Stormwater Mitigation For Nitrogen Removal And H & M Potter School Outdoor Environmental Learning Center

A Berkeley Shores Homeowners Civic Association
Water Quality Initiative

INTRODUCTION:

In the context of Governor Christie's 10 point plan to save Barnegat Bay from further degradation, Berkeley Shores Homeowners and Civic Association's Water Quality Committee proposed local strategies in the spirit of that endeavor. Those strategies are outlined in their published document entitled "WATER QUALITY STRATEGY PROPOSALS FOR BERKELEY SHORES". A number of solutions to the increasing degradation of Barnegat Bay and our tributory lagoons were investigated by the BSHCA Water Quality Committee. Of the various solutions investigated, two specific initiatives were chosen to be championed because they would have the most profound effect on water quality in regards to cost / benefit ratio. The two separate initiatives (in the order of the most profound effect) include the following:

1. CIRCULATION PIPES BETWEEN LAGOON ENDS AND ADJACENT SALT MARSH.

   It was demonstrated by aerial photography (page 10 of the document) and other outside studies that the *spartina alterniflora* in the salt marsh removes up to 80% of the nitrogen pollutants from the lagoon water. This only occurs through circulation pipes where there is sufficient hydraulic gradiant provided natually be the tide twice a day.

2. STORMWATER MITIGATION AND NITROGEN ABATEMENT.

   The Committee had calculated that 160 acres of stormwater runoff drains and is piped directly into the most westerly lagoon of Berkeley Shores. This is done with a series of six outfall pipes, the largest being 48 inches in diameter. The 160 acres is encompassed by State Highway Route 9 on the west, Veeder Lane on the north, Moorage Ave. and Bow Street on the east, and Anchorage Boulevard on the south. The Committee proposed to eliminate the six outfall lines dumping into Moorage Ave. lagoon, and redirect the flow to a "constructed stormwater wetlands" on the north side of Veeder Lane, across the street from the H & M Potter School on Ocean County Public Land Trust Property.

This publication addresses initiative number 2 above and urges local and county officials to formulate an engineering plan based on our conceptional vision outlined in this publication.

GRANT FUNDS AVAILABLE:

Governor Christie's Barnegat Bay Comprehensive Plan of Action item #2 is to fund stormwater mitigation projects. It provides for $17 million in grants for stormwater upgrades from the DEP State Revolving Funds. Also available are New Jersey Environmental Infrastructure Trust funds (targeted at $100 million over the next decade for zero-interest or very low interest and principal forgiveness loans). Competition for these funds are rated by the amount of nitrogen runoff that is eliminated by a stormwater mitigation project. It is these grant funds that we propose to utilize for initiative # 2 above (stormwater mitigation and nitrogen abatement).

WHAT IS A "CONSTRUCTED STORMWATER WETLANDS":

A "Constructed Stormwater Wetlands" or "Rain Garden" is an artificial pond, marsh or swamp created as a new habitat for emerging plant and wildlife and for anthropogenic discharge of stormwater. It is a low-cost and sustainable, engineered, best management practice (BMP) designed to reduce stormwate*r* pollution. Constructed wetlands are considered to be one of the most reliable stormwater treatment practices. They are designed to function similarly to a self-sustaining natural wetland, and should require only moderate maintenance to function. In New Jersey the "Constructed Stormwater Wetlands" are regulated by NJDEP and are designed and constructed in accordance with "BEST MANAGEMENT PRACTICES MANUAL CHAPTER 9.2, STANDARD FOR CONSTRUCTED STORMWATER WETLANDS". A copy is included in Appendix C of our prior publication entitled "WATER QUALITY STRATEGY PROPOSALS FOR BERKELEY SHORES"

