



estuary news

Volume 8 / Issue 1
Summer 1997

Newsletter of the Delaware Estuary Program

Message from the Director

We've spent years *planning* for the protection of the Delaware Estuary. Now we're actually undertaking projects to protect it. The Partnership is working with individuals and groups across the estuary on priority programs that will actively involve a large number of people in education and outreach initiatives. Some of the more extensive projects are outlined below.

The Partnership recently received a \$20,000 grant from the State of New Jersey to partner with the Cumberland Soil Conservation District and the Federal Natural Resources Conservation Service to develop a locally led pilot program in watershed education and coalition building in Cumberland County, NJ (Actions L2 and E4). We will all work closely with the New Jersey Geographic Coalition, the Delaware Bay Schooner Project, the Delaware Bayshore office of The Nature Conservancy, and local governments in Cumberland County on similar watershed education projects in which they are engaged.

The Partnership will be working actively with Pennsylvania's Department of Environmental Protection as the lead for the three states to expand the recently conducted Delaware Estuary Education Institute into an ongoing project for all schools in the region (Action E19). The National Estuary Program is contributing \$25,000 for the project in fiscal year 1998 and the three states will be making significant in-kind and other contributions. The Partnership looks forward to having the Institute become one of the major educational initiatives in the Delaware Estuary Program.

To address chemical usage and household hazardous waste (HHW), EPA Region II's 319 Program provided the Partnership

with a \$20,000 grant to develop a model program for the tri-state watershed, and to conduct local outreach to encourage its implementation. The results of this initiative will be shared with the three states and with various governmental agencies, non-profit organizations, and the general public.

The Partnership, working with the Public Participation Implementation Team (PPIT), has reinstated the minigrant program for estuary-related education and action projects. Using an initial \$30,000 from EPA Regions II and III, we will work during the next several years to enlarge both the scope of the minigrant program and the pot of money that is available to involve more people and organizations in activities that benefit the estuary.

We are celebrating the momentous shift in the Delaware Estuary Program's focus from planning to action with a new layout for the *Estuary News*. In every issue, you can now look forward to finding featured columns that will highlight estuary events, conservation activities, places to visit, and much, much more. By loosening up the presentation a bit will we be able to help you see that "discovering the secrets of the estuary" can be lots of fun.

So lean back and look over this issue. We hope that you will take advantage of the Delaware Estuary during the last few dog days of summer, and all year long for that matter. Please pass the word on to others so that they too can discover the wonders of this remarkable resource located right in our backyard.

Give us a call us at **1-800-445-4935** or e-mail us at partners@udel.edu and let us know about some of the secrets you've discovered.

Kathy Klein, Editor
Estuary News

Finally, we recently went to Silver Spring, Maryland, to discuss partnering with the Wildlife Habitat Council on habitat enhancement projects on commercial and industrial sites. Similarly, we are discussing cooperative agreements with the Fish and Wildlife Service to assist private landowners with wildlife habitat improvement projects. We think developing these and other "public-private partnerships" can help to sustain and improve the estuary.

These are the first of many projects we look forward to conducting with our public and private partners. We believe that they represent a good cross-section of efforts that will protect and enhance the estuary's resources. We will be

updating you on the progress of these initiatives in future issues of *Estuary News* and encourage you to call us if you would like to get involved.

*Bud Watson, Executive Director
Partnership for the Delaware Estuary*

MAKING WAVES

The Pea Patch Isl and Heronry Special Area Management Plan

By Dave Carter and Jennifer Lukens

The Pea Patch Island Heronry, located in the Delaware River between Delaware City, DE, and Fort Mott, NJ, is the largest Atlantic coast heronry north of Florida. This wildlife resource, with nine different species of herons, has national significance due to its size and location. At its peak, from 1989 through 1993, the population was estimated at 12,000 pairs of birds. Concern for the sustainability of the heronry has grown over the past few years because the population of birds on the island has been declining, with present estimates at only 7,000 pairs.

Research conducted during the past four years has shown that nearly half of the chicks born on the island died before they were large enough to leave their nest. These findings indicate that there may be a problem with the long-term viability of the heron population on the island.

