

Cooperative Stewardship Plan Hamilton – Trenton – Bordentown Marsh 2010



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***Cooperative Stewardship Plan - Hamilton - Trenton - Bordentown Marsh
2010***

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*Cooperative Stewardship Plan for the Hamilton - Trenton - Bordentown Marsh
Committee*

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Vision

The Hamilton - Trenton - Bordentown Marsh, located two and a half miles from the NJ State capitol building in Trenton, is the northernmost tidal freshwater wetland on the Delaware River. What awaits the visitor, scientist and child alike, are overlays of complexity - the area is known for its significant natural history, represented by diverse habitats with considerable biodiversity, and its rich cultural history that includes Native Americans, early colonists, and Joseph Bonaparte. The wetlands and adjacent uplands are an important local and regional open space resource. The Marsh is an exceptional place providing visitors with varied cultural, natural, and recreational experiences.

This *Cooperative Stewardship Plan for the Hamilton-Trenton-Bordentown Marsh -2010* supports a vision that:

- protects critical natural and cultural resources,
- preserves valuable wetland functions,
- optimizes the educational potential of the Marsh,
- enhances recreational opportunities,
- establishes a clear identity for the Marsh as a whole that is known and appreciated by local residents,
- celebrates the 13,000 years of history evident in the area and promotes a local sense of pride,
- establishes linkages with broader regional systems, and
- builds strong partnerships for consistent long-term stewardship.

Through quality education and interpretive programs, students and adults can learn about the natural and human history of the Marsh, the impact humans have on their environment, and the benefits associated with these outstanding wetlands. As they become better informed, citizens using the Marsh for education and recreation will become more aware and appreciative of the Marsh, develop a stewardship ethic, and influence others. “The environmentally literate citizen will understand how ecosystems function; their impact on their environment; how to deal sensibly with problems that involve scientific evidence, variability, uncertainty, and economic, aesthetic, and ethical considerations; and what they need to do, individually or as part as community- to keep the environment healthy, sustain its resources, and create a good quality of life for themselves, their children and future generations.” (Modified from the NJ State Environmental Education Primer, 2009).

Six goals have been identified to achieve this vision. These are: Protection and Preservation, Stewardship, Education, Recreation, Marsh Identity and Interpretation, and Coordinated Management and Organization. For each, strategies and tasks are delineated in the stewardship plan and in priority action items that follow. The stewardship plan is flexible and can respond to new opportunities and changing circumstances.



Map. 1. Extent of the Hamilton – Trenton – Bordentown Marsh is shown in green over an aerial photograph. In addition to wetland areas, uplands in public ownership are also included. (As of 2009, prepared by Herb Lord).

Introduction

Location

The Delaware River's northernmost tidal freshwater wetland is located at the western edge of central New Jersey, between Trenton, Hamilton Township, Bordentown Township, and Bordentown City. The Hamilton-Trenton-Bordentown Marsh's borders cross Mercer and Burlington counties, which have a combined 2008 population of more than 810,300 residents, a 12.4% increase since 1999. Thousands of students attend public and private schools in Trenton, Hamilton Township, Bordentown Township, and Bordentown City. While the Marsh was once considered a wasteland, it is now recognized as an oasis of natural wildness in a densely populated urban landscape.

The Marsh is located approximately 2.5 miles south of the New Jersey capitol building in Trenton. Highways - NJ-29, NJ-129, NJ-206, I-195, and I-295 - intersect at the Marsh and provide views for the thousands who drive over it. The Marsh can also be viewed from the Light Rail train as it passes between Bordentown and Trenton. The Light Rail stop at Bordentown and a soon-to-be-built bridge will provide bicycle and pedestrian accessibility to the new 3-mile long D&R Canal State Park towpath trail on Duck Island.

Travel and tourism in the Delaware River region constitute major industries that have led to increased demand for a variety of public access opportunities along the Delaware River. The Marsh has much to offer the casual visitor, as well as students of natural history and cultural history.

Significance of the Marsh

With its natural and cultural resources, the Hamilton -Trenton- Bordentown Marsh is a unique urban open space. Within its boundaries, the Marsh, as designated here, has approximately 1250 acres of wetlands and 1700 additional adjacent acres of publicly owned uplands; together these provide open space totaling more than 3000 acres. The Marsh's diverse habitats support over 1,200 species of plants and animals. Birds such as osprey, great blue heron, ducks, geese, and great egrets thrive in and around its waterways. Recently, bald eagles successfully nested in the Marsh. The Marsh has also supported humans since pre-historic times; Native Americans lived there beginning 13,000 years ago. Present-day visitors to the Marsh can experience this fascinating place on over 8 miles of walking trails and 11 miles of canoe / kayak trails.

What awaits the visitor, scientist and child alike, are overlays of complexity. The varied natural ecosystems can be examined, for example, (1) as separate landscape entities – ponds or woods; (2) for their organisms, such as the butterflies found on one day in July during a nationwide census or the dragonfly larvae found in a sample of mud in a class lesson; (3) for their contributions to wetland functions (e.g., groundwater recharge, protecting water quality, and easing the impact of floods); (4) or for the productivity of

plants that become part of food chains and food webs in Delaware Bay. Evidence of human footsteps can come from the unexpected presence of a cultivated plant (e.g., periwinkle or daffodils) or from the systematic archaeological digs at Watson Woods (documenting the lives of Woodland Indians) or at Point Breeze (Joseph Bonaparte). (Artifacts can be seen at the NJ State Museum and at the Abbott House on Kuser Road).

The Marsh continues to be the subject of academic studies. In recent years, more than 60 scientific articles and book chapters about marsh ecology have been published concerning the Marsh. (See Appendix 1). These have contributed to our understanding of the value of wetlands, the productivity of tidal freshwater wetlands, as well as the relationships of seeds in the soil to vegetation. Similarly, studies undertaken by archaeologists continue to improve our understanding of the lives of Native Americans, colonists, and Joseph Bonaparte.



Acknowledgement of the significance of the Marsh comes from various sources. New Jersey Network (NJN) has featured the Marsh in two documentaries. The award winning *Turning the Tide*, which first aired in 2006, shows the marsh as an important natural area and *Bonaparte's Retreat*, released in 2009, considers how Point Breeze contributed to Joseph Bonaparte's legacy to the United States. Also in 2006, the Marsh was featured in *Marsh Meditations*, a Princeton Artists Alliance exhibit at the Bristol-Myers Squibb Gallery in Lawrenceville. In 2010, Marsh photographs will be featured in a D&R Greenway exhibit, "Ebb and Flow of 10,000 Years: the Hamilton - Trenton - Bordentown Marsh." These, as well as specialized symposia, and field and canoe trips, have had enormous value in educating the public about the Marsh.

While many enjoy the Marsh for a wide variety of passive recreational activities, the Marsh is an invaluable resource for education. By coordinating science, math, and other subjects, for example, with local outdoor experiences and by engaging in marsh-based projects, students can connect with nature and become stewards of their communities' natural resources. From a high school student who participated in a field research workshop (under the auspices of Rider University): "I learned a great deal about science, and also that there is a great place to discover nature only minutes from where I live." From another: "I was thankful that we were able to go to the beaver lodge, and to see how the water levels differ on each side of the beaver dam. The experience was one that I will remember for the rest of my life." Students (and volunteers) learn about history and nature from hands' on work. The rapture of a young person touching a northern water snake or watching an eel swim in a glass container, the involvement of graduate students exploring how Native

Americans might have built a fishing weir on Crosswicks Creek or sieving soil at Point Breeze where Joseph Bonaparte once lived, or the excitement of students from the Katzenbach School for the Deaf on Earth Day, are all important educational experiences.

