Ecologists Use Sanctuary to Track Effects of Climate Change

Compiled by Lindsay Hollister

As the only research facility in the Recreation and Parks Department, we pride ourselves on the studies conducted here. Volunteer scientists carry out many of the projects, but another less visible group of scientists carry out independent projects. Visiting researchers study Jug Bay to better the understanding of natural resources, their strengths and vulnerabilities.

The Fall edition of *Marsh Notes* contained an article by Keala Cummings about the sediment trapping abilities of our wetlands. Under the guidance of Dr. Lora Harris of the Chesapeake Biological Laboratory, Keala’s research “estimated that our mixed plant sites were accreting about 3 - 4 millimeters of sediment a year, and the spatterdock communities almost twice that amount”. She concluded that since rising sea level rates are 2 - 4 millimeters per year at Jug Bay “it would seem that our study sites are not in any immediate danger from flooding”.

These intriguing conclusions prompted us to learn more about the climate change implications of other studies carried out here by visiting scientists. Through interviews with the researchers, this article looks at four of those studies, the ties to climate change, and how we as resource managers can take an active role in the preservation of our habitats.

If you look across the river from our Observation Deck and up Railroad Creek, you might see a cluster of white salinity addition tanks revealing the study site of Dr. Andrew Baldwin from the University of Maryland.

![Map of visiting scientists study sites.](Map credit: Dave Linthicum & Peggy Dickinson)

What is the primary objective of your study?

AB: How saltwater intrusion affects the elevation of tidal freshwater marshes.

How does your research relate to climate change issues?

AB: Understanding effects of sea level rise will provide advance warning of potential losses of tidal freshwater wetlands. At the local level losses of these wetlands will mean reduced habitat for fish and wildlife, plant diversity, and other ecosystem functions such as nutrient cycling. Research findings will be broadly applicable as well. Coastal wetlands worldwide will be affected by rising sea level via similar mechanisms.

What have you discovered so far?

AB: Too early to tell. Experiments were set up in 2008 and will run for several years before conclusive results will be available.

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Building on the work of co-investigators Dr. Jason Keller and Dr. Patrick Megonigal of the Smithsonian Environmental Research Center, Dr. Ariana Sutton-Grier expanded a microbial study site near the River Pier two years ago.

What is the primary objective of your study?

AS-G: Plants can influence soil dynamics through oxygen inputs from their root systems. This contributes to different microbial metabolic pathways (i.e. what the microbes "eat" or how they get their energy). The hypothesis was that in plots with plants, more oxygen in the soil would produce more oxidized iron (Fe+3) which might stimulate microbial Fe+3 reduction, and less production of methane (CH4). Methane is about six times more efficient at trapping heat than carbon dioxide (CO2). In our unplanted plots we expected the opposite, more microbes reducing CO2 to CH4 and less microbial Fe+3 reduction.

How does your research relate to climate change issues?

AS-G: We are very interested in understanding the controls on methane production in freshwater marshes such as Jug Bay. These types of wetlands are some of the largest natural sources of methane. The soil has little or no oxygen because of regular tidal flooding. Also, the plant communities tend to be very productive so the soil has a lot of organic material that decomposes slowly in the anaerobic environment. This leads to high carbon/low oxygen conditions that are perfect for methanogens (the microbes that produce methane). We want to understand what conditions promote alternative microbial metabolic pathways, such as iron reduction, that don’t release methane, because these pathways are much more climate friendly.

What have you discovered so far?

AS-G: We have not found any support for our hypothesis that planted plots would have more iron reduction and less methanogenesis than unplanted plots. We are currently investigating whether soil temperature plays a more important role in the dynamics between iron reduction and methane production. (More to come on that in the future!)

Along the Railroad Bed Trail white poles in groups of four represent the Sediment Elevation Table (SET) sites. Monitored from 1999 to 2001 they went unmeasured until 2007 when Dr. Patricia Delgado of the Chesapeake Bay National Estuarine Research Reserve began collecting data again.

What is the primary objective of your study?

PD: To assess the potential impacts of sea level rise and salt water intrusion on the health and long term persistence of Jug Bay’s tidal freshwater marshes. We plan to install water wells, which will show changes to the water table that could be linked to hydrological changes. The same water wells will help us monitor long term changes in salinity.

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Dear Friends,

In a previous letter to you, I mentioned the need to manage deer within the Sanctuary. On the fifth of November, the Anne Arundel County Council approved legislation to manage wildlife within county-owned parks. In particular, the legislation will permit hunting as a method to manage wildlife. Although the legislation is general, the Recreation & Parks Director, pursuant to a wildlife management agreement, must control the activity. This legislation is not for the purpose of recreational hunting; it is solely for the purpose of controlling wildlife and in this case, the population of whitetail deer who are destroying the habitat surrounding Jug Bay.

The decision of the Friends of Jug Bay to support this management tool came after examining alternative methods for reducing deer populations. The size and topography of Jug Bay Wetlands Sanctuary makes it impossible to use passive methods such as fencing or birth control. At present, experience in other Maryland jurisdictions has shown that hunting is the only effective means for limiting the size of the deer herd. Without control, the deer herd can increase by 60% per year and, thus, can quickly overwhelm the area. As a result, the Board of Directors felt that the deterioration of the ecosystem surrounding Jug Bay requires immediate action to stem its decline. I would like to share with you the statement we submitted to each county council member in support of the legislation, since it outlines our reasons for supporting the legislation.

Dear Council Member

The Friends realize that preservation of the diversity of life in the Sanctuary requires that no one species be allowed to dominate and to destroy the premier ecosystem in Anne Arundel County. The Jug Bay Wetlands are a designated component of the Chesapeake Bay National Estuarine Research Reserve.1 The environs of Jug Bay represent land preservation at its best: national, state and local interests have saved one of the largest estuarine wetlands on the east coast. Anne Arundel County deliberately acquired surrounding land, applied agricultural easements and limited commercial development at Waysons Corner to protect the Sanctuary further.

The Sanctuary serves as an educational resource for school children to learn how wetlands serve the bay. Most importantly, it serves its citizens by being at the forefront of a new recreational activity: high quality citizen-based scientific research. Citizens perform or assist with studies involving water monitoring, nutrient dynamics, reptile and amphibian research, plant research, fish surveys, and long-term national bird surveys.

However, the sustainability of the wetlands depends on a robust forest buffer for protection, and the forest, itself, depends on regeneration for its protection.

One species, deer, is threatening this regeneration process. Deer can browse from the forest floor to as high as they can reach standing on their hind legs. They remove most herbaceous growth, important for habitat and food for other animals, and also the young trees, vital to the future of the forest, itself. Furthermore, deer spread the seeds of invasive plants from their fur or in their droppings, contributing to the further decline of the forest habitat.

Unfortunately, the very purpose of the Sanctuary, to protect the animals within its borders, has created an opportunity for an unnatural expansion of the deer population. Their predators, wolves, were removed from Anne Arundel County long ago. The number of deer removed outside the park by hunting, permits, and disease is not enough to preserve farm crops or the Sanctuary. The Friends contacted nearby farmers and estimate roughly 90 deer per year are removed through permits and disease; yet, crop damage this year remains steady, averaging 30-35% annually.

If the forest habitat is destroyed beyond its ability to regenerate itself, invasive species will dominate. Habitat restoration will then become quite expensive. When trees continually fail to reproduce, and invasive vines and other weeds cover the forest floor, restoration costs become increasingly large. Inaction will result in the loss of the ecosystem.

The economic impact of this deer explosion on local farmers is severe. However, the likely future cost of inaction to taxpayers would be several times larger, even to the tipping point of total loss.

Al Tucker, FOJB President

1 The total acreage under direct governmental management or conservation easements well exceeds 10,000 acres. The Chesapeake Bay National Estuarine Research Reserve consists of 2,087 acres of open water, tidal marshes, swamp, fields, and upland.
Observations from the Field: Exploring the Forest Understory

By Susan Matthews

To a pair of expert eyes like David Laughlin’s, the plant habitats of the Sanctuary reveal many things. David Laughlin is a professional horticulturist and long-time volunteer. In his spare time, David has collected and donated native seeds for the Maryland Department of Natural Resources Tree-mendous Program, which coordinates events to restore native trees along stream banks across the state. Recently David has volunteered his time to help update our plant species’ survey. He tentatively identified two ferns that had not previously been observed here: the Sparselobe Grapefern (*Botrychium biternatum*), and the Spinulose Woodfern, (*Dryopteris spinulosa*).

David also observed that hardwood saplings in the understory have developed adaptations that enable them to retain photosynthetic activity longer than the mature hardwood trees. He noticed that the hardwood saplings retain their foliage longer than the mature hardwood species.

Increased roadways throughout our region have resulted in fragmentation and destruction of our once continuous forested areas. David notes that roadways also create openings within the forest canopy that enable trees that grow in full sun—such as Virginia Pine, Sweet Gum, Sassafras and Big-toothed Aspens—to become established. Streams also provide openings within the canopy where sun-loving species like River Birch and Willow can become established. Forest fires historically played an important role in reestablishing pioneer forests and open meadow habitats. Today, roadways also contribute to the creation of new regions where pioneer and non-native species can become established.
Wireless Sensors Provide a Glimpse into Box Turtles’ Underground World

By Susan Matthews

In June 2007, the Department of Earth and Planetary Sciences at The Johns Hopkins University (JHU) and Sanctuary staff began a two-year study to examine the soil ecology of turtle nesting and overwintering sites. Soil ecosystems play a pivotal role in the development and survival of Box Turtles. Females nest from late May through July, laying four or five eggs in a chamber 3 - 4 centimeters below the surface of the soil. For turtles and many other reptile species, the incubation temperature of the substrate determines the sex of the clutch. At incubation temperatures of 22.5 to 27.0°C, male box turtles will be produced; at temperatures of 28.5°C or higher the nest will produce almost all females.

This project is a collaboration between principle investigator Dr. Katalin Szlavecz, an Associate Research Professor at JHU; Dr. Andreas Terzis and his students at the Computer Sciences Department; and Chris Swarth and Susan Matthews. Dr. Szlavecz’s research interests include the diversity and ecology of soil invertebrates, soil biogeochemical cycling, urban ecosystems, and invasive species.

JHU researchers have designed remote sensor networks that collect continuous soil moisture and temperature data. The raw data are uploaded from the “motes” (small computers with wireless capabilities) onto a personal computer where the data can be further analyzed. This is a great advantage over traditional data loggers, which must be physically removed from the ground to access the data. In addition, wireless sensor networks allow researchers to continuously monitor soil conditions over a longer time period without disturbing the site.

In 2007, thirteen motes were deployed. We monitored the soil conditions in three Box Turtle nests all summer. Attached to each mote were two moisture and two temperature probes, which tracked the soil conditions at the bottom and surface of the egg chamber. The other ten motes were deployed in the fall to monitor the conditions of Box Turtle overwintering sites. The nest monitoring study was extended in the summer of 2008 with the addition of two more Box Turtle and six Red-bellied Turtle nests.

### Soil Moisture and Rate of Turtle Hatchings

This graph displays soil moisture and rain event data from June-October for a Box Turtle nest in the meadow. On October 20, 2007, (120 days after the nest had been laid) the first hatchling emerged following a rain event.
Winter 2008–09 Public Programs at Jug Bay

Reservations and entrance fees are required for all events, unless noted.
Call 410-741-9330 or e-mail programs@jugbay.org
Check out www.jugbay.org for information, directions and updates to our schedule.

Open to the public 9 am–5 pm Wednesday and Saturday
(Closed Sundays December through February)
Programs are open to families and individuals. An adult must accompany children under 13.
Scouts and other groups must call to arrange a separate program.
Please note age limits for each program.

Entrance Fees: Adults $3; Children under 18 $2; Over 60 $2; FOJB family membership $25.

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Birding at Jug Bay
Saturday, January 3; 8-11 am
Saturday, February 7; 8-11 am
Saturday, March 7; 8-11 am
Learn the skills of identifying birds by sight and sound. Binoculars and field guides will be available to borrow. Not appropriate for children under 12.

Diving Ducks and their Invertebrate Prey
Tuesday, December 16; 7-9 pm
$5 per person
Chris Swarth will describe the results of his ongoing study of the wintering waterbirds on the Patuxent River estuary and the invertebrate prey that sustains them. Dozens of volunteers help with this long-term study that takes place annually in February. A key finding is that duck species segregate along the 55-mile length of the estuary where they find just the right mix of food items that they require.

Full Moon Hike
Saturday, December 13; 4-6:30 pm
Enjoy a brisk evening hike under the “Moon before Yule”. We’ll see the sun set and explore the trails around the Sanctuary’s River Farm. Meet at the Wetlands Center and drive to the River Farm. Be prepared to hike three to four miles. Children should be at least 6 years old.

Birds for Beginners
Saturday, December 13; 9-11 am
Learn about our native songbirds and their habitats. Bring a field guide and binoculars if you have them. Appropriate for children over 10 and adults who are beginning birders.

Explore the Riggleman Preserve
Saturday, January 3; 10 am-1 pm
Join us on a hike to explore the beautiful Riggleman Preserve with its varied upland and wetland habitats. Meet punctually at the Wetlands Center. We’ll carpool to the Riggleman Preserve. Dress warmly, bring a snack or lunch, and be prepared to hike several miles. Children should be at least 10 years old.

The Life of the Beaver
Saturday, January 31; 3:30-5:30 pm
Join us to learn about beaver adaptations and then take a hike to the beaver ponds. Dress warmly and bring a flashlight. Children should be at least 6 years old.

Animal Sleepers
Saturday, February 7; 10 am-Noon
A lot of animals disappear from our sight during the winter. We’re aware that many warm-blooded animals such as