# Nonpoint Source Program

## 2023 Annual Report


**DNREC Division of Watershed Stewardship**

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# Preface


South side of the C&D Canal, west of Summit Bridge

The 2023 Nonpoint Source (NPS) Program Annual Report is developed by the Delaware Department of Natural Resources and Environmental Control (DNREC) to meet a grant condition in each annual **Clean Water Act (CWA) Section 319(h)** grant award to the state of Delaware from the U.S. Environmental Protection Agency (EPA). This programmatic condition in the award states that the report shall contain the following:

- A brief summary of progress in meeting the schedule of milestones in the approved **Delaware NPS Management Program**;
- Reductions in nonpoint source pollutant loading and improvements in water quality that have resulted from implementation of the management program; and
- Descriptions of priority watershed-based plan accomplishments. Accomplishments should be based on the implementation of milestone goals/objectives as identified in each priority plan. The goal information can be displayed in the form of a watershed goal/accomplishment chart showing percentage achieved, supplemented by a short narrative that should give the reader a clear understanding of the actions being taken as well as the outputs and outcomes which are occurring from the actions. If monitoring was completed, a summary of that information should also be included.

# What Is Nonpoint Source Pollution?

NPS pollution is defined as polluted stormwater runoff associated with rainfall, snowmelt or irrigation water moving over and through the ground. As this water travels, it can collect and carry pollutants such as sediments, nutrients, toxics and pathogens. These pollutants eventually reach lakes, rivers, streams, wetlands, coastal waters and ground waters of Delaware.


Gas line pier at Port Mahon, Leipsic Watershed

NPS pollution is associated with a variety of activities on the land, including farming, logging, urban/construction runoff, onsite sewage systems, streambank degradation and shore erosion. For example, stormwater runoff from large storm events can transport nutrient sources of nitrogen and phosphorus into local streams, rivers and ponds. Under natural conditions, this is beneficial. However, if excessive nutrients enter these water bodies and cause nuisance algae blooms, then these nutrients are deemed pollutants.

The pollution contributed by nonpoint sources is the main reason why many of Delaware's waters are considered "impaired." Impaired waters are those waters that do not meet Water Quality Standards for designated uses (e.g., fishing, swimming, drinking water, shellfish harvesting, etc.). Progress in managing NPS pollution in Delaware is represented in this report. It was produced by the **DNREC NPS Program to meet the Clean Water Act, Section 319(h)** grant conditions and to demonstrate consistency with **EPA's 2022-2026 Strategic Plan**. The main area of EPA's Strategic Plan in which Delaware intends to focus its work is: Goal 1: Tackle the Climate Crisis, Objective 1.2: Accelerate Resilience and Adaptation to Climate Change Efforts, and Goal 5: Ensure Clean and Safe Water for All Communities, Objectives 5.1: Ensure Safe Drinking Water and Reliable Water Infrastructure and 5.2: Protect and Restore Waterbodies and Watersheds.

# The DNREC NPS Program

As part of DNREC, **Delaware's NPS Program** is committed to addressing the issue of NPS pollution as it affects Delaware's numerous waterbodies. Efforts include grant funding, education, outreach and partnerships with other organizations that work together to reduce NPS pollution in Delaware.

## NPS Program Funding

NPS pollution constitutes the nation's largest source of water quality problems. Approximately 40% of the United States rivers, lakes and estuaries surveyed to date are not clean enough to meet basic uses, such as fishing or swimming, due to NPS pollution.

To counter the ever-expanding NPS pollution problem, Congress established the NPS Pollution Management Program under **Section 319** of the Clean Water Act (CWA) in 1987. This program provides states with grants to implement NPS pollution controls to achieve goals that are described in NPS pollution management program plans.

On Aug. 4, 1988, Delaware's original NPS Program was approved by the EPA, making it one of the first programs in the nation to comply with **Section 319** of the CWA. Delaware administers its NPS Program utilizing the Five-Year Nonpoint Source Program Management Plan that was most recently updated in 2019. Using CWA **Section 319** federal grant funding, Delaware's NPS Program administers a competitive grant program to solicit best management practices (BMP) implementation project proposals that address NPS pollution and enhance water quality efforts.

The grant provides funding for projects designed to reduce NPS pollution in Delaware's impaired waterbodies. Reduction of NPS pollution is most often achieved through incorporation of specific BMPs into project workplans. Whenever possible, funds are focused in sub-watersheds where NPS control activities are likely to have the greatest positive impact. Funded restoration activities are implemented using the most effective measures and practices available in order to achieve water quality improvements.

Eligible types of management program implementation activities include the following:

- Non-regulatory NPS reduction programs
- Technical assistance
- Financial assistance
- Education
- Training
- Technology transfer
- Demonstration projects

Proposals are solicited annually from potential grant applicants through an advertised request for proposal (RFP) process. These grant application proposals are reviewed, evaluated and prioritized to determine which are most suitable for implementation funding. At least 40% of the overall project cost must be represented by non-federal matching funds.

## Delaware NPS Issues

More than 90% of Delaware's waterways are considered impaired. The state's list of impaired waters in the most recently issued **2022 State of Delaware Combined Watershed Assessment Report (305(b)** and Determination for the Clean Water Act Section 303(d) List of Waters Needing TMDLs, includes assessment units (waterbodies and stream segments) throughout the state with 10 different impairments. The most common impairments are NPS-related pollutants including pathogens and nutrients (nitrogen and phosphorus).

Most impairments come from nonpoint sources which are harder to control. As Delaware is a groundwater-driven state, removing NPS pollutants becomes an even more difficult and complex problem to solve. Due to the rate that groundwater travels through the system, many NPS pollutants that entered the systems 30 years ago are just now entering surface water bodies at the present day. As such, the effectiveness of current agricultural BMPs will not be realized until much further in the future.

"Impaired waters" are polluted waters. More technically, they are waters that do not meet water quality standards for their designated uses, such as recreation, fishing or drinking. Waters designated as impaired could be suffering from excess nutrients, low dissolved oxygen, toxins, bacteria, heat or any combination of these problems.

Reduction of NPS pollution is achieved through the incorporation or installation of specific BMPs addressing agriculture, silviculture, construction, septic systems and hydromodification activities. To encourage and support the BMP installation, the NPS Program administers a competitive grant program currently made possible through **Section 319** of the CWA. While this federal financial support has proven successful in complementing Delaware's NPS efforts, the NPS Program routinely seeks additional finances to expand activities to more systematically address Delaware's NPS concerns.

Additional roles and responsibilities of the NPS Program include geospatial BMP tracking and reporting, assisting with the management of the **Chesapeake Bay Implementation Grant (CBIG),** management of the **Surface Water Matching Planning Grant (SWMPG)** and **Community Water Quality Improvement Grant (CWQIG)** administered through the **Water Infrastructure Advisory Council (WIAC)**, management of the agricultural State Revolving Fund (SRF) Program, support for developing Pollution Control Strategies (PCS), and watershed plan development and/or coordination.

# Vision and Mission

DNREC envisions a Delaware that offers a healthy environment where people are committed to the protection, enhancement and enjoyment of the environment; where Delawareans' stewardship of natural resources ensures the sustainability of these resources for the appreciation and enjoyment of future generations; and where people recognize that a healthy environment and a strong economy support one another.

Trussum Pond, Broad Creek Watershed

DNREC's mission is to protect and manage the state's vital natural resources, protect public health and safety, provide quality outdoor recreation, and to serve and educate the citizens of the First State about the wise use, conservation, and enhancement of Delaware's environment.

The **NPS Management Program** is a dynamic and open-ended program intended to facilitate and promote statewide efforts to manage NPS pollution. The following priorities guide this program:

1. The NPS Program will support the identification and quantification of those problems that are caused specifically by NPS pollution through assessment updates;

2. The NPS Program will be implemented and updated to realistically reduce NPS pollution in a cost-effective manner;

3. The NPS Program will address NPS pollution through a program that balances education, research, technical assistance, financial incentives and regulation;

4. The NPS Program will follow a non-degradation policy in areas where surface and ground waters meet state water quality standards and to realistically improve water quality in areas that do not meet these standards;

5. The NPS Program will continue to use a coordinated approach for implementation and maintain an open-ended framework to incorporate new initiatives and support interactive approaches based on the effectiveness of existing policies and implementation mechanisms; and

6. The NPS Program will support the development and implementation of Pollution Control Strategies (PCS) and/or nine element (a-i) watershed implementation plans for watersheds of identified impaired or threatened waters in accordance with the Unified Watershed Assessment List.

In Delaware, DNREC is the lead agency for the development and implementation of the NPS 319 Program, through its Division of Watershed Stewardship.

# Executive Summary

The DNREC NPS Program has focused this annual report on 10 priority watersheds in Delaware: the Appoquinimink River, Broadkill River, Chester and Choptank River, Christina Basin, Inland Bays, Little Assawoman Bay, Nanticoke River, Pocomoke and Wicomico River, St. Jones River and the Upper Chesapeake. All of these priority watersheds suffer from impairments linked to nonpoint source water pollution.

In Federal Fiscal Year (FY) 2022 (Oct. 1, 2021 to Sept. 30, 2022), the Delaware NPS Program received $1,223,200 in federal Section 319(h) grant funds to focus on nonpoint source water pollution reduction efforts. For Federal FY23 (Oct. 1, 2022 to Sept. 30, 2023), the NPS Program was awarded $1,238,700.


Mist on the Nanticoke River

This annual report documents the activities and highlights of the DNREC NPS Program during the 2023 calendar year. It also fulfills the reporting requirements contained in Section 319 of the federal CWA. The NPS Program annually prepares this report to inform stakeholders on the state's progress in the area of NPS water pollution reduction. Although this report should not be considered a complete enumeration of all NPS pollution reduction activities, it describes the most important features and accomplishments of Delaware's NPS Program.

In 2023, the DNREC NPS Program continued to reduce water pollutant levels by working towards the achievement of milestone targets. Milestone targets are near-term or long-term commitments that promote a steady pace of progress towards water quality improvement. This report identifies accomplishments during the 2023 calendar year that helped Delaware achieve long-term and short-term milestones (Appendix A), which have been identified in the state's NPS Management Program. Milestone activities successfully implemented during 2023 to support and/or enhance the program include, but are not limited to: providing grant funding, education and outreach, and enhancing partnerships with other organizations to work together to reduce NPS pollution in Delaware.

- **Grant funding –** For Federal FY23 (Oct. 1, 2022 to Sept. 30, 2023), the DNREC NPS Program was awarded $1,238,700 in federal Section 319(h) grant funds to focus on nonpoint source pollution reduction efforts. Grant funding was utilized and leveraged to implement pollutant control projects, BMPs, and actions featured in the table on page 11. The Federal FY24 grant cycle began Oct. 1, 2023 and ends Sept. 30, 2028. The NPS Program submitted a federal Section 319(h) grant application to the EPA in April 2023 for FY24.

- **Education and Outreach –** The COVID-19 pandemic caused major disruptions beginning in March 2020. In-person meetings, events, trainings, conferences and other workshops were either canceled, postponed indefinitely/and or converted into a virtual format. As of late 2021, the pandemic continued to cause disruptions with outreach and education events that were previously conducted in-person. Some of these events were transitioned into a virtual format, whereas others were suspended until the public health crisis improved. Beginning in 2022, outreach events began to transition back into an in-person environment. The NPS Program re-engaged with many outreach events to help educate the public on NPS pollution and water quality. A detailed list of outreach and education events can be found in Appendix C.

- **Partnerships** – The **DNREC NPS Program** continues to develop longstanding relationships with existing partners as well as seeking to foster working relationships with new partners. The NPS Program continues to work closely with the county Conservation Districts to implement various agricultural-related BMPs in the landscape and non-profit organizations to implement urban focused BMPs. Periodic meetings with project implementation partners were conducted throughout the year to discuss possible BMP implementation projects.

- **Environmental Justice and Climate Resiliency –** In 2022, the NPS Program incorporated Environmental Justice scoring metrics into the grant request for proposal process when soliciting for BMP projects. DNREC has established a Delaware Climate Action Plan which focuses on minimizing greenhouse gas emissions and maximizing resilience to climate change impacts. Also in 2022, the Division of Watershed Stewardship began a Riparian Forest Buffer pilot program in the Chesapeake Bay Program with a focus on climate resiliency. In 2023, the Delaware Community Conservation and Assistance Program (DECAP) was created to help implement smaller, homeowner-focused BMPs within the Chesapeake Bay watershed and can also support underserved communities.

# Overall Pollution Load Reduction from BMP Implementation

Overall, the NPS Program leveraged funding with and/or directly funded projects that were completed during the calendar year in EPA-accepted watersheds. Total nitrogen load reductions were 2,679,826 pounds and total phosphorous load reductions were 68,474 pounds (see table below for major BMP areas). Delaware continues to ensure that projects funded with **CWA Section 319** dollars make progress towards restoring or protecting waters impaired by NPS pollution.

| Pollutant Controls, Practices and Actions | 2023 Annual Progress | Unit |
|---|---|---|
| Cover Crop (traditional and commodity) | 116,276 | Acres |
| Nutrient Relocation (net export from watershed) | 41,290 | Tons |
| Nutrient Management Plan | 320,370 | Acres |

## Notes:

1. Cover crop acres are reported annually and can vary from year to year due to both financial and weather-related circumstances. This figure represents the total acres of cover crops that were directly funded by **Section 319** grant dollars as well as those acres where grant funded conservation planners provided technical assistance in the signup, implementation and destruction verification of those cover crops.

