

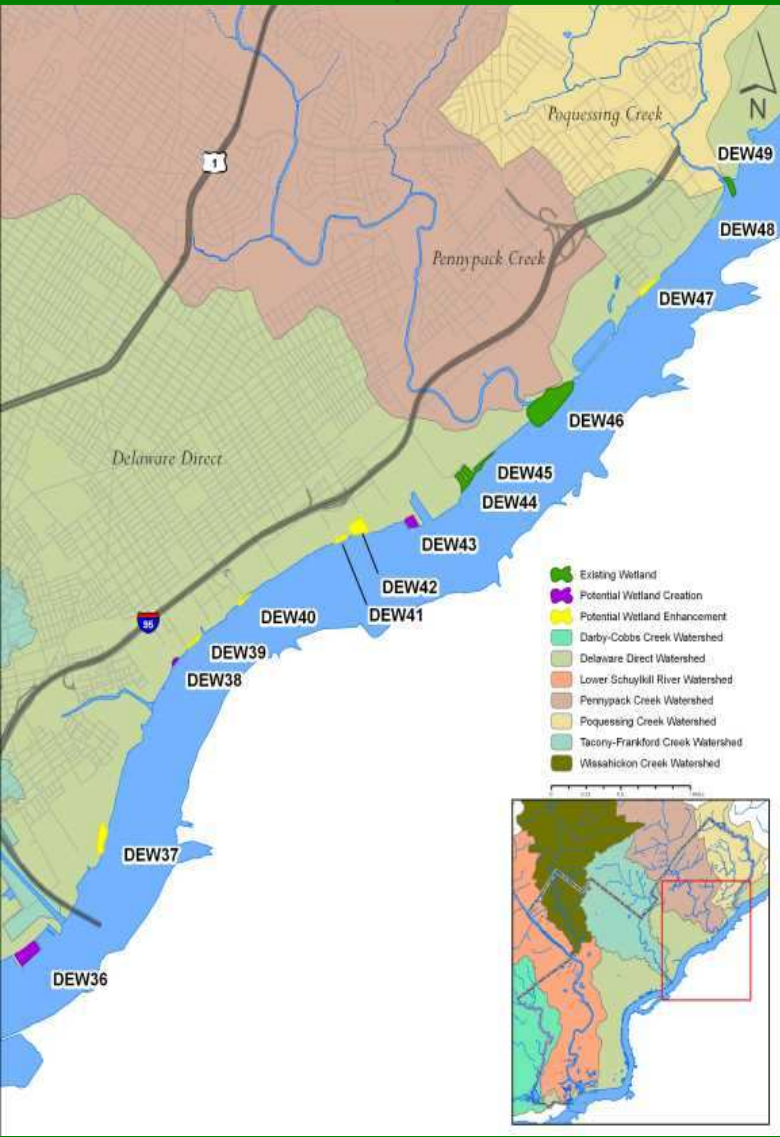
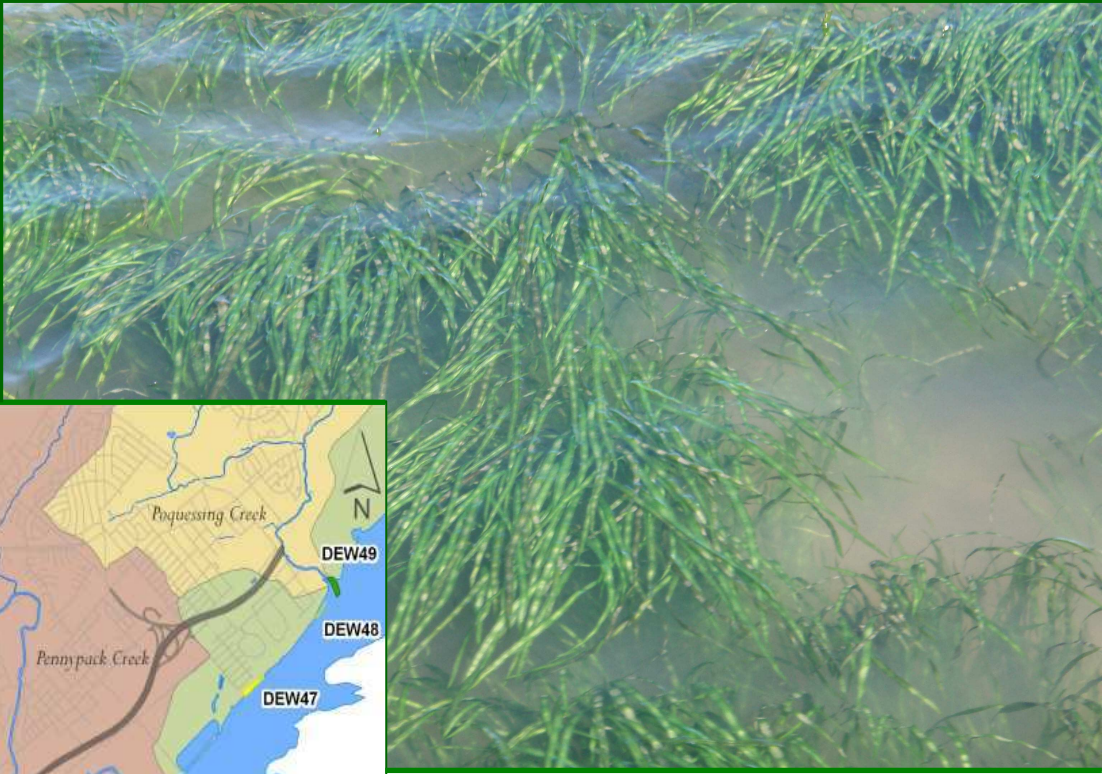
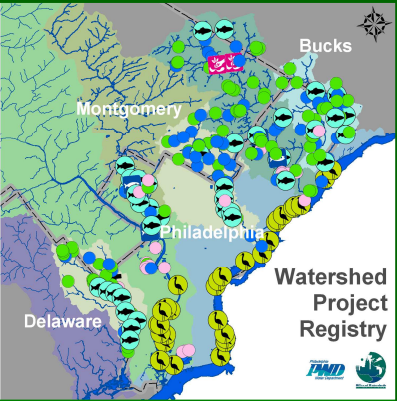
# TIDAL WETLAND