Cultural Richness

The archaeological record is closely intertwined with the geology and biota of the Marsh. In 1976, because of its significant archeological record, the area was recognized with designation as The Abbott Farm National Historic Landmark, NJ's first archaeological National Landmark. It is considered the most significant Woodland Indian site along the east coast of North America. Charles Conrad Abbott, for whom the landmark is named, was an important 19th century archaeologist. Virtually all the leading archaeologists and geologists of the late 19th and early 20th centuries worked and observed excavations here. The importance of this legacy has led to development of the *Abbott Farm National Historic Landmark Interpretive Plan* and accompanying *Technical Report* by Mercer County. (See: <http://www.state.nj.us/counties/mercercounty/about/community/openspace/abbott.html>. For archaeological publications see the *Technical Report*). Furthermore, archaeological studies, including excavations and investigations, for example, of Native American uses of Crosswicks Creek for fishing, continue.

Many historical sites occur in and near the marsh. These include: The Watson House (1708), the oldest house in Mercer County, the Isaac Pearson House (1773), and the Abbott-DeCou Mansion (1797). Thomas Farnsworth settled along Crosswicks and Blacks Creeks (1682) on property that Joseph Borden subsequently bought (1724) and laid out as Bordentown. Revolutionary War boats were sunk in Crosswicks Creek to prevent them from falling in the hands of the British. From 1817 – 1839 Joseph Bonaparte, brother of Napoleon and exiled King of Spain, lived at Point Breeze near Bordentown. The Delaware & Raritan Canal and the Camden and Amboy Railroad, built near the west edge of the Marsh in the 1830s, transported passengers and cargo, coming from Philadelphia, to New York City. In the late 1800s, White City Amusement Park was built near what is now known as Spring Lake. Clay from the marsh supported regional brick and pottery factories.

The Marsh lies within the boundaries of the Crossroads of the American Revolution National Heritage Area designated in 2006. (See: <http://www.revolutionarynj.org/heritageArea/index.php>).

Species Richness

The Marsh is unsurpassed urban open space. As such, it has been recognized as a premier birding place and is listed in *A Guide to Bird Finding in New Jersey* (Boyle, W. 2002, Rutgers University Press) and *Smithsonian Guide to Natural America – Mid-Atlantic States* (Walter, E. & J. Wallen. 1999, Smithsonian Books).

In addition, the Marsh has been designated a New Jersey Natural Heritage Priority Site by the NJDEP Natural Heritage Program and as an Important Bird Area by the New Jersey Audubon Society.



There is an ongoing effort to document species and habitat diversity. While some inventories, such as that for birds, are fairly complete, other groups of organisms, such as fish, mollusks, insects, and lower plants (e.g., algae, mosses, and liverworts), are woefully neglected. To date (2010), the plant species found at the Marsh exceed 900, and include seed plants (869 species),

ferns and allies (32) and mosses and liverworts (16); of these, 30 plant species are endangered / threatened/ and rare for New Jersey. Animals include: butterflies (32+ species, including the pipevine swallowtail that is rare for the region), fishes (including adjacent Delaware River, 62; the most diverse freshwater fish community in NJ that includes sturgeon, which during colonial times were stored in Sturgeon Pond), amphibians and reptiles (23, including the common map turtle and northern brown snake), birds (237, including 100 nesting species; there is habitat for least bittern, bald eagle, Virginia rail, and cliff swallow, all rare for NJ), and mammals (22, including beaver, muskrat, fox, red bat, as well as beluga whale and harp seal that have been occasional visitors).



Habitat Richness

The many types of habitats found in the Marsh make possible the diverse kinds of plants and animals found there. Among the wetlands are several kinds of communities, including those with and without the influence of tides. *(It should be noted that the tidal waters of the marsh are freshwater. Also, tides are caused by the gravitational pull of the moon (mostly) and the sun, and occur at this distance from Delaware Bay because of the force of oceanic tides. High and low tides occur twice a day, with a range of more than 6 feet).*

Tidally influenced habitats include: tidal rivers and channels; marshes, dominated by non-woody annual and perennial species, where wild rice grows more than 10 feet tall; and virtually impenetrable swamps, with trees and /or shrubs, as well as herbaceous plants. Another tidal wetland is the 96-acre constructed wetland on Duck Island that compensates for wetland destroyed by highway construction during the 1990s. Non-tidal wetlands include ponds, marshes, swamps, and impoundments caused by beaver. Floodplains along Crosswicks Creek and the Delaware River and islands within the marsh are inundated during floods. At higher elevations, away from the presence of standing water, along and at the tops of the bluffs, which surround the marsh on the north, east, and south sides, are upland forests. These, too, vary and in some places there are thickets of mountain laurel and rhododendron and magnificent tulip trees more than 3 feet in diameter. In addition, to these 'natural' habitats, are disturbed (e.g., roadsides) and reclaimed (landfill) areas.

Land Uses and Ownership

Humans have exploited the Marsh since Native Americans first settled there. Initially, food gathering was a main activity. With European settlement, came wetland reclamation and the building of dikes and dams and the use of uplands for agriculture. The 1800s saw the building of the D&R Canal, the railroad, and an amusement park, and the beginnings of industrially-driven filling of portions of the Marsh. With the 1950s came the construction of power and gas pipe lines, and in the 1980s and 1990s highway construction. Many of the post-1800 activities continue to influence the Marsh.

Like Native Americans, colonists hunted and fished there. These uses continue. Boating for business and pleasure has been a long-term use of Marsh waterways. Yacht clubs, anchored at the mouth of Crosswicks Creek, have had a long association with the Marsh. The Yapawi Aquatic Club was founded in 1892. Its name was suggested by Charles Conrad Abbott and "is the Indian name for the hill at the foot of which the clubhouse stands." (*Bordentown Register*, 10/14/32). It was followed by the Bordentown Yacht Club, organized in 1937. Both clubs donate their resources and staff to support community needs, river clean-up, emergency services, and educational programs. Many other organizations also use the Marsh for educational and recreational activities that include, for example, class field trips and workshops, hiking, bird watching, photography, and botanical and nature studies.

In addition to its varied cultural and natural resources, the Marsh has multiple public owners and many users - making coordination of stewardship of the Marsh a difficult task. These owner acreages, though approximate, provide a view of the complexity: NJDOT – including highways, the landfill, and the 94-acre constructed wetland on Duck Island, 648 acres; private, 617; Hamilton Township, 501; NJDEP - including D&R Canal State Park at the Bordentown Bluffs and three other parcels along the Crosswicks Creek floodplain, 391; Mercer County – Roebling Park, 404; Bordentown Township - Northern Community Park, 168; PSEG, 165; Bordentown City, 63; Railroad,

61; other - ~ 21. These total 3,039 acres. (Acreages are estimates based on tax parcel information. The private value does not include developed areas). Several acres acquired recently in Bordentown City along Blacks Creek are now included in the Marsh.

