		
Hexafluoropropylene oxide dimer acid	13252-13-6	12.0	0.0	0.0			
Hexafluoropropylene oxide dimer acid ammonium salt	62037-80-3	406.1	0.0	0.0			
Hydrazine	302-01-02	15,007.0	45,021,000,000.0	3,000,000.0	x		
Hydrogen cyanide	74-90-8	1,140.1	1,938,170.0	1,700.0			x
Hydrogen fluoride	7664-39-3	982.8	24,570.6	25.0			
Hydrogen sulfide	6/4/83	206,939.0	372,490,001.2	1,800.0			
Hydroquinone	123-31-9	4,576.0	274,560,000.0	60,000.0			
Isobutyraldehyde	78-84-2	71.0	0.0	0.0			
Isoprene	78-79-5	455.0	0.0	0.0	x		
Lead	7439-92-1	13,614.6	245,063,208.5	18,000.0	x	x	x
Lead and lead compounds	N420	43,604.1	784,873,702.5	18,000.0	x	x	x
Lithium carbonate	554-13-2	162.6	0.0	0.0		x	x
m-Cresol	108-39-4	661.9	13,238.8	20.0			
m-Xylene	108-38-3	141.4	706.8	5.0			
Malathion	121-75-5	5.0	70.0	14.0	x		
Maleic anhydride	108-31-6	253.5	2,535.3	10.0			
Manganese	7439-96-5	158,205.1	1,123,257.2	7.1			
Manganese and manganese compounds	N450	3,861,300.2	27,415,228.7	7.1			
Mercury	7439-97-6	861.5	8,615,214.2	10,000.0		x	
Mercury and mercury compounds	N458	3,107.9	31,078,930.8	10,000.0		x	
Methanol	67-56-1	4,020,697.0	4,020,697.0	1.0		x	
Methyl acrylate	96-33-3	35.0	1,155.0	33.0	x		
Methyl iodide	74-88-4	12.0	3,480,000.0	290,000.0	x		
Methyl isobutyl ketone	108-10-1	10,313.7	134,078.4	13.0	x	x	
Methyl methacrylate	80-62-6	40.8	28.9	0.7			
Methyl tert-butyl ether	1634-04-04	3,480.6	323,695.8	93.0			
Metribuzin	21087-64-9	11.9	916.3	77.0			
Molybdenum trioxide	1313-27-5	28,439.2	10,806,903.6	380.0	x		
n-Butyl alcohol	71-36-3	33,228.1	332,281.4	10.0			
n-Hexane	110-54-3	3,510.2	59,673.7	17.0			x
N-methyl-2-pyrrolidone	872-50-4	6,680.9	0.0	0.0		x	x

Chemical	CAS number	Total chemicals released (lbs.)	Toxicity-weighted chemicals released (lbs. eq.)	Toxicity weight	Cancer effects	Developmental effects	Reproductive effects
N-methylolacrylamide	924-42-5	5.0	0.0	0.0	x		
N,N-Dimethylformamide	68-12-2	2,539.0	25,390.0	10.0	x		
Naphthalene	91-20-3	4,356.3	217,814.0	50.0	x		
Nickel	7440-02-0	8,752.5	796,480.7	91.0	x	x	x
Nickel and nickel compounds	N495	50,960.7	4,637,423.6	91.0	x	x	x
Nicotine and salts	N503	29.0	0.0	0.0		x	
Nitrate compounds	N511	175,751,834.3	110,723,632.5	0.6			
Nitric acid	7697-37-2	365,100.3	98,577,057.5	270.0			
Nitroglycerin	55-63-0	15,103.0	31,716,300,000.0	2,100,000.0			
Nitromethane	75-52-5	950.0	0.0	0.0	x		
Nonylphenol	N530	53.6	0.0	0.0			
Nonylphenol ethoxylates	N535	1,317.9	0.0	0.0			
o-Anisidine	90-04-0	20.0	1,600,000.0	80,000.0	x		
o-Cresol	95-48-7	140.2	2,804.0	20.0			
o-Toluidine	95-53-4	194.0	46,560,000.0	240,000.0	x		
o-Xylene	95-47-6	3,220.8	16,103.8	5.0			
Octachlorostyrene	29082-74-4	0.0	0.0	0.0			
Oxyfluorfen	42874-03-03	0.3	2,044.0	7,300.0			
p-Chloroaniline	106-47-8	116.0	12,760,000.0	110,000.0	x		
p-Cresol	106-44-5	292.5	58,500.0	200.0			
p-Phenylenediamine	106-50-3	53.0	53,000.0	1,000.0			
p-Xylene	106-42-3	40.4	202.2	5.0			
Pendimethalin	40487-42-1	5.1	50.5	10.0			
Pentachlorobenzene	608-93-5	131.3	170,691.0	1,300.0			
Pentachlorophenol	87-86-5	857.0	342,800,000.0	400,000.0	x	x	x
Perfluorohexanesulfonic acid	355-46-4	6.4	0.0	0.0			
Perfluorooctane sulfonic acid	1763-23-1	1.2	0.0	0.0	x	x	
Perfluorooctanoic acid	335-67-1	8.5	0.0	0.0	x	x	
Peroxyacetic acid	79-21-0	2,752.1	12,384,451.0	4,500.0			
Phenanthrene	85-01-8	307.4	0.0	0.0			
Phenol	108-95-2	27,867.2	91,961.8	3.3			
Phosphine	7803-51-2	1.9	6,303.0	3,300.0			
Phthalic anhydride	85-44-9	26.0	13.0	0.5			

