



ESTUARY NEWS



NEWSLETTER OF THE PARTNERSHIP FOR THE DELAWARE ESTUARY: A NATIONAL ESTUARY PROGRAM

Wetlands Protection and Restoration are High Priority

By Kathy Klein, Executive Director, Partnership for the Delaware Estuary

Wetlands, simply put, are wonderful. To understand the role they play in the Delaware Estuary, we must first define the term. Wetlands are areas where water covers the soil, or is present at or near the surface of the soil, all year or for varying periods of time dur-

ing the year, including during the growing season. The two main categories of wetlands are **coastal** (influenced by tides) and **inland**, the latter of which are commonly found along non-tidal rivers and streams. In our region, we are blessed with having both categories of wetlands.

"...up to 24 percent of the Estuary's originally existing wetlands have been lost or extensively altered as a result of modifications."

The Delaware Estuary is currently home to more than 405,000 acres of wetlands. This is equivalent to more than 337,000 football fields. At first, this may seem like a lot until you consider that up to 24 percent of the Estuary's originally existing wetlands have been lost or extensively altered as a result of modifications. These modifications resulted from salt hay farming and other agricultural uses, ditching for mosquito control, filling for land development, degradation from pollution, invasion of exotic species, and the expansion of undesirable native species.

continued on page 2



Kathy Klein (above), of the Partnership, points to numerous ribbed mussels attached to a plug of *Spartina* pulled from a Delaware Estuary salt marsh.

In this Issue

- 3 Estuary Basics**
Freshwater Tidal Wetlands: A Gem of the Delaware Estuary
- 4 Making Waves**
Delaware Estuary Tidal Wetlands: A National Treasure
- 6 Species Specific**
Three *Spartina* Sisters: Holding Delaware Marshes Together
Phragmites: Hate it or Love it?
- 10 Policy**
Hundreds of Rare Species at Risk in 'Isolated Wetlands'
- 11 Updates**
Coast Guard Completes Investigation of Athos I Oil Spill
- 12 Teachers' Page**
2006 Delaware Estuary Watershed Workshop
Contest Teaches Thousands About Stormwater
- 14 Estuary Events**

Wetlands

More information can be found on the Web using the resource list on page 3

Wetlands Protection continued from page 1

Only in the past 30 years or so have we begun to realize the ecological importance of wetlands. Wetlands recharge groundwater, filter pollutants, provide habitat for waterfowl and other wildlife, support fisheries, and are sanctuaries for rare and endangered species. They also help control floodwater by slowing its velocity and acting as temporary storage basins, and they operate as sediment traps that slow erosion.

This important role was tragically illustrated by the recent hurricanes that hit Louisiana and Mississippi, where the rate of wetland loss has been greater than anywhere else in the world. Locally, we should also be concerned with how sea level rise is going to impact our region's wetlands and adjacent uplands.

The Delaware Estuary is fortunate to have an almost continuous ring of coastal wetlands, with varying degrees of salinity, from Cape Henlopen to Wilmington, Delaware, and from Cape May to Camden, New Jersey. These coastal wetlands are comprised of brackish and salt marshes that are dominated by emergent herbaceous vegetation (plants that grow with their stems above and below water), and these consist mainly of rushes, sedges, and grasses that die back every winter. Now that wetlands have begun to be recognized as important ecosystems, thousands of acres have been purchased for protection by federal, state and local government agencies, as well as by national, regional, and local land conservancies.

In addition to our coastal wetlands in the lower portion of the tidal Estuary, we are unique among other large North American estuaries in that we have a very large freshwater tidal region.

White Paper Hot Off the Presses

An important outcome of the 2005 Delaware Estuary Science Conference was the development of the *White Paper on the Status and Needs of Science in the Delaware Estuary*. This white paper translates the key points and science needs articulated at the conference into a consensus summary regarding the state of our scientific knowledge. It also serves as a blueprint for addressing demands and provides guidance for directing future efforts toward the most pressing science and management needs. This document is available for download as a PDF file at www.DelawareEstuary.org. To locate it, simply proceed to the "Datasets and Reports" Web page under "Science and Research."

This area extends along the Delaware River from near Wilmington, Delaware, to the head of tide at Trenton, New Jersey. Historically, vast portions of the shores along this stretch of the river were freshwater tidal marshes, but due to conversion and degradation, less than five percent of pre-settlement acreage remains.

Based on their ecological importance, it is not surprising that coastal wetlands were identified as being a high priority at the 2005 Delaware Estuary Science Conference, and in a recently released white paper (see above). Given these findings, the focus of this issue of *Estuary News* has been devoted to wetlands. I encourage you to learn more about them and the Partnership for the Delaware Estuary's plans to address wetland issues in the future. I also encourage you to take some time and explore these amazing ecosystems located across our region. ■

MEETINGS CONTACT LIST

Meetings of the Estuary's Implementation Teams and Advisory Committees occur on a regular basis and are open to the public. For meeting dates and times, please contact the individuals listed below:

Estuary Implementation Committee

Kathy Klein, Executive Director (Chair)
(800) 445-4935, ext. 102
kklein@delawareestuary.org

Monitoring Advisory Committee

Edward Santoro, Monitoring Coordinator
(609) 883-9500, ext. 268
edward.santoro@drbc.state.nj.us

Toxic Advisory Committee

Thomas Fikslin, Branch Head
(609) 883-9500, ext. 253
thomas.fikslin@drbc.state.nj.us

Polychlorinated Biphenyls Implementation Advisory Committee

Pamela Bush, esq.
(609) 883-9500, ext. 203
pamela.bush@drbc.state.nj.us

Fish Consumption Advisory Team

Thomas Fikslin, Branch Head
(609) 883-9500, ext. 253
thomas.fikslin@drbc.state.nj.us

Science Coordination

Danielle Kreeger, Estuary Science Coordinator

(800) 445-4935, ext. 104
dkreeger@delawareestuary.org

Habitat Restoration Coordination

Kellie Westervelt, Restoration Director
(800) 445-4935, ext. 111
kwestervelt@delawareestuary.org

Delaware Estuary Education Network

Lisa Wool, Program Director
(800) 445-4935, ext. 105
lwool@delawareestuary.org



Freshwater Tidal Wetlands: A Gem of the Delaware Estuary

By Danielle Kreeger, Science Coordinator, Partnership for the Delaware Estuary

Until relatively recently, most wetlands were regarded as wastelands of little value until diked, filled or otherwise transformed for development. This attitude has led to the destruction and degradation of wetlands around the world. Although public perceptions in regard to wetlands have shifted, and regulatory changes adopted in the 1970s have established "no net loss" policies, pressure from developers continues to mount. Even today wetlands are being lost at an alarming rate.