To better manage this unique resource, a Special Area Management Plan (SAMP) is being developed with representatives from local, state, and federal government agencies, nonprofit organizations, and business and industry. This is a collaborative effort that is taking a problem-driven, consensus-building approach.

The individuals working on the SAMP have already identified and



Black crowned night heron. Photography by Bill Buchanan.

characterized the factors that may be affecting the heronry and are working to develop strategies to address these problems. In doing so, information has been compiled into a document that details the priority issues. An area of particular concern is the intensive urbanization in southern New Castle County, DE, and the loss of upland habitat and degradation of the wetland habitat downstream.

The draft SAMP is scheduled to be finished in October 1997. Prior to the release of this draft, informational workshops will be held for individual interest groups to solicit their comments. The target date for the completion of the final SAMP is January 1998.

For more information about this initiative, contact Dave Carter or Jennifer Lukens, who are with Delaware DNREC at (302) 739-3451.

ESTUARY EXCURSIONS



The Philadelphia Inquirer/Roger Hassler

VISIT PEA PATCH ISLAND VIA NEW FERRY SERVICE

This spring marked the opening of ferry service between Delaware City, Delaware, Fort Delaware on Pea Patch Island, and Fort Mott, New Jersey. The ferry, called the Delafort, operated by the Delaware River and Bay Authority, has made taking a trip back in time possible for people living on both sides of the river.

All three stops on the Delafort's route have important historical significance. Fort DuPont, located near the Delaware City ferry dock, was a Civil War waterfront fortification and a part of a three-part defense system designed to protect Philadelphia from troops traveling up the river. Fort Delaware was a Civil War prison where thousands of Confederate soldiers were held, many of whom died in captivity. Fort Mott was built later on Pea Patch island in anticipation of the Spanish-American War.

Visitors to the island have the added opportunity to take a walk on the Prison Camp Trail where they can view the island's heronry from an observation platform. From this platform the edges of the colony, where the great blue herons and great egrets live and breed, are visible. Be sure to take along a pair of binoculars so that you can get a close look at these beautiful birds.

The Delafort operates Wednesday through Sunday and on holidays through the end of August. During September the ferry will operate on weekends only. The boat leaves on the hour, every hour, from 10 a.m. until 5 p.m., from Delaware City for the fifteen-minute ride to Pea Patch Island. There are picnic sites located on the island, and beverages and snacks are available at a concession stand. From the island, the ferry sails to Fort Mott, from which it leaves to travel back to Pea Patch Island on the half hour. The fare for the trip is \$6.00 for adults and \$4.00 for children between the ages of 2-12.

For more information, call the Fort Delaware State Park Office at (302) 834-7941.

Estuary Events

UPCOMING IMPORTANT DELAWARE ESTUARY DATES and EVENTS

Harold H. Haskin Fisherman's Forum
Friday, September 19, 1997, 7 pm
Commercial Township Municipal Hall
Port Norris, New Jersey

John Volk, Director of the Connecticut Division of Aquaculture, will talk about the revitalization of the Connecticut oyster industry over the last decade. For more information, call Susan Ford at (609) 785-0074, ext. 105.

7th Annual Delmarva Coastal Cleanup
Saturday, September 20, 1997, 9 am - 1 pm

Residents of the Delmarva Peninsula will join forces again this fall in the seventh annual Delmarva Coastal Cleanup. Sponsored by Delmarva Power and a number of environmental organizations, this event is aimed at removing debris from the shores of the Delaware and Chesapeake Bays, their tributaries, and Atlantic beaches. Cleanups will be held at approximately 60 sites. For more information, call DNREC at (302) 739-4506.

The Port Penn Wetlands Festival
Saturday, September 20, 1997, Noon - 5 pm
Port Penn, Delaware

This festival is a truly unique town fair that celebrates traditional watermen. The festival will feature watermen's crafts, music, and refreshments. For more information, call Lee Jennings, Nature Center Manager, at (302) 836-7254.

