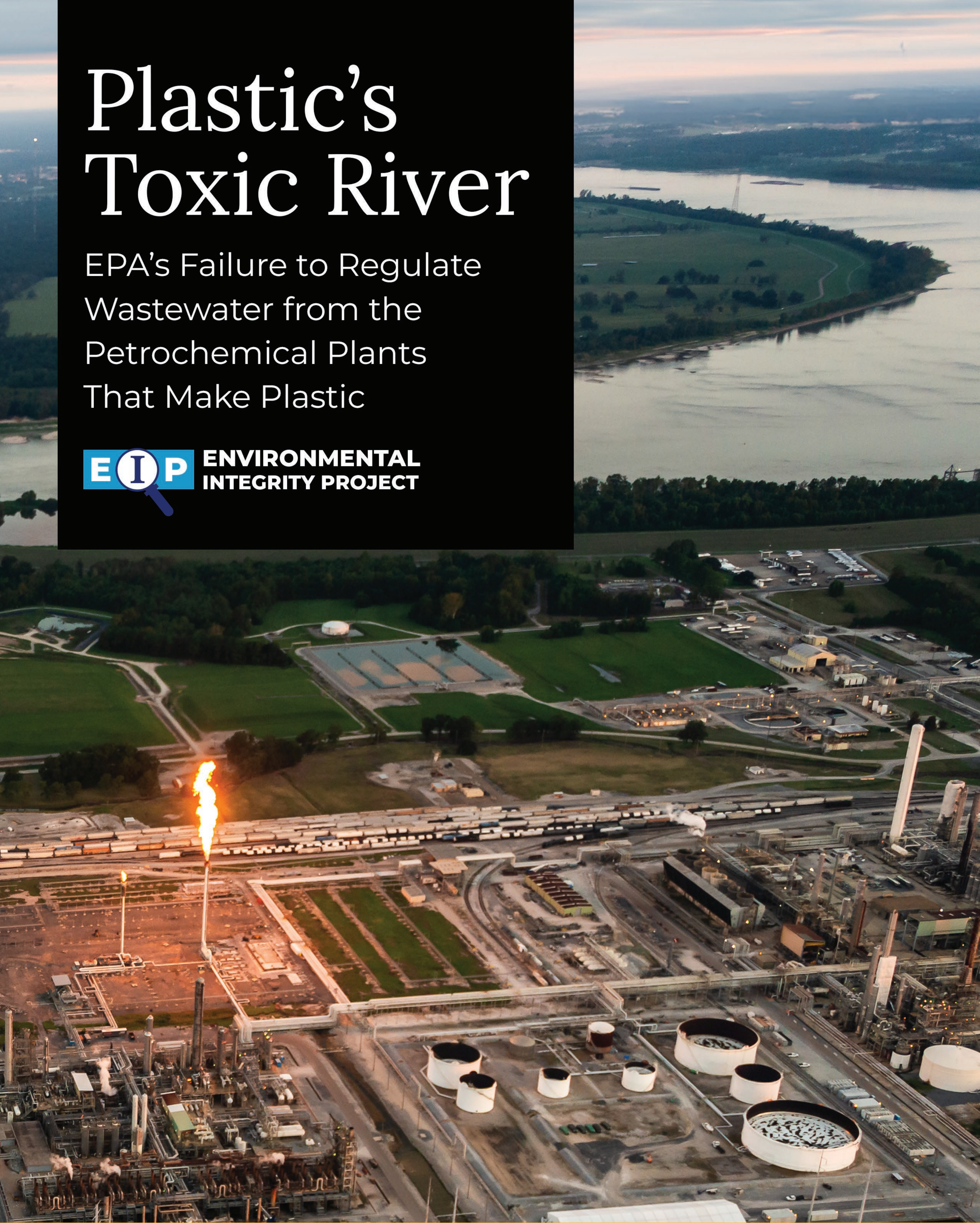
Plastic's Toxic River

EPA's Failure to Regulate Wastewater from the Petrochemical Plants That Make Plastic

ENVIRONMENTAL INTEGRITY PROJECT



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The Environmental Integrity Project:
The Environmental Integrity Project is America's environmental watchdog. We are a nonprofit organization dedicated to protecting public health and our natural world by holding polluters and government agencies accountable under the law. We advocate for tough but fair environmental standards and empower communities fighting for clean air and clean water.

For more information on EIP, visit: www.environmentalintegrity.org

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Cover image: The Dow petrochemical and plastics plant in Plaquemine, Louisiana, beside the Mississippi River, is one of the worst nitrogen and phosphorus polluters in the industry. This page shows the Houston Ship Channel, which receives pollution from several petrochemical plants. Photos by Garth Lenz.

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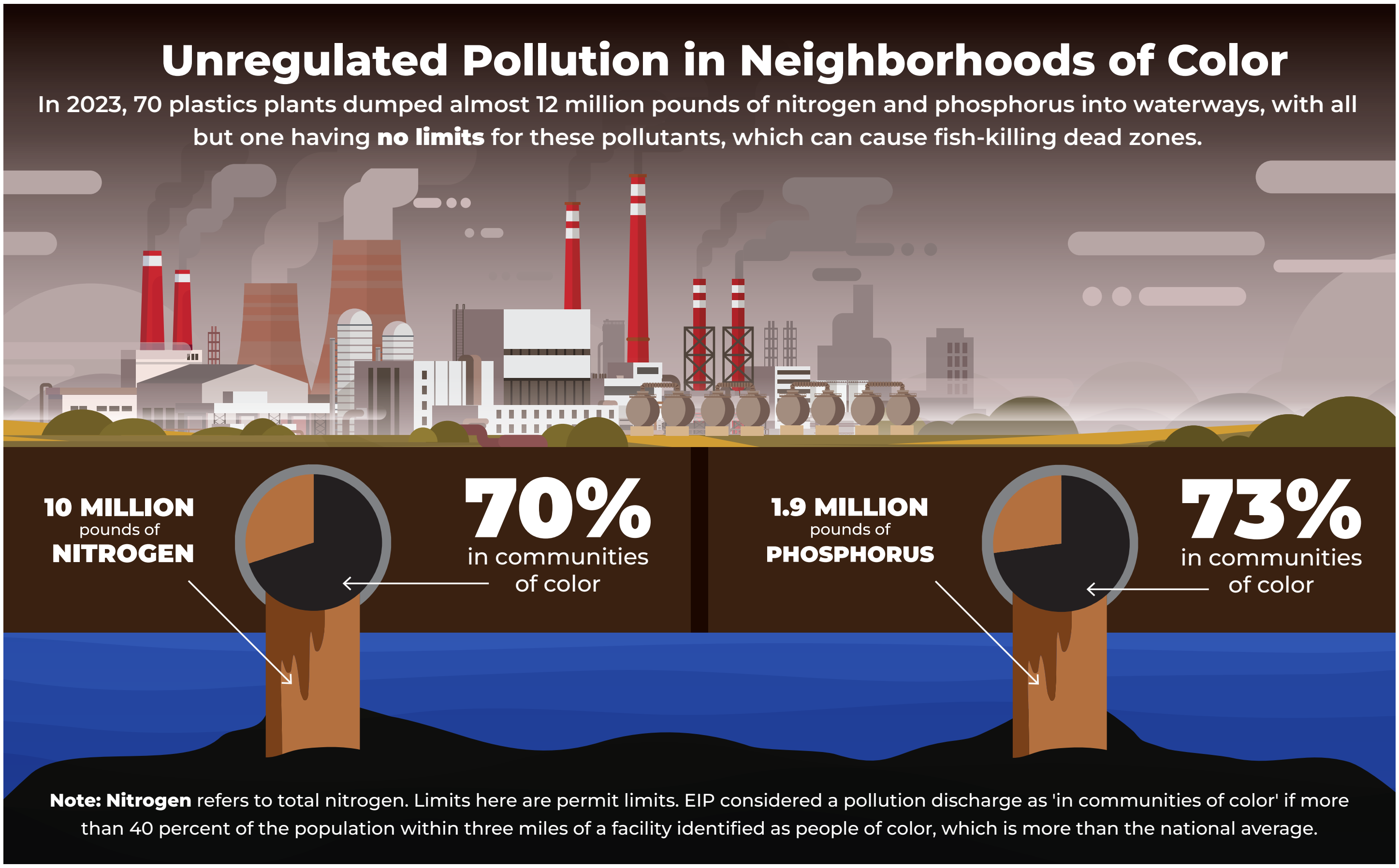
EXECUTIVE SUMMARY

Fueled by cheap natural gas and oil, the plastics industry has grown rapidly in recent decades. Proposals for 10 new plants that manufacture plastics and their chemical ingredients in the U.S., and 24 expansions at existing plants, suggest that the industry will continue booming.[1] Environmental harm from plastics is widespread throughout its lifecycle – from the extraction, transportation, and refining of the raw fossil-fuel ingredients, to the manufacturing of plastic products, to the management of waste. The industry's pollution litters and contaminates our water, air, food, and even our bodies.

Despite this increasingly harmful footprint, plastics manufacturers have mostly escaped having to use modern pollution controls to clean wastewater before it is dumped into waterways. Though federal rules limit some pollutants, many harmful chemicals released by plastics manufacturers are completely unregulated by the U.S. Environmental Protection Agency (EPA) – including contaminants that scientists have identified as carcinogenic or otherwise harmful to human health. These include dioxins, which are known cancer-causing agents that are highly toxic and persist in the environment;[2] and 1,4-dioxane, a likely carcinogen that EPA scientists recently indicated is threatening drinking water sources.[3] Nitrogen and phosphorus pollution discharged from plastics and petrochemical plants – which cause algal blooms and fish-killing low-oxygen zones – are also not controlled by EPA's industrial wastewater rules. Although state agencies can set limits for these pollutants in individual wastewater discharge permits, practices vary across states and the limits are inadequate and inconsistent. For



example, the release of floating plastic waste from manufacturing plants – including tiny pellets called "nurdles" – is already illegal under the water quality standards of most states,[4] but this prohibition is often not enforced by state regulators and so EPA should issue a rule to make this ban clear.

Federal regulations on the wastewater from plastics manufacturing plants have not been updated in over 30 years, are grossly outdated, and fail to protect waterways and downstream communities.[5] The Clean Water Act requires EPA to set wastewater discharge limits (called "effluent limitation guidelines") for harmful pollutants based on the best available technology economically achievable. Because treatment technologies improve over time, EPA is supposed to review existing limits every five years and strengthen them when data show treatment options have improved.[6] EPA has failed to comply with this mandate, resulting in an excessive amount of potentially dangerous water pollution pouring from plastics manufacturers into America's waterways, according to a review of public records by the Environmental Integrity Project (EIP).

No pollution limits set by EPA

The plastics industry releases about a half billion gallons of wastewater per day and lacks any EPA standards for many pollutants. For example:

Pollutant	Harm
Nitrogen	Low-oxygen "dead zones" and toxic algae
Phosphorus	Dead zones, toxic algae
1,4-dioxane	Suspected carcinogen
Dioxins	Potent carcinogen
Mercury	Brain and nerve damage
Total dissolved solids	Harm to fish and water infrastructure

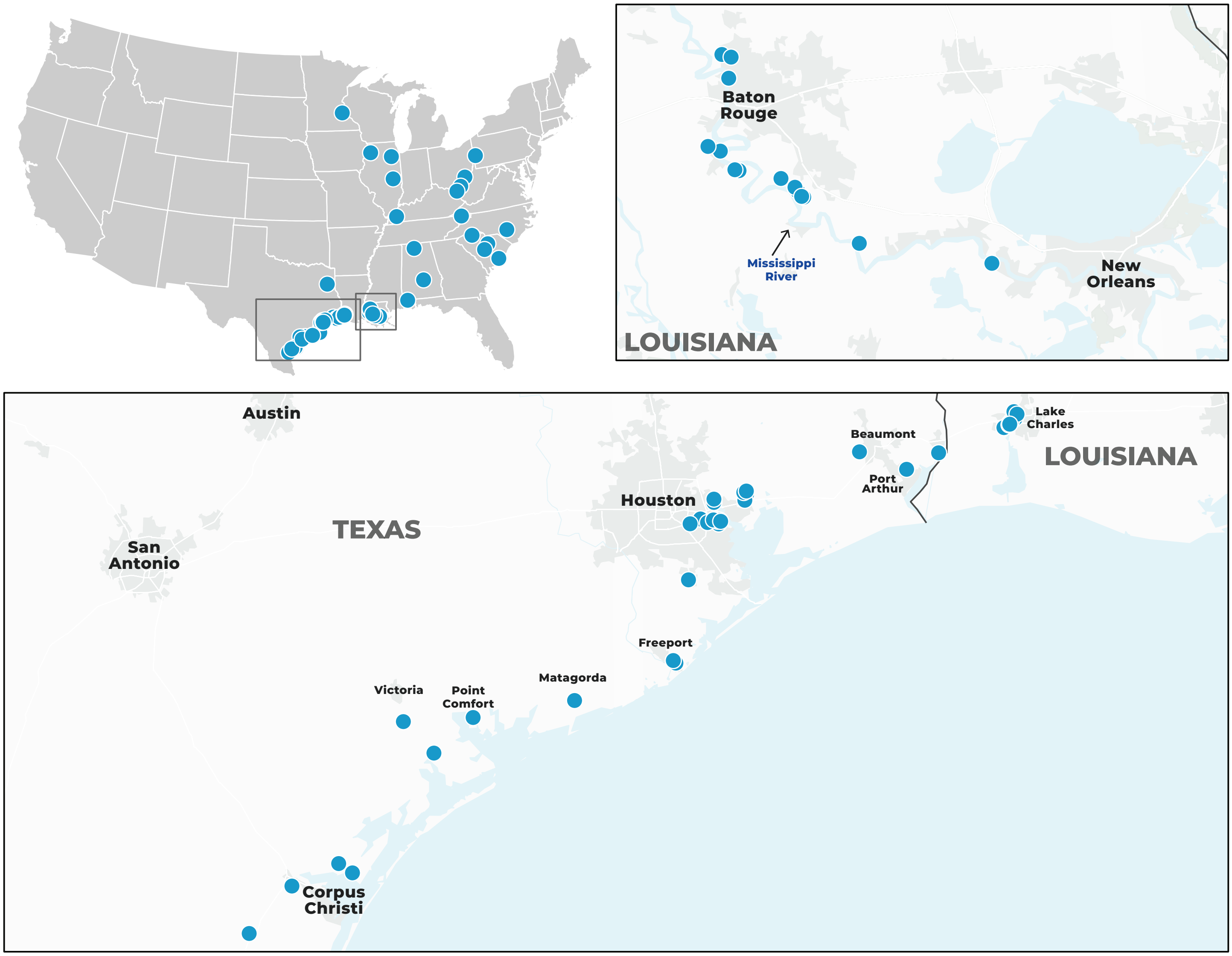
Plastics plants are a small subset of a larger industrial sector established by EPA for effluent limitation guidelines, which includes manufacturers of organic chemicals, plastics, and synthetic fibers. EPA estimates that more than 1,000 chemical plants in this larger sector produce over 25,000 different chemical products, including many different plastic resins, benzene, solvents, and more. These facilities can specialize in just one product, but many are highly complex, navigating multiple chemical processes, producing many different chemical products, and are often integrated with other facilities, such as petroleum refineries that process crude oil into the raw materials used to make chemical products and plastics.[7]

EIP analyzed public records and data for 70 petrochemical plants that manufacture the most common plastics and their primary chemical ingredients and discharge wastewater directly into rivers, lakes, and other water bodies. (See map below.)[8] The plastics plants in this report are those that make raw or pure plastics, sometimes referred to as resins, pellets, or nurdles, that are eventually turned into plastic products, like plastic bottles. EIP did not include facilities that only make the end-use or consumer products. This report also does not include data from oil refineries that also make plastics and plastics ingredients, or plastics plants that share wastewater treatment plants with refineries.[9] (See Appendix A for a full discussion of our methodology and EIP's 2023 report "Oil's Unchecked Outfalls.")

As part of the analysis, EIP found:

- **Uncontrolled Pollution:** EPA has failed to revise and update federal wastewater limits for chemical plants and plastics manufacturers for over 30 years in violation of the Clean Water Act, despite the fact that pollution control technology that could dramatically reduce pollutants is commercially available. This neglect has allowed the industry to mostly avoid installing modern pollution controls and has resulted in sometimes

Plastics Plants That Discharge Directly Into Waterways



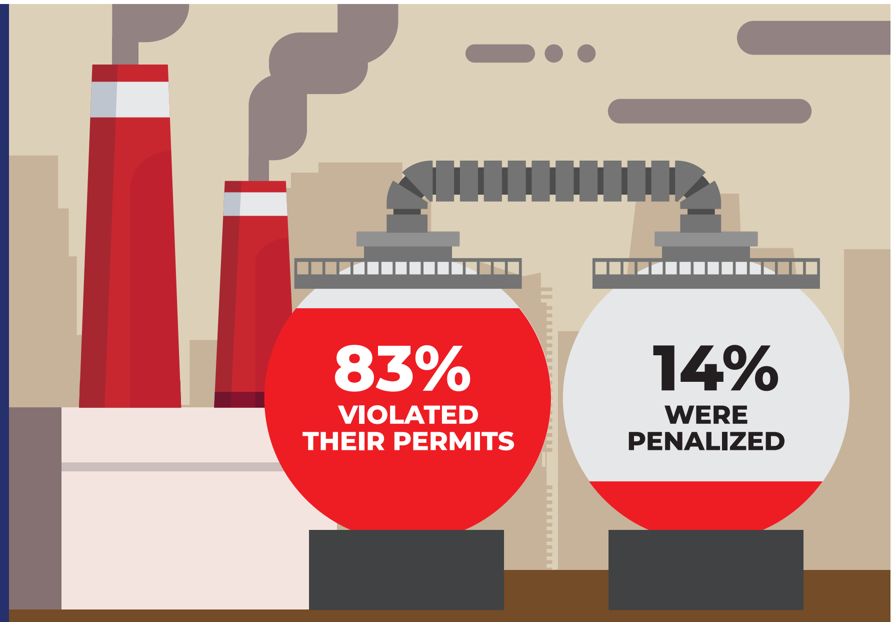
Note: These maps show manufacturers of plastics and their main chemical ingredients, not including makers of finished plastics products or oil refineries that also make chemicals..

nonexistent limits for pollutants like nitrogen, phosphorus, and dioxins.

- **Nutrient Pollution:** In 2023, the 70 petrochemical plants making plastics and their ingredients released nearly 10 million pounds of nitrogen into the nation's waterways, as much as 81 municipal sewage plants. These plants also released 1.9 million pounds of phosphorus, or as much as 108 municipal sewage plants. None of the 70 plants we studied for this report had limits on total nitrogen in their pollution control permits, and only one had a limit on phosphorus pollution.[10]
- **1,4-Dioxane:** 1,4-Dioxane is a harmful pollutant for which EPA has yet to set any federal wastewater limits, despite increasing evidence that it may cause cancer. Manufacturers of polyethylene terephthalate (PET) plastic – a common plastic used for bottles and polyester fibers – are a major source of the pollutant, which is a threat to drinking water. Data show eight plastics plants released an estimated 74,285 pounds of 1,4-dioxane to waterways in 2022. Just two of these facilities have limits for this pollutant in their permits that were set by the states.
- **Dioxins:** Although dioxins are among the most toxic chemicals known to science, EPA has set no limits on

Permit Violations Rarely Penalized

58 of 70 plastics plants violated their water pollution control permits at least once from 2021 through 2023. But only 8 of these 58 were penalized.



Source: EPA Enforcement and Compliance History Online (ECHO) database.

the amount of these potent carcinogens that plastics and petrochemical plants are allowed to release into waterways. These toxic chemicals can be a byproduct of manufacturing chlorine-based plastics, like polyvinyl chloride (PVC) and their ingredients. Ten of the 17 plants manufacturing PVC or its ingredients reported releasing 1,374 grams of dioxins and dioxin-like compounds to waterways in 2022. Only three of the 17 plants have any kind of limits on how much of this carcinogen they are allowed to release, and these were set by the states in individual pollution control permits.

- **Plastic Nurdles and Microplastics:** Dozens of plastics manufacturers across the country make tiny plastic pellets called "nurdles" – as well as plastic flakes, beads, and powders – that are molded into consumer plastic goods. Although absolute numbers are not known, releases of these plastic particles into waterways appear to be common, with nurdles washing up in clusters along beaches in the Gulf Coast region and elsewhere, threatening wildlife. In Texas alone, volunteers collected 96,000 nurdles from beaches in July 2024.
- **Frequent Violations, Rare Enforcement:** Even with weak pollution limits in their permits, nearly 83 percent (58 of 70) of the plants examined by EIP violated these limits by releasing more pollution than allowed at least once from 2021 to 2023, according to company self-reported data in EPA records.[11] Despite these permit violations, only 14 percent (8 of 58) of these plants faced a financial penalty over this period. And the penalties were relatively small, averaging only $266 per violation for 813 violations during this time. Nearly half (43 percent) of total penalties were issued to one facility in Texas, the LyondellBasell La Porte Complex. The plant with the most violations – the Chemours Washington Works plant in Washington, West Virginia – had 115 violations from 2021 to 2023, but no penalties.[12] (See list on page 26.)
- **Outdated Permits:** Forty percent of the plastics plants examined for this report – 28 of 70 – are operating on water pollution control permits that are outdated but have been administratively continued by state agencies, and one other permit has expired. Wastewater permits are supposed to be updated every five years, but state agencies often can't keep up due to budget and staffing constraints. By operating under outdated permits, facilities continue to pollute waterways without making adjustments based on changing water quality, new treatment technology, a facility's performance, or new water quality standards.

In addition to all these problems, petrochemical plants have been recognized by EPA as potential sources of per- and polyfluoroalkyl substances or PFAS, the "forever chemicals" that persist in waterways and have been linked to increased cancer risk, hormone disruption, reduced ability of the body to fight infections, and reproductive harms, including low birth weight in babies and developmental delays.[13] Data about these pollutants released by plastics and petrochemical plants is scarce, however, because of a lack of EPA limits or even monitoring requirements. Uncontrolled wastewater pollution and a lack of sufficient state and federal enforcement pose real threats to downstream communities, which are often communities of color or low-income neighborhoods overburdened by industrial pollution. In 2023, 70 percent of the total nitrogen pollution dumped by plastics plants into waterways, and 73 percent of the phosphorus, was in places where more than 40 percent of the population within three miles are people of color.[14]

Local Impact

In Louisiana, residents of Lake Charles and Westlake are advised to avoid consumption of certain fish and not swim or participate in watersports along parts of the Calcasieu River due to unsafe levels of toxic chemicals, including dioxins, that can cause cancer and other health problems.[15] However, some residents of a state that prides itself as the "sportsman's paradise," are unaware of these warnings, which are not posted in all areas, and eat contaminated fish, according to EIP's interviews with fishers in Lake Charles.[16] (See case study on page 29.) One of the polluters is the Westlake Eagle US 2 Lake Charles plastics chemical plant, which reported releasing the third most dioxin and dioxin-like compounds of any plant in the U.S. into waterways in 2022, the most recent available year for this EPA data.[17] Despite this pollution and the impairment of local fish with dioxins, there are no limits in the plant's permit for the amount of dioxin the plant is allowed to release.[18] Neither the EPA or state has imposed any limits on the amount of several other pollutants the factory dumps, which included 459,756 pounds of nitrogen in 2023.[19] Some local residents are calling on EPA to more tightly regulate the plant's discharges – as well as wastewater from at least 20 other plastics and chemical plants that pollute Louisiana's waters.

In West Virginia, a PET plastics plant, APG Polytech in Apple Grove, routinely violated its permitted limits for releasing 1,4-dioxane into the Ohio River, potentially endangering the health of people living downstream in Huntington, WV, and Cincinnati, OH, which draw drinking water from the river. Local residents and the Cincinnati water authority waged a successful advocacy and legal campaign to convince the West Virginia Department of Environmental Protection to tighten the limits for the pollutant in the plant's permit and defend the permit from APG's appeal. But not every community can afford to hire attorneys to wage such legal battles to better protect local water supplies. National rules would help protect more communities across the U.S. by requiring all plastics and petrochemical plants to prevent or reduce releases of 1,4-dioxane pollution.