The Delaware Estuary is home to one of the largest freshwater tidal estuaries in the world, and its freshwater tidal marshes represent a special feature of this system. A freshwater tidal marsh is a special type of wetland that is critically imperiled in the Estuary.

Early records indicate that these marshes once extended along the shoreline from South Philadelphia to Wilmington, Delaware. Settlers began the destruction of these resources in the upper Estuary by filling them to allow for the expansion of cities founded close to the head of tide. This resulted in the development of a major port complex in the urban corridor of the tidal Delaware River. Although less than five percent of their pre-settlement acreage is thought to remain, freshwater tidal marshes provide important benefits to the ecosystem and populace.

Similar to salt marshes lower in the Estuary, rates of primary production in freshwater tidal marshes are some of the highest in the world, even rivaling those of tropical rain forests. This growth provides essential food and habitat for wildlife, waterfowl, fish, and other living resources. For example, channels in these marshes act as nursery areas for endangered sturgeon (*Acipenser brevirostrum*).

In contrast to salt marshes, freshwater tidal marshes are renowned for their high biodiversity, which includes special species such as wild rice (*Zizania aquatica*). In addition to their ecosystem importance, these areas act as greenbelts, which enhance quality of life and provide recreational outlets for people in urban landscapes. Since the Delaware Estuary is situated amongst one of the greatest concentrations of heavy industry in the nation, these marshes also intercept more pollutants and provide greater overall water quality benefits than more pristine wetlands located far from urban areas.

For these reasons, the protection and restoration of freshwater tidal marshes is a priority for the Partnership for the Delaware Estuary and its collaborators.

For more information about wetlands, please visit our website, www.DelawareEstuary.org, as well as the sites listed in the column to the right. ■



Diverse vegetation is abundant among the freshwater tidal marshes of the Upper Delaware Estuary.

Wetland Education Resources

Wetland information can be found on the following websites:

Center for Watershed Protection
www.CWP.org/Wetlands/Index.htm

Delaware Division of Fish and Wildlife
www.dnrec.state.de.us/fw/are.htm

Delaware River Basin Commission
www.state.nj.us/drbcc/edweb/resources.htm

Estuaries.gov

University of Delaware Graduate College of Marine Studies: www.Ocean.udel.edu/Public/Teacher.html

U.S. Environmental Protection Agency
www.epa.gov/owow/wetlands

Information regarding wetland education institutions and programs can be found at:

Bombay Hook National Wildlife Refuge
www.FWS.gov/Northeast/BombayHook

Delaware National Estuarine Research Reserve
www.dnrec.state.de.us/dnrec2000/Divisions/Soil/DNERR

New Jersey Audubon Society's Nature Center of Cape May: www.NJAudubon.org/Centers/NCCM

Palmyra Cove Nature Park: www.PalmyraCove.org

Philadelphia Academy of Natural Sciences
www.AcNatSci.org/Education

The Wetlands Institute: www.WetlandsInstitute.org



MAKING WAVES

Delaware Estuary Tidal Wetlands:

A NATIONAL TREASURE

By Danielle Kreeger, Science Coordinator, Partnership for the Delaware Estuary

The Delaware Estuary is unique among large coastal systems in the United States in that it has a wealth of coastal tidal wetlands in a nearly continuous fringe around its bayshore. Tidal wetlands are a prominent feature of the landscape from Wilmington to Cape Henlopen, Delaware, and from Camden to Cape May, New Jersey. Smaller pockets of tidal freshwater wetlands can still be found in the upper Estuary, however, more than 95 percent of these have been lost to development over the past several hundred years.

The ecological and management implications of these extensive wetlands were hot topics at the 2005 Delaware Estuary Science Conference, where they were trumpeted as one of the defining traits that distinguishes our Estuary from others of national importance. Dr. John Teal, who is widely considered to be the father of modern marsh ecology, emphasized this point at the conference.

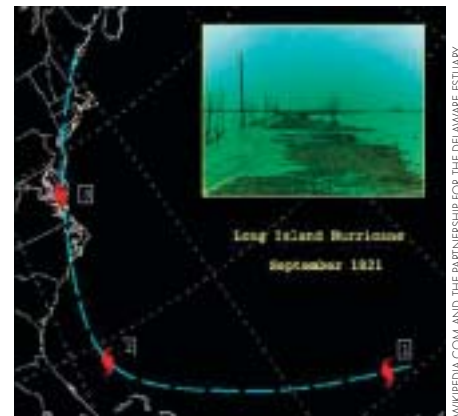
Teal declared, "Delaware Bay is different from estuaries north and south of it—different in sediment loading and in the type of edge. In Delaware Bay the silts and fines are abundant, resulting in less phytoplankton and little SAV (submerged aquatic vegetation) compared to other estuaries, but there is more marsh and, therefore, more nursery habitat for commercial and recreational fishes."

In addition to their habitat value for fish, other scientists at the conference highlighted the role that tidal wetlands play

in absorbing contaminants, nutrients and suspended sediments, thus benefiting overall water quality in the system. For instance, a 1998 study commissioned by the Delaware River Basin Commission and led by the Philadelphia Academy of Natural Sciences found that even the vestigial tidal freshwater wetlands that remain in the urban corridor are capable of removing about 10 percent of phosphorus entering that part of the system. Studies have not yet been conducted to tally the cumulative water quality benefits of all tidal wetlands in the Estuary, but many scientists at the conference surmised that they probably function similar to kidneys or lungs for the system.