South Jersey Sportsmen's Jamboree
Saturday, September 20 & Sunday, September 21, 1997
from 9 am - 5 pm on both days
Millville, New Jersey

All nature lovers are invited to join in the fun at this two-day outdoor heritage event. Activities offered include a free fishing contest for kids, New Jersey State Wild Turkey Calling Contest, an outdoor art exhibit, kayak demonstrations, the Garden State Beer Classic, and much more. For more information, call (609) 692-3041.

Launching of the Kalmar Nyckel
Saturday, September 28, 1997, 8 am - 4 pm
Wilmington, Delaware

Join the Kalmar Nyckel Foundation in the launching of their authentic recreation of the largest colonial ship to bring European settlers from Sweden to the Delaware Valley. The day-long festivities along the Christiana River will include Swedish Folk Dancers, tours of the Kalmar Nyckel and other tall ships, music, crafts, games, and refreshments. For more information, call the Kalmar Nyckel Foundation at (302) 429-7447.

University of Delaware Coast Day
Sunday, October 5, 1997
Lewes, Delaware

This annual festival, one of the largest in the estuary region, is designed to help people learn more about our seas and shores. The day will include tours of ships, hands-on activities, prizes, food, and much more. For more information, call (302) 831-8083.

TRIBUTOUR

Message in a bottle in the fortescue glades

By Susan Jones

Last February, I was working with Ken Lore, Manager of Natural Lands Trust's 5,200 acre Fortescue Glades Wildlife Refuge in Downe Township, Cumberland County, NJ, cleaning up a section of the preserve on the Oranokaen Creek, when we spotted a bottle with a message in it. The first line of the message explained that the rest of message was written using the ARDOIS signaling code.

Using the Delaware County Library Computer System, I was able to locate a book in the Ridley Township Library on signaling codes. The book explained that the ARDOIS signaling code was used a great deal during World War II for ship-to-ship communication.

As it turned out, the message was from a boy in Haddonfield, NJ, who had coded his name and address, along with a request to "please wright back." He had neglected, however, to code date or the place from which he had set the bottle afloat. His parents, who still happen to live at the same address included in the note, helped fill in some of the missing blanks. The bottle was tossed into the Delaware Bay at Thompson's Beach in 1970, about 12 miles from where it was found.

The "boy" is now 37 years old and lives in Connecticut with two sons of his own, who happen to be about the same age their father was when the bottle was released.

In today's world, it's great that kids can use the Internet to connect with other kids in different places - and that it doesn't take 27 years for them to get an answer to their correspondence. What's not great however, is that in today's world the sea level is rising and threatening the existence of both the beach from which the message was sent and the marsh in which the message was found.

Susan Jones is a member and volunteer of the Natural Lands Trust. She is also a member of the DELEP Public Participation Implementation Team.

The Natural Lands Trust, based in Media, Pennsylvania, has a 1.5 mile trail in the Fortescue Glades Wildlife Refuge that leads visitors to a tidal marsh and an observation tower. From this location, there is wonderful bird watching. For more information and directions, call Brenda Engstrand at (610) 353-5587.

Teamwork

Updates from the DELEP Implementation Teams— A Guide to DELEP's Alphabet Soup

Through the two Coordinating Conferences that were held this past January and May, implementation teams have been established and are working to realize the goals set forth in the Management Plan. Below are brief descriptions of the implementation teams and names and phone numbers of contacts to call if you would like to participate.

Monitoring Implementation Team (MIT)

The MIT is made up of experts in the areas of water quality, toxics, living resources, habitat, land use, and mapping of land cover. The MIT is forming subcommittees to work on land use/land cover area mapping and living resource monitoring. In addition, the MIT is developing specific indicators for the Delaware Estuary and has been reviewing national and state efforts in the development of indicators.

Funds from the Delaware Estuary Program have been used by the Delaware River Basin Commission (DRBC) to hire a Monitoring Coordinator to work with the MIT. The Coordinator will publish an annual monitoring report at the beginning of each calendar year that will be designed to be useful to both the general public and the scientific community. For more information, call Jonathan Sharp at (302) 645-4259.