2. Nutrient relocation (manure relocation) tonnage is reported annually and can vary from year to year due to various agriculture-related logistics, including weather and chicken house clean out schedules which are directed by the poultry integrator. Other logistical factors such as fuel cost can cause fluctuations of tonnage relocated annually.

3. Nutrient management acres are reported annually and can vary from year to year due to the duration and expiration dates of nutrient management plans. This figure represents the total nutrient management acres that were directly funded by **Section 319** grant dollars through conservation planners and the Delaware Department of Agriculture's Nutrient Management Program with both technical and financial assistance provided.

# Watersheds

Delaware has 10 "priority" watersheds that have EPA-accepted a-i, 9 element watershed implementation plans (WIP) with BMP projects implemented utilizing CWA **Section 319**(h) funds. Each of the priority watersheds are represented individually within this section to highlight the watershed's characteristics and TMDL goals, and to reflect implementation progress (both annually and cumulative) of BMPs that are funded directly with CWA **Section 319**(h) funds.

Delaware's 10 priority watersheds with EPA-accepted watershed implementation plans are:

- Appoquinimink River
- Broadkill River
- Chester River and Choptank River
- Christina Basin
- Inland Bays
- Little Assawoman Bay
- Nanticoke River
- Pocomoke River and Wicomico River
- St. Jones River
- Upper Chesapeake

White Clay Creek subwatershed - Christina Basin

The BMP Progress Reporting Table found on each individual watershed's page are those BMPs funded with Clean Water Act (CWA) **Section 319**(h) grant funds through the Delaware NPS Program. The WIP goal is established by the accepted a-i, nine element watershed implementation plan and reflects the implementation necessary to achieve the required TMDL nutrient loading reductions.

## Notes:

1. The Christina Basin a-i watershed plan does not identify a numerical cover crop acre implementation goal. Based on the identified 2,738 acres of grain production area within the watershed, a best professional judgement of 1,369 acres (50%) would be allocated as the goal due to anticipated cropping rotation practices.
2. The Christina Basin a-i watershed plan does not identify a numerical nutrient management implementation goal. Based on the identified 7,560.6 acres of total agricultural land use in the subwatersheds, and subtracting 322.4 acres of trees and wildlife, the identified goal is 7,238.2 acres which represents grain production and pasture and hay acreage across the subwatersheds.
3. Christina Basin consists of White Clay Creek, Red Clay Creek, Brandywine Creek, and Christina River subwatersheds.
4. The Little Assawoman Bay a subwatershed of the Inland Bays watershed had an updated watershed plan developed in 2023 and is reflected on its own individual watershed page for the purposes of this report.
5. Upper Chesapeake includes Elk River, Bohemia River, Sassafras River, & the C&D Canal.

# Appoquinimink River

**Watershed Description:** The 16-mile Appoquinimink River meanders through farmlands and wetlands in southern New Castle County, Delaware, draining 47 square miles. The headwater drains mostly agricultural lands and feeds four major ponds. The tidal freshwater segment of the Appoquinimink is bound by the head of tide at Noxontown Pond and Silver Lake, and by Drawyer Creek's confluence with the Appoquinimink. The remainder of the watershed consists of a tidal marsh extending to the Delaware River. The Appoquinimink River system consists of five main tributaries: the Appoquinimink River main stem, Deep Creek, Dove Nest, Hangman's Run and Drawyer Creek. There are several shallow, human-made small lakes and ponds in the watershed: Wiggins Mill Pond, Noxontown Pond, Silver Lake and Shallcross Lake. The Appoquinimink River is tidal from the confluence with Delaware Bay to the dam at Noxontown Lake on the main stem, the dam at Silver Lake on Deep Creek, and the confluence with Drawyer Creek. Salinity intrusion from Delaware Bay typically reaches upstream to river kilometer 8.5, past the Drawyer Creek confluence.

**Appoquinimink River Watershed**


**Goals:** Total Maximum Daily Loads (TMDLs) were established for the entire Appoquinimink River in December 2003. These TMDLs called for 325,215 lbs/year and 8,578 lbs/year reductions in NPS nitrogen (N) and phosphorus (P), respectively. An implementation plan was developed by a diverse team of citizens and government agency staff and presented to DNREC for promulgation to reach the prescribed TMDLs. Load reductions will be achieved through the implementation of Best Management Practices in agriculture, development, wastewater and private stewardship. The strategy is designed to reduce nutrient loadings from current and future land practices. This combination of actions will lead to the achievement of the TMDL.

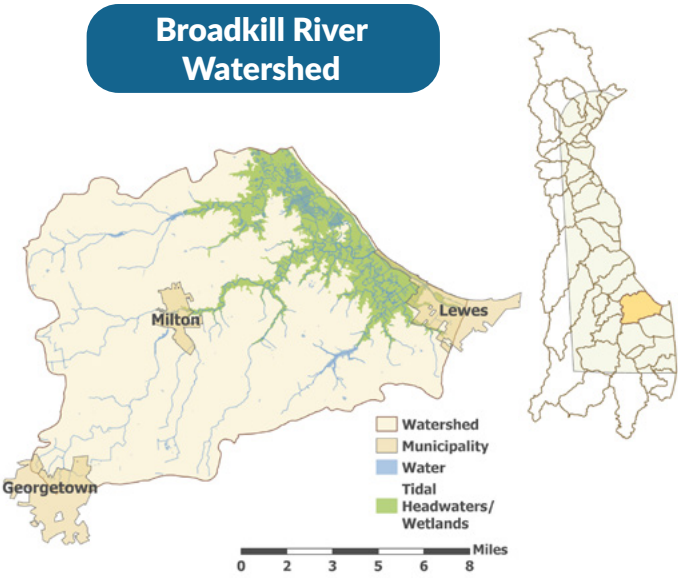
## Best Management Practices (BMP) Progress 2023

| BMP Name | Units | 2023 Progress | Cumulative Progress | WIP Goal | % Achieved | TN Load Reductions (lbs/year) | TP Load Reductions (lbs/year) | TSS Load Reductions (Tons/year) |
|---|---|---|---|---|---|---|---|---|
| Cover Crop (traditional and commodity) | Acres | 0 | Annual | 3,460 | 0 | 0 | 0 | 0 |
| Nutrient Relocation (net export from watershed) | Tons | 0 | Annual | N/A | 0 | 0 | 0 | 0 |
| Nutrient Management | Acres | 12,311 | Annual | 12,584 | 102 | 16,757 | 166 | 0 |
| Hardwood Tree Planting | Acres | 15.2 | 44.43 | N/A | 100 | 2,261 | 43 | 0 |
| Riparian Buffer (forest and vegetative) | Acres | 0 | 36 | 6 | 600 | 1,775 | 9 | 42 |
| Total Reduction | | | | | | 20,793 | 218 | 42 |
| Watershed Implementation Plan (WIP) Load Reduction Goal | | | | | | 325,215 | 8,578 | N/A |
| % Load Reduction Achieved | | | | | | 6 | 3 | N/A |

# Broadkill River

**Watershed Description:** The Broadkill River Watershed is located in the east central portion of Sussex County, Delaware. It is bounded on the north by the Cedar Creek Watershed, on the west by the Gravelly Branch and Deep Creek watersheds, on the south by the Lewes-Rehoboth Canal, Rehoboth Bay and Indian River watersheds, and on the east by the Delaware Bay. The mainstem of the Broadkill River is approximately 25 miles long. The major watercourse in this segment is the Broadkill River, which originates at the Town of Milton, and discharges into the Roosevelt Inlet near Lewes. Major impoundments in the area are Wagamons and Diamond ponds located near Milton. The Broadkill River flows generally eastward until it approaches the coast where it turns abruptly and flows south to discharge into the Roosevelt Inlet. The flow of this stream is sluggish and the water is turbid. The watershed drains an area of 107 square miles.

**Broadkill River Watershed**




**Goals:** The established Total Maximum Daily Load (TMDL) requires a 40% reduction in NPS nitrogen (N) and phosphorous (P) from the 2002-2003 baseline levels of 1,353,055 lbs/yr (3,707 lbs/day) and 57,597 lbs/yr (157.8 lbs/day), respectively. The NPS required nitrogen and phosphorous load reduction is 541,222 lbs/yr and 23,039 lbs/yr, respectively. As a result of land use changes from 2002-2007, the 2007 baseline NPS loads changed to total N of 2,891 lbs/day and P of 124.1 lbs/day. Total N reductions of 667.1 lbs/day (243,700 lbs/yr) and total P reductions of 29.4 lbs/day (10,740 lbs/yr) are required. This shall result in a yearly average total nitrogen and phosphorous load of 2,224.2 lbs/day (811,833 lbs/yr) and 94.7 lbs/day (34,565.5 lbs/yr), respectively, to achieve the 2025 TMDL.

## Best Management Practices (BMP) Progress 2023

| BMP Name | Units | 2023 Progress | Cumulative Progress | WIP Goal | % Achieved | TN Load Reductions (lbs/year) | TP Load Reductions (lbs/year) | TSS Load Reductions (Tons/year) |
|---|---|---|---|---|---|---|---|---|
| Cover Crop (traditional and commodity) | Acres | 7,317 | Annual | 9,763 | 62 | 122,802 | 350 | 215 |
| Nutrient Relocation (net export from watershed) | Tons | 558 | Annual | 3,165 | 18 | 3,102 | 329 | 0 |
| Nutrient Management | Acres | 23,254 | Annual | 26,476 | 88 | 80,486 | 1,338 | 0 |
| Hardwood Tree Planting | Acres | 17 | 210 | 192 | 109 | 14,133 | 137 | 61 |
| Rain Garden | Acres | 0 | 5.4 | N/A | 100 | 108 | 3 | 0 |
| Total Reduction | | | | | | 220,631 | 2,157 | 276 |
| Watershed Implementation Plan (WIP) Load Reduction Goal | | | | | | 243,700 | 10,740 | N/A |
| % Load Reduction Achieved | | | | | | 91 | 20 | N/A |

# Chester and Choptank Rivers

**Watershed Description:** In Delaware, the majority of the Chester and Choptank watersheds are in Kent County, while a portion of the Chester River originates in New Castle County, Delaware. Both rivers drain into Maryland's Eastern Shore, including Kent County, Queen Anne's County, and Caroline County. The Chester and Choptank watersheds include 88,217.5 acres, or 137.8 square miles of land area. Chester River in Delaware includes a 40-square-mile drainage area with headwaters beginning at the divide between New Castle and Kent counties. Delaware headwater segments, including Cypress Branch, Sewell Branch and Gravelly Run, flow west into both Kent County and Queen Anne's County, Maryland. The Choptank River Watershed, located immediately south of the Chester River, includes 62,191 acres. Headwater tributaries to the Choptank River include Tappahanna Ditch, Culbreth Marsh Ditch and Cow Marsh Creek.

## Chester and Choptank Rivers Watersheds


**Goals:** The TMDL established for the Chester and Choptank River Watersheds capped the nonpoint source nitrogen loads at the 2001 to 2003 baseline levels of 708 lbs/day (258,600 lbs/year) and 1,359 lbs/day (496,400 lbs/year), respectively. A phosphorus reduction goal of 40% is set from the 2001 to 2003 baseline levels for the Chester and Choptank watersheds, which equates to 12.3 lbs/day and 51.1 lbs/day, respectively. Baseline loads in the Chester and Choptank for phosphorus are 19,940 lbs/year and 46,390 lbs/year, with TMDL allocated loads set to 11,800 lbs/year and 27,720 lbs/year, respectively. Total phosphorous load reductions of 26,810 lbs/year are required for the Chester and Choptank.

## Best Management Practices (BMP) Progress 2023

| BMP Name | Units | 2023 Progress | Cumulative Progress | WIP Goal | % Achieved | TN Load Reductions (lbs/year) | TP Load Reductions (lbs/year) | TSS Load Reductions (Tons/year) |
|---|---|---|---|---|---|---|---|---|
| Cover Crop (traditional and commodity) | Acres | 7,632 | Annual | 26,260.50 | 29 | 77,455 | 232 | 146 |
| Nutrient Relocation (net export from watershed) | Tons | 1,002 | Annual | N/A | 0 | 4,137 | 196 | 0 |
| Nutrient Management | Acres | 21,159 | Annual | 37,249.60 | 57 | 61,654 | 1,068 | 0 |
| Hardwood Tree Planting | Acres | 0 | 377 | 177.8 | 212 | 15,553 | 150 | 68 |
| Water Control Structure | Acres | 0 | 348 | 3,120.70 | 11.2 | 2,602 | 0 | 0 |
| Stream Restoration | Feet | 0 | 1,924 | 11,722 | 16.4 | 260 | 303 | 0 |
| Wetlands Restoration | Acres | 0 | 551 | 2,113.40 | 26.1 | 22,347 | 216 | 180 |
| Total Reduction | | | | | | 184,008 | 2,165 | 349 |
| Watershed Implementation Plan (WIP) Load Reduction Goal | | | | | | 755,000 | 26,810 | N/A |
| % Load Reduction Achieved | | | | | | 24 | 8 | N/A |

# Christina Basin

**Watershed Description:** The Christina Basin is a 565-square-mile basin contained in the larger Delaware River Basin. The Christina Basin, located in New Castle County in northern Delaware, includes four sub-watersheds:

- Brandywine Creek, 325 square miles
- Red Clay Creek, 54 square miles
- White Clay Creek, 107 square miles
- Christina River, 78 square miles

Although a small portion can be found within Maryland, the Christina Basin falls principally within two states which includes Pennsylvania to the north and Delaware to the south. The Pennsylvania portion is characterized by more open space including agricultural land and forests, while the more urban, southerly portion in Delaware tends to be more residential.