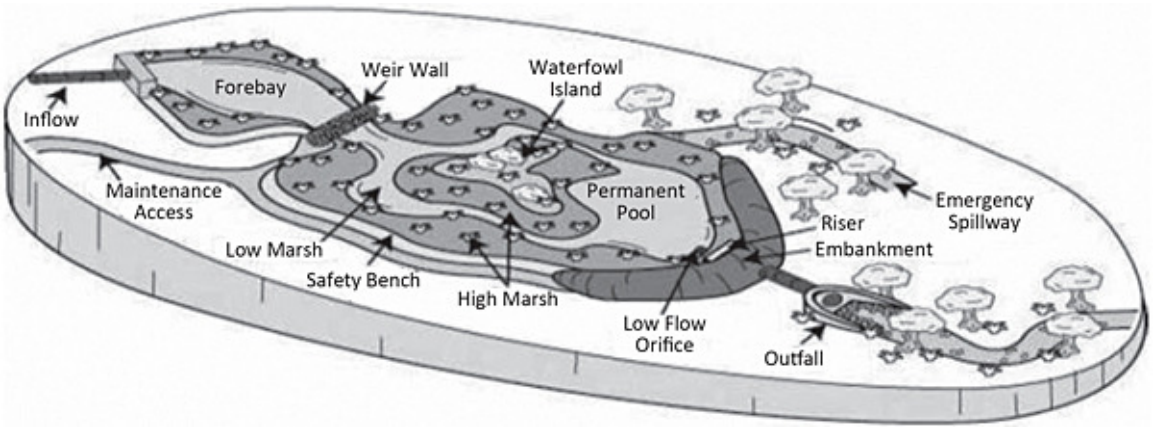


Figure No. 1 - Typical Constructed Stormwater Wetlands

Figure No. 2 – Photograph of typical Constructed Stormwater Wetlands

ADVANTAGES OF A "CONSTRUCTED STORMWATER WETLANDS":

The proposed "constructed stormwater wetlands" would be a habitat enhancement by creating an attractive natural setting along with the following ecosystem services:

- Creating a habitat for emerging plant and wildlife in the constructed wetlands.
- Foster a diverse community of microorganisms that break down or transform a wide variety of toxic and polluting substances.
- Water quality improvement by removing nitrogen and phosphorus detrimental to Barnegat Bay.
- Aesthetics and landscaping enhancement.
- Flood storage and reducing peak runoff from entering lagoons.
- Abating silt and sediment runoff from entering the lagoons.

In addition to providing excellent plant and wildlife habitat; the "constructed stormwater wetlands could serve as an "outdoor classroom" for environmental education instruction across the street from the H & M Potter School. It will also be an added scenic enhancement along the entryway to Berkeley Shores.

INTEGRATING THE CONSTRUCTED STORMWATER WETLANDS AS AN OUTDOOR CLASSROOM FOR ENVIRONMENTAL STUDIES:

Providing school students with accessible and high quality natural resource conservation education is crucial if our society intends to develop future generations with an understanding and appreciation of their natural environment. Research shows that concern for nature is based on positive childhood experiences in natural environments. Learning is most effective when it is hands-on, through personal experience, active participation and repeated exposures. While there may be several high quality nature centers and natural areas in the region, the expense and logistics of transporting students off-campus makes field trips the exception in education rather than a frequent activity. By eliminating the time and expense of travel, students could gain from hands-on conservation education experiences. The Outdoor Classroom is designed to fulfill this need.

The Outdoor Classroom utilizes Ocean County Public Trust Lands and would eliminate any need for acquisition funding. The Outdoor Classroom allows cross-curriculum instruction in nearly all subject areas of primary education. The proximity of the Outdoor Classroom to the school will allow frequent use with a minimum of travel time. The Classroom's features will support educational lesson plans for primary students, limited only by their teacher's imagination.

TYPICAL COMPONANTS OF AN OUTDOOR ENVIROMENTAL CLASSROOM:

1. RESOURCE CONSERVATION – Hands-on soil and water conservation activities. Conservation watershed and plantings.
2. FROG POND – Water quality testing experiments. Aquatic life study.
3. OUTDOOR CLASSROOM STUDY CENTER – Roofed pavilion and open-air work area.
4. BUTTERFLY GARDEN – Insect attracting ornamental plantings.
5. BIRD WATCHING – Observation deck, walking trails, footbridge, wildlife nesting boxes and tracking station.
6. WEATHER STATION – Meteorlogic equipment, tide & weather prediction.
7. TALLGRASS PRAIRIE – Native grass and wildflower display plots.
8. ARBORETUM – Tree preservation area, trees marked with common & scientific name.
9. STORMWATER WETLANDS – Wetlands plant and animal studies.