## Overview

Tidal wetlands are one of the most productive ecosystems. They produce large amounts of plant material which are broken down into small debris by the countless animals and micro-organisms which live in the sediments of wetlands. According to the 33 CFR - Code of Federal Regulations – Title 33: Navigation and Navigable Waters, tidal wetlands are defined as tidal waters that rise and fall in a predictable and measurable rhythm or cycle due to the gravitational pull of the moon and sun. Tidal waters end where the rise and fall of the water surface can no longer be practically measured in a predictable rhythm due to masking by other waters, wind, or other effects. Tidal wetlands are located channel ward of the high tide line.

Tidal wetlands exist along the tidal portion of the Schuylkill River and the Delaware River. The Delaware River has been altered from its natural state since the time of European settlement in the 17th century. By the 18th century Philadelphia was a major city and port; large areas of forests were cleared, and the shoreline was altered by dredging, diking, and filling. These actions resulted in decreased water quality and the disappearance of many tidal freshwater wetlands once continuous from Trenton, NJ to Chester, PA. Poor water quality, lack of habitat, and overfishing stressed fisheries found in the Delaware River and populations were reduced.





Prior to development, the tidal portion of the Schuylkill River was also surrounded by freshwater marshes. Today, streambanks are degraded and altered from their natural state. Approximately 76% of the land area surrounding the tidal portion of the Schuylkill River is urban or residential. The banks along the lower reach, from the Delaware River confluence to stream mile five, are dominated by industrial uses such as oil refineries. Continuing upstream, the River runs through center city Philadelphia, a heavily developed area. The tidal Schuylkill is impacted by urban runoff, industrial sources and combined sewer overflows.