The Dow Sabine River plant near Orange, Texas. The plant had 12 water pollution violations from 2021 to 2023, but no penalties, according to EPA. Photo by Garth Lenz.

In Texas, activists collect thousands of plastic pellets on the beaches in Galveston that have drifted down from plastics manufacturing plants that endanger wildlife and litter public beaches. Because prohibitions on the release of "nurdles" are seldom enforced or listed in state permits, activists have launched a campaign for a new state law to halt the discharges of these plastic particles.

Recommendations

Plastics manufacturers and other petrochemical plants have reaped the economic benefits of decades of out-of-date federal wastewater regulations while downstream communities have paid the price. While these plants are supposed to control discharges based on the best available technology, permits issued by state agencies authorize them to dump toxins and harmful pollutants into waterways, threatening public health, damaging aquatic ecosystems, and worsening a global microplastic problem. To help address these problems, EIP recommends:

1. **REQUIRE THE USE OF MODERN WASTEWATER POLLUTION CONTROLS:** EPA last updated the effluent limitation guidelines for the plastics and petrochemicals category (Organic Chemicals, Plastics, and Synthetic Fibers) in 1993, despite the Clean Water Act's mandate to update rules to keep pace with advances in technology. EPA must bring these regulations up to date to reflect modern treatment technology and known threats to the environment and public health.
2. **PROHIBIT PLASTIC DISCHARGES INTO WATERWAYS:** The water quality standards in most states prohibit plastics facilities from discharging plastic pellets and "nurdles" in wastewater and stormwater. EPA should promulgate a rule that makes this ban clear and consistent for all states. Permits should require frequent visual inspections for nurdles to help prevent discharges.
3. **IMPROVE MONITORING REQUIREMENTS IN PERMIT APPLICATIONS AND PERMITS:** When applying for a wastewater permit, companies are required to sample wastewater for a suite of pollutants that extend beyond the routine monitoring mandated by the permit.[20] This suite of pollutants has not been updated since 1987 and, currently, does not include 1,4-dioxane, PFAS, and other dangerous pollutants known or suspected to be discharged by these plants.[21] EPA should update its permit application monitoring list and add 1,4-dioxane, PFAS, and other pollutants of concern. When issuing permits, EPA and states should also require that permittees monitor their process water and stormwater for these pollutants.
4. **INCREASE POLLUTER ACCOUNTABILITY:** EPA and state agencies must increase enforcement of Clean Water Act permit violations, impose penalties that will discourage future violations, and address resource problems that hinder permit writers from issuing new, updated permits. Polluting companies have little financial incentive to clean up their wastewater without having to pay meaningful penalties for violations of the law.
5. **IMPROVE PERMIT TRANSPARENCY AND RECORDKEEPING:** All wastewater discharge permits and supporting documents, like permit applications and fact sheets, must be made freely available to the public online. Currently, states approach these documents differently, with some providing all documents online while others require costly public information requests. These documents contain critical information that allow the public to better understand what pollutants are being discharged and should be available in a format that helps the public and government agencies hold polluters accountable.

Although contaminated wastewater from the petrochemical plants that manufacture plastic is only one small part of the global environmental burden imposed by this toxic industry, it is an area over which EPA already has clear authority under the federal Clean Water Act. Under this law, EPA has an obligation to update and strengthen water pollution control standards for every known pollutant, including emerging pollutants, as more modern treatment technologies become available. EPA has neglected this mandate for decades when it comes to the plastics industry. With plastic production continuing to grow, it is past time for EPA to comply with its statutory obligation to reduce, and ultimately eliminate, water pollution from the plastics industry.

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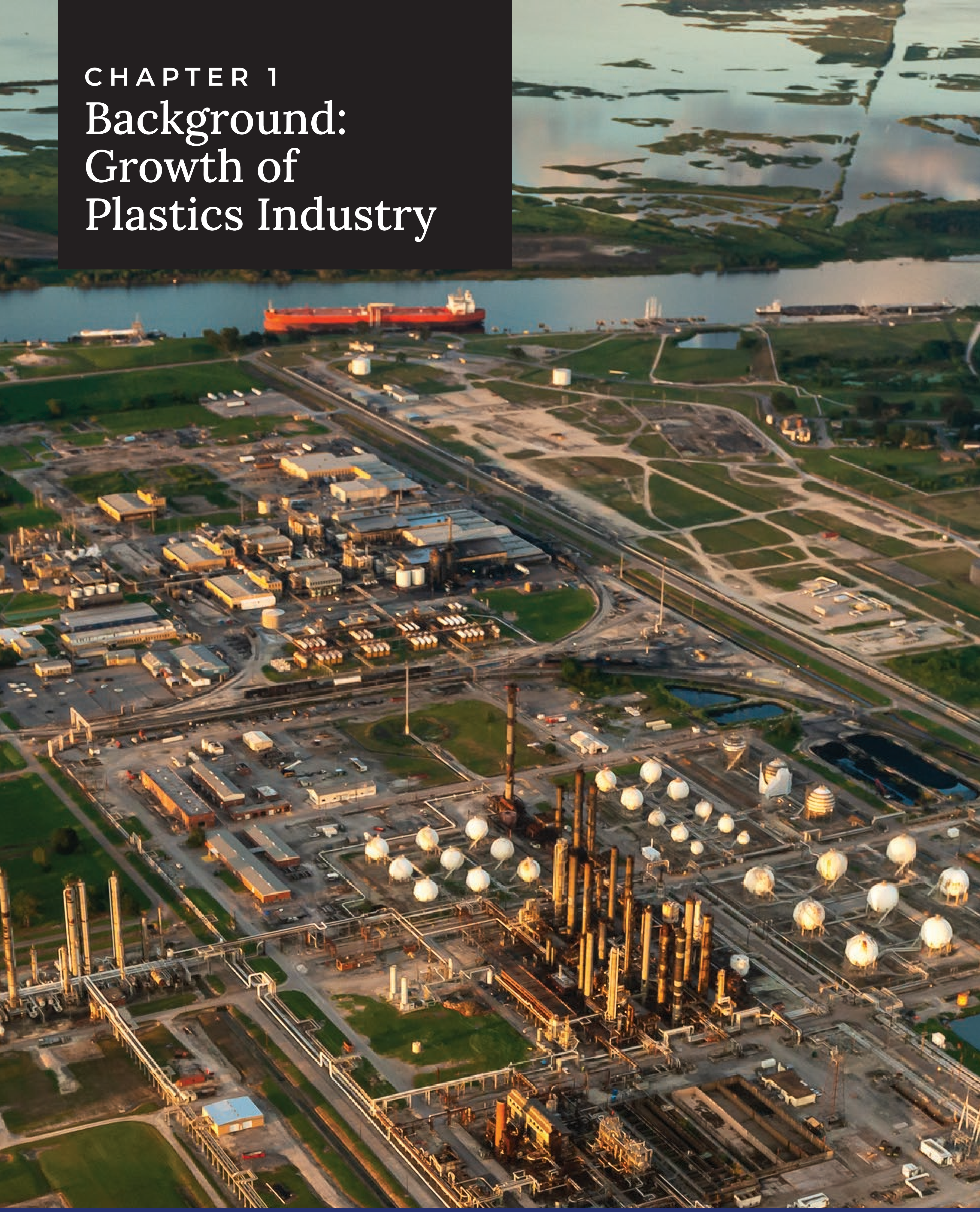
CHAPTER 1

Background: Growth of Plastics Industry

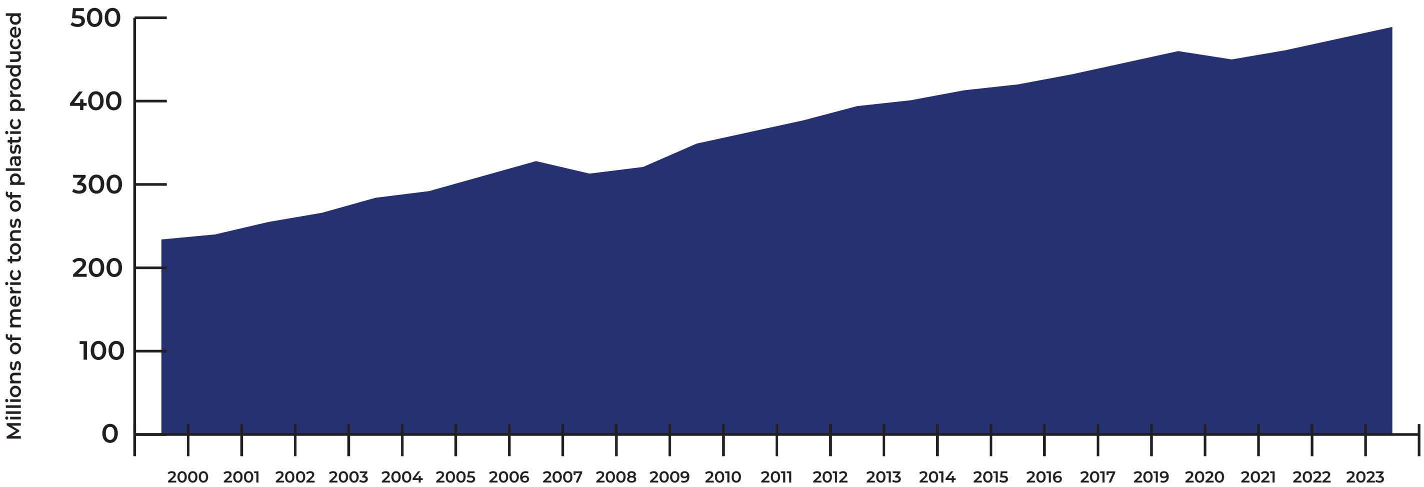


The TPC Group plastics chemical plant in Port Arthur, Texas.Wastewater from TPC plant shown is sent through a nearby industrial treatment plant in Port Neches jointly used and owned by Indorama Ventures, TPC Group, and Bluehall. Photo by Garth Lenz.

Background: Growth of Plastics Industry

The plastics industry has exploded in recent years. In the past two decades alone, global plastics production has doubled from 234 million metric tons in 2000 to 489 million metric tons in 2023.[22] Since the 1950s, manufacturers have generated an estimated 10 billion metric tons of plastics, most of which still exists in the environment.[23] In that time, plastics have been incorporated into a staggering variety of products, from food packaging to construction materials to medical equipment and electronics. Even the transportation industry uses significant amounts of plastic – such as the plastic bumpers, seats, and dashboards in cars.

Global plastics production 2000 to 2023



Source: Organization for Economic Cooperation and Development (OECD)

The rapid growth of the industry in the U.S. is driven by the low cost of natural gas and oil in addition to the demand for plastics. Plastics manufacturing requires processing the components of natural gas and oil into feedstocks – the key ingredients in plastics – such as ethylene. Government subsidies have also encouraged this growth in plastics production. Two-thirds of plastics plants built or expanded since 2012 received tax breaks from state or local governments worth a total of almost $9 billion dollars.[24] The rapid growth of the industry is expected to continue, with 10 new plastics plants in the works and 24 proposed expansions in the US alone, as of July 2024.[25]

Plastic plants may be standalone facilities but are often part of sprawling petrochemical complexes that manufacture a huge range of chemicals, sometimes including the ingredients used to make plastics. Different plastics require different inputs. PVC plastic, for example, is made by linking molecules of vinyl chloride together, while PET uses terephthalic acid and ethylene glycol. Common types of plastics and some of their uses include:

- Polyethylene, the most common plastic, is used in a variety of applications from general packaging to cling wrap;
- Polypropylene, a more durable plastic used to make microwaveable materials;
- Polyvinyl chloride (PVC), used in construction materials; and
- Polyethylene terephthalate (PET), a type of polyester often found in single-use packaging such as water bottles or in synthetic fabrics.

Plastics manufacturing releases many harmful chemicals into the environment. The plants emit significant amounts of air pollution, including nitrogen oxides (NOx), carbon monoxide, and toxic chemicals like benzene and 1,3-butadiene. PVC plants also emit vinyl chloride, a known carcinogen. On top of this are climate-warming pollutants. Scientists at the Lawrence Berkeley National Laboratory in 2024 estimated that global plastic production emits 2.24 billion metric tons of greenhouse gases (as carbon dioxide equivalents) each year, or as much as 600 coal-fired power plants.[26]

EIP's analysis found plastic plants also generate wastewater containing large amounts of nutrient pollution. This wastewater is discharged to rivers, lakes, and other waterways, where it contributes to harmful algal blooms and oxygen depletion. PVC plants also release dioxins, a group of chemicals that is among the most toxic known to science. Dioxins can cause cancer and respiratory disease, developmental issues, and disrupt people's immune and hormone systems.[27] Many PET facilities discharge 1,4-dioxane, a likely carcinogen.[28] Several plastics facilities are also known to release nurdles or other microplastics into waterways, where they build up in aquatic environments and threaten fish and birds that eat them.

Globally, plastic production emits as much climate-warming pollution as

600 coal-fired power plants

each year.

EIP analyzed public records, including permit documents and industry-reported data available through public databases, to evaluate water pollution from plastics and petrochemical facilities and their compliance with environmental permits and laws. This report includes 70 petrochemical plants that manufacture the most common plastics, including polyethylene, polypropylene, polyethylene terephthalate (PET), polyvinyl chloride (PVC), and other plastic resins, and the key chemical ingredients and building blocks ("feedstocks") needed to manufacture those plastics, such as ethylene, propylene, purified terephthalic acid, ethylene dichloride, vinyl chloride monomers, and more (see Appendix A for detailed methodology). These facilities are part of a larger industrial category – the Organic Chemicals, Plastics, and Synthetic Fibers point source category – regulated by EPA wastewater effluent limitation guidelines.[29] EIP's analysis is limited to facilities that discharge wastewater – specifically, "process" wastewater that comes in contact with the chemical manufacturing process – directly into rivers, lakes, and other water bodies. EIP did not include plastics manufacturers that send their wastewater to municipal wastewater treatment plants or refineries, or that only dispose of wastewater in underground injection wells in this analysis.

Though some petrochemical facilities specialize in one or two products, others are part of much larger operations and produce a variety of products. Some of the facilities in EIP's analysis manufacture chemicals in addition to plastics and their primary ingredients, including chemicals used for solvents, pharmaceuticals, fertilizers, and other products. They may also receive, treat, and/or discharge wastewater from other types of industrial facilities, such as inorganic chemical plants or rubber manufacturers.[30] Because many of these plastics products rely on chemicals refined from fossil fuels, including oil, some petrochemical plants are integrated with petroleum refineries. EIP did not include plastics and petrochemical plants integrated with refineries in this analysis. For a full list of facilities included in this analysis see Appendix B.

CHAPTER 2

The Regulatory Structure for Industrial Water Pollution

The BASF Geismar plastics chemical plant along the Mississippi River in Louisiana. Photo by Garth Lenz.

The Regulatory Structure for Industrial Water Pollution

The Clean Water Act and its implementing regulations require that wastewater discharge permits for facilities (or "NPDES" permits)[31] include technology-based limits that reflect the best available technology economically achievable.[32] This "best available technology" standard was intended to encourage using emerging research and treatment technology to set stronger limits and move industrial dischargers towards eliminating discharges entirely, as quickly as possible.[33] These best available technology limits are not supposed to be static. As technology improves, Congress intended these limits to improve too. "[A]s available pollution-control technology advances, pollution-discharge limits will tighten," according to a key court decision in 2019.[34]

EPA has set technology-based wastewater discharge limits (called effluent limitation guidelines) that are supposed to reflect the best available technology for dozens of industrial sectors, including the Organic Chemicals, Plastics, and Synthetic Fibers sector.[35] But the wastewater limits for these industries currently on the books do not represent the best available technology anymore. EPA established these limits in 1987 and modified them in minor ways in 1993, more than 30 years ago.[36] Wastewater technology has significantly advanced since then. For instance, membrane filtration technology today can generally treat the metals and total suspended solids discharged from plastics and petrochemical plants, and is already being used at some facilities in the sector.[37] But when EPA was considering wastewater treatment for plastic plants in the 1980s, the agency considered membrane filtration to be experimental and infeasible.[38] That is no longer true.[39]

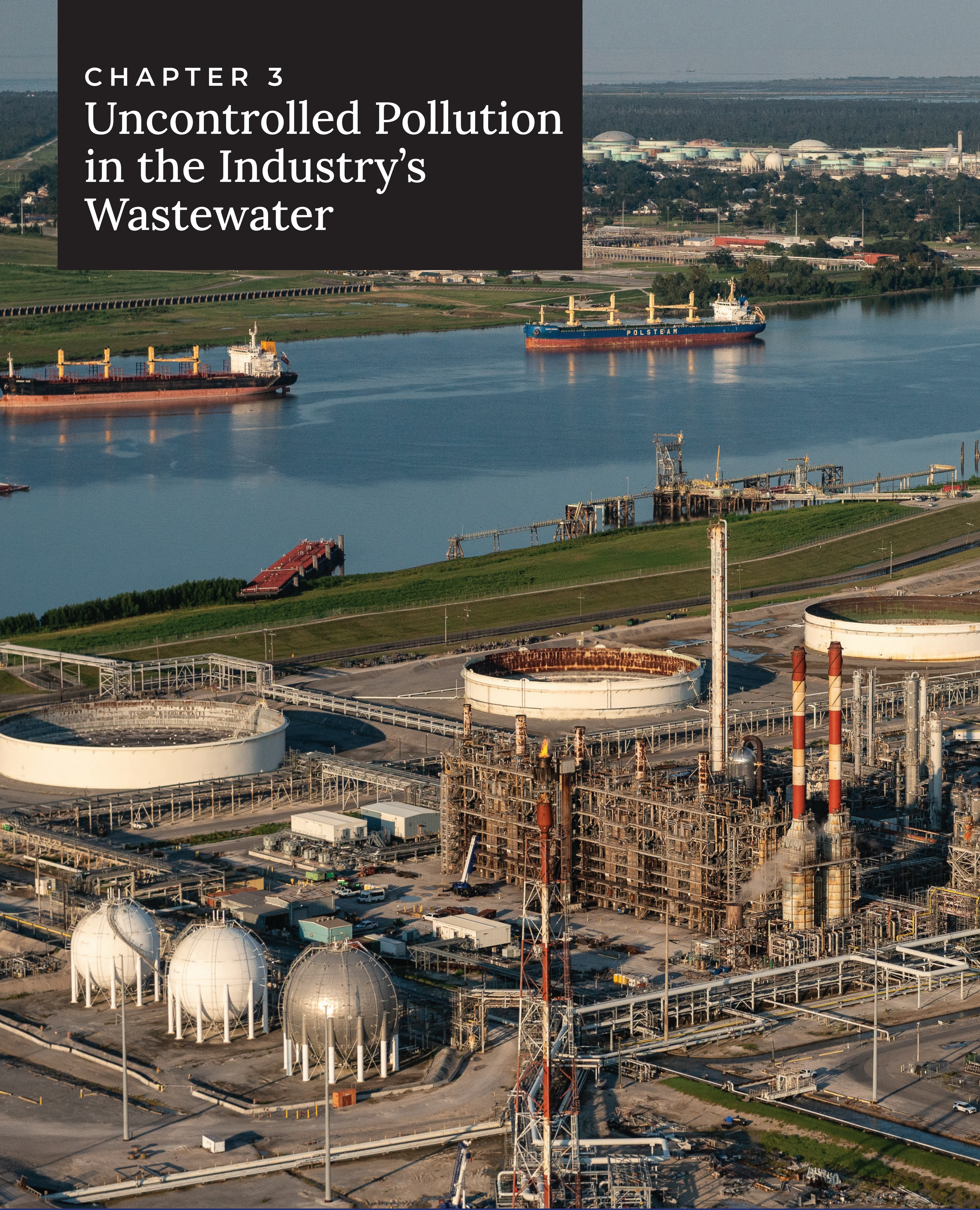
EPA has not updated its wastewater treatment technology standards for the plastics industry in 31 years. Pictured here is a drainage ditch at the Dow Plaquemine chemical plant in Louisiana.

These outdated wastewater limits are also incomplete. The Clean Water Act requires that effluent limitation guidelines control all pollutants discharged by plastics and petrochemical plants, for both wastewater and stormwater.[40] But this is not the case. There are big holes in the effluent limitation guidelines for the plastics and petrochemical sector. For example, there are no limits for one of the most serious threats to water quality: nutrient pollutants like nitrogen and phosphorus, which can kill aquatic life by depleting oxygen and cause hazardous algae blooms that threaten the safety of drinking water. When establishing the effluent limitation guidelines for this industry more than three decades ago, EPA did not even mention the sector's significant nutrient pollution.[41] Nor did EPA include dioxins, a potent carcinogen, when it developed the 1987 pollution limits. EPA decided not to limit dioxins at that time because it concluded that the methods used to detect the chemical in 1984 and 1985 were outdated by 1987.[42] But EPA did not go back and consider adding dioxin limits when it modified the guidelines in 1993, and it has never gone back since, even though better testing methods are now available.[43] The 1987 federal guidelines also do not include any pollution limits for the contaminated stormwater pouring off these sites.[44]

When federal wastewater regulations do not apply to pollutants or waste streams, the state environmental agencies that issue permits are required to set "best available technology" limits on a case-by-case basis.[45] But states have failed to fill in the gaps created by these old and incomplete federal limits. As we discuss in the rest of the report, state permits lack limits for many pollutants from plastics plants, including nitrogen, phosphorus, dioxins, and 1,4-dioxane.

CHAPTER 3

Uncontrolled Pollution in the Industry's Wastewater



The Dow Union Carbide chemical plant in Taft, Louisiana, on the Mississippi River. The plant had eight water pollution violations from 2021 to 2023, but no penalties, according to EPA. Photo by Garth Lenz.

Uncontrolled Pollution in the Industry's Wastewater

As described previously, discharge permits issued pursuant to the Clean Water Act set requirements for industrial facilities that release wastewater into waterways. These permits may include numerical limits for specific pollutants – in many cases driven by federal effluent limitation guidelines, but in some cases set by the states – or just require a company to monitor and report pollutants, without a specific limitation. Companies document monitoring data in discharge monitoring reports that are submitted to the state or permitting agency. These monitoring reports are limited to the parameters defined in the facility's permit, and do not necessarily reflect all of the pollutants that may be in the discharged water. Monitoring data for some additional pollutants are included in permit applications that companies submit to agencies.[46] EIP reviewed data from these discharge monitoring reports, permit applications, and company reports to EPA's Toxics Release Inventory to analyze pollutants that are currently unregulated by federal wastewater guidelines for plastics and petrochemical plants (in the industrial sector of Organic Chemicals, Plastics, and Synthetic Fibers).

Nutrient Pollution: Nitrogen and Phosphorus

Seventy plastics and petrochemical plants discharged an estimated 9.9 million pounds of nitrogen into U.S. waterways in 2023, which is about as much as 81 average municipal wastewater treatment plants. The plastics plants also dumped an estimated 1.9 million pounds of phosphorus into waterways, or as much as 108 municipal wastewater treatment plants.[47]

Too much nitrogen and phosphorus in waterways contributes to nutrient pollution, which feeds algal blooms and depletes oxygen in waterways, suffocating aquatic life and leading to "dead zones." Some of these algal blooms release toxins that can irritate people's respiratory systems, attack the liver and nerves, and kill livestock and pets. EPA has identified nutrient pollution as "one of the most widespread, costly, and challenging environmental problems impacting water quality in the United States."[48] This pollution comes from a number of sources, including agricultural fertilizer and runoff, municipal stormwater, septic systems, and sewage treatment plants, as well as industrial dischargers like the plastics and petrochemical plants identified in this report.[49]

Plastics plants dumped 9.9 million pounds of nitrogen into waterways in 2023, as much as

81 sewage plants.