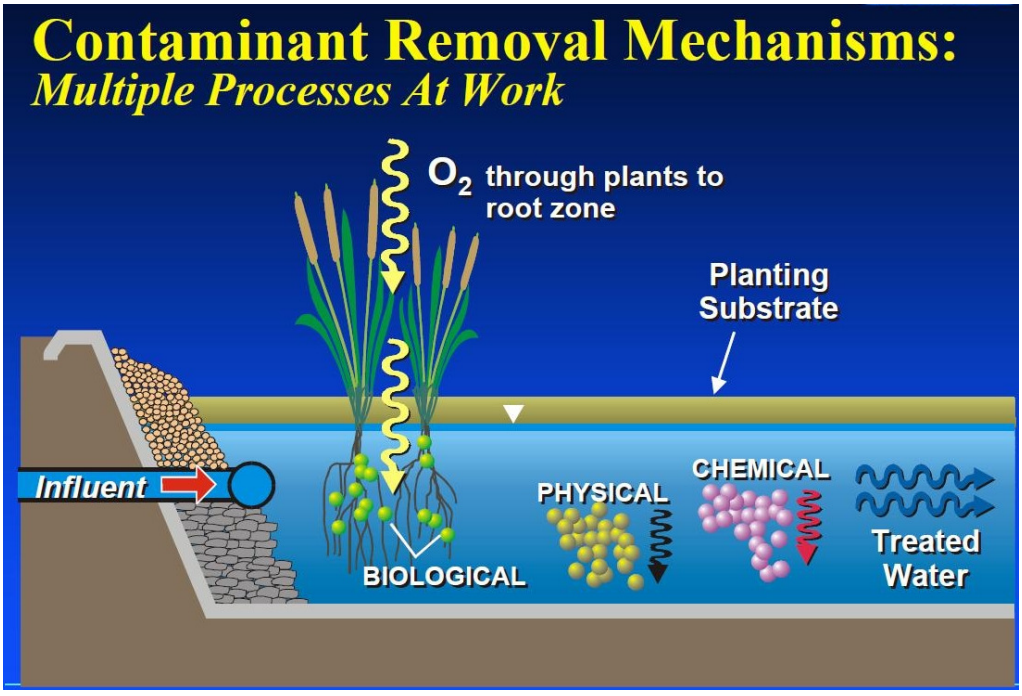
HOW DO "CONSTRUCTED STORMWATER WETLANDS" REMOVE POLLUTANTS:

Actually, the bioengineering is a pretty sophisticated process but, the pollutant removal process works in three ways:

1. PHYSICAL (sedimentation, filtration, adsorption, volatilization).
2. CHEMICAL (precipitation, adsorption, hydrolysis, oxidation/reduction).
3. BIOLOGICAL (bacterial metabolism, plant metabolism, plant absorption and natural die-off).

Types of contaminants removed include:

1. Organic substances.
2. Nutrients (e.g. nitrogen, phosphorus).
3. Heavy metals.
4. Suspended and colloidal materials.
5. Pathogens.



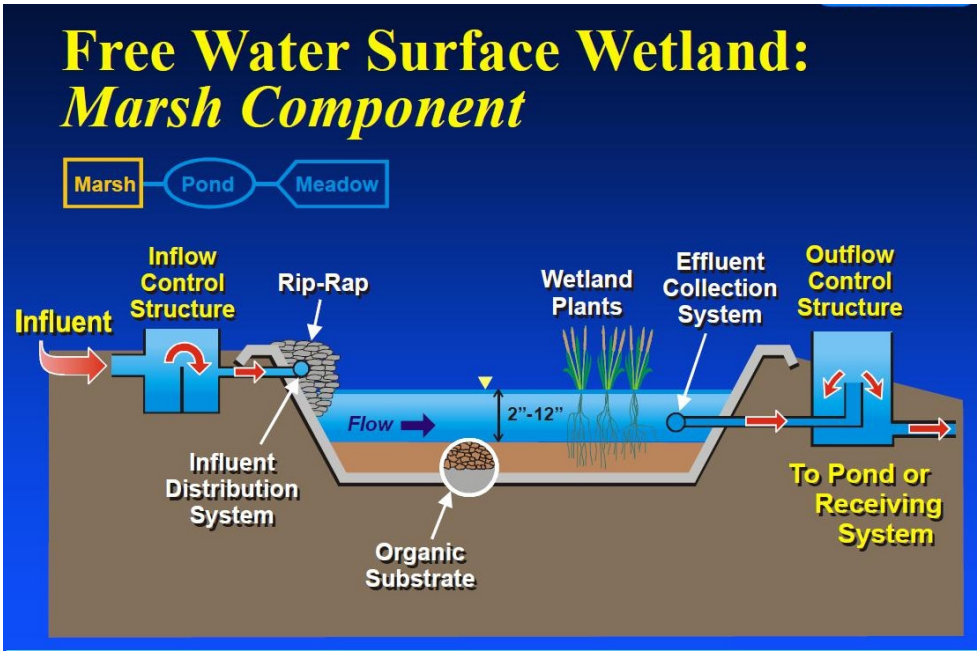
Basically there are two types of "constructed stormwater wetlands". The first type is called a "free water surface system" (marsh to pond to meadow). The second type is called a "subsurface flow system" (engineered cells containing gravel, soil and/or sand treatment.