During the 1950s the Delaware River near Philadelphia was devoid of oxygen for up to four months of the year, providing an effective barrier to fish migration. Treatment plants and water quality initiatives have since greatly improved water quality, and fish stocks in the Delaware River are improving. Currently, the Delaware River supports several commercially and recreationally important fish species including the American shad, *Alosa sapidissima*, striped bass, *Morone saxatilis*, and shortnose sturgeon, *Acipenser brevirostrum*. American shad and striped bass are anadromous species that

spend their adult life in the ocean, but migrate to freshwater to spawn. There is a significant shortnose sturgeon population found year round in the Upper Delaware Estuary estimated to include between 6,000-14,000 adults. Wetlands provide essential habitat for these, and many other species.

The passage of the Clean Water Act in 1972 was a turning point for water quality. During the 1970s and 1980s, corrective, preventative, and protective measures were taken and Delaware River water quality showed significant improvement. In recent years, certain populations of anadromous fish species, such as American shad (*Alosa sapidissima*), Atlantic sturgeon (*Acipenser oxyrinchus*) and striped bass (*Morone saxatilis*) have been steadily improving and recreational use of the river has increased.



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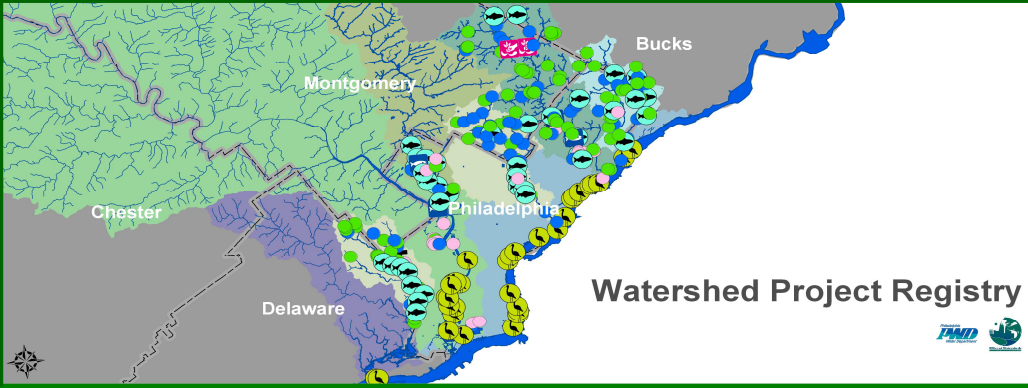
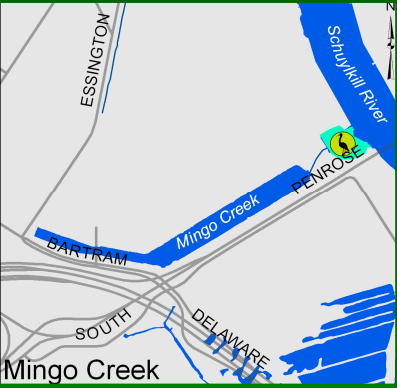
## *Mingo Creek Tidal Wetland*

There is a large tidal mudflat located at the confluence of the Mingo Creek surge basin and the main channel of the Schuylkill River. The 4.4 acre area receives waters pumped in from the Mingo Creek basin. During dry weather, this occurs approximately once a week. In addition to receiving pumped water, the water level within the proposed area is tidally influenced. The tide is semidiurnal with mean high water level and mean low water level fluctuating by approximately 6ft.

Prior to development, the tidal portion of the Schuylkill River was surrounded by freshwater marshes. Today, streambanks are degraded and altered from their natural state. As part of an effort to identify wetland restoration sites, PWD staff assessed the tidal section of the Schuylkill River in October 2006. Fourteen restoration sites, totaling 29 acres, were identified and mapped. The area between the Mingo Creek surge basin and the main channel of the Schuylkill River ranked first priority for wetland restoration.