Current uses are varied. Municipal lands includes, for example, a public park, water supply plant, sewage treatment facility, and open space. State lands, overseen by NJDEP and NJDOT, provide public parkland, roadways, a railroad, a capped landfill, and open space. There are more than 32 municipal and highway storm drains that enter the Marsh and eight brownfields that are potential sources of pollutants to the Marsh.

Background of the Project

This document, *Cooperative Stewardship Plan for the Hamilton-Trenton-Bordentown Marsh-2010*, is a updated version of the *Hamilton / Trenton Marsh Management Plan 1999*, published by the Hamilton / Trenton Marsh Management Plan Committee and coordinated by Delaware & Raritan Greenway. The 1999 plan and maps can be seen on the D&R Greenway Land Trust website (<http://www.drgreenway.org/partners.htm>).

The 1999 plan was developed by a broad group, representing landowners, public agencies, and interested parties, with public comment. Its purpose was to set goals for coordinated strategies to address: Protection and Preservation of Marsh resources, Stewardship, Education, Recreation, and Cooperative Management by public owners.



In response to the 1999 plan, Friends for the Marsh was established in 2002. Friends members include local citizens, public landholders, and interested parties. Friends works under the aegis of D&R Greenway Land Trust, who applies for and manages grant funds on behalf of Friends for the Marsh to support Marsh goals. Friends was the coordinating group for this update, the *Cooperative Stewardship Plan for the Hamilton- Trenton-Bordentown Marsh -2010*.

During 2008-2009, Friends for the Marsh hosted meetings of partners, specifically land-owning agencies – municipal, county, and state, and PSEG, for the purpose of sharing information and discussing issues and goals. Subcommittees discussed proposed revisions to the 1999 plan; focus areas were: Stewardship, Protection, and Preservation; Education; Recreation; and Marsh Identity / Interpretation. Input from the public about the 1999 plan was obtained at three public meetings held in Hamilton, Bordentown, and at the Marsh nature center during June 2009, and via emails. Discussions were

facilitated by the National Park Service Rivers, Trails and Conservation Assistance Program.

What Has Changed Since 1999

Notable achievements include the purchase by Mercer County of a building to be used as a nature center and development of the *Abbott Farm National Historic Landmark Interpretive Plan*. The vision of a nature center at the Marsh, which had long been a goal as noted in the 1999 Management Plan, was set in motion when D&R Greenway Land Trust received Green Acres development grants in 2004 and 2005 and Mercer County agreed to match them. It was opportune that at the same time a residential property adjacent to the Roebing Park entrance on Westcott Avenue came on the market. In May of 2005, Mercer County acquired the property with a ranch-style house and two small, unimproved adjacent lots. This location, situated at the entrance to the Marsh at Roebing Park and on already developed land, meant that a center would not be built within the sensitive marsh environment.

The Mercer County Marsh Nature and Interpretive Center at Roebing Park Master Plan was completed in September of 2007 by SSP Architecture Group. It recognizes the importance of building a center that would interpret the rich cultural and environmental resources of the Marsh. It also provides a conceptual plan for transforming the house, which is to be renovated in 2010, into a sustainable educational and interpretive center.

The development of the plan for the center, the efforts made by the Friends for the Marsh on the nature center plan, as well as the knowledge and appreciation that the Marsh is part of the Abbott Farm National Historic Landmark, led Mercer County to create the interpretive plan. The *Abbott Farm National Historic Landmark Interpretive Plan* was funded by a Garden State Historic Preservation Trust grant from the New Jersey Historic Trust. Completed in May of 2009, the plan includes two companion reports, the *Interpretive Plan* prepared by Jane Clark Chermayeff and Associates LLC and the *Cultural Resource Technical Document* prepared by Hunter Research, Inc. Development of the interpretive plan revealed Landmark complexities, its layers of cultural history, and the interdependency that exists between humans and nature. Further, this plan acknowledges the significance of the Landmark and its important relationship to the natural environment, and, therefore, incorporates and supports recommendations regarding interpretive themes and methodologies for the nature center and the Marsh.

In addition since 1999:

- The Marsh is now referred to as the Hamilton-Trenton-Bordentown Marsh.
- Friends for the Marsh was founded in 2002 as a volunteer group of interested residents, educators, and individuals who plan and provide

educational programs about the Marsh, and assist with trail maintenance and clean-up activities.

- Programs developed, e.g., by D&R Greenway Land Trust, D&R Canal State Park, Friends for the Marsh, Mercer County Parks, the Outdoor Club of South Jersey, Central Jersey Sierra Club, Rider University, and others, have provided numerous educational opportunities for students and the public.
- The D&R Canal State Park 3.3-mile towpath trail on Duck Island, completed in 2008, is now available for bicycling and pedestrians. This trail will eventually connect to the railroad bridge over Crosswicks Creek. Improvements are planned for Lock #1 by the State of New Jersey.
- Residents report that the Spring Lake and the Watson Woods areas of John A. Roebling Memorial Park, owned by Mercer County, have become safer, cleaner, and more family-friendly.
- Since 1999, botanists have observed more than 100 additional kinds of plants and now the list exceeds 900.
- The Marsh has been designated a New Jersey Natural Heritage Priority Site. Thus, the NJ Natural Heritage Program considers the Marsh important for the preservation of global biodiversity.
- The Marsh has been designated by the New Jersey Audubon Society as an Important Bird Area (IBA). The IBA program was initiated by BirdLife International in Europe in the 1980s. More than 2500 areas across the Americas have been identified as IBAs, joining Europe, the Middle East, and Africa where millions of acres have received better protection as a result.
- The Marsh is within the National Heritage Area designated as Crossroads of the American Revolution.

Some Givens

- Marsh habitats and conditions change due to natural forces and to human activities; nothing stays exactly as it is now.
- Government agencies own and manage large parts of the Marsh.
- Each agency will continue its management and enforcement responsibilities as defined by its individual charter.
- Mercer County will own, provide support staff, and maintain the nature center.
- Parkland is usually for public use.
- Friends for the Marsh is an organization of citizen volunteers with no authority to manage or enforce. The Friends are organized to facilitate preservation and protection of the Marsh, to promote Marsh stewardship, and to educate the public of the many variable and unique resources of the Marsh. Friends strive to partner with agencies and other organizations to protect, preserve, enhance, and promote the natural, cultural, and recreational resources provided by the Marsh.
- The plan will be a guide to help government agencies coordinate activities.
- The plan will not create any new authorities or laws.
- The plan will not prevent any existing legal recreational activities.

Some Assumptions

- Partners' agreement on vision and goals will benefit the Marsh.
- Partners' communication and coordination will benefit the Marsh.
- The stewardship plan will be based on currently known science and research.
- Teaching people (of all ages) about the values and fragility of the marsh helps the Marsh in the long run.
- The more people care and understand about a place, the more they work to protect it.
- Environmental education and contact with nature leads to a conservation ethic. [Much research shows this, e.g., Louv, R. 2008. *Last Child in the Woods: Saving our Children from Nature-Deficit Disorder*. Algonquin Books of Chapel Hill, and references cited therein].
- Education includes, e.g., classes, field trips, signs, printed materials, nature center exhibits, and websites.
- The CSP will stimulate cooperation among user groups.



Part I

Overview of the Plan

The *Cooperative Stewardship Plan for the Hamilton - Trenton -Bordentown Marsh – 2010* has six key goals developed by partners’ subcommittees. These are based on discussions centering on goals proposed in the *1999 Marsh Management Plan*. What is presented here is an updating of those five goals (Protection and Preservation, Stewardship, Education, Recreation, and Management), and the addition of a sixth (Marsh Identity and Interpretation).