Despite the threat that nitrogen and phosphorus pose to the environment and public health, these pollutants are still unregulated by federal effluent limitation guidelines for many industrial sectors, including plastics manufacturers, petrochemical plants, and refineries. In 2020, EPA reviewed nutrient discharges from industrial sectors regulated by federal effluent limitation guidelines and declined to prioritize and set federal wastewater limits for nitrogen and phosphorus pollution from the Organic Chemicals, Plastics, and Synthetic Fibers sector.[50] EPA estimated that the entire sector – encompassing 757 facilities – dumped 14.1 million pounds of nitrogen and 5.4 million pounds of phosphorus into waterways in 2018, but according to EIP's analysis, that significantly underestimated the problem. (See Appendix C for EIP's full analysis).

EPA also claimed that much of the industry was already achieving low levels of nutrient pollution that reflected advanced treatment technologies, but that was not true, EIP found. In 2023, more than half of the plastics and chemical plants with available information discharged nitrogen at higher concentrations than the 3 milligrams per liter achieved by common wastewater treatment.[51] Nearly 90 percent of the plastics plants released higher concentrations of phosphorus than 0.1 milligrams per liter, which is also achievable with basic biological nutrient removal and filtration technologies.[52] See the table below. (Table 1).

Table 1. Nutrient Pollution in 2023 from Plastics Plants Examined for this Report

	Nitrogen	Phosphorus
Total Load (lbs)	9,927,795	1,932,449
Average Concentration (mg/L)	10.0	1.8
Maximum Concentration (mg/L)	206.5	12.3
Number of facilities releasing pollution above concentrations attainable by common wastewater treatment technologies. (Nitrogen = 3 mg/L; Phosphorus = 0.1 mg/L)	35	53
Number of Facilities with Data	64	60

Note: Some facilities discharge wastewater through multiple outfalls. Where data were available for more than one outfall, EIP averaged the outfall-level average concentrations.
Source: Discharge monitoring data accessed through EPA's Enforcement Compliance History Online (ECHO) database, wastewater discharge permit documents.

Without federal regulations requiring facilities in this sector to limit their nutrient pollution, many plastics and chemical plants are able to dump these harmful pollutants into waterways unchecked. And this pollution disproportionately affects communities of color and low-income communities. According to EPA data analyzed by EIP:[53]

- Seventy percent of the total nitrogen pollution and 73 percent of phosphorus pollution dumped into waterways in 2023 was discharged by facilities located in areas where more than 40 percent of the population within a three-mile radius were people of color (which is above the national average.)
- Seventy-six percent of nitrogen pollution and 69 percent of phosphorus pollution was discharged by facilities located in areas where more than 30 percent of the surrounding people were in low-income households.

In Louisiana, for example, the Dow Plaquemine plastics plant discharged over two million pounds of nitrogen and 240,000 pounds of phosphorus into the Mississippi River in the Plaquemine community south of Baton Rouge in 2023. Fifty-four percent of the people in the surrounding community are people of color, 32 percent live in low-income households, and are further burdened by harmful air pollution.[54] Just a few miles downstream, two PVC plastic plants – the Shintech Plaquemine plant and Westlake Chemical & Vinyls Plaquemine facility – collectively discharged about 169,000 pounds of nitrogen and 263,000 pounds of phosphorus into the river last year. More than 75 percent of the populations surrounding these two plants identify as people of color, and nearly half live in low-income households. Near Corpus Christi, Texas, the Occidental OxyChem Ingleside plant, which manufactures ingredients used to make PVC plastic, dumped nearly 688,000 pounds of nitrogen into Corpus Christi Bay in 2023. The plant released wastewater with very high concentrations of nitrogen into a community where over 55 percent of the population are people of color and 36 percent live in low-income households.[55]

State environmental agencies have a legal obligation under the Clean Water Act to add permit limits or monitoring requirements for pollutants (like nitrogen and phosphorus) not covered by federal wastewater regulations,[56] but many states do not go beyond the federal rules. For example, none of the 70 plastics plants examined for this report had permit limits for total nitrogen, and only one had a limit for phosphorus pollution.[57] Twenty-seven permits include numeric limits for ammonia, a form of nitrogen.[58]

Table 2. Top 10 Nitrogen Dischargers, 2023

Rank	Facility	Location	Permit ID	Total Nitrogen Discharged (lbs)	Average Concentration (mg/L)
1	Dow Freeport*	Freeport, TX	TX0006483	3,335,444	1.5
2	Dow Plaquemine	Plaquemine, LA	LA0003301	2,069,455	8.0
3	Occidental OxyChem Ingleside Plant	Ingleside, TX	TX0104876	687,840	105.2
4	Westlake Eagle US 2 Lake Charles Complex	Lake Charles, LA	LA0000761	459,756	1.8
5	Chemours Washington Works	Washington, WV	WV0001279	418,122	2.8
6	Eastman Kingsport	Kingsport, TN	TN0002640	275,138	3.0
7	Koch/INVISTA Nylon Camden Plant	Lugoff, SC	SC0002585	206,898	52.3
8	Indorama Ventures Port Neches Facility	Port Neches, TX	TX0005070	202,951	7.6
9	BASF Geismar Site	Geismar, LA	LA0002950	191,839	7.1
10	Formosa Point Comfort Plant	Point Comfort, TX	TX0085570	185,850	8.3

*Nitrogen data were only available for Dow Freeport's external outfalls because of how the Texas Commission on Environmental Quality structures permit applications. As a result, these pollution loads include significant volumes of cooling water.
Source: Discharge monitoring data accessed through EPA's ECHO database, wastewater discharge permit documents.

Table 3. Top 10 Phosphorus Dischargers, 2023

Rank	Facility	Location	Permit ID	Total Phosphorus Discharged (lbs)	Average Concentration (mg/L)
1	Dow Freeport*	Freeport, TX	TX0006483	659,935	0.3
2	Shintech Plaquemine Plant	Plaquemine, LA	LA0120529	260,551	12.3
3	Dow Plaquemine	Plaquemine, LA	LA0003301	240,599	1.1
4	Dow Union Carbide St. Charles Operations	Taft, LA	LA0000191	99,768	5.2
5	Chevron Phillips Chemical Cedar Bayou Plant	Baytown, TX	TX0003948	71,371	3.6
6	Indorama Ventures Port Neches Facility	Port Neches, TX	TX0005070	66,265	2.5
7	Sasol Lake Charles Chemical Complex	Westlake, LA	LA0003336	55,816	4.3
8	Formosa Point Comfort Plant	Point Comfort, TX	TX0085570	44,760	2.0
9	Chemours Washington Works	Washington, WV	WV0001279	43,953	0.3
10	Occidental Geismar Facility	Geismar, LA	LA0002933	38,526	8.5

*Phosphorus data were only available for Dow Freeport's external outfalls because of how the Texas Commission on Environmental Quality structures their permit applications. As a result, these pollution loads, which include significant volumes of cooling water
Source: Discharge monitoring data accessed through EPA's ECHO database, wastewater discharge permit documents

1,4-Dioxane

The lack of federal regulation of 1,4-dioxane is a prime example of the dangers posed by outdated effluent limitation guidelines. Plastics plants, specifically plants that manufacture PET plastics, also produce 1,4-dioxane, a likely carcinogen, and are allowed to release this pollutant directly into surface waters. 1,4-Dioxane is a dangerous compound. Short-term exposure can irritate the throat, eyes, and skin, and long-term exposure can cause liver damage, kidney damage, and probably leads to increased cancer risk.[59] Far from a recent development, the EPA has been aware of the potential human dangers of 1,4-dioxane since at least 1987. A 1987 Health Advisory from EPA's

Office of Drinking Water concluded that 1,4-dioxane "may be classified . . . [as a] probable human carcinogen."[60] EPA in 2023 proposed a draft assessment saying that 1,4-dioxane presents an "unreasonable risk to human health," specifically to people downstream of industrial sources drinking contaminated water, but the agency has not set effluent limits for the chemical.[61]

In the absence of any federal standards, limiting 1,4-dioxane in industrial wastewater is left entirely to the states and the judgment of individual state permit writers. Wastewater discharge data show that this hands-off approach to regulating 1,4-dioxane is ineffective. Just a few mega-polluters are discharging tens of thousands of pounds of 1,4-dioxane into surface waters annually.

In total, the eight plastics plants included in EIP's study that reported discharges to EPA's Toxics Release Inventory released 74,285 pounds of 1,4-dioxane directly into waterways in 2022.[62] Nearly all of the 1,4-dioxane pollution, 72,598 pounds (98 percent), came from just four PET manufacturers – APG Polytech Apple Grove in West Virginia, Alpek Polyester Columbia and Alpek Polyester Cooper River in South Carolina, and Alpek Polyester Cedar Creek in North Carolina. These four plants discharged the toxin into the Ohio River, Congaree River, Cooper River, and Cape Fear River, respectively.

Of these four PET plants, only one has 1,4-dioxane limits in its wastewater discharge permit: the APG Polytech Plant in West Virginia. And those limits were added only fairly recently, in 2021, after sustained advocacy efforts by communities living downstream.[63] (See page 32 for more information) The table below lists the 1,4-dioxane discharges reported by eight plastics plants examined for this report.

Table 4. 1,4-Dioxane Water Releases from Plastics and Chemical Plants, 2022

Facility	Location	Water Releases of 1,4-Dioxane Reported (lbs)	Facility makes PET Plastic?	Facility has Permit Limits for 1,4-Dioxane?
APG Polytech Apple Grove Facility*	Apple Grove, WV	29,960	Yes	Yes
Alpek Polyester Columbia Site*	Gaston, SC	23,728	Yes	No
Alpek Polyester Cooper River Site*	Moncks Corner, SC	9,756	Yes	No
Alpek Polyester Cedar Creek Site*	Fayetteville, NC	9,154	Yes	No
Dow Union Carbide St. Charles Operations	Taft, LA	1,120	No	No
Eastman Kingsport	Kingsport, TN	420	Yes	No
Dow Union Carbide Seadrift Operations	Seadrift, TX	78	No	No
Indorama Auriga Polymers Spartanburg*	Spartanburg, SC	69	Yes	Yes

Facilities with an asterisk (*) have monitoring requirements in their permits. See the report's data spreadsheet for pollution estimates from 2022 and 2023 discharge monitoring data.
Source: 2022 Toxics Release Inventory, Discharge monitoring data accessed through EPA's ECHO database.

This pollutant is often referred to as a "forever chemical" because it does not break down and is stable in water.[64] Removing 1,4-dioxane from water is challenging because only a few effective treatment technologies exist, and they are not commonly employed in municipal wastewater treatment plants (WWTPs).[65] For instance, the Asheboro WWTP in Asheboro, North Carolina, receives wastewater from a nearby PET plastics manufacturing facility, the StarPet plant owned by Indorama Ventures. While water samples downstream from the Asheboro WWTP contained high concentrations of 1,4-dioxane, even upstream samples contained slightly elevated concentrations. Between January 2018 and August 2022, the average concentration of 1,4-dioxane in treated water from the Asheboro WWTP was 116 micrograms per liter. If someone were exposed to drinking water at concentrations of 116 micrograms per liter over a long period of time, their cancer risk would be roughly 3 in 10,000, a level that EPA would consider unacceptable.[66] The 1,4-dioxane concentrations at all five PET plants examined for this report that monitor for the pollutant had an average discharge concentration in 2022 and 2023 that also exceeded what EPA would consider acceptable (35 micrograms per liter.) The highest average concentration in 2023 was at the APG Polytech Apple Grove Facility in West Virginia, which averaged 46,140 micrograms per liter.

1,4-Dioxane pollution is likely worse and more widespread than we know and comes from a variety of additional sources, beyond just plastics plants, including hydraulic fracturing fluid for oil and natural gas drilling, as well as the manufacturing of detergents and personal care products.[67] The lack of regulations for 1,4-dioxane in wastewater and the pollutant's resistance to conventional treatment technologies have already contributed to drinking water contamination. EPA required large public drinking water systems to test for 1,4-dioxane between 2013 and 2015, and of the more than 4,000 water systems tested, 22 percent had detectable concentrations of 1,4-dioxane. EPA's study did not provide enough information to identify which drinking water systems were impacted by plastics plant water pollution.[68]

Dioxins

Dioxins, not to be confused with 1,4-dioxane, are a group of chlorinated chemical compounds that are highly toxic, persist in the environment, and can bioaccumulate in the food chain. Dioxin and dioxin-like compounds are harmful at much lower concentrations than most chemicals and have been linked to cancer, reproductive and developmental problems, hormone disruption, and weakened immune systems.[69] EPA has set a drinking water standard of 0.00003 milligrams of dioxin per liter of water.[70] That means just one droplet of dioxin in about 792,000 gallons of water (the amount in about 44 backyard swimming pools) would violate drinking water standards. To use another yardstick, one drop of dioxin would contaminate the amount of water an average person would use in almost 26 years.[71]

These toxic compounds are created during the combustion or manufacture of some chlorinated products, such as PVC plastics, and other industrial products.[72] Despite the harmful nature of dioxins, EPA has failed to set federal limits on the amount of dioxins and dioxin-like compounds that can be released into waterways by plastics and chemical plants. EPA has not considered setting federal dioxin limits since 1987, when it decided not to set limits because of changes in methods to measure the chemicals.[73]

One drop of dioxin, a potent carcinogen, is enough to contaminate 44 swimming pools of water.

Though state permit writers are required to establish permit limits in the absence of federal limits, many states have not done so. Of the 17 petrochemical plants EIP identified that produce PVC or its chlorinated ingredients, only three have limits in their permits for dioxins.[74] But 10 of the 17 plants reported releasing a total of 1,374 grams of dioxin and dioxin-like compounds in 2022.[75] Two thirds of these reported dioxin discharges were into waterways where more than 40 percent of the population within a three-mile radius were people of color, which is greater than the national average. Nearly all – 95 percent – were discharged by facilities located in areas where more than 30 percent of the surrounding community were in low-income households. See Table 5 for the highest reported dioxin discharges.

Four PVC and chlorinated-chemical plants in our analysis discharge wastewater into waterways that have been designated as impaired by dioxins. These include, in Louisiana, the Westlake Eagle US 2 Lake Charles Complex, which released 38.6 grams of dioxin and dioxin-like compounds into the Calcasieu River. And in Texas, three Occidental OxyVinyls facilities discharge wastewater into the Houston Ship Channel – the Pasadena PVC plant, Deer Park PVC plant, and La Porte vinyl chloride monomer (VCM) plant.[76] In total, 25 of the 70 facilities in EIP's analysis dump wastewater into waterways impaired by dioxins.

Table 5. Top 10 Dioxin and Dioxin-Like Compound Dischargers, 2022

Rank	Facility	Location	Permit ID	Permit Limits?	Water Releases of Dioxins Reported (grams)
1	Dow Freeport	Freeport, TX	TX0006483	Yes	883.6
2	Westlake Vinyls Calvert City Facility	Calvert City, KY	KY0003484	No	398.7
3	Westlake Eagle US 2 Lake Charles Complex	Lake Charles, LA	LA0000761	No	38.6
4	Occidental OxyVinyls La Porte VCM Plant	La Porte, TX	TX0070416	Yes	26.9
5	Formosa Baton Rouge Facility	Baton Rouge, LA	LA0006149	No	13.1
6	Dow Plaquemine	Plaquemine, LA	LA0003301	No	5.3
7	Occidental OxyChem Ingleside Plant	Ingleside, TX	TX0104876	No	4.6
8	Westlake Chemical & Vinyls Plaquemine Facility	Plaquemine, LA	LA0007129	No	2.5
9	Westlake Vinyls Geismar Facility	Geismar, LA	LA0000281	No	0.5
10	Sasol Lake Charles Chemical Complex*	Westlake, LA	LA0003336	No	0.5

*EIP did not identify this facility as a PVC or chlorinated-chemical facility.

Source: 2022 EPA Toxics Release Inventory, discharge monitoring data accessed through EPA's ECHO database.

Nurdles

These tiny pellets are pre-production microplastics that serve as the building blocks for nearly all finished plastic products, including single-use food and beverage containers and toys. Because of a lack of adequate filtration systems at manufacturing plants, as well as accidental spills, nurdles are often released into waterways and can be found on shores and beaches around the world.[77] The cylindrical or disk-shaped pellets are one to five millimeters in diameter and are most often made of polymers of ethylene, propylene, styrene and vinyl chloride.[78] Globally, it is estimated that plastics manufacturers release between 2.2 trillion and 22.4 trillion nurdles into the environment each year.[79]

Nurdle and microplastic production has been documented in 27 states in the U.S., with the largest number of plants in Texas and Louisiana.[80] A 2023 report identified nine locations where nurdle spills have happened, and eight places that experience continual pellet releases into the environment, eventually ending up in waterways, including along the Gulf Coast in Point Comfort and in Corpus Christi, TX.[81] A community science volunteer monitoring project called the "Nurdle Patrol" has collected about 2.3 million nurdles from beaches and shorelines in the United States since November 2018, with nearly 92 percent of these nurdles found along the Gulf Coast in Texas or Louisiana.[82] While the high concentration of nurdles found in these areas is partially a result of a greater number of surveys conducted there, the amounts are likely due to the fact that nurdles are manufactured in those same areas. The totals found during the surveys are a sampling and do not represent the true total number of nurdles distributed throughout Gulf Coast ecosystems.

Nurdles, like most plastic, can persist in the environment for hundreds or thousands of years. One of the main concerns about nurdles is that many bird and fish species eat the plastic pellets. Ingestion of nurdles can lead to injury and death, as well as changes in reproduction, metabolism, and behavior. Pellet consumption can lead to starvation because animals with digestive tracts full of nurdles eat less food.[83] These impacts are particularly concerning in the Gulf Coast, where large numbers of nurdles are produced and then released into ecologically sensitive coastal waters and wetlands. The Gulf Coast contains about half of coastal wetlands in the United States.[84]

Plastic pellets also transport and release toxic chemicals into the environment. Additives like flame retardants leach out of pellets, degrading water quality and sometimes migrating into the tissues of organisms.[85] Pellets absorb carcinogens like polychlorinated biphenyls (PCBs) or dichlorodiphenyldichloroethylene (DDE). When these nurdles are eaten by fish, birds or other animals, the toxic chemicals spread through the food chain.[86]

As nurdle pollution into waterways grows, so do the number of lawsuits aimed at holding polluters accountable. Residents of the Gulf Coast group called San Antonio Bay Estuarine Waterkeeper filed a lawsuit against Formosa Plastics in 2017 for releasing billions of nurdles from a plastics plant in Point Comfort into Lavaca Bay and other waterways.[87] In 2019, Formosa agreed to pay $50 million to settle the lawsuit and promised to implement steps to halt the pollution.[88] In Charleston, South Carolina, the Southern Environmental Law Center filed a lawsuit on behalf of the Charleston Waterkeeper and allies against the plastic pellet packaging and shipping company Frontier Logistics arguing the company was responsible for nurdle releases to Charleston Harbor.[89] Frontier Logistics agreed to pay $1.2 million to settle the lawsuit in 2021.[90]

A lack of enforcement and clear rules from EPA are partly to blame for this growing problem. Although the water quality standards in most states prohibit the discharge of plastic pollution into U.S. waterways, this ban is often not enforced by state regulators. And there are no specific regulations from EPA to state permit writers that explicitly prohibit "nurdles" from entering waterways, which can make it difficult to hold polluters accountable. Some state permits for individual plastic plants have prohibitions on "floating solids…that result in observed deposits in the receiving waters," which could potentially apply to nurdles, but these are not always enforced.[91] Lawmakers are starting to recognize the problem. In 2024, Representatives from California and Alaska introduced the "Plastic Pellet Free Waters Act." If passed, the bill would require the EPA to create a rule to prohibit discharges of plastic pellets and other types of plastic into the nation's waters.[92] Advocates in Texas plan to introduce similar legislation at the state level, following up on an earlier but unsuccessful bill in 2021.[93]

Tiny plastic pellets like these, called nurdles, are released by the millions from some plastics plants, littering beaches and harming fish and birds that eat them.

“Forever Chemicals” or PFAS

EPA has identified petrochemical and plastics plants (specifically, facilities in the category of Organic Chemicals, Plastics, and Synthetic Fibers) as a known or suspected source of “forever chemicals” or per- and polyfluoroalkyl substances (PFAS).[94] For this reason, EPA has recommended that states include PFAS monitoring and pollution-control best management practices in the permits that states issue for this industrial sector.[95] In addition to facilities that manufacture PFAS, like the Chemours Washington Works in West Virginia, EPA has found that PFAS may be “transferred to other facilities where they are blended, converted, or integrated with other materials to produce new commercial or intermediate products such as plastic, rubber, resins, coatings, and cleaning products.”[96] Wastewater from these facilities is then directly discharged to surface waters or released through municipal wastewater plants that rarely have treatment or limits for PFAS.[97]

Other sources of PFAS at these plants are commonly used varieties of firefighting foam, which contain PFAS.[98] Plastics plants are prone to fires and explosions. For instance, at least 38 percent (27 of 70) of plastic and chemical plants in our analysis have had explosions or fires that received news coverage since 2000.[99] Putting out such chemical fires has typically required the use of a variety of firefighting foam – called “Class B” firefighting foam – containing PFAS. This, in turn, has meant that plastics plants both store PFAS-containing foam on site and train with it. Some states have required that facilities disclose whether they are storing PFAS-containing foam on site, prohibit training with PFAS-containing foam, or require plants to use PFAS substitutes. But the majority of plastics plants are located in states like Texas that have not taken any of these steps.[100] This means that these plants are likely discharging PFAS through their stormwater systems any time they train with firefighting foam or use it to put out fires. It may also mean that their groundwater is contaminated from previous use of PFAS-containing foam.

EPA is taking some initial steps to address PFAS discharges. It is preparing a long-overdue rulemaking to limit PFAS from the small number of facilities that actually manufacture and formulate PFAS.[101] Many of these plants, like the

Fires and the use of firefighting foam, containing PFAS, are common at plastics plants. On July 31, 2019, an explosion and fire at the ExxonMobil Baytown Olefins plant injured dozens of workers. Photo by Shutterstock.

Chemours Washington Works in West Virginia and the 3M Cottage Grove Plant in Minnesota, have already been linked to long-term drinking water contamination.[102] New EPA rules require that, as of this year, facilities – including the plastics plants in this report – will have to finally begin reporting their discharges of certain PFAS to EPA's Toxics Release Inventory database, starting with discharges in 2023.[103] The Biden Administration also announced last year that EPA plans to propose, in 2025, amendments to its standard permit application form to require PFAS monitoring in wastewater outfalls.[104]

These are good first steps, but not enough. Only two of the 70 plastic plants studied for this report have any PFAS monitoring requirements in their permits, and only one has limits on the pollutant, set by the state.[105] Most states have few or no restrictions on using PFAS-containing firefighting foam in fires and explosions.[106]

Other Pollutants of Concern

Pollution from the manufacturers of plastics and their key ingredients are not limited to those identified above. Though federal effluent limitation guidelines for this industrial sector – the Organic Chemicals, Plastics, and Synthetic Fibers sector – set limits for a number of pollutants, data and research indicate there are many gaps in the current regulations.