The following diagrams illustrate:

1. The Free Water Surface System, with 3 components (Marsh-Pond-Meadows)
2. The subsurface Flow System, with only one component.

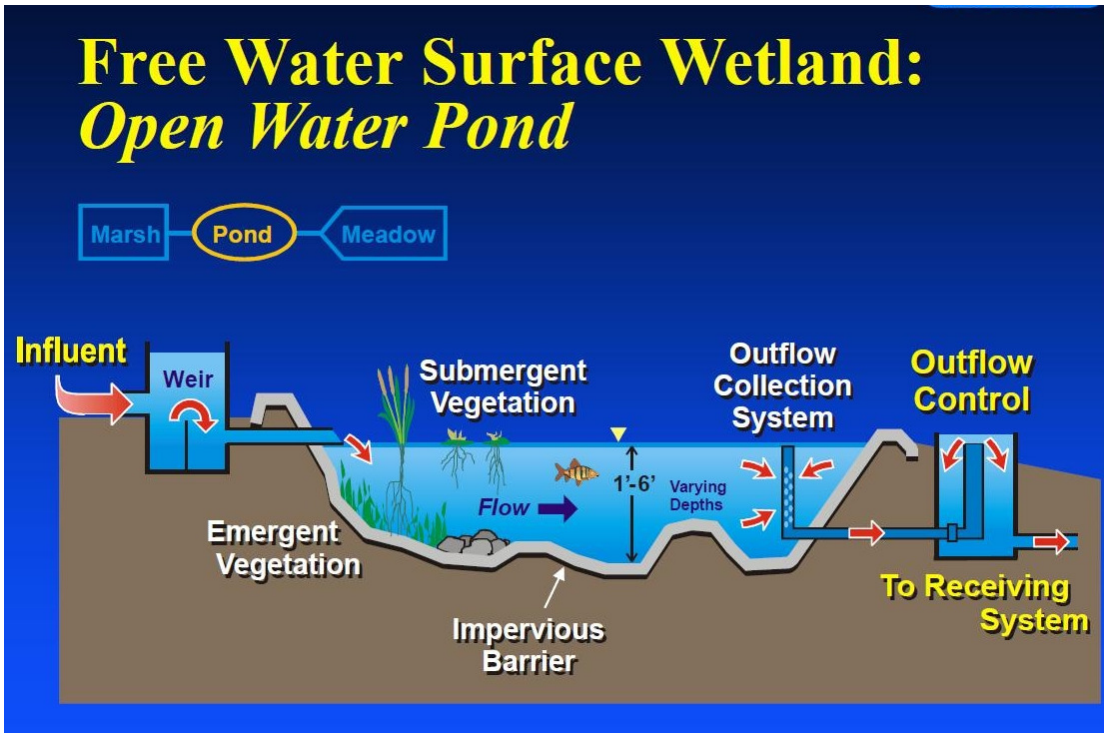
THE THREE DIAGRAMS FOR THE FREE WATER SURFACE SYSTEM LOOK LIKE THIS:

FIRST COMPONENT – MARSH:



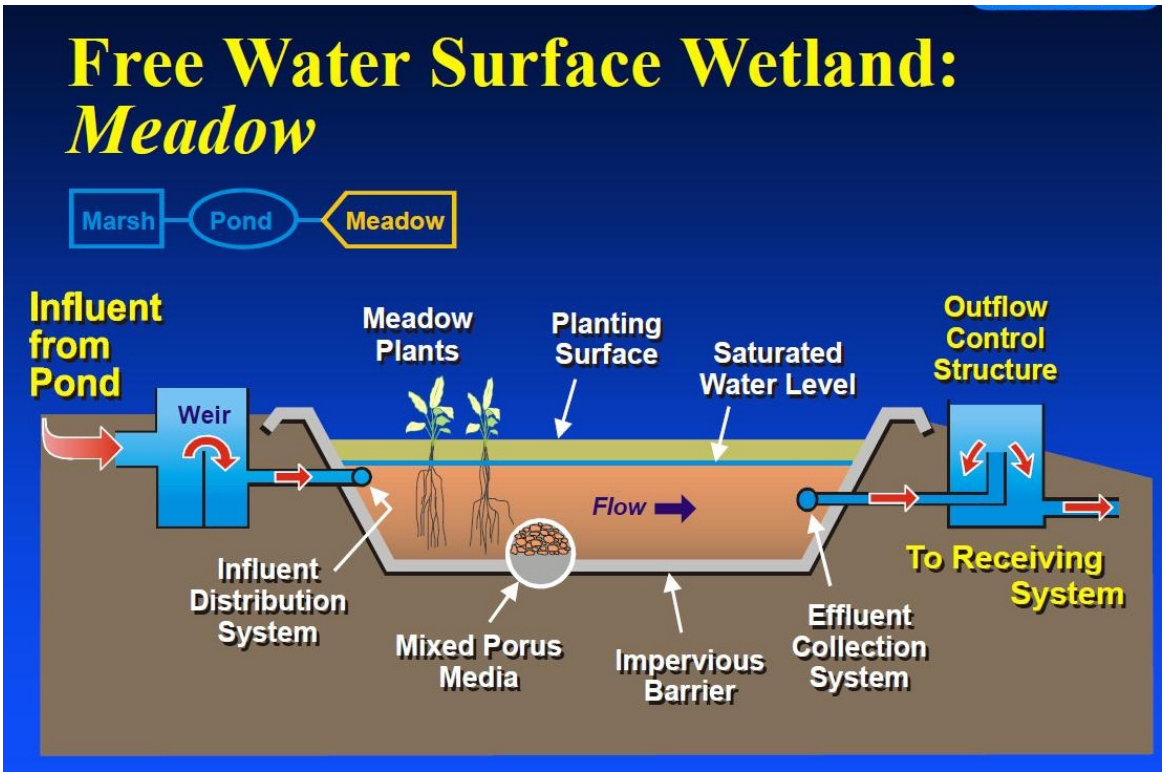
Sample photo of a marsh componant

SECOND COMPONANT – POND:



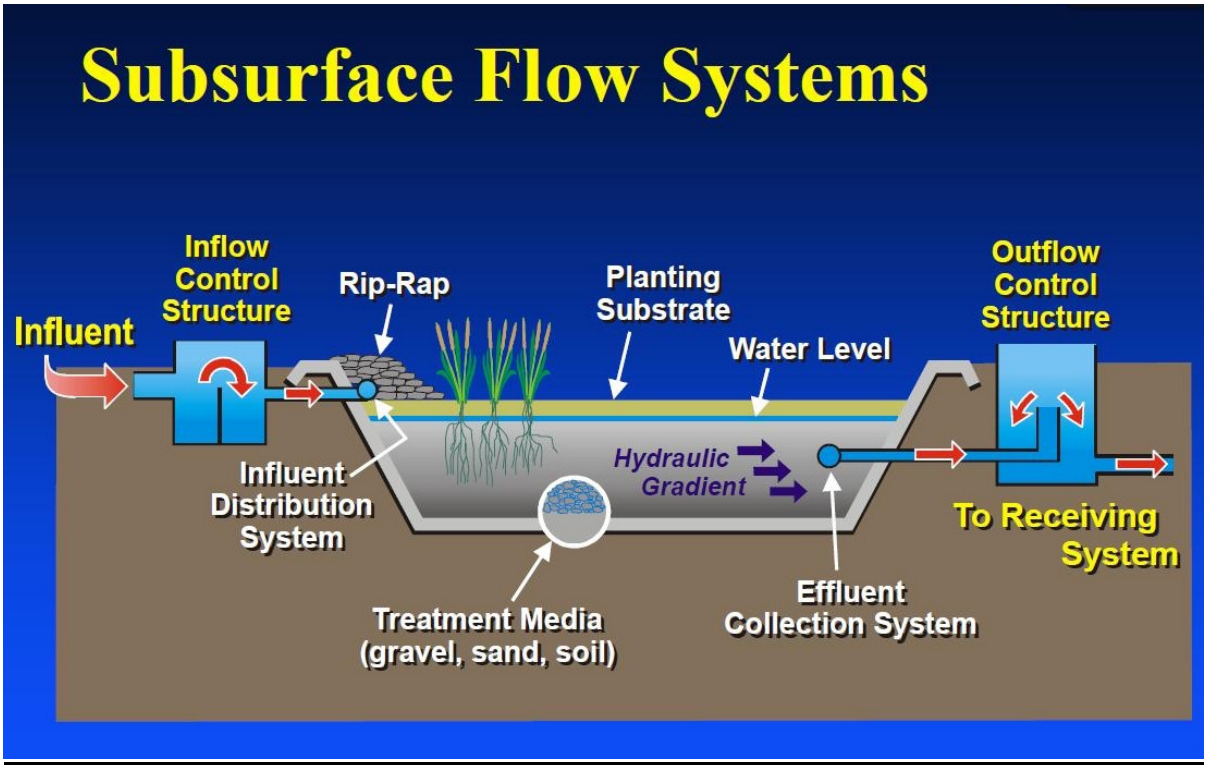
Sample photo of the pond componant

THIRD COMPONANT – MEADOW:



Sample photo of the meadow componant

THE SUBSURFACE FLOW SYSTEM LOOKS LIKE THIS:



Sample photo of a subsurface flow system under construction

Sample photo of a subsurface flow system completed

PROPOSED LOCATION FOR STORMWATER WETLANDS PREVIOUSLY VETTED FOR ENVIRONMENTAL CONCERNS:

In the mid 1990's the previous owner of the property Lifetime Homes, LLC had proposed 365 homes on the site with an on-site stormwater management system to compltely contain all runoff on the site with a series of ponds. At that time, there was an argument as to what portion of the site was wetlands and what was not.

Our BSHCA Water Quality Committee did extensive research into this matter and obtained volumns upon volumns of documents via OPRA requests to various governmental agencies. The documents indicated that after lengthy litigation between NJDEP, US Army Corps of Engineers, and the prior owner; the outcome was a definative bounds of ordinary resource value wetlands (no buffer required) and intermediate value wetlands (50 foot buffer required). Also included in the documents was the environmental impact statement that confirms that there is no "threatened or endangerspecies", etc. as also verified by court documents.

The proposed location of the "Constructed Stormwater Wetlands" will be in a wooded area previously vetted by NJDEP, USCOAE, and Courts to be "buildable".

THE EXISTING STORMWATER SYSTEM:

The existing surface flow of the 160 acres to the west of Moorage Ave. is in a generally west to east direction. The runoff from all the land between Route 9 and Red Bank Ave., between Veeder Lane and Anchorage Blvd. is collected by a series of catch basins along Red Bank Ave. Most of this runoff is then piped between the H & M Potter School and the Little League complex to a Manhole on the west side of Moorage Ave. The entire school parking lot and roof drains are also piped to this manhole. From this manhole the stormwater is then piped (48" diameter) across Moorage Ave. and a drainage easement on the south side of # 102 Moorage Ave. to the lagoon.

MITIGATION PROPOSAL:

Our proposal is to intercept the stormwater runoff at the existing manhole on the west side of Moorage Ave. across the street from # 102 Moorage Ave. and re-direct the pipe northerly along Moorage Ave. 600 feet to the north to the proposed "Constructed Stormwater Wetlands". There are also proposed some ancillary drainage pipe connections and re-directions to elliminate a total of six (6) lagoon outfall pipes. The overall concept is shown on our plan entitled "STORMWATER MITIGATION AND NITROGEN ABATEMENT PLAN". This plan is offered only as a suggestive option, and as such, is subject to engineering design.

OUTDOOR CLASSROOM PROPOSAL:

The Barnegat Bay Partnership and other sources offer educational grant funding for outdoor learning center componants previously outlined in this report. The outdoor learning center is proposed to be integrated within and around the constructed stormwater wetlands. It would typically contain walking trails, footbridge, observation deck, roofed pavilion, an arboretum and more.

Available curricula, lesson plans, and teaching resources are available from The Barnegat Bay Partnership. Some of their curricula contain:

- What the bay HINGES on: An educational activity guide on the ecological and cultural importance of shellfish and their restoration
- Invasive Species Integrated Curriculum Unit for middle school students
- Water Conservation Education Project (sample lessons)
- Horseshoe Crabs? Pretty as a Picture Lesson Plans and Activities
- The Pine Barrens: Up Close & Natural Inquiry-Based Curriculum
- New Jersey Pinelands Online Curriculum Guides
- Interpretive Programs (Primary through Adult) at the Forest Resource Education Center
- Barnegat Bay Interactive Online Field Guide
- Learning About the Barnegat Bay Watershed Curriculum Guide for K-3 Teachers
- Borrow a Discovering Barnegat Bay Tool-Kit (contact the BBP) Guardians of Barnegat Bay DVD and corresponding activities.