## Christina Basin Watershed


The Watershed Implementation Plan development for the Christina Basin Watershed was accepted by the EPA in spring 2013.

**Goals:** The EPA TMDL bases its required reductions on a subwatershed basis. Delaware collects data on a watershed wide level basis. An estimate of nitrogen (N) and phosphorous (P) reduction loads from a subwatershed level basis were added together to make a total of estimated reductions that are required on a watershed wide level basis to achieve the TMDL. Estimated total nitrogen and phosphorous load reductions required to achieve TMDL requirements are 343.54 lbs/day (125,392.10 lbs/year) and 43.08 lbs/day (15,724.20 lbs/year), respectively.

## Best Management Practices (BMP) Progress 2023

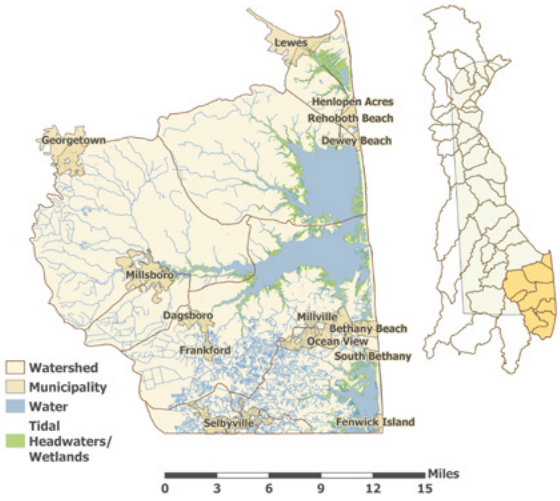
| BMP Name | Units | 2023 Progress | Cumulative Progress | WIP Goal | % Achieved | TN Load Reductions (lbs/year) | TP Load Reductions (lbs/year) | TSS Load Reductions (Tons/year) |
|---|---|---|---|---|---|---|---|---|
| Cover Crop (traditional and commodity) | Acres | 0 | Annual | 1,369 | 0 | 0 | 0 | 0 |
| Nutrient Management | Tons | 202 | Annual | 7,238 | 3 | 442 | 5 | 0 |
| Hardwood Tree Planting | Acres | 0.05 | 0.8 | N/A | N/A | 26 | 0 | 1 |
| Stream Restoration | Acres | 0 | 4,265 | N/A | N/A | 111 | 26 | |
| Rain Garden | Structure | 0 | 36 | N/A | N/A | 41 | 0 | 0 |
| Total Reduction | | | | | | 620 | 31 | 1 |
| Watershed Implementation Plan (WIP) Load Reduction Goal | | | | | | 125,392 | 15,724 | N/A |
| % Load Reduction Achieved | | | | | | 1 | 0 | N/A |

# Inland Bays

**Watershed Description:** The Inland Bays/Atlantic Ocean Basin comprises approximately 313 square miles of eastern Sussex County, Delaware. Starting at Lewes and Cape Henlopen State Park at the southern edge of the entrance to Delaware Bay, the area extends southward approximately 24 miles along the Atlantic shoreline to the Maryland State Line. It includes the coastal towns of Rehoboth Beach, Dewey Beach, Bethany Beach, South Bethany Beach and Fenwick Island. State Route 1 (SR 1) extends parallel to the shoreline and connects the towns.

The three inland bays (Rehoboth Bay, Indian River Bay, and Little Assawoman Bay) are located just landward of the Atlantic Ocean shoreline. Rehoboth Bay contains the Lewes-Rehoboth Canal and Rehoboth Bay Watershed; the Indian River Bay contains the Indian River, Iron Branch and Indian River Bay watersheds; and the sub watersheds of Dirickson Creek, Miller Creek, and the remainder of the area that drains to the Delaware portion of the Assawoman canal.

## Inland Bays Watershed




**Goals:** Goals call for the increased implementation of numerous NPS best management practices (BMPs), especially in the agriculture sector. The approved watershed plan calls for a reduction in NPS total nitrogen loading of 3,764 lbs/day (1,373,860 lbs/year) and total phosphorous loading of 133 lbs/day (48,545 lbs/year). The goals are those that were presented by Inland Bays Pollution Control Strategy (PCS), which is also an accepted EPA watershed plan. The PCS involves many strategies to reduce nitrogen (N) and phosphorous (P) to meet the TMDL, but presented here are initiatives of the 319 program.

## Best Management Practices (BMP) Progress 2023

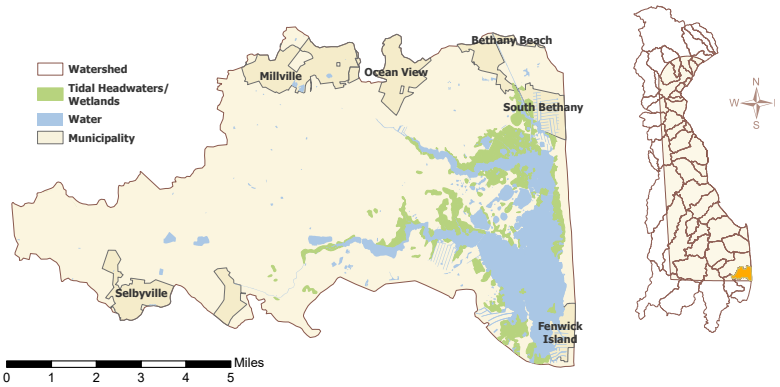
| BMP Name | Units | 2023 Progress | Cumulative Progress | WIP Goal | % Achieved | TN Load Reductions (lbs/year) | TP Load Reductions (lbs/year) | TSS Load Reductions (Tons/year) |
|---|---|---|---|---|---|---|---|---|
| Cover Crop (traditional and commodity) | Acres | 12,767 | Annual | 37,637 | 34 | 242,038 | 618 | 376 |
| Nutrient Relocation (net export from watershed) | Tons | 12,595 | Annual | 20,909 | 60 | 70,525 | 4,956 | 0 |
| Nutrient Management | Acres | 41,779 | Annual | 53,827 | 70 | 226,185 | 33,836 | 0 |
| Riparian Buffer (forest and vegetative) | Acres | 2.5 | 291.5 | 3,246 | 9 | 35,412 | 284 | 133 |
| Rain Garden | Structure | 0 | 1 | 3 | 33.3 | 15 | 0 | 0 |
| Grass Buffers (CREP CP 21) | Acres | 0 | 70 | 1,772 | 4 | 7,713 | 70 | 32 |
| Wetlands Restoration | Acres | 0 | 29 | 4,175 | 0.7 | 2,118 | 20 | 16 |
| Total Reduction | | | | | | 584,006 | 39,784 | 557 |
| Watershed Implementation Plan (WIP) Load Reduction Goal | | | | | | 1,373,860 | 48,545 | N/A |
| % Load Reduction Achieved | | | | | | 43 | 82 | N/A |

# Little Assawoman Bay

**Watershed Description:** The Delaware portion of the Little Assawoman Bay and its headwaters is in Sussex County and is comprised of 31,150 acres, of which 38% is natural, 35% developed, and 27% agricultural land use. BMP information presented is specific to this subwatershed because it is part of the overall Inland Bays watershed.

There are two major tributaries entering the Little Assawoman Bay: the smaller Miller Creek, and the larger Dirickson Creek. Miller Creek is positioned to the north of the Little Assawoman Bay, with a drainage area of approximately 99 acres. Dirickson Creek is positioned south and has a drainage area of approximately 1,359 acres.

## Little Assawoman Bay Watershed




**Goals:** The Little Assawoman Bay Total Maximum Daily Load (TMDL), established in 2004, requires a 40% reduction in both nitrogen and phosphorous for the watershed to meet water quality standards from the 1990 baseline year. The reduction must come from nonpoint sources (NPS) since there are no point sources in this watershed. The most critical sources of nitrogen and phosphorus in the LAB watershed are residential in the developed sector and cropland in the agricultural sector. Estimated total nitrogen load reduction required to achieve the TMDL requirement is 177,394 lbs./year and Phosphorous is 4,562 lbs./year.

## Best Management Practices (BMP) Progress 2023

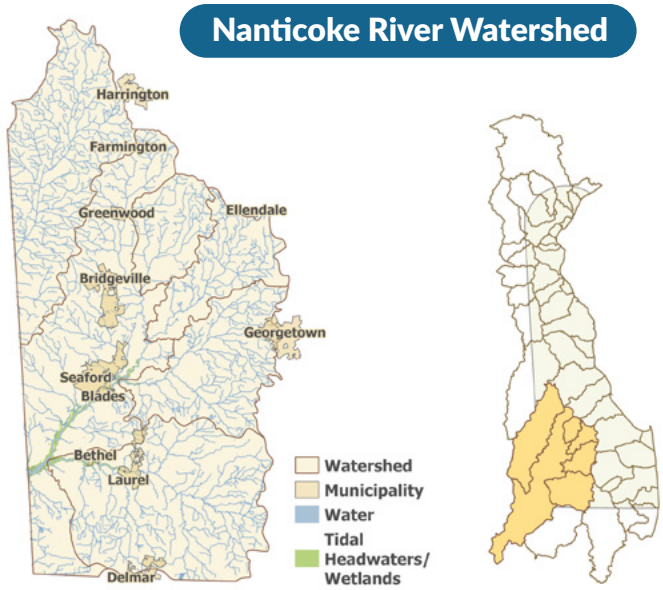
| BMP Name | Units | 2023 Progress | Cumulative Progress | WIP Goal | % Achieved | TN Load Reductions (lbs/year) | TP Load Reductions (lbs/year) | TSS Load Reductions (Tons/year) |
|---|---|---|---|---|---|---|---|---|
| Cover Crop (traditional and commodity) | Acres | 232 | Annual | 2,728 | 8 | 3,667 | 13 | 7 |
| Nutrient Relocation (net export from watershed) | Tons | 372 | Annual | Maximum Available | N/A | 2,084 | 146 | 0 |
| Nutrient Management | Acres | 7,370 | Annual | 4,478 | 164 | 27,089 | 554 | 0 |
| Riparian Buffer (forest and vegetative) | Acres | 0.3 | 289.4 | 709 | 41 | 27,230 | 288 | 118 |
| Grass Buffers (CREP CP 21) | Feet | 0 | 70 | 4,303 | 4 | 6,631 | 77 | 31 |
| Wetlands Restoration | Acres | 0 | 29 | 938 | 0.7 | 1,867 | 22 | 16 |
| Total Reduction | | | | | | 68,568 | 1,100 | 172 |
| Watershed Implementation Plan (WIP) Load Reduction Goal | | | | | | 266,090 | 6,844 | 1,211 |
| % Load Reduction Achieved | | | | | | 26 | 16 | 14 |

# Nanticoke River

**Watershed Description:** The Nanticoke River Watershed includes the Middle Nanticoke and Upper Nanticoke rivers. The majority of the two rivers originate in Sussex County, Delaware, while a portion of the Middle and Upper Nanticoke rivers originate in Kent County, Delaware. Both rivers drain to the southwest into Maryland's Eastern Shore, including Caroline County, Dorchester County and Wicomico County. The Nanticoke encompasses 315,890.7 acres, or 493.6 square miles, of land area.

The Middle Nanticoke River refers to the Marshyhope Creek. Headwater tributaries to the Upper Nanticoke River include Gum Branch, Gravelly Branch, Deep Creek and Broad Creek.

## Nanticoke River Watershed




**Goals:** Current goals call for the increased implementation of numerous NPS best management practices (BMPs), especially in the agriculture sector. The milestones allow jurisdictions the opportunity to adapt implementation strategies as necessary to meet the goals and achieve the TMDL standard. According to the approved Nanticoke River Watershed Plan, total nitrogen (N) and phosphorous (P) load reductions of 736,508 lbs/year and 33,941 lbs/year, respectively, are required to achieve the 2025 TMDL load allocations.

