



Pennsylvania Sea Grant Erie Office moves to Tom Ridge Environmental Center



www.behrend.psu.edu/seagrant

The Lake Erie office of Pennsylvania Sea Grant has moved to its new location at the Tom Ridge Environmental Center (TREC) at Presque Isle in Erie. TREC is also home to the Department of Environmental Protection's Office of the Great Lakes, the Regional Science Consortium, Earth Force, the Purple Martin Conservation Association, and the Department of Conservation and Natural Resources administrative offices. The daily interaction of these environmental groups will be beneficial to common efforts and to the people we serve.

TREC is a 65,000 square foot building designed to showcase environmentally-friendly technology that can be used for homes or businesses. For example, rainwater is collected for use in toilet flushing to significantly reduce overall water consumption. Solar panels, pervious parking lots, and bird-friendly windows are

other examples of how the Tom Ridge Environmental Center is putting green construction into practice. The building was designed to achieve a LEED Silver Rating from the U.S. Green Building Council.

The visitor center, which contains exhibit, classroom and laboratory areas, is scheduled to open to the public in the summer of 2006.



The Tom Ridge Environmental Center, Sea Grant's new home. Our new phone number is 814-217-9017 and our new fax is 814-217-9021 (see page 6 for Staff Directory).

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Developing an Invasive Species Management Plan for Pennsylvania

PA Sea Grant helps jump start a state-wide invasive species management planning effort.

Zebra mussels in Lake Erie, flathead catfish in the Delaware River, and purple loosestrife in waterways and wetlands are harming Pennsylvania's ecosystem. The introduction and spread of invasive species threatens the economic and ecological health of the Commonwealth. In fact, invasive species are second only to

habitat loss as a threat to biodiversity nationwide.

According to Executive Order 13112, an invasive species is defined as "a species that is 1) non-native to the ecosystem under consideration and 2) whose introduction causes or is likely to cause economic or environmental harm or harm to human health."

While there are a number of activities occurring throughout the Commonwealth

to prevent the introduction and spread of invasive species, Pennsylvania does not yet have a comprehensive plan to direct these efforts. In order to address this gap, Pennsylvania Sea Grant organized *Setting the Road Map: A Workshop to Begin Developing an Invasive Species Management Plan for Pennsylvania*, held October 26-27, 2005, in State College, Pa.

This workshop was attended by 65 participants representing state and federal agencies, environmental non-profits, and

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Sea Grant Staffers Attend Field Studies in Ichthyology Course



Seining for darters in French Creek.

Anne Danielski, Sean Rafferty and Colleen Wellington of the Lake Erie Sea Grant office had the opportunity to get up close and personal with Pennsylvania fish this

summer when they attended a week-long intensive field course taught by Dr. Jay Stauffer of Penn State's School of Forest Resources. Participants studied native fish in Elk Creek, Walnut Creek, Twentymile Creek, and Presque Isle Bay in the Lake Erie watershed. They also seined for darters and madtoms in French Creek, one of the most diverse creeks in Pennsylvania in terms of fish and mussels.

Students collected fish during the day and at night to prove Dr. Stauffer's assertion that stream fauna is different during the day and at night.

"This type of hands-on course is exactly what I need to keep up my skills for working in the field with students. The most fascinating component of the course was snorkeling in

French Creek, observing the fish and interacting with them in their natural habitat" said Anne Danielski, Pennsylvania Sea Grant education specialist.

The course was offered for credit or for personal enrichment through the Regional Science Consortium at the Tom Ridge Environmental Center. In addition to this course, other upcoming classes include *Restoration Ecology, Field Studies in Ornithology, Phytoplankton, and Plant Propagation*.

For more information on the Regional Science Consortium visit www.RegSciConsort.com or contact Jerry Covert, Consortium Director, at JBCovert1@aol.com.

Landowners Learn to Work with Nature to Protect Bluffs

On Saturday, May 14, 2005, 114 lakefront property owners attended a workshop to provide them with expert information to maintain their bluff property in the face of natural geologic processes such as erosion due to wave action and high winds.

The coastal cliffs overlooking Lake Erie are called bluffs, and can range in height from 5 feet to nearly 200 feet above lake level. The average rate of bluff recession in Pennsylvania is one foot per year. Bluff recession is usually caused by wave undercutting at the base of the bluff, groundwater seepage through the bluff face and surface erosion.