Chemical	CAS number	Total chemicals released (lbs.)	Toxicity-weighted chemicals released (lbs. eq.)	Toxicity weight	Cancer effects	Developmental effects	Reproductive effects
Picloram	1918-02-1	22.0	110.0	5.0			
Polychlorinated biphenyls (PCBs)	1336-36-3	17.7	35,485,400.0	2,000,000.0	x	x	
Polycyclic aromatic compounds	N590	5,037.4	906,731,514.0	180,000.0	x		
Propionaldehyde	123-38-6	14,503.0	6,381,320.0	440.0			
Propylene (Propene)	0115-07-01	64.0	76.8	1.2			
Propylene oxide	75-56-9	1,092.0	262,080,000.0	240,000.0	x	x	
Pyridine	110-86-1	56.0	56,000.0	1,000.0	x		
sec-Butyl alcohol	78-92-2	593.0	5,930.0	10.0			
Selenium	7782-49-2	848.6	169,723.2	200.0			
Selenium and selenium compounds	N725	11,923.2	2,384,630.0	200.0			
Silver	7440-22-4	11.2	2,240.0	200.0			
Silver and silver compounds	N740	1,153.2	230,648.0	200.0			
Simazine	122-34-9	15.0	180,000.0	12,000.0		x	x
Sodium nitrite	7632-00-0	1,584,269.4	15,842,684.0	10.0			
Styrene	100-42-5	479.3	2,396.7	5.0	x		
tert-Butyl alcohol	75-65-0	3,580.0	179,000.0	50.0			
Tetrabromobisphenol-A (TBBPA)	79-94-7	11.0	0.0	0.0	x	x	x
Tetrachloroethylene (Perchloroethylene)	127-18-4	958.4	2,012,598.0	2,100.0	x		
Thallium	7440-28-0	0.3	3,780.0	14,000.0			
Thallium and thallium compounds	N760	516.0	7,224,000.0	14,000.0			
Thiabendazole	148-79-8	8,947.9	107,374,920.0	12,000.0		x	
Thiram	137-26-8	15.1	1,011.7	67.0			
Toluene	108-88-3	13,720.3	178,363.5	13.0		x	
Trichloroethylene	79-01-6	1,327.6	6,106,730.0	4,600.0	x	x	x
Triethylamine	121-44-8	2,371.5	1,185,750.0	500.0			
Trifluralin	1582-09-08	0.3	215.6	770.0			
Vanadium	7440-62-2	3,277.3	458,820.6	140.0			
Vanadium and vanadium compounds	N770	364,932.8	51,090,595.2	140.0			
Vinyl acetate	108-05-04	7,872.0	7,872.0	1.0	x		
Vinyl chloride	75-01-4	70.7	106,110,000.0	1,500,000.0	x		
Vinylidene chloride (1,1-dichloroethylene)	75-35-4	29.0	580.0	20.0	x		
Xylene (mixed isomers)	1330-20-7	13,434.6	67,172.8	5.0			
Zinc and zinc compounds	N982	602,101.9	1,986,936.0	3.3			

Notes

1 "One in three" based on 2,270 HUC8 subbasins in the U.S. from U.S. Geological Survey, *Hydrologic Unit Codes (HUCs) Explained*, undated, archived at https://web.archive.org/web/20220902184814/https://nas.er.usgs.gov/hucs.aspx, 2 September 2022. For more information on how watersheds are defined in this report, please see text box on page 8.

