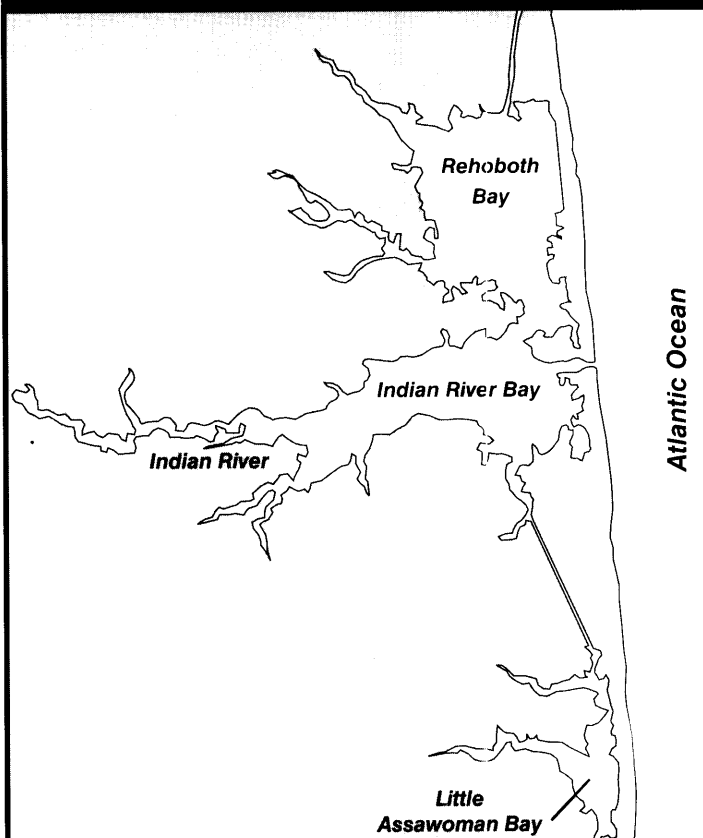




# Georgetown Stormwater Management Project

## Demonstrating Practical Tools For Watershed Management Through The National Estuary Program

### Delaware Inland Bays, Delaware



#### Characteristics:

- The Delaware Inland Bays consist of Rehoboth, Little Assawoman, and Indian River Bays.
- The Bays and their tributaries stretch across about 32 square miles and drain a 182 square mile watershed.
- About 120,000 people live in the Bay watershed.
- Approximately 75 square miles of the watershed are used as farmland, 3 square miles are urban, and the rest is mainly open space and forest.

**The Problem:** The overloading of nutrients in the Bay from point and nonpoint sources has resulted in decreased water quality and loss of habitat.

- Submerged aquatic vegetation beds once thrived in the Bays; however, excessive nutrient levels have suppressed their growth.
- Soft clam, oyster, and bay scallop fisheries are essentially extinct.
- Nonpoint sources, especially stormwater runoff, are the primary source of nutrient loading in the Bays.

**The Project:** The Georgetown Stormwater Management Demonstration Project was designed to construct an artificial freshwater wetland for stormwater control and habitat creation in an urban area, the Georgetown Industrial Park.

### The National Estuary Program

*Estuaries and other coastal and marine waters are national resources that are increasingly threatened by pollution, habitat loss, coastal development, and resource conflicts. Congress established the National Estuary Program (NEP) in 1987 to provide a greater focus for coastal protection and to demonstrate practical, innovative approaches for protecting estuaries and their living resources.*

*As part of this demonstration role, the NEP offers funding for member estuaries to design and implement Action Plan Demonstration Projects that demonstrate innovative approaches to address priority problem areas, show improvements that can be achieved on a small scale, and help determine the time and resources needed to apply similar approaches basinwide.*

*The NEP is managed by the U.S. Environmental Protection Agency (EPA). It currently includes 28 estuaries: Albemarle-Pamlico Sounds, NC; Barataria-Terrebonne Estuarine Complex, LA; Barnegat Bay, NJ; Buzzards Bay, MA; Casco Bay, ME; Charlotte Harbor, FL; Columbia River, OR and WA; Corpus Christi Bay, TX; Delaware Estuary, DE, NJ, and PA; Delaware Inland Bays, DE; Galveston Bay, TX; Indian River Lagoon, FL; Long Island Sound, CT and NY; Maryland Coastal Bays, MD; Massachusetts Bays, MA; Mobile Bay, AL; Morro Bay, CA; Narragansett Bay, RI; New Hampshire Estuaries, NH; New York-New Jersey Harbor, NY and NJ; Peconic Bay, NY; Puget Sound, WA; San Francisco Bay-Delta Estuary, CA; San Juan Bay, PR; Santa Monica Bay, CA; Sarasota Bay, FL; Tampa Bay, FL; and Tillamook Bay, OR.*

## Introduction To Delaware Inland Bays

Along Delaware's southeastern coast, between Rehoboth Bay and Fenwick Island, lie three interconnected bodies of water known as the Delaware Inland Bays. Historically, the Inland Bays were a natural, primarily freshwater, estuarine environment capable of supporting a wide variety of wildlife. Large, thriving beds of submerged aquatic vegetation (SAV), such as eelgrass, provided a home for numerous waterfowl, shellfish, and finfish.