Another topic of discussion at the conference was the role tidal wetlands can play in flood protection and their ability to provide a first-line-of-defense to protect against storm surge. This dialogue increased nationally last fall in the wake of Hurricanes Katrina and Rita. Specifically, the flooding that took place in New Orleans was widely considered to have been worsened by the steady erosion of their protective coastal wetlands, which, to that point, had been lost at a rate of about 50 square kilometers per year. One important reason cited for those losses was the flow and channel management of the Mississippi River, resulting in the redirection of freshwater into deeper areas off the river delta. This river water carries suspended sediments that would normally settle out in coastal wetlands, helping them to keep pace

continued on page 15



The Delaware Estuary is not immune to large hurricanes, nor'easters and back-bay flooding, lest we forget examples like the Long Island Hurricane of 1821.



Photographs from space reveal valuable sediment being washed to sea, much like what is happening in the Mississippi River.

Program Leading Way for Wetland Restoration

By Brenda Evans, Senior Environmental Specialist, PSEG Estuary Enhancement Program

The Estuary Enhancement Program (EEP) is an innovative and comprehensive restoration and preservation program being implemented by Public Service Enterprise Group (PSEG). This program provides broad-based, long-term benefits for the environment, ecology, natural resources and people of the Delaware Estuary.

The goal of this program is to help increase the production of fisheries and other aquatic resources to ensure the health and protection of balanced fish and shellfish populations. This is being accomplished through the restoration and preservation of well

over 30 square miles of degraded wetlands and upland buffers within the Delaware Estuary: an area larger in size than Manhattan Island. The restoration of these marshes in New Jersey and Delaware, in addition to the other ecological enhancements, is associated with the operations of PSEG's Salem Generating Station.

PSEG developed and implemented the EEP in collaboration with a team of recognized experts in salt marsh restoration, ecology and aquatic biology. Also involved were independent scientists, environmental groups, public officials, local communities, and natural resource and land management agencies. Through cooperation with state agencies from both New Jersey and Delaware, PSEG continues to protect fisheries through provisions including aquatic habitat restoration; the monitoring of fish species; construction, oversight and maintenance of fish ladders and artificial reefs; and other programs.

As part of its restoration program, PSEG has restored sites that **continued on page 13**

BEFORE By 1996, this site in Dennis Township, New Jersey, had been ravaged by the effects of long term agriculture and diking.



AFTER Having been part of the Estuary Enhancement Program, the same site was deemed a success in 2000 using pre-established criteria.



“The Estuary Enhancement Program has successfully restored degraded marshes. The marshes are functioning. The marshes are making fish. The program is highly successful.”

— John M. Teal, Ph. D., Scientist Emeritus
Woods Hole Oceanographic Institution





Green algae are among the numerous species that subsist on the dead stems of *Spartina*.

Even in waters of high-salinity, smooth cordgrass can grow quite high thanks to adaptations due to stress.

Three *Spartina* Sisters:

By Jack Gallagher, Professor, and Denise Seliskar, Research Scientist, College of Marine Studies, University of Delaware

The three "sister" species of *Spartina* (cordgrass) that dominate saline and brackish marshes around the Delaware Bay are keystone organisms in defining both the structure and function of these productive intertidal habitats. These grasses are especially adapted to fulfill such roles while growing in the oxygen-poor, saline-rich sediments that fringe the bay.

Spartina deals with salt by excluding it from the root's surface using chemical pumps, or by transporting it to the leaves where cells force it to the leaf's surface. Either way, the toxic effects of salt are avoided.

At higher salt levels, the sys-

tem breaks down and the plant is damaged. However, even for the most tolerant of the sisters, this concentration is well above the salinity of coastal seawater. Therefore, the locations in which each of the sisters grows throughout Delaware Bay marshes are an indicator of how well they can deal with various combinations of these stresses.

The tallest of the sisters is big salt marsh cordgrass known as *Spartina cynosuroides*. This species can reach twice the height of a person and is typically found in low salinity marshes, away from the mouth of the Estuary and upstream from secondary rivers that enter the bay.

Smooth cordgrass, or *Spartina alterniflora*, dominates high salinity marshes. It can be found both on the creek banks where it grows several feet high and on the flat plains of marshes where it grows little more than a foot. Salt-meadow cordgrass, or *Spartina patens*, is the finest-textured of the three species and may have stems two feet in length, but because of their fine texture, they often fall down and form a sward of swirled green cowlicks. This species grows in the higher elevations of salt marshes and also in coastal dunes.

The rhizome mat, plus a myriad of fine roots, binds the sediment together and prevents erosion. These devel-

Spartina has special cell pumps that transport sea salt to the surface of its leaves.





Field researchers often sample the roots of cordgrass to learn more about their growth.



Large marshes of smooth cordgrass act as biofilters and natural storms barriers.



The stem and rhizomes of smooth cordgrass transport oxygen to its fine roots.

Holding Delaware Marshes Together

Photos by Jack Gallagher and Denise Seliskar

oping roots and rhizomes also provide an oxidizing environment, or rhizosphere, adjacent to the roots. Supplying oxygen to the cells of their mud-saturated root systems is overcome by the presence of air conduits forming an in-plant snorkel. Not only are organisms in the rhizosphere supplied with oxygen, but also the chemical state of metals and organic compounds are modified in the newly-developing soil. These changes alter toxicity and the ability of the metals and organic compounds to move in the water, as well as to be taken up by the roots of plants.