Water Conservation Implementation Team

The Water Conservation Implementation Team is an "Advisory Committee" made up of various agencies, led by staff from the Delaware River Basin Commission. The team's focus will be the implementation of the "reuse of wastewater" recommendation in the CCMP (Action W4). For more information, call Jeff Featherstone at (609) 883-9500.

Regional Information Management Service (RIMS) Implementation Team

The RIMS was designed by the DELEP Data Management Committee to improve the exchange of environmental information across the politically-fragmented Delaware Estuary Region. Serving both data providers and data users, RIMS was intended to build public understanding of the estuary through its use by educators and students.

The RIMS Implementation Team is currently guiding the development of a Web site to replace the telephone-based bulletin board system that was established in 1995. This new Web site, managed by the Delaware River Basin Commission, includes Internet links to actual data at other sites, and allows direct electronic correspondence with DELEP personnel whose E-mail addresses are listed.

Until a domain name is acquired, the Web address for RIMS is <<http://www.state.nj.us/drbc/1rims.htm>>. To get information onto RIMS, call the RIMS Data Manager at (609) 883-9500 ext. 241 (leave a message) or E-mail <rimsmgr@drbc.state.nj.us>. For more information, call Bruce Hargreaves at (610) 758-3683.

Public Participation Implementation Team (PPIT)

The PPIT is coordinated by the Partnership for the Delaware Estuary and is focused on the continued implementation of the DELEP public participation program (Action Item E1). The team

has been working on the redesign of this newsletter, implementation of the minigrant program, selection of a program mascot, and other related outreach efforts. For more information, call Kathy Klein or Bud Watson at 1-800-445-4935.

Water Quality Advisory Committee

This committee is run by DRBC and is working to achieve the fishable/swimmable goals of the Estuary Program (Action W12). The committee is developing a new model that will be used to establish total maximum daily loads (TMDLs) to support full aquatic life and primary contact recreation. For more information, call Paul Webber at (609) 883-9500.

Habitat and Living Resources Implementation Team

The Habitat And Living Resources Implementation Team is led by Wetlands Coordinator, Wendell Scheib, whose position is funded by EPA Region III through an agreement with the New Castle County Conservation District in Newark, Delaware.

This team's vision is to "facilitate a locally supported and driven program that promotes integrity, health, and vitality of the estuary and promotes private/public partnerships to foster a sustainable, biodiverse ecosystem." Through a tri-state, coordinated effort, the team will enhance and coordinate wetlands management in the estuary. In addition, it will be targeting wetlands habitat enhancement opportunities for immediate and future actions. For more information, call Wendell Scheib at (610) 793-3698.

Toxics Advisory Committee (TAC)

The TAC is an implementation team that advises the Delaware River Basin Commission on the Toxic Management Strategy (Action T1) for the estuary. Recent TAC topics of discussion have included the impacts of contaminants on birds of prey and the coordination of fish contamination advisories. The TAC will also provide a forum to discuss issues related to toxics that are not covered by existing regulations. For more information, call Tom Fikslin at (609) 883-9500 ext. 253.

Local Government Resource Teams (LGRT)

The LGRT, a reconstitution of the committee that served in an advisory capacity during the planning phase of the program, will be used to increase outreach to local governments and to provide a mechanism for local government input into program implementation decisions. Each of the three states is planning to develop its own resource team. These three teams will meet jointly for regional discussions and individually to discuss local issues.

Membership on the LGRT will be comprised of municipal and county representatives and individuals representing Conservation Districts. Representatives of federal, state, and regional agencies will serve the teams in an advisory capacity.

For more information, contact: Pennsylvania - Lou Guerra (610) 832-6100; Delaware - William Briery, Jr. (302) 739-5726; and, New Jersey - Liz Rosenblatt (609) 633-1349.

Making Waves

Cooper River Park Riverbank Restoration Project A Collaborative Initiative

By Fred Stine

Cooper River Lake was formed by the draining of the Cooper River. It, and the Park that surrounds it, are owned and maintained by Camden County, New Jersey. Excessive stormwater runoff, persistent wave action, foot-thick ice floes, and large driftwood logs have all contributed to over eight miles of severely eroded riverbank.