Although a few areas of the Bays are still considered healthy, products of industry and development, mainly the nutrients nitrogen and phosphorus, have caused a noticeable decline in water quality and a loss of habitat. This, in turn, has shaken the fragile lines connecting the health of the Inland Bays to the plant and animal life existing within and around the estuaries. As a result, Delaware's Inland Bays have suffered.

Excessive amounts of nitrogen and phosphorus have robbed the once healthy waterbodies of oxygen. This has led to either fish kills or movement of fish to other areas. The high levels of nitrogen and phosphorus have also inhibited the growth of SAV in the Inland Bays, eliminating the freshwater habitat needed by wildlife such as scallops, white perch, and striped bass. Presently, no substantial SAV beds exist in the Bays, and previously existing soft clam, bay scallop, and oyster fisheries are, for the most part, extinct.

A 1988-1990 study of nutrient loads indicated that the nitrogen and phosphorus inputs to the Bays come from both point and nonpoint sources; nonpoint sources, especially stormwater runoff, however, are the primary source of nutrients to the Bays. It has been estimated that nonpoint sources contribute 1,040 tons of nitrogen per year and 30 tons of phosphorus per year to Indian River and Rehoboth Bay. Loadings have increased in areas with a large amount of impermeable surfaces, such as roadways or parking lots.

## Overview Of Georgetown Industrial Park

Georgetown Industrial Park, located in and owned by Sussex County, Delaware, is a highly urbanized 200-acre site. An airport occupies about one-half the site, whereas the other half contains light industrial businesses. The entire 200-acre industrial park drains past an open field by way of drainage ditches. Stormwater and nutrients are transported directly into Peterkins Branch, a tributary of the Indian River. The Indian River then carries the nitrogen

and phosphorus-laden stormwater eastward to the Delaware Inland Bays.

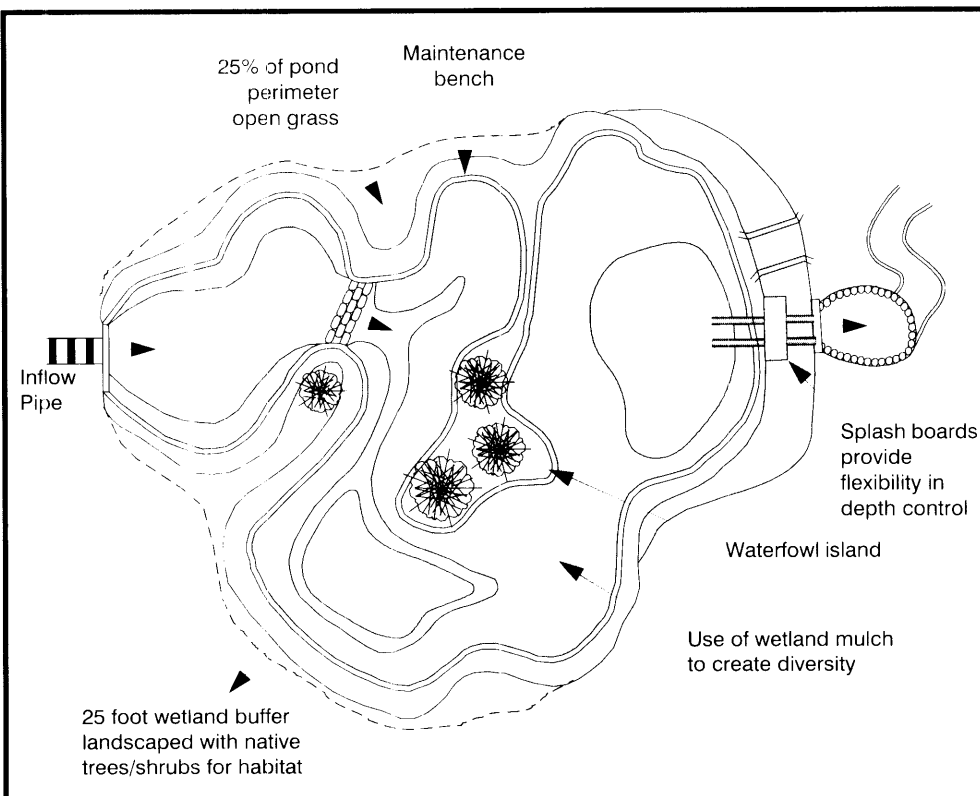
The Georgetown Industrial Park was chosen as a demonstration project because it typifies the problem of stormwater-carried nutrients in an urban watershed. In addition, the demonstration project provided the perfect arena for testing the new and unique method of using a constructed wetland for stormwater control. EPA joined forces with the Delaware Department of Natural Resources and Environmental Control, the Soil Conservation Service, the Sussex Conservation District, and the Sussex County government to develop a plan to demonstrate the use of an artificial wetland for stormwater management and habitat creation.