Thus, the *Spartina* sisters set the stage belowground, not only for the development of three-dimensional microhabitats, but also for the transformation of sedi-

ment deposits into a rich soil profile. These organic resources, which are formed in the shoots and transported to the roots, serve as food for a variety of microbes and invertebrates. They also change the environment to make it more suitable for colonization by other plant species. These changes are physical as well as chemical since decay is slow in the oxygen-poor soil and the accumulation of partially-decayed root systems leads to the elevation of the soil's surface.

Above ground, the stems and leaves modify the environment, which shifts from aerial to aquatic as the tides ebb and flood. These flows are dampened by the plant stems twice daily during the tides, resulting

in sediment deposition from turbid waters. During storms, the flexible stems bend as waves roll over broad marsh plains, absorbing wave energy before it reaches the uplands.

Some *Spartina* enters the food web via marsh crabs, snails and insects that graze upon leaves, but the majority of energy flows through the products of decay as detritus. Fungal and bacterial enzymes convert plant cell walls into microbial tissues, and these become links in complex food chains. The collapse of the decaying *Spartina* also causes light levels on the marsh's surface to increase. Dead stems of *Spartina* are a place for attachment and a source of remineralized nutrients for algal populations to thrive.

These perennial grasses become established from floating seeds that strand on open sediment, and by fragments of underground stems (rhizomes) that drift with the tide and spread through growth. In the established marsh, spring growth is more rapid than their current photosynthesis can support. Much of this quick development is fueled by carbohydrates that are stored within rhizomes over the winter.

Production of smooth cordgrass ranges from one to four kilograms per square meter, depending on the local environment. Likewise, big salt marsh cordgrass has annual yields that grow upward of six kilograms per square meter, and those of salt-meadow cordgrass

continued on page 15



Phragmites: Hate it or

Phragmites *australis*, or the common reed referred to as “phrag,” is one of the most abundant plants in the world. With a distribution throughout the temperate and subtropical zones of all continents, it is also perhaps the most infamous wetland plant on Earth.

Salt marsh cordgrass is often displaced by exotic species, such as *Phragmites*.

PARTNERSHIP FOR THE DELAWARE ESTUARY

Love it?

By Joan G. Ehrenfeld, PhD., Professor, Cook College, Rutgers University

Benefit or Bane?

In many parts of the globe, *Phragmites* has been, and continues to be, a highly valued resource. Some of its many uses include forage and bedding for animals, thatch for roofing, stream bank protection, Native American implements, and habitat for a wide variety of animals, both vertebrate and invertebrate. It is also the most frequently used species in wetlands created for the treatment of wastewater. However, in the Eastern United States, it is often considered as the epitome of evil due to its uniform, dense growth, which excludes nearly all other plant life.

Phragmites is thought to support little in the way of wildlife, fish or invertebrates, and it is feared for its ability to rapidly occupy huge swaths of land. The genetic variety in most of the United States, or the hated kind that forms dense monocultures, is now thought to be non-native, having originated in Eastern Europe. Many believe this species has prevailed over and nearly eliminated the native variety that has always grown in the Delaware Estuary.

The Root of *Phragmites*' Success

Phragmites deserves our respect. In order to appreciate the species' success in commandeering wetland habitats, it is helpful to understand the numerous adaptations it has undergone to deal with harsh environments. *Phragmites* is a member of the grass family and thus, it has features characteristic of this group. These include peculiar flower structures and hollow stems with strengthening cross-plates at the nodes. The hollow stems connect to a vast underground system of

roots and rhizomes (underground stems that spread out laterally).

The rhizomes in particular are one of the secrets of its success. They measure over an inch in diameter and often over 20 feet long. These stems are hollow and allow oxygen to travel from the leaves to its root tips in the oxygen-deficient soil. They also have a bud at each node that can form new shoots (large, hollow stems) that may emerge from the soil.

Rhizomes can grow downward as well as outward. In fact, a single *Phragmites* plant can spread out laterally and form a large clonal colony while, at the same time, maintaining a root system deep in the soil. This takes place thanks to its ability to transport oxygen-containing air through its rhizome system. *Phragmites*' method for moving oxygen downward to the roots is also a unique and specialized system, which gives it a great advantage in the highly anaerobic soils of marshes.

When stems die and break off, they leave the base of the shoot sticking above the surface of the ground. As wind blows across the hollow bases of these old stems, it lowers the air pressure inside. This decrease in pressure causes a flow of air from the leaves of each new shoot through the rhizome system, and this supplies even more oxygen to roots that sprout from the rhizomes. Through this mechanism, *Phragmites* can move oxygenated air three to four feet from each stem, or much farther than plants lacking this structure.

The rhizomes also give the plant another kind of insurance, for even when separated from the mother plant, buds located on fragments of rhizomes can germinate and

start new plants. The most common causes for this method of spread are storms and human activities, both of which distribute rhizome fragments across the land.

Water Cleansing, at a 'Phrag'ment of the Cost

Phragmites' ability to grow rapidly, and tolerate high concentrations of nutrients and pollutants, has made it the plant of choice for artificial wetlands. Engineers have discovered that these wetlands carry out the same processes as wastewater treatment plants. Therefore, wetlands are now frequently constructed in ways that make them as effective at cleansing polluted waters as conventional treatment plants, but at a fraction of the cost thanks to energy supplied by the sun.

Phragmites is the most commonly used plant for such wetlands. Its ability to move oxygen to its roots enhances the growth of microbes necessary for treating wastes. Its rapid and large growth also removes large amounts of excess nutrients from the water, and its ability to tolerate high concentrations of toxic substances makes it ideally suited for these wetlands. Perhaps it is no wonder this species has thrived with such success in the industrial corridor that is the Delaware River.

For more information about the native and non-native varieties of *Phragmites* in North America, please visit www.InvasivePlants.net/Phragmites/Morphology.htm. Dr. Ehrenfeld's research on the subject can also be found at www.rci.rutgers.edu/~ehrenfel. ■



Hundreds of Rare Species at Risk in 'Isolated Wetlands'

By Emile D. DeVito, Ph.D., Manager of Science & Stewardship, New Jersey Conservation Foundation

Freshwater wetlands are some of the most species-rich habitats in the world. In recognition of their ecological significance, they have been protected under federal law for many years. That said, not all wetlands are treated equally under the law.