2 "Local watershed" as used in this report corresponds to the Hydrologic Unit Code (HUC8) watershed aggregation level. See page 8 for more detail on watershed definitions used in this report.

3 U.S. Environmental Protection Agency, *Addition of Natural Gas Processing Facilities to the Toxics Release Inventory Final Rule*, updated 24 November 2021, archived at https://web.archive.org/web/20220819145109/https://www.epa.gov/toxics-release-inventory-tri-program/addition-natural-gas-processing-facilities-toxics-release.

4 U.S. Environmental Protection Agency, *Toxics Release Inventory (TRI) Basis of OSHA Carcinogens*, November 2020, archived at https://web.archive.org/web/20220120014048/https://www.epa.gov/sites/default/files/2019-11/documents/osha_carcinogen_basis_november_2019_update.pdf.

5 U.S. Environmental Protection Agency, *GuideME: Guidance: De Minimis Exemption*, undated, accessed at https://ordspub.epa.gov/ords/guideme_ext/f?p=guideme:gd:::::gd:deminimis, 19 August 2022.

6 Recommended: Philippe Grandjean and Richard Clapp, "Perfluorinated alkyl substances: Emerging insights into health risks," *New Solutions: A Journal of Environmental and Occupational and Health Policy* 25(2): 156, 2015, DOI: 10.1177/1048291115590506; One drop of water = 0.05 ml; volume of Olympic-sized swimming pool = 2,500,000 l, per Anne Helmenstine, "How many molecules and atoms in a drop of water?" *Science Notes*, 12 March 2020, archived at https://web.archive.org/web/20220706145122/https://sciencenotes.org/how-many-molecules-and-atoms-in-a-drop-of-water/; Jason Moak, Phinizy Center for Water Sciences, *Olympic Swimming Pools*, undated, archived at https://web.archive.org/web/20220706145213/https://phinizycenter.org/olympic-swimming-pools/, 6 July 2022.

7 More than 12,000 types of PFAS: U.S. Environmental Protection Agency, *CompTox Chemicals Dashboard: PFAS Master List of PFAS Substances*, accessed at https://comptox.epa.gov/dashboard/chemical-lists/PFASMASTER, 2 September 2022.

8 TRI reporting rules: U.S. Environmental Protection Agency, *New Toxics Release Inventory Data Show Decline in Releases of Certain Toxic Chemicals* (press release), 3 March 2022, archived at https://web.archive.org/web/20220819144025/https://www.epa.gov/newsreleases/new-toxics-release-inventory-data-show-decline-releases-certain-toxic-chemicals; Pollution control standards: See 86 Fed. Reg. 14560, 17 March, 2021; Office of Management and Budget, *Revisions to the Metal Finishing Effluent Guidelines to Address PFAS Discharges in Chromium Electroplating Wastewater*, RIN 2040-AG24, Spring 2022, archived at https://web.archive.org/web/20220706151803/https://www.reginfo.gov/public/do/eAgendaViewRule?pubId=202204&RIN=2040-AG24.

9 For more, see: U.S. Rep. A. Donald McEachin et al., *Letter to Dr. Michal Freedhoff, Assistant Administrator, Office of Chemical Safety and Pollution Prevention Re: Closing PFAS Reporting Loopholes under the Toxics Release Inventory*, 11 April 2022, archived at https://web.archive.org/web/20220819133035/https://mceachin.house.gov/sites/mceachin.house.gov/files/Letter%20to%20EPA%20on%20PFAS%20Reporting%20Loopholes%20vF.pdf.

10 "It is the national goal that wherever attainable, an interim goal of water quality which provides for the protection and propagation of fish, shellfish, and wildlife and provides for recreation in and on the water be achieved by July 1, 1983." 33 U.S.C. 1251(a)(2)

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