## Project Objectives

The objectives of the project were to reduce nitrogen and phosphorus loads entering the Bays, create additional habitat for wildlife, and demonstrate the effectiveness of using an artificially constructed wetland for stormwater management.

## Implementing The Project

The Georgetown Industrial Park site was selected as the demonstration site in 1990. Because the industrial park is owned by the County of Sussex, acquisition of property was not necessary. The County and State of Delaware negotiated a lease agreement for the 2-acre project site for \$1 a year. Design and construction of the pond was completed in fall 1991. The pond was planted with emergent wetland plants in spring 1992. The



*A shallow marsh system wetland similar in design to the Georgetown wetland.*

design and construction phases of the project involved a number of steps:

- Staff wetland biologists field verified that there were no natural wetlands at the project site.
- The constructed wetland was designed as an "off line" treatment system. Flow diversions were designed for placement in the two existing drainage ditches to direct the first inch of runoff from the industrial park to the wetland. This "off line" approach would divert the first flush to the wetland, while larger flows could continue unimpeded.
- Construction was sequenced so that the wetland was built from the outside-in, allowing the emerging pond to act as its own sediment basin during construction. The actual connection of the pond with the existing drainage ditches was not done until the entire excavation was completed and the site was stabilized by vegetation above the normal pond elevation.
- To enhance wildlife benefits, the wetland was constructed in an irregular shape, and 75 percent of the depths in the pond were less than 2 feet. An island was built in the pond to lengthen flow paths from inflow to outflow, providing a secure location for nesting birds. The outlet consisted of a weir structure with splash boards to control pond elevation as needed.

- Approximately 30 percent of the pond surface area was planted with emergent plants to accelerate the development of the wetland. Although construction of the pond was completed in fall 1991, wetland planting took place in spring 1992, so that wetland grasses and brush could have a full growing season to maximize planting success.

The project team organized a "Planting Picnic" offering pizza and hamburgers to participants. The team enlisted the help of 150 high school students who volunteered their green thumbs for the planting event. While students were planting, small group information sessions were held to explain the need for and expectations of the project. Overall, 8,000 plants including buttonbush shrubs, duck potato grass, and bald cypress trees were planted in about 4 hours. The planting event was attended by local officials and covered by news reporters and TV stations.

### The Georgetown Industrial Park Success Story

**T**he Georgetown Stormwater Management Demonstration Project proved to be an innovative, successful, and attractive way to control stormwater runoff. The project team found that, much like a natural wetland, the constructed wetland acts like a "sponge," soaking up and retaining stormwater runoff. While holding the stormwater, the wetland removes nitrogen, phosphorus, and other pollutants through filtration by wetland plants, microbial activity, and uptake by wetland plants and algae, before gradually releasing stormwater to the Bays.

Although no funding has been made available for monitoring actual pollutant load reductions, it is estimated that up to 60 percent of the nitrogen and up to 40 percent of the phosphorus will be removed from the stormwater after flowing through the wetland. In addition, the suspended sediments could be reduced by up to 80 percent and trace metals by approximately 60 percent.

The wetland, which is maintained by the State of Delaware, has also flourished as a habitat for plants, waterfowl, mammals, insects, and fish. Vegetation as well as plant diversity is booming, and many waterfowl have been sighted at the wetland. Some species, such as duck and quail, have already established nests.

Visually, the wetland adds scenic value to the industrial park. The project has demonstrated that constructing an artificial wetland would not only be an effective way to treat nutrient loading from stormwater runoff, but an attractive one as well.

The Georgetown Stormwater Management Demonstration Project successfully illustrates the ability to use an artificially-constructed wetland to control stormwater and create additional habitat. The applicability of project conditions and methods used to other areas is widespread. Artificial wetlands can be used quite successfully in other regions of the country to treat stormwater, especially in coastal areas. However, conditions change from region to region, so it is important to consider factors such as soil types, available space, and baseflow or groundwater supply.



*High School students planted shrubs, grasses, and trees in the wetland to provide habitat and increase filtering capabilities.*

## Lessons Learned

**T**he Georgetown Stormwater Management Demonstration Project illustrated that constructed wetlands are an excellent option for treating urban stormwater runoff and its associated pollutants. Additional lessons learned from the project include:

- Lease arrangements and memoranda of understanding can take longer to put in place than actual design and construction. A strategy to facilitate the process helps minimize delays in implementation.
- A major cost factor for any stormwater management project is the cost associated with removal and disposal of earth excavated from the project site. Consideration should be given to disposal locations close to the site. In the case of the Georgetown Stormwater Management Demonstration Project, fill material was needed to extend a runway at the nearby airport, so the materials had to be trucked only a short distance.
- Plantings should be done at a time of year when the plants have a full growing season to ensure rapid and lush growth. In Delaware, planting should be done in spring so that plants have a full growing season prior to dormancy.



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