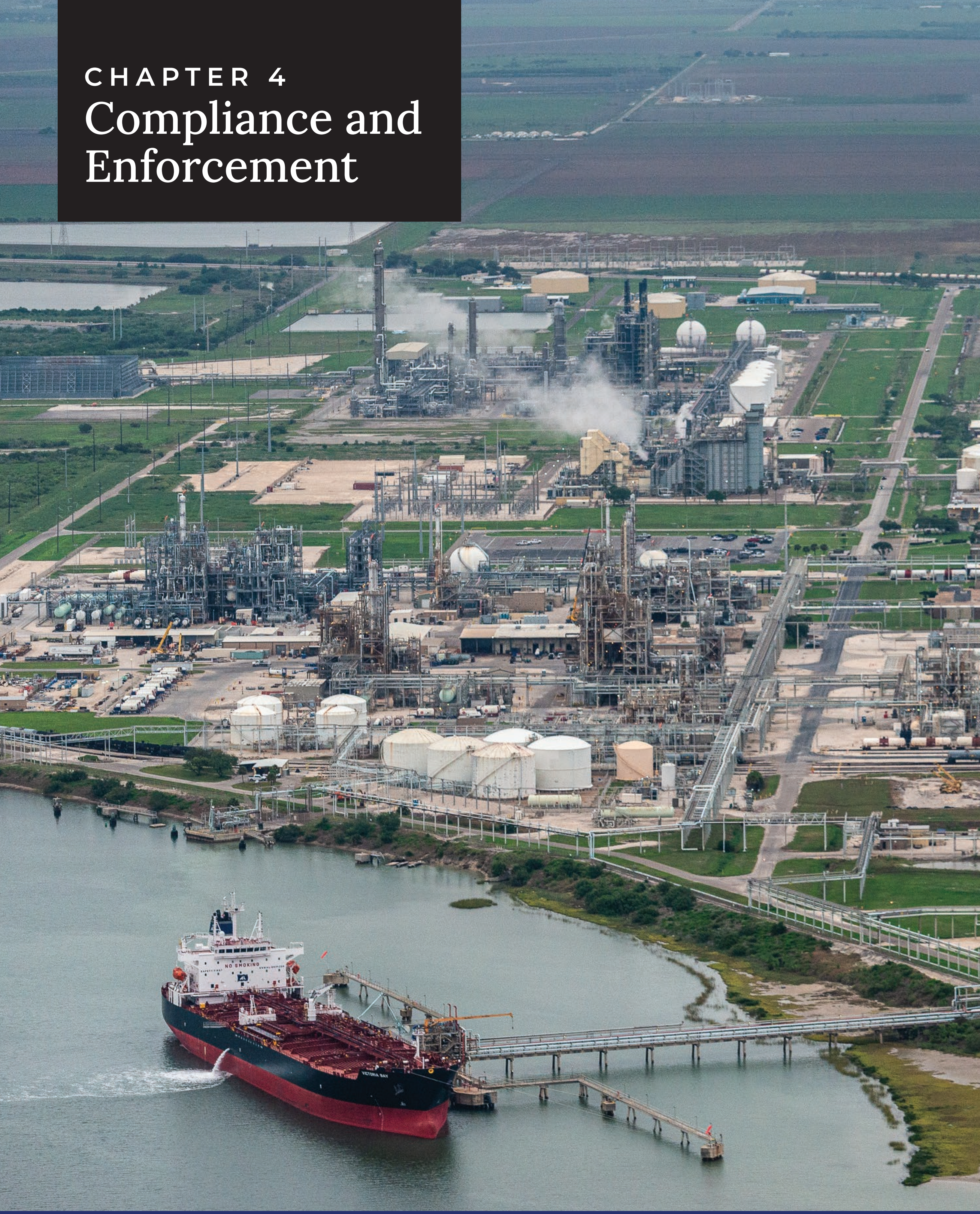
Discharge monitoring reports, wastewater permit applications, and other releases reported by companies show industrial wastewater discharged by these facilities contain a multitude of pollutants for which EPA does not have standards for this industry. These pollutants can be found in different kinds of wastewater, including process wastewater and stormwater. For example:

- **Total Dissolved Solids** are dissolved minerals, like salts, in a water sample. Salts, like chlorides and sulfates, can harm fish, make water unsuitable for irrigation, and can be costly to treat and corrode plumbing infrastructure.[107] Facilities in EIP's analysis discharged over 4.5 billion pounds of total dissolved solids into waterways in 2023. In the absence of federal limits, state environmental agencies set permit limits for this pollutant at just three of the 70 facilities in EIP's analysis.
- **Ethylene glycol:** Ethylene glycol is used as a coolant, antifreeze, solvent, and has other industrial uses. Exposure to humans can cause respiratory and nervous system problems, digestive issues, kidney damage, and more.[108] Very high concentrations can be toxic to aquatic life, but the chemical does not persist long in water, and lower levels have low toxicity.[109] Twelve facilities in EIP's analysis reported releasing 221,329 pounds of ethylene glycol to surface waters in 2022, with no federal or state-issued limits.
- **Mercury:** Five plastics plants reported releasing 14 pounds of mercury and mercury compounds to waterways in 2022. Exposure to small amounts of mercury can harm health, especially during development and childhood, and damage the nervous system, among other impacts.[110] Only two of these five plants had any state-issued limits on mercury, and none had federal limits.
- **Total organic carbon** measures the amount of carbon present in organic compounds in a water sample. Total organic carbon is non-specific, meaning that it does not identify the specific organic compound, but it can indicate the presence of organic pollutants – including the chemicals manufactured by plastics plants.[111] Facilities in EIP's analysis discharged 21.7 million pounds of total organic carbon in 2023, with no federal limits and some permit-based limits that vary by plant. High levels of total organic carbon can cause fish kills and low-oxygen "dead zones."[112]

This list is by no means exhaustive, and some states may include limits for some of these pollutants in state-issued water pollution control permits for a few plants. However, the limits are inconsistently applied and individual plant permits are often not as protective as they would be if EPA issued updated federal effluent limitation guidelines for the industry that require modern pollution control technology. See Appendix D for a list of chemicals reported by the 70 facilities in this analysis to EPA's Toxics Release Inventory.

CHAPTER 4

Compliance and Enforcement



The Occidental Oxychem Ingleside chemical plant on Corpus Christi Bay in Texas. Photo by Garth Lenz.

Compliance and Enforcement

Much of the pollution described in earlier sections – including the discharge of nitrogen, phosphorus, 1,4-dioxane, and dioxins – is legal because of the weak or nonexistent limits in permits. Still, even as state environmental agencies issue weak wastewater permits, plastics plants manage to violate their existing limits and therefore the Clean Water Act. Enforcement at the federal and state levels has fallen short of holding companies accountable. As of the end of July 2024, 40 of the 70 plastics plants examined for this report (57 percent) were identified by EPA as being in noncompliance with the Clean Water Act at that time.[113]

EPA data show 90 percent of plastics plants (63 of 70) in EIP's analysis were in noncompliance with the federal Clean Water Act for at least one quarter in 2021-2023. Noncompliance with the Clean Water Act can include releasing more pollution than allowed, failing to report monitoring data, and failing to comply with conditions in the permit or enforcement actions. Discharge monitoring data on EPA's Enforcement and Compliance History Online (ECHO) database show 83 percent of facilities (58 of 70) had at least one effluent violation from 2021 to 2023 – meaning they exceeded a numeric limit and dumped more pollution than allowed by the permit. See the table that follows for the plants with the most water pollution (effluent) violations, according to company reports to EPA, and Appendix B and the attached spreadsheet for a full list of facilities.

Table 6. Most Water Pollution Violations by Facility, 2021-2023*

Rank	Facility	Location	Effluent Violations	Clean Water Act Enforcement Actions	Penalties
1	Chemours Washington Works	Washington, WV	115**	1	0
2	Indorama Ventures Port Neches Facility	Port Neches, TX	102	1	0
3	LACC Ethylene & Derivatives Plant	Westlake, LA	62	4	$23,350
4	Shintech Freeport Plant	Freeport, TX	34	0	0
5	Shintech Plaquemine Plant	Plaquemine, LA	30	1	0
6	Enterprise Mont Belvieu Hatcherville Complex	Baytown, TX	27	1	0
7	LyondellBasell La Porte Complex	La Porte, TX	27	1	$92,711
8	APG Polytech Apple Grove Facility	Apple Grove, WV	26	1	$30,000
9	Westlake Eagle US 2 Lake Charles Complex	Lake Charles, LA	25	0	0
10	Enterprise Mont Belvieu FM 1942 Complex	Mont Belvieu, TX	25	0	0

* Effluent violations flagged by EPA's ECHO database are alleged violations, based on industry self-reported data, and do not necessarily represent final, legal determinations nor imply companies were charged with criminal or civil violations or convicted in court. Penalties reflect fines a company pays to the enforcement authority and do not include costs associated with coming into compliance or funding environmentally beneficial projects.
** EPA ECHO data show 162 effluent violations. EIP adjusted violations after reviewing data from West Virginia Department of Environmental Protection based on known ECHO data errors. See Methodology for details.

Source: EPA ECHO, WVDEP

Overall, the 58 facilities with at least one water pollution violation over the last three years exceeded a pollution limit 813 times from 2021 to 2023. These include violations for excessive amounts of suspended solids; releases of oil, grease, and copper; and pollutants that deplete oxygen in waterways, among others. (Table 7). Enforcement actions and financial consequences, however, remain sparse. EPA and states settled just 16 enforcement actions in that time period, collecting a meager $216,289 in penalties, or roughly $266 per water pollution violation. Nearly half (43 percent) of those total penalties were issued to just one facility in Texas, LyondellBasell La Porte, east of Houston. (Because penalties follow violation notices by at least several months and often more, the penalties in the 2021 to 2023 period were not necessarily for violations in that same period.)

Table 7. Effluent Violations by Pollutant, 2021-2023

Rank	Pollutant	Number of Facilities	Number of Exceedances
1	Total Suspended Solids	32	178
2	Biological Oxygen Demand	29	137
3	pH	39	83
4	C3 Dimer Acid/Salt (GenX PFAS)	1	77
5	Enterococci	12	45
6	Total Organic Carbon	9	26
7	Chemical Oxygen Demand	4	26
8	Oil & Grease	16	25
9	1,4-Dioxane	1	24
10	Copper	6	21

Note: pH exceedances were adjusted to exclude errors EIP identified in WV pH violations (see Methodology).
Source: EPA ECHO, WVDEP

Outdated Permits

In addition to the minimal enforcement by federal and state agencies as companies violate their wastewater permits, permitting agencies have also fallen behind on updating permits. The Clean Water Act requires that wastewater discharge permits are issued for five-year terms. Companies must reapply for permit renewal at least 180 days before the expiration date and permitting agencies – often the state – are expected to review and reissue a new permit. However, often faced with limited resources, permitting agencies frequently fail to reissue a new permit in time. As long as the company has submitted a complete application, the agency categorizes a permit as "administratively continued." Under an administratively continued permit, facilities are able to continue discharging wastewater legally under the terms of the most recent permit, despite being past the expiration date.[114]

Data in EPA's ECHO database indicates 28 of the 70 plastics plants (40 percent) examined for this report are discharging under administratively continued permits.[115] Four of these permits expired more than five years ago (2019 or earlier).[116] By failing to issue new, updated permits, states are allowing facilities to continue dumping pollutants without accounting for changes in the water quality of receiving waterways. The states are also failing to account for any changes in a facility's compliance record that might suggest the need for an updated permit; or new treatment technologies that could improve performance. The public and impacted communities are also deprived of opportunities to provide comment on any draft permits the permitting agency fails to issue, reducing their ability to advocate for stronger permits. The bottom line is that a backlog of outdated wastewater permits continue to allow manufacturers to discharge pollution without modern wastewater pollution controls and at levels that may harm waterways and downstream communities.

CHAPTER 5

Local Case Studies of Pollution's Harm

An 11-year-old boy fishes in the Houston Ship Channel, downstream from several plastics manufacturing plants that release toxic chemicals into the waters and fish.

LOUISIANA:

A Plastics Factory with No Limits on the Dioxin it Dumps

James Hiatt catches a catfish near the outfalls of the Westlake Eagle plastics plant on the Calcasieu River, but can't eat it because it is contamainted with dioxins. The plant is one of the largest dischargers of dioxins in the U.S., yet has no limits on this highly toxic carcinogen in its permit.

LAKE CHARLES, LOUISIANA – As the sun rose over the egg-shaped metal tanks and flaming smokestack at the Westlake Eagle chemical plant in southwest Louisiana, James Hiatt motored his fishing boat nearby and cast a line baited with shrimp into the Calcasieu River.

After a few minutes, something bit. “He’s a fighter! But I can’t even tell what he is,” Hiatt said, cranking hard on his reel.[117] “He didn’t feel that big, but when he gets close to the boat here, he does not want to come up.”

He leaned over, grabbed the line and hauled up a thrashing catfish, about a foot long.

“No, I’m not going to eat this,” Hiatt said, eyeing the fish warily before tossing it back. “Because we caught it here in the Calcasieu River, and there is contamination here. You are not supposed to eat fish here because of the dioxins in the fish – and not just dioxins, but mercury, PCBs and furans. The food chain is contaminated here because of these chemical plants.”

EPA records show that the Westlake Eagle US 2 Lake Charles plastics chemical plant, which makes chemical ingredients for PVC plastics, is one of the largest dischargers of dioxin – a known carcinogen – in the U.S.[118] Testing has found levels of dioxins and other chemicals in the fish in this river so high that the state advises people to eat no catfish caught here and only two meals a month of other fish.[119]

But despite the dioxin impairment of waterways, neither the state of Louisiana or EPA have placed any limits on the amount of the cancer-causing dioxin that the Westlake plant is allowed to dump into the river.[120] There are no warning signs at a nearby public boat launch, and some fishermen say they eat contaminated fish.[121] The plant last year also released 459,756 pounds of nitrogen – a pollutant that feeds fish-killing, low-oxygen "dead zones" – with no federal or state limits on total nitrogen in its permit.[122]

"They shouldn't be allowed to put people in harm's way. If the pollution makes me sick, or kills the fish, **they ought to be held accountable**."

- Ike Guidry, a fisherman in Lake Charles, who suffered from cancer, pointing to a scar from his surgery.

One of the anglers is Ike Guidry, 65, a construction worker and former Air Force sergeant who has fished in Lake Charles his whole life. In February, he was diagnosed with cancer. He said EPA should crack down on the chemical pollution from the plants surrounding Lake Charles, because he doesn't want his grandchildren – who also love fishing – to face a cancer risk.[123]

Guidry said he had to suffer through 35 radiation treatments and eight chemotherapy sessions. He does not know what caused his disease, but said he fears that his lifelong fish consumption (often, several meals a month from the Calcasieu River) could have contributed to his cancer risk. He said he does not smoke.

"I wouldn't want anyone to go through what I had to go through," Guidry said, pointing at the scar on his neck, where he had surgery to remove his glands. "They shouldn't be allowed to put people in harm's way. If the pollution makes me sick, or kills the fish, they ought to be held accountable."

Although people frequently fish downstream from the Westlake Eagle plant, its pollution releases are substantial. The plant discharged an average of 83 million gallons of wastewater a day into the Calcasieu River in 2023, which included 5.3 million pounds of suspended solids that year, as well as 348 pounds of copper, 60 pounds of lead, and 3.5 pounds of mercury, according to the company's reporting to state agencies and EPA.[124]

The Westlake Eagle US 2 Lake Charles plastics chemical plant released 83 million gallons of wastewater a day into the Calcasieu River in 2023.

Among several other incidents, a fire at the Westlake Eagle plant on February 10, 2022, knocked out water treatment equipment at the plant. This failure allowed acidic wastewater and oil to pour into the river, causing a fish kill that caused chemical burns on the gills of the fish, according to a state report.[125]

Paul Geary, a retired union organizer and fisherman from Lake Charles, said that the owners of Westlake and other chemical plants should be held accountable for contaminating the river and putting people's health at risk.[126]

"They used to call Louisiana the 'Sportsman's Paradise,'' Geary said. "Now you don't hardly hear that word said like they used to. It's no longer the sportsman's paradise because of the impacts of the petrochemical industry."

Rebecca Cipriano, 60, a retired Lake Charles resident who is disabled and needs a wheelchair, still regularly fishes in Lake Charles, despite the health advisories.[127] She lives near the lake and said fishing is the only way she knows of enjoying the outdoors.

"There's nothing we can do about it. We live here, and we don't have any other place to fish," Cipriano said. "I've been fishing all my life. I come down here every chance I can get. Sometimes I catch red drum and cook it up for my family."

To protect people, EPA needs to update and strengthen the effluent limitation guidelines for chemical and plastics plants across the country, said Hiatt, the executive director of an environmental group called For a Better Bayou. These standards have not been updated in more than three decades and fail to regulate many pollutants, like dioxins.

Hiatt said this federal action is needed because both federal and state governments have done little to make companies like Westlake actually address decades of toxic discharges into the rivers of southwest Louisiana.

For example, in 2018, a federal court approved an $11 million consent decree with the previous owners of the Westlake site, as well as Citgo, Occidental Petroleum and several other companies in the Lake Charles area, to settle claims of water pollution violations going back years, including for dioxins, PCBs, lead and mercury.[128] The companies were required to remove or cap contaminated sediment, among other actions.

Despite the clear contamination in the area, state and federal regulators have still not required dioxin limits in the permit for the Westlake plant. To Hiatt, this misses the whole point. "It doesn't make any sense," Hiatt said.

An aerial photo of the Westlake Eagle US 2 Lake Charles plastics chemical plant on the Calcasieu River, one of the largest industrial sources of dioxin pollution in the U.S., according to EPA data. Photo by James Hiatt, For a Better Bayou.

WEST VIRGINIA: Plastics Factory Exposes Millions of People Downstream to Health Risks from 1,4-Dioxane

The APG Polytech plastics plant in West Virginia was the largest industrial source of 1,4-dioxane water pollution in the U.S. in 2021 and 2022. Photo by Beyond Petrochemicals.

APPLE GROVE, WEST VIRGINIA – In the tiny town of Apple Grove, West Virginia (population: 155) pollution pours from the outfall of a plastics manufacturing plant into the Ohio River, which is the drinking water source for five million people downstream, including in West Virginia, Ohio, and Kentucky.

The factory, owned by a company called APG Polytech, produces polyethylene terephthalate (PET), which is used to make plastic soda bottles, fast-food containers, synthetic fibers, and other products. APG has been the largest discharger of 1,4-dioxane into surface waters in the country in recent years, releasing more of this chemical – a probable human carcinogen – than any other source in 2021 and 2022, according to EPA.[129]

After a legal battle, the company was first forced to meet limits on 1,4-dioxane in its state-issued water pollution control permit in 2021.[130] But the company struggled to meet those limits and in November 2023, the West Virginia Department of Environmental Protection fined APG $30,000 for violating their permit discharge limit of 1,4-dioxane into the Ohio River, issued a consent order, and set deadlines to finish constructing a better pollution control system.[131]

Discharge monitoring reports from the company show the plant has significantly reduced 1,4-dioxane concentrations in its wastewater and has met its permit limits since July 2024, according to EPA's Enforcement and Compliance History Online (ECHO) database, suggesting pollution controls can dramatically reduce pollution from these facilities.[132]

Across the U.S. and all industrial sectors, 12 facilities reported releasing 74,301 pounds of 1,4-dioxane directly into waterways in 2022. The APG Polytech plant accounted for 40 percent of that total, according to data in EPA's Toxics Release Inventory.[133]

Given the risk this level of 1,4-dioxane posed to downstream drinking water supplies, West Virginia included limits for the pollutant in the APG Polytech plant's 2016 permit. However, APG Polytech's predecessor company (M&G Chemicals) used the lack of national regulation to successfully fight those limits in an administrative appeal.[134]

The APG Polytech plant in West Virginia was fined $30,000 for violating its permit limits for

1,4-dioxane

into the Ohio River, a source of drinking water for millions of people.

When the permit came up for renewal five years later in 2021, the downstream utilities and clean water advocates were better prepared to fight for 1,4-dioxane limits.

Greater Cincinnati Water Works, Louisville Water, West Virginia American Water, and West Virginia Rivers Coalition submitted comments and data to West Virginia's environmental agency in 2021 showing elevated 1,4-dioxane levels in their water supplies and arguing for 1,4-dioxane limits. West Virginia included limits in the final 2021 permit.[135] This time, when APG appealed the permit, a coalition of clean water advocates and downstream water utilities pushed back and lobbied for stronger public health protections, using a team of hired lawyers. APG's appeal failed and the 1,4-dioxane limits were kept in the permit. They convinced state regulators the limits were necessary because of the magnitude of the chemical releases into the Ohio River and the company's lack of any progress towards eliminating the discharge.

Getting and keeping these limits was a public health victory that will substantially reduce exposure to a probable human carcinogen through drinking water. While APG had struggled to control its 1,4-dioxane pollution after 2021, resulting in the 2023 consent decree, if APG can continue to meet its limits like it has in 2024,[136] the new permit will reduce the 1,4-dioxane pollution into the Ohio River from the plant from around 100 pounds per day to less than 1 pound per day.[137] But these limits took a sustained, difficult, and expensive legal and advocacy campaign. Without that campaign, APG Polytech would have likely won their appeal – and avoided any limits on the pollutant – as they did in the 2016 permit cycle. That would have resulted in at least five additional years of no limits for 1,4-dioxane.

The APG Polytech plant in Apple Grove, West Virginia. Photo by Beyond Petrochemicals.

Across the U.S., many small towns and water providers can't afford these kinds of expensive legal battles, and so their residents may be exposed to harmful pollutants, including 1,4-dioxane from plastics plants. To ensure equal protection for all waterways, EPA needs to set national standards for the plastics industry, clean water advocates argue.

For example, in South Carolina, a PET plastics manufacturer called Alpek Polyester Columbia released 23,728 pounds of 1,4-dioxane into the Congaree River in 2022 – with no limits on the pollutant in the plant's discharge permit.[138] "We are incredibly concerned that the Alpek Columbia facility is discharging thousands of pounds of dangerous chemicals into the Congaree River just upstream from Congaree National Park," said Bill Stangler, the Congaree Riverkeeper in South Carolina. "The EPA and the South Carolina Department of Environmental Services must establish limits on 1,4-dioxane to protect our rivers and the communities that depend on them."[139]

While EPA has not set a maximum contaminant level of 1,4-dioxane for drinking water, EPA risk assessments have found that lifetime exposure to 35 micrograms per liter concentration in drinking water corresponds to a cancer risk of 1 in 10,000, a level EPA would consider unacceptable.[140] APG Polytech's updated water pollution control permit allows a 152 micrograms per liter monthly average discharge and 345 micrograms per liter daily maximum.[141]

"The multiple-year delay in designing and constructing an appropriate treatment system to abide by permit limits are quite possibly years that APG has taken from the lives of Huntington residents," the West Virginia Rivers Coalition said in a critique of the consent order.[142]

Autumn Crowe, the director of West Virginia Rivers, said the organization urged the state to increase the fines being given to APG Polytech for their 1,4-dioxane discharges. "We've had APG in our crosshairs for several years now because they are a chronic violator," she said. "We asked the state to increase fines so it's more than a little slap on the wrist that doesn't deter them."[143]

The Alpek plastics plant in South Carolina releases large amounts of 1,4-dioxane, a likely carcinogen, into the Congaree River.
Photo by Bill Stangler, Congaree Riverkeeper.

TEXAS:

Volunteers Scoop Plastic Pellets From Beaches While Pushing for a Legislative Fix

Clean water activists in Texas are pushing for a new state law to ban the release of nurdles from plastics plants, like these collected from Sylvan Beach, south of Houston.

LA PORTE, TEXAS – Near the fishing pier at a public beach south of Houston, volunteers gathered for a cleanup. With cranes of a nearby shipping terminal looming in the background, they hunched and squatted to pick up hundreds of tiny plastic pellets that had washed ashore.

These pellets, "nurdles," are a constant presence along the Texas Gulf Coast, home to about 20 facilities that turn chemicals sourced from oil and gas into plastic. The nurdles are melted down and poured into molds to create plastic bottles, packaging, and grocery bags, among other products. The pellets are a common sight in Galveston Bay, a heavily industrialized area with at least six plastic factories within five miles of Sylvan Beach, where the volunteers got together on a July afternoon.[144]

In addition to pellets, the plastic and chemical manufacturing plants in the region – including the Occidental OxyVinyls La Porte plant not far from this beach – also release nitrogen, phosphorus, dioxins and other pollutants that can contaminate fish or harm aquatic life by feeding low-oxygen "dead zones."

Nurdles are not only an unsightly nuisance but a serious risk to wildlife. Fish and birds can easily swallow them, leaving their bellies full of pellets they cannot digest. Other contaminants can hitch a ride on the pellets, as well.

"It's also a real risk for human health, because as fish eat these products, and then we eat the fish, we can then, in turn, be exposed to these microplastics," said Luke Metzger, executive director of Environment Texas.[145]

Trash, including plastic bottles, has long been a common sight on Texas beaches, whose nearly 370 miles of coastline on the Gulf of Mexico receives more marine debris than any other state.[146] But on top of these plastic bottles and containers are the tiny nurdles that some Texas plastics factories have a long track record of releasing into creeks, bayous, and bays.

