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Keystone WILD! Notes

FALL 2009
Inside the issue:

The WRCP board and staff and what we do ... 2

WRCPeople: Meet John Rawlins ... 3

A Word from the Wild!: Citizen scientists and climate change ... 4

WILD!Watch: Eyes of the night ... 5

Pa.'s first Private Wild Plant Sanctuary ... 7

Across the Atlantic, some conservation issues remain the same ... 10

Researching red-bellied turtles ... 11

NEW FEATURE! Our Changing Climate ... 14

Youghiogheny River scour: An unusual place for unlikely plants ... 15

Weed It & Reap: Wavyleaf basketgrass ... 18

Wild! for Kids: Unscramble the wildflowers of fall ... 19

Wild! for Kids: Autumn word search ... 20

Wild!Buys ... 21

Barbara Grace, daughter of the owners of Pa.'s first Private Wild Plant Sanctuary, took this photo of moss and autumn leaves on the property.

PENNSYLVANIA WILD RESOURCE CONSERVATION PROGRAM

WRCP / Keystone WILD!Notes

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LINDA STEINER, Editor

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WRCPeople

JOHN E. RAWLINS, Ph.D.

Wild Resource Conservation Program Advisory Committee

Raised on a sheep ranch in eastern Oregon, I studied vertebrate zoology, cell biology and statistics as an undergraduate at Oregon State University, and then insect systematics at Cornell University, as the last doctoral student of the late Professor John G. Franclemont.

After receiving a doctorate at Cornell, I was an Assistant Professor of Zoology at the University of Texas - Austin for several years, before moving to the Carnegie Museum of Natural History in Pittsburgh as the curator in charge of the Section of Invertebrate Zoology *(www.carnegiemnh.org)*.

My research interests emphasize the morphology and phylogeny of Lepidoptera (moths and butterflies), with special emphasis on the immature stages of moths. I have a strong interest in biotic inventory and the use of insects (especially moths) as indicator systems for habitat conservation and resource management.

I am interested in topics integrating technology with insects and their kin (e.g., using zoological structures and functions as biomodels in robotics). Some of my recent projects include a National Science Foundation-sponsored biotic inventory of invertebrates and plants on Hispaniola; assisting a National Science Foundation-sponsored inventory of butterflies in Ghana; Army Research Office work on snake robots; studies on phylogeny of world cutworm moths and their relatives; a federally funded State Wildlife Project for Invertebrate Species of Special Concern in Pennsylvania; and collaborative work on Neotropical ghost moths.

At the Carnegie Museum of Natural History, I administer the Section of Invertebrate Zoology and curate its rapidly growing Lepidoptera collection, with global strength in every lineage of moths and butterflies, especially Afrotropical, Caribbean and Neotropical. I conceived and founded the museum's Biodiversity Services Facility. This facility provides services to research programs addressing issues related to biodiversity, as well as providing large-volume identification work for federal and state agencies concerned with discovering and managing invasive species.

I've been an active volunteer advisor to biodiversity-related efforts in Pennsylvania for many years: Pennsylvania Wild Resource Conservation Program Advisory Committee (2004 to present); Pennsylvania Natural Heritage Program Advisory Committee (2002-2005); Pennsylvania Biological Survey in diverse roles (1988 to present); and Three Rivers Ecological Research Center Advisory Committee, Pennsylvania Fish and Boat Commission (2009).

I live in Greene County in a log cabin I named "Moth Ridge," but I spend most of my time in Pittsburgh, working in the vast insect collection of the Carnegie Museum of Natural History. I enjoy outdoor activities if "bugs" are involved, as well as photography, reading and exploring. I'm a news junkie who actively follows political and social issues in the media.

Having the good fortune to be born and raised near wilderness areas in the mountains of eastern Oregon, I have a strong appreciation for and understanding of natural ecosystems worldwide. As an enthusiastic nature lover and a professional insect specialist, I'm acutely aware of the details of biodiversity, its importance, and the critical necessity for protecting natural systems for our future. I've interacted with the WRCP staff over many years, and my colleagues and I at Carnegie Museum have received funding from WRCP for research on several projects.

It was entirely natural for the WRCP staff to invite me to join the WRCP Advisory Committee in fall 2004, and I'm now near the end of my second term with that advisory group. For the entire life of the program, the WRCP has been a remarkable asset for Pennsylvania; it has accomplished a great deal for the sake of our native fauna and flora, and we must all work hard to be sure it keeps on doing just that.

Photo by Jamie Hill III

Dr. John Rawlins, above, says: "This is where I spend most of my time. Being in a natural history collection can be somewhat 'outdoors indoors,' if you understand what I mean."

A Word From the WILD!

by Greg Czarnecki

Citizen Scientists and Climate Change

Most of the stories you read in *Keystone Wild!Notes* are focused on research and conservation work done by professional scientists helping us understand and conserve Pennsylvania's native species and habitats. As important as their work is, it's not enough. There aren't enough scientists or enough funding to do all of the research that is needed.

The need for more research is especially important now, because we need to monitor the impacts that climate change is having on our natural systems. Detecting shifts in migration patterns, population size and distribution, and the timing of natural cycles will be critical if we are to help our species and habitats adjust to these new conditions.

That's where the citizen scientist comes in. There are many monitoring projects that rely on local observations collected by people like you. Here are just a few:

USA National Phenology Network *(www.usanpn.org)* collects information on the timing of plant life-cycle events, such as leaf emergence, flowering and fruit development. They are looking for volunteers to monitor 200 different plant species.

Project BudBurst *(http://www.windows.ucar.edu/citizen_science/budburst)* uses citizen scientists to collect observations of plant life cycles to learn how plant species are responding to climatic changes.

Frogwatch USA *(www.nwf.org/frogwatchusa)* has participants monitor frog and toad species at their local wetland or pond during the breeding season.

North American Bird Phenology Program *(www.pwrc.usgs.gov/bpp/index.cfm)* contains nearly all of the bird migration data collected from the late 19th century up until the Second World War. All of this information is contained on note cards that have been scanned, but until it is entered into a database, it can't be analyzed. They're looking for volunteers to enter the data from their home computers so that it can be used to compare historical trends with current migration patterns and timing.

Journey North *(www.learner.org/jnorth)* is a global study of wildlife migration and seasonal changes, designed specifically for students. Students and school groups enter their local observations, which are then incorporated into a global database. Students can track the migration of animals ranging from monarch butterflies to gray whales.

You don't need any formal scientific training to contribute to these projects; they provide all the training you need. So if you've ever wanted to participate in a scientific study or put your powers of observation and love of nature to good use, here's your chance -- become a citizen scientist.

Columnist GREG CZARNECKI is the Executive Director of WRCP

SPEND SOME TIME IN COSMO'S WORLD!

Join Cosmo the flying squirrel and Terra the river otter as they explore the natural world around us. Learn about our changing climate, invasive species and more! See them at *www.dcnr.state.pa.us/wrcp* and on YouTube.

WILD! Watch

by Heidi Mullendore

Photo by Bob Steiner

I shivered as the cool night air swirled in through the windows of the car. The warm autumn days were ending in chilly nights, and frost was transforming green fields into the muted browns and golds of autumn.

I was driving home along a lonely country road, my mind on the day's events. Suddenly, several brown shapes stepped from the foliage. My headlights caught the yellow-green eyeshine of deer, as they fed by the side of the road. I slowed the car to a crawl, as a doe and her fawns picked their way carefully across the road, their eyes glowing eerily in the headlights.

Late summer and early fall, with its abundance of food and cover, is a busy time for many hunters across the state. They start scouting for the upcoming seasons. Their camouflage clothing comes out of storage, along with their hunting equipment and spotlights. The gist of the sacred sport (never call it a hobby!) of scouting by spotlighting is to pile into the truck on a chilly autumn night and drive around to search for deer, using a powerful spotlight.

Even if you've never been spotlighting, you've probably experienced the heart-stopping moment of coming around a curve at night and your headlights startling some deer crossing the road. The yellow-green eyeshine of deer after dark is familiar to most Pennsylvanians. Seeing eyes glowing in the dark sparks many emotions, but as spooky and mysterious as eyeshine may seem, the science behind the shine provides us with some interesting insights into the nocturnal world.

Our eyes contain specialized light-receptors, called rods and cones. Cones allow us to see color and sharp detail. Cones function well in the bright light of daytime, the reason that humans are diurnal, or daytime, animals. Rods, on the other hand, function well in dim light conditions and aid in light gathering and seeing motion. As evening descends and the amount of light available diminishes, the color vision that humans enjoy during the day recedes and we see things only in black, white and shades of gray.

Nocturnal animals have many times more rods than cones, and thus do not have color vision. After sundown, deer and many other animals have a distinct advantage in low-light conditions, as the moon and stars provide enough light to allow nocturnal animals to navigate with ease.

The doe in front of my car lowered her head and stomped her foot. Her eyes glowed eerily in the headlights. With a quick snort, she and the fawns abruptly leapt off the road and into the trees. For a few seconds, I could hear them running through the woods in the blackness. Trying to coax my heartbeat back to normal, I drove on carefully, looking for the telltale eyeshine of various night critters that can make after-dark driving on back roads an obstacle course.

(continued on page 6)

Caught in the camera's flash, a night-roaming raccoon shows it can be a predator, because both its eyes shine at the same time. Raccoons, like most predators, have binocular vision. Prey animals' eyes are located at the sides of their head, so they generally show single-eye eyeshine.

Photo by Bob Steiner

Photo by Bob Steiner

The camera's flash shows a white-tailed deer's characteristic green-yellow eyeshine. The shine is due to a reflective membrane at the back of the eye, which helps nocturnal animals see better after dark.

EYES OF THE NIGHT, from page 5

Why do some animals exhibit the spectral glow of eyeshine and some do not? It all has to do with a special, mirrorlike membrane at the back of the eye, called the *tapetum lucidum,* meaning "bright tapestry." Animals with a tapetum make more use of light. As light enters the eye, it passes through the retina and is reflected from the tapetum, sending the light back through the retina. This provides the eye with twice the light as would be available normally. Many animals that move about in low-light conditions have this layer of cells to enhance their vision, allowing them to function quite well in the dark.

Around another bend in the road, my headlights revealed two gleaming orbs -- the yellowish eyeshine of a foraging predator. A raccoon was my guess. Even though its body was half hidden in the roadside weeds, the pair of reflected lights revealed the animal to be a predator, with its binocular stare.

Many prey species, such as rabbits, have eyes placed more to the sides of their head, and thus can only show one glowing eye at a time. The challenge of identifying animals by their eyeshine is a fun pastime during nighttime drives through the country. Be sure to learn and follow the rules about spotlighting, on the Pennsylvania Game Commission's web site *(www.pgc.state.pa.us)*.

Spotlighting will point out animals that have a tapetum. The eyes of foxes, opossums, bear and owls show red eyeshine; bobcats and deer usually exhibit a greenish shine; bullfrogs also show green and skunks show amber. "By their eyes ye shall know them" -- although not everyone agrees on the color for each species.

Scientists still do not know why some nocturnal animals have a tapetum and some do not. Interestingly enough, the bat, that classic nocturnal hunter, does not have a tapetum. To further complicate the issue, there are several types of tapetum.

You might think humans have a tapetum that produces eyeshine, as evidence shows in the common "red-eye" effect in camera-flashed family photos. Sadly, we do not. This ghoulish red effect is actually a reflection of the many blood vessels in our eyes, since our pupils do not have time to contract against a bright burst of light.

Still, we humans have a greater capacity for seeing at night than most of us realize. Try going out to a dark forest or field and sitting for a half hour or more without using artificial light. Even on a moonless night, our eyes develop night vision. A chemical called rhodopsin -- otherwise known as visual purple -- allows us to better see in the dark. Light breaks down this chemical, but with time in the dark, 80 percent of our night vision is recovered in 30 to 45 minutes. And thanks to the rods in our eyes, motion is easy to detect in these low-light conditions.

A simple flashlight is a great tool for spotting eyeshine during an evening stroll. Hold the light to your forehead and look down the beam of light, not into it. Take note of the color of the animal eyeshine you observe. See if you can tell if the animal is lower on the food chain because it has singular eyeshine, or if it is higher up because it has the binocular eyeshine of a predator.

Whether you decide to spotlight nighttime wildlife or allow your own night vision to guide you through the evening, many great discoveries await the nocturnal naturalist. Illuminate and expand your knowledge of natural history while searching for eyeshine, watching the movement of nocturnal animals, or just enjoying the thrill of walking through a starlit forest. It's an experience you won't soon forget.

Photo by Heidi Mullendore

The camera flashes and a northern saw-whet owl reveals its red eyeshine during an eye-color comparison test that indicates the bird's health. To see eyeshine on night-roaming wildlife, use a spotlight or flashlight, but know the law. According to the Pennsylvania Game Commission, recreational spotlighting can be done legally until 11 p.m., except during certain hunting seasons. Do not shine the light on buildings or farm animals. For more details, visit *www.pgc.state.pa.us* or contact the Pennsylvania Game Commission office in your area.

WILD!WATCH columnist HEIDI MULLENDORE is the Environmental Education Specialist at Canoe Creek State Park

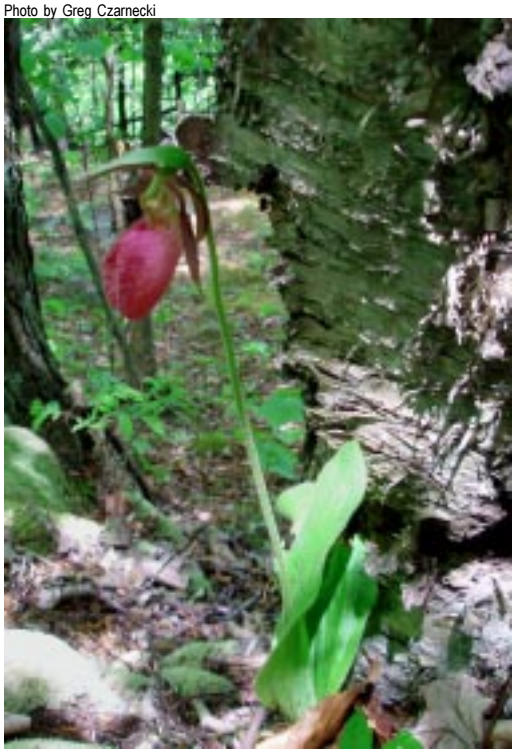
Celebrating Pennsylvania's First

Barbara and Mike Yavorosky's 7.6-acre property, along Panther Creek on the border of Lackawanna and Wayne counties, is special, but not just to them. Earlier this year, the property became Pennsylvania's first officially designated Private Wild Plant Sanctuary and that makes it special to everyone.

The designation was announced on June 17 by John Quigley, Acting Secretary of the Pennsylvania Department of Conservation and Natural Resources (DCNR), and a dedication ceremony was held at the site on June 19. It was the culmination of three years of work and interest in having the site designated says Mike Yavorosky, which began when he became aware of Pennsylvania's Private Wild Plant Sanctuary Program and applied to DCNR.

The foundation for the program was laid in 1983, when the Wild Resource Conservation Act was passed. This established not only the Wild Resource Conservation Program, but also provided the authority for the conservation of Pennsylvania's native wild plants.

Photo by Greg Czarnecki



A pink lady's-slipper blooms in the Panther Creek Valley.

To implement the law, DCNR adopted regulations that established a plant classification system; created permit and license procedures; established restrictions regarding threatened, endangered and vulnerable plants; and provided for the designation of sites as wild plant sanctuaries.

In 1995, DCNR's Bureau of Forestry published "a blueprint for the management of our forest resources" called "Penn's Woods: Sustaining Our Forests." In the document, the agency committed to, among other things, establishing a system of publicly and privately owned wild plant sanctuaries. Since then, more than 50 public wild plant sanctuaries have been established in State Forests.

To establish the Private Wild Plant Sanctuary Program,

Photo by Barbara Grace

View upstream from the lower part of Panther Creek. The valley, its waterfalls, woods and wildflowers are accessible to the public from the O&W Rail-Trail, about 1 mile north of Simpson.

DCNR's Office of Conservation Science, under the leadership of Pat Pingel, organized a team of botanists to develop criteria for the sanctuaries. The Yavoroskys heard about the program and were the first to apply and have their land designated as a sanctuary.

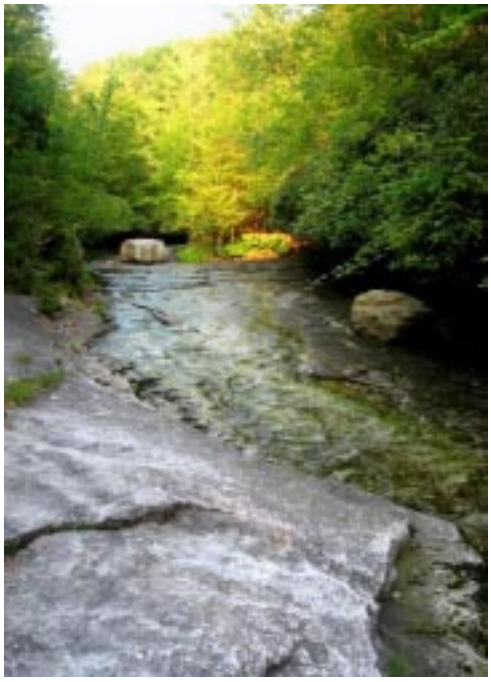
The valley and stream on the Yavorosky property have been traditionally open to the public to enjoy, says Mike, and he plans to keep it that way. "The people of the community use it, for picking berries and swimming and all that," he explains. People also hike in to the series of waterfalls, one of which, says Mike, is "at least 80 feet high." The stream's headwaters are on Moosic Mountain and the elevation changes quickly and dramatically.

But it's not waterfalls that have led to this property, which extends 50 feet from either side of the stream for more than a mile up mountain, receiving the sanctuary designation; it's the unique and undisturbed plant community. The scenic stream gorge and surroundings contain a rhododendron-hemlock plant community and heath-birch barrens. The property has rocky outcrops with seeps and small, scattered wetlands. Some of the notable plant species include trilliums

(continued on page 8)

Wild Plant Sanctuary, from page 7

Above and right, photos by Barbara Grace; below, photo by Greg Czarnecki.



Above, mountain laurel blooms at the Panther Creek Private Wild Plant Sanctuary; and a stream view looking up from the big pool. Botanists have documented a healthy and diverse native plant community on the property, and the sanctuary has been noted with the Pennsylvania Natural Heritage Program as a site of local conservation significance.

and lady's-slippers. There are no invasive species, which makes this an intact native plant ecosystem.

Why protect wild plants that are not on public property? Most of Pennsylvania's threatened and endangered plants (and animals) occur on private lands. If those lands remain unprotected, they may be at risk of being developed, impacted by pollution or climate change, or even disappearing entirely as viable habitat.

The Private Wild Plant Sanctuary Program formally commends private landowners for conserving such native plant species and/or native plant communities. By encouraging the conservation of natural areas and native plants on private lands, DCNR can expand its role as stewards of the Commonwealth's natural resources and raise awareness about Pennsylvania's special places and plants.

Chris Firestone, DCNR's Wild Plant Program Manager, says, "By bringing

At the Private Wild Plant Sanctuary dedication ceremony, June 19, 2009, the owners' daughter, Barbara Grace, snapped this photo of family and attendees. From left to right, Lynn Conrad (NEPA Rail-Trail Council); Luke Yavorosky (owners' grandson); S. Robert Powell (Carbondale Museum and Historical Society); Michael Grace (owners' grandson); Barbara Yavorosky (owner); Scott Linde (Linde Corp.); Michael Yavorosky (owner); Pat Pingel (DCNR); Sally Just (DNCR); Jessica Sprajcar (DCNR); Ellen Shultzabarger (DCNR); and Greg Podniesinski (DCNR).

information on plant species of special concern to the landowner and helping them manage the property, we're helping to sustain our biodiversity. This is part of engaging property owners and making them aware of Pennsylvania's biodiversity and the importance of biodiversity. These plants are part of the larger ecosystem."

Landowners are recognized for their interest in native plants and plant communities with a plaque they can display. Enrolling in the program does not impact the landowner's private property rights. They do not have to allow public access, and can withdraw from the program at any time.

Would Mike Yavorosky encourage other landowners of special properties to enroll? "I'm very happy my property has been accepted into the Private Wild Plant Sanctuary Program," says Mike Yavorosky. "I think it gives recognition to people

(continued on page 9)

Wild Plant Sanctuary, from page 8

are the goal for the upcoming year.

"We want the sites to be ecologically diverse," says Shultzabarger. "The first was a stream and woods. Maybe the next will be an open, grassy field with butterfly activity or a barrens community or something else. We don't want all of the sites to be the same type of plant community, but be a diverse sample of plant communities across the state."

"We established the Private Wild Plant Sanctuary program to encourage and recognize good stewardship practices, including scientifically-sound ecological restoration, for native habitats and wild plant species," says Sally Just, Director of DCNR's Office of Conservation Science." "The Yavoroskys are the first of what we hope are many enlightened landowners interested in conserving and managing their special places for future generations to enjoy."

Details about Pennsylvania's Private Wild Plant Sanctuary Program, including an application and site criteria, are on the web site *www.dcnr.state.pa.us/forestry/wildplant/*. You can also e-mail *RA-PAPlantSanctuary@state.pa.us* for more information.

who are preserving something."

Next steps for the program, according to Ellen Shultzabarger, Chief of DCNR's Ecological Services Section, are to get a web site up and running and choose the next few Private Wild Plant Sanctuaries. Six sites, in locations across the state,

Scenes from the Panther Creek Wild Plant Sanctuary (clockwise from above): Galax leaves (the plant will produce a tall spire of small white flowers in June); painted trillium in bloom; the owners' grandson playing in the big pool near the bottom of the gorge; and flower buds of the rosebay rhododendron.

Visit these web sites for more on Pennsylvania's wild plants and wildflowers:
www.iconservepa.org
www.bhwp.org
www.pawildflower.org
www.dcnr.state.pa.us/forestry/wildplant/native.aspx

Painted trillium photo by Greg Czarnecki; other photos by Barbara Grace

Photos by Jessica Sprajar

ACROSS THE ATLANTIC, SOME CONSERVATION ISSUES REMAIN THE SAME

by Jessica Sprajcar

World traveler I am not, although I was recently lucky enough to spend one month traveling throughout central Germany. Five of us traveled from south-central Pennsylvania to Deutschland for a vocational and cultural exchange. From mid-May to mid-June I traveled from villages to small towns, learning about the country's biodiversity and the myriad ways they protect it. The following is a brief account of the habitats and species I encountered along the way.

During our stay in the state of Thuringen, we hiked part of the famous Rennsteig trail through the Vessertal-Thuringen Forest Biosphere Reserve, one of 16 nature preserves in Germany designated as such by the United Nations Educational, Scientific and Cultural Organization (UNESCO).

This reserve covers 42,000 acres of nearly contiguous mountain spruce forest. What is so interesting about the UNESCO Biosphere sites is how they are managed. While recreation, agriculture and other human uses may take place in the transition area surrounding the Reserve, the central core of habitat must remain in a natural state with no fragmentation caused by roads, trails or other man-made structures. In areas along the Reserve, we saw wildlife bridges crossing the Autobahn, helping animals migrate from one habitat patch to another without risking vehicle/wildlife collisions.

Germany does not have a state park system like Pennsylvania. They have 14 national parks and a system of nature reserves called Naturschutzgebiet, established under the Federal Nature Conservation Act. We traveled to a nature reserve outside of the town of Jena, in search of orchids. It is believed that without the Naturschutzgebiet, orchids would probably not exist in the wild in Germany, due to overharvesting and human land use.

Fortunately for us, we discovered 10 different orchid species in just over an hour. Species included the lady orchid (*Orchis purpurea*), a fly orchid (*Ophrys insectifera*) and a spider orchid (*Ophrys holoserica*). All these species of orchids are very delicate looking, with individual flowers only a few centimeters in length. Colors ranged from pale purple to white to blackish-red. It was like a scavenger hunt, trying to locate these small beauties among the tall grasses and other wildflowers. It truly was a magical experience to see them in such abundance and to learn that their presence there is due in large part to sheep grazing in the park, which helps keep out woody vegetation that would otherwise shade out these special plants.

I would love to say that Germany is free from the scourge of invasive species, but unfortunately that is not the case. Species that are native to Pennsylvania, like raccoons and black locust trees, are taking over in Germany due to a lack of natural predators. Raccoons, which my German hosts affectionately called Waschbären or "wash bears," were introduced into the country in the 1930s for the fur trade. Some escaped from captivity, began breeding in the wild, and are now well established, wreaking havoc on farms and natural habitats. Hunting and trapping have been used to try and keep the population from growing, but it appears that raccoon numbers continue to swell. Now they are overflowing into neighboring European countries.

On the other hand, something that was really fascinating for me to see was garlic mustard in its natural habitat. While garlic mustard is an invasive plant in Pennsylvania, dominating many forest edges and backyards, it is native to Germany and grows in small patches alongside other plants. It acted like any other native wildflower because it had native insects and herbivores keeping it under control.

These two examples of "invasiveness" impressed on me the fact that a plant or animal is not always invasive. It has a home range but, due to a certain set of circumstances, it can be uprooted and moved somewhere else. If conditions there are just right, these species may become invasive pests, like raccoons in Germany and garlic mustard in Pennsylvania.

Traveling to other countries can help grow our understanding of different natural resource management practices and the unique challenges a particular area may face. Germany, just like Pennsylvania, has a wealth of native plants and animals to protect from invasive species, land use development and climate change impacts. Perhaps we can learn from each other's conservation successes and setbacks to ensure that biodiversity thrives for generations to come.

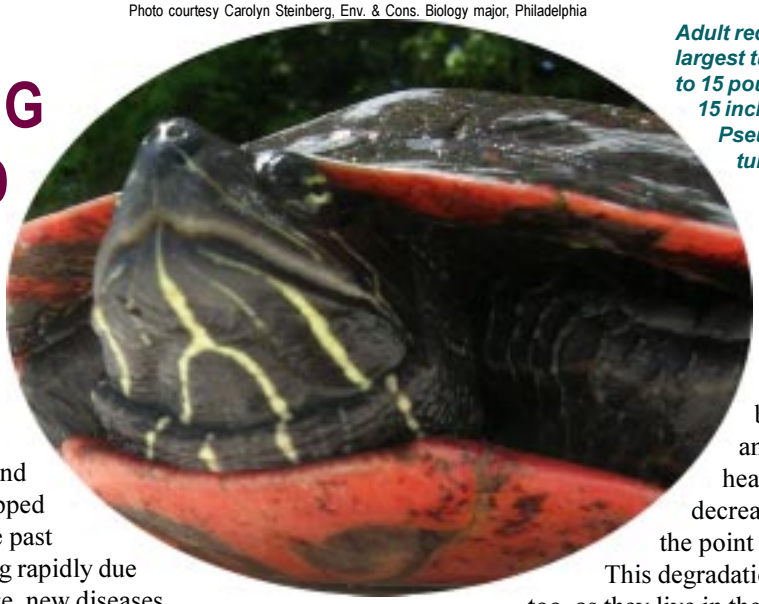
Top left, a scenic view in the 42,000-acre Vessertal-Thuringen Forest Biosphere Reserve. Above, a lady orchid (Orchis purpurea) in bloom, at a nature reserve in Germany. Right, author Jessica Sprajcar with one of the Naturschutzgebiet, or nature reserve, signs. She is the Conservation Programs Manager in DCNR's Office of Conservation Science.

WRCP Grants at Work --

RESEARCHING RED-BELLIED TURTLES

by Dr. Anne Bower
Philadelphia University

Photo courtesy Carolyn Steinberg, Env. & Cons. Biology major, Philadelphia



Adult red-bellied turtles are the third largest turtles in the state. They weigh 11 to 15 pounds and have a shell about 12 to 15 inches long. Their scientific name is Pseudemys rubriventris -- meaning a turtle with a red belly.

Where have all the frogs, toads and turtles gone? Reptile and amphibian populations have dropped markedly around the globe in the past decade. Their homes are changing rapidly due to water pollution, climate change, new diseases and conflicts with humans over land use and recreation. Habitat loss and degradation are considered to be the top reasons for the loss *(Amphibiaweb, http://amphibiaweb.org/declines/declines.html)*.

In Pennsylvania, the threatened red-bellied turtle lives in the most developed and densely populated southeast corner of the state. This large, long-lived, colorful turtle lives in coastal streams, rivers and wetlands along the eastern seaboard, but nests on land, often right where you would want to build your house for the best view.

Starting at age nine -- red-bellied turtles can live 50 to 100 years -- the females nest on land within one mile of the river's edge. They return to the same area year after year, which means the nest could end up in a parking lot, mowed lawn, oil refinery, casino or other developed location.

The large, aquatic turtles need to have access to deep stream channels and wetlands, because hatchlings (young turtles) eat lots of insects. The adults are more vegetarian and rely on plants. The hatchlings, in turn, are eaten in large numbers by the ever-increasing raccoon population that thrives in cities and suburbs.

Turtles need rocks and logs in streams to bask on daily to warm their bodies. Red-bellied turtles want to have a clear escape route, so they prefer to bask on sites in deep water. Boaters, canoeists, swimmers and kayakers disturb this shy species from their sun-tanning activities. Plastic water bottles, basketballs, car parts and chemical pollution, such as heavy metals from industry, all decrease the quality of the water to the point where fish are not safe to eat. This degradation affects red-bellied turtles, too, as they live in the water all the time, except when the females go on land to build a nest.

Another big issue for red-bellied turtles is competition from unwanted pets, such as red-eared sliders, which are native to Florida. Many people who buy turtles as pets are not aware of how long they live and how much daily care they need. They don't realize they need to write the turtle into their will! Will an 8-year-old want to still care for that turtle when he is 90? So what do people do with unwanted red-eared sliders? They release them into local parks and streams, where they compete with our native turtle species for food, basking sites and habitat.

To better understand red-bellied turtles and the threats they face, Philadelphia University is conducting research in the last 1,200 acres of freshwater tidal marsh in the state, located at John Heinz National Wildlife Refuge at Tinicum *(www.fws.gov/heinz/index.html)*. The refuge is less than one mile from the Philadelphia airport and immediately adjacent to the I-95 superhighway.

The goal of the project is to find out what habitats adult male

(continued on page 12)

Photos below and right, by Greg Czarnecki

Red-bellied turtles live in the coastal region of southeast Pennsylvania, which puts their habitat needs into conflict with this highly urban area. One stronghold of the turtle is the John Heinz National Wildlife Refuge at Tinicum (view at left), near Philadelphia.

Red-bellied turtles, from page 11

and female red-bellied turtles use over the course of an entire year, from breeding season in the spring through brumation, which is when turtles dig into the soft mud on the bottom of ponds and streams to survive the winter. Do they stay in the refuge or do they move into the larger Delaware River, where the oil refineries and airport are? This information will help the Pennsylvania Fish and Boat Commission and other agencies determine what types of areas need to be conserved to protect this species as redevelopment for tourism, industry and commerce occurs along urban, coastal rivers.

Photo by Greg Czarnecki

In April 2008, red-bellied turtles were captured in basking traps, measured and had radio-transmitters attached by a team led by Dr. Anne Bower, Associate Professor of Environmental and Conservation Biology at Philadelphia University, and Tessa Bickhart and Mike Torocco of Herpetelogical Associates. Turtles were tracked by boat and on foot twice weekly until they entered their winter dormancy period (brumation) at the end of October and again in the spring as they reemerged.

Photo courtesy Dr. Anne Bower, Philadelphia University

Photo courtesy Dr. Anne Bower, Philadelphia University

Above, Dr. Anne Bower and assistants retrieve a red-bellied turtle captured at a basking platform trap. At left, Environmental and Conservation Biology major Kelly Stark measures a red-bellied turtle. Right, distinguishing characteristics of Pennsylvania's threatened red-bellied turtle (left in photo) and the invasive red-eared slider (right in photo) include the color and markings of its belly. Never release unwanted pet red-eared sliders into the wild, where they will compete with native turtles. Below, Dr. Anne Bower uses telemetry equipment for tracking red-bellied turtles.

Photo by Greg Czarnecki

Initial results show that some of the red-bellied turtles travel over 4 miles outside of the refuge and into the Delaware River. The turtles used a wide array of habitats, including highly polluted streams, seasonal wetlands, fishing ponds, industrial areas and a marina. GIS maps of home range and habitat use are being constructed for males versus females and large versus small turtles, to describe patterns of land use for different seasons of the year.

The project would not have been possible without the amazing support in time and effort by Brenda Lee Phillips (wildlife biologist) and Gary Stolz (refuge manager) from John Heinz National Wildlife Refuge. Tom Trotman and others from the Conoco-Phillips Trainer Refinery constructed telemetry boxes and mounted equipment and solar panels on utility poles for radiotracking. Funding was provided by grants from NASA SCRIBE #NNX06AG66G and the Wild Resources Conservation Program. Equipment was donated by West Marine.

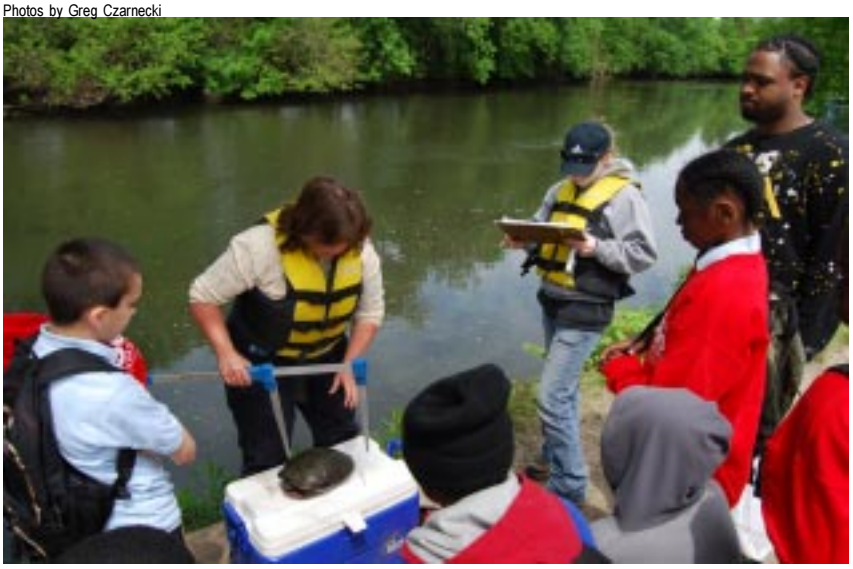
Together with the field research, the second goal of the project was to communicate results to teachers and environmental educators, so the instructors could immediately use the information about turtle conservation with their students. Philadelphia University partnered with the Education and Wildlife Rehabilitation Departments of the Schuylkill Center for Environmental Education *(http://www.schuylkillcenter.org/)* to develop and test educational materials about threats to turtle conservation, under the direction of Karen Foster.

The Eastern Red-bellied Turtle Curriculum Guide was created to supplement existing materials from the Pennsylvania

(continued on page 13)

Below, Dr. Anne Bower shows a visiting school class how the researchers take data, such as measurements, on rare red-bellied turtles. Afterward, the class watched the turtles being returned to the wild. A Red Bellied Turtle Curriculum Guide has been developed and sections will be posted online. For more information contact Dr. Bower (e-mail below).

Photos by Greg Czarnecki



Red-bellied turtles, from page 12

Fish and Boat Commission, Pennsylvania Game Commission and DCNR, with specific focus on *Pseudemys rubriventris*. The book contains 24 lesson plans covering topics from classification and natural history of the species to threats and conservation efforts.

The lessons were written for middle through high school levels, with evident adaptations for younger and older learners. Lessons are provided for every type of venue. Each lesson can be taught on its own, with supplemental information given from other lessons. Every lesson has Pennsylvania State Environment and Ecology Standards attached to it, as well as objectives, a materials list, potential extensions and a resource list. All worksheets and paper materials are provided either in the booklet or on a flash drive attached to the back of the curriculum guide.

The Miquon School, Green Street Friends School and Green Woods Charter School all acted as test centers where preliminary lesson plans could be tested to see how well students learned the concepts. Students' knowledge about turtle conservation issues prior to the activity was a score of 43 percent on the pretest. After the lesson, students scored 79 percent on the post-test, for an average increase in knowledge of 36 percent across all schools.

A one-day Threatened Red-bellied Turtle Teacher Workshop was held at John Heinz National Wildlife Refuge at Tinicum in May 2009. Twenty-five educators attended from Silver Lake Nature Center, Schuylkill Center for Environmental Education, EPA, home school organizations and teachers from a wide range of urban and suburban schools who taught an average 100 to 200 students per year.

Each participant received a stipend, ACT 48 Credits (if requested), a Red Bellied Turtle Curriculum Guide with 24 lessons and worksheets, a flash drive with additional lesson materials, and numerous handouts from the Pennsylvania Fish and Boat Commission. All of the participants agreed to fill out pre/post test assessments and a workshop evaluation form. An introductory PowerPoint presentation on the many aspects of the red-bellied turtle, a Pennsylvania Wildlife program by the Schuylkill Wildlife Rehabilitation Clinic, and a field study -- complete with radio telemetry demonstration, habitat walk and turtle measurements performed on live specimens -- were among the activities that rounded out the day.

The teachers were thrilled to get the materials, the hands-on demonstration about the research and to see first-hand the threats to wildlife in Pennsylvania as demonstrated by Schuylkill Wildlife Rehabilitation Clinic. They were surprised about how much they did not know. The teachers' average pretest score was 44 percent. They commented on the depth and usefulness of the materials for different teaching settings. Their knowledge after the workshop jumped to 72 percent. Support after the workshop by phone and e-mail assisted teachers in using the lessons in their classrooms.

In the future, some of the lessons will be added to the web sites of the Schuylkill Center for Environmental Education *(www.schuylkillcenter.org)* and the Philadelphia University *(www.philau.edu)*.

So what's the best thing you can do for turtles? Keep pet store turtles at home for their entire 50-year life-span and remember that your life-style choices directly impact the quality of streams for everyone.

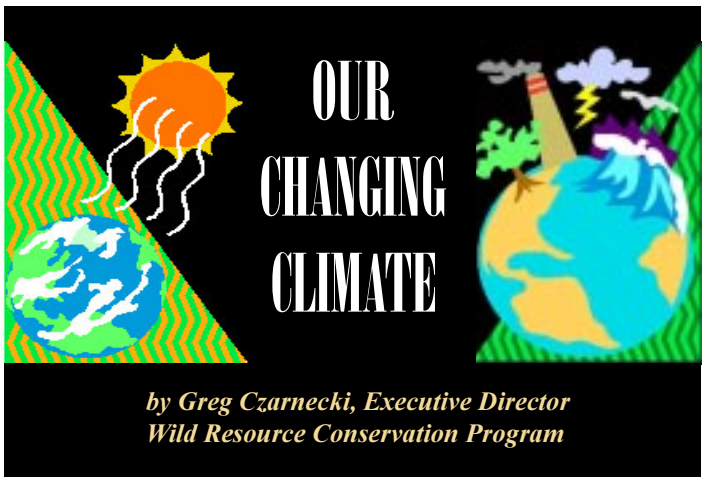
Among the challenges that living in an urban environment presents to the red-bellied turtle is degraded water quality.

-- Dr. Anne Bower is an Associate Professor at Philadephia University, in the School of Science and Health. She may be contacted at bockarie@philau.edu. For information on the university's Environmental and Conservation Biology Major program, visit (www.philau.edu/Schools/ssh/Ugrad_Majors/Environmental_and_Conservation_Biology/)

Want to learn more about red-bellied turtles? We invite you to visit these web sites:

www.naturalheritage.state.pa.us/factsheets/Red-bellied%20Turtle.pdf

www.dcnr.state.pa.us/wrcp/rbturt.aspx



Welcome to *Keystone Wild!Notes* newest feature, "Our Changing Climate."

In this column, we're going to explore climate change and how it will influence Pennsylvania's species and habitats. To kick it off, I thought we'd begin with the basics. So let's talk about what's gotten us into this mess -- CARBON.

It's important to recognize that carbon is not bad. In fact, it's the element on which all life is based. We are all carbon-based units, to borrow a phrase from Star Trek. So why, then, is it causing such problems?

In order to answer that, we first need to understand where and in what forms carbon naturally occurs. Carbon is found in four global reservoirs:

1) Geologic – Carbon occurs underground in the form of coal, oil and natural gas.

2) Terrestrial – On land, carbon is found in the form of living things, like people and trees, and in the soil.

3) Atmospheric – Carbon is found in the atmosphere in several different forms, but the most common is carbon dioxide.

4) Oceanic – Sea water contains high levels of dissolved carbon dioxide, carbonates and other carbon compounds; and it's contained within the bodies of sea creatures as well.

These reservoirs aren't static. Carbon is constantly moving back and forth between them through the carbon cycle. The rate and direction of this movement has been relatively stable, at least until recently.

We've been removing huge amounts of carbon from the geologic reservoir. This began with the industrial revolution, and then really kicked into high gear after Edwin Drake drilled the first commercially successful oil well in Titusville, Pennsylvania, in 1859.

As we burn coal, oil and natural gas for fuel, we transfer geologic carbon to the atmospheric reservoir. Additionally, deforestation, particularly in the tropics, is converting large amounts of terrestrial carbon into atmospheric carbon as well.

The end result is the insulating blanket of atmospheric carbon dioxide that makes our planet habitable is beginning to feel more like a down comforter in summertime.

And on top of that, as the level of carbon dioxide in the atmosphere increases, the amount that is transferred to the oceans is also increasing, leading to concerns about ocean acidification.

If we're throwing the system out of balance, what should we do?

There are three essential and complimentary steps:

1) Stop transferring carbon from the geologic to the atmospheric reservoir. In other words, switch from fossil fuels to renewable energy.

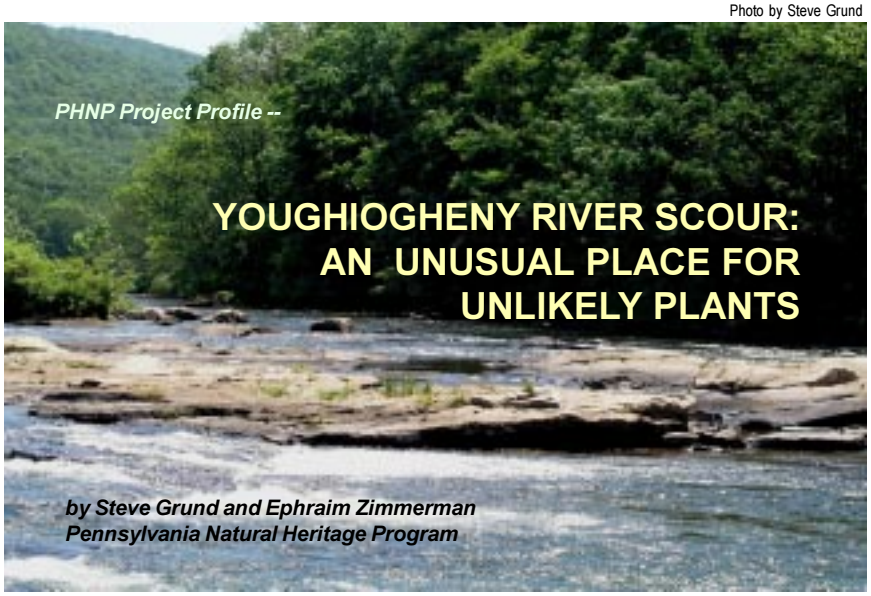
2) Begin removing carbon from the atmospheric reservoir and putting it into one of the other reservoirs. This is a process known as carbon sequestration.

3) Begin planning for and coping with the changes to come *(see the story on climate change adaptation in the Summer 2009 issue, www.dcnr.state.pa.us/wrcp)*.

Each of these strategies, and many more aspects of climate change, will be covered in future installments of this series. If you have specific climate change topics you'd like us to cover, send me an e-mail at gczarnecki@state.pa.us.

Stock photo / Art Explosion

Photo by Steve Grund



PHNP Project Profile --

YOUGHIOGHENY RIVER SCOUR: AN UNUSUAL PLACE FOR UNLIKELY PLANTS

by Steve Grund and Ephraim Zimmerman
Pennsylvania Natural Heritage Program

While kayaking or canoeing the rivers of Western Pennsylvania, you might have noticed patches of prairie-like grasslands found along the sand, cobble, boulder and bedrock banks.

These ecosystems are home to many species of conservation concern, and they have become increasingly rare in Pennsylvania due to habitat conversion and damming. They have also suffered from the onslaught of invasive alien plants. These prairie-like ecosystems are often found at the mouths of tributary streams, where small deltas called "cobble fans" form, as well as on islands, at rapids and where large boulders or exposed bedrock is directly in contact with the flowing water. They are definitely places you don't want to be during the spring floods!

Known as ice-scour grasslands, riverbank bedrock communities, or river floodplain prairies, these grass and herb dominated ecosystems are pummeled each year by intense floodwaters and flowing sheets of ice that crash and scour the floodplains, at times down to the bedrock.

Flooding is a natural disturbance process on all streams and is important for maintenance of floodplain ecosystems of various kinds. On larger rivers, especially those that carry significant amounts of ice during spring melts, this process is very vigorous, ripping up much of the vegetation, creating a zone we call "river scour."

In Pennsylvania, significant river scour occurs on the Allegheny, Clarion, Conemaugh, Delaware, Susquehanna, Juniata and Youghiogheny rivers, as well as on some stretches of their major tributaries. On many rivers, especially the Monongahela, the lower Susquehanna and the Ohio, damming of the rivers for flood control, water supply and to form navigation pools and recreational lakes has highly modified or eliminated floodplain habitats, including scour.

The Youghiogheny River, specifically the stretch called the Youghiogheny Gorge, between the Youghiogheny Reservoir and Connellsville, is the most dynamic large river in Pennsylvania because of the steep descent it makes while cutting through Laurel Ridge and Chestnut Ridge. This steep gradient is why the rapids are there, and scour has kept much of the area along the stream free of substantial accumulations of soil.

From its origin in the mountains of Maryland and West Virginia, the Youghiogheny weaves its way through a variety of landscapes, rock formations and elevational gradients, resulting in a great diversity of scour habitats. Add to the habitat diversity the large number of Appalachian species that extend to the northern limits of their ranges in this deep river valley, which runs from south to north, and you get one of Pennsylvania's most important regions for biodiversity conservation.

Scour zones share ecological characteristics with river banks, floodplains, wetlands and prairies. This combination of conditions leads to a unique grouping of species generally associated with one or more of those ecosystems.

Often the most conspicuous component of scour habitats are what we tend to think of as prairie grasses, such as big bluestem (*Andropogon gerardii*), little bluestem (*Schizachyrium scoparium*), switch grass (*Panicum virgatum*), cordgrass (*Spartina pectinata*) and Indian grass (*Sorghastrum nutans*). While commonly associated with the Midwestern prairies of Ohio, Michigan, Illinois and Wisconsin, these plants find a home in Pennsylvania among the scoured cobbles and bedrock of the river floodplains.

Despite the importance of these species, only a few other species usually associated with prairies are common in the scour areas along the Youghiogheny. These include wild-indigo (*Baptisia tinctoria*), tall tickseed (*Coreopsis tripteris*), flowering spurge (*Euphorbia corollata*), yellow star-grass (*Hypoxis hirsuta*), and early goldenrod (*Solidago juncea*).

A smaller number of the plants found in scour areas in the Youghiogheny River Gorge are species commonly found on stream banks and floodplains in less dynamic habitats. Perhaps the most conspicuous of these is a tree, the sycamore (*Platanus occidentalis*). Sycamores are common -- even locally abundant -- but rarely reach what we think of as tree size in this habitat. Some of the sycamores are gnarly, small but perhaps very old, having been repeatedly battered by the powerful forces of floods

(continued on page 16)

Photo by Steve Grund

Top, a scour island in the Youghiogheny River. Left, pink-flowered swamp milkweed grows in scoured cobble areas along river.

Youghiogheny River Scour, from page 15

and ice scour. A few silver maple (*Acer saccharinum*) and green ash (*Fraxinus pennsylvanica*) are also present.

Another floodplain tree species that is occasional in Youghiogheny Gorge scour communities is umbrella magnolia (*Magnolia tripetala*). This species is common in and near the coastal plain in southeastern Pennsylvania, but is also found in Fayette County, known from several locations along the Youghiogheny and Casselman rivers.

Photo by Steve Grund

Other stream bank and floodplain species found commonly in Youghiogheny scour include ninebark (*Physocarpus opulifolius*), one of our sedges (*Carex torta*), nodding onion (*Allium cernuum*), bluets (*Houstonia caerulea*), cardinal-flower (*Lobelia cardinalis*), and wingstem (*Verbesina alternifolia*).

Surprisingly, the largest group of plants found in the Youghiogheny River scour communities are the wetland species. These ecosystems have meager amounts of organic soil, so it seems out of place to find all these wetland plants in a habitat where, unless you are visiting during a flood event, your feet only get wet when you step (or slip!) directly into the water of the stream. But they're there.

Smooth alder (*Alnus serrulata*), southern arrow-wood (*Viburnum dentatum*), swamp rose (*Rosa palustris*), blue vervain (*Verbena hastata*), boneset (*Eupatorium perfoliatum*), buttonbush (*Cephalanthus occidentalis*), flat-topped white aster (*Doellingeria umbellata*), golden ragwort (*Packera aurea*), royal fern (*Osmunda regalis*), sensitive fern (*Onoclea sensibilis*), swamp milkweed (*Asclepias incarnata*), and tall meadow-rue (*Thalictrum pubescens*) are wet habitat plants that are common in scour areas along the Youghiogheny.

One small but interesting set of plant species occurs in Pennsylvania primarily or only along the Youghiogheny in ice scour communities. A few plants are globally rare.

Photo by Paul Wiegman

The most famous of these is the globally imperiled large-flowered marshallia (*Marshallia grandiflora*, sometimes called "Barbara's buttons" or just "marshallia"). Marshallia is typically found in crevices of horizontally oriented bedrock, but can also grow in coarse cobble and occasionally in sand. It is an attractive member of the composite family, with pink flower heads that bloom from mid June to early July. Its range includes a few counties in Tennessee and extends in the Allegheny Mountains north through Kentucky and West Virginia into Pennsylvania. The Youghiogheny Gorge represents its northern limit.

Also globally imperiled is sand grape (*Vitis rupestris*). Unlike most grapes, sand grape does not climb on other plants even if given the opportunity; it has only vestigial tendrils. It can, however, survive in very severe scour habitats, where it anchors firmly into bedrock crevices. It is annually scoured to almost nothing but its roots, yet consistently grows back.

Carolina tassel-rue (*Trautvetteria caroliniensis*) grows abundantly along the Youghiogheny River and a few of its tributaries, but nowhere else in Pennsylvania. It is sometimes found in the inhospitable extreme scour zone where sand grape grows, but grows more luxuriantly at the rear of the scour zone, where some soil accumulates. The plant has showy flowers, but it is the stamens rather than petals that put on the show.

Stiff-leaved aster (*Ionactis linariifolius*) grows in Western Pennsylvania only in scour habitats in the Youghiogheny River Gorge. Often it grows by itself in small crevices in rocks that require some rock-hopping to get to. This is a very attractive plant even before it flowers, with numerous short, stiff, dark green, linear leaves on an unbranched stem usually less than a foot long. The pale lilac flower heads make it even prettier.

Of course there are animals that use scour zones, as well. Several rare dragonflies and damselflies use the open habitat for basking and hunting. Tiger beetles also like these open, sunny habitats. Northern water snakes (*Nerodia sipedon*) and copperhead snakes (*Agkistrodon contortrix*) like the warm rocks and the cool spaces below, as well as the adjacent water -- so watch your step. River otters (*Lontra canadensis*) have been reintroduced to the Youghiogheny Gorge and seem to be doing well.

(continued on page 17)

Photo by Steve Grund

Photo below by Dave Powell, USDA Forest Service, Bugwood.org

Plants of the Youghiogheny River scour zones are adapted to ripping floods, then full sun. Several are rare. From top, large-flowered marshallia; buttonbush; cardinal-flower and plant community; Carolina tassel-rue; and sand grape.

Photo below by Scott Bauer, USDA Agricultural Research Service, Bugwood.org

Youghiogheny River Scour, from page 16

Photo by Steve Grund

Copperhead snakes find a home in Youghiogheny River scour zones.

Among the birds that use scour habitat in the Youghiogheny Gorge are common yellowthroats (*Geothlypis trichas*), song sparrows (*Melospiza melodia*), rufous-sided towhees (*Pipilo erythrophthalmus*) and spotted sandpipers (*Actitis macularia*).

Major threats to riverside scour communities include outright habitat conversion by development, water pollution, trampling in areas popular for recreation, changes to river hydrology and the establishment and spread of invasive plant species. Often, these threats occur together.

In the Youghiogheny Gorge, major habitat conversion is unlikely because most of the gorge is within Ohiopyle State Park. Some small areas have been lost to park development, such as boat accesses, but most of the habitat conversion occurred before the park was established. Much of that, such as scattered small mining towns and mills, has recovered significantly since being abandoned decades ago.

Water pollution can impact scour ecosystems, especially in coal mining areas, but the Youghiogheny Gorge has experienced limited damage from mine drainage. Nutrient loading from agriculture and sewage is a concern, but less so in this area than in many other parts of Pennsylvania, because much of the watershed is forested.

Trampling in recreation areas can cause damage, and some sandy beach areas along the Youghiogheny River that are popular lunch spots are devoid of vegetation. It's unclear how susceptible scour plants are to trampling. This is a natural disturbance system, but the wrong kind of disturbance or disturbance at the wrong time can clearly cause damage, both directly and by encouraging invasive species.

Dams alter the timing of water flow and reduce the amount of ice during the spring thaw. Dams reduce the natural spikes in flow after rain events and spring warming that lead to flooding and scour. The impact of the Youghiogheny Reservoir Dam is significant but is mitigated by the entrance of a major tributary, the Casselman River, just below the dam. Studies are needed to determine whether adjustments should be made in management of the dam to assure long-term viability of scour ecosystems and the globally and regionally imperiled plants that live there.

Dams and other permanent structures, such as bridges, also contribute to invasive species problems by slowing the flow of water, causing river sediments to accumulate. These sediments, often rich in nutrients, and the reduction of scouring provide ideal conditions for invasive plants.

The most significant invasive plant along the river in the Youghiogheny River Gorge is Japanese knotweed (*Polygonum cuspidatum*). Although it cannot grow under vigorous scour conditions, it proliferates in adjacent areas where the rushing water slows down, causing soil and other materials it is carrying to drop out, creating what we call "deposition zones." The dense growth of the knotweed in these zones might slow the water even more, creating a positive feedback loop that increases the size of the deposition zones. Also, the profuse growth of knotweed's semi-woody stems one year leads to copious piles of dead stems the next, a process that probably reduces the size of scour zones by burying portions of them.

Purple loosestrife (*Lythrum salicaria*) is a relatively new invasive species in the area and will likely become a major problem, as it can withstand flood forces enough to invade some of the scour habitats. Morrow's honeysuckle (*Lonicera morrowii*), another invasive plant, is common in the Youghiogheny River Gorge and displaces native species at the outer edge of the scour zone.

Funding by the Wild Resource Conservation Program as well as the Bureau of State Parks has enabled Pennsylvania Natural Heritage Program biologists to find and document the rare species in the Youghiogheny River Gorge. The work continually refines our understanding of which species are most at risk, where they are and what might be threatening them.

A Pennsylvania Natural Heritage Program study of floodplains, funded by the U.S. Environmental Protection Agency, has also contributed significantly to our understanding of this ecosystem. The staff at Ohiopyle State Park actively uses this information to prioritize invasive species management efforts and to inform management generally, so that recreation at the park continues to be compatible with viability of the highly significant ecological systems there.

So, go and enjoy! Raft or kayak and have fun on the "Yough." While there, learn the plants and look for river otters and tiger beetles. Show these things to other people; they will probably tread more lightly once they, too, understand.

About the authors: Ephraim Zimmerman is an Ecologist with the PNHP and the Western Pennsylvania Conservancy. He recently completed a study of river floodplains of Pennsylvania's portion of the Ohio River Watershed.
Steve Grund is a Botanist for the Western Pennsylvania Conservancy and the PNHP. He has chaired the Pennsylvania Rare Plant Forum since 1997.

& WEED IT & REAP

Have You Seen This Weed?

Aliases: *Oplismenus hirtellus* subspecies *undulatifolius*

Last Seen: While formerly calling southeast Asia its home, wavyleaf basketgrass can now also be found spreading throughout parks and forests in Virginia and Maryland. Because of the close proximity of these states to Pennsylvania, this invader could already be here, threatening our natural habitats.

Description: This low-lying grass has 1 to 4-inch-long rippled leaves and stems with small hairs along their length. The plant spreads by creeping stems as well as seeds that may stick to clothing, animals and other surfaces. Once this grass enters a habitat, it can spread quickly, blanketing the area like Astroturf.

Wave Goodbye to this Invasive Grass!

Because large populations are not yet established in Pennsylvania, there is hope that we can beat this plant before it gets out of control. A noxious weed team in Pennsylvania is doing surveys along the Appalachian Trail near the Maryland border to keep an eye out for signs of wavyleaf basketgrass. If you think you have seen this plant, write down where you saw it, take a photograph of it if you can, and contact your local state park, state forest or conservation district office right away. Quick action is needed to stop this grass in its tracks! For photos of wavyleaf basketgrass and ways to help identify it, go to: *www.dnr.state.md.us/wildlife/WLBG/index.asp*

-- Text and illustration by Jessica Sprajcar, Conservation Programs Manager, DCNR Office of Conservation Science

WILD! For Kids

Photos by Linda and Bob Steiner

Everyone talks about how colorful autumn leaves are. But did you know that the blooming time for some wildflowers is in the fall? These fall wildflowers are as bright and beautiful as the autumn leaves, and they come in just as many colors. Fall-blooming wildflowers must bloom, be pollinated and produce seeds before winter's ice and cold. Look up at autumn's changing leaves, but also look down to see fall's wildflower show. Where can you see fall wildflowers? Most grow in open places that receive a lot of sunlight. Look for goldenrod and aster in fields and along road edges. Turtlehead and cardinal-flower are found on the borders of lakes and streams. Like many fall wildflowers, New York ironweed and Joe-Pye-weed grow tall, above neighboring plants, to get the sun's energy they need to flower, set seed and attract pollinators. When you are in the woods this fall, look for a short tree whose branches have small, stringy yellow flowers -- this is the witch-hazel. For more about Pennsylvania's native wild plants, visit the recommended web sites on page 9.

1) THEEDURALT =

_ _ _ _ _ _ _ _ _ _

2) SEART = _ _ _ _ _

Unscramble the words below each photo to reveal the names of these fall wildflowers. Hint: All of the flowers were mentioned in the introduction. The answers are at the bottom of the page.

3) WEN KORY DREWIONE =

_ _ _ _ _ _ _ _ _ _ _ _

4) DIRLAANC - FROLEW =

_ _ _ _ _ _ _ _ - _ _ _ _ _ _

5) OEJ - YEP - EDEW =

_ _ _ - _ _ _ - _ _ _ _

6) NODOGDREL = _ _ _ _ _ _ _ _ _

7) THWIC - ZALHE =

_ _ _ _ _ - _ _ _ _ _

1) Turtlehead; 2) Aster; 3) New York ironweed; 4) Cardinal-flower; 5) Joe-Pye-weed; 6) Goldenrod; 7) Witch-hazel.

WILD! Buys -- Show Your Wild Side!

USE ORDER FORM ON PAGE 24

OUR TOPS ARE TOPS!

WRCP Logo Long-sleeved T-shirt (Adults)
The WRCP logo is embroidered on a 100% cotton T-shirt (Chocolate brown)
Men's sizes: M, L, XL, XXL -- $18
Ladies' sizes: S, M, L, XL, XXL -- $18

WRCP Logo Long-sleeved Faded Blue Denim Shirt
Men's sizes: S, M, L, XL -- $25; 2XL, 3XL -- $27
Ladies' sizes: S, M, L, XL -- $25; 2XL, 3XL -- $27
This 100% cotton shirt features double-needle stitching and a button-down collar. WRCP logo is embroidered above the patch pocket (no pockets on ladies' shirt).

WRCP Logo Long-sleeved Forest Green Pique Polo Shirt (Men's sizes only)
Sizes: S, M, L, XL -- $25; 2XL, 3XL -- $27
This extra-heavy 100% ring-spun Egyptian cotton pique polo shirt features WRCP logo embroidered on the left chest.

NEW!

COSMO'S WORLD T-SHIRTS
The WRCP logo is on the front (see above) and Cosmo and Terra are on the back (at right). The T-shirt is 100% cotton, pre-shrunk and available in both Tangerine and Natural.
Children's sizes: S, M, L -- $15
Adult sizes: S, M, L -- $17

Salamander T-shirt
The image of the red eft is embroidered in full color on this 100% cotton T-shirt (Periwinkle).
Youth sizes: S, M, L -- $12
Adult sizes: S, M, L, XL, XXL -- $14

WILD! Buys -- Show Your Wild Side!

USE ORDER FORM ON PAGE 24

WRCP Logo T-shirt (Youth)
The WRCP logo is embroidered on a 100% cotton T-shirt (Sand).
Youth sizes: S, M, L -- $12

WRCP Logo Hooded Sweatshirt
The WRCP logo is embroidered on an 80/20 cotton/poly hooded sweatshirt. (Blue; Gray)
Adult sizes: S, M, L, XL, XXL -- $27
Youth sizes:
S, M, L - $22

Flying Squirrel T-shirt
The image of a flying squirrel is embroidered in full color on this 100% cotton T-shirt (Sand).
Youth sizes: S, M, L -- $12
Adult sizes: S, M, L, XL, XXL -- $14

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** Limited quantities*

Fuzzy River Otter looks just like the real animal reintroduced into PA through efforts funded by the WRCP. 20 inches from nose to tail -- $12 (+.72 tax)

WILD! Buys -- Show Your Wild Side!

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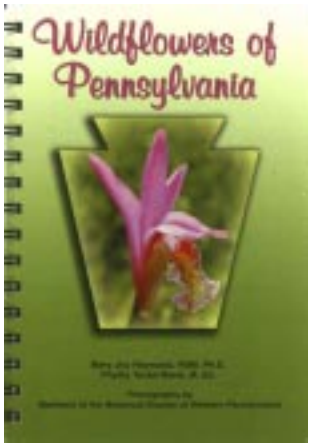
READ ALL ABOUT IT -- IN WILD! BOOKS

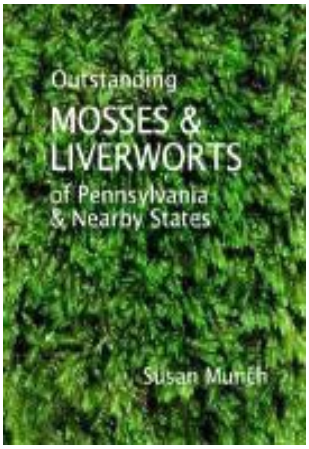


WILDFLOWERS OF PENNSYLVANIA

This book is for all who enjoy nature and would like to become more acquainted with wildflowers. It will help the observer to identify the plants seen on a spring, summer or fall hike in a natural area. The book uses photographs of the plants, as photos reveal much more detail than can be found in drawings.
Price: $20 (+ $1.20 tax)

OUTSTANDING MOSSES AND LIVERWORTS OF PENNSYLVANIA

Botanist Susan Munch brings us the first full-color field guide for mosses in the Mid-Atlantic region. The guide's 89 pages contain detailed color photographs allowing for easy ID of many of the most common, yet striking, mosses and liverworts. No microscope is necessary. The guide is suitable for both professionals and non-botanists.
Price: $20 (+ $1.20 tax)

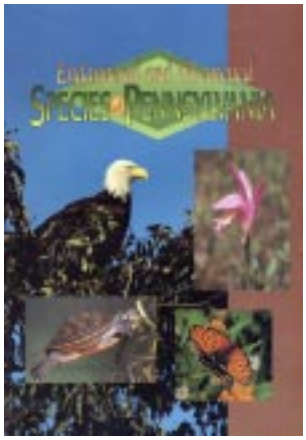


THE RETURN OF MAGIC

A delightful children's book for ages 4 and up, the Return of Magic tells the story of a young kestrel through poetry and beautiful watercolor illustrations. The book is packed with information on the life cycles of these colorful raptors and even includes a design for building a kestrel nesting box. "The Return of Magic" was written and illustrated by Wendy Plowman, for the Hawk Mountain Sanctuary.
Price: $5 (+ $.30 tax)

WE HAVE BOOKS ON RARE SPECIES ... AND THEY'RE FREE!

"ENDANGERED AND THREATENED SPECIES OF PENNSYLVANIA"



We have to make room for new publications, so we are offering individual copies of these two books, free of charge ($2 shipping fee per book).

Teachers: Contact us for the publications in bulk (717-787-3212).

"Endangered and Threatened Species of Pennsylvania" is 80 pages, softcover, published 1995.

"Species of Special Concern in Pennsylvania" is 430 pages, hardcover, published 1985.

"SPECIES OF SPECIAL CONCERN IN PENNSYLVANIA"

WILD! Buys -- Show Your Wild Side!

USE ORDER FORM ON PAGE 24

Full of style and color, these wildlife earrings by Jabebo "Inspire Curiosity" and are made in Pennsylvania with post-consumer materials and surgical steel hangers. Price: $10 (+ .60 tax) for each pair. Please note earring name on order form.


Global Biome


Piping Plovers


Little Brown Bats


Great Blue Herons


Ruby-throated Hummingbirds


White-breasted Nuthatches

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Barn Owls


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(colors not identical)


River Otters


Cardinals
(male & female)


Fritillary Butterflies


Painted Turtles


Flying Squirrels

WRCP Salamander Ball Cap

Our cap features the red eft salamander, the land-dwelling sub-adult of the aquatic red-spotted newt. The cap is constructed of garment-washed 100% cotton twill. One size fits all (adjustable). Colors: Blue (at right); Sand (light tan); and Green. Price: $15 (No tax)

WILD! Buys -- Show Your Wild Side!

USE FORM BELOW FOR ALL ORDERS

MUSHROOMS AND MORE, OH MY!

The Wild Resource Conservation Program has released its 14th documentary video, *"FUNGI: Pennsylvania's Hidden Treasures."* This award-winning video looks at both the ecological and the economic importance of fungi, an under-appreciated but essential part of our ecosystem. A DVD of the video is available as an appreciation gift for donations of $15 or more to WRCP. Order using the form below from WRCP, P.O. Box 8764, Harrisburg, PA 17105-8764; 717-787-3212; or e-mail debmiller@state.pa.us.

TO ORDER MERCHANDISE:

Print out and fill in the form below. Mail with check payable to "Wild Resource Conservation Program" and add Pa. sales tax and appropriate shipping fees. For more information, call (717) 787-3212 or e-mail debmiller@state.pa.us.

PA. STATE SALES TAX

WRCP is responsible for collecting 6% Pennsylvania sales tax on most items we sell, excluding apparel. The amount owed on each item is noted next to the item price.

SHIPPING FEES

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$10.01 - $20.00	$4
$20.01 - $40.00	$5
$40.01 - $70.00	$6
$70.01 - $100.00	$7
$100.01 or more	$8

Spring-09

ITEM DESCRIPTION	Quantity	Price Each	Sales Tax	Item Total

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KEYSTONE WILD! NOTES: Please enter my web subscription (e-mail address below).

Total Order	
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Add donation amount:	
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DONATION to WRCP: *If you wish to receive thank-you gifts, for $15 choose either Invasive Plants DVD ☐ or Fungi DVD ☐ Donate $25 and up, receive both!*

**Please make check payable to "Wild Resource Conservation Program"*

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Street Address (No P.O. Boxes) _____
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