Goal: Protection and Preservation

Goal: Stewardship

Goal: Education

Goal: Recreation

Goal: Marsh Identity and Interpretation

Goal: Coordinated Marsh Management and Organization

The plan, intended to be a strategic plan, is in two parts. The first, which considers each of these goals, is a 10-year plan. The second provides Priority Action Items that complement the Goals; these are ‘short-term’ items that can be accomplished in 1-2 years following completion of the plan. Each Priority Action Item has implementing step(s). An example of a priority action is control of invasive species because of their adverse impact on biodiversity. Action on this has already begun. A grant application was made to the NJ Conserve Wildlife Matching Grant Program by D&R Greenway Land Trust in 2009 with the following objectives: provide a list of invasive plant species, map invasive species, develop a plan for control, and develop a corps of volunteers to remove target species.



Goal: Protection and Preservation

Permanently protect the habitats, plants and animals, cultural resources, and conservation value of the Marsh.

STRATEGY: Create a current inventory of major habitats.

TASKS:

- Identify habitats and delineate boundaries.
- Determine habitat changes over time, utilizing NJDEP Land Use/Land Cover mapping in conjunction with pollen and other studies.
- Evaluate impact of habitat quality on wildlife, using the NJDEP Natural Heritage Program database and other relevant data sources.
- Determine potential impacts of sea level rise on tidal areas of the Marsh.
- Determine affects of global climate change on Marsh habitats.
- Develop a natural history companion text that complements the archaeology text, *Cultural Resources Technical Document*, prepared by Hunter Research for the *Abbott Farm National Historic Landmark Interpretive Plan*.

STRATEGY: Provide an accessible inventory of historical and archaeological resources.

TASKS:

- Identify documented sites and their locations.
- Identify sites that have been or are currently being subjected to unauthorized digging and looting.
- Develop sensitivity map, based on current knowledge, delineating where additional sites may be located.

STRATEGY: Determine how the Marsh fits into a broader network of natural areas including the Lower Delaware Wild and Scenic River, John Heinz Wildlife Refuge (Tinicum), Delaware River Estuary, D&R Canal, as well as the Assunpink, Crosswicks, Delaware River, and D&R greenways.

TASKS:

- Evaluate how the Marsh is related to and impacts regional ecological issues (e.g., flood management, water quality, etc.) by compiling and interpreting data from NJDEP, NJDOT, and other relevant sources.
- Define boundaries of the Marsh, including all publically-owned tidal stretches and associated uplands, utilizing data from NJDEP Green Acres Program, D&R Greenway, Mercer County, Burlington County, and municipalities.
- Identify land acquisition goals as they relate to linkages and networks of open space.

STRATEGY: Formulate protection plans and secure permanent protection for natural and cultural resources.

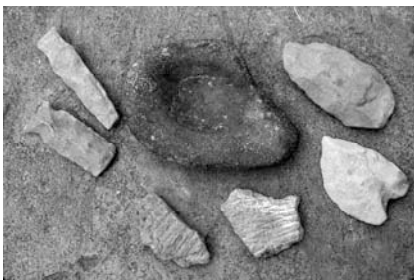
TASKS:

- Designate specific areas and resources requiring protection.
- Provide private landowners with information about methods and benefits of land preservation.
- Negotiate land preservation and /or public access with willing landowners/sellers for acquisition of fee or easement in order to protect resources.
- Secure necessary funding to implement acquisition or easement purchase.
- Identify relevant laws or regulations related to protection and those responsible for monitoring or enforcement.
- Periodically update public landownership map with newly acquired properties and expanded boundaries.

STRATEGY: Balance human uses with protection of critical natural and cultural resources through management and monitoring to preserve integrity of resources.

TASKS:

- Minimize potential negative impact of development of public access via trails, boardwalks, and other manmade structures.
- Inform users through signage at access points and by educational outreach of the impacts of loud and intrusive human activities on wildlife.
- Control access to sensitive natural areas, such as colonial waterbird and bald eagle nesting sites. Provide information regarding penalties for harassment and disturbance.
- Control access to prevent looting of artifacts at the Bordentown Bluffs and elsewhere.
- Promote legislation regarding looting penalties and provide signage indicating penalties.
- Create stewardship agreements and monitoring plans for public lands.



Goal: Stewardship

Maintain the integrity of the natural and cultural resources of the Marsh through good stewardship practices following resource management guidelines.

STRATEGY: Balance human use of resources with protection to preserve integrity of resources.

TASKS:

- Determine how use has changed historically (e.g., agriculture, hunting over the past 200 years) and how this has impacted Marsh resources. In addition to complement the completed *Abbott Farm National Historic Landmark Interpretive Plan*, create oral histories with people who have significant life experience in the Marsh.
- Identify sites for enhancement, cleanup, educational, recreational, or other use with sensitivity to the impact the intervention might have.
- Develop plan for ongoing monitoring of use impacts on resources, habitat changes, invasive and/or exotic species, water quality and other criteria that measure the health of the Marsh. Determine what should be monitored, including monitoring for unintended consequences of management actions, and whether threats are short- or long-term.
- Monitor deer impact on vegetation and establish hunting policies if necessary. Work with the State's Fish and Wildlife's Bureau of Wildlife Management to determine deer densities within the Marsh and, if necessary, develop a working group to develop strategies to address overabundant deer.
- Monitor fish populations.
- Work with local organizations to monitor feral cat and dog populations.

STRATEGY: Maintain biodiversity and protect critical natural and cultural resources. Recognize the impact of any action on known and as yet unknown archaeological sites.

TASKS:

- Create a Wildlife Action Plan specific to the Marsh by extracting pertinent information from the New Jersey Wildlife Action Plan.
- Develop best management practices (BMPs) for target habitats and resources (e.g., bald eagle, marsh birds, archaeological sites, deer).
- Control invasive species (plants, animals).
- Plant only locally native species.
- Enhance wildlife habitats where appropriate.
- Maintain open tidal flats based on above BMPs where appropriate.
- Encourage growth of native plants that provide nutritious food, which serves diverse wildlife, and shelter for animals.
- Maintain and update inventories of natural and cultural resources in partnership with colleges and universities.

- Enlist colleges and universities to conduct relevant research projects and demonstrations within the Marsh.
- Develop monitoring plans to evaluate success and/or impacts of accomplished tasks.

STRATEGY: Determine mitigation methods for hazardous waste sites.

TASKS:

- Make an inventory of contaminated sites in the Marsh through the NJDEP's Known Contaminated Sites List database.
- Research site remediation regulations for applicability to enable protection, mitigation, and re-use of sites; see <http://www.state.nj.us/dep/srp/regs/>.
- Collaborate with NJDEP to develop understanding of the environmental challenges for contaminated areas.

STRATEGY: Minimize the impact of pollution.

TASKS:

- Educate property owners about alternative techniques and through model demonstration projects in partnership with universities to minimize use of herbicides and pesticides.
- Maintain regular trash removal and eliminate illegal dumping along roadways.
- Prevent pollution from storm drain runoff and reduce input of flotsam.
- Limit pollution impact caused by increased access and usage.
- Determine impact of dredging the Delaware River on water quality and habitat sedimentation.
- Evaluate the NOAA oil spill plan for the Delaware River near the mouths of Crosswicks Creek, Duck Creek, and the constructed wetland.