The most notorious example is Formosa Plastics in Point Comfort, about two hours southwest of Houston. There, local activists in 2019 won a landmark $50 million Clean Water Act settlement from the plastics manufacturer for polluting a bay and nearby wetlands with nurdles.[147]

Luke Metzger, Executive Director of Environment Texas, during a press conference about plastic pollution at Sylvan Beach. Volunteers there collected about 1,000 plastic pellets from the sand in 10 minutes.

To help draw attention to the nurdle invasion, scientists at the University of Texas Marine Science Institute in 2018 created the Nurdle Patrol, a community science project where volunteers collect as many nurdles as possible in 10 minutes and submit their data to the group's website.[148]

At Sylvan Beach, the 10 or so volunteers ended up with about 1,000 nurdles combined after their 10-minute search on a single day in July, Metzger estimated. Countless more remained along the shore.

Since 2018, Nurdle Patrol volunteers have cleaned more than 2 million of the pellets from Texas beaches.[149] However, Metzger said the scale of plastic factory pollution is too vast for people to address individually.

That is why Environment Texas is joining with Public Interest Research Group and other organizations, to promote the Plastic Pellet Free Waters Act, which would make it explicitly clear to industry and regulators that it is illegal for companies to discharge nurdles into waterways.[150] A similar bill on the state level was introduced during the 2022-2023 Texas legislative session but did not pass.

"This problem is so overwhelming – volunteers just can't pick all these up," Metzger said. "What we need is for these factories to stop discharging these pellets into our waterways, stop spilling them into our waterways, and clean up their mess."

A day earlier and nearly 30 miles south, Joanie Steinhaus descended the steps from Seawall Boulevard to a beach on Galveston Island. Located on a sandy strip of land where Galveston Bay meets the Gulf of Mexico, the beach was about 25 miles away from the nearest plastic factory.

Even here, the nurdles were easy to find. Along the line of debris deposited at high tide, Steinhaus turned over bits of dried plants and wood, finding plastic pellets along with crumbled bits of Styrofoam and colorful pieces of used plastic.

The nurdles and other plastic waste could have come from hundreds of miles away, Steinhaus explained. Waste that washes ashore in Galveston floats downriver from the Houston area as well as from Louisiana. Currents in the Gulf that rotate counterclockwise bring in plastic waste from as far away as the mouth of the Mississippi River, 330 miles east.

“We've been looking at sand and water samples for seven years around Galveston Island, both bay and beachfront, and every sample we've collected has microplastics in it,” Steinhaus said.[151]

Steinhaus, the ocean program director for environmental group Turtle Island Restoration Network, has made a big impact in the community since moving there a little over a decade ago. She and her staff hold beach cleanups and outreach events at schools and community groups to raise awareness of local wildlife and the threats to their health.

To draw more attention to the sea turtles that nest on the island, she helped persuade local leaders and businesses to install custom-painted turtle statues along some of Galveston’s main tourist strips. Galveston is the northernmost nesting point for Kemp’s ridley sea turtles, an endangered species that nests primarily in Mexico, but is also nesting grounds for more common species like green sea turtles.

No species is safe from plastic pollution – including humans, Steinhaus explained. Nurdles may be the most virgin form of plastic, but plastic and its byproducts are finding countless pathways into our bodies.

“It’s in our brains, it’s in our blood, it’s across the placenta, it’s in breast milk,” she said. “We’re breathing it in, we’re drinking it, we’re eating it.”

Plastic debris not only litters beaches like this one, but kills birds and fish and persists in the environment for hundreds or thousands of years.

CHAPTER 6
Recommendations

Paul Geary, an angler on the Calcasieu River, said that the owners of chemical plants should be held accountable for contaminating the river. “They used to call Louisiana the ‘Sportsman’s Paradise," he said. "...But it's no longer the sportsman’s paradise because of the impacts of the petrochemical industry.”

For too long, wastewater pollution controls, regulations, and accountability for plastics manufacturers and chemical plants have failed to keep pace with the rapid growth of the industry. Outdated federal regulations and piecemeal state level protections have allowed the industry to dump unnecessary pollution into waterways, putting downstream communities at risk and harming the livelihoods of those that rely on a healthy aquatic ecosystem. Excessive and avoidable nutrient pollution contributes to dead zones. Uncontrolled dioxins may increase the cancer risks to people that eat these fish. 1,4-Dioxane endangers drinking water systems. PFAS and microplastics infiltrate our environment and our bodies.

Fortunately, steps can be taken to cut this industrial pollution and protect communities and promote a healthier environment. EPA and state agencies have a statutory obligation and the authority to address these shortfalls under the Clean Water Act. Key steps EIP recommends include:

1. **REQUIRE THE USE OF MODERN WASTEWATER POLLUTION CONTROLS:** EPA must come into compliance with the Clean Water Act’s mandate to update wastewater regulations to keep pace with advances in technology. EPA last updated effluent limitation guidelines for manufacturers of plastics, organic chemicals, and synthetic fibers in 1993. Guidelines for other related industries, including inorganic chemicals, petroleum refining, and plastics molding date back even further. EPA must bring these regulations up to date to reflect modern treatment technology and new, known threats to the environment and health.

2. **PROHIBIT PLASTIC DISCHARGES INTO WATERWAYS:** The water quality standards in most states prohibit plastics facilities from discharging plastic pellets and nurdles in wastewater and stormwater. EPA should promulgate a rule that makes this ban clear and consistent for all states. Permits should require frequent visual inspections for nurdles to help prevent discharges.

3. **IMPROVE MONITORING REQUIREMENTS IN PERMIT APPLICATIONS AND PERMITS:** Companies have been protected in part by a shroud of secrecy when it comes to toxic pollutants like 1,4-dioxane and PFAS. Limited publicly available data makes it difficult for the public and regulating agencies to know how much companies dump of certain pollutants. Though wastewater permit applications require companies to sample for a suite of chemicals in wastewater, the list has not been updated since 1987 and does not currently include 1,4-dioxane and PFAS. EPA should update its permit application monitoring list and add these and other new pollutants of concern. When issuing permits, EPA and states should require permittees to, at a minimum, monitor their process water streams and stormwater for these pollutants to increase visibility of these harmful toxins.

4. **INCREASE POLLUTER ACCOUNTABILITY:** Over 80 percent of facilities exceeded pollution limits in their Clean Water Act permits, but few faced financial penalties, from 2021 to 2023. Lack of enforcement provides little incentive for polluting companies to clean up their wastewater. Further stifling accountability is the backlog of permit applications that allow companies to discharge on outdated permits and hinders public comment opportunities. EPA and state agencies must increase enforcement and penalties associated with Clean Water Act permit violations and address resource issues that may be hindering permit writers from issuing new permits in a timely manner.

5. **IMPROVE PERMIT TRANSPARENCY AND RECORDKEEPING:** All wastewater discharge permits and supporting documents, like permit applications and fact sheets, must be made freely available to the public online and submitted electronically in a format that makes it easier for EPA and state agencies to evaluate discharges and potential pollution controls. Currently, states approach these documents differently. Some states provide all documents online while others require, sometimes costly, public information requests to gain access to them. These documents contain critical information that allow the public to better understand what pollutants are being discharged by facilities, and other information that helps hold companies and permitting agencies accountable. Modernizing recordkeeping and requiring data be submitted electronically would allow EPA and state agencies to more efficiently evaluate data for individual facilities and across industries.

Appendix A: Methodology

This report relies on data from many different publicly-available data sources, including: EPA's Enforcement and Compliance History Online (ECHO) and ICIS-NPDES database; EPA's 2022 Toxics Release Inventory (TRI); EPA's Assessment, Total Maximum Daily Load Tracking and Implementation System (ATTAINS); state environmental agency websites; and the Plastics Plants Inventory compiled by EIP and Materials Research. EIP also compiled and reviewed National Pollutant Discharge Elimination System (NPDES) permits (wastewater discharge permits) and their associated applications, fact sheets, and rationales through public information requests and, where available, document repositories on state agency websites.

INCLUDED FACILITIES

EIP identified and collected data for 70 plastics and chemical plants for this analysis. For the purposes of this report, the terms "facilities," "plants," "dischargers," and other terms associated with unique sources, or the number of these sources, in this report reflect the number of individual NPDES permits.

In developing this list of facilities, we began broadly with EPA's Effluent Limitation Guidelines (ELGs) "NPDES ID and Parameter Code to Point Source Category" crosswalk and narrowed the NPDES IDs to those categorized as Point Source Category 414, 414.1, and 414.2 (the Organic Chemicals, Plastics, and Synthetic Fibers category, or "OCPSF").[152] General permits, stormwater permits, groundwater permits, and other non-individual permits were also excluded from the list, resulting in a total of 827 permits from this crosswalk. This list was further supplemented by the Texas Commission on Environmental Quality (TCEQ) Water Quality Permit Database – identifying permits associated with Standard Industrial Classification (SIC) Codes 2821, 2823, 2824, 2865, 2869, 2899[153]; the Louisiana Department of Environmental Quality's (LDEQ) list of agency interests categorized as "Chemicals and Allied Products."[154] Information about these NPDES IDs were downloaded from EPA's ECHO database. EIP excluded permits where ECHO data indicated the permit was terminated, where there were no reported discharges in 2022, biofuels facilities, and where data showed fewer than 10 pollutants regulated under the OCPSF ELG with numerical limits (unless the facility was classified as a "major" discharger). This final exclusion criteria was applied as a screening tool to eliminate permits that likely did not authorize discharge of OCPSF process wastewater. This resulted in the identification of 268 potential wastewater dischargers.

EIP further narrowed the scope of this analysis to dischargers that manufacture the following plastics and plastics ingredients/feedstocks:

Plastic	Plastic Feedstock*
Polyethylene (PE)	Ethylene
Polypropylene (PP)	Propylene
Polyethylene terephthalate (PET)	Ethylene, purified terephthalic acid, mono-ethylene glycol (MEG)
Polyvinyl Chloride (PVC)	Ethylene, ethylene dichloride, vinyl chloride monomers

*These are not the only ingredients used to make these plastic products, but are key organic chemicals used to produce the plastic. Additional inorganic chemical feedstocks, like chlorine and chlor-alkali, are key feedstocks for PVC plastics, but EIP did not include facilities that only manufacture inorganic chemicals.

Plastics and plastic ingredient facilities were identified from the broader OCPSF list using the EIP/Materials Research Plastics Plant Inventory.[155] In addition to the Plastics Plant Inventory, we reviewed NPDES permit applications and fact sheets to identify the manufactured products that contribute to the process wastewater discharged by a facility. From a review of permit applications, we included five additional facilities that reported manufacturing plastic resins and were subject to Subpart D (Thermoplastic Resins) of the OCPSF ELG: Arkema Mobile Facility (AL0042447), SABIC Innovative Plastics US (AL0054704), 3M Cottage Grove (MN0001449), Koch/INVISTA Nylon Camden Plant (SC0002585), and Chemours Washington Works (WV0001279).

Facilities were also limited to those that directly and continuously discharge process wastewater into waterways and excludes those that send process wastewater to publicly-owned treatment plants, underground injection wells, or otherwise send process wastewater elsewhere. EIP reviewed permits and permit applications to identify the types of wastewater that were discharged by a facility. Facilities produce and discharge many types of wastewater, including process wastewater, which comes in direct contact with the manufactured product, its residues or byproducts, or other materials used to make the product; cooling water; stormwater; sanitary wastewater; and more. Facilities can discharge many different types of wastewaters, sometimes combined before discharging. EIP excluded any that did not discharge any process wastewater subject to the OCPSF ELG category.

Though we limited the facilities to those that discharged wastewater subject to the OCPSF ELG category, many industrial plants manufacture a variety of products that may also be regulated by a different ELG or industrial category, such as the Inorganic Chemicals category or Petroleum Refining category. We did not include any plastics and petrochemical plants that are integrated with petroleum refineries and were studied in EIP's 2023 report, "Oil's Unchecked Outfalls," which addressed similar wastewater pollution loads, compliance issues, and outdated regulations as this report.[156]

POLLUTANT DISCHARGES

EIP reviewed and included pollution data using two methods and sources: pollution loads and concentrations from discharge monitoring reports (DMRs) and permit documents, and EPA's 2022 TRI.

Discharge Monitoring Reports and Permit Applications (Calculated Loads and Concentrations)

Load and concentration calculations were limited to outfalls that discharge process wastewater with a continuous (not "intermittent") flow, based on information included in NPDES permits and applications. Facilities have varying flow structures – some facilities discharge all wastewater through a single external outfall, while others have a more complicated network of internal and external outfalls with different combinations of wastestreams. Where data were available, we prioritized estimating pollution data at the outfalls where compliance with the ELG would apply. For example, at an internal outfall discharging treated process wastewater, prior to being combined with other waste streams not regulated by the ELG. If data were only available at outfalls discharging a variety of waste streams (e.g., stormwater, cooling water), we estimated data at these points. Some facilities are subject to multiple ELG categories and discharge process wastewater from more than one industrial category. We included any outfalls that met the above criteria and included OCPSF process wastewater that may or may not include additional industrial wastewater.

DMR Data: Facilities that discharge to waterways are required to monitor and report water quality data in DMRs as outlined by the facility's NPDES permit. These permits specify the requirements for each outfall, including what pollutants must be monitored, whether there are numeric limits for the pollutant, the monitoring frequency (e.g., monthly, quarterly), the type of measurement (e.g., concentrations, loading rates), measurement units, flow rates, and more. Companies submit DMRs to state agencies. EPA processes the data, standardizes certain elements in its ICIS-NPDES database, then posts and updates the data online for the public, which can be downloaded on ECHO. DMR data can contain errors. Common errors include incorrect values, units, and misplaced decimal places. We used our best judgment to make corrections in our analysis and submitted error reports to EPA as needed. We downloaded 2022 and 2023 DMR data in April, May, and July 2024.

Permit Documents: Permit documents were reviewed to identify which outfalls would be included in our analysis and to collect information about wastewater characteristics unavailable in DMR data. Companies must submit information about wastewater discharges in their permit applications, including outfall-level sampling data for a wide range of pollutants that may not be identified in the final, issued permit. Generally, permit applications include sampling data from any outfalls that discharge process wastewater. Effluent sampling typically includes a concentration and mass loading rate (e.g., pounds per day). Companies are only required to submit results from one sample, though they may collect multiple and provide long-term average values. Texas applications, however, limit their sampling data to external outfalls and typically include up to four sample events per pollutant. Monitoring results contained in permit applications are supposed to represent typical discharges from the facility.

Quantifying Pollution Discharges

We used a combination of DMR data downloaded from EPA's ECHO database and data submitted in facility NPDES permit applications. We applied a tiered approach to selecting data, using DMR data where they were available and supplementing DMR data gaps with information from permit applications. As such, if DMRs did not include monitoring data for phosphorus, for example, we looked to permit applications for the concentrations reported there.

EIP quantified pollution discharges for total nitrogen and nitrogen compounds (see "Total Nitrogen" below), phosphorus, 1,4-dioxane, total dissolved solids, sulfate, chloride, total organic carbon, and chemical oxygen demand. We used 2022 and 2023 DMR data and discharge data from permit applications to calculate pollution loads, concentrations, and loading rates using the equations shown in the box below.

Pollution Load and Concentration Equations:

Load: If mass quantities (kg/day) are available:
Load (pounds) = Pollutant Mass Loading Rate (kg/day) x Days in Monitoring Period x 2.205 (Conversion Factor)

Load: If concentrations (mg/L) are available:
Load (pounds) = Flow (MGD) x Pollutant Concentration (mg/L) x Days in Monitoring Period x 8.346 (Conversion Factor)

Concentration: If concentration (mg/L) is unavailable:
Concentration (mg/L) = Load (pounds) ÷ [Flow (MGD) x Days in Monitoring Period x 8.346 (Conversion Factor)]

DMR data is generally reported monthly, though some permits authorize less frequent monitoring (e.g., quarterly, semi-annually). We calculated monthly loads prior to aggregating into an annual load. Where data were reported less frequently than monthly, we applied loading rates and concentrations for the monitoring period to associated months. For example, if a facility monitored quarterly, reporting a concentration in March, June, September, and December, we applied March concentrations to January, February, and March; June concentrations to April, May, and June; and so forth.

Because DMR data may be reported in a number of ways – monthly averages vs. daily max, loading rates vs. concentrations – we established a hierarchy of using the best available data. DMR data was selected before permit application data. Averages were used before maximums. For DMR data, loading rates were used over concentrations. For data from permit applications, concentrations were used over loading rates (loads were calculated from permit application concentration using actual flow rates reported in DMRs).

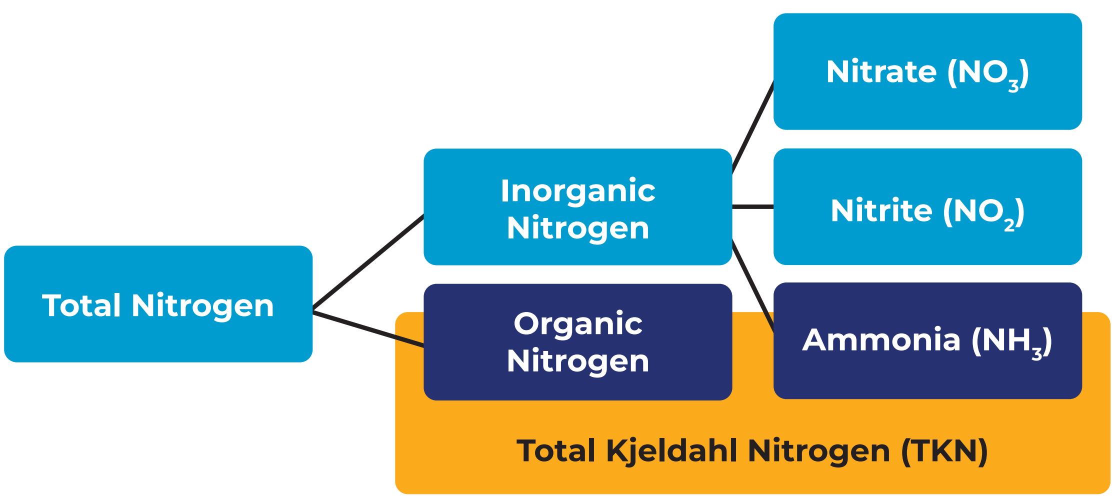
We made the following additional assumptions when estimating pollution discharges.

- Monitoring data in permit applications are representative of a facility's discharges in 2022 and 2023. Companies generally submit permit applications every five years and sampling data submitted in permit applications generally precedes the time period we estimated discharges from, but we used the most recently available data we could obtain when we collected permit documents throughout 2023 and 2024.
- We treated data from both DMRs and permit applications reported as "less than [value]," "below the detection level," or "not quantifiable" as zero. In some cases, where all DMR values or permit application data were below a detection level, EIP data will indicate the facility reported no amount of the pollutant, though it is possible some level of the pollutant is present in the discharge.
- When DMR data were available but contained some gaps (e.g., a facility failed to sample for one or more monitoring periods), we calculated the average value from existing data in 2022 and 2023 and applied the average to the missing monitoring period.

Total Nitrogen: Total nitrogen includes a number of different nitrogen species or compounds (See diagram below). Companies typically report individual nitrogen compounds as nitrogen, instead of total nitrogen. We calculated loads for each nitrogen compound where data were available then combined the data to estimate total nitrogen. Not all facilities report data for each nitrogen compound. As such, total nitrogen may be an underestimate. In cases where data could overlap, we ensured compounds were not double counted. For example, if organic nitrogen, total Kjeldahl nitrogen (TKN), ammonia, nitrate, and nitrate were available, we would only combine TKN (which includes organic nitrogen and ammonia), nitrate, and nitrite.

Total Dissolved Solids: Where total dissolved solids data were unavailable, we combined any available sulfate and chloride data to estimate total dissolved solids. Total dissolved solids can include other pollutants beyond sulfate and chloride, so actual loads may be higher. We excluded total dissolved solids data from the Dow Freeport Plant

Nitrogen Species



(TX0006483) from the analysis, as data were only available at an external outfall with a large volume of non-contact cooling water that likely contains considerable total dissolved solids in its source water.

Toxics Release Inventory (Company-Reported Pollution Discharges)

Many industrial facilities, including the plastics and petrochemical plants included in this analysis, are required to report release of certain toxic pollutants to the environment to EPA's TRI database every year. TRI data include direct discharges to surface waters, transfers to wastewater treatment plants, air emissions, and more. Facilities are required to report releases if they are part of a specified industrial sector, meet certain employee thresholds, and manufacture, process, or use one of nearly 800 toxic chemicals above certain threshold quantities in a year.[157] Unlike DMR data, companies report releases at the facility level, not by outfall, and may therefore include sources and waste streams not included in EIP's calculated pollutant discharges (e.g., stormwater). Companies are instructed to include pollution from "process outfalls such as pipes and open trenches, releases from on-site wastewater treatment systems, and the contribution from stormwater runoff, if applicable."[158] Additionally, companies may have different methods of estimating pollutant discharges than those EIP used when calculating water pollution discharges.

We relied on surface water discharges reported in the 2022 TRI data for information about some pollutants not widely reported in DMR data or NPDES permit applications – specifically, dioxins and dioxin-like compounds and 1,4-dioxane. Facility-level 2022 TRI data were downloaded in August 2024. TRI data used to estimate total pollution discharges across our entire facility universe were downloaded in September 2024. EPA makes preliminary TRI data for the most recent calendar year available every July through September. As of September 10, 2024, EPA has made preliminary 2023 data available on TRI with data processed as of July 10, 2024.[159] Because preliminary data is incomplete and has not undergone a complete data quality process by EPA, EIP chose not to include 2023 TRI data in its analysis.

PERMIT LIMITS

We reviewed 2022-2023 discharge monitoring reports from ECHO to identify whether a facility's permit included monitoring requirements or permit limits for specific pollutants. The presence of monitoring requirements or limits reflect all outfalls at a facility, not only outfalls discharging process wastewater. Monitoring requirements or permit limits effective after December 31, 2023 are not reflected in our data.

IMPAIRMENT DATA

We used NPDES permits and permit applications to identify outfall locations and receiving waterways. Outfall locations were then mapped using ArcGIS Pro 3.0.2 and overlaid with EPA's Assessment and Total Maximum Daily Load Tracking and Implementation System (ATTAINS) data. This dataset contains information about the conditions of surface waters within the United States. Outfalls were joined with waterway information corresponding to the receiving waterway listed in facility permitting documents.

Where possible, outfalls were joined to the ATTAINS data corresponding to the immediate receiving waterway listed in facility permitting documents. However, in some cases the immediate receiving waterway did not have ATTAINS data available, and the next listed receiving waterway was used. For example, the receiving waterway for outfall 010 at the Westlake Polymers Poly I & II Polyethylene Production Plant is listed as "Facility East Ditch, then to an unnamed drainage ditch, then to Bayou D'Inde". There is no ATTAINS data available for Facility East Ditch or unnamed drainage ditch, and therefore data for Bayou D'Inde was used. For facilities with multiple outfalls, the ATTAINS data for each receiving waterway was combined. For example, if any of the outfalls discharged to an impaired waterway, then the facility was designated as discharging to an impaired waterway

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There are several limitations associated with using ATTAINS data. Not all waterways have been assessed for every use, and each state has differences in the standards and methodologies used for listing and de-listing impaired waterways. ATTAINS displays the most recent impairment data available for each waterway, but this can vary from state to state. ATTAINS data for this analysis reflect data from 2022 and 2024.