Approximately two acres of the area are suitable for creating a tidal wetland. The restoration goals of creating a tidal wetland include planting appropriate wetland vegetation in the littoral zones, including areas inundated with water up to a level of 6.5 ft during high tide. Wetland vegetation will provide habitat for young-of-the-year (YOY) American shad (*Alosa sapidissima*), hickory shad (*A. mediocris*), and other fauna residing in and around the Schuylkill River. It is hoped that wetland vegetation will also help to improve local water quality.





## Watershed Project Registry



As part of a grant issued by the National Fish and Wildlife Foundation – Delaware Estuary Watershed Grants Program, the Philadelphia Water Department conducted a tidal wetland planting in the spring of 2008 on the south side of the Mingo tidal mudflat. A total of 3,000 plants were purchased as part of this grant. The 3,000 plants consisted of four different species; *Peltandra virginica*, *Pontederia cordata*, *sagittaria latifolia* and *nuphar advena/lutea*. In order to reduce grazing from geese, grids were installed within the tidal mudflat and enclosed with geese exclusion fencing. Appropriate vegetation was planted in the littoral zone, extending into areas inundated to a maximum of 6.5 ft during high tide. To further increase the likelihood of survival, gallon and quart size container plants were used.



Weekly monitoring showed that geese were still able to enter into the planting grids and graze on the wetland plants. PWD decided to install a protective grid made of fishing line on top of the planted grids. At the end of the growing season in October 2008, there were few remaining planted grids that had foliage and the only surviving foliage was *Pontederia cordata* and a minimal amount of *sagittaria latifolia*. In some cases, the protective top covering had been damaged by large pieces of driftwood which allowed the geese to once again access into the grids. Signs of plant growth have been observed during Spring 2009 which show that plant life may be successful in this habitat with the proper protection. For future tidal wetland creation sites along the Schuylkill and Delaware Rivers, structures to dampen wave action might help the success of the plants. Also, a barrier should be installed to prevent driftwood from entering the planting area and damaging the plants.



# TIDAL WETLAND

## *Pier 70 Tidal Wetland Creation*

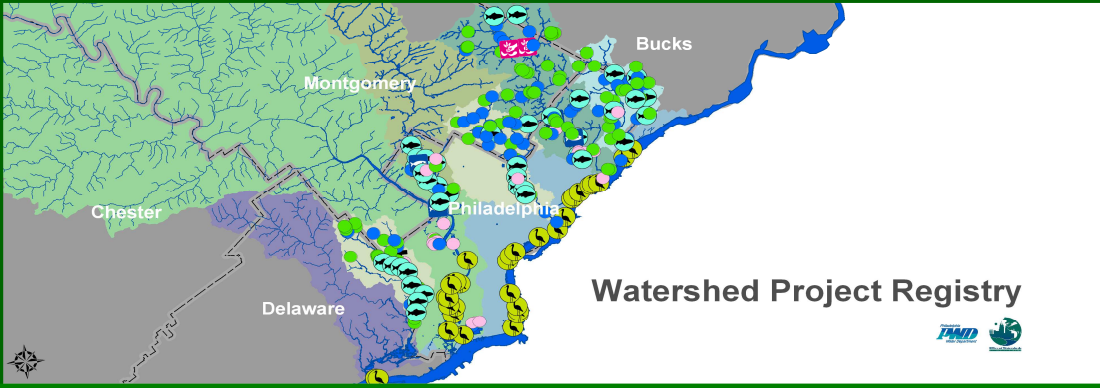
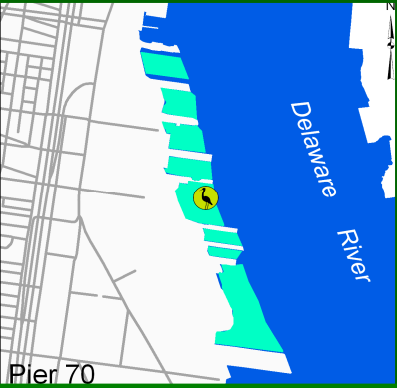
A 25 mile portion of the upper Delaware estuary within Philadelphia County was assessed by the Philadelphia Water Department (PWD) in 2007. Existing wetland areas, wetland enhancement areas, and potential wetland creation areas were identified and mapped. This portion of the river is bounded downstream by the Darby Creek confluence and upstream by the Poquessing Creek confluence.