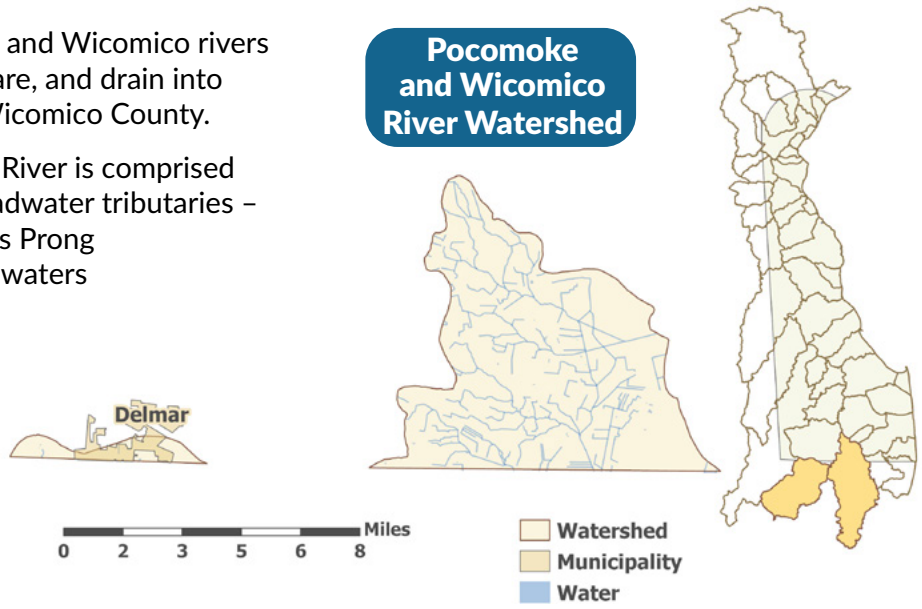
## Best Management Practices (BMP) Progress 2023

| BMP Name | Units | 2023 Progress | Cumulative Progress | WIP Goal | % Achieved | TN Load Reductions (lbs/year) | TP Load Reductions (lbs/year) | TSS Load Reductions (Tons/year) |
|---|---|---|---|---|---|---|---|---|
| Cover Crop (traditional and commodity) | Acres | 51,552 | Annual | 43,343 | 119 | 763,957 | 2,449 | 747 |
| Nutrient Relocation (net export from watershed) | Tons | 23,125 | Annual | Maximum Available | 0 | 139,619 | 9,099 | 0 |
| Nutrient Management | Acres | 92,510 | Annual | 143,647 | 64 | 390,405 | 7,079 | 0 |
| Hardwood Tree Planting | Acres | 0 | 746 | 157 | 475 | 35,974 | 543 | 101 |
| Water Control Structure | Structure | 0 | 1,219 | 2,394 | 50.9 | 9,106 | 0 | 0 |
| Stream Restoration | Feet | 0 | 1.3 | 465 | 0.3 | 911 | 1,060 | 0 |
| Wetlands Restoration | Acres | 0 | 1,935.50 | 74,043 | 2.6 | 93,355 | 1,408 | 304 |
| Total Reduction | | | | | | 1,433,327 | 21,638 | 1,152 |
| Watershed Implementation Plan (WIP) Load Reduction Goal | | | | | | 736,508 | 33,941 | 228 |
| % Load Reduction Achieved | | | | | | 195 | 64 | 500 |

# Pocomoke and Wicomico River

**Watershed Description:** The Pocomoke and Wicomico rivers both originate in Sussex County, Delaware, and drain into Maryland's eastern shore, primarily in Wicomico County.

The Delaware portion of the Pocomoke River is comprised of 35 square miles and includes four headwater tributaries – Bald Cypress Branch, Gum Branch, Lewis Prong and North Fork Green Branch. The headwaters for the Wicomico River begin at the Delaware-Maryland divide, with the Delaware portion contributing only 2.1 square miles. Four very small stream segments of the Wicomico watershed are located in Delaware, accounting for just 0.7 stream miles.




**Goals:** A TMDL was established in 2005 for the Pocomoke River. The Pocomoke nitrogen and phosphorous load allocations are 102.75 lbs/day (37,256 lbs/year) and 6.1 lbs/day (2,228 lbs/year), respectively. The Wicomico nitrogen and phosphorus load allocations are 9,103 lbs/year and 708 lbs/year, respectively. The combined total nitrogen (N) and phosphorous (P) load reductions needed to achieve the 2025 TMDL in the Pocomoke and Wicomico watersheds are 49,060 lbs/year and 3,047 lbs/year, respectively.

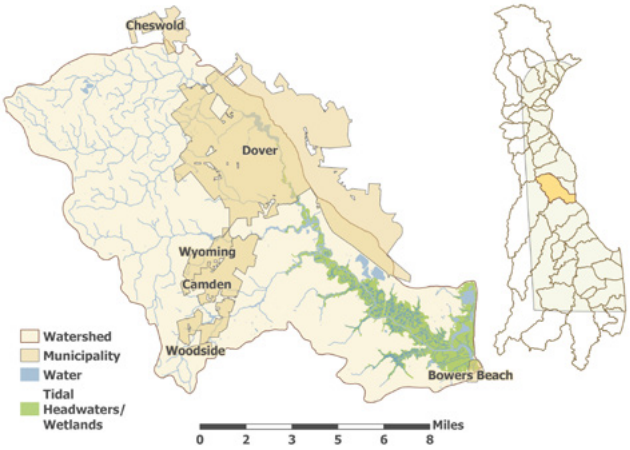
## Best Management Practices (BMP) Progress 2023

| BMP Name | Units | 2023 Progress | Cumulative Progress | WIP Goal | % Achieved | TN Load Reductions (lbs/year) | TP Load Reductions (lbs/year) | TSS Load Reductions (Tons/year) |
|---|---|---|---|---|---|---|---|---|
| Cover Crop (traditional and commodity) | Acres | 4,354 | Annual | 2,217 | 196 | 62,854 | 246 | 62 |
| Nutrient Relocation (net export from watershed) | Tons | 0 | Annual | Maximum Available | 0 | 0 | 0 | 0 |
| Nutrient Management | Acres | 8,691 | Annual | 10,067.57 | 86 | 10,658 | 29 | 0 |
| Hardwood Tree Planting | Acres | 0 | 49.3 | 24 | 206.3 | 2,851 | 38 | 7 |
| Water Control Structure | Structure | 0 | 87 | 189.24 | 45.9 | 650 | 0 | 0 |
| Stream Restoration | Feet | 0 | 481 | 1,713 | 28.1 | 65 | 76 | 0 |
| Wetlands Restoration | Acres | 0 | 138 | 153.62 | 89.8 | 7,929 | 95 | 27 |
| Total Reduction | | | | | | 85,007 | 484 | 96 |
| Watershed Implementation Plan (WIP) Load Reduction Goal | | | | | | 49,060 | 3,047 | 17 |
| % Load Reduction Achieved | | | | | | 173 | 16 | 565 |

# St. Jones River

**Watershed Description:** The St. Jones River Watershed is approximately 25.9 square miles (16,576 acres) and is located in the central portion of Kent County, Delaware. It drains 90 square miles of land. The major watercourse in the watershed is the St. Jones River, which has its headwaters in the western part of the county, about 22 miles upstream from the Delaware Bay. Significant ponds in the watershed are Silver Lake, Moores Lake and Wyoming Mill Pond. Flat wetlands, usually forested, exist mostly in the upper portion of the watershed and eventually drain into creeks and streams. Non-tidal riverine wetlands and tidal wetlands line the banks of the river, sometimes up to a half-mile wide toward the mouth of the river. Wetlands comprise 9,669 acres of the watershed and provide critical services such as nutrient removal, erosion control, habitat for plants and wildlife, flood reduction and storm water storage to the citizens of Delaware.

## St. Jones River Watershed




The St. Jones Watershed has 5,236 acres of protected lands, including 3,750 acres preserved in the St. Jones River Reserve, a component of the Delaware National Estuarine Research Reserve (DNERR).

**Goals:** Reduce the overall levels of nitrogen (N) and phosphorus (P) in the waterway by 40% from the 2002-2003 baseline loads, or 869.5 lbs/day (317,368 lbs/year) and 63.4 lbs/day (23,141 lbs/year), respectively. NPS specific nitrogen and phosphorous load reductions of 838.5 lbs/day (306,053 lbs/ year) and 52.93 lbs/ day (19,309 lbs/ year) are required. The TMDL also calls for a nitrogen and phosphorous reduction from its stormwater (MS4) discharges of 21.8 lbs/day (7,957 lbs/year) and 3.4 lbs/day (1,241 lbs/year), respectively.

## Best Management Practices (BMP) Progress 2023

| BMP Name | Units | 2023 Progress | Cumulative Progress | WIP Goal | % Achieved | TN Load Reductions (lbs/year) | TP Load Reductions (lbs/year) | TSS Load Reductions (Tons/year) |
|---|---|---|---|---|---|---|---|---|
| Cover Crop (traditional and commodity) | Acres | 4,879 | Annual | 6,246 | 78 | 54,354 | 160 | 192 |
| Nutrient Relocation (net export from watershed) | Tons | 0 | Annual | 6,480 | 0 | 0 | 0 | 0 |
| Nutrient Management | Acres | 14,177 | Annual | 35,849 | 40 | 16,315 | 282 | 0 |
| Hardwood Tree Planting | Acres | 0 | 16.9 | N/A | N/A | 752 | 7 | 7 |
| Grass Buffers | Acres | 0 | 8.5 | 1,174 | 0.7 | 572 | 6 | 5 |
| Riparian Buffer | Acres | 0 | 7 | 1,161 | 0.61 | 520 | 4 | 4 |
| Total Reduction | | | | | | 72,513 | 459 | 208 |
| Watershed Implementation Plan (WIP) Load Reduction Goal | | | | | | 317,368 | 23,141 | N/A |
| % Load Reduction Achieved | | | | | | 23 | 2 | N/A |

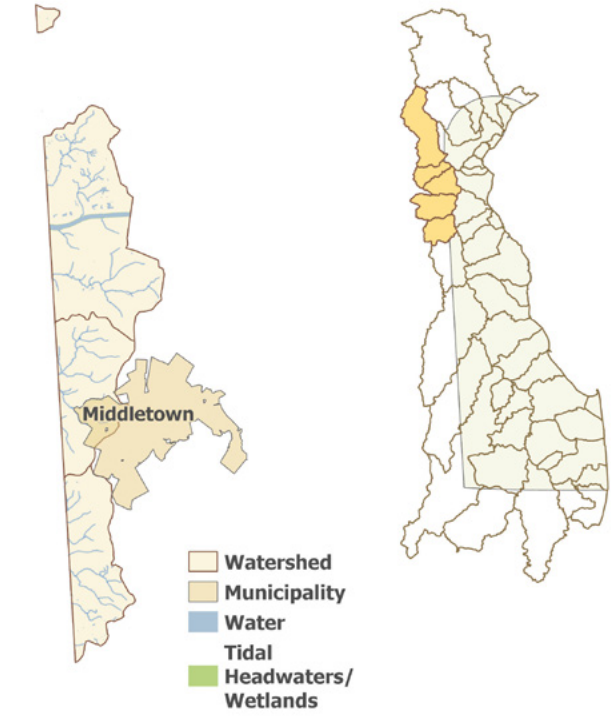
# Upper Chesapeake

**Watershed Description:** The Upper Chesapeake Watershed includes the Elk, Bohemia and Sassafras Rivers and the C&D Canal, all of which originate in New Castle County, Delaware, and drain to the west into Maryland's upper Eastern Shore primarily in Cecil County. The Upper Chesapeake includes 23,351.7 acres or 36.5 square miles of land area.

The Upper Chesapeake as a whole is made up of a mixture of land uses, primarily including agriculture, forest and developed lands. Over two-thirds of the Upper Chesapeake is agricultural use (38.6%) or developed land (34.2%) with the remaining land use largely comprised of forest (27.2%).

**Goals:** The watershed plan for the Upper Chesapeake states that load reductions proposed meet the allocations for the Upper Chesapeake in the Bay TMDL. By targeting the most effective best management practices (BMPs) to the critical areas with the greatest recovery potential, the total nitrogen (TN) agriculture load can be decreased from 112,510 to 60,365 lbs/year. The agricultural total phosphorous (TP) loads can be reduced from 19,235 to 6,134 lbs/year. The TN urban load is the second largest load and can be reduced from 67,790 to 60,138 lbs/year. Urban TP loads can be reduced from 4,332 to 3,668 lbs/year. The TN from septic systems can be reduced from 32,709 to 29,722 lbs/year.

## Upper Chesapeake Watershed




## Best Management Practices (BMP) Progress 2023

| BMP Name | Units | 2023 Progress | Cumulative Progress | WIP Goal | % Achieved | TN Load Reductions (lbs/year) | TP Load Reductions (lbs/year) | TSS Load Reductions (Tons/year) |
|---|---|---|---|---|---|---|---|---|
| Cover Crop (traditional and commodity) | Acres | 0 | Annual | 7,439 | 0 | 0 | 0 | 0 |
| Nutrient Relocation (net export from watershed) | Tons | 1,002 | Annual | Maximum Available | 0 | 4,137 | 196 | 0 |
| Nutrient Management | Acres | 11,156 | Annual | 14,280 | 78 | 252 | 3 | 0 |
| Hardwood Tree Planting | Acres | 0 | 49.55 | N/A | N/A | 1,376 | 8 | 13 |
| Water Control Structures | Structure | 0 | 87 | 155 | 56 | 650 | 0 | 0 |
| Stream Restoration | Feet | 0 | 481 | 2,732 | 17.6 | 65 | 76 | 0 |
| Wetlands Restorations | Acres | 0 | 138 | 247 | 56 | 3,873 | 24 | 68 |
| Total Reduction | | | | | | 10,353 | 307 | 81 |
| Watershed Implementation Plan (WIP) Load Reduction Goal | | | | | | 62,784 | 13,765 | N/A |
| % Load Reduction Achieved | | | | | | 16 | 2 | N/A |

# Project Highlights

## Urban and Community Forestry (U&CF) Program - Urban Tree Plantings

Delaware's Urban and Community Forestry Program provides technical, educational, and financial assistance throughout the State. The Delaware Forest Service has full-time forestry staff who assist cities, towns, and communities with tree planting and management practices. The U&CF Grant Program accepts applications for up to $5,000 in matching grants for tree inventory or planting projects on public land and community open space. The U&CF grant program is open to all Delaware municipalities, homeowner associations, certified non-profit organizations, as well as schools and churches.


Urban Tree Planting, Brandywine Creek Watershed


Taryn Davidson, Delaware Urban Coordinator

In 2023, the NPS Program leveraged Section 319 grant funding with eligible U&CF applicants to conduct urban tree planting efforts in various priority watersheds across the State. The collaboration between the NPS Program and the Delaware Department of Agriculture's Forestry Program has been long standing. The projects funded in part by the Section 319 grant maximized the leveraging of funds as each applicant provided a 1:1 match which exceeds the requirements currently established by the NPS Program.