To assess the impact of a 2001 Supreme Court decision that removed isolated wetlands from federal protection, a non-profit conservation organization known as NatureServe recently completed a 50-state survey. Their findings are cause for concern. The NatureServe study found that 81 of the 276 different types of wetlands in the United States met the criteria for being classified as isolated, and these are no longer federally protected.

The report specifically focused on the link between isolated wetlands and at-risk species, or those that are classified as being in real danger of becoming extinct due to a variety of factors. It found that a total of 274 at-risk plant and animal species are supported by isolated wetlands across the nation. Of these, 86 species are listed as threatened or endangered, or were candi-

dates for listing under the Endangered Species Act. More than half of these existed only in isolated wetland habitats. In New Jersey, a high proportion of wetlands would meet the federal definition for "isolated."

What Makes These Wetlands Unique?

Isolated wetlands are geographically secluded from the systems of rivers, lakes and swamps that make up larger, navigable water systems. Ponds in the Pine Barrens are one example of the isolated wetlands one can find in New Jersey. Despite their physical separation from larger water bodies, they share the most important trait of all wetlands: They are extremely diverse biologically.

The Delta Waterfowl Foundation further documents the diversity in small wetlands. This non-profit maintains that more than half the ducks born annually in North America come from isolated wetlands, which also provide critical habitat for hundreds of other bird species. In fact, the group's research, which dates back over 60 years, shows that 10, one-acre wetland parcels produce three times as many ducks as one, 10-acre wetland.

'Courting' Disaster

Fortunately, New Jersey's Freshwater Wetlands Act protects isolated wetlands larger than one acre in size. Small wetlands and vernal, or "spring," ponds receive no protection, however, regard-

less of the large diversity of threatened or endangered animals and plants they support. Two years ago, the New Jersey Department of Environmental Protection promulgated rules to protect these rare, vernal breeding ponds, but the New Jersey Builders Association had these rules revoked in court.

It is unclear how many acres of wetlands are affected by court decisions such as these. Although the Endangered Species Act offers protection for the habitats of threatened and endangered species, the federal government has put a freeze on adding new species to the list, regardless of any objective scientific support.

Because so many at-risk species rely—often exclusively—on isolated wetlands for important habitat, losing them could seriously damage the chances of survival and recovery for many of the nation's rare plants and animals. We should find a way to extend federal protection to all wetlands once again, and strengthen New Jersey's law before vital natural resources are lost.

Learning More

To learn more about the importance of isolated wetlands, please visit the following websites: www.NaturesServe.org, www.DeltaWaterfowl.org, www.Water-Ed.org and www.EPA.org. Information can also be obtained by e-mailing the New Jersey Conservation Foundation at Info@NJConservation.org or online at www.NJConservation.org. ■



Coast Guard Completes Investigation of Athos I Oil Spill

The United States Coast Guard issued the following press release on January 20, 2006:

PHILADELPHIA, PA—The Coast Guard completed its investigation into the cause of an oil spill that occurred in the Delaware River on the evening of November 26, 2004. Investigators concluded that the Greek tanker "Athos I" came into contact with a submerged anchor while maneuvering through Anchorage #9 enroute to its berth at the Citgo Asphalt Refining Facility in Paulsboro, New Jersey. The anchor punctured the vessel's bottom plating in both a ballast tank and cargo tank, resulting in the release of nearly 264,000 gallons of crude oil.

Following the incident, surveys of the river bottom in the vicinity of the ship were conducted by the Army Corps of Engineers and commercial surveyors contracted by the vessel's owner. The surveys revealed numerous submerged objects in the area, including a large concrete block and a pump casing. The vessel actually struck all three of these objects; however, analysis of paint chips and the unique shape and dimensions of the hull's damage revealed that the anchor was the source of the puncture.

"There was no evidence that any violation of applicable international rules, federal law or regulations contributed to this incident," said Capt. David Scott, commander of Coast Guard Sector Delaware Bay. "The vessel came up river with a draft of 36 feet six inches. Our investigator's review of the vessel's voyage management plan indicated that appropriate calculations were made to ensure adequate under keel clearance for the prevailing 40-foot channel depth."

Coast Guard investigators were unable to determine the owner of the 18,000-pound anchor, nor could they establish how long it had been submerged in Anchorage #9.

"Evidence suggests the anchor may have been lodged in the vessel for a brief time," Scott said, "therefore we were not able to determine its precise location, nor its orientation before coming in contact with the vessel."

Because bottom surveys conducted subsequent to the incident revealed numerous submerged objects in that area, the Coast Guard has recommended that navigation guidelines currently in effect for the Delaware River be reviewed to ensure they remain appropriate.

"In addition, we've also recommended that legislation be adopted that requires immediate reporting to the Coast Guard of any objects that have been lost or discarded into a navigable channel or anchorage that can impede safe navigation," Scott said.

The active spill clean up of nearly 57 miles of shoreline in Pennsylvania, New Jersey and Delaware was concluded just last month. More than 18,000 tons of oily solids were removed in the clean up and the cost is estimated to exceed \$150 million.

"We will continue to monitor the affected areas and are prepared to take appropriate action in the event any residual Athos I-related oil is detected in the future," Scott noted.

For further information, please call Sector Delaware Bay Public Affairs Officer, Lt. Rick Minnich, at (215) 271-4862. The final investigation report can be accessed on the internet by visiting www.MarineInvestigations.us, clicking on "Casualty Reports" and then on "Miscellaneous Investigation Reports." ■





2006 Delaware Estuary Watershed Workshop

By Shaun Bailey, Marketing and Communications Specialist

Monday, July 10, to Friday, July 14

The Partnership for the Delaware Estuary, in collaboration with the Philadelphia Academy of Natural Sciences, has begun to register teachers who would like to participate in the 10th annual Delaware Estuary Watershed Workshop for Teachers.