COMPLIANCE DATA

Compliance data for facilities were downloaded from EPA's ECHO database.[160] Quarterly Clean Water Act (CWA) compliance data from 2021 to 2023 reflects CWA program search results from EPA's ECHO database as of April 1, 2024. Current compliance status and permit status reflect CWA program search results from ECHO as of August 1, 2024. Enforcement actions, penalties assessed, and single event violations for 2021 to 2023 were downloaded from ECHO's ICIS-NPDES National Dataset as of August 1, 2024.[161]

EIP calculated numeric effluent violations for 2021-2023 from DMR data downloaded from ECHO for each facility in July 2024. Effluent violations included in our analysis include violations identified in DMR data as "DMR, Limited – Numeric Violation." Unlike the pollution discharges EIP estimated, our summary of effluent violations at each facility include all outfalls, parameters, statistical bases (e.g., monthly averages, daily maximums), and value types (e.g., concentrations, quantities). Because some facilities may have limits for multiple statistical bases and value types for a single pollutant, some monitoring periods may include more than one effluent violation for a single pollutant, outfall, and facility.

Compliance status, violation status, and effluent violations in EPA's Enforcement and Compliance History Online (ECHO) database are based on industry self-reported data. EPA considers violations as alleged violations and data in ECHO does not necessarily represent final, legal determinations nor imply companies were charged with criminal or civil violations or convicted in court.[162] Penalties reflect fines a company pays to the enforcement authority and do not include the costs a company may pay to come into compliance, such as installing new pollution controls, or the cost of supplemental environmental projects. Payment of a penalty as a result of a settlement does not necessarily indicate the company admit liability for violations.

EPA has disclosed several known data problems in the ECHO database, some of which impact data downloaded and the facilities analyzed in this report, due to data migration issues between state agencies and EPA.[163] EPA identified data alerts that had the potential to impact five facilities in our analysis: 3M Cottage Grove (MN0001449), Alpek Polyester Cedar Creek Site (NC0003719), APG Polytech Apple Grove Facility (WV000132), Braskem America Neal Plant (WV0001112), and Chemours Washington Works (WV0001279). We compared DMR data on ECHO against original DMR data available on state websites for these facilities to verify our summary data related to quarters in noncompliance, numeric effluent violations, single event violations, enforcement actions, and penalties assessed. Our review of state DMR data was limited to validating violations shown in ECHO. Based on a review of data on state website, we made the following adjustments to data we downloaded and presented from ECHO:

- **Alpek Polyester Cedar Creek Site:** Reduced the number of quarters in noncompliance between 2021 and 2023 from 7 to 2 quarters. EPA's data alert for North Carolina indicates some facilities may falsely be flagged for deficient parameter reporting or failing to report data for entire outfalls. EIP only identified effluent violations across two quarters from documents made available by the North Carolina Department of Environmental Quality.
- **Braskem America Neal Plant:** Reduced the number of quarters in noncompliance between 2021 and 2023 from 6 to 5 quarters. EPA's data alert for West Virginia indicates there may be errors falsely flagging some facilities to be marked as being in noncompliance. EIP only identified violations that substantiated five quarters of being in violation.
- **Chemours Washington Works:** Reduced the number of numeric effluent violations between 2021 and 2023 from 162 to 115. EPA notes data errors related to pH violations in WV as well as erroneous violations for missing DMR data for stormwater outfalls. A review of DMRs available from the West Virginia Department of Environmental Protection indicate DMR data were not missing from stormwater outfalls as there were no qualifying events to warrant reporting. EIP also reviewed potential pH violations noted in ECHO and could only substantiate one valid pH violation from state data.

Appendix B: Facility Information

State	City	Facility	Plastic Resins & Key Plastic Ingredients	Permit ID	Water Pollution Violations, 2021-2023	Enforcement Actions, 2021-2023	Receiving Waterway	% People of Color (3-Mile)	% Low Income (3-Mile)
AL	Decatur	Indorama Ventures Xylenes and PTA	PTA, p-xylene	AL0000108	2	0	Tennessee River	47.31	35.06
AL	Axis	Arkema Mobile Facility	thermoplastic resins and polymers	AL0042447	2	0	Mobile River	30.81	33.24
AL	Burkville	SABIC Innovative Plastics US	polycarbonate resin, chlorine, BPA, phosgene	AL0054704	0	0	Alabama River (Woodruff Lake)	32.47	32.07
IA	Clinton	LyondellBasell Clinton Plant	ethylene, polyethylene	IA0000191	1	0	Mississippi River	5.41	21.7
IL	Tuscola	LyondellBasell Tuscola Plant	polyethylene	IL0000141	9	0	Kaskaskia River	4.33	28.19
IL	Morris	LyondellBasell Morris Plant	ethylene, polyethylene	IL0002917	0	0	Illinois River and Auz Sable Creek	23.99	15.3
KY	Calvert City	Westlake Vinyls Calvert City Facility	ethylene, chlor-alkali, VCM	KY0003484	7	0	Tennessee River	2.56	41.74
LA	Taft	Dow Union Carbide St. Charles Operations	ethylene, polyethylene	LA0000191	8	0	Mississippi River	33.38	29.79
LA	Geismar	Westlake Vinyls Geismar Facility	PVC, EDC, VCM, chlorine, caustic soda	LA0000281	3	0	Mississippi River	35.09	15.53
LA	Lake Charles	Westlake Eagle US 2 Lake Charles Complex	chlor-alkali, EDC, VCM, chlorinated chemical derivatives	LA0000761	25	0	Calcasieu River	15.35	27.75
LA	Geismar	Occidental Geismar Facility	chlorine, caustic soda, EDC	LA0002933	0	0	Mississippi River	39.91	26.04
LA	Geismar	BASF Geismar Site	ethylene oxide, ethylene glycol	LA0002950	2	0	Mississippi River	35.52	21.09
LA	Plaquemine	Dow Plaquemine	ethylene, polyethylene, propylene, ethylene oxide, benzene, EDC	LA0003301	5	0	Mississippi River	53.82	31.86
LA	Westlake	Sasol Lake Charles Chemical Complex	ethylene, polyethylene, ethylene oxide, MEG	LA0003336	11	1	Calcasieu River	15.72	29.09
LA	Lake Charles	LyondellBasell Lake Charles Polymers	polypropylene	LA0003689	5	0	Calcasieu River	13.36	28.12

Appendix B: Facility Information

State	City	Facility	Plastic Resins & Key Plastic Ingredients	Permit ID	Water Pollution Violations, 2021-2023	Enforcement Actions, 2021-2023	Receiving Waterway	% People of Color (3-Mile)	% Low Income (3-Mile)
LA	Baton Rouge	ExxonMobil Baton Rouge Plastics Plant	polyethylene	LA0005355	0	0	North ditch to Baton Rouge Harbor Canal	92.81	49.54
LA	Baton Rouge	ExxonMobil Baton Rouge Polyolefins Plan	ethylene, polyethylene, polypropylene, propylene	LA0005479	0	0	Baton Rouge Harbor Canal to the Mississippi River	92.4	50.51
LA	Geismar	Shell Geismar Plant	ethylene oxide, MEG, alpha olefins	LA0005754	7	0	Mississippi River	38.82	25.6
LA	Baton Rouge	Formosa Baton Rouge Facility	VCM, PVC	LA0006149	1	0	Mississippi River	93.45	61.81
LA	Plaquemine	Westlake Chemical & Vinyls Plaquemine Facility	PVC, EDC, VCM, chlorine	LA0007129	4	0	Mississippi River	75.21	46.65
LA	Convent	Occidental Convent Plant	chlorine, caustic soda, EDC	LA0056171	0	0	Mississippi River	79.93	45.06
LA	Geismar	NOVA Geismar Ethylene Plant	ethylene, propylene	LA0069612	9	0	Mississippi River	42.57	13.45
LA	Westlake	Indorama Ventures Westlake Ethylene Plant	ethylene, propylene	LA0069850	11	0	Bayou D'lnde	13.03	28.77
LA	Sulphur	Westlake Polymers Poly I & II Polyethylene Production Plant	polyethylene	LA0071382	3	0	Facility East Ditch, then to an unnamed drainage ditch, then to Bayou D'Inde	14.19	28.66
LA	Sulphur	Westlake Petrochemicals Complex	ethylene, styrene, polyethylene	LA0082511	8	0	Calcasieu River	12.39	23.02
LA	Addis	Shintech Addis Plant A	PVC	LA0111023	0	0	Mississippi River	44.83	22.42
LA	Plaquemine	Shintech Plaquemine Plant	ethylene, PVC, VCM, EDC, chlorine, caustic soda	LA0120529	30	1	Mississippi River	79.16	47.33
LA	Westlake	LACC Ethylene & Derivatives Plant	ethylene, MEG	LA0127268	62	4	Calcasieu River Ship Channel	12.99	29.86
LA	Westlake	Louisiana Integrated Polyethylene Joint Venture Westlake Facility	ethylene, polyethylene, ethylene oxide, MEG	LA0127532	0	0	Calcasieu River	15.45	29.86
MN	Cottage Groce	3M Cottage Grove	thermoplastic resins and polymers	MN0001449	6	0	Mississippi River	18.89	7.23
NC	Fayetteville	Alpek Polyester Cedar Creek Site	PET	NC0003719	4	1	Cape Fear River	36.02	35.58

Appendix B: Facility Information

State	City	Facility	Plastic Resins & Key Plastic Ingredients	Permit ID	Water Pollution Violations, 2021-2023	Enforcement Actions, 2021-2023	Receiving Waterway	% People of Color (3-Mile)	% Low Income (3-Mile)
PA	Monaca	Shell Polymers Monaca Site	ethylene, polyethylene	PA0002208	9	0	Ohio River	6.39	20.62
SC	Gaston	Alpek Polyester Columbia Site	PET, PTA	SC0001333	3	0	Congaree River	62.06	48.84
SC	Lugoff	Koch/INVISTA Nylon Camden Plant	nylon polyamide resins and fibers	SC0002585	4	0	Wateree River	31.93	37.17
SC	Spartanburg	Indorama Auriga Polymers Spartanburg	PET	SC0002798	0	0	Pacolet River	34.96	36.24
SC	Moncks Corner	Alpek Polyester Cooper River Site	PET	SC0026506	8	1	Cooper River	31.37	14.32
TN	Kingsport	Eastman Kingsport	PET, acetic acid	TN0002640	0	0	South Fork Holston River	9.82	45.84
TX	Longview	Eastman Longview	ethylene, polyethylene, propylene, ethylene oxide, p-xylene, MEG	TX0000949	5	0	Unnamed tributary, thence to Sabine River above Toledo Bend Reservoir	73.9	44.28
TX	Seadrift	Dow Union Carbide Seadrift Operations	polyethylene, ethylene oxide	TX0002844	8	0	Victoria Barge Canal Tidal	31.55	16.5
TX	Channelview	LyondellBasell Channelview North Complex	ethylene, propylene, butadiene, benzene, propylene oxide, styrene monomer	TX0003531	9	0	Unnamed drainage ditch to Wallisville Gully to San Jacinto River Tidal	84.12	36.54
TX	Baytown	Chevron Phillips Chemical Cedar Bayou Plant	ethylene, polyethylene, propylene, 1-hexene, alpha olefins	TX0003948	20	0	Cedar Bayou Tidal and drainage ditch to Cedar Bayou Above Tidal	47.59	15.27
TX	Alvin	INEOS Chocolate Bayou Plant	ethylene, alpha olefins, ethylene oxide, polyethylene, polypropylene, propylene	TX0004821	5	0	Chocolate Bayou Tidal	47.31	34.13
TX	Port Neches	Indorama Ventures Port Neches Facility	ethylene, propylene, ethylene oxide, MEG, propylene glycol, propylene oxide	TX0005070	102	1	Neches River Tidal	23.47	25.42
TX	Bishop	Celanese Ticona Polymers Bishop Plant	polyethylene	TX0006025	4	0	Drainage ditch to San Fernando Creek to Baffin Bay/Alazan Bay/Cayo del Grullo/Laguna Salada	90.84	50.24

Appendix B: Facility Information

State	City	Facility	Plastic Resins & Key Plastic Ingredients	Permit ID	Water Pollution Violations, 2021-2023	Enforcement Actions, 2021-2023	Receiving Waterway	% People of Color (3-Mile)	% Low Income (3-Mile)
TX	La Porte	INEOS Polyethylene La Porte Plant	polyethylene, polypropylene	TX0006033	13	0	Phillips Ditch, thence to Santa Anna Bayou, thence to Houston Ship Channel (San Jacinto River Tidal)	37.8	22.23
TX	Victoria	Koch/INVISTA Nylon Victoria Site	polyethylene	TX0006050	4	0	Guadalupe River below San Marcos River	49.06	38.99
TX	Houston	Koch/INVISTA Propylene Flint Hills Resources	propylene	TX0006068	9	0	Unnamed drainage ditch to Sims Bayou Tidal	93.38	50.77
TX	Orange	Dow Sabine River Operations	ethylene, polyethylene	TX0006327	12	0	Sabine River Tidal	34.87	41.64
TX	Pasadena	Occidental OxyVinyls Pasadena PVC Plant	PVC	TX0006335	1	0	Houston Ship Channel Tidal	73.13	36.94
TX	Freeport	Dow Freeport	ethylene, polyethylene, polypropylene, propylene, VCM, EDC, chlorine	TX0006483	15	1	Brazos River Tidal	77.54	56.44
TX	Deer Park	Occidental OxyVinyls Deer Park PVC Plant	PVC	TX0007412	2	0	Houston Ship Channel Tidal	40.69	21.47
TX	La Porte	Total Petrochemicals & Refining La Porte Polypropylene Plant	polypropylene	TX0007421	4	0	Phillips Ditch into Santa Ana Bayou, then Houston Ship Channel/San Jacinto Tidal	39.16	22.86
TX	Pasadena	Chevron Phillips Pasadena Plastics Complex	polyethylene	TX0007552	0	0	Unnamed ditch to Houston Ship Channel/Buffalo Bayou Tidal	90.23	49.39
TX	Freeport	Shintech Freeport Plant	PVC	TX0053813	34	0	Dow "A" Canal to Brazos River Tidal	79.53	53.14
TX	Beaumont	ExxonMobil Beaumont Polyethylene Plant	polyethylene	TX0068934	9	0	Willow Marsh Bayou, thence Hillebrandt Bayou	67.13	32.04
TX	Channelview	LyndondellBasell Channelview South Plant	ethylene, propylene	TX0069493	9	0	Harris County Flood Control District ditch G103-02-03 to San Jacinto River Bsain	83.49	33.16
TX	La Porte	Occidental OxyVinyls La Porte VCM Plant	EDC, VCM	TX0070416	11	0	Houston Ship Channel/San Jacinto River Tidal	36.12	23.48
TX	La Porte	Braskem America La Porte Plant	polypropylene, polyethylene	TX0074276	20	0	San Jacinto Bay	38.68	21.26

Appendix B: Facility Information

State	City	Facility	Plastic Resins & Key Plastic Ingredients	Permit ID	Water Pollution Violations, 2021-2023	Enforcement Actions, 2021-2023	Receiving Waterway	% People of Color (3-Mile)	% Low Income (3-Mile)
TX	Corpus Christi	LyondellBasell Corpus Christi Complex	ethylene, propylene	TX0076996	13	0	Corpus Christi Inner Harbor	66.93	31.68
TX	Port Comfort	Formosa Point Comfort Plant	ethylene, polyethylene, polypropylene, propylene, ethylene oxide, MEG, PVC, VCM, EDC, chlorine, caustic soda	TX0085570	23	0	Lavaca Bay/Chocolate Bay	37.17	23.03
TX	Bay City	LyondellBasell Matagorda Plant	polyethylene	TX0087173	1	0	Colorado River Tidal	9.62	29.81
TX	Mont Belvieu	ExxonMobil Mont Belvieu Plastics Plant	polyethylene	TX0089125	1	0	Cedar Bayou Above Tidal	21.81	18.55
TX	Mont Belvieu	Enterprise Mont Belvieu FM 1942 Complex	propylene	TX0102326	25	0	Unnamed tributary to Cedar Bayou Tidal	30.19	17.01
TX	Ingleside	Occidental OxyChem Ingleside Plant	ethylene, VCM, chlorine, caustic soda, EDC	TX0104876	3	0	La Quinta Channel	55.52	36.32
TX	La Porte	LyondellBasell La Porte Complex	ethylene, polypropylene, polyethylene	TX0119792	27	1	Unnamed ditch to San Jacinto Bay	37.2	24.74
TX	Baytown	Enterprise Mont Belvieu Hatcherville Complex	propylene	TX0134465	27	1	Unnamed ditch to Cedar Bayou Above Tidal	32.82	18.37
TX	Gregory	Gulf Coast Growth Ventures Facility	ethylene, polyethylene, MEG	TX0137715	4	0	Corpus Christi Bay	58.25	29.32
WV	Apple Grove	APG Polytech Apple Grove Facility	PET	WV0000132	26	1	Ohio River	1.85	38.52
WV	Kenova	Braskem America Neal Plant	polypropylene	WV0001112	20	0	Big Sandy River	1.65	24.83
WV	Washington	Chemours Washington Works	nylon polymers, polyacetal resins, polyvinyl butyral resins	WV0001279	115*	1	Ohio River	2.94	22.75

Note: Violations flagged by EPA in ECHO are alleged violations and do not imply companies were charged with criminal or civil violations or convicted in court. "Additional Effluent Violations from Other Sources" are "Single Event Violations," which reflect effluent violations not captured in discharming monitoring reports, such as an inspection or incident report.
* EIP revised EPA ECHO data due to potential errors. See Methodology (Appendix A) for details. See full spreadsheet for more details.
Sources: EIP/Materials Research Plastics Inventory, EPA ECHO, Wastewater Permit Documents

Appendix C: Nutrient Pollution

In 2020, EPA released a study analyzing wastewater nutrient pollution across the industrial categories covered by the Clean Water Act Effluent Limitation Guidelines (ELGs), hereinafter referred to as the "Nutrient Study."[164] The Nutrient Study aimed to estimate total nitrogen and phosphorus discharges from 59 industrial point source categories, then use this data to rank and prioritize categories for potential revisions to the ELGs.

EPA's Nutrient Study found the Organic Chemicals, Plastics, and Synthetic Fibers (OCPSF) category did not warrant prioritization or further review because "the majority of facilities are already achieving discharges consistent with concentrations achieved by POTWs" with advanced treatment technology targeting nitrogen and phosphorus pollution.[165] As such, the ELGs for the sector continue to lack any limits for nitrogen and phosphorus. EPA identifies in its study three treatment levels, technologies, and objectives at POTWs as a point of comparison, copied below:

Table 8. Water Environment Research Foundation (WERF) Nutrient Removal Methods and Treatment Objectives

Treatment Level	Nutrient Removal Mechanism	Treatment Objectives	
		Total Nitrogen	Total Phosphorous
Level 2	Nitrification/Denitrification and Biological Phosphorus Removal	8 mg/L	1 mg/L
Level 4	BNR, Nitrification/Denitrification and Biological Phosphorus Removal, High Rate Clarification and Denitrification Filtration	3 mg/L	0.1 mg/L
Level 5	Nitrification/Denitrification and Biological Phosphorus Removal, High Rate Clarification and Denitrification Filtration, Microfiltration/Reverse Osmosis on about Half the Flow	< 2 mg/L	< 0.02 mg/L

Source: WERF, 2011; EPA Nutrient Study, page 3-1.

EPA estimated the sector – which included 757 facilities – discharged 14.1 million pounds of nitrogen, with a median concentration of 0.523 milligrams per liter, into waterways in 2018. Phosphorus totaled 5.4 million pounds with a median concentration of 0.164 milligrams per liter.

But EIP's analysis shows EPA likely underestimated the problem. EIP's analysis included just 70 plastics and petrochemical plants that released at least 9.9 million pounds of nitrogen and 1.9 million pounds of phosphorus into waterways in 2023.[166] The addition of 14 facilities EIP did not include in its analysis of plastics plants, but which also discharge OCPSF wastewater, added an additional 3 million pounds of nitrogen and 1.4 million pounds of phosphorus (Table 8).

Table 9. Additional OCPSF Facilities Not Included in EIP's Universe of Plastics Manufacturers, 2023

Facility	Location	NPDES	Nitrogen Discharged (lbs)	Average Nitrogen Concentration (mg/L)	Phosphorus Discharged (lbs)	Average Phosphorus Concentration (mg/L)
Ascend Performance Materials Operations, LLC	Decatur, AL	AL0000116	275,861	47.7	948,598	162.7
Bayer CropScience LP	Luling, LA	LA0005266	85,914	8.1	320,846	30.1
Bayer Cropscience Kansas City	Kansas City, MO	MO0002526	229,705	56.3	25,887	7.1
Dupont Specialty Products Usa LLC - Spruance Plant	North Chesterfield, VA	VA0004669	178,412	2.7	19,487	0.3
BASF Freeport Site	Freeport, TX	TX0008788	194,412	15.1	18,763	1.5
Goodyear Tire & Rubber Beaumont Chemical Plant	Beaumont, TX	TX0005061	80,121	8.5	13,682	1.5
Taminco Higher Amines, Inc. - St. Gabriel Plant	Saint Gabriel, LA	LA0046361	134,955	119.1	10,980	9.7
BASF Mcintosh Site	Mcintosh, AL	AL0003093	99,091	11.4	10,458	1.2
Angus Chemical Company	Sterlington, LA	LA0007854	58,495	22.1	9,188	3.5
Syngenta Crop Protection LLC - St. Gabriel Plant	Saint Gabriel, LA	LA0005487	318,322	52.5	1,388	0.4
Chemours Chambers Works	Pennsville Twp, NJ	NJ0005100	104,311	7.1	821	0.1
Cornerstone Chemical Company	Westwego, LA	LA0004367	462,886	43.0	527	0.0
Kraton Polymers US LLC	Belpre, OH	OH0007030	488,467	208.6	-	0.0
Altivia Services, LLC	Institute, WV	WV0000086	245,283	37.2	-	0.0

Source: Discharge monitoring data accessed through EPA's Enforcement and Compliance History Online (ECHO) database, wastewater discharge permit documents

Collectively, total nitrogen discharges from this small subset of the OCPSF industrial category – plastics plants in EIP's analysis and the facilities in Table 8 above – totals 12.9 million pounds of nitrogen and 3.3 million pounds of phosphorus in 2023, nearly as much as EPA estimated for 757 facilities. Within this subset of the sector, EIP estimated a median concentration of 4.28 milligrams nitrogen per liter and 1.1 milligrams phosphorus per liter, far higher than EPA's Nutrient Study estimates and above concentrations achieved by POTWs with advanced treatment technology defined in the EPA's study.

Table 10. Comparison of EPA Nutrient Study and EIP Analysis

	EPA Nutrient Study (2018)	EIP Plastics Plants (2023)	EIP Broader Analysis (2023)
Number of Facilities*	757	64	78
Nitrogen			
Total Nitrogen Discharged (lbs)	14,100,000	9,927,795	12,884,032
Nitrogen Concentration - Median, 50th Percentile (mg/L)	0.523	3.2	4.3
Nitrogen Concentration - 75th Percentile (mg/L)	2.05	7.7	9.9
Facilities Discharging at Concentrations Above 3 mg/L (Level 4)	Not Identified in Nutrient Study	35	48
Facilities Discharging at Concentrations above 8 mg/L (Level 2)	Not Identified in Nutrient Study	14	26
Phosphorus			
Total Phosphorus Discharged (lbs)	5,410,000	1,932,449	3,313,075
Phosphorus Concentration - Median, 50th Percentile (mg/L)	0.164	1.02	1.1
Phosphorus Concentration - 75th Percentile (mg/L)	0.546	2.5	2.8
Facilities Discharging at Concentrations Above 0.1 mg/L (Level 4)	Not Identified in Nutrient Study	53	63
Facilities Discharging at Concentrations above 1 mg/L (Level 2)	Not Identified in Nutrient Study	30	38

*EIP reviewed documents for 70 plastics plants and 84 total OCPSF facilities, but nitrogen and phosphorus data could not be obtained for 6 and 10 facilities, respectively.
Source: EPA Nutrient Study, Discharge monitoring data accessed through EPA's ECHO database.