Brandywine Creek Watershed, Urban Tree Planting


These trees above and right were planted in Westminster Village to replace trees lost due to storm damage.

The U&CF grant program helps to increase tree canopy throughout Delaware. Other goals include harnessing the natural benefits of trees including cleaner air and water, energy savings, reduced stormwater runoff, and climate resiliency. The Section 319 grant provided $30,000 for these urban tree planting efforts which resulted in 1,898 trees of various sizes being planted in the Brandywine Creek, Inland Bays, St. Jones River, and Christina River watersheds.


Forestry staff plants a new tree, Brandywine Creek Watershed

# Load Reductions

In 2023, the DNREC NPS Program load reductions were calculated for Section 319-funded projects implemented on a watershed scale. The load reductions are calculated using guidance established during the pollution control strategy development process and the current EPA-approved DNREC model.


Great Blue Heron catching a fish, Brandywine Creek

## 2023 Project Load Reductions/Year by Watershed

| Project | Nitrogen (lbs.) | Phosphorus (lbs.) |
|---|---|---|
| Appoquinimink River | 20,793 | 218 |
| Broadkill River | 220,631 | 2,157 |
| Chester and Choptank Rivers | 184,008 | 2,165 |
| Christina Basin | 620 | 31 |
| Inland Bays | 584,006 | 39,784 |
| Little Assawoman Bay | 68,568 | 1,231 |
| Nanticoke River | 1,433,327 | 21,638 |
| Pocomoke and Wicomico Rivers | 85,007 | 484 |
| St. Jones River | 72,513 | 459 |
| Upper Chesapeake Bay | 10,353 | 307 |
| Total | 2,679,826 | 68,474 |

## Total Nitrogen (TN) Load Reductions (LRs) by Watershed

| Nitrogen Load Reductions (lbs./year) | Appoquinimink River | Broadkill River | Chester Choptank | Christina Basin | Inland Bays | Little Assawoman | Nanticoke | Pocomoke Wicomico River | St. Jones | Upper Chesapeake | Total TN (lbs./years) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Cover Crops | 0 | 122,802 | 77,455 | 0 | 242,038 | 3,667 | 763,957 | 62,854 | 54,354 | 0 | 1,327,127 |
| Nutrient Relocation | 0 | 3,102 | 4,137 | 0 | 70,525 | 2,084 | 139,619 | 0 | 0 | 4,137 | 223,604 |
| Nutrient Management | 16,757 | 80,486 | 61,654 | 442 | 226,185 | 27,089 | 390,405 | 10,658 | 16,315 | 252 | 830,243 |
| Hardwood Tree Planting | 2,261 | 14,133 | 15,553 | 26 | 0 | 0 | 35,974 | 2,851 | 752 | 1,376 | 72,926 |
| Riparian Buffer | 1,775 | 0 | 0 | 0 | 35,412 | 27,230 | 0 | 0 | 520 | 0 | 64,937 |
| Grass Buffer | 0 | 0 | 0 | 0 | 7,713 | 6,631 | 0 | 0 | 572 | 0 | 14,916 |
| Water Control Structures | 0 | 0 | 2,602 | 0 | 0 | 0 | 9,106 | 650 | 0 | 650 | 13,008 |
| Stream Restoration | 0 | 0 | 260 | 111 | 0 | 0 | 911 | 65 | 0 | 65 | 1,412 |
| Wetland Restoration | 0 | 0 | 22,347 | 0 | 2,118 | 1,867 | 93,355 | 7,929 | 0 | 3,873 | 131,489 |
| Rain Garden | 0 | 108 | 0 | 41 | 15 | 0 | 0 | 0 | 0 | 0 | 164 |
| **Total Nitrogen Reductions** | **20,793** | **220,631** | **184,008** | **620** | **584,006** | **68,568** | **1,433,327** | **85,007** | **72,513** | **10,353** | **2,679,826** |

# Total Phosphorous (TP) Load Reductions (LRs) by Watershed

| Phosphorous Load Reductions (lbs./year) | Appoquinimink River | Broadkill River | Chester Choptank | Christina Basin | Inland Bays | Little Assawoman | Nanticoke | Pocomoke Wicomico River | St. Jones | Upper Chesapeake | Total TP (lbs./years) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Cover Crops | 0 | 350 | 232 | 0 | 618 | 13 | 2,449 | 246 | 160 | 0 | 4,068 |
| Nutrient Relocation | 0 | 329 | 196 | 0 | 4,956 | 146 | 9,099 | 0 | 0 | 196 | 14,922 |
| Nutrient Management | 166 | 1,338 | 1,068 | 5 | 33,836 | 554 | 7,079 | 29 | 282 | 3 | 44,360 |
| Hardwood Tree Planting | 43 | 137 | 150 | 0 | 0 | 0 | 543 | 38 | 7 | 8 | 926 |
| Riparian Buffer | 9 | 0 | 0 | 0 | 284 | 288 | 0 | 0 | 4 | 0 | 585 |
| Grass Buffer | 0 | 0 | 0 | 0 | 70 | 77 | 0 | 0 | 6 | 0 | 153 |
| Water Control Structures | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Stream Restoration | 0 | 0 | 303 | 26 | 20 | 0 | 1,060 | 76 | 0 | 76 | 1,561 |
| Wetland Restoration | 0 | 0 | 216 | 0 | 0 | 22 | 1,408 | 95 | 0 | 24 | 1,765 |
| Rain Garden | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 |
| **Total Phosphorous Reductions** | **218** | **2,157** | **2,165** | **31** | **39,784** | **1,231** | **21,638** | **484** | **459** | **307** | **68,474** |

# Future Changes and Challenges

Delaware has developed this report to highlight accomplishments made in 2023 to reduce nitrogen, phosphorus and sediment nonpoint source pollution. The charts and tables on pages 25 to 26 signify the continued progress in reducing loads to impaired watersheds. Additional commitments were made by DNREC and EPA with the development of annual milestones identified in Delaware's 2019 NPS Management Plan. These milestones describe the outcomes and key actions expected over a determined timeframe. The NPS Program in 2023 submitted a draft FY25-FY29 NPS Management Plan to EPA to cover the next five year timeframe.

Lewes and Rehoboth Canal, Sussex County

The NPS Management Plan includes objectives that address nonpoint sources of surface and ground water pollution including drinking water sources, in alignment with the goals of the CWA. Objectives of the plan include both implementation and how results will be tracked (e.g., water quality improvements or load reductions). Additionally, long-term goals and short-term milestones are integrated with other key environmental and natural resource programs. The program's goals and objectives are periodically revised to reflect progress or problems encountered, develop strategies to make progress towards achieving the goals, and develop indicators to measure progress. Updates to the NPS Milestones can be found in Appendix A.

Delaware continues to make progress toward meeting water quality goals with continued commitments of funding implementation activities to address the agricultural and urban sectors. The DNREC NPS Program continues to develop new working relationships with BMP implementation partner organizations to further water quality enhancement efforts.

For example, many of the key personnel working within the Delaware Conservation Districts help to write nutrient management plans, install agriculture BMPs and help farmers to identify and address resource concerns. Additional DNREC staff work with private landowners on buffers, wetland and stream restoration projects, as well as septic system pump-outs, repairs, and/or replacements.

The Delaware Department of Agriculture staff works with farmers and the agricultural community to continue the implementation and enforcement of the Nutrient Management Law and Regulations. The Delaware NPS Program continues to provide funding to the Department of Agriculture's Nutrient Management Program toward manure relocation efforts and personnel to help implement the nutrient management program, assist with nutrient management plan cost share practices, and help track and report agricultural BMP practices that are inspected by the program.

While some goals have yet to be reached, Delaware has continued to make substantial progress and has invested significant effort into programmatic changes, such as regulations, permits and reorganizing programs. Although these additional efforts improve accountability, they do not necessarily have an immediate impact on nutrient reductions. Delaware's agricultural community works every day to conserve and protect our water resources, with many of our farmers implementing BMPs that are not accounted for or reported. The program has captured some of the previously unreported BMP data through statewide transect surveys and Chesapeake Bay-related verification efforts.


Leipsic River

The cropland residue and cover crop transect surveys were established in 2014 and continued on an annual basis until the COVID-19 pandemic disrupted the survey in 2020. The cropland residue and cover crop transect surveys were tested in 2023 with new GIS technology. Currently, the full survey is on schedule to commence in spring 2024. The cropland surveys help quantify the amount of residue cover remaining on the field after the commencement of planting in the spring so farmers can get credit for conservation tillage practices. The cover crop surveys conducted throughout the state help capture any additional, non-cost share funded, cover crop implementation acres established by farmers that would otherwise function in reducing nutrient and sediment losses but not be reported and credited as such.

These transect surveys were conducted over a five-year period (2014 to 2019), providing a five-year period of baseline data. This baseline data could be used to make statistical projections of cropland residue associated with conservation tillage and cover crop acreage in subsequent years for all three counties in the state.

Funding for cover crop cost share programs has increased farmer participation and allowed the state to increase cover crop BMP implementation acreages. In 2019, an additional $2.9 million in state FY20 funds was allocated for conservation cost share practices specifically designated for cover crops. As a result of this increased funding, implementation of cover crop acres across all counties in Delaware increased. However, the COVID-19 pandemic in 2020 caused budgetary hardships at the state level. The additional $2.9 million in state funds that was awarded in 2019 dropped to $1 million in 2020 for state FY21. Improved budgetary outlooks for state FY22 resulted in an appropriation of $3.2 million. In FY23, the program sustained funding at $3.2 million. The FY24 budget appropriated $5.2 million as demand for cover crop implementation by farmers increased throughout the state. The state budget situation is ever evolving, so there are possibilities of funding amounts fluctuating across fiscal years dependent upon the budgetary climate.

In terms of regulations, Delaware promulgated new Onsite Wastewater Regulations in 2013, to help Delaware to meet future nutrient reduction goals for septic connections, pump-outs, and advanced treatment systems. In February 2019, the Delaware Sediment and Stormwater Regulations were updated and implemented, covering all land-disturbing activities greater than 5,000 square feet. Also, in 2019, the Sediment and Stormwater Program drafted, submitted and received approval for a new Construction General Permit (CGP). The CGP is required for any land-disturbing activities greater than one acre that require National Pollutant Discharge Elimination System (NPDES) permit coverage. Delaware's new CGP went into effect March 11, 2021.

DNREC's NPS Program has undergone several internal reorganizations over the last couple of years, which previously aligned the following programs: 319 NPS program, Chesapeake Bay Implementation Program and the Conservation Reserve Enhancement Program (CREP), as well as additional funding and resources through Delaware's Water Infrastructure Advisory Council (WIAC). The NPS Program now manages and administers two grants under the WIAC umbrella, including the Surface Water Matching Planning Grant (SWMPG) and the Community Water Quality Improvement Grant (CWQIG) in addition to the CWA Section 319 grant.

In 2023, the Chesapeake Bay Implementation Team increased staffing levels and formed an independent Chesapeake Bay Program within the Division of Watershed Stewardship. This program directly manages the Chesapeake Bay Implementation Grant (CBIG), the Chesapeake Bay Infrastructure Investment and Jobs Act (IIJA) Grant, the Delaware Riparian Forest Buffer Program, and the Delaware Community Conservation Assistance Program (DECAP). The NPS Program works closely with the Chesapeake Bay Program as both programs share the same goals of enhancing water quality by addressing NPS pollution.

A future goal of the Chesapeake Bay Implementation Program and NPS Program is to further enhance the Chesapeake Bay Implementation Program's BMP Tracker database to store statewide BMP data instead of just Chesapeake Bay watershed-specific data. Established in late 2019, the new database still needs work to merge historical data from an older database before hopefully expanding it to encompass statewide BMP data. A contractor was hired in 2021 to assist with the historical data migration to the BMP Tracker Tool. These efforts are ongoing. However, there are challenges on how certain data is submitted at geographic scales. Some of these challenges are linked to landowner privacy protections.

The Division of Watershed Stewardship's Watershed Assessment and Management Section (WAMS) led the effort to develop, through contractor assistance, a BMP planning and tracking tool called the Delaware Targeting and Planning Tool (DTAP), which works in conjunction with the BMP Tracker tool. The DTAP helps users with the planning process to identify, target and more efficiently position BMPs within watersheds to maximize the financial capacity of various grants that provide funding toward those implementation efforts. In 2023, DTAP was tested internally by Division of Watershed Stewardship staff to provide user feedback to the contractor. The DTAP is functional for nutrient load reduction modeling. There are still some case-by-case modeling scenarios being troubleshooted for specific BMP load reduction modeling since this is still a newly implemented tool.

There are challenges with implementing strategies and initiatives to help achieve water quality. The NPS Program works with various partner organizations in the agriculture and urban sectors to identify and implement appropriate water quality BMP projects that maximizes load reduction and monetary investment efficiencies. Typical challenges include inflationary pressures that increase project costs and the capacity of partner organizations to achieve grant match requirements. Looking forward, DNREC's NPS Program will continue to make progress toward its goals and will work to align funding with water quality priorities. Although Delaware faces many challenges, DNREC remains committed to working with partners at the state, local and federal levels to reduce NPS pollution entering our waterbodies.

# List of Partner Organizations/Committee Members

The hard work and many hours of agency staff members, organization members and private individuals who have partnered with the NPS Program in 2023 to address, reduce, identify and/or measure NPS pollution in Delaware is greatly appreciated. It is a credit to our partners as they have cooperated in the face of many challenges to help support the initiatives of the NPS Program.