Over the years, more than 250 teachers have immersed themselves in a wide range of laboratory and field experiences throughout Delaware, Pennsylvania, and New Jersey, all of which have been taught by Estuary experts. Participants have gained information, references, methods and activity plans that are all applicable in the classroom.

The agenda for this year's workshop includes many learn-

ing opportunities, such as oil spill seminars, experiments led by scientists, an overnight stay at the beachside campus of the University of Delaware in Lewes and more. Teachers will also receive classroom equipment worth more than \$250, as well as free accommodations and meals throughout the week-long event.

Roster spots are limited to just 25 kindergarten through 12th grade educators, so early signup is recommended. To apply, teachers must submit a registration form and \$50 registration fee. Other requirements include attendance at a June 29 introductory meeting and canoe trip on the Schuylkill River, as well as a reunion meeting on October 14. Those who successfully



Teachers Mary Mizii (right) and Kathy Michener (left) pick creatures from a net after seining in Delaware Bay.

complete the workshop will be eligible for continuing professional education hours or professional development hours, depending on the state in which the educator is employed.

Sponsorship assistance for this

year's workshop is being provided by the Delaware Department of Natural Resources and Environmental Control, National Oceanic and Atmospheric Administration, Pennsylvania American Water, Pennsylvania Department of Environmental Protection's (PA DEP) Coastal Zone Management Program, PA DEP's Environmental Education Grants Program, Philadelphia Water Department, Public Service Enterprise Group, and Stroud Water Research Center.

The brochure and agenda for this year's workshop can be downloaded from our website at www.DelawareEstuary.org. For more information or to register, please call Lisa Wool, at (800) 445-4935, extension 105. ■



Wendy Carey of the University of Delaware's College of Marine Studies leads teachers through a coastal dune and native plant garden.



Academy Scientist, David Velinsky, holds a Yellow Springs Instruments meter, which is used to determine water quality.



Contest Teaches Thousands About Stormwater

By Shaun Bailey, Marketing and Communications Specialist, Partnership for the Delaware Estuary

The Partnership for the Delaware Estuary, the Philadelphia Water Department, and Delaware's Department of Transportation are in the midst of the 2006 "Clean Water Begins and Ends With You" drawing contests. As entries continue to arrive by mail, we are constantly taken aback by the artistic ability of youth throughout the Estuary.

For the past eight years, stormwater runoff pollution prevention has been the theme for

this contest, which is now held separately in both the City of Philadelphia and Delaware. Many adults have never learned about this important environmental issue, much less children. That is why the Partnership strives to educate both groups using this competition and its resulting advertising campaign.

The first place drawings for each contest will be used in ad campaigns celebrating the 36th anniversary of Earth Day.

Advertisements will appear on buses operated by the Southeastern Pennsylvania Transportation Authority and DART First State. Two calendars—each featuring 16 winning drawings—will also be available in April.

Contest winners will be recognized at an awards ceremony in late April. This year's winning artists will receive framed certificates, a variety of art supplies, and savings bonds ranging from \$50 to \$200 based

upon placement and age group. In addition, every teacher of a winning student will receive a \$25 gift certificate to an arts and crafts store.

For more information or to receive future contest mailings, please call Program Specialist, Dee Ross, at (800) 445-4935, extension 106. Information is also available on our website, www.DelawareEstuary.org. ■

Program Leading Way for Wetland Restoration continued from page 5

were previously diked for agriculture or salt hay farming in Dennis, Maurice River and Commercial Townships in New Jersey. Two of the three previously diked sites met pre-established, final success criteria in only four growing seasons following the completion of construction activities. The third (Commercial Township) met interim criteria within the expected time frame and is expected to meet final criteria on or ahead of schedule.

These measures are helping to expand habitat for aquatic life while reclaiming a significant amount of wetlands lost from productivity. In addition, the restored wetlands now provide

environmental, educational and recreational benefits that will continue long after the Salem station ceases to operate.

The results of this program are many. Natural tidal flows have been restored to thousands of acres and native plants have returned. With them, so have the fish and wildlife that shelter, feed and produce young in marsh ecosystems. Recent tests have even revealed that fish and wildlife usage now equals or exceeds levels found in adjacent natural marshes. In fact, the EEP's previously diked farm sites alone have proven to produce more aquatic life than those affected by the Salem station's operation.

In total, the benefits being achieved by the EEP include:

- **Expansion of habitat and food sources for fish and wildlife**
- **Increased biodiversity within the Estuary**
- **Protection of natural and historic resources**
- **Expansion of the "greenway," or contiguous natural resources, being protected along the coasts of the Delaware Bay and Delaware River**
- **Advancement of the scientific community's knowledge about the functions, values and contributions that salt**

marshes have in the ecosystem

The program's design and its outcomes to date are the result of many unique partnerships and cooperative efforts. Truly it is a demonstration of how public participation, consensus building, public-private partnering, and creative thinking can result in win-win solutions for complex environmental and ecological issues, as well as the protection of vital natural resources.

For more insight into the EEP, please visit www.PSEG.com. Added information can also be obtained by calling (888) MARSHEs. ■



ESTUARY EVENTS



Philadelphia Flower Show

Sunday, March 5, to Sunday, March 12, 2006; Times vary

Pennsylvania Convention Center, Philadelphia, Pennsylvania

The Philadelphia Water Department and the Partnership for the Delaware Estuary are sponsoring an exhibit at the Philadelphia Flower Show, where this year's theme is "Enchanted Spring...A Tribute to Mother Nature." This display, entitled "Nature's Solution to Urban Run-off," will feature the department's Stormwater Wetland at Saylor's Grove, which filters polluted stormwater before it enters area waterways. For more information, please visit www.TheFlowerShow.com. All proceeds will benefit The Pennsylvania Horticultural Society.

Teachers' Open House

Saturday, March 25, 2006

10 a.m. to 2 p.m.