STRATEGY: Minimize the impact of development and other activities (e.g., industrial development, agricultural uses, herbicide use on golf courses, etc.) that would negatively impact the watershed and tidal waters.

TASKS:

- Gather information on all regulations that apply.
- Strive to reduce nonpoint source pollution by coordinating with the appropriate agencies and municipalities.
- Educate local governments about existing regulations, innovative methods, and alternative means of resource protection.
- Encourage adoption of ordinances that will protect or minimize impacts to resources.
- Provide information on significance and boundaries of Marsh resources to regulatory agencies to assist permit review.
- Determine funding availability, e.g., NJDEP Division of Watershed Management Section 319(h) Nonpoint Source Pollution Grant.

STRATEGY: Determine mitigation methods for disturbed cultural resources (historic, archaeological).

TASKS:

- Identify cultural resources that correspond with locations of hazardous waste.
- Identify cultural resources that correspond with stream or river areas that might be subjected to dredging.
- Identify archaeological sites or deposits that are being looted.
- Work with the Archaeological Society of New Jersey, colleges, universities, and interested institutions to develop mitigation and monitoring plans for impacted cultural resources.



Goal: Education

Use the Marsh as an educational site integrating the natural and human history with uniqueness of these urban wetlands in order to foster knowledge, understanding, and action. Work with the Marsh nature and interpretive center to promote Marsh education.

STRATEGY: Identify and build target audiences and determine their needs. Target audiences should include local residents, inner city youth and adults, private landowners, school students, teachers, visitors, ecotourists, government agencies (municipal, county, state and federal), business leaders, land planners, environmental and community groups, colleges and universities, and the media.

TASKS:

- Evaluate needs of audiences.
- Identify existing partner groups, including Native American groups, who could provide funding, staffing, programs, and other educational resources.

STRATEGY: Develop integrated, experiential educational programs, which incorporate the *Abbott Farm National Historic Landmark Interpretive Plan*, and enhance audience connectedness and harmony with the Marsh. These programs should address the following aspects of the Marsh:

Natural history and science (e.g., geography, geology, biology, and ecology).

Natural services, such as water filtration, ground water recharge, and flood control.

Interacting scientific processes, (e.g., geological, hydrological, and ecological).

Archaeological resources, including contributions of Native Americans, colonists, and 19th century historical figures.

Interconnectivity within and between ecosystems and the broader landscape; and connectedness between needs of children and outdoor nature experiences.

The evolution of the Marsh over a geological time scale, as well as during human occupation. The latter includes the archeology and human history of the Marsh, the impact of shifting use and abuse of the Marsh, and the effects of urbanization and restoration.

Evolution of attitudes about the Marsh, e.g., from wasteland to resource and social justice issues.

TASKS:

- Develop educational school-based programs to:
 - Provide integrated educational opportunities for students that align with the core curriculum requirements for K-12.
 - Update the teachers' manual and other visual resources.
 - Develop slide programs, displays, and other outreach materials.

- Provide education programs to help teachers use the Marsh as a valued local natural teaching resource.
- Using the Marsh, provide professional development programs and workshops for educators, naturalists, volunteers and other alternative educators.
- Provide ecological experiences and research opportunities for students and faculty of area colleges and universities.
- Provide archeological programs and research opportunities for professionals, students and the public.
- Foster environmental awareness and an environmental ethic among the general public, the corporate constituency, and others through adult education.
- Develop a corps of volunteers to support education and outreach programs.
- Once a formal partnership is established, seek certification as a professional development provider from the NJ Department of Education to encourage teachers to participate in Marsh programs.
- Develop public- and family-based programs.
- Establish a school advisory subcommittee that includes curriculum administrators and teachers.
- Invite school boards, principals, superintendents, and elementary and middle school teachers to special events.

STRATEGY: Develop indoor and outdoor education facilities to enhance audience connectedness and harmony with wetlands, provide audiences with an understanding of past, present, and future dependence on wetlands, and integrate science, technology, and human use with environmental impacts.

TASKS:

- Complete indoor facilities at the Marsh nature and interpretive center that will include:
 - a gathering place for small groups,
 - a resource center and information available to students and the public,
 - classroom/laboratory space, and
 - storage facilities for educational materials.
- Develop attractive self-sustaining visitors' center and interpretive programs.
- Enhance and/or construct outdoor facilities to promote education that include, e.g.,
 - a network of linked trails (e.g., self-guided, bilingual, handicapped accessible, for the blind) in uplands, on boardwalks in wetland areas, and on waterways (for canoes and kayaks),
 - observation deck for observing wildlife,
 - a covered pavilion for an outdoor classroom, and
 - model Native American village and archeological excavation /research sites.
- Create interpretive signage and displays.



Goal: Recreation

Provide for the safe enjoyment and recreational use of the Marsh by the visiting public.

STRATEGY: Foster use of the Marsh by the public for compatible recreation activities including: a) walking, hiking, jogging, cross-country skiing, nature study, birding, canoeing, kayaking, and picnicking; b) bicycling on designated trails only; and c) fishing and hunting in designated areas, following the NJ Division of Fish and Wildlife regulations and seasons.

TASKS:

- Create a recreational brochure that identifies specific areas open to recreation and other activities, including hunting, permitted in each area.
- Compile guidelines and rules of the Marsh for Friends for the Marsh website with appropriate links to obtain further information, for example, to see the NJ Division of Fish and Wildlife hunting regulations website.
- Interface recreational trips with education programs.
- Create a map that identifies where and what types of hunting are allowable in the Marsh and make available to the public.

STRATEGY: Promote recreational safety programs for boaters and paddlers.

TASKS:

- Develop a safety brochure and post safety, waterway courtesy, and tide information on Friends for the Marsh website. Provide website links to the U.S. Coastguard, American Canoe Association, and other boating organizations.
- Install appropriate signage at access points (see Signage Strategy under Coordinated Marsh Management goal).
- Work with yacht clubs to provide safety instructions for paddlers.

STRATEGY: Balance recreational use of the Marsh with protection of natural and cultural resources.

TASK:

- Coordinate annual meetings among public agencies to discuss problems, coordinate operations, and enhance communications about illegal uses, enforcement, and emergency responses. Examples of agencies to include are local police departments, park personnel, and conservation officers.
- Post usage guidelines at access points in the Marsh.
- Maintain gates to minimize illegal access.

STRATEGY: Create access points for recreation where appropriate, with sensitivity to natural and cultural resources.