**Debbie Absher**
Sussex Conservation District

**Bonnie Arvay**
DNREC Sediment and Stormwater Program

**Jayme Arthurs**
USDA - NRCS State Office

**David Baird**
Sussex Conservation District

**Ashley Barnett**
DNREC Nonpoint Source Program

**Carol Bason**
Delaware Botanic Gardens

**Mark Biddle**
DNREC Watershed Assessment and Management

**Kesha Braunskill**
United States Forestry Service

**Chris Brosch**
Delaware Department of Agriculture Nutrient Management Program

**Lori Brown**
DNREC Watershed Assessment and Management

**Tyler Brown**
DNREC Division of Watershed Stewardship

**Michael Case**
DNREC Drainage Program

**Kimberly Cole**
DNREC Climate Coastal Programs

**Bob Coleman**
Delaware Department of Agriculture Nutrient Management Program

**Ben Coverdale**
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# Appendices

## Appendix A - 2023 Milestones

| Type | Timeline | Milestone | Comments/Status Updates |
|---|---|---|---|
| Short Term | FY19 to FY24 | Increase number of outreach and education interactions by 10% over FY 2018 baseline (approx. 8,500 and 3,500 interactions, respectively) | A 10% increase in the number of outreach and education interactions over the FY18 baseline of 8,500 and 3,500 interactions during FY19 to FY24 respectively, would be a combined total of 13,200 outreach and education interactions over the FY19 to FY24 timeframe. In 2019, the NPS Program staff had a total of 7,500 interactions. In 2020, the NPS Program staff had a total of 1,637 interactions. In 2021, the NPS Program staff had a total of 11,199 interactions (4,316 in-person and 6,883 virtual). In 2022, the NPS Program staff had a total of 6,842 interactions (5,182 in-person and 1,660 virtual). In 2023, the NPS Program had a total of 10,876 interactions (4,112 in-person and 6,764 virtual). Since 2019 there have been a total of 38,054 outreach and education interactions. The 2019, 2020, 2021, 2022 and 2023 total interactions represent 206% of the interaction goal during this measured timeframe of FY19 through FY24. |
| Short Term | FY19 to FY24 | Increase estimated nutrient load reductions from implementation of NPS BMPs in non-Chesapeake Bay and Chesapeake Bay priority watersheds by at least 5% and 20%, respectively. The modeling tools used for the Chesapeake Bay will be used for all watersheds to assess progress from the determined 2002-baseline year. Using the Chesapeake Assessment Scenario Tool, loads will be assessed to enumerate progress in the Management Plan. | Due to formatting and collection differences between the Grant Reporting and Tracking System (GRTS) submission and CB Program Progress submission, it is difficult to standardize data for a CAST analysis outside of the CB watershed.<br><br>GRTS is an online data management system through EPA where states can track and report grant-funded projects including BMP data, budgets, etc. Through use of Chesapeake Bay Regulatory and Accountability Program grant (CBRAP) funding, the program has developed a new BMP Tracking and Reporting Tool which was used for CB watershed progress beginning in 2019. In the future, the plan is to further develop the BMP Tracker Tool to handle statewide BMP data and utilize a new targeting and planning tool that hopefully can calculate statewide load reductions.<br><br>Based on load reductions calculated for all priority watersheds with the DNREC load reduction tool and the DTAP Tool, the following observations were leveraged and/or noted when comparing to 2022 estimated load reduction data across priority watersheds where Section 319 grant funds were utilized for BMP implementation. Nutrient load reductions in non-Chesapeake Bay watersheds increased by greater than 5% in 2023 as compared to 2022. Nutrient load reductions in Chesapeake Bay watersheds did not increase by at least 20% in 2023 as compared to 2022.<br><br>The DTAP Tool was functional for this annual report to calculate cover crop and nutrient management load reductions. Other BMPs will be tested in the model for load reduction calculations in 2024. All other BMP load reductions continued to be calculated using the existing approved DNREC model. Since DNREC is transitioning from the existing load reduction modeling tool to the DTAP tool, it can be expected that calculated load reduction values/efficiencies may differ between the two. The DTAP is utilizing the most current nutrient reduction efficiencies when calculating estimated load reductions. |

| Type | Timeline | Milestone | Comments/Status Updates |
|---|---|---|---|
| Short Term | FY19 to FY24 | Characterize baseline conditions and establish timeframe for subsequent monitoring following BMP implementation in priority watersheds that do not have established baselines and re-evaluate old baselines. | The currently accepted a-i watershed implementation plans (WIP) have WIP reduction goals included in the individual watershed progress report for all identified priority watersheds. BMP implementation and reporting to the NPS program is calculated and compared to the established WIP goals for each priority watershed. NPS baseline loads have been established by the DNREC Watershed Assessment and Management Section (WAMS) for all priority watersheds within the NPS Program. Revaluation of baseline loads is at the discretion of WAMS. The WAMS oversees water quality monitoring stations throughout the State and the associated water quality monitoring data can be accessed at https://cema.udel.edu/applications/waterquality/ |
| Short Term | FY19 to FY24 | Demonstrate stable or improving water quality trends for the sub-watersheds of the Inland Bays and Chesapeake Bay relative to data established from 1990 to present. | Delaware maintains a General Assessment Monitoring Network (GAMN) of approximately 139 stations. Twenty-three of the stations are monitored monthly and the remaining stations are monitored either six or 12 times per year. Each station is monitored for conventional parameters such as nutrients, bacteria, dissolved oxygen, pH, alkalinity and hardness. Some stations are monitored for dissolved metals. The data from this monitoring is entered into Water Quality Exchange (WQX) and Water Quality Portal (WQP) databases and used for the State of Delaware Combined **Watershed Assessment (305(b))** and Determination for the **Clean Water Act Section 303(d)** List of Waters Needing TMDLs Report and other uses by interested parties. More information about Delaware's Water Quality monitoring is available online at:<br><br>**dnrec.alpha.delaware.gov/watershed-stewardship/assessment/water-quality-monitoring/**<br><br>In addition to uploading data to WQX and WQP, the Department also works in cooperation with the University of Delaware to share available water quality data in a more user-friendly format in the Delaware Water Quality Portal at this URL: **demac.udel.edu/waterquality**<br><br>**Trend Analysis for Nitrogen and Phosphorus at 11 Freshwater Sites:**<br><br>The following information was utilized from the Integrated 303(d) and 305(b) Report, where nutrient trend analyses were conducted at selected monitoring sites throughout the state through 2019. For total nitrogen concentrations, trends have been detected from nine out of the 11 sites; an upward trend has been detected from three sites in Nanticoke River, Marshyhope Creek and Deep Creek Branch, and a downward trend from six sites in Beaverdam Ditch, Millsboro Pond, Blackbird Creek, Brandywine Creek, White Clay Creek and the Christina River. For total phosphorus concentrations, trends have been detected from eight out of the 11 sites; an upward trend has been detected from three sites in Beaverdam Ditch, Silver Lake of St. Jones River, Deep Creek Branch, and a downward trend from 5 sites in Nanticoke River, Red Clay Creek, White Clay Creek, Brandywine River and Christina River. |

| Type | Timeline | Milestone | Comments/Status Updates |
|---|---|---|---|
| Short Term | FY19 to FY24 | Remove an identified impairment from a Land River Segment currently included on Delaware's list of impaired waterways. | A 5.12 mile segment of the Pocomoke River (DE250-001-03) in the Pocomoke River watershed was removed from Delaware's list of impaired waters for bacteria according to the state's 303(d), 305(b) integrated report. This success story was accepted by EPA in 2023. Although the milestone goal is to remove one segment within the established FY timeframe, the NPS Program is ambitiously attempting to identify a water body delisting each year. |
| Long Term | FY19 to FY24 | Show significant progress towards completion of implementation activities for all Delaware's priority watersheds with approved Nine Element Watershed Plans. | This progress is continually assessed and tracked through BMP data submissions to the NPS Program. Progress is reported in the GRTS system and reflected holistically in the NPS Program Annual Reports. In 2021, the NPS Program contracted with an environmental consulting firm to update the Little Assawoman Bay watershed implementation plan. This watershed plan was completed in 2023. In late 2023, the NPS Program engaged with an environmental consulting firm to update three more existing watershed plans. Tentatively, the Christina Basin, St. Jones River, and Appoquinimink River watershed plans will be updated. Cover crop implementation acres continue to be a strong point for Delaware priority watersheds as increased financial investments have occurred to encourage more adoption. |
| Long Term | FY19 to FY24 | Demonstrate water quality improvement in 20% or more of the priority and monitored priority watersheds as reported in the NPS Annual Report. | Long term nitrogen and phosphorous data has been collected and analyzed by DNREC WAMS for 11 freshwater stream sites. As of the 2022 Integrated Report development, not all priority watersheds funded by the NPS Section 319 grant were analyzed for trends. However, a downward trend in nitrogen was noted at two sites in the Inland Bays and three sites in the Christina Basin watershed. A downward trend in phosphorous was noted at a site in the Nanticoke River, and four sites in the Christina Basin. One-third (three out of nine) of the priority watersheds showed improved water quality via downward nitrogen and/or phosphorous trends. Water quality monitoring and trend data are maintained by the DNREC WAMS. |
| Long Term | Annually through FY30 | Show annual increases in funding and quantities of BMPs implemented in priority watersheds. | In 2023, the State FY24 budget appropriated approximately $5.2 million in state general funds towards cover crop implementation efforts. This appropriation reflected an increase of $2 million as compared to the previous high appropriation amount. Delaware has made the commitment to provide financial resources to increased BMP implementation. As demonstrated by increase implementation rates of farmers over the past couple fiscal year cycles, the request for additional cover crop funding by the Delaware Department of Agriculture was requested and granted by the state legislature.<br><br>These cover crop funds have preliminarily resulted in increased cover crop acre adoption by farmers when compared to historical years. Funding through the Chesapeake Bay Implementation Grant has been utilized since 2020 to implement cover crops in Most Effective Basins (MEB) within the Chesapeake Bay watershed. Approximately $364,540 per year, contingent upon EPA funding, is made available for BMP implementation in priority watersheds. The CWA Section 319 grant has historically provided funding toward cover crops to the County Conservation Districts.<br><br>In 2023, the Conservation Program Section fully implemented a State Riparian Forest Buffer Program in the Chesapeake Bay watershed as well as a Community Conservation Assistance Program (DECAP) which provides funding to implement homeowner urban BMPs. |

| Type | Timeline | Milestone | Comments/Status Updates |
|---|---|---|---|
| Long Term | Annually through FY30 | Remove one water body currently listed for nutrient pollutants from the 303(d) List. | According to the most recent 2022 Integrated Report, there were 10 water segments delisted throughout the state for nutrients. Six of these water segments were in priority watersheds, including: two in the Little Assawoman Bay (Inland Bays), one in the Choptank River, one in the Broadkill River, one in the Nanticoke River, and one in the Christina Basin (Brandywine Creek watershed). DNREC WAMS continuously monitors water quality trends throughout the various WQX and WQP monitoring stations in the state. As continued BMP implementation is funded by grant efforts, and water quality monitoring trends are analyzed, any water body delisting for nutrients will be reflected in this report. |

# Appendix B – Water Quality Trend Data

Delaware maintains a General Assessment Monitoring Network (GAMN) of approximately 139 stations. Twenty-three of the stations are monitored monthly and the remaining stations are monitored either six or 12 times per year. Each station is monitored for conventional parameters such as nutrients, bacteria, dissolved oxygen, pH, alkalinity, and hardness. Some stations are monitored for dissolved metals. The data from this monitoring is entered into EPA's Water Quality Exchange (WQX) and Water Quality Portal (WQP) databases and used for the State of Delaware Combined Watershed Assessment (305(b)) and Determination for the Clean Water Act Section 303(d) List of Waters Needing TMDLs Report and other uses by interested parties. More information about Delaware's Water Quality monitoring is available online at: **dnrec.alpha.delaware.gov/watershed-stewardship/assessment/water-quality-monitoring.**

In addition to uploading data to WQX and WQP, the Department also works in cooperation with the University of Delaware to share available water quality data in a more user-friendly format in the Delaware Water Quality Portal at: **demac.udel.edu/waterquality**.

## Trend Analysis for Monitoring Sites (Nitrogen and Phosphorous):

As an integral part of tracking watershed progress toward achieving TMDL targets, trend analysis of nutrient condition (concentration and load) has been performed at various locations throughout the State. The estimation of the direction and magnitude of trends in total nitrogen (TN) and total phosphorous (TP) concentrations as well as the associated certainties are presented.

Eleven C1 monitoring sites throughout the state provided long-term nitrogen and phosphorus data to be analyzed for trends using the Weighted Regressions on Time, Discharge, and Season (WRTDS) method. For total nitrogen concentrations, trends have been detected from nine out of the 11 sites; an upward trend has been detected from three sites in Nanticoke River, Marshyhope Creek and Deep Creek Branch, and a downward trend from six sites in Beaverdam Ditch, Millsboro Pond, Blackbird Creek, Brandywine Creek, White Clay Creek and the Christina River. For total phosphorus concentrations, trends have been detected from eight out of the 11 sites; an upward trend has been detected from three sites in Beaverdam Ditch, Silver Lake of St. Jones River, Deep Creek Branch, and a downward trend from five sites in Nanticoke River, Red Clay Creek, White Clay Creek, Brandywine River and Christina River.

## Figure 1: Location of C1 Monitoring Sites for Trend Analysis

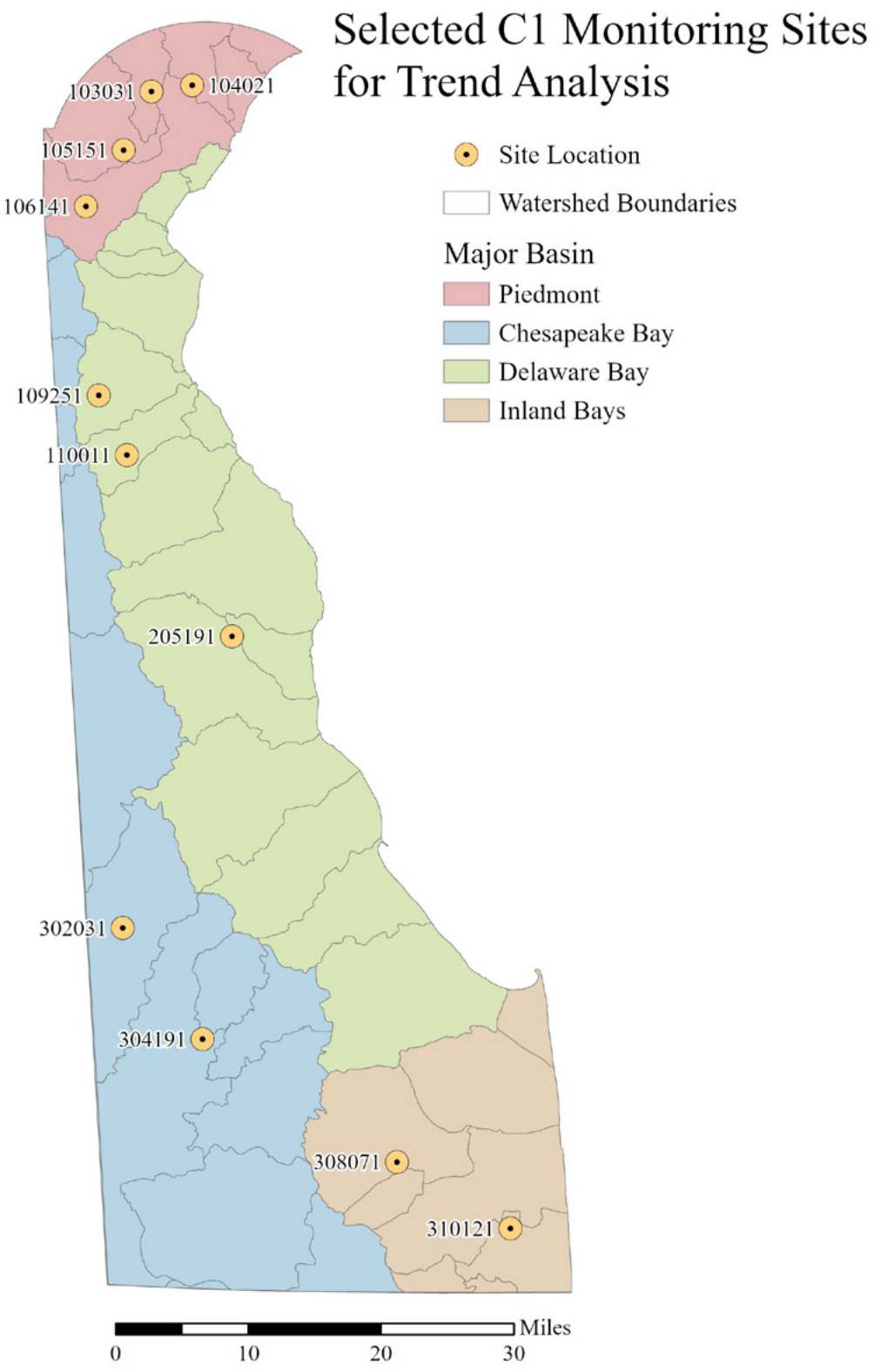



Table 1 shows selected C1 monitoring sites and their co-located USGS stream gage sites.

## Table 1: Selected C1 Monitoring Sites and Their Co-located USGS Stream Gage Sites

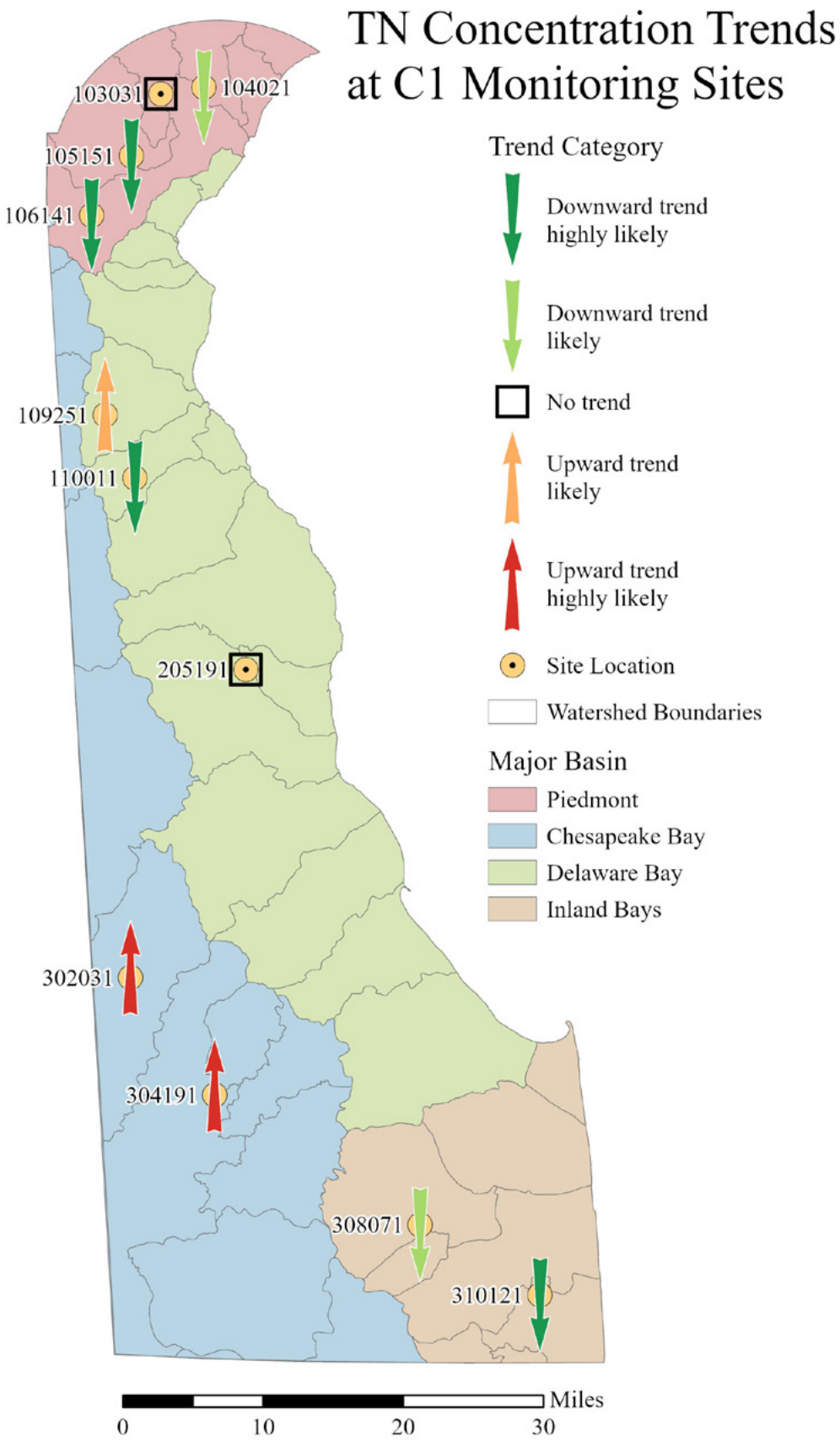
| C1 Site ID | Location Description | USGS Stream Gage ID | USGS Stream Gage Name | Drainage Area (mi2) |
|---|---|---|---|---|
| 103031 | Red Clay at Lancaster Pike (Rt. 48) | 1480000 | Red Clay Creek at Wooddale, DE | 47.0 |
| 104021 | Brandywine Creek at New Bridge Rd. (Rd. 279) | 1481500 | Brandywine Creek at Wilmington, DE | 314.0 |
| 105151 | White Clay Creek at Delaware Park Blvd. | 1479000 | White Clay Creek near Newark, DE | 89.1 |
| 106141 | Christina River at Sunset Lake Rd. (Rt. 72) | 1478000 | Christina River at Coochs Bridge, DE | 20.5 |
| 109251 | Appoquinimink River trib., Deep Creek Br. at Summit Bridget Rd. (Rt.71) | 1483155 | Silver Lake Tributary at Middletown DE | 1.7 |
| 110011 | Blackbird Creek at Blackbird Station Rd. (Rd. 463) | 1483200 | Blackbird Creek at Blackbird, DE | 4.1 |
| 205191 | St. Jones River, Silver Lake at Spillway (Dover City Park) | 1483700 | St. Jones River at Dover, DE | 31.9 |
| 302034 | Marshyhope Creek at Fishers Bridge (Rd. 308) | 1488500 | Marshyhope Creek Near Adamsville, DE | 46.8 |
| 304191 | Nanticoke River, at Rifle Range Rd. (Rt. 545) | 1487000 | Nanticoke River Near Bridgeville, DE | 75.4 |
| 308071 | Indian River, Millsboro Pond outlet at John Williams Hwy. (Rt. 24) | 1484525 | Millsboro Pond Outlet at Millsboro, DE | 61.7 |
| 310121 | Little Assawoman Bay, Beaver Dam Ditch at Beaver Dam Rd. (Rd. 368) | 1484695 | Beaverdam Ditch Near Millville, DE | 2.2 |

## Table 2: Trend Analysis Results for TN and TP Concentrations at C1 Monitoring Sites

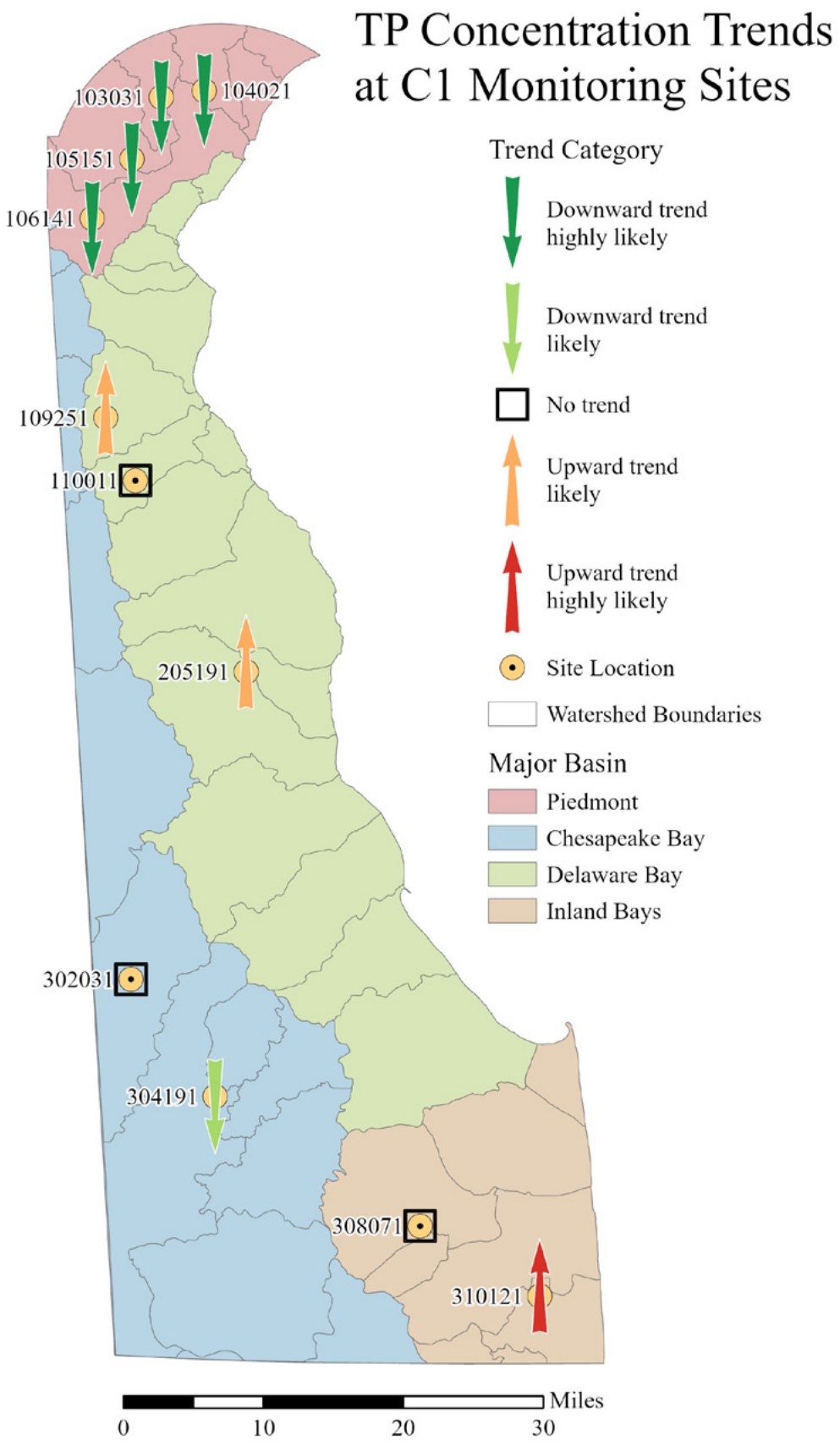
| C1 Site ID | Location Description | Period (water year) | Estimated TN Change (mg/l) | Estimated TP Change (mg/l) | TP Trend* | TP Trend* |
|---|---|---|---|---|---|---|
| 103031 | Red Clay at Lancaster Pike (Rt. 48) | 1999 - 2019 | -0.07 | -0.177 | ▬ | ▼ |
| 104021 | Brandywine Creek at New Bridge Rd. (Rd. 279) | 1999 - 2019 | -0.19 | -0.070 | ▼ | ▼ |
| 105151 | White Clay Creek at Delaware Park Blvd. | 1999 - 2019 | -0.63 | -0.142 | ▼ | ▼ |
| 106141 | Christina River at Sunset Lake Rd. (Rt. 72) | 1999 - 2019 | -0.83 | -0.026 | ▼ | ▼ |
| 109251 | Appoquinimink River trib., Deep Creek Br. at Summit Bridget Rd. (Rt.71) | 2008 - 2019 | 0.45 | 0.005 | ▲ | ▲ |
| 110011 | Blackbird Creek at Blackbird Station Rd. (Rd. 463) | 2002 - 2019 | -0.67 | -0.003 | ▼ | ▬ |
| 205191 | St. Jones River, Silver Lake at Spillway (Dover City Park) | 1999 - 2019 | 0.00 | 0.012 | ▬ | ▲ |
| 302034 | Marshyhope Creek at Fishers Bridge (Rd. 308) | 1998 - 2019 | 2.02 | 0.006 | ▲ | ▬ |
| 304191 | Nanticoke River, at Rifle Range Rd. (Rt. 545) | 1989 - 2019 | 1.67 | -0.029 | ▲ | ▼ |
| 308071 | Indian River, Millsboro Pond outlet at John Williams Hwy. (Rt. 24) | 1998 - 2019 | -0.46 | 0.002 | ▼ | ▬ |
| 310121 | Little Assawoman Bay, Beaver Dam Ditch at Beaver Dam Rd. (Rd. 368) | 1999 - 2019 | -2.85 | 0.059 | ▼ | ▲ |

* ▼ Dark green triangle for highly/very likely downward trend, ▼ light green triangle for likely downward trend, ▲ orange triangle for highly/very likely upward trend, ▲ yelow triangle for likely upward trend, ▬ dark blue line for no trend

## Figure 2: TN Trend Directions at the Selected Monitoring Site



## Figure 3: TP Trend Directions at the Selected Monitoring Sites



# Appendix C - Education and Outreach Events

Despite the prior logistical challenges posed by the pandemic, the **DNREC NPS Program** remained active in outreach events in both a virtual and in-person format. A breakdown of some of the events and initiatives:

**On March 6, 2023,** a "Pollinator Workshop: Five Steps for More Butterflies in Your Garden" was conducted at the Laurel Public Library. This presentation led by a Delaware Master Naturalist highlighted practices to increase butterfly population while also improving the health of local waterways. Partners included the Delaware Nature Society and Nanticoke Watershed Alliance, which are part of the Reclaim Our River Program. The NPS Program had an exhibit and free milkweed seeds for Monarch butterflies and additional resources were distributed to approximately 40 people in attendance.

**On March 18, 2023,** the NPS Program staffed the annual Beach Grass Planting event at the Delaware Seashore State Park. Volunteers are the backbone of Delaware's shoreline stabilization. Every spring since 1990, except when pandemic conditions prevented it, dedicated volunteers have stabilized Delaware's sand dunes by planting more than 5 million stems of Cape American beach grass along ocean and bay beaches. Fifty-eight volunteers attended the planting at this location.

**On March 27, 2023,** the Nonpoint Source Program provided information and resources while staffing an exhibit at the pollinator workshop, "Helpful Tools for the Birds and Bees in 2023," led by Delaware Master Naturalist Carol Stephens. Attendees learned about native shrubs, trees and flowers most likely to attract birds, bees and other pollinators while also helping to improve local water quality. The presentation took place at the Laurel Public Library and was organized by the Reclaim Our River Program, a partnership between DNREC, Delaware Nature Society, and Nanticoke Watershed Alliance. Thirty-seven people attended the workshop.

**On April 15, 2023,** as part of the month-long celebration of Earth Day in April 2023, DNREC, partners and volunteers cleaned up an area around Concord Pond near Seaford. The Division of Watershed Stewardship, Nonpoint Source Program in conjunction with the Reclaim Our River Program, a partnership between DNREC, the Delaware Nature Society and the Nanticoke Watershed Alliance, hosted the cleanup. Volunteers removed trash from the area and received guidance and resources on how to identify and remove invasive plant species from around the pond. Fifteen volunteers attended the cleanup.

**On April 29, 2023,** the Nonpoint Source Program staffed an exhibit at the Nanticoke Watershed Alliance, native plant sale and a presentation, of "A Place for Pollinators," at the Laurel Public Library. Attendees learned about pollinator-friendly options for a variety of landscapes. Native container gardening, designer ditches, bog gardens and carnivorous plants, groundcovers and lawn replacements in the sun and the shade were discussed. The DNREC exhibit included information on practices that support pollinators and improve water quality. Approximately 50 people were in attendance.

**On May 3, 2023,** the Nonpoint Source Program hosted the Biennial Nonpoint Source Partnership Meeting at its DNREC facility in Lewes, Delaware. Partners of the Delaware Nonpoint Source Program that attended included federal, state, and local agencies, town/city officials, Conservation Districts, non-profit organizations, and the University of Delaware. This year's in-person event had approximately 60 attendees. The event highlighted current and future work of the NPS Program, project highlights by grantees, new load reduction models being developed within DNREC, as well as updates from various other organizations concerning conservation programs.

**On May 6, 2023,** the Nonpoint Source Program staffed an exhibit at the DNREC and Center for Inland Bays, Water Family Fest and Native Plant Sale at the James Farm Ecological Preserve, in Ocean View. The event highlights the work of each organization to improve Delaware's wetlands, water and recreational shorelines. The exhibit included information on how to reduce nonpoint source pollution with resources available to the public. Approximately 200 attendees visited the NPS exhibit.

**On May 13, 2023,** the Division of Watershed Stewardship's Chesapeake Bay Implementation Program gave a presentation on the science behind the Division of Watershed Stewardship, the Delaware Community Conservation Assistance Program (DeCAP), and how all parties can work together to make a more sustainable Delaware. DeCAP, provides support and financial incentives for landowners interested in installing stormwater Best Management Practices (BMPs) in Delaware's Chesapeake Bay Watershed. Eligible BMPs include rain gardens, wetlands, tree plantings, and pollinator meadows. Approximately 30 people attended the presentation.

**Flood Awareness Week (May 15 – 23, 2023)**
In conjunction with DNREC and the Delaware Emergency Management Agency within the Department of Safety and Homeland Security, Governor John Carney proclaimed May 15 to 19, 2023 as Delaware Flood Awareness Week. The goal was to better inform residents about flood risk, likelihood of flooding from extreme weather events brought on by climate change, preparation, and effects on water quality. The DNREC Nonpoint Source Program contributed to the promotion of the awareness week, which included a social media campaign, flood awareness quiz, trainings, article in Outdoor Delaware online magazine, and DART bus wrap. The social media campaign reached 4,923 people and engaged 92 people.


**On June 1, 2023,** the NPS Program staff exhibited at the Delaware River and Bay Authority's World Environmental Day in New Castle County. Representatives from federal, state and local governments, environmental service organizations and private industry attended the event, sharing information on programs designed to improve the environment. More than 120 people visited the NPS exhibit.

**On June 3, 2023,** the Nonpoint Source Program staffed an exhibit at the annual Townsend fair which took place at the Townsend Municipal Park. Attendees visited vendors and educational booths, and enjoyed food, music, contests, and a parade. The NPS exhibit consisted of materials and activities designed for residents to learn how to help reduce nutrient and sediment pollution. Approximately 80 people visited the exhibit.

**On June 20, 2023,** the Chesapeake Bay Implementation Program gave a presentation on the science behind the Division of Watershed Stewardship, the Delaware Community Conservation Assistance Program (DeCAP), and how all parties can work together to make a more sustainable Delaware. DeCAP provides support and financial incentives for landowners interested in installing stormwater Best Management Practices (BMPs) in Delaware's Chesapeake Bay Watershed. Eligible BMPs include rain gardens, wetlands, tree plantings, and pollinator meadows. Approximately 40 people attended the presentation.

**On July 26, 2023,** the Nonpoint Source Program staffed an exhibit at the Delaware State Fair highlighting DNREC's freshwater mussel surveying work. The exhibit encouraged vistors to learn about the benefits of mussel's water filtering capabilities and experience a day in the life of an environmental scientist with a hands-on activity. Participants saw the equipment used in mussel surveys and got a chance to find, identify and document freshwater mussels. Approximately 2,200 people visited the DNREC building on that day.

**On Aug. 5, 2023,** the Nonpoint Source Program in conjunction with the Town of Blades, Nanticoke Watershed Alliance and Delaware Nature Society's Abbott's Mill Nature Center hosted the Recycled Cardboard Boat Regatta. The regatta provides participants and attendees a fun and educational day on the water. Throughout the day, exhibitors shared important information on how to improve water quality and attendees got a chance to connect with the Nanticoke River. The Nonpoint Source Program staffed an exhibit focusing on practices residents can use to help reduce nutrient and sediment pollution. Staff members also captained a boat in the regatta, winning the award, "Pride of the Fleet." Approximately 200 people were in attendance.


**On Aug. 8, 2023,** the Nonpoint Source Program participated in the "Greenwood Night Out" event hosted by the Greenwood Police Department. The event aims to strengthen neighborhood spirit and a police-community partnership. NPS staffed an exhibit focusing on practices residents can use to help improve local water quality. Approximately 105 attendees visited the exhibit.

**On Aug. 23, 2023,** the Nonpoint Source Program helped staff the Shoreline and Waterway Management Section with a marine debris cleanup at the North Inlet in Bethany Beach. Ten tons of concrete and asphalt that washed up onto the beach was removed. Approximately 30 people attended, both from DNREC and the public.

**On Oct. 1, 2023,** the University of Delaware hosted its annual Coast Day, an educational event at the Lewes Campus, allowing attendees to interact with researchers and educators, try hands-on activities, and attend presentations on a range of topics. The Nonpoint Source Program staffed an exhibit highlighting practices residents can use to help improve local water quality. The exhibit drew 477 visitors.

**On Oct. 21, 2023,** the Nonpoint Source Program staffed an exhibit at the Blackbird Creek Fall Festival in Townsend. The event was hosted by the Delaware National Estuarine Research Reserve and fosters stewardship of the Delaware Bayshore by celebrating the richness of estuaries and Delaware's cultural traditions. Approximately 300 people visited the exhibit.

**Delaware Watersheds Photo Contest – Oct. 13 to Nov. 24, 2023**
The Delaware Watersheds Photo Contest, hosted by the Division of Watershed Stewardship and staffed by the Nonpoint Source Program, is open to photographers of all ages and skill levels. The contest aims to share the beauty of Delaware's diverse environment while acting as a vivid reminder of everything that happens on land directly affects what happens in local waterways. The winner receives a prize pack including a $250 Visa gift card, a 2024 Delaware State Parks annual pass, a print of the winning photograph, and a certificate signed by Governor John Carney and DNREC Secretary Shawn M. Garvin. The winning photo is also published in Outdoor Delaware online magazine. Over 200 photos were entered. Approximately 41,753 people were reached and approximately 6,672 people were engaged through the social media campaign.

The 2023 winning photo was this closeup of a white-tailed deer.

**On Nov. 4, 2023,** the Nonpoint Source Program staffed an exhibit at the Odessa Fall Family Fair, a community-based, fall-themed event with family activities and educational opportunities. The exhibit consisted of information that residents can use to help improve the health of local water quality. Approximately 100 people visited the exhibit.

**The NPS Program continues to participate in a monthly "Luncheon Learn," throughout 2023.**
These meetings rotate monthly between virtual and in-person. These monthly sessions bring together partner organizations including the University of Delaware, County Conservation Districts, the Farm Service Agency, the Natural Resources Conservation Service, the Delaware Department of Agriculture, the Delmarva Chicken Association, Non-profit organizations, and the Delaware Association of Conservation Districts to discuss opportunities to improve, enhance, and leverage various programs to address resource concerns throughout the State.

DNREC's **Nonpoint Source Program** administers a competitive grant made possible through **Section 319** of the Clean Water Act (CWA). The grant provides funding for projects designed to reduce nonpoint source (NPS) pollution in Delaware. NPS pollution may be defined as any pollution that originates from a diffuse source (such as an open field or a road) and is transported to surface or ground waters through leaching or runoff. Reduction of NPS pollution may often be achieved through incorporation of specific best management practices (BMPs) into project workplans. Projects may target any source of NPS pollution, but most frequently involve agriculture, silviculture, construction, marinas, septic systems, and hydromodification activities.

In addition to funding projects that achieve reductions in NPS pollution, the DNREC NPS Program is committed to addressing these issues through educational programs, publications, and partnerships with other organizations working to reduce NPS pollution in Delaware.

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