The Pier 70 site extends from the intersection of Delaware Avenue and Washington Avenue to the intersection of Delaware Avenue and Snyder Avenue. Adjacent land spans seven different landowners. The Pier 70 site was mapped to be 33.2 acres; however a more detailed study is required to determine what portion of the site is appropriate for wetland vegetation planting. The 33.2 acres do not include piers and other upland features. This site lies within the tidally influenced portion of the Delaware

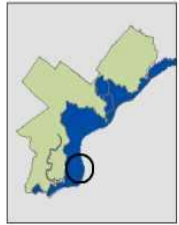
River and has a tidal range of approximately 6 feet.

The Delaware River has been altered from its natural state since the time of European settlement in the 17th century. Eventually, the Clean Water Act was passed in 1972 to help protect the water quality of the river. Despite such improvements, the upper estuary remains threatened by the heavy development and industrialization that surrounds it. A 23-mile segment of the estuary has been listed by the Pennsylvania Department of Environmental Protection (PADEP) for metals, priority organics, and PCBs in the 2006 Pennsylvania Integrated Water Quality Monitoring and Assessment Report. This portion of the river falls within Delaware River Basin Commission (DRBC) zones 2, 3 and 4 and is subject to water quality standards as defined by DRBC.



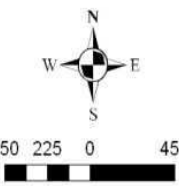


## Watershed Project Registry



**Legend**

- Wetland Site
- Combined Sewer
- Sanitary Sewer
- Storm Sewer



This proposal is for the creation of approximately 33.2 acres of a freshwater tidal wetland in the upper Delaware estuary. Wetland creation at this site will consist of planting appropriate wetland vegetation, constructing a structure to dampen wave action, constructing a structure to divert CSO wet weather flow, installing habitat structures within the wetland, enhancing existing fishing piers, and installing educational display signs. This site can be accessed through adjacent land owned by several landowners.

Suggested wetland vegetation is native to the Pennsylvania area and based on compilations found in existing wetlands in the upper Delaware estuary. The vegetative community of many existing wetlands is composed of almost monospecific stands of either *Nuphar advena* (spatterdock) and/or *Vallisneria americana* (freshwater eel grass). Other vegetation such as *Pontederia cordata* (pickerelweed), *Sagittaria sp.* (arrowhead), *Carex sp.* (sedge), *Lythrum salicaria* (purple loosestrife), *Phragmites australis* (common reed), *Elodea Canadensis* (waterweed), *Potamogeton sp.* (pondweed), and *Ceratophyllum demersum* (coontail) were present to a lesser extent. A detailed topographic survey and study of the hydrologic characteristics of the site are necessary before appropriate plant species can be determined. Annual high flow events should be taken into account when describing hydrologic characteristics. The Delaware River experiences flow events that increase the gage height at Trenton from 8 ft to more than 14 feet (a roughly 6 ft increase).