Six regional experts shared their expertise about the geology of Lake Erie bluffs, bluff erosion, and the impact of landscaping and regular property maintenance. The approach was to encourage property



Workshop participants at a field site visit in West Springfield, Pa. The two trees in the center of this photo have since slid over the bluff.

owners to understand and work with nature instead of against it in order to protect their property for future generations.

Speakers included Dan Dahlkemper of Dahlkemper Landscape Architects; Jim Cardman, Fairview Township Zoning Administrator; Bob Wisener of the City of Erie Department of Planning; Ray Buyce, professor of geology at Mercyhurst College; and Mike Campbell and Marlene Cross of Mercyhurst's biology department.

Drs. Cross and Campbell are working on a related project to update a vegetation manual for landowners dealing with vegetative management of bluffs for erosion and recession control. This manual will be available online on the Pennsylvania Sea Grant Web site in spring 2007.

If you are a bluff front property owner and would like to be included in future workshops, contact Marti Martz at mam60@psu.edu.

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commercial industries. Randy Westbrook of the U.S. Geological Survey gave the keynote address, emphasizing the need for increased awareness on the part of individuals.

This event was the first step toward creating a comprehensive plan for invasive species management that: establishes interagency responsibilities; describes coordination among different agencies and

organizations; recommends approaches to funding invasive species work, addresses prevention, early detection, and rapid response; identifies opportunities for control and restoration including research needs; and describes effective outreach and education. The ideas generated during speaker presentations and breakout sessions will be key in steering the Pennsylvania Invasive Species Council (PISC), the umbrella organization charged with developing Pennsyl-

vania's invasive species management plan. The proceedings document from the workshop will be given to PISC for consideration as it begins to develop an invasive species management plan for the Commonwealth. Partial funding for the workshop was provided by the Great Lakes Commission.

For more information contact Sarah Whitney at swhitney@psu.edu.

NEMO is Charging Full Steam Ahead!

The Pennsylvania Lake Erie Nonpoint Education for Municipal Officials (NEMO) program is now in its third year. The program began in 2003 when the Pennsylvania Department of Environmental Protection awarded an Environmental Stewardship and Watershed Protection Growing Greener Grant to Pennsylvania Sea Grant to establish a NEMO program in Pennsylvania's Lake Erie drainage basin.

Pennsylvania Lake Erie NEMO staff offer educational and technical assistance related to nonpoint source pollution that enables land-use decision makers to incorporate nonpoint source pollution prevention practices into their decision-making process. Of particular interest is the reduction of nonpoint source pollution such as sediment, pathogens, nu-

trients, toxic contaminants, and litter as development increases in our watersheds.

NEMO staff has developed working relationships with several municipalities in the Erie region. Assistance has come in the form of educational presentations including *Linking Land Use to Water Quality*, *Smart Growth and Conservation Design*, identifying sources of funding for environmental protection projects and assisting with the application process; and geospatial support.

Currently, NEMO staff is working with townships and developers to promote conservation subdivision design. The goal of conservation design is to preserve open space and protect environmentally sensitive areas such as wetlands, floodplains,

and steep slopes. Given a parcel of land to be developed into a subdivision, conservation design would include protecting environmentally sensitive areas and dedicating 50 percent of the remaining property as open space. Units would be built on the remaining land so that views of open space are maximized. Conservation design does not constitute "a taking of land." Conservation zoning permits the same number of units per parcel as traditional neighborhood design.

For more information about the Pennsylvania Lake Erie NEMO program or conservation design, contact Sean Rafferty at sdr138@psu.edu, or visit the NEMO Web site at www.behrend.psu.edu/seagrant/extension/nemo.html.

Sea Grant Welcomes Marti Martz



Marti Martz

Marti Martz has joined the Lake Erie office staff effective August 1, 2005, as a coastal outreach specialist. Marti worked as a Sea Grant student intern at the Erie office while pursuing her undergraduate degree in Environmental Studies at Edinboro University

of Pennsylvania. Marti is a Pennsylvania Master Gardener and worked as an intern for Presque Isle State Park where she helped develop and implement an invasive plant control program for the park.

As coastal outreach specialist, Marti will take on a number of tasks that include serving as part-time communicator, acting as a liaison between Sea Grant and the Regional Science Consortium at the Tom Ridge Environmental Center, assisting DCNR staff on projects such as aquaponics

and the natural history collections at Tom Ridge Environmental Center, and working with Mercyhurst College staff on the publication of a suggested plant manual for revegetation of bluff front property (see Bluff article, previous page). She will also assist with coordination and facilitation of the Great Lakes Center for Science Education Excellence (COSEE) project. Marti can be reached at mam60@psu.edu.