Some sections of the riverbank have more than a five-foot vertical drop, making the area an ecological and public safety hazard. In 1993, a group of concerned citizens and government agencies initiated a riverbank restoration project using bioengineering methods of erosion control. This effort has resulted in stabilization of 4,500 linear feet of waterfront and the establishment of a riparian buffer of deep-rooting grasses and shrubs left to grow in a natural setting, ranging from 30 to 100 feet wide.

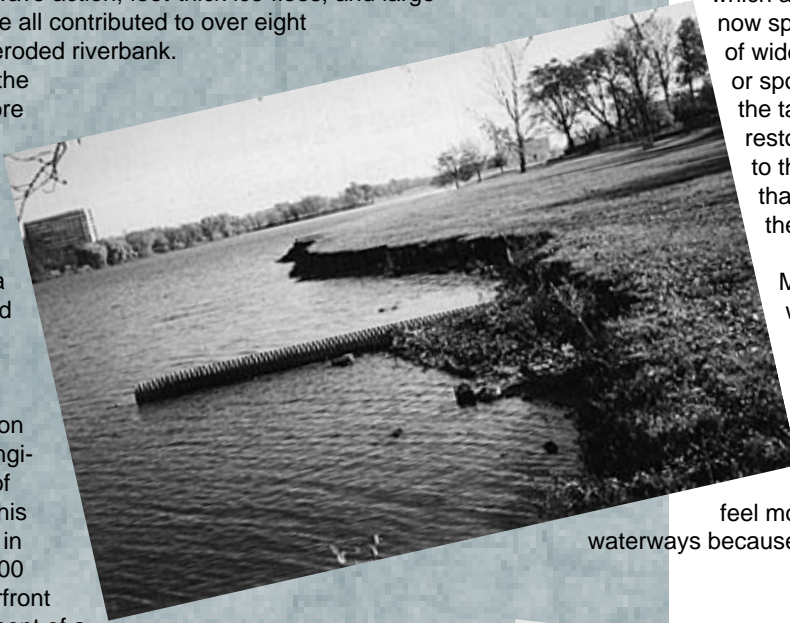
However, the success of the Cooper River restoration project cannot be measured by linear feet alone. The success of the project is, in fact, much wider. First, over the years, this public/private partnership has brought together many national regional and local government agencies, and organizations, and hundreds of citizen volunteers and has addressed several Action Items from the Delaware Estuary's Management Plan. Second, in many ways, we began this initiative by the seat of our pants.

At the outset, our technical experts were themselves just learning what could be accomplished with bioengineering, and what its limitations were. Since that time, the field experience gained through the Cooper River project has been shared with hundreds of students of stream ecology, including agency staff, consultants, and civic organizations. In fact, three other bioengineering projects have sprung up within five miles of the original Cooper site. Third, the Fish & Wildlife funding that was used to help fund the work required Camden County to contractually commit to maintaining the restoration site in a natural state for 25 years. Fourth, raising awareness of the Cooper River's recovery has inspired both PSE&G and Fish & Wildlife to explore installation of fish passages on the first two of the three dams located along the river.

Finally, the restoration site is encouraging local educational and recreational opportunities. Bird and insect watchers, with their field guides in hand, visit the newly-established riparian buffer, which attracts a variety of wildlife. Picnickers can now spread a blanket out in the park without fear of widespread Canada Goose droppings soiling or spoiling their enjoyment (geese tend to avoid the taller vegetation, typical in bioengineering restoration, which obscures their escape route to the water). In fact, the site is so attractive that a couple chose to be married in one of the project's no-mow wildflower meadows.

Most important, for the Cooper River watershed and the greater Delaware River watershed, this restoration project will translate into improved water quality and wildlife habitat, making this area a destination point and no longer a place to avoid. It also has built a constituency of watershed stewards: citizens who

feel more connected and committed to their local waterways because they actively participated in its protection.



