Eugene Meyer is a retired Loyola University biology professor and a member of our Scientific Advisory Committee. For the past few years Gene has provided excellent advice on our efforts to control white-tailed deer and to manage the invasive plant species in the Sanctuary. We asked him to share his opinions of forest restoration with our readers.

1. How can visitors to a state or county park recognize if a forest is healthy or damaged?

The photographs show what to look for. Look for two things when you walk in a woods with mature oaks. The first is oak seedlings up to one foot tall. The second is oak saplings one to five feet tall. It is easy to see young oaks because they have huge leaves and they often keep some leaves in winter.

Areas that get a lot of sunlight will have the fastest growing, robust saplings. Look in open places where a tree has fallen, and near road and trail edges. Saplings can be abundant: an acre of healthy open forest in Quabbin, Massachusetts, that is recovering from past damage, contained 2,000 to 4,000 saplings, hundreds of which were oak saplings. To envision this, a 20 by 20 foot meeting room would have two to eight oak saplings.

Look in old pine woods as well as hardwood forests; blue jays preferentially plant acorns in pine needle duff, especially in brightly lit places. Blue jays can fly a lot farther than squirrels can walk. They can plant acorns 100 yards from the nearest adult oak.

At a glance, if the ground for 75 yards in a woods is mostly bare leaves, the logical question is: Does this forest have a future? Are most of the saplings holly and beech? Deer eat these last, only when the more palatable species are gone. Look up to see if mature oaks are overhead, but there are no oak saplings. A woods dominated by beech trees is at risk because a beech bark fungus disease can kill 50% of the mature trees. That disease is in Pennsylvania and West Virginia, but has not been found in Maryland yet.

Why focus on oak trees? First, they are the dominant tree genus in most of our area. Second, they support many insects that in turn support our songbirds. Douglas Tallamy, the well known entomologist, found that oaks host over 500 species of butterflies and moths. That is more insect diversity than any other plant in our area. Their caterpillars are a prime food that many songbirds feed to their young.

A damaged forest can have patches of bright green plants on the forest floor. Are they invasives or wildflowers in season? Anyone can learn to recognize the top local invasive plants which crowd out native wildflowers. If you need help just ask a long-time gardener! A gardener taught me the most common invasives.

2. How do deer and invasive plants combine to damage parkland forests?

Deer can make it easier for exotic plants to invade. When deer eat the native plants they make it much easier for invasive plants to grow without competing for light. Deer avoid the most toxic and spiny native flowers and shrubs. For example, Jack-in-the-Pulpit and Mountain Laurel are very toxic. Deer can also transport exotics in their droppings. Deer droppings can germinate over 30 different species of exotic plants. They can also spread seeds that stick to their fur, such as Wavyleaf Basketgrass, a new and highly aggressive invasive. Birds also transport invasive plant seeds such as Porcelainberry.

If you visit this mature White Oak near Middle and Utility trails, you’ll see there are no seedlings or saplings around it. Our goal is to change that.

Continued on page 2
3. Why is it important to measure if the woods are improving (or not) rather than just counting deer or invasive plants?

We manage only what we measure, what we pay attention to. When our goal is to have the forest survive for future generations and to see wildflowers returning with our help, then we must look to see where the woods are improving. If we do not look at the woods and rely only on deer counts and hunt results, we won’t know whether that ecosystem will survive. Deer can change their travel routes and they become remarkably elusive at times, so people often wonder how many there are in one place. It is not easy to estimate deer populations. The famous ecologist Aldo Leopold once said, “Anyone can argue about deer numbers, but no one can argue about dead and missing trees.”

4. Can you describe some successful forest restoration projects?

Here are three forest restoration projects. Each started with stripped woods with very few saplings. The first project was informal and easily done. On 12 acres near Westminster, Maryland, I found the oak seedlings and saplings shown in the photographs. This forest is recovering because the landowner takes three to seven deer each year on his land for his table. His neighbors on nearby farms also take many deer. By the way, the place to look for the young oaks in the photos was on slopes and near old pines.

A large formal study shows the forest is being restored on 50,000+ acres at the Quabbin reservoir. It supplies one third of the drinking water for Boston. That forest had been stripped by deer. After 14 years of hunting; white pine, hickory, black birch, and oak saplings are now abundant. In some sections, deer numbers are as low as four to seven per square mile.

In another large study, Red Maples now successfully reproduce in the Allegheny National Forest (western Pennsylvania) in the Kinzua project. Until deer hunting was increased, maple seedlings and saplings rarely survived the intense herbivory and the forest was severely damaged; now 50% of the study plots have Red Maple saplings. The key is getting 10 or fewer deer per square mile.

5. What recommendations would you make to someone who wants to practice good forest stewardship?

It’s fun to look in your own backyard and in parks for native tree seedlings and saplings. If there are none even with plenty of mature oaks, maples, or hickory nearby, we can ask why. In un-mowed areas, with a

The abundance, or lack of, oak seedlings and saplings is an important indicator of forest health.
Dear Friends,

Wetlands continue to disappear, even as they remain critical for mitigating the effects of climate change. I have often spoken about the real economic value of wetlands for pollution control, climate regulation, food, and flood control. More important is the role they play in life support for the non-wetland areas where we live.

Recently I heard a presentation by Dr. Marcus Griswold who discussed the effects of climate change in Maryland. As I listened, I realized how superficial my understanding of the topic was and perhaps still is. What caught my attention was the description of Blackwater Refuge underwater in about 100 years. Although I had seen it many times before, Dr. Griswold was discussing what the picture implies about the remainder of the state. He focused on issues that the inevitable environmental changes will cause. I realized that we may have to adapt to these changes and accept the impacts. The economic consequences for the state will be severe and in many cases they will be insurmountable, if we continue on our present trajectory. Mitigation in those areas of the state most severely impacted may not be impossible. As a result, planning should concentrate on preserving remaining ecosystems that will sustain the remainder of the state.

What can we expect from climatic changes?

1. Increased annual precipitation with extreme rain events — a 10% to 20% increase leads to high-energy runoff that impacts water quality.
2. Higher temperatures — a 2 - 4 °C higher average implies drier summers.
3. Increased likelihood of summer droughts — stream ecosystems will be adversely affected and increases the need for crop irrigation.
4. Reduced recharge of groundwater supplies — results from combined effect of extreme rain and drier summers.
5. Sea level rise and lowered groundwater reserves — causes saltwater intrusion into aquifers.

The economic implications will intrude upon every aspect of our current ways of life. Many farmers will be physically displaced, and small acreage farms in other parts of the state will not be economically viable. Stormwater systems will need to be more robust to keep sewerage systems isolated from stormwater. Building and zoning codes will have to be changed. Many coastal building codes currently require a house to be built two feet above the 100-year base flood elevation. With a rapid sea level rise and increased storm frequency, this becomes a meaningless number.

Ecological impacts, such as, loss of ecosystem services, and collapse of biodiversity cannot be reckoned. Perhaps the largest unquantifiable impact will be the availability of freshwater. In Maryland the largest portion of the state’s population lives on the coastal plain and depends on aquifers for water. These aquifers depend on palustrine (forested) wetlands for recharge. In fact, palustrine wetlands constitute over 70% of the wetlands in Maryland. The estuarine wetlands get all the press, but the palustrine wetlands do the heavy lifting. They absorb the energy of storms; they provide the habitat for a large range of animals and they are critical to recharging aquifers, especially the surficial aquifers that support stream and river flows.

There is a great online resource, the National Wetlands Inventory, at www.fws.gov/wetlands. I recommend you take a look at the Sanctuary and the land around it. You will be surprised at the size and number of palustrine wetlands that feed the estuarine wetlands at Jug Bay. More surprising is the number of small vernal pools that dot the neighborhood on private property. Unfortunately, these are the wetlands easily put at risk by development. A recent study (Gutzwiller and Flather 2011) shows that development within 1900 feet is sufficient to increase the risk of wetland habitat loss based on local wetland features and characteristics of the landscape surrounding the wetland.

The current practice within Maryland allows development to occur up to the edge of wetlands. It appears that this practice does not protect the wetland. In some cases the state allows intrusion into wetlands if the developer contributes to a mitigation bank within the same watershed under the so-called “no net loss” rule. Research shows that created/restored wetlands may take more than a century to reach the quality of the original wetland. Although the state recognizes the value of wetlands and has gone to great lengths to protect them, the current regulations may not be sufficient to prevent their loss.

This is not a very encouraging picture, but there is a great need to understand the complex relationships of wetlands with their surrounding ecosystems. Time is not on our side. Perhaps the most important action we can take is to raise the awareness that preservation of wetlands holds the key to the future of the state and may rank higher than other efforts to reclaim the Bay.

Al Tucker,
President
Who will forget the “Snowmageddon/Snowpocalypse” winter of 2009/2010? Regardless of whether you loved or hated all that snow, it was a boon to the aquatic animals that depend on seasonal, or vernal, pools. These ephemeral wetlands are fascinating places to research and explore. So, what exactly is a vernal pool and why should we care? In the simplest terms, a vernal pool is a type of pond that dries out periodically, has no fish, and supports the breeding of specially adapted amphibians and invertebrates (obligate species). Vernal pools provide ecological services: they are important breeding habitat, have a unique invertebrate community, and support aquatic and terrestrial food webs.

A Vernal Pool Primer

Excerpt from: An Introduction to Mid-Atlantic Seasonal Pools by Lesley J. Brown and Robin E. Jung

The availability of the vernal pool habitat varies widely from season to season and year to year because they dry out. The animals that use this habitat have developed behavioral, physiological, or structural adaptations that allow them to survive and reproduce in this highly dynamic environment. They can be divided into three categories: migratory breeders, non-breeding migrants, and permanent residents.

Migratory breeders live elsewhere as adults; travel to the pools to reproduce, and then depart. Four obligate amphibian species occur at Jug Bay: Marbled Salamander, Wood Frog, Spotted Salamander, and the Eastern Spadefoot Toad. A number of other amphibians may also breed in these pools, but are facultative species. Some insects migrate to the pools as well, including caddisflies, predaceous diving beetles, backswimmers, and water boatmen. Non-breeding migrants visit the pools for feeding, rather than breeding. These species include some aquatic insects, turtles, snakes, birds, and mammals.

Permanent residents do not spend significant time away from the vernal pool habitat. They are capable of withstanding drying and extreme temperature changes because of physiological and behavioral adaptations. Some beetles, fingernail clams, and other invertebrates aestivate (go dormant) in the sediment during the dry or winter seasons. Flatworms, mosquitoes, beetles, and the distinctive crustacean fairy shrimp (Order Anostraca), survive pool drying as eggs or cysts that hatch when the pool floods again.

A Short History of Vernal Pool Research in the Sanctuary

As part of our herpetofauna study, in 1988 three sites were established to capture reptiles and amphibians using drift fence and pitfall buckets. We captured 21 species using these techniques and learned that Marbled Salamander, Wood Frog, and Spotted Salamander were the most abundant.

By 1994 the study area had expanded to five sites in order to learn more about the breeding and migration of Marbled and Spotted Salamanders. One site was abandoned in 1996 due to low capture rates, but we collected data at the other four sites in the spring and fall from 1994 to 1998. We learned that Marbled Salamanders peak migration occurs in mid-September with evening rainfall, males tend to arrive first and leave quickly, and females tend to remain at the vernal pools longer. The mass migrations of Spotted Salamanders that have been reported by other researchers were not observed here and based on trapping data and other observations Marbled Salamanders were clearly more abundant.

Volunteers continued to collect data on the fall migration of Marbled Salamanders at three sites through 2007. Naturalist Karyn Molines and volunteer Pete Uimonen have summarized the data from this study and are preparing to publish the results in a herpetological journal.

Vernal Pool Research in the 21st Century

Building on what was learned from previous studies, the Sanctuary’s vernal pool research continues to evolve. Habitat
availability varies from year to year and we use new research techniques, adding to our body of knowledge. In Table 1 you can see that in three of the past 12 years, the pools were dry in the spring. This may seem catastrophic for the obligate amphibian species that were unable to breed 25% of the time. However, these amphibians are adapted to the ephemeral conditions of their breeding habitat, do not need to breed every year, and can live up to 20 years. If this year is dry, there is always next year!

In the spring of 2000, new branches of vernal pool research emerged. A property expansion gave us access to manmade “rut” and “quarry” pools along the Upper Railroad Bed trail which were surveyed in 2000 and 2001. Using baseline maps created from April surveys, volunteers tracked multiple pools throughout the spring and summer to record egg masses, larval amphibians, pool depth, and pool area. In addition, Marbled Salamander larvae were captured in 2001 and 2003 using small mesh bags stuffed with leaves (leaf packs) to measure their growth.

Table 1: Summary of springtime vernal pool research efforts from 2000 to 2011.

<table>
<thead>
<tr>
<th>Year</th>
<th># Pools Surveyed</th>
<th>Research Technique</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>14</td>
<td>Visual Surveys: Egg Masses, Larvae, and Hydrology</td>
</tr>
<tr>
<td>2001</td>
<td>11</td>
<td>Visual Surveys: Egg Masses, Larvae, and Hydrology; Leaf Packs: Marbled Salamander Development</td>
</tr>
<tr>
<td>2002</td>
<td>0</td>
<td>DRY SPRING</td>
</tr>
<tr>
<td>2003</td>
<td>3</td>
<td>Leaf Packs: Marbled Salamander Development; Intern Study; Teen Herp Search</td>
</tr>
<tr>
<td>2004</td>
<td>1</td>
<td>Teen Herp Search</td>
</tr>
<tr>
<td>2005</td>
<td>1</td>
<td>Breeding Study: Spotted Salamander Migration, Egg Masses, Larvae; Teen Herp Search</td>
</tr>
<tr>
<td>2006</td>
<td>0</td>
<td>DRY SPRING</td>
</tr>
<tr>
<td>2007</td>
<td>1</td>
<td>Breeding Study: Spotted Salamander Migration, Egg Masses, Larvae; Using GPS to Track Hydrology</td>
</tr>
<tr>
<td>2008</td>
<td>4</td>
<td>Using GPS to Track Hydrology; Transect Surveys: Egg Masses, Larvae and Depth; Visual Surveys: Eastern Spadefoot Development</td>
</tr>
<tr>
<td>2009</td>
<td>0</td>
<td>DRY SPRING</td>
</tr>
<tr>
<td>2010</td>
<td>12</td>
<td>Adopt-a-Pool Surveys: Egg Masses, Larvae, and Hydrology; Using GPS to Track Hydrology; Transect Surveys: Egg Masses, Larvae, and Depth</td>
</tr>
<tr>
<td>2011</td>
<td>15</td>
<td>Adopt-a-Pool Surveys: Egg Masses, Larvae, and Hydrology</td>
</tr>
</tbody>
</table>

With the acquisition of the Glendening Nature Preserve (GNP), new pools became available for investigation. In 2003 two pools were surveyed by intern Sarah Glatt, and by teen volunteers conducting a Herp Search. Obligate amphibians were found in both pools. Research at the largest (Forest) pool has continued. Heavy summer rains in 2003, 2005, 2007, and 2008 spurred the explosive breeding of Eastern Spadefoots. Also, a migration and breeding study of Spotted Salamanders was conducted in 2005 and 2007.

Vernal Pools and Hydrology

We are now using GPS technology to track the area of large pools in conjunction with depth measurements. In 2008, volunteer and Scientific Advisory Board member Dr. Jeff Campbell worked with staff to develop a transect system for the Forest Pool to randomize dipnetting surveys and to collect depth data from multiple points. Though the transects are difficult to maintain, GPS tracking continues and depth measurements from a permanent grid pole (# 530-S near the deepest point in the pool), will provide enough data in the coming years for area-to-volume analysis.

Another way we examine hydrology is by employing a variation of the U.S. Geological Survey’s “water year” to better understand the surface-water supply to our

Continued on page 6
study pools. Graph 1 shows the cumulative precipitation between October and April, as measured by total monthly rain and snow fall from our weather station. In the winter of 2001/2002 precipitation was low, and we had a dry vernal pool season the following spring. In the winter of 2009/2010 there was record snow fall and full vernal pools the following spring. The middle line is the mean of the other precipitation between fall 1999 to spring 2011; some years the pools filled in spring, some years they did not.

Recent Discoveries

This brings us back to those blizzards of winter 2009/2010. After the record snow fall came record snow melt. Using the rut/quarry surveys of 2000 and 2001 as a model, volunteers adopted one or more pools to monitor for the season. We documented use of the pools by the four obligate amphibians and we estimated their abundance with egg mass counts and dipnetting surveys. We also monitored hydrologic changes by mapping pool size, recording depth and taking water chemistry measurements. We learned that pool size and species abundance in spring 2010 was comparable to spring 2000, but that five of the original 13 pools had disappeared.

We continued and expanded the Adopt-a-Pool project in spring 2011. Volunteers began measuring the total length of larval obligate species. By monitoring growth rates of amphibians in different pools we can compare productivity between pools. Though all our pools share the key characteristics of periodic drying, no fish, and supporting breeding of specially adapted animals; some are semi-permanent. Exploring the pros and cons of different pool features as they relate to the reproductive success of obligate amphibians is a goal. Graph 2 shows Marbled Salamander growth rates from two 2011 sites and 2003 data from the Wet Forest Leaf Pack study.

Looking at species presence in Table 2, the Eastern Spadefoot Toad is under-represented. Their sporadic breeding habits are such that they are rarely recorded during the spring breeding season. Additional, and spontaneous surveys are required to adequately document this species.

The most striking discovery has been the contrast between Spotted Salamander egg masses and larval captures. During the 2005/2007 Forest Pool study, dozens of egg masses were counted, but only two larvae were found. In the 2000/2001 study, 10 of the 14 pools surveyed contained egg masses yet no larvae were found. In the 2010/2011 study, all 18 pools surveyed contained egg masses, but larvae were found in only six pools. Interestingly, in five of the six pools where spotted larvae were captured no marbled larvae were captured, and in the sixth, only two marbled larvae were captured. Our data suggests that predators may limit the reproductive success of Spotted Salamanders at Jug Bay.

Researching vernal pools is much like the pools themselves. Data collection has been ephemeral with some years bearing little data and others a wealth. Never knowing what the weather will be each year, some of our best laid plans have been scuttled because the pools never filled. This spring however, we are sure to have a successful vernal pool season. The pools have been filled for months, and Marbled Salamander larvae have been in some pools since December.

We’ve received wonderful feedback from participants about all the aquatic life they see and the challenging fun of measuring wriggling salamander larvae. If you would like to learn more about these fascinating habitats, the creatures they contain, and how you can help us study them, join us for our Vernal Pool Research Field Days: Saturdays, March 3 and 17; 10:00 am - 3:00 pm.

Table 2: Summary of obligate amphibian presence at pools surveyed in 2000/2001 and 2010/2011.

<table>
<thead>
<tr>
<th>Year</th>
<th>Study</th>
<th># Pools Surveyed</th>
<th>Spotted Salamander egg masses</th>
<th>Wood Frog egg masses</th>
<th>Marbled Salamander larvae</th>
<th>Wood Frog tadpoles</th>
<th>Spotted Salamander larvae</th>
<th>Spadefoot Toad tadpoles</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000 - 2001</td>
<td>14</td>
<td>10</td>
<td>1 - 2</td>
<td>5</td>
<td>4 - 5</td>
<td>0</td>
<td>1 - 2</td>
<td></td>
</tr>
<tr>
<td>2010 - 2011</td>
<td>18</td>
<td>18</td>
<td>9</td>
<td>9</td>
<td>9</td>
<td>6</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>
Birdwalk
First Saturday of each month; 8:00 - 11:00 am
Learn the skills of identifying birds by sight and sound. Experience the amazing bird diversity of the Sanctuary. Binoculars and field guides are available to borrow. Not appropriate for children younger than 12.

Bird Migrations
Saturday, Mar 3; 9:30 am - noon
Where do they go in winter? Join Sanctuary naturalist Emma Boyer to learn about bird species found in summer at the Sanctuary and where they go in winter. The talk will be followed by a hike to search for early birds returning to our area. For adults and children 12 and older.

Friends of Jug Bay Annual Meeting
Sunday, March 18; 2:30 - 5:00 pm
Please join us for our annual meeting, to be held at the Sanctuary’s McCann Wetlands Center. Preceding the business meeting, there will be a variety of sweet and savory finger foods to enjoy with fellow Friends and Sanctuary supporters. The Jug Bay Award will be presented to Greg Lewis, manager of Patuxent River Park. Please RSVP to http://www.friendsofjugbay.org/events.html

Equinox Hike
Saturday, Mar 24; 5:00 - 7:30 pm
Join a volunteer naturalist for an exploration of the Sanctuary to celebrate the coming of Spring. Look and listen for signs of new life which is exploding all around us. We’ll end on the Marsh Boardwalk and watch the sunset over the Patuxent. For ages 10 and up.

Herp Atlas Survey Orientation
Saturday, Mar 31; 1:00 - 4:00 pm
Assist with the Maryland Amphibian and Reptile Atlas Survey, a 5-year project to map the distribution of all amphibians and reptiles within the state. Participants will learn about Herp Atlas procedures and search and identification techniques, which will enable them to expand their activities to other areas. Participation is limited to 10 people, aged 10 and older. Registration is required. Meet promptly at the Wetlands Center.

Big Tree Hike
Saturday, Apr 14; 10:00 am - 1:00 pm
We will visit some of the oldest trees in the Sanctuary, give them a hug, and measure their diameter. We’ll compare our measurements with earlier data recorded during our forest ecology study. We will also learn about the benefits native trees provide to us and to the forest ecosystem. Meet at the Plummer House.

Soup and Science: How Can We Help the Monarch Butterfly?
Sunday, Apr 15; noon - 3:00 pm
Enjoy a variety of hearty home-made soups, then enjoy a presentation on the fascinating life of the Monarch butterfly. Educator Sean McQuinn will discuss the butterfly’s life cycle and migration habits, threats to its over-wintering habitat in Mexico, conservation methods, and the work that Anne Arundel County students are doing in the Monarch program at Arlington Echo. Please RSVP to http://www.friendsofjugbay.org/events.html

Continued on page 8
Our Blood Runs Cold . . .
(for students entering 7th or 8th grades in Fall 2012)
Monday, Jul 9 – Friday, Jul 13
9:30 a.m. - 3:30 p.m.
Fee: $150 ($130 FOJB members)
...or so they say. Discover what it means to be an ectotherm (cold-blooded animal), as we investigate the lives of reptiles, amphibians, fish, insects and spiders. Seining for fish in the marshes and river and exploring the ponds for salamanders and frogs will take us to the habitats where many animals are found. Canoeing on the Patuxent River, we’ll search for turtles and water snakes. During the Thursday overnight campout, we’ll enjoy a chorus of frogs on our Night Hike.

Reptiles and Amphibians
(for students entering 5th or 6th grades in Fall 2012)
Monday, Jun 25 - Friday, Jun 29
9:30 a.m. - 3:30 p.m.
Fee: $150 ($130 FOJB members)
Turtles, lizards, snakes, frogs, toads and salamanders will be the stars of this program. We’ll investigate the differences and similarities between reptiles and amphibians. Each day we will explore a different habitat. We’ll search ponds for tadpoles as we learn about the life cycles of frogs, toads, and salamanders. A canoe trip, overnight camp-out on Thursday, and a nocturnal Herp Hike are highlights of the camp. Art projects, games and experiments will enhance our daily activities.

Explore the Patuxent:
Teen Leadership Paddle
(for students entering 9th – 12th grades in Fall 2012)
Monday, Jul 16 – Friday, Jul 20
Monday, Aug 6 – Friday, Aug 10
Fee: $200 ($175 for early registrants and FOJB members)
Explore the Patuxent is a five-day (with 3 nights camping) canoeing expedition geared towards high school students. We’ll paddle up some of the smaller branches of the river to look for beavers, birds, and flowering wetland plants. Please arrive promptly at the starting time. Bring plenty of water, sunscreen, a lunch, and shoes that can get wet. Children must be at least 7 years old and accompanied by an adult.
To reserve a space, mail your payment of $10 per person (including FOJB) in advance to the Sanctuary with completed registration form (www.jugbay.org/education).
Little Patuxent Oxbow Field Trip
Saturday, May 19; 10:00 am - 3:00 pm
Spend the day exploring this fascinating natural area east of Laurel. We’ll learn about the Oxbow Lake Nature Preserve from some of the residents that helped get it protected while hiking along the wetland edge to see birds, aquatic animals, blooming mountain laurel, and more. Pack a bagged lunch. For adults and families with children at least 10 years old. A carpool will leave from the Sanctuary at 9:00 am, or call for directions. No fee.

The Lives of Amphibians and Reptiles
Evening lectures: Tuesdays, Jun 5 and 12; 7:00 - 9:00 pm
Field Trip: Saturday, Jun 16; 9:00 am - 1:00 pm
Leader: Chris Swarth
This short course covers the life history strategies and ecology of local reptiles and amphibians. A field trip will let us explore Sanctuary habitats to search for and observe many of the 40 species found here. For adults and teens. Advanced registration required. $25/person fee. Download a form at www.jugbay.org/education

Wetlands Scavenger Hunt
Sunday, June 10; 10:00 am – noon
Join a scavenger hunt along the marsh boardwalk! Test your ability to find plants and animals in the wetlands. Ages 5 and older. Patuxent River wetlands. We’ll paddle up some of the smaller branches of the river to look for beavers, birds, and flowering wetland plants. Please arrive promptly at the starting time. Bring plenty of water, sunscreen, a lunch, and shoes that can get wet. Children must be at least 7 years old and accompanied by an adult. To reserve a space, mail your payment of $10 per person (including FOJB) in advance to the Sanctuary with completed registration form (www.jugbay.org/education).

Upcoming Volunteer Events

Vernal Pool Research Field Days
Saturday, Mar 3; 10:00 am - 3:00 pm
Saturday, Mar 17; 10:00 am - 3:00 pm
Join us for a day in the field exploring the temporary ponds where wood frogs and salamanders breed. Participants will learn about vernal pool ecology and how to participate in our Adopt-a-Pool research project. For adults and families. Free entrance.

Workshop: Graphs and Charts and Stats, Oh My!
Saturday, Mar 10; 10:00 am – 2:00 pm
Leaders: Chris Swarth and Marilyn Fogel
You might think that collecting field data is more fun than interpreting data. Join us for a workshop where we’ll show you that it can also be fun, and perhaps even more rewarding, to graph and analyze data. We’ll provide plenty of Jug Bay data for you to learn how to play with numbers and to enjoy new findings. This workshop is geared towards volunteers (and all others with an interest) who help with Sanctuary research studies. And we promise... no quizzes!
Advanced registration required. $12.50/person fee (lunch provided). Download a form at www.jugbay.org/education

CBNERR Wetland Research - SETs
Weekdays between Monday, Mar 19 - Friday, Mar 30
Our partners with the Chesapeake Bay National Estuarine Research Reserve will be conducting field work during this block of time. The research involves measuring the Sediment Elevation Tables (SETs) at fixed locations in the marshes here at Jug Bay, and at Monie Bay on the lower eastern shore. This allows us to track sediment erosion and accretion levels over time. Please contact Lindsay Carroll if you would like to participate 410-260-8724 or lcarroll@dnr.state.md.us

Marsh Cleanup
Saturday, Mar 31; 9:00 am - noon
Hill’s bridge at Route 4 is a popular location for fishing and paddlers to put-in. It is also full of trash from misuse. Help us send a positive message to users of the area by cleaning up the riverside. Wear shoes that can get muddy. Bring thick work gloves if you have them. All ages welcome. Meet at Patuxent Wetland Park on the north side of the bridge. Get directions at: www.jugbay.org/visit_us/directions

Become a Canoe Guide
Sunday, Apr 1; 2:00 – 4:00 pm
This workshop will be a land-based training for volunteers to lead canoe trips at Jug Bay. It will cover volunteer responsibilities, canoe safety, and paddling techniques, canoe routes, marsh ecology, and an overview of Sanctuary policies. Volunteers must have canoeing experience. For adults or older teens.

Stream Monitoring
Saturday, Apr 21; 10:00 am – 3:00 pm
Join us to learn about stream ecology and assist with our research, focused on three streams flowing through the Sanctuary. We’ll hike to the stream, sample for stream insects, then bring them back to the Wetlands Center to sort and identify them by noon. Stay for the afternoon sort and ID session as long as you can. For teens and adults.

Canoe Trip for Canoe Guides
Saturday, Apr 28, 9:00 am – 1:00 pm
This trip is a follow-up for participants in our canoe guide training, and for existing canoe volunteers. We will take a trip up river and through some of the marsh channels to see the varied habitats and life if the spring wetlands. Dress for the weather and bring a snack. Call 410-741-9330 to register.

Fish Survey
Saturday, Jun 2; 10:00 am – 3:00 pm
Using a seine net, we monitor the fish populations living in streams and wetlands. Volunteers willing to get wet are needed to help catch, identify and measure (and then release) fish. Wear old shoes that tie tightly and clothes that can get wet and muddy. Bring a bag lunch, change of clothes, shoes and a towel. Surveys will be rescheduled if it rains. For teens and adults.

To participate 410-260-8724 or lcarroll@dnr.state.md.us

Leaders: Chris Swarth and Marilyn Fogel

\[9\]
Volunteer Statistics:

Joe Acton
Liv Averill
Sandy Barnett
Jimmy Beadenkopf
Susan Blackstone
Dick Blas
Cynthia Bravo
Mark Brady
Jeff Campbell
Amanda Carlacci
Karen Caruso
Kathy Chow
Regan Christian
Harry Coulombe
Lynne Cush
David Davis
Fae Davis
Mara Day
Cathryn Dippo
Ben Doody
Pat Durbin
Linda Ebersole
Kathy Ellett
Kim Elliot
Kirsten Enzinger
Dave Farr
Cheryl Fellenz
Jack Filigenzi
Jean Filigenzi
Lee Fisher
Bobby Francisco
David Gallum
Joyce Gillespie
Sam Glover
Diane Goebes
Ernie Goins
Christine Gordon
Jim Harle
Ben Hollister
Stan Hopkins
Chris Howard
Katrina Hrabinski
Vincent Hrabinski
Matthew Keeling
Dave Larrabee
Elizabeth Leipold
Daniel Lind
Eric Lind
Matthew Lind
Alec Loudermilk
Andrea Loudermilk
Cliff Loudermilk
Erica Loudermilk
Sean McGuinn
Bill Miles
Louise Miles
Dave Mozurkewich
Anne Muecke
Manfred Muecke
Dotty Mumford
Chelsea Nevius
Sue Nugent
Stobhan Percey
Bryan Perry
Dave Perry
Tom Penska
Matthew Phipps
Michael Quinlan
Olaf Rask
Luke Rehr
Gordon Reynolds
Anna Schollenberger
Ken Shallop
Jeff Shenot
Lisa Siciliano
Les Silva
Bob Smith
Rob Steinberg
Sandy Teliak
Nora Terres
Matthew Tomitz
Denny Townsend
Al Tucker
Peter Uimonen
Sara Van Schaik
Van Vogel
Nancy Weber
Bruce Weidele
Bob Williams III
Sea Williams
Bill Wilson

During the winter, volunteers logged 767 hours. A contribution worth over $17,000.

Thank You!

Donations:

- **Kirsten Enzinger**: flowers and shrubs for the butterfly garden.
- **Karen Caruso**: electric kettle.
- **Jack & Jean Filigenzi**: renewing our Flickr subscription.
- **John Funk & Elaine Fitsimmons**: *Bird of North America* life histories of 405 species.

**Pindell Clean-up**

In January, volunteers Mike Quinlan, Bob Williams, and Sandy Teliak took it upon themselves to clean up the lower floodplain of Pindell Branch.

Day 1: The most common items found were ESSO Motor Oil cans, probably 50 of them. A total of five bags of trash and nine tires, one still on the rim, were removed and properly disposed of.

Day 2: The clean-up continued with six trash bags of bottles and cans, cinder blocks, a rusted auto gas tank, steering wheel, and seats. Also found was one of the missing grid poles, likely 509-U; it was remarked and replaced.

We thank you for your proactive volunteer work!
A frequently discussed topic at the Sanctuary is the problem of invasive species. We try to control many invasive species such as Japanese Honeysuckle, Oriental Bittersweet, and resident Canada Geese, along with numerous other offenders. There is another group of organisms that plays the role of invader but is easily overlooked: pathogens. A pathogen is an infectious agent and includes microbes and microorganisms such as a virus, bacterium, prion (ex. “mad cow disease”), or fungus that causes disease. Many alterations to the global environment; such as high speed trade and travel, climate change, and urbanization, facilitate the introduction and spread of invasive pathogens. West Nile Virus (WNV) is one such pathogen. Introduced into the United States in 1999, it had spread across the country by 2003. Its wide ranging outbreaks have taken their toll, infecting approximately 1.8 million people and killing over 1,300. WNV has also killed millions of birds. Though not often classified with Kudzu and carp, WNV is a prime example of an invasive species causing an immense impact on an ecosystem, with major economic and public health consequences.

Dr. Marm Kilpatrick, an ecologist at the University of California, Santa Cruz, is one of the lead researchers studying WNV and bird populations in the U.S. His team has a long-term study area in the south part of the Sanctuary. His crew captures and draws blood from dozens of songbirds every year and their mosquito trapping has documented an impressive 18 species in the Sanctuary.

In a recent article in Science Magazine (2011), Dr. Kilpatrick summarized the history of the WNV invasion and our knowledge about this disease. He states that three key findings provide insight into this type of pathogen introduction. “First, WNV transmission in North America is highest in urbanized and agricultural habitats. Second, after its introduction, the virus quickly adapted to infect local mosquito vectors more efficiently that the originally introduced strain. Third, highly focused feeding patterns of the mosquito vectors of WNV result in an unexpected host species being important for transmission.”

WNV is in the same family as dengue fever, Japanese encephalitis and yellow fever. It is endemic to tropical Africa, Southern Asia, and northern Australia but has made episodic appearances in Europe. Knowledge of the ecology of the virus in its native range was very useful as a basis for predicting and studying the traits of outbreaks in the U.S. When studying a viral epidemic, scientists must define characteristics of the virus and its transmission in a specific area, and determine the vectors (how the virus moves between hosts) and the hosts.

Incidence of human WNV infection is correlated with urbanization and agriculture. This follows the trend of other pathogens linked with anthropogenic effects on an ecosystem. For example, vectors and hosts can be more common in fragmented habitats, or the virus can be transmitted by
domestic and human-commensal species, or, human-tolerant wildlife. Many pathogens like rabies, H5N1 avian influenza, and lyme disease are linked to altered systems and therefore often pose a threat to humans.

The strain of WNV first discovered in 1999 was similar to one that had been circulating in Israel in 1998. Therefore it is likely that the Israel strain is the source of our invasion. In situations where there is no shared evolutionary history, rapid co-evolution is expected between the virus, the vectors, and the hosts. The original NY99 strain has adapted to a more efficiently transmitted strain, WN02. Our locally evolved genotype differs in three nucleotides, which results in one amino acid change. Between 2002, when WN02 was discovered, and 2004 it completely displaced the original.

In the U.S., two of the more important mosquito vector species are among the same species that carry the virus in its original home range. They have been identified as both the enzootic vector (bird to bird) and the bridge vector (bird to human). Both species get the majority of their meals from birds and have been shown to take less than 15% of their meals from humans. It was previously thought that the bridge vector would be a mosquito species that was more anthropophilic but integrated analysis of several factors indicated Culex pipiens and C. restuans were responsible for the majority of human infection. They were more abundant and had higher WNV infection prevalence in many of the outbreak areas.

When discerning the avian host one could not simply examine abundance and host-infectiousness which would implicate House Sparrows and crow spp. Further investigation found that mosquitoes fed on neither species regularly relative to the birds' abundance. Between 30% and 80% of feedings by WNV key mosquito vector species are on the American Robin (Turdus migratorius)! Thus, while robins make up only 1% to 20% of the studied avian communities, this species becomes a major player in WNV transmission in the U.S. This focused feeding on robins amplifies the intensity of transmission of the virus. Over the past 25 years, robin populations have increased by 50% to 100% because they flourish in human-altered environments. It is interesting to consider whether the WNV transmission dynamics would have been different had robin populations not expanded.

While we may be struggling with other invasive species, there is some good news when it comes to WNV. During Kilpatrick’s studies here and at nearby rural locations, all the mosquitoes that were trapped tested negative for WNV and they found very low occurrences of birds with WNV antibodies. It is exciting to know that the Sanctuary and its bird and mosquito populations are contributing in a major way to our understanding of disease transmission.

Acknowledgements

As always, our projects are greatly enhanced by volunteer participation. The following people participated regularly in vernal pool research between 2000 and 2011:

Marion Alley, Sarah Alley, Andrew Bofto, Marie Brady, Broadneck High School National Honors Society, Gordon Burton, Mary Burton, Cassie Bushong, Jeff Campbell, Harry Coulombe, Sandy Curry, Indigo Diggs, Niko Diggs, Nile Diggs, Phoenix Diggs, Eric Duce, Erik Eagle, Kim Elliott, Adam Fee, Evan Fee, Robert Frezza, Rosemary Frezza, Lynette Fullerton, Alice Hall, Darcy Herman, Jean Kapusnick, Diane Leason, Nicole Lyddane, Steven Lyddane, Clara Mankowski, Joe Mankowski, Madeline Mankowski, Dave Mozurkewich, Amy Narimatsu, Ed Peckham, Siobhan Percy, Mark Priest, Mike Quinlan, Juanita Robinson, Yuka Tasumi, Sandy Teiak, Rita Thaxton, Pete Uimonen, Bob Williams, Owen Wood, Susan Wood.

Top Right: Sarah Alley examines her catch. Bottom Right: Larval Marbled Salamanders in the measuring tray. They have feathery external gills behind their heads that shrink as their lungs develop.
To learn more about forest restoration...

Botanist Charlie Davis leads stimulating classes and field trips. Entomologist and naturalist Nick Spiro was an enormous help as I searched for solutions. Nick, Charlie Davis and Joe McSharry all lead field trips for the Maryland Natural History Society (marylandnature.org). Researchers Patrick Brose and Susan Stout (US Forest Service’s Warren Pennsylvania Center) have a technical book on oak regeneration, and Stout has a well-documented website on deer and forests (www.fs.fed.us/ne/warren/prob1.htm). David deCalesta’s work on forest recovery at Kinzua is in its own class. To understand native forest wildflowers, hear Smithsonian botanist Dennis Whigham.

National Geographic society has the best video on this subject, Predators. The first DVD includes the history of elk damage, followed by wolf reintroduction, at Yellowstone National Park and the research there by ecologists William Ripple and Robert Beschta. The research paper on their Zion National Park study is a classic. They showed how predators’ impact on mule deer populations can save an entire ecosystem, including streams, wildflowers, butterflies, toads, and frogs.

lot of deer damage to nearby gardens, the cause becomes clear. The key question is, where are the deer coming from, and what can we do to save those habitats?

You can learn how to tell oak saplings from those of maples, hickory, and beech; it becomes easy. Asking experienced gardeners is fun.

Solutions: we can solve these problems when we recognize that the land is out of balance. It is up to us to save habitats. At each place we can ask how and where to restore predation. The laws in Maryland have changed substantially to make hunting more effective in parks. At some places, a tall fence prioritizes management (a rare skill!) and hand pulling for the other 10%. A very useful booklet is Jill Swearingen’s Plant Invaders of Mid-Atlantic Natural Areas, updated, available through the Maryland Native Plant Society. Once you know the name of an invasive plant, good summaries of effective control methods are at a National Park Service website www.nps.gov/plants/alien/factmain.htm

The Maryland Native Plant Society

“We can solve these problems when we recognize that the land is out of balance. It is up to us to save habitats.”

(www.mdflora.org) has dozens of great field walks and talks each year, and nice people. Audubon Naturalist Society (www.audubonnaturalist.org) has a remarkable list of activities. Of course the Sanctuary has a great staff and a good calendar of events too.

Two outstanding books: Aldo Leopold’s, A Sand County Almanac is thought-provoking. Douglas Tallamy’s Bringing Nature Home: How You Can Sustain Wildlife with Native Plants, has been updated and expanded and is full of color photographs of his property in Delaware. It has a good scientific base and describes how and why to choose garden plants.

6. How did you become so interested and involved in forest ecosystem restoration?

On a herp search I got hungry walking in the woods. Even though it was early summer, there was nothing to eat… no berries and nothing soft. If people stayed there, they would starve! I thought of the American Indians who lived and found food in these woods for 10,000 years. The culprits were obvious: there were many deer hoof prints in the soft soil. The Native Americans and other top predators had effectively prevented the deer from irrupting and destroying the habitat for all the other species. This began my concern over the health and future of our forests.

When I hiked through the woods I slowly realized that I could hardly ever find oak seedlings or saplings under six feet tall. Even in forests that I knew very well, I could only find one, then a second, and finally a third. There should have been thousands of seedlings, but there were only three. At the Sanctuary, oak seedlings are so uncommon that when at last I found a few, I took notes about them. The next year they were gone. The Sanctuary woods are stripped and most of the understory is gone except for the most spiny and toxic plants.

I’m a solution-oriented person. Teaching reinforces my optimistic approach to problems. First ask, What are plausible solutions? Second, can we outline the advantages, drawbacks, and limitations of each solution. This gives us a good basis for choosing how to act. Many people are aware that something is wrong with our forests. When we learn how to look closely at forest, and we learn what restoration methods work, then we can act to bring our forests back.
Take a Closer Look…
Mantids

Elizabeth Ahmann, Volunteer Contributor

Jug Bay is fortunate to be home to two types of “praying mantids,” so-named for their fore legs that bend, looking like arms folded in prayer. The Carolina mantis (Stagmomantis carolina) and the Chinese mantis (Tenodera sinensis) are relatively large, though slender and elongated, insects - with mobile triangular heads, prominent compound eyes, and threadlike antennae. They are able to grasp and hold prey in their long, spiny forelegs, and stand, walk and jump using their long middle and hind legs. First described in writing in 1763, Carolina mantids are native to the Southern U.S., while Chinese mantids have been naturalized in the U.S. since at least 1896 when they were imported to help with pest management.

Both types of mantids live from summer to early fall in meadow and garden habitats, among herbs, flowers and low shrubs. Their compound-eyed heads give them a wide visual range; their middle and hind legs can hold them quite still on branches; and their fore legs can grasp prey rapidly, even faster than a fly can bat its wings. These abilities, and their camouflage colors, make mantids excellent ambush hunters. Both the Chinese and Carolina mantids are voracious carnivores, eating butterflies, moths, flies, wasps, bees, other mantids (females sometimes cannibalize the males during the mating process), as well as caterpillars. The larger Chinese mantids also have been known to eat small frogs, lizards and even hummingbirds!

Mantids protect themselves from predation by birds and bats through camouflage, concealment, and – when threatened directly – by standing tall and fanning out their wings. They may also pinch with their fore legs in self defense.

Beyond Jug Bay, Carolina mantids can be found from New Jersey south to Florida; west to Utah, Arizona, and Texas, and through Mexico to Central America. While Chinese mantids originally had a limited range in the U.S., they are now widespread due to ready commercial availability of their egg cases.

To distinguish the two types of mantids, look carefully at their size, color, and wings. The Chinese mantis is the longer of the two at 2.5 to 3.2 inches. It is tan to pale green in color, with tan fore wings edged with green along the front margins. The Carolina mantis is no larger than 2.4 inches long, is pale green to a dusty brownish gray in color, and has shorter wings, especially in females, that do not extend the full length of the abdomen.

The two mantids can also be distinguished by their oothecas, or communal egg cases, overwintering on stems of plants or tree twigs. The oothecas of the Chinese mantids, holding up to 200 eggs each, are roundish in shape and a bit smaller than ping pong balls; sometimes one overlaps another. In contrast, oothecas of the Carolina mantis, containing just 30-80 eggs each, are elongated and more slender. These oothecas are tan, coated with a dried frothy material to provide protection from birds, and are sometimes confused with the darker, harder egg case of the Eastern tent caterpillar. When the mantid nymphs have hatched in the spring, the front of either mantid’s ootheca looks ridged like tiny Venetian blinds.

The larger, more bulbous Chinese mantis egg case is more easily spotted than the native Carolina.

So, depending on the season, take a closer look for mantid oothecas (winter/spring) or the Chinese and Carolina mantids themselves (summer/early fall) to appreciate these fascinating insects.

Editor’s Note:
The inspiration for this article came from the Pine Barrens at the Glendening Preserve, where oothecas were plentiful this winter. Over 100 Chinese mantid egg cases can be seen attached to the twigs of small sweetgums. In contrast, only three Carolina egg cases were found in the same area.
My time with CBNERR-MD has enabled me to do a variety of activities within education and stewardship. I work directly with Department of Natural Resources staff and rotate between the three Reserve components helping employees at the sites. I am learning a lot!

My work in education has been diverse: I have been trained at Jug Bay Wetlands Sanctuary in the outdoor classrooms program, learning to lead activities which range from water quality testing to forestry education. I have also helped teach at the Monie Bay site, assisting with a predator/prey simulation game during Wetlands & Wildlife Field Day where all the fourth grade students in Somerset County come for an outdoor education day. I have communicated with the Aquatic Resource Education team at DNR to organize Project WET, WILD, and Learning Tree trainings and will be attending the facilitator training to become a certified teacher of programs. I am assisting in the organization and implementation of the Data & the Estuary teacher training workshops and Patuxent Teen Paddle. I represent the Reserve with exhibits at the Maryland Association for Environmental & Outdoor Education conference in Ocean City and the Maryland Green Schools Youth Summit. I am also assisting with Education Coordinator Coreen Weilminster and Reserve component staff to update existing education programs by aligning them with appropriate Maryland State Curriculum.

In the stewardship sector I have assisted Chris Snow, Stewardship Coordinator with deer management. I have also scheduled the 2012 monitoring programs: secretive marsh birds, bay grasses, reptiles and amphibians, larval and juvenile fish, and benthic macroinvertebrates. I am helping with a Quality Assessment and Quality Control of the land use/land change labels on the GIS map of the three reserve components. Another project is to help promote the visibility and transfer of information about the Reserve and translate pertinent scientific information to a variety of audiences, including volunteers and other citizens.

I also have my own capstone project. I will be merging education and stewardship to create a rain garden at Somerset Intermediate School. Students will learn about rain gardens through a video I will be creating, followed by a hands-on soil lab that I wrote to help the students determine the best location for their garden. Their stewardship will involve them helping with the design for the rain garden and doing some manual labor planting the garden with me.

I have been learning a lot about CBNERR as a whole, how the program compliments the Department of Natural Resources, and how it works with county partners. Being able to collaborate with multiple organizations has shown me how important partnerships are and I hope to continue developing strong partnerships in future careers.

For the past five months, The Chesapeake Bay National Estuarine Research Reserve-MD has had the privilege of being a host site for a new and progressive initiative in Maryland. The Chesapeake Conservation Corps initiative, a program that provides service learning opportunities and green job training for young people through environmental and energy conservation projects is supported by Constellation Energy, the Chesapeake Bay Trust, and the State of Maryland. Please meet Stephanie Fischer, a 2010 graduate of the University of Maryland, College Park (BS, Biology), and a native of Philadelphia, Pennsylvania.
Friends of Jug Bay Annual Meeting
Sunday, March 18; 2:30 – 5:00 pm

Please join us for our annual meeting to be held at the Sanctuary’s McCann Wetlands Center. Preceding the business meeting, there will be a variety of sweet and savory finger foods to enjoy with fellow Friends and Sanctuary supporters. At the meeting, we will elect new officers and board members for the Friends of Jug Bay and learn about the accomplishments of the Friends and the Sanctuary over the past year. Also, the Jug Bay Award will be presented to Greg Lewis, manager of Patuxent River Park.

Dr. Julie Schablitsky, Chief Archeologist for the Maryland State Highway Administration, will be our keynote speaker:

“Exploring the Scorpion”

This year marks the bicentennial of the War of 1812 when the British chased the Chesapeake Bay flotilla up the Patuxent River enroute to Washington. Commodore Joshua Barney, in a dramatic maneuver to avoid capture by the British, scuttled his flagship, the USS Scorpion, just upriver of the Route 4 bridge.

Dr. Schablitsky has spent the past two summers exploring the wreck of the USS Scorpion and will provide an exciting, illustrated talk on her work.

Please RSVP to www.friendsofjugbay.org/events.html