EPA's study relied on estimating nutrient pollution from available discharge monitoring report data at external outfalls in its ICIS-NPDES database, and acknowledges limitations to this data. Discharge monitoring data is limited to the pollutants a permit requires a facility to monitor and report. EPA used what data were available in the dataset to estimate pollution loads for facilities without nutrient data. EIP similarly used available DMR data to estimate pollution load in its analysis. However, where monitoring data were unavailable due to a lack of requirements in permits, EIP mined wastewater permit applications for facility and outfall specific nutrient concentrations to estimate nutrient loads and, where possible, narrowed the analysis to outfalls with process wastewater regulated by the ELG (see Appendix A for detailed methodology).

Appendix D: Master Spreadsheet of Data on 70 Plastics Plants

References and Endnotes

[1] Environmental Integrity Project, "Plastics Plants Inventory," July 2, 2024. Link: https://environmentalintegrity.org/plastics-plant-inventory/.
[2] U.S. Environmental Protection Agency, "Learn About Dioxin." Accessed August 2024. Link: https://www.epa.gov/dioxin/learn-about-dioxin.
[3] U.S. Environmental Protection Agency, "1,4-Dioxane Draft Revised Unreasonable Risk Determination Final Risk Evaluation for 1,4-Dioxane," July 2023. Link: https://www.epa.gov/system/files/documents/2023-07/Draft%20Revised%20Risk%20Determination%2014-Dioxane-2023.pdf; U.S. Environmental Protection Agency, "Third Unregulated Contaminant Monitoring Rule (UCMR) Data Summary: 2013-2015," March 2024. Accessed August 30, 2024. Link: https://www.epa.gov/system/files/documents/2024-04/ucmr3-data-summary.pdf.
[4] U.S. Environmental Protection Agency, "Narrative Water Quality Criteria Related to Trash and Plastics." Accessed October 2024. Link: https://www.epa.gov/wqs-tech/narrative-water-quality-criteria-related-trash-and-plastics.
[5] Specifically, in this report, we are discussing EPA's Organic Chemicals, Plastics, and Synthetic Fibers (OCPSF) point source category, last updated in 1993. 40 CFR Part 414.
[6] 33 USC §§ 1251(a)(1), 1311(b)(2), 1317(a)(2); *Sw. Elec. Power Co. v. EPA*, 920 F.3d 999, 1005 (5th Cir. 2019); see also *Citizens Coal Council v. EPA*, 447 F.3d 879, 883 (6th Cir. 2006) (the CWA "directs EPA to institute progressively more stringent effluent discharge guidelines in stages") (quoting *BP Explor. & Oil, Inc. v. EPA*, 66 F.3d 784, 789 (6th Cir. 1995)).
[7] U.S. Environmental Protection Agency, Organic Chemicals, Plastics and Synthetic Fibers Effluent Guidelines." Accessed September 2024. "Link: https://www.epa.gov/eg/organic-chemicals-plastics-and-synthetic-fibers-effluent-guidelines.
[8] Among the public records we examined were industry-reported wastewater monitoring data, data submitted in permit applications for wastewater discharge permits, data from EPA's Enforcement and Compliance History Online (ECHO) database, and EPA's Toxics Release Inventory. See Methodology in Appendix A for more information.
[9] Environmental Integrity Project, "Oil's Unchecked Outfalls," January 26, 2023. Link: https://environmentalintegrity.org/reports/oils-unchecked-outfalls/.
[10] Although none of the 70 plants had permit limits on total nitrogen, 27 of the 70 had limits on ammonia, which is a form of nitrogen.
[11] Compliance status and violations flagged in EPA's Enforcement and Compliance History Online (ECHO) database are based on industry self-reported data. EPA considers violations as alleged violations and data in ECHO does not necessarily represent final, legal determinations or imply companies were charged with criminal or civil violations or convicted in court. EPA has flagged data quality errors that could impact data reported in ECHO. EIP has worked to verify effluent data and violations for facilities in states impacted by these potential errors. See methodology in Appendix A for more details.
[12] This facility manufactures PFAS, plastics, and other materials. EPA Enforcement and Compliance History Online (ECHO) data show 162 effluent violations from 2021 to 2023. EIP adjusted violations after reviewing data from West Virginia Department of Environmental Protection based on known ECHO data errors. See Methodology for details.
[13] Fox, Radhika, Assistant Administrator, U.S. Environmental Protection Agency, Office of Water, Memorandum to EPA Regional Water Division Directors, Regions 1-10, December 5, 2022. Link: https://www.epa.gov/system/files/documents/2022-12/NPDES_PFAS_State%20Memo_December_2022.pdf; U.S. Environmental Protection Agency, "Our Current Understanding of the Human Health and Environmental Risks of PFAS." Accessed October 16, 2024. Link: https://www.epa.gov/pfas/our-current-understanding-human-health-and-environmental-risks-pfas.
[14] EIP analysis of demographic data in EPA Enforcement and Compliance History Online (ECHO) and EJScreen databases. Links: https://echo.epa.gov/ and https://www.epa.gov/ejscreen.
[15] PCBs are polychlorinated biphenyls, industrial chemicals that can disrupt the immune system. Louisiana Department of Environmental Quality, "Fishing Consumption and Swimming Advisories." Accessed August 11, 2024. Link: https://deq.louisiana.gov/page/fishing-consumption-and-swimming-advisories.
[16] EIP interviewed anglers in Lake Charles and on the Calcasieu River the week of August 12-16, 2024.
[17] Among facilities reporting dioxin and dioxin-like compounds to EPA's Toxics Release Inventory (TRI). U.S. Environmental Protection Agency, "Toxics Release Inventory (TRI) Explorer." Accessed September 2024. Link: https://enviro.epa.gov/triexplorer/tri_release.chemical
[18] NPDES Permit No. LA0000761 (October 11, 2022). Issued by Louisiana Department of Environmental Quality to Westlake Eagle US 2 LLC Lake Charles Complex. Link: https://environmentalintegrity.org/wp-content/uploads/2024/09/2022.10.11_Eagle-US-2-Lake-Charles_LA0000761-Permit-and-Rationale.pdf
[19] Nitrogen and ammonia estimated from discharge monitoring reports and sampling data in the facility's permit application, NPDES ID LA0000761.
[20] 40 CFR Part 122.
[21] U.S. General Services Administration: Office of Information and Regulatory Affairs, "PFAS Requirements in NPDES Permit Applications," Fall 2023. Accessed September 2024. Link: https://www.reginfo.gov/public/do/eAgendaViewRule?pubId=202310&RIN=2040-AG34; 40 CFR Part 122, Appendix D. Link: https://www.ecfr.gov/current/title-40/chapter-I/subchapter-D/part-122/appendix-Appendix%20D%20to%20Part%20122.
[22] Organization for Economic Co-operation and Development, "Global Plastics Outlook Policy Scenarios to 2060, Figure 3.5: Primary plastics will still make up the lion's share of production in 2060." June 21, 2022. Link: https://www.oecd-ilibrary.org/environment/global-plastics-outlook_aa1edf33-en.
[23] Ibid.

[24] Environmental Integrity Project, “Feeding the Plastics Industrial Complex: Taking Public Subsidies, Breaking Pollution Laws,” March 14, 2024. Link: https://environmentalintegrity.org/wp-content/uploads/2024/03/Feeding-the-Plastics-Industrial-Complex-3.14.24.pdf.
[25] Environmental Integrity Project, “Plastics Plants Inventory,” as of July 2, 2024. Link: https://environmentalintegrity.org/plastics-plant-inventory/.
[26] Nihan Karali, Nina Khanna, and Nihar Shah, "Climate Impact of Primary Plastic Production," April 2024. Link: https://escholarship.org/uc/item/6cc1g99q.
[27] U.S. Environmental Protection Agency, “Learn about Dioxin.” Accessed August 2024. Link: https://www.epa.gov/dioxin/learn-about-dioxin.
[28] U.S. Environmental Protection Agency, “Integrated Risk Information System: 1,4 Dioxane,” September 20, 2013. Link: https://iris.epa.gov/ChemicalLanding/&substance_nmbr=326.
[29] 40 CFR Part 414.
[30] Here and elsewhere in this report, when we refer to “wastewater,” we are referring specifically to “process wastewater,” a variety of wastewater that comes into contact with the process of manufacturing chemicals, or a mixture of wastewater that includes process wastewater.
[31] NPDES stands for National Pollutant Discharge Elimination System.
[32] 33 USC §§ 1251(a)(1), 1311(b)(2), 1317(a)(2).
[33] *Kennecott v. EPA*, 780 F.2d 445, 448 (4th Cir. 1985).
[34] *Sw. Elec. Power Co. v. EPA*, 920 F.3d 999, 1005 (5th Cir. 2019); see also *Citizens Coal Council v. EPA*, 447 F.3d 879, 883 (6th Cir. 2006) (the CWA “directs EPA to institute progressively more stringent effluent discharge guidelines in stages”) (quoting *BP Explor. & Oil, Inc. v. EPA*, 66 F.3d 784, 789 (6th Cir. 1995)).
[35] 40 CFR Part 414.
[36] 40 CFR Part 414; 52 Fed. Reg. 42,522 (Nov. 5, 1987); 58 Fed. Reg. 36,872 (July 9, 1993).
[37] U.S. Environmental Protection Agency, “Preliminary Technology Review: Membrane Wastewater Treatment Systems,” September 14, 2021. Link: https://www.regulations.gov/document/EPA-HQ-OW-2021-0547-0172.
[38] *See, e.g.*, 47 Fed. Reg. 28,260, 28,262 (June 29, 1982) (EPA rejecting use of membrane filtration as infeasible for the inorganic chemicals sector).
[39] U.S. Environmental Protection Agency, “Preliminary Technology Review: Membrane Wastewater Treatment Systems,” September 14, 2021. Link: https://www.regulations.gov/document/EPA-HQ-OW-2021-0547-0172.
[40] By “wastewater” here and elsewhere in the report, we are referring specifically to “process” wastewater, a variety of wastewater that comes into contact with the chemical manufacturing process, or a mixture of wastewater that includes process wastewater. 33 USC §§ 1311(b)(2)(A), 1317(a)(1), 1317(a)(2), 1342(p)(2)(B).
[41] 52 Fed. Reg. 42,522 (Nov. 5, 1987).
[42] U.S. Environmental Protection Agency, “Development Document for Effluent Limitations Guidelines New Source Performance Standards and Pretreatment Standards for the Organic Chemicals and The Plastics And Synthetic Fibers Point Source Category, Vol. I,” October 1987. Link: https://www.epa.gov/sites/default/files/2015-10/documents/ocpsf_tdd_1987_vol1.pdf; see also 52. Fed. Reg. at 42,544 (“There are one metal priority pollutant (antimony) and three organic priority pollutants (2,4,6-trichlorophenol and 3,3'-dichlorobenzidine and dioxin) for which the Agency does not have sufficient data to regulate or exclude them in the end-of-pipe biological treatment subcategory.”)
[43] 58 Fed. Reg. 36,872 (July 9, 1993).
[44] *See* 52 Fed. Reg. at 42,566 (excluding “general site surface runoff,” from any OCPSF limits).
[45] 40 CFR §§ 125.3(a)(2), (3); see also *Comment to 40 C.F.R.* § 125.3 (“These factors must be considered in all cases, regardless of whether the permit is being issued by EPA or an approved State”).
[46] 40 CFR Part 122.
[47] These estimates are likely low because of incomplete records obtained from the Texas Commission on Environmental Quality (records for 6 facilities lacked nitrogen data, and 10 lacked phosphorus data). Assumes the average municipal wastewater treatment plant discharges 123,000 pounds of nitrogen and 17,800 pounds of phosphorus per year. U.S. Environmental Protection Agency, “Environmental Assessment for the Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category,” September 2015. Link: https://www.epa.gov/sites/default/files/2015-10/documents/steam-electric-envir_10-20-15.pdf.
[48] U.S. Environmental Protection Agency, “EPA’s Review of Nutrients in Industrial Wastewater Discharge,” December 2020. Link: https://www.regulations.gov/document/EPA-HQ-OW-2018-0618-0659.
[49] Ibid.
[50] Ibid.
[51] EPA evaluated nutrient removal methods and treatments in its 2020 Nutrient Study and identified three treatment levels for nitrogen and phosphorus removal. The report showed the most advanced nutrient removal technologies can achieve concentrations below 2 milligrams of total nitrogen per liter and 0.02 milligrams of total phosphorus per liter. EIP is comparing facilities to “Level 4” treatment, which include biological nutrient removal, nitrification/denitrification and biological phosphorus removal, high rate clarification and denitrification filtration, which achieves concentrations of 3 milligrams per liter of Total Nitrogen and 0.1 milligrams per liter of Total Phosphorus. However, EIP’s review of permit applications, in addition to monitoring reports, show total nitrogen and phosphorus concentrations may be higher. See Appendix C for more information. U.S. Environmental Protection Agency, “EPA’s Review of Nutrients in Industrial Wastewater Discharge,” December 2020, Table 3-1. Link: https://www.regulations.gov/document/EPA-HQ-OW-2018-0618-0659.
[52] U.S. Environmental Protection Agency, “EPA’s Review of Nutrients in Industrial Wastewater Discharge,” December 2020, Table 3-1. Link: https://www.regulations.gov/document/EPA-HQ-OW-2018-0618-0659.
[53] EIP analysis of demographic data in EPA Enforcement and Compliance History Online (ECHO) and EJScreen databases. Links: https://echo.epa.

gov/ and https://www.epa.gov/ejscreen
[54] U.S. Environmental Protection Agency, "Enforcement and Compliance History Online (ECHO): Detailed Facility Report: Dow Hydrocarbons & Resources LLC - Louisiana Operations - Plaquemine." Accessed September 27, 2024. Link: https://echo.epa.gov/detailed-facility-report?fid=110064635293#community.
[55] The Occidental OxyChem Ingleside plant released the second highest nitrogen concentration among the 70 plastics plants in this analysis, 105 milligrams per liter.
[56] 40 CFR §§ 125.3(a)(2), (3); *see also Comment to 40 C.F.R. § 125.3* ("These factors must be considered in all cases, regardless of whether the permit is being issued by EPA or an approved State").
[57] The one plant with a permit limit for phosphorus was the Indorama Ventures Xylenes and PTA plant in Alabama.
[58] Ammonia is one of several nitrogen compounds. See Methodology for more details.
[59] U.S. Environmental Protection Agency, "Technical Fact Sheet – 1,4-Dioxane," January 2014. Link: https://semspub.epa.gov/work/01/575107.pdf.
[60] U.S. Environmental Protection Agency, Office of Drinking Water, "Health Advisory: p-dioxane," March 31, 1987. Link: https://nepis.epa.gov/Exe/ZyPDF.cgi/2000SOXI.PDF?Dockey=2000SOXI.PDF.
[61] U.S. Environmental Protection Agency, "Final Risk Evaluation for 1,4-Dioxane," July 15, 2024. Link: https://www.epa.gov/assessing-and-managing-chemicals-under-tsca/final-risk-evaluation-14-dioxane; U.S. Environmental Protection Agency, "1,4-Dioxane Draft Revised Unreasonable Risk Determination," July 2023. Link: https://www.epa.gov/system/files/documents/2023-07/Draft%20Revised%20Risk%20Determination%2014-Dioxane-2023.pdf.
[62] Water releases reported to the Toxics Release Inventory (TRI) reflect discharges to surface waters from process outfalls and trenches and discharges from on-site wastewater treatment systems, which may include pollution from stormwater. EIP is using 1,4-dioxane from the 2022 TRI because 2023 TRI data is not finalized as of September 2024. EIP estimated 1,4-dioxane releases in 2022 and 2023 using limited discharge monitoring data which is accessible in the attached spreadsheet, but data is limited to just five facilities with monitoring requirements in their permits. U.S. Environmental Protection Agency, "Toxics Release Inventory (TRI) Explorer." Accessed August 30, 2024. Link: https://enviro.epa.gov/triexplorer/tri_release.chemical.
[63] NPDES Permit WV0000132 (April 27, 2021). Issued by the West Virginia Department of Environmental Protection to APG Polytech, Apple Grove Facility.
[64] Hogue, Cheryl, "1,4-Dioxane: Another forever chemical plagues drinking-water utilities," *Chemical & Engineering News*, November 8, 2020. Link: https://cen.acs.org/environment/pollution/14-Dioxane-Another-forever-chemical/98/i43; Godri Pollitt, Krystal J., et al., "1,4-Dioxane as an emerging water contaminant: State of the science and evaluation of research needs," *Science of the Total Environment*, Vol. 690, November 10, 2019. Link: https://doi.org/10.1016/j.scitotenv.2019.06.443.
[65] McElroy, Amie C., Hyman, Michael R., Detlef R.U. Knappe, "1,4-Dioxane in drinking water: emerging for 40 years and still unregulated," *Current Opinion in Environmental Science & Health*, Vol. 7, February 2019. Link: https://doi.org/10.1016/j.coesh.2019.01.003.
[66] Specifically, EPA estimates people drinking water contaminated with concentrations of 1,4-dioxane above 35 micrograms per liter over a lifetime face a cancer risk of 1 in 10,000. NPDES Permit NC0026123 Fact Sheet (August 29, 2022). Issued by the North Carolina Department of Environmental Quality to the City of Asheboro, Asheboro WWTP; U.S. Environmental Protection Agency, Office of Water, "2018 Edition of the Drinking Water Standards and Health Advisories," March 2018. Link: https://19january2021snapshot.epa.gov/sites/static/files/2018-03/documents/dwtable2018.pdf.
[67] U.S. Environmental Protection Agency, "1,4-Dioxane Draft Revised Unreasonable Risk Determination," July 2023. Link: https://www.epa.gov/system/files/documents/2023-07/Draft%20Revised%20Risk%20Determination%2014-Dioxane-2023.pdf.
[68] U.S. Environmental Protection Agency, "Third Unregulated Contaminant Monitoring Rule (UCMR) Data Summary: 2013-2015," March 2024. Accessed August 30, 2024. Link: https://www.epa.gov/system/files/documents/2024-04/ucmr3-data-summary.pdf.
[69] U.S. Environmental Protection Agency, "Learn about Dioxin." Accessed August 2024. Link: https://www.epa.gov/dioxin/learn-about-dioxin.
[70] For 2,3,7,8-tetrachlorodibenzodioxin (2,3,7,8-TCDD), specifically. U.S. Environmental Protection Agency, "Consumer Factsheet on: DIOXIN (2,3,7,8-TCDD)." Accessed September 2024. Link: https://archive.epa.gov/water/archive/web/pdf/archived-consumer-fact-sheet-on-dioxin.pdf.
[71] The drinking water limit for 2,3,7,8-TCDD is 0.0003 milligrams per liter, so one TCDD droplet (assumed to = 90 milligrams) would contaminate 3 million liters of water, or 792,517 gallons (1 gallon = 3.78541 liters). Assuming the average person uses 82 gallons of water per day, 365 days per year, a person would use 792,602 gallons in 26 years. Average volume of an average backyard is assumed to be 18,000 gallons. U.S. Environmental Protection Agency, "WaterSense: Statistics and Facts," Accessed September 2024. Link: https://www.epa.gov/watersense/statistics-and-facts; Sierra Club, "Facts About Texas Water," January 2003. Link: http://www.texasthestateofwater.org/screening/pdf_docs/texas_water_facts/facts3.pdf.
[72] Belliveau, Michael and Stephen Lester, "PVC Bad News Comes in 3s," *The Center for Health, Environment and Justice and The Environmental Health Strategy Center*," December 2004. Link: https://chej.org/wp-content/uploads/PVC%20-%20Bad%20News%20Comes%20in%203%27s%20-%20REP%20005.pdf.; U.S. Environmental Protection Agency, "Consumer Factsheet on: DIOXIN (2,3,7,8-TCDD)." Accessed September 2024. Link: https://archive.epa.gov/water/archive/web/pdf/archived-consumer-fact-sheet-on-dioxin.pdf.
[73] U.S. Environmental Protection Agency, "Development Document for Effluent Limitations Guidelines New Source Performance Standards and Pretreatment Standards for the Organic Chemicals and the Plastics and Synthetic Fibers Point Source Category, Vol. I," October 1987, Link: https://www.epa.gov/sites/default/files/2015-10/documents/ocpsf_tdd_1987_vol1.pdf; *see also* 52. Fed. Reg. 42,522, 42,544 (Nov. 5, 1987) ("There are one metal priority pollutant (antimony) and three organic priority pollutants (2,4,6-trichlorophenol and 3,3'-dichlorobenzidine and dioxin) for which the Agency does not have sufficient data to regulate or exclude them in the end-of-pipe biological treatment subcategory.")

[74] EIP reviewed wastewater permit applications for these 17 facilities and found 12 reported 2,3,7,8-TCDD, the most toxic form of dioxin, was not present in their wastewater. Still, six of those facilities reported releasing dioxins and dioxin-like compounds to surface waters in the 2022 Toxics Release Inventory, the most recent year final data is available. Companies are required to disclose the amount of 2,3,7,8-TCDD in their facility's process wastewater discharges when applying for wastewater discharge permits. TRI data, however, includes the broader category of dioxins and dioxin-like compounds and may include additional wastewater streams.

[75] Water releases reported to the Toxics Release Inventory (TRI) reflect discharges to surface waters from process outfalls and trenches and discharges from on-site wastewater treatment systems, which may include pollution from stormwater. U.S. Environmental Protection Agency, "Toxics Release Inventory (TRI) Explorer." Accessed August 2024. Link: https://enviro.epa.gov/triexplorer/tri_release.chemical.

[76] The Pasadena and Deer Park PVC plants did not report dioxin releases to the TRI and claimed in permit applications that 2,3,7,8-TCDD was not present in wastewater.

[77] Karlsson, Therese M., et al., "The unaccountability case of plastic pellet pollution," *Marine Pollution Bulletin Vol.* 129, April 2018. Link: https://www.sciencedirect.com/science/article/pii/S0025326X18300523?via%3Dihub.

[78] Perkins, Sam, Doran, Joshua, Dr. Jon Burton, "Mapping the Global Plastic Pellet Supply Chain," *Prepared for Fidra by Oracle Environmental Experts Ltd*, August 2023. Link: https://hub.nurdlehunt.org/resource/oracle-mapping-the-global-plastic-pellet-supply-chain/; Tunnell, Jace W., et al., "Measuring plastic pellet (nurdle) abundance on shorelines throughout the Gulf of Mexico using citizen scientists: Establishing a platform for policy-relevant research," *Marine Pollution Bulletin Vol.* 151, February 2020. Link: https://www.sciencedirect.com/science/article/pii/S0025326X19309506.

[79] Perkins, Sam, Doran, Joshua, Dr. Jon Burton, "Mapping the Global Plastic Pellet Supply Chain," *Prepared for Fidra by Oracle Environmental Experts Ltd*, August 2023. Link: https://hub.nurdlehunt.org/resource/oracle-mapping-the-global-plastic-pellet-supply-chain/.

[80] Environment America, "Where is Plastic Produced?" July 2024. Accessed August 30, 2024. Link: https://environmentamerica.org/resources/where-is-plastic-produced/.

[81] Perkins, Sam, Doran, Joshua, Dr. Jon Burton, "Mapping the Global Plastic Pellet Supply Chain," *Prepared for Fidra by Oracle Environmental Experts Ltd*, August 2023. Link: https://hub.nurdlehunt.org/resource/oracle-mapping-the-global-plastic-pellet-supply-chain/.

[82] Nurdle Patrol, "Nurdle Map," *Mission-Aransas National Estuarine Research Reserve (Reserve) at the University of Texas Marine Science Institute*. Accessed August 29, 2024. Link: https://nurdlepatrol.org/app/map.

[83] Dhanesha, Neel, "The Massive, Unregulated Source of Plastic Pollution You've Probably Never Heard of," Vox, May 6, 2022. Link: https://www.vox.com/recode/23056251/nurdles-plastic-pollution-ocean-microplastics.

[84] Perkins, Sam, Doran, Joshua, Dr. Jon Burton, "Mapping the Global Plastic Pellet Supply Chain," *Prepared for Fidra by Oracle Environmental Experts Ltd*, August 2023. Link: https://hub.nurdlehunt.org/resource/oracle-mapping-the-global-plastic-pellet-supply-chain/.