The Schuylkill Center for Environmental Education, Philadelphia, Pennsylvania

Teachers from throughout the Delaware Estuary are encouraged to experience the educational resources of the SCEE. Hike with staff and discover the richness

of area ecosystems while being involved in on-site learning programs, team-building, a low-ropes initiative and raffles. Teaching materials will be available free of charge and educators are welcome to attend a

Frogwatch training afterward from 2:00 to 4

p.m. Call (215) 482-7300, extension 110, for information and to pre-register for these free events.



Backyard Wetland Conservation Webcast

Tuesday, March 28, 2006

8:00 to 10 p.m.

www.IWLA.org/SOS/SOSWeb.htm

Join the Izaak Walton League for a live webcast designed to educate citizens on wetland conservation. "Wetland-Friendly

Lawn and Garden" will include information on how to create rain gardens, install rain barrels, landscape with native plants, and reduce the use of pesticides and fertilizers. A second webcast entitled "Wet Spots into Wonderlands" (April 25, 8:00 to 10 p.m.) will also teach people the benefits of having wetlands on their property, how to protect them, and how to create vernal pools or bog gardens.

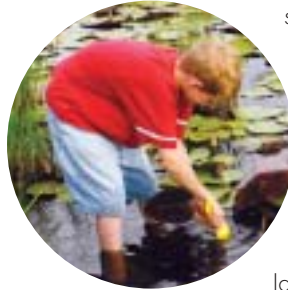
5th Annual Christina River Cleanup

Saturday, April 1, 2006

9 a.m. to 1 p.m.

Christina River and its tributaries in New Castle County, Delaware

Join the Partnership for the Delaware Estuary and many others as we do some spring cleaning in the riparian areas along the historic Christina River. This is an excellent volunteer activity for businesses, civic groups, families and individuals seeking worthwhile conservation activities. For more information on specific sites or to register, please call Shirley Posey at (302) 838-1897, or visit www.ChristinaRiverCleanup.org.



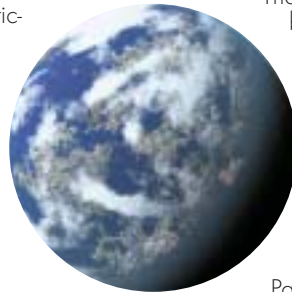
POW! The Planning of Wetlands

Saturday, April 8, 2006

9 a.m. to 4 p.m.

John Heinz National Wildlife Refuge at Tinicum, Philadelphia, Pennsylvania

This course guides educators through the creation, restoration or enhancement of a wetland on school grounds, or within the community. "POW!" incorporates a number of exciting activities that allow students to participate in designing, preparing and monitoring a planned wetland. All activities are compatible with state and national science standards, and each participant will receive a copy of "POW! The Planning of Wetlands." For more information on this \$50 event, please call Karleen Vollherbst at (410) 745-9620, extension 3052.



Earth Day Saturday, April 22, 2006

Delaware River Watershed Education Youth Eco-Leadership Summit

Sunday, April 30, to

Tuesday, May 2, 2006

Tuscarora Inn and Conference Center Mt. Bethel, Pennsylvania

Middle school and high school students, as well as their teachers, who are studying the Delaware River

Watershed are invited to share

their research and stewardship initiatives at this annual seminar. This year the focus will be on biodiversity issues and research in the basin.

Field sessions are scheduled at Delaware Water Gap

National Recreation Area,

Jacobsburg State Park and Minsi

Lake. For more information, e-mail

Bonnie Tobin, education supervisor at Delaware Canal State Park, at

BTobin@State.pa.us, or visit

www.State.nj.us/drbc.

23rd Annual World Series of Birding

Saturday, May 13, 2006

Cape May Bird Observatory, Cape May Point, New Jersey

The New Jersey Audubon Society wants to help you raise money for the conservation cause of your choice at the World Series of Birding. Since 1984, over \$8 million has been raised by those participating in this competitive birding activity. For more information or to register, please call (609) 884-2736, or visit www.WorldSeriesofBirding.org.

11th Annual Delaware River Sojourn

Sunday, June 18, to Sunday, June 25, 2006

Throughout the Delaware Estuary

The Delaware River Sojourn has become an annual celebration of the Delaware River. This year's adventure will be an eight-day paddling journey full of happy memories, good exercise, new friends and a renewed appreciation for a wonderful resource. This year will feature a daytrip led by the Partnership for the Delaware Estuary on Saturday, June 24.

Paddlers of all experience levels are invited to attend. Please visit www.DelawareRiverSojourn.org for more information, and to see photographs from past sojourns.



A National Treasure continued from page 4

with rising sea level. Instead, the redirection of the river has robbed the Gulf Coast's marshes of this essential resource.

Human casualties are one example of the acute toll of the 2005 storms, but the chronic consequences on human health and lost jobs will be felt for many years, perhaps decades. For example, some fear that fishery and shellfishery interests may suffer as a result of increased algal blooms, dead zones, contaminant exposures, and negative, indirect food web relationships. The eventual implications for national policy also remain uncertain. However, with greater than 50 percent of the nation's populace living in approximately 300 coastal counties, we expect that tidal wetlands will gain stature as an important component of emergency preparedness, as well as for their numerous ecosystem services.

Although the Delaware Estuary is not prone to storm surge from hurricanes, it is also not immune

to it. Therefore, the lessons from Katrina should extend beyond how wetlands help with hurricane preparedness, because they illustrate the complex interrelationships between physical and biological processes, as well as environmental health, ecosystem services, and human



This satellite photo of the John Heinz National Wildlife Refuge at Tinicum shows the limited promise of landward retreat by tidal wetlands due to development.

socioeconomics. Linkages between flow management, water withdrawals, sediment budgets, dredging, sea level rise, land subsidence, water quality, and the health of tidal wetlands were already being discussed prior to Katrina. Other threats that continue to

imperil the Estuary's wetlands include invasive vegetation such as Phragmites, and direct human impacts resulting in the loss of freshwater tidal marshes in the upper Estuary.