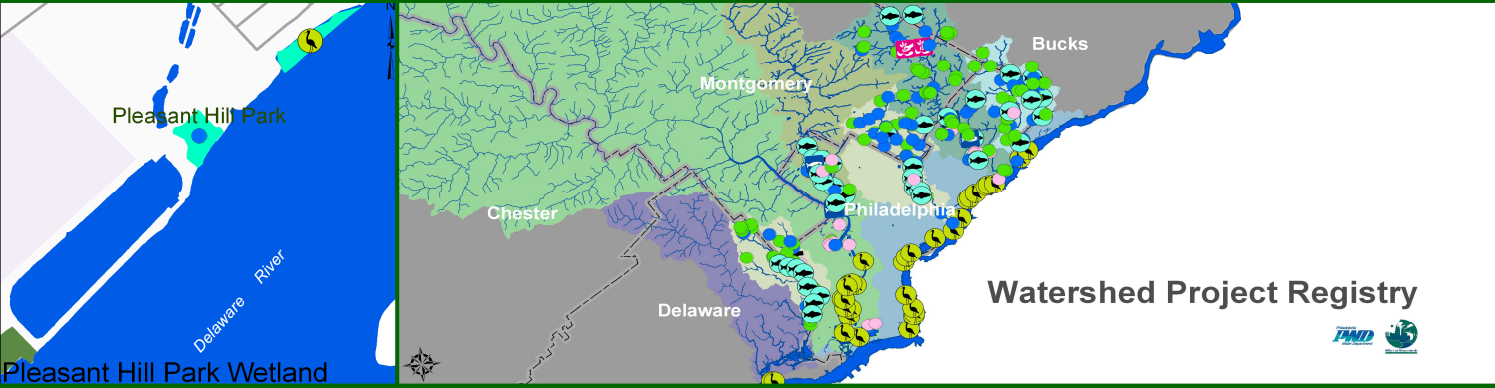
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## *Pleasant Hill Park Tidal Wetland*

Pleasant Hill Park is a 35-acre park on the northern edge of the Delaware Estuary in northeast Philadelphia. Part of the Fairmont Park System, it is relatively isolated from its urban surroundings by the Baxter Water Treatment Plant to the south, the Delaware River to the east, and Interstate 95 to the west. Pleasant Hill Park resides in a sub-watershed comprised of 211 acres of mainly residential and commercial areas. The sub-watershed is located within the larger Delaware Direct Watershed and therefore channels drainage directly to the Delaware River.

The park once supported a popular shad and perch hatchery that stemmed from the natural piscine populations of the Delaware River. The remnants of the historical hatchery include a multi-story building located in the flood plain near the southwestern edge of the park and four dilapidated ponds. The ponds are fed water from the Baxter Water Treatment Plant during the summer and fall, but the water supply is discontinued every year in the winter and spring due to high chlorine levels. The ponds are stocked periodically, but are anoxic and cannot support resident fish life. Within Pleasant Hill Park there is also a recreational building, parking lot, boat launch, and baseball field. The recreational building, located between Pond C and the parking lot, was built in the 1970s and now serves as a restroom for the public and office for park staff.





In 2005, the City of Philadelphia Department of Recreation hired Andropogon Associates LTD and the Temple University Landscape Architecture & Horticulture Department to develop the Pleasant Hill Park Master Site Plan Report. The goals of this plan are discussed below:

**Riparian Buffer**

The concrete blocks and rip rap currently protecting the shoreline will be removed and replaced with a natural riparian buffer. Stabilizing the shoreline with a shallower grade will allow for the creation of a 100 ft wide forested riparian buffer along 760 ft of shoreline between the parking lot and river. Native plants suitable to the local environmental conditions, including temperature and soil type, will replace invasive non-native plants that have overgrown the shoreline of Pleasant Hill Park.

Riparian buffers are a very effective means of protecting aquatic resources, including increasing water quality, providing habitat for wildlife, providing flooding mitigation, and maintaining the integrity of the shoreline.

**Tidal wetland**

South of the boat launch, concrete blocks and rip rap will be removed to reveal the shoreline. This area of Pleasant Hill Park has been overgrown with Japanese Knotweed. By grading back the shoreline, a 3.5 acre wetland can be created that will include open water, shallow marsh, and mudflats. Approximately 450 ft of shoreline will be transformed into wetlands. Raised areas of land in the tidal marsh will slow the erosive force of the Delaware River's main current and protect the wetlands. Native vegetation suitable for the varying water depths in the wetland will be planted to stabilize the banks, increase water quality, and provide habitat for aquatic and semi-aquatic wildlife.



**Expand public use**

It is vitally important for the public not just to use the shoreline and wetland area, but to learn from this restoration project. Education through signage, a walkway through the wetlands, and park programs will help bridge the gap between the 'science' of restoration projects and the impact on the ecosystem. Future conservation of our aquatic resources depends on the education of the public.