TASKS:

- Maintain upkeep of current access points through staff and volunteers.
- Where appropriate, enhance existing public access points with, for example, kiosks, visitor center, restrooms, parking areas, signage, trash management, trails, benches, and links to neighboring recreational facilities, to make public access more attractive and to encourage appropriate low-impact uses by the public.
- Enhance Roebling Park: e.g., provide with restrooms, outdoor pavilion, boardwalk, and observation tower, e.g., overlooking headwaters of Watson Creek; restore White City Amusement Park stairway; maintain trails.
- Investigate dredging a portion of Spring Lake to enhance fishing and boating.
- Create a trail linking waterfront development area, Duck Island constructed wetland, Roebling Park (Watson Woods and Spring Lake areas), and D&R Canal and the Delaware River Heritage Trails.
- Consider placement of observation deck/tower and blinds for observing wildlife.
- Locate benches at scenic overlooks for restful reflection.
- Enhance Bordentown Bluffs by: stabilizing erosion of bluffs, providing railing at lookout, securing artifact sites, providing public parking area and benches, installing interpretive signage and kiosk with visitor information, and maintaining trails.
- Enhance trail access and develop a marsh/swamp boardwalk upstream of the Rt. 206 bridge.
- Enhance constructed wetland on Duck Island by maintaining walking trails, creating a canoe launch for public access, and providing restroom facilities.
- Enhance D&R Canal State Park by dredging the canal from lock 1 to lock 2, linking canal and waterfront development, and eliminating tidal influence to provide for canoeing access.
- Create self-guided walks and canoe/kayak trails at the Marsh.



Goal: Marsh Identity and Interpretation

To provide opportunities for interpretation of the many natural and cultural components of the Marsh and to create and promote an identity consistent with the *Abbott Farm National Historic Landmark Interpretive Plan*.

STRATEGY: Create a framework that supports the visitor's orientation to and experience of the Marsh.

TASKS:

- Create or utilize an existing nonprofit to support the Marsh nature and interpretive center by:
 - providing volunteers to support programs and events, and
 - preparing and applying for grants to support staffing and programs.
- Create a professional and technical advisory board to support a holistic interpretation of the entire Marsh:
 - to include a broad range of professionals including historians, educators, scientists, and individuals with other relevant skills,
 - to advise the nonprofit and Marsh nature and interpretive center on programming.
- Promote restoration of historic buildings and sites bordering the Marsh to enhance its appeal as a destination.
- Create an atmosphere that encourages businesses in local communities near the Marsh.

STRATEGY: Develop media that raises awareness and promotes the Marsh resources.

TASKS:

- Create a brand that integrates the natural and cultural resources of the Marsh and the Abbott Farm National Historic Landmark in one descriptive and cohesive name.
- Develop design standards for logo, signage, website, maps, and other promotional materials.
- Develop an interactive portal website linking public partners of the Marsh and the general public.
- Create and maintain a comprehensive Marsh website.
- Publish a comprehensive map/brochure to include additional regional attractions to encourage visitors to make the Marsh a destination. Include access points, publicly accessible land, trail connections, permitted recreational activities, points of interest, and support services such as restaurants and liveries.
- Communicate to the public via newsletters, newspaper articles, radio and television programs, and special events, etc.

STRATEGY: Explore partnerships with universities, colleges, and high schools in a variety of subject areas.

TASKS:

- Create a student internship program.
- Explore research opportunities.

Goal: Coordinated Marsh Management and Organization

Develop a concise overall management protocol and organizational structure for all land owned by public agencies, including municipal, county and state, within the Marsh boundaries to implement plan goals.

STRATEGY: Establish a formal partnership among the land-owning agencies and partner organizations to facilitate ongoing information sharing and to coordinate stewardship, educational, and recreational activities.

TASKS:

- Contract with a consultant to facilitate the establishment of a formal partnership and initiate the implementation of the *Cooperative Stewardship Plan* working with an advisory committee.
- Draft a formal agreement among partners.
- Seek endorsement of all partners.

STRATEGY: Promote safety and security standards that encourage safe, appropriate, and enjoyable uses of the Marsh.

TASKS:

- Encourage respect of private property.
- Promote safe, appropriate, and enjoyable uses of the Marsh.
- Post and publicize contact information for security and emergencies.

STRATEGY: Promote ongoing communication with all stake holders, including the public and neighbors, regarding Marsh use.

TASKS:

- Encourage activities that involve the public and neighbors for the purpose of enhancing awareness and creating ‘ownership’ attitudes.
- Inform public of Marsh stewardship activities.

STRATEGY: Develop and install limited signage.

TASKS:

- Develop a unified signage system that is agreed upon and used by all Marsh landowners.
- Determine appropriate locations for safety information, orientation, interpretation, and/or self-guided trail signage, minimizing signage to the extent practicable.
- Mark access points and include recreational usage guidelines, safety information, and emergency phone numbers.

STRATEGY: Coordinate maintenance and operations within the Marsh among public landowners.

TASKS:

- Collaborate on maintenance schedules and procedures, set desired maintenance standards and practices, and strive to share resources to streamline duties, efficiency, and minimize costs.

- Set standards for site furnishings including (but not limited to) benches, trash receptacles, picnic tables, bike racks, gates, trail markers, and portable toilets.
- Seek funding and in-kind support from local businesses and government sources for maintenance of access and other points of interest.
- Develop and coordinate operating procedures for use of Marsh facilities by organized groups.

STRATEGY: Develop volunteer opportunities to support recreational, educational, and stewardship activities.

TASKS:

- Recruit volunteers to monitor activities within the Marsh.
- Investigate the recruitment of a volunteer coordinator.
- Develop volunteer opportunities.
- Maintain existing programs, such as volunteer programs including (but are not limited to) NJ Division of Fish and Wildlife's Wildlife Conservation Corps, Mercer County Parks volunteers, Friends for the Marsh, and NJ State Park Service's Volunteer-in-Parks Program.
- Provide funding, including in-kind funding, for volunteer activities.

STRATEGY: Design a concept plan for the Marsh that identifies amenities such as primary and secondary access points, trails, benches, picnic areas, parking areas, and observation points.

TASKS:

- Work with all partner organizations/land owners, adjacent municipalities, volunteer and user groups and the general public to obtain input on the plan.
- Hire a consultant to design and illustrate a Marsh concept plan.

STRATEGY: Determine a long-range funding plan for the Marsh.

TASKS:

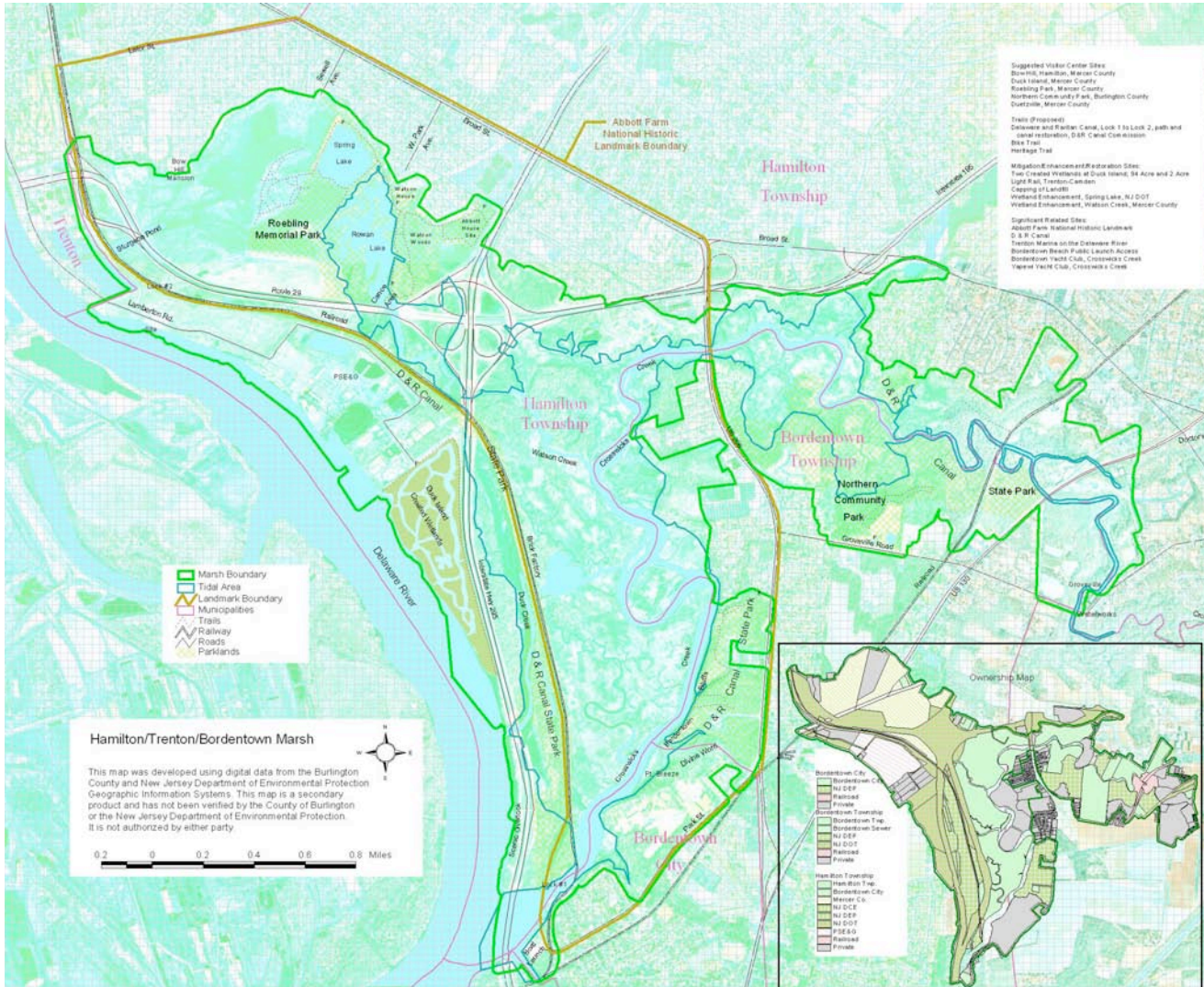
- Develop an overall budget for all Marsh operations and determine what is already being funded and where budget short-falls exist.
- Establish a grants sub-committee to seek funding for short-fall areas.
- Seek a long-range funding source for the Marsh.
- Secure funds to develop education programs and facilities.
- Seek advertising support for brochure, website, and newsletter from local businesses.

STRATEGY: Determine where and how Marsh information (e.g., maps, data, written materials, etc.) is to be stored.

TASKS:

- Seek temporary storage and location for Marsh information.
- Plan long-term storage and location for Marsh information.
- Provide website links for public retrieval of information, while protecting sensitive information.

Map 2. Shown are the boundaries of the Abbott Farm National Historic Landmark and the insert shows estimated extent of Marsh ownership. (Prepared by Herb Lord, 2009).



Part II

PRIORITY ACTION ITEMS

The purpose of this Priority Action Items addendum is to implement strategies in the *Cooperative Stewardship Plan* in a manner that produces short-term results, by selecting doable tasks that can be completed in a 1-2 year period. The implementing steps are listed, showing how a task can be completed. As tasks are completed, a periodic review of goals will determine the next task for implementation.

Goal: Protection and Preservation

STRATEGY: Create a current inventory of major habitats.

TASK:

- Determine habitat changes over time, utilizing NJDEP Land Use/Land Cover mapping in conjunction with pollen and other studies.

Implementing steps:

- 1) Research and compile relevant natural history data.
- 2) Review historic aerials held by the NJDEP Division of Maps and Publications.
- 3) Compare 1995/97, 2002, and soon-to-be-released 2009 NJDEP Land Use/Land Cover maps.
- 4) Summarize gathered information and make accessible to partners and the public.

STRATEGY: Provide an accessible inventory of cultural and archaeological resources.

TASK:

- Develop sensitivity map, based on current knowledge, delineating where additional sites may be located.

Implementing steps:

- 1) Organize information from the *Abbott Farm National Historic Landmark Interpretive Plan* and the *Cultural Resources Technical Document* to make data user-friendly, while protecting sensitive sites.
- 2) Investigate the possibility of identifying additional “contributing properties” to cultural resources in order to discourage development on culturally sensitive sites.

STRATEGY: Formulate protection plans and secure permanent protection for natural and cultural resources.

TASK:

- Periodically update public landownership map with newly acquired properties and expanded boundaries.

Implementing steps:

- 1) Contact the NJDEP Green Acres Program, Mercer and Burlington Counties, and municipalities to obtain their parcel data.
- 2) Determine GIS information available.
- 3) Include all publically-owned areas, tidal waterways, and adjacent uplands.
- 4) Strive for consistent mapping of Marsh boundaries (e.g., *Coordinated Stewardship Plan* maps, NJ Audubon Important Bird Area (IBA) map, NJDEP Landscape Project map), and indicating the Abbott Farm National Historic Landmark.
- 5) Obtain GPS data of cultural resource sites that are subject to impacts (hazardous waste, dredging, looting) and add as a map layer.
- 6) Make information available via webpage.

Goal: Stewardship

STRATEGY: Minimize the impact of pollution.

TASK:

- Prevent pollution from highway storm drains.

Implementing step:

- 1) Work with NJDOT to mitigate impacts from pollution draining from highways through storm drain design alterations.

STRATEGY: Maintain biodiversity and protect critical natural and cultural resources. Recognize the impact of any action on known and as yet unknown archaeological sites.

TASKS:

- Control invasive species (plants, animals).

Implementing steps:

- 1) Meet with NJDOT about reducing the abundance of reed grass (*Phragmites australis*) on the Duck Island constructed wetland.
- 2) Conduct inventory of selected invasive plant species and map their locations.
- 3) Develop task force to reduce selected invasive plant species.

- Enhance wildlife habitats where appropriate.

Implementing step:

- 1) Discuss a mowing plan for the landfill with NJDOT. Mowing should not occur until after July 15th to protect grassland birds using the area for nesting.
- 2) Plan steps for erosion control along the bluffs. Contact Burlington and Mercer County Soil Conservation District offices.

STRATEGY: Determine mitigation methods for hazardous waste sites.

TASK:

- Compile list of hazardous waste sites within the marsh through the NJDEP “Known Contaminated Sites” database.

Implementing step:

- 1) Conduct database search and document findings.

STRATEGY: Minimize the impact of development and other activities (e.g., industrial development, agricultural uses, herbicide use on golf courses, etc.) that would negatively impact the watershed and tidal waters of the Marsh.

TASK:

- Strive to reduce nonpoint source pollution by coordinating with the appropriate agencies and municipalities.

Implementing steps:

- 1) Discuss sedimentation in Crosswicks Creek with local Soil Conservation District offices and watershed associations to help determine causes and best management practices (BMPs).
- 2) Work with municipalities and watershed associations to develop BMPs for enhancing riparian buffers within the Marsh.
- 3) Track status of US Army Corps of Engineers Philadelphia District plans to dredge the Delaware River and communicate with the Delaware Riverkeeper about issues.

STRATEGY: Determine mitigation methods for disturbed cultural resources (historic, archaeological)

TASKS:

- Identify cultural resources that correspond with locations of hazardous waste.
- Identify cultural resources that correspond with stream or river areas that might be subjected to dredging.
- Identify archaeological sites or deposits that are being looted.