Fred Stine is the Citizen Action Coordinator for the Delaware Riverkeeper Network. The Cooper River Park Riverbank Restoration Project was funded, in part, by a grant from the Delaware Estuary Program. For more information, call (215) 369-1188.

*Photographs:
BEFORE (upper left) - Eroded bank of the Cooper River showing the steep vertical drop.
AFTER (lower right) - Restored river bank showing grasses, shrubs and wildflowers planted for long-term stabilization.*

TIDINGS

Fall 1997 DELEP Coordinating Conference is Coming Soon!

The third DELEP Coordinating Conference is scheduled for Wednesday, October 29, 1997 from 8:00 a.m. - 4:00 p.m., at the Clayton Hall Conference Center on the University of Delaware's Newark campus. The theme of this conference is "State of the Estuary."

If you have not previously attended a Coordinating Conference and wish to be added to the mailing list for this event, please call Kathy Klein at 1-800-445-4935. Also, give Kathy a call if you are interested in being a presenter or having information displayed at the conference.

29 Estuary Minigrant Proposals Received

The Partnership for the Delaware Estuary is pleased to report that it received 29 minigrant applications from organizations located up and down the estuary. The specific goal of the 1997 minigrant program is to assist groups in public activities that can advance the implementation of the actions recommended by the Management Plan.

The proposals submitted will be reviewed this summer by members of the Delaware Estuary Program's Public Participation Implementation Team. The projects selected for funding will be announced in September. For more information, call Kathy Klein at 1-800-445-4935.

Tips to Prevent Stormwater Runoff Pollution

The Philadelphia Water Department, through its Stormwater Runoff Pollution Prevention Education Citizen Advisory Council, has developed a set of tip cards to teach people about steps they can take to reduce non-point source pollution. To order a set of the tip cards, call the Philadelphia Water Department at (215) 685-6300.

New Jersey Women's Outdoor Workshop Series

The New Jersey Division of Fish, Game & Wildlife has designed a series of workshops to provide women with the opportunity to learn outdoor skills. For workshop dates and other information, call Laurie Pettigrew at (609) 629-7214.

New Jersey Aquatic WILD Training Workshops

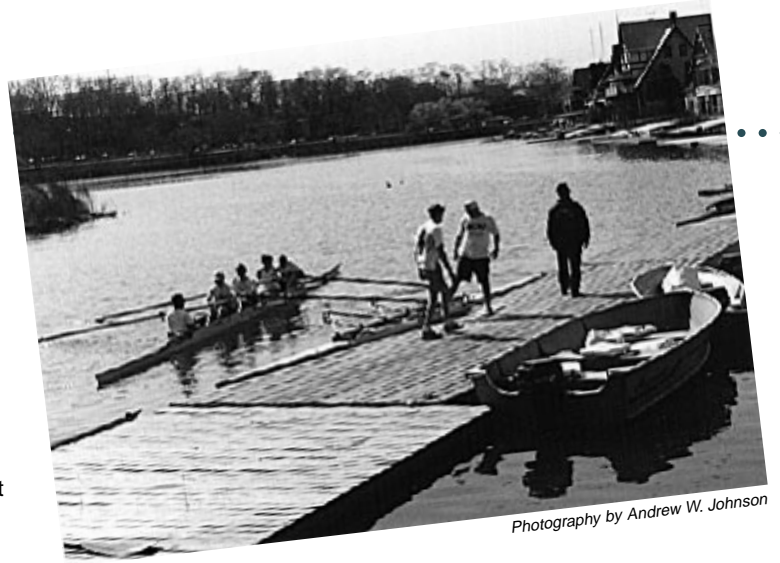
Aquatic WILD, part of Project Wild, is a 40-activity, K-10, interdisciplinary curriculum supplement designed to raise awareness, to instill protective attitudes and to convey information on oceans and coastal and inland waters, and to stress the importance of water in industry and our everyday lives. For information about teacher training workshops, call Larry Sarnier at (609) 748-2031.