Pennsylvania Seaway Trail Now a National Scenic Byway



On September 22, 2005 the Federal Highway Administration designated the Pennsylvania Seaway Trail as a National Scenic Byway at a ceremony in Washington, D.C.

The Erie Area Convention and Visitors Bureau, Erie County government, Pennsylvania Sea Grant, and a group of 20 stakeholders worked with PennDOT to attain this national designation. Attractions along the Pennsylvania portion of the trail include Presque Isle State Park, the Tom Ridge Environmental Center, Erie Bluffs State Park, the Port of Erie on Presque Isle Bay, the U.S. Brig Niagara and Erie Maritime Museum, Lake Erie wineries and grape growing region and the North East Borough historic district.

34 Acres Along Bluffs Preserved

In other land conservation news, Pennsylvania Sea Grant is pleased to announce the protection of a 34-acre tract along the Lake Erie shoreline.

This acreage is particularly valuable because of its quarter-mile Lake Erie frontage. It contains valuable habitat in its unique two-tiered bluff system. The property also is the site of approximately 30 gravesites dating back to the early nineteenth century.

The property remains in the hands of the owners but will be protected from future development through the use of conservation easements. It will be open to the public twice a year for guided tours. Pennsylvania Sea Grant partnered with the Lake Erie Region Conservancy (LERC) to work with these local landowners and achieve this success.

For more information on these or other land use issues contact Dave Skellie at dus18@psu.edu.

Current Sea Grant Student Research Projects

Why Have Young-of-Year Brown Bullhead Catfish Populations Dropped?

Colleen Wellington, an Allegheny College student, is interested in finding why the population of brown bullhead catfish (*Ictalurus nebulosus*) in Presque Isle Bay has dropped since the 1970s. One census based on commercial harvest estimated there were 240,000 bullheads in Presque Isle Bay in 1979; however, researchers conducting a tagging study estimated the population as approximately 31,000 in 1999.

During the summer of 2005, Colleen used a combination of trapping, seining, dip



Brown bullheads in their temporary home.

netting, electro shocking, and visual observation to locate young-of-year bullheads in Presque Isle Bay and two Lake Erie tributaries, Sixteenmile Creek and Elk Creek. She found very few young-of-year brown bullheads in Presque Isle Bay while Sixteenmile

Creek and Elk Creek produced much higher densities.

Colleen is now analyzing these numbers to determine whether possible production of sterile hybrid offspring may have caused the drop in catfish populations in Presque Isle Bay. She is also interested in investigating other possible causes which might affect reproduction rates such as contaminated sediments, or predation by round gobies. Colleen's study may shed light on these questions.

Is there Hybridization Between Brown, Black and Yellow Bullhead Catfish in Presque Isle Bay?

Some bullheads from Presque Isle Bay look a little different from other bullheads in Lake Erie. Could they be black and brown or yellow and brown bullhead hybrids? John Cingolani, a master's candidate from Penn State University's School of Forest Resources, is investigating this question through genetic and morphological (body character) study.

Three species of bullheads, brown, black

and yellow, were once found in Presque Isle Bay, however, black bullheads have not been observed since the 1930's. Brown and black bullheads are known to hybridize in the western portions of Lake Erie and so it may be possible that brown bullheads in Presque Isle Bay have some genetic inheritance from black bullheads.

Genetic information on the bullheads that currently inhabit the bay will allow researchers to determine if hybrids are present and if bullheads from Presque Isle Bay are different in their genetic or morpho-

logical composition from bullheads in other portions of Lake Erie.

John collected 30 fish from each of six Lake Erie sites: three sites in Presque Isle Bay, one in Ohio, one in New York and one at Long Point, Ontario, Canada. If hybrids are found, physical measurements of these fish will be used to determine visual differences between hybrids, yellow and brown bullheads. In the future, John plans to compare Lake Erie populations to those from inland waterways.

Can Finding the Size of the Banded Killifish Home Range Help Locate Contamination Hotspots?

Rory Hanczar, a senior at Penn State Behrend, spent much of his summer studying the movement of banded killifish (*Fundulus diaphanous*) in Presque Isle Bay. Rory's study was to determine if killifish move freely around the waters of Presque Isle Bay or if they prefer to stay in a localized area of one acre or less. If killifish have small home ranges, they may be an ideal bioindicator of contaminated hotspots in Presque Isle Bay sediment.