[85] Ibid; Karlsson, Therese M., et al., "The unaccountability case of plastic pellet pollution," *Marine Pollution Bulletin Vol.* 129, April 2018. Link: https://www.sciencedirect.com/science/article/pii/S0025326X18300523?via%3Dihub.

[86] Perkins, Sam, Doran, Joshua, Dr. Jon Burton, "Mapping the Global Plastic Pellet Supply Chain," *Prepared for Fidra by Oracle Environmental Experts Ltd*, August 2023. Link: https://hub.nurdlehunt.org/resource/oracle-mapping-the-global-plastic-pellet-supply-chain/.

[87] San Antonio Bay Estuarine Waterkeeper, et al, vs. Formosa Plastics Corp., Texas, civil action 6:17-CV-47, U.S. District Court for the Southern District of Texas, Victoria Division, June 27, 2019. Link: https://static.texastribune.org/media/files/18f831aad20a56a2b7e2b4e04f02e0e1/Formosa%20settlement.pdf.

[88] Fernández, Stacy, "Plastic company set to pay $50 million settlement in water pollution suit brought on by Texas residents," *The Texas Tribune*, October 15, 2019. Link: https://www.texastribune.org/2019/10/15/formosa-plastics-pay-50-million-texas-clean-water-act-lawsuit/.

[89] Southern Environmental Law Center, "Press Release: Groups file lawsuit against Frontier Logistics over plastic pollution," March 18, 2020. Link: https://www.southernenvironment.org/press-release/groups-file-lawsuit-against-frontier-logistics-over-plastic-pollution/.

[90] Southern Environmental Law Center, "Frontier Logistics agrees to $1.2 million settlement in pellet-pollution lawsuit," March 3, 2021. Link: https://www.southernenvironment.org/news/frontier-logistics-agrees-to-1-2-million-settlement-in-pellet-pollution-lawsuit/.

[91] U.S. Environmental Protection Agency, "Narrative Water Quality Criteria Related to Trash and Plastics." Accessed October 2024. Link: https://www.epa.gov/wqs-tech/narrative-water-quality-criteria-related-trash-and-plastics.

[92] H.R.7634 – 118th Congress (2023-2024): Plastic Pellet Free Waters Act, H.R. 7634, 118th Cong. (2024). Link: https://www.congress.gov/bill/118th-congress/house-bill/7634?s=6&r=1.

[93] Tex. H.B. 3814, 87R Leg., 2021. Link: https://capitol.texas.gov/BillLookup/History.aspx?LegSess=87R&Bill=HB3814.

[94] Fox, Radhika, Assistant Administrator, U.S. Environmental Protection Agency, Office of Water, Memorandum to EPA Regional Water Division Directors, Regions 1-10, December 5, 2022. Link: https://www.epa.gov/system/files/documents/2022-12/NPDES_PFAS_State%20Memo_December_2022.pdf.

[95] Ibid.

[96] U.S. Environmental Protection Agency, Office of Water, "Multi-Industry Per – and Polyfluoroalkyl Substances (PFAS) Study – 2021 Preliminary Report," September 2021. Link: https://www.epa.gov/system/files/documents/2021-09/multi-industry-pfas-study_preliminary-2021-report_508_2021.09.08.pdf.

[97] Wastewater, in this sense, is "process wastewater." See, e.g., Michigan Department of Environment, Great Lakes, and Energy, *Evaluation of PFAS in Influent, Effluent, and Residuals of Wastewater Treatment Plants* (WWTPs) in Michigan at Table 11 (at least two OCPSF facilities sent measurable levels of PFAS to Michigan domestic wastewater plants).

[98] Specifically, "Class B" firefighting foams often contain PFAS. Interstate Technology & Regulatory Council, "PFAS – Per- and Polyfluoroalkyl Substances: Fire Fighting Foams." Accessed September 2024. Link: https://pfas-1.itrcweb.org/3-firefighting-foams/.

[99] According to an EIP Google search of online news articles, by plant or facility name, since 2000 that mention fires or explosions.
[100] Interstate Technology & Regulatory Council, "PFAS – Per- and Polyfluoroalkyl Substances: Fire Fighting Foams," September 2023. Accessed September 2024. Link: https://pfas-1.itrcweb.org/3-firefighting-foams/.
[101] 86 Fed. Reg. 14560 (March 17, 2021), Advance Notice of Proposed Rulemaking for PFAS Manufacturers and Formulators.
[102] U.S. Environmental Protection Agency, "Chemours Washington Works History and Safe Drinking Water Act (SWDA) Settlements." Accessed September 27, 2024. Link: https://www.epa.gov/oh/chemours-washington-works-history-and-safe-drinking-water-act-swda-settlements#:~:text=water%2C%20or%20soil.-,EPA%20SDWA%20Actions%20at%20Washington%20Works,DuPont%20facilities%20in%20West%20Virginia; Minnesota Pollution Control Agency, "East Metro | 3M PFAS contamination." Accessed September 2024. Link: https://www.pca.state.mn.us/local-sites-and-projects/east-metro-3m-pfas-contamination.
[103] U.S. Environmental Protection Agency, "Addition of Certain PFAS to the TRI by the National Defense Authorization Act." Accessed September 2024. Link: https://www.epa.gov/toxics-release-inventory-tri-program/addition-certain-pfas-tri-national-defense-authorization-act.
[104] By wastewater, here we are referring specifically to "process water," a type of wastewater that comes into contact with the manufacturing process. U.S. General Services Administration: Office of Information and Regulatory Affairs, "PFAS Requirements in NPDES Permit Applications," Fall 2023. Accessed September 2024. Link: https://www.reginfo.gov/public/do/eAgendaViewRule?pubId=202310&RIN=2040-AG34.
[105] The Arkema Mobile Facility (AL0042447) permit only requires monitoring. The Chemours Washington Works (WV0001279), a PFAS and plastics manufacturer, has PFAS limits in its permit. The 3M Cottage Grove (MN0001449) processes PFAS chemicals, but as of September 2024, its wastewater permit does not include PFAS monitoring or limits. The Minnesota Pollution Control Agency proposed a draft permit in July 2024 which, if issued, would add limits for some PFAS compounds. U.S. Environmental Protection Agency, "PFAS Analytical Tools: PFAS Discharge Monitoring Report Data from CWA NPDES." Accessed October 2024. Link: https://awsedap.epa.gov/public/extensions/PFAS_Tools/PFAS_Tools.html; Minnesota Pollution Control Agency, "Cottage Grove | 3M Chemical Operations," Accessed September 25, 2024. Link: https://www.pca.state.mn.us/local-sites-and-projects/cottage-grove-3m-chemical-operations.
[106] Interstate Technology Regulatory Council, "PFAS - Per- and Polyfluoroalkyl Substances. 3 Firefighting Foams." Accessed October 2024. Link: https://pfas-1.itrcweb.org/3-firefighting-foams/; See, e.g., Louisiana Revised Statutes Tit. 40, § 1615 (PFAS restrictions exclude emergency firefighting and some training).
[107] U.S. Geological Survey, "Chloride, Salinity, and Dissolved Solids," March 2019. Link: https://www.usgs.gov/mission-areas/water-resources/science/chloride-salinity-and-dissolved-solids.
[108] U.S. Environmental Protection Agency, "Ethylene Glycol," January 2000. Link: https://19january2017snapshot.epa.gov/sites/production/files/2016-09/documents/ethylene-glycol.pdf.
[109] S. Dobson, "Ethylene Glycol : Environmental aspects," prepared by Institute of Terrestrial Ecology, Natural Environment Research Council, Huntingdon, United Kingdom, published by World Health Organization, 2000. Link: https://iris.who.int/bitstream/handle/10665/42268/9241530227.pdf; Charles A. Staples et al, "Fate, effects and potential environmental risks of ethylene glycol: a review," Chemosphere, April 2001, Pages 377-383. Link: https://www.sciencedirect.com/science/article/abs/pii/S004565350000148X.
[110] World Health Organization, "Mercury and Health," March 31, 2017. Accessed September 2024. Link: https://www.who.int/news-room/fact-sheets/detail/mercury-and-health.
[111] University of Georgia Extension, "Understanding Laboratory Wastewater Tests: I. Organics (BOD, COD, TOC, O&G)," Circular 992, July 2022. Link: https://secure.caes.uga.edu/extension/publications/files/pdf/C%20992_6.PDF.
[112] European Environment Agency, "Total Organic Carbon (TOC)." Accessed October 2024. Link: https://www.eea.europa.eu/help/glossary/eper-chemicals-glossary/total-organic-carbon-toc.
[113] Compliance status and violations in EPA's Enforcement and Compliance History Online (ECHO) database are based on industry self-reported data. EPA considers violations as alleged violations and data in ECHO does not necessarily represent final, legal determinations nor imply companies were charged with criminal or civil violations or convicted in court. EPA has flagged certain data quality errors that could impact data reported in ECHO. EIP has worked to verify effluent data and violations for facilities in states impacted by these potential errors. See methodology in Appendix A for more details. U.S. Environmental Protection Agency, "Enforcement and Compliance History Online (ECHO)." Accessed August 2024. Link: https://echo.epa.gov/.
[114] U.S. Environmental Protection Agency, "National Pollutant Discharge Elimination System (NPDES): NPDES Permit Basics," December 11, 2023. Accessed September 2024. Link: https://www.epa.gov/npdes/npdes-permit-basics.
[115] As of August 1, 2024, EPA data indicated the NPDES permit for the Alpek Polyester Cedar Creek plant in Fayetteville, NC (Permit NC0003719) had expired October 31, 2022. Documents available on the North Carolina Department of Environmental Quality website show the company submit a permit application on May 3, 2022, prior to the 180-day deadline, but the state has not issued a new permit as of August 23, 2024. EIP is identifying this permit as administratively continued, rather than expired.
[116] These include, according to permit status on EPA ECHO, Koch/INVISTA Nylon Camden Plant (SC0002585), expired 3/31/2018; Alpek Polyester Cooper River Site (SC0026506), expired 8/31/2018; Dow Freeport (TX0006483), expired 7/1/2019; and 3M Cottage Grove (MN0001449), expired 1/31/2008. According to the Minnesota Pollution Control Agency, the 3M Cottage Grove permit renewal was delayed by litigation. The agency proposed a draft permit in July 2024. As of September 25, 2024, a final permit has not been issued. Minnesota Pollution Control Agency, "Cottage Grove | 3M Chemical Operations," Accessed September 25, 2024. Link: https://www.pca.state.mn.us/local-sites-and-projects/cottage-grove-3m-chemical-operations.
[117] Hiatt, James, Director, For a Better Bayou, interview with the Environmental Integrity Project on August 14, 2024.
[118] Among facilities reporting dioxin and dioxin-like compounds to EPA's Toxics Release Inventory (TRI). The company has reported to TRI that

dioxin and dioxin-like compounds are both produced and a byproduct of the facility, and discharged 38.6 grams of dioxin and dioxin-like compounds to the Calcasieu River in 2022. Water releases reported to TRI can include water releases from process outfalls and stormwater, but the company did not report releases of this pollutant were attributable to stormwater. U.S. Environmental Protection Agency, "Toxics Release Inventory (TRI) Explorer." Accessed September 2024. Link: https://enviro.epa.gov/triexplorer/tri_release.chemical; U.S. Environmental Protection Agency, "Toxics Release Inventory, Form R Reports, Document Control No. 1322220872737." Accessed October 2024. Link: https://enviro.epa.gov/envirofacts/tri/form-r/dcn-details/1322220872737/2022.

[119] Louisiana Department of Environmental Quality, "Fishing Consumption and Swimming Advisories." Accessed August 11, 2024. Link: https://deq.louisiana.gov/page/fishing-consumption-and-swimming-advisories.

[120] LPDES Permit No. LA0000761 (October 11, 2022). Issued by Louisiana Department of Environmental Quality to Westlake Eagle US 2 LLC Lake Charles Complex. Link: https://environmentalintegrity.org/wp-content/uploads/2024/09/2022.10.11_Eagle-US-2-Lake-Charles_LA0000761-Permit-and-Rationale.pdf.

[121] EIP searched for fish consumption health advisory signs or postings at the public boat launch at the Prien Lake Park, at 3700 W. Prien Lake Road in Lake Charles, on August 14 and 15 of 2024, and did not find any. Nor did EIP find any fish consumption advisories posted those days along the public fishing areas along Lakeshore Drive near the Lake Charles Event Center. During EIP's interviews with six fishers in these areas, they said they do eat fish from the Calcasieu River.

[122] Pollution discharges estimated from 2023 discharge monitoring reports and sampling data in the facility's permit application, NPDES ID LA0000761.

[123] Guidry, Ike, interview with the Environmental Integrity Project in Sulphur, Louisiana, on August 15, 2024.

[124] Pollution discharges estimated from 2023 discharge monitoring reports and sampling data in the facility's permit application, NPDES ID LA0000761.

[125] Louisiana Department of Environmental Quality, Electronic Document Management System (EDMS), "Southwest Regional Office Incident Report Document No. 13191451," February 11, 2022. Link: https://edms.deq.louisiana.gov/app/doc/view?doc=13191451.

[126] Geary, Paul, interview with the Environmental Integrity Project, on the Calcasieu River near Lake Charles, Louisiana, on August 14, 2024.

[127] Cipriano, Rebecca, interview with the Environmental Integrity Project in Lake Charles, Louisiana, on August 14, 2024.

[128] USA, LDEQ et al vs. Citgo, Occidental, PPG et al, Civil Action 2:18-cv-00402, consent decree filed October 15, 2018. Link: https://pub-data.diver.orr.noaa.gov/admin-record/6221/BDI%20-%20Court%20approved%20CD.pdf

[129] Among sources required to report discharges to EPA's Toxics Release Inventory. U.S. Environmental Protection Agency, "Toxics Release Inventory (TRI) Explorer." Accessed September 2024. Link: https://enviro.epa.gov/triexplorer/tri_release.chemical.

[130] West Virginia/NPDES Permit Number WV0000132 (April 27, 2021). Issued by the West Virginia Department of Environmental Protection Division of Water and Waste Management to APG Polytech, LLC. Link: https://environmentalintegrity.org/wp-content/uploads/2024/09/APG-Final-Permit.pdf.

[131] West Virginia Department of Environmental Protection, "Consent Order Issued Under the Water Pollution Control Act West Virginia Code Chapter 22, Article 11, Order No. 10184," November 8, 2023. Link: https://documents.dep.wv.gov/AppXtender/datasources/DEPAX16/applications/38/document/1071136?qrid=%7B0b1e0a68-803f-4f2e-8d78-a456aa696fd8%7D&qridx=24.

[132] U.S. Environmental Protection Agency, "Enforcement and Compliance History Online, Effluent Charts for AGP Polytech, LLC NPDES Permit No. WV0000132." Accessed September 2024. Link: https://echo.epa.gov/effluent-charts#WV0000132.

[133] These are limited to facilities required to report to EPA's Toxics Release Inventory and those that reported a non-zero value for surface water releases. U.S. Environmental Protection Agency, "Toxics Release Inventory (TRI) Explorer." Accessed September 2024. Link: https://enviro.epa.gov/triexplorer/tri_release.chemical.

[134] Stuck, Richard, Source Water Protection Manager, Greater Cincinnati Water works, "Using the TRI and Clean Water Act to Reduce 1,4-Dioxane in the Ohio River," October 25, 2023. Link: https://www.epa.gov/system/files/documents/2023-11/stuck-richard_using-the-tri-and-clean-water-act-to-reduce-14-dioxane-in-the-ohio-river-508.pdf.

[135] West Virginia/NPDES Permit Number WV0000132 (April 27, 2021). Issued by the West Virginia Department of Environmental Protection Division of Water and Waste Management to APG Polytech, LLC. Link: https://environmentalintegrity.org/wp-content/uploads/2024/09/APG-Final-Permit.pdf.

[136] U.S. Environmental Protection Agency, "Enforcement and Compliance History Online, Effluent Charts for AGP Polytech, LLC NPDES Permit No. WV0000132." Accessed September 2024. Link: https://echo.epa.gov/effluent-charts#WV0000132.

[137] Initial permit limits were based on concentration-based limits of 60,200 micrograms per liter averaged monthly and 90,800 micrograms per liter maximum daily. Assuming compliance with the final permit limits and an average flow of 0.19 million gallons per day, the average flow for outfalls 001 and 002 in 2023, the final limit of 152 micrograms per liter averaged monthly should reduce discharges from 95.5 pounds per day to 0.24 pounds per day. WV/NPDES Permit Number WV0000132, Modified July 5, 2022. Link: https://documents.dep.wv.gov/AppXtender/datasources/DEPAX16/applications/38/document/966673?lqid=-1&lqrid=%7B0b1e0a68-803f-4f2e-8d78-a456aa696fd8%7D&lqaid=38&qrid=%7B0b1e0a68-803f-4f2e-8d78-a456aa696fd8%7D&qridx=67.

[138] Data from 2023 discharge monitoring reports for the Alpek Columbia plant suggest an estimated 32,078 pounds of 1,4-dioxane released in 2023 (See Appendix A for EIP's methodology for calculating loads from discharge monitoring reports). Preliminary numbers from EPA's Toxics Release Inventory show slightly different figures, 29,684 pounds of 1,4-dioxane in 2023. U.S. Environmental Protection Agency, "Enforcement and Compliance History Online, Effluent Charts for Alpek Polyester USA, LLC, NPDES Permit No. SC0001333." Accessed September 2024. Link: https://echo.epa.gov/effluent-charts#SC0001333; U.S. Environmental Protection Agency, "Toxics Release Inventory Facility Report: Alpek Polyester USA LLC

– Columbia Site." Accessed September 2024. Link: https://enviro.epa.gov/facts/tri/ef-facilities/#/Water/2905WDKMRC57KAV.
[139] Email from Bill Stangler, Congaree Riverkeeper, to the Environmental Integrity Project on September 4, 2024.
[140] U.S. Environmental Protection Agency, "Integrated Risk Information System (IRIS) Chemical Assessment Summary: 1-4 Dioxane; CASRN 123-91-1," September 20, 2013. Link: https://iris.epa.gov/static/pdfs/0326_summary.pdf.
[141] West Virginia/NPDES Permit Number WV0000132, Modified July 5, 2022. Link: https://documents.dep.wv.gov/AppXtender/datasources/DEPAX16/applications/38/document/966673?lqid=-1&lqrid=%7B0b1e0a68-803f-4f2e-8d78-a456aa696fd8%7D&lqaid=38&qrid=%7B0b1e0a68-803f-4f2e-8d78-a456aa696fd8%7D&qridx=67.
[142] West Virginia Rivers Coalition, "Action Alert: Our Water, Our Future: Demand Accountability from APG Polytech," August 10, 2023. Accessed September 2024. Link: https://wvrivers.org/2023/08/our-water-our-future-demand-accountability-from-apg-polytech/.
[143] Crowe, Autumn, Director, West Virginia Rivers Coalition, telephone interview with the Environmental Integrity Project, July 23, 2024.
[144] The volunteers gathered on Sylvan Beach on July 31, 2024.
[145] Metzger, Luke, Executive Director, Environment Texas, interview with the Environmental Integrity Project on July 31, 2024.
[146] Strassman, Neil, "Texas' shoreline is swamped by plastic trash – the most of any state," *Texas Climate News*, March 16, 2018. Link: https://texasclimatenews.org/2018/03/16/texas-shoreline-is-swamped-by-plastic-trash-the-most-of-any-state
[147] Collier, Kiah, "Retired Texas shrimper wins record-breaking $50 million settlement from plastics manufacturing giant," *The Texas Tribune*, December 3, 2019. Link: https://www.texastribune.org/2019/12/03/texas-judge-approves-settlement-agreement-water-pollution-formosa/
[148] University of Texas Marine Science Institute, "Nurdle Patrol." Accessed August 30, 2024. Link: https://nurdlepatrol.org/
[149] Environment Texas, "Statement: New bill will tackle large threat posed by tiny plastics." Accessed August 30, 2024. Link: https://environmentamerica.org/texas/media-center/statement-new-bill-will-tackle-large-threat-posed-by-tiny-plastics-2/
[150] Congress.gov, "H.R. 7634 – Plastic Pellet Free Waters Act." Accessed August 30, 2024. Link: https://www.congress.gov/bill/118th-congress/house-bill/7634?q=%7B%22search%22%3A%22chamberActionDateCode%3A%5C%222024-03-12%7C118%7C1000%5C%22+AND+billIsReserved%3A%5C%22N%5C%22%22%7D&s=2&r=14
[151] Steinhaus, Joanie, Ocean Program Director, Turtle Island Restoration Network, interview with the Environmental Integrity Project on July 30, 2024.
[152] U.S. Environmental Protection Agency, Water Pollutant Loading Tool – Resources, "NPDES ID and Parameter Code to Point Source Category (ZIP)," downloaded July 31, 2023. Link: https://echo.epa.gov/trends/loading-tool/resources/
[153] Texas Commission on Environmental Quality, "Water Quality Permit Query." Accessed August 14, 2023. Link: https://www6.tceq.texas.gov/wqpaq/index.cfm?fuseaction=home.AdvanceSearchResult.
[154] Louisiana Department of Environmental Quality, Electronic Document Management System, "Agency Interest Lookup, Type: Chemicals and Allied Products." Accessed August 14, 2023. Link: https://edms.deq.louisiana.gov/edmsv2/ai-lookup.
[155] Environmental Integrity Project and Materials Research, "Plastics Plant Inventory," July 2, 2024. Link: https://environmentalintegrity.org/plastics-plant-inventory/.
[156] Environmental Integrity Project, "Oil's Unchecked Outfalls," January 26, 2023. Link: https://environmentalintegrity.org/reports/oils-unchecked-outfalls/.
[157] U.S. Environmental Protection Agency, "Introduction to the Toxics Release Inventory (TRI) for Industrial and Federal Facilities," July 2022. Link: https://www.epa.gov/system/files/documents/2022-07/Intro%20to%20TRI%20for%20Facilities.pdf; U.S. Environmental Protection Agency, "TRI-Listed Chemicals." Accessed August 31, 2024. Link: https://www.epa.gov/toxics-release-inventory-tri-program/tri-listed-chemicals.
[158] U.S. Environmental Protection Agency, Toxics Release Inventory, "Reporting Forms and Instructions, Section 5. Quantity of the Toxic Chemical Entering Each Environmental Medium On-Site (Form R)." Accessed October 2024. Link: https://ordspub.epa.gov/ords/guideme_ext/f?p=guideme:rfi::::rfi:4_5.
[159] U.S. Environmental Protection Agency, "2023 TRI Preliminary Dataset." Accessed August 9, 2024. Link: https://www.epa.gov/toxics-release-inventory-tri-program/2023-tri-preliminary-dataset.
[160] U.S. Environmental Protection Agency, "Enforcement and Compliance History Online (ECHO)." Accessed September 2024. Link: https://echo.epa.gov/.
[161] U.S. Environmental Protection Agency, "Enforcement and Compliance History Online (ECHO), Data Downloads, ICIS-NPDES National Dataset (Part 1)." Accessed September 2024. Link: https://echo.epa.gov/tools/data-downloads.
[162] U.S. Environmental Protection Agency, "Detailed Facility Report Data Dictionary." Accessed October 2024. Link: https://echo.epa.gov/help/reports/dfr-data-dictionary#CWAComp.
[163] U.S. Environmental Protection Agency, "Enforcement and Compliance History Online (ECHO), Known Data Problems." Accessed August 12, 2024. Link: https://echo.epa.gov/resources/echo-data/known-data-problems.
[164] U.S. Environmental Protection Agency, "EPA's Review of Nutrients in Industrial Wastewater Discharges," December 2020. Link: https://www.regulations.gov/document/EPA-HQ-OW-2018-0618-0659.
[165] U.S. Environmental Protection Agency, "EPA's Review of Nutrients in Industrial Wastewater Discharge," December 2020. Link: https://www.regulations.gov/document/EPA-HQ-OW-2018-0618-0659.
[166] These estimates are likely low because of incomplete records obtained from the Texas Commission on Environmental Quality (records for 6 facilities lacked nitrogen data, and 10 lacked phosphorus data).