For all these reasons, it is not surprising that tidal wetlands were designated as a high priority in the recent white paper entitled "Status and Needs of Science in the Delaware Estuary," (see box on page 2) which summarizes key points from the science conference and provides a blueprint for addressing the Estuary's most pressing scientific needs.

Considering that no single entity is currently focused on tidal wetland issues Estuary-wide, the Partnership for the Delaware Estuary (Partnership) intends to help fill this void by working with collaborating groups to advance a focused wetlands agenda. Since the most recent comprehensive wet-

land survey was completed in the 1980s, we will first work to update our wetlands inventory while assessing the status and trends of different dominant types (freshwater tidal, brackish, salt marshes). We will also work to preserve, enhance and restore these critical habitats wherever opportunities arise. Furthermore, we intend to encourage research that will lead to a better understanding of the economic value of tidal marshes.

Lastly, to be proactive in the face of rising sea levels, we plan to extend these efforts landward, into the "wetland buffer" zone within the first few meters above the mean high tide level. Where possible, we will also identify areas that can be set aside to allow for landward migration of wetlands. Through all of these efforts, the Partnership intends to take a leadership role in promoting awareness and understanding about the importance of tidal wetlands as a life and economy-sustaining factor for the region and nation. ■

Three Sisters continued from page 7

annually range from about three kilograms per square meter in Delaware to almost six in some Maine stands.

Human use of these closely related species has varied over time. In many marshes along the coasts, salt-meadow cordgrass was harvested for use as bedding and forage for cattle, mulch for gardens, and pack-

ing material. Although occasionally used as packing material to ship live marine animals in the past, smooth cordgrass is now appreciated primarily for its value in providing "ecosystem services," such as aquatic nutrient removal, oxygen regeneration, sediment stabilization and carbon dioxide reduction. Smooth cordgrass and other cordgrasses also provide

important services for marsh mammals, birds, fish, mollusks, and crustaceans, all of which we appreciate for their aesthetic or gastronomical values.

Spartina marshes are some of the most fruitful natural ecosystems. Given their adaptations to handle stress, high production and three-dimensional architecture, it is no wonder the

three *Spartina* sisters play key roles in the physical, chemical, and biological facets of Delaware Bay wetlands. For more information on *Spartina* research, please visit Jack Gallagher or Denise Seliskar online at www.Ocean.UDel.edu/CMS ■





Partnership for the Delaware Estuary
 One Riverwalk Plaza
 110 S. Poplar Street, Suite 202
 Wilmington, DE 19801

ADDRESS SERVICE REQUESTED

US POSTAGE
 Non-Profit Org
 PAID
 Wilmington, DE
 Permit #1885

Partnership for the Delaware Estuary, Inc.

Kathy Klein, Executive Director
 Tel: (800) 445-4935 ext. 102 / Fax: (302) 655-4991
 E-mail: kklein@delawareestuary.org

Environmental Protection Agency

Irene Purdy, EPA Region II
 Tel: (212) 637-3845 / Fax (212) 637-3889
 E-mail: purdy.irene@epa.gov

Amie Howell, EPA, Region III
 Tel: (215) 814-5722 / Fax: (215) 814-2301
 E-mail: howell.amie@epa.gov

Pennsylvania

Andrew Zemba
 Department of Environmental Protection
 Tel: (717) 772-5633 / Fax: (717) 783-4690
 E-mail: azemba@state.pa.us

Delaware

John Kennel
 Department of Natural Resources and Environmental Control
 Tel: (302) 739-5726 ext. 109 / Fax: (302) 739-3491
 E-mail: john.kennel@state.de.us

New Jersey

Kerry Kirk Pflugh
 Department of Environmental Protection
 Tel: (609) 663-7242 / Fax (609) 777-1282
 E-mail: kerry.pflugh@dep.state.nj.us

Delaware River Basin Commission

Bob Tudor
 Tel: (609) 883-9500 ext. 208 / Fax (609) 883-9522
 E-mail: robert.tudor@drbc.state.nj.us

Philadelphia Water Department

Howard Neukrug
 Tel: (215) 685-6319 / Fax: (215) 685-6207
 E-mail: howard.neukrug@phila.gov

Editor

Shaun Bailey, Marketing and Communications Specialist
 Partnership for the Delaware Estuary

Layout & Design

Janet Andrews, LookSmartCreative

The Estuary News encourages reprinting of its articles in other publications. Estuary News is published quarterly by the Partnership for the Delaware Estuary, Inc., under an assistance agreement (CE-993985-08-0) with the U.S. Environmental Protection Agency (EPA). The purpose of this newsletter is to provide an open, informative dialogue on issues related to the Delaware Estuary Program. The viewpoints expressed here do not necessarily represent the views of the Partnership or EPA, nor does mention of names, commercial products or causes constitute endorsement or recommendation for use. For information about the Delaware Estuary Program, call 1-800-445-4935.

PRINTED ON RECYCLED PAPER

Partnership for the Delaware Estuary:
 a National Estuary Program

The Partnership for the Delaware Estuary, Inc., is a private, nonprofit organization established in 1996. The Partnership leads collaborative and creative efforts to protect and enhance the Delaware Estuary and its tributaries for current and future generations. The Partnership is the home of the Delaware Estuary Program, one of 28 National Estuary Programs. To find out how you can become one of our partners, call the Partnership at 1-800-445-4935 or visit our website at www.DelawareEstuary.org.



Send a Free Gift Subscription

Give a friend a subscription to *Estuary News*

Name _____

Affiliation _____

Address _____

City, State, Zip _____

Telephone _____ E-mail _____

I no longer wish to receive *Estuary News* Send me *Estuary News* via e-mail

Send to: Partnership for the Delaware Estuary
 One Riverwalk Plaza, 110 S. Poplar St., Suite 202, Wilmington, DE 19801

You can also notify us by sending your request to bhaas@delawareestuary.org