Previous studies have found that some species of killifish exhibit asymmetrical banding on their sides or develop tumors when exposed to certain toxins. If the exposure of

killifish to polluted waterways is reflected in abnormal banding patterns, then the fish may be used as a tool to identify contamination hotspots.

To determine the size of the home range, Rory collected and marked the killifish with three different fluorescent dyes, one for each sampling location. After releasing the fish and recapturing them, he was able to track their movements. All of the recaptured killifish in Rory's study were collected within 30 yards of the original capture site indicating that they have a small home range.

Future studies that include histology of killifish are needed to investigate the suitability of *F. diaphanous* as a bioindicator for contamination hotspots.

"Our Sea Grant interns have demonstrated a capacity to conduct high-quality applied research projects on Presque Isle Bay" - Eric Obert, Extension Director.



Killifish are sprayed with fluorescent dye to mark their original location before release and recapture.

The Delaware River 'Airshed': Pollution Traveling on the Wind

Just when you were getting comfortable with the term 'watershed'...

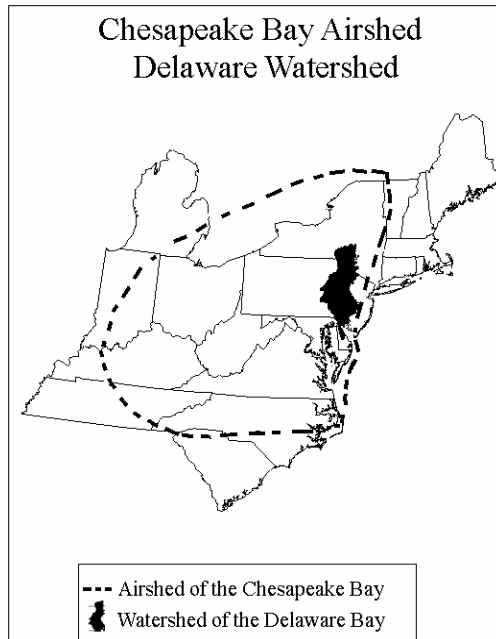
What do the activities of a power plant in Ohio, a dairy farm in Pennsylvania, and an automobile in Washington D.C. all have in common? These seemingly unrelated places and actions could have an impact on the Delaware River *airshed*.

Since the movement of airborne materials is strongly influenced by weather patterns, the Delaware River airshed is defined as the geographic area that contributes most of the air-transported material (air pollution) that are deposited in the river.

Like watersheds, airsheds transcend political boundaries, but unlike watersheds, airshed shapes and sizes depend on the strength and direction of the prevailing winds. As a result, airsheds have no sharp boundaries and are usually many times larger than their corresponding watersheds. So air pollution originating from Ohio, western Pennsylvania, or Washington D.C. can easily travel to the Delaware River watershed in a day or two. Who would have guessed that the environmental integrity of the Delaware Estuary is influenced by regional activities outside the watershed's boundaries and all the Estuary's elements—the air, the land and the water—are intimately connected?

Scientists refer to the process by which airborne materials are transported and dispersed as *atmospheric deposition*. Atmospheric deposition may be wet, in the form of rain or snow; or dry, as when gases or particles directly contact a water body. Most of the atmospheric transport in the Delaware Watershed is wet, occurring along with precipitation. Since the prevailing winds and storms in the Delaware Valley typically come from the southwest, most of the airborne pollutants deposited in the Delaware Estuary come from this direction as well.

Polluting atmospheric depositions may be categorized as acidic, nutrient, or toxic. Most of the acid deposition in the mid-Atlantic region starts as sulfur dioxide gas from the burning of fossil fuels, but quickly changes to sulfuric acid rain when mixed with water, creating acid rain. Nutrient deposition includes nitrogen



The dotted line is an approximate boundary of the Chesapeake Bay airshed, which includes the source of most of the material that is transported by the atmosphere to the Chesapeake Bay. So what is the boundary of the Delaware River airshed? Nobody knows for sure; the formal Delaware Bay airshed boundary has not yet been determined, but it probably overlaps substantially with the Chesapeake airshed. (Figure adapted from an illustration developed by EPA modeler Robin Dennis.)

compounds, such as oxides of nitrogen and ammonia, which can significantly influence water quality. Toxic deposition is often divided into heavy metals, such as mercury, and organic materials, such as PCBs (polychlorinated biphenyls).