Fairmount Park Community Rowing Program

The Schuylkill River Development Council, Philadelphia Fairmount Park Commission, Vesper Boat Club, and Temple University are working together to offer rowing classes for beginner and intermediate scullers. Lessons are being given at the East Park Canoe House, located near the Strawberry Mansion Bridge on Kelly Drive. For more information, call (215) 985-4808.

Friends of the Manayunk Canal Established

A new organization, Friends of the Manayunk Canal, is working to protect, restore, and preserve the natural and historical resources of the Manayunk Canal and Fairmount Park's Towpath. For more information, call (215) 483-9238.



Photography by Andrew W. Johnson

NJN's New Down Jersey Video

NJN TV's new video entitled "Down Jersey," the local name for Salem, Cumberland, and western Cape May counties, explores the environment, history, and culture of people whose lives reflect the Delaware Bay's great wealth of resources. To order a copy of this video and a catalog that describes other NJN videos that explore the Delaware Estuary, call (609) 777-5093.

Wetlands Delineation Manual Now on the World Wide Web

The 1987 Corps of Engineers' Wetlands Delineation Manual is now on the U.S. Army Engineer Waterways Experiment Station's Environmental Laboratory Wetlands homepage. Links are provided to sites containing supplementary information. The report can be read with Adobe Acrobat Reader, which is available free of charge on the Web. The manual can be found at URL <<http://www.wes.army.mil/el/wetlands/wlpubs.html>>. For more information contact Dr. Russell F. Theriot at (601) 634-2733 or at <THERIOR@EX1.WES.ARMY.MIL>.

PSE&G's Estuary Enhancement Program Receives Two Awards

Public Service Electric & Gas Company (PSE&G), New Jersey's oldest and largest power utility serving nearly three quarters of the state's population, received two awards for activities related to its Estuary Enhancement Program (EEP). The first award, from the Edison Electric Institute, was for outstanding contribution and commitment to Electric Utility Resource Stewardship and Land Management. PSE&G also received a New Jersey Historic Preservation Award for its cooperative efforts with the New Jersey Department of Environmental Protection Division of Fish, Game & Wildlife to preserve the cultural landscapes of the Bayside Tract located in historic Greenwich Township in Cumberland County, New Jersey.

The EEP is contributing to the restoration, enhancement and preservation of more than 20,500 acres (32 square miles) of salt marsh and adjacent uplands along the Delaware Bay in New Jersey and Delaware. For more information contact Marcia D. Walton at (609) 339-7915.

T.R.A.I.L. Boss Program -

Volunteers for Estuary Improvement Projects

The T.R.A.I.L. (Teaching Resources And Individual Leadership) Boss National Leadership Program provides high school and college students with the opportunity to earn community service credit. If your organization has a project that it needs completed, such as streambank restoration or trail repair, and can provide supervision to volunteers, call Harry A. Olson at (215) 483-4390.

If you have any information that you would like to have printed in *Estuary News*, please call Kathy Klein at 1-800-445-4935.

SPECIES SPECIFIC

Copepods - Food For The Masses

By Donald E. Sterns

Somebody has to be at the bottom of the food chain. In the Delaware Estuary, it's the copepod. Numerically speaking, copepods clearly dominate the zooplankton population, and if you're a fish or a crab larva in the estuary, you'll be seeing a whole lot of copepods at meal-time.

Copepods are minute crustaceans, with adults being just visible to the unaided human eye. Because they function as primary consumers of phytoplankton, environmental factors that control phytoplankton production will also control copepod production. Copepod production in turn plays a large role in controlling many populations of estuarine spawned fish, and these fish in turn are a key source of food for many wading birds and even some mammals. Clearly, copepods are important.

Although these zooplanktoners are carried by currents, they are not evenly mixed throughout the estuary. Their different tolerances for salinity help determine their zones of abundance. There are six species that are reported to make up the majority of the copepod population, and *Acartia tonsa* is clearly the king. Other species are carried in from the ocean or down from the river and are seasonally significant. These few resident copepod species have evolved unique physiological flexibility that allows them to survive the large environmental variations characteristic of coastal plain estuaries, such as the Delaware Estuary, and cannot be replaced by freshwater or offshore species.