Implementing steps:

- 1) Obtain GPS locations of cultural resource sites that are subject to impacts (hazardous waste, dredging, looting).
- 2) Overlay these locations on Marsh map for mitigation planning purposes.

Goal: Education

STRATEGY: Identify and build target audiences and determine their needs. Target audiences should include local residents, inner city youth and adults, private landowners, school students, teachers, visitors, eco-tourists, government agencies (municipal, county, state and federal), business leaders, land planners, environmental and community groups, colleges and universities, and the media.

TASK:

- Develop a school advisory subcommittee that includes curriculum administrators and teachers.

Implementing steps:

- 1) Establish ad hoc committee to: a) develop broad mission statement, vision and goals to be used as a blueprint by an education committee; b) identify particular people or groups who would bring expertise to program development; and c) contact potential members for the committee.
- 2) Conduct school advisory committee meetings to: a) refine mission, vision, and goals; b) assess the needs of the target audiences; c) establish goals and a timeline for educational programs based on the needs assessment; and d) develop a plan for seeking funding.

Goal: Recreation

STRATEGY: Foster use of the Marsh by the public for compatible recreation activities including: a) walking, hiking, jogging, cross-country skiing, nature study, birding, canoeing, kayaking and picnicking; b) bicycling on designated trails only; and c) fishing and hunting in designated areas, following the NJ Division of Fish and Wildlife regulations and seasons.

TASK:

- Create a recreational brochure that identifies specific areas open to recreation and the activities permitted in each area.

Implementing steps:

- 1) Identify use areas.
- 2) Verify existing information and provide new information as available. Information to be contributed includes access points and parking for recreational activities, boat launches, trails, picnicking and other recreational uses, permitted hunting areas, and general use regulations for public areas.
- 3) Develop a GIS map that can be used for establishing policies and provide information to agencies and the general public.
- 4) Apply for funding for brochure design and printing.

Goal: Marsh Identity and Interpretation

STRATEGY: Develop media that raises awareness and promotes the Marsh resources.

TASK:

- Create a brand that integrates the natural and cultural resources of the Marsh and the Abbott Farm National Historic Landmark in one descriptive and cohesive name.

Implementing steps:

- 1) Obtain grant money.
- 2) Issue a Request for Proposals (RFP) for a consultant on the Mercer County website.
- 3) Interview and select consultant.
- 4) Execute contract with consultant.
- 5) Manage the project.

Goal: Coordinated Marsh Management and Organization

STRATEGY: Establish a formal partnership among the land-owning agencies and partner organizations to facilitate ongoing information sharing and to coordinate stewardship, educational, and recreational activities.

TASKS:

- Draft a formal agreement among partners.

Implementing steps:

- 1) Review samples of Memoranda-of-Agreement guidelines to determine the best format for a Marsh stewardship entity.
- 2) Form ad hoc committee(s) as needed.
- 3) Finalize formation of Marsh partnership.

- Identify and contract with a consultant to facilitate the establishment of a formal partnership and initiate implementation of the *Cooperative Stewardship Plan*.

Implementing steps:

- 1) Identify funding source(s) (3-5 yrs).
- 2) Determine job description (e.g., facilitation of partnership development; implementation of Priority Action Items; development of maps and brochure(s); development of media and other PR pieces; develop meeting schedule for entity members, partners, security officers, etc.).

STRATEGY: Determine a long-range funding plan for the Marsh.

TASK:

- Develop a budget for all Marsh operations and determine what is already being funded and where budget short-falls exist.

Implementing step:

1) Work with partners to understand and solicit information regarding Marsh funding needs.

- Seek a long-range funding source for the Marsh.

Implementing steps:

1) Investigate funding sources.

2) Write grant applications.



Appendix 1

Ecological Publications - Hamilton - Trenton –Bordentown Marsh

As with much of science, serendipity played a part in bringing the Marsh to the attention of Dennis F. Whigham, a faculty member at Rider College. To the best of his recollection, in 1972, David Earling, a student in an evening class, asked Dr. Whigham to look at the area near his house in Trenton that was threatened by development; that property was at the edge of the Marsh. Thereafter began a collaboration between Drs. Whigham, Robert L. Simpson, V. Thomas Parker, and Mary A. Leck, and with colleagues at Rutgers - Camden, Rutgers - New Brunswick, The College of New Jersey, University of Kentucky, New England University (NSW, Australia), and elsewhere. Leck is currently Emeritus Professor of Biology at Rider University; Parker –Professor of Biology, San Francisco State University; Simpson – Professor of Biology, The University of Michigan at Dearborn; and Whigham - Senior Scientist and Deputy Director, Smithsonian Environmental Research Center, Edgewater Maryland).

The studies, dealing with, for example, plant productivity, decomposition, seed germination ecology, as well as insects and breeding birds, have significantly increased our understanding of the structure and functions of tidal freshwater wetlands and of wetlands in general. The list below includes publications based wholly or in part on data obtained from Hamilton – Trenton - Bordentown Marsh studies or review these studies. In some cases (e.g., Leck et al. 2008. *Seedling Ecology and Evolution*), works were stimulated by marsh findings and contain reference to research done at the Marsh.

These wetlands continue to instruct.

Undergraduates at Rider University have studied topics such as water quality, seed germination, seed dispersal (by studying water currents), and the effect of management of purple loosestrife on plant species diversity.

Classes from Mercer County Community College, Rider University, Rutgers University, The College of New Jersey, and the University of Pennsylvania visit regularly. Moreover, the 94-acre man-made wetland on Duck Island provides a field laboratory where colonization by plants and animals, soil development, and other changes can be studied. Many classes of school children have had field trips there.



A list of plant species may be found in Leck & Leck 2005; however, the list is now incomplete as species continue to be discovered.

This publications list was included in response to public comments.

(Please note that archaeological references can be found in the Abbott Farm National Historical Landmark Interpretive Plan – Cultural Resources Technical Document. (See:

<http://www.state.nj.us/counties/mercer/about/community/openspace/abbott.html>).

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Marsh Cooperative Stewardship Plan Participants

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City of Bordentown, Bordentown Township, Burlington County, City of Trenton, D&R Canal Commission, D&R Greenway Land Trust, Divine Word Missionaries, Friends for the Marsh, Hunter Research, Inc., NJ Conserve Wildlife, Township of Hamilton, Mercer County, NJDEP, NJDOT, NJ Transit, and PSEG.

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- 8 *Eastern-tailed Blue*, mating butterflies, Duck Island trail –
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- Great Egret*, from kayak Crosswicks Creek – Herb Lord
- Winged-stem*, Duck Island – MA Leck
- 10 *Halloween* (dragonfly), Spring Lake – Herb Lord
- 13 *American Bittern*, near parking lot at Spring Lake –
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- 14 *William Schindler*, *Archaeology graduate student*,
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- 16 *Marsh Artifacts*: broken points, pottery pieces, scrapers,
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- 24 *Canoe at Low Tide*, constructed wetland on Duck Island –
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- 34 *Tidal Ice*, Watsons Creek – MA Leck
- 35 *Sturgeon Pond*, from Rt. 29/129 – Jeff Worthington
- 39 *Pickerelweed*, Spring Lake – Mary Anne Borge
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