In a recent Penn State study of 85 Pennsylvania watersheds, atmospheric deposition accounted for about 48 percent of the nitrogen in Pennsylvania waterways. Atmospheric deposition arising from agriculture, industry, and urban areas contributes most of the nitrogen load in the Commonwealth's waters. Thirty-seven percent of the atmospheric deposition in Pennsylvania comes from agriculture, and 63 percent originates from industrial and urban areas. "Nitrogen in synthetic fertilizers and manure can rise as a gas, then come back down," says Barry

Evans, senior research associate at Penn State's Environmental Resources Research Institute. "Also, a lot of the nitrogen that rises from the combustion of fossil fuels, such as coal and oil, comes back down as wet or particulate matter." As it travels over farmland, ammonia from farmland adds to the nutrients. Additional nitrogen compounds that land in the Delaware River come from automobile exhaust. The Clean Air Act had the positive effect of reducing acidic sulfur emissions and acid rain, however, nitrogen deposition has remained relatively constant during the same time period.

Few states produce higher utility emissions than Pennsylvania. Mercury gas is released when coal is burned for power. When emitted from power plants the gaseous mercury eventually falls to the ground, and into our waterways, where it can end up in the tissue of fish. This is one reason why the Commonwealth recommends eating no more than an average of eight ounces per week of recreationally caught fish in Pennsylvania.

PCBs are also air transported into the Delaware Estuary. Some PCB compounds tend to accumulate in fish and large tissue concentrations can increase the risk of human nerve damage and cancer. While traces of PCBs have been detected at local air monitoring stations, the Delaware River Basin Commission estimates that atmospheric deposition accounts for less than three percent of the total input to the Delaware Estuary. More study is needed to find out how much of this PCB input is terrestrial and how much arrives in the Delaware Estuary via air.

For more information and suggestions on how to reduce your contribution to airshed pollution, contact Ann Faulds at afaulds@psu.edu, or visit one of the following Web sites:

NOAA Air Resources Laboratory
www.arl.noaa.gov/research/projects/radml.html

EPA
www.epa.gov/airmarkets/cmap/mapgallery/mg_webnitrates.html

The Pennsylvania State University
<http://aginfo.psu.edu/PSA/s99/where.html>

Presque Isle Bay: An Area Of Concern in Recovery



Rich Neville of PA DEP, and Sean Rafferty of PA Sea Grant, collect samples of Presque Isle Bay sediment.

Pennsylvania Sea Grant and the Pennsylvania DEP are continuing to study Presque Isle Bay sediment. In September 2005 the EPA research vessel, *Mudpuppy*, and Gannon University's research vessel, *Environaut*, spent a week collecting sediment cores in Presque Isle Bay, Lake Erie. The *Mudpuppy*, a 32' flat-bottom boat, is

equipped to core sediment in shallow rivers and harbors. It has performed sediment sampling at 27 of the 43 Great Lakes Areas of Concern (AOC). Presque Isle Bay is an AOC in Recovery, identified as the Great Lakes' 43rd Area of Concern in 1991 and then attaining a recovery designation in 2002.

Of the 26 American AOCs, 15 have identified restrictions on dredging as a beneficial-use impairment. The Presque Isle Bay AOC is one of these. Pennsylvania Sea Grant's goal is to generate model sediment im-

pairment standards that can be used in other AOCs as they work toward delisting. In order to attain this goal Sea Grant has formed a Sediment Advisory Group; compiled and evaluated existing sediment data; is attempting to evaluate current sediment quality conditions in the AOC; and in due course, will establish delisting

criteria for the Presque Isle Bay AOC.

The *Mudpuppy* collected sediment cores and the *Environaut* collected grab samples from 15 locations in Presque Isle Bay. This material was taken to the labs at the Tom Ridge Environmental Center at Presque Isle. Here the samples were prepared, packaged and shipped to laboratories at Severn Trent, EPA, and USGS. These samples will be analyzed to determine deposition rates, total organic carbon, PAHs, metals, and grain size. Some will be bias samples, which continue to gather data from areas previously sampled, and others are random samples. Sediment samples were also collected from the mouth of Cascade Creek, Mill Creek and Scott Run, the three tributaries which feed directly into the bay.

Results of these analyses will be made available to regulators, scientists, stakeholders, and the informed public in order to support a variety of environmental decisions. Representatives of other AOCs will be invited to workshops to solicit their input on sediment monitoring programs and delisting criteria.

For more information contact Eric Obert at eco1@psu.edu.

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