With life spans measured in weeks or months, many of the copepod species have adapted to seasonal changes in abundance by laying resting eggs that accumulate in the shallow sediments during environmentally unfavorable periods, then hatch to start the next generation when favorable conditions reappear. Summer is the most

productive time of the year for the Delaware Estuary and therefore it's not too surprising that this is the season in which copepods are the most abundant and many fish larvae are present, eating and growing.

While copepods are vulnerable to toxic substances in the environment, their high productivity and short life span provide them the opportunity to recover fairly quickly from single, short-term events such as oil spills or an anoxic (a total absence of oxygen) events. Of more concern is reduced productivity resulting from chronic exposure to sublethal levels of organic toxins and metals. The urbanized and industrialized portions of the estuary are relatively more contaminated and, therefore, copepods here are generally more at risk than those downstream.

While no studies have been done in the Delaware Estuary that can track copepod abundances over the long term, numbers seem to be comparable to other east coast estuaries. However, because copepods are so critical to the entire estuarine food-web, their fate should be important to all of us. The habitat requirements that determine copepod survival and production in the Delaware Estuary also determine the survival of the critical larval stages of estuarine dependent fishes.

This article was adapted from a chapter abstract in the Delaware Estuary Program's publication, "Living Resources of the Delaware Estuary." If you would like to read more about birds, fishes, invertebrates, mammals and plants that are key to the Delaware Estuary's ecosystem, look for this award-winning book at your local library, or call 1-800-445-4935 to find out how you can obtain a copy.

Illustration by Liz Minor, Energetics, Inc.

Tidal Tales

Love Letter to My Estuary

Mary Spitzer, 1997

Gentle wooded hillsides
gorged, filled and impacted homeland,
glistening creeks and rivers
winding beneath concrete
overpasses, conduits and pavements
I treasure you.

Forgive my apparent disinterest.
You of marshy coves and unexpected pastures
accept my ardent, flawed, appreciation.

Mary Spitzer is an artist and designer who has had a life-long love of the outdoors. She lives in Philadelphia and is working on a series of essays on the lower estuary.

Fun Facts

- The first official pollution survey of the estuary was done in 1799.
- Over 90% of the estuary meets the fishable/swimmable goals of the Clean Water Act.
- The estuary receives wastewater discharges from 162 industries and municipalities.
- In May and June the shorelines of the lower Delaware Bay host the second largest population of migrating shore birds in North America.
- The Delaware Bay horseshoe crab population is the largest in the world.
- Over 200 species of fish, both resident and migrant, live, feed, or spawn in the Delaware Estuary.



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Estuary News

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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 (X-993483-01-0) 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.

PARTNERSHIP PARTNERS

Thanks and Welcome to the Partnership's Newest Members

The Partnership for the Delaware Estuary sends a sincere thank you and welcome to its newest Founding Partners, listed below. To find out how you can become a member, call Kathy Klein or Bud Watson at 1-800-445-4935.

C. Drew Brown - Philadelphia, PA
David B. Carter - Dover, DE
Sarah W. Cooksey - Dover, DE
John J. Coscia - Philadelphia, PA
Majorie Crofts - Dover, DE
Delaware Association of Conservation Districts - Dover, DE
DNREC Division of Soil and Water - Dover, DE
Delaware Valley Regional Planning Commission - Philadelphia, PA
Ed Grusheski - Philadelphia, PA
Stanley LaBruna - West Deptford, NJ
Mike Laffey - Villas, NJ

Mantua Township Environmental Commission - Mantua, NJ
Richard W. Parker - Mantua, NJ
PSE&G - Newark, NJ
Philadelphia Water Department - Philadelphia, PA
Radnor Middle School "WATERSHED Program" - Wayne, PA
Dariel Rakestraw - Dover, DE
Ed Silcox - Wayne, PA
Township of Lower - Villas, NJ
Vineland Nature Club - Vineland, NJ
Wawa, Inc. - Wawa, PA
Anne Louise Witt - Yardley, PA
Fred Wood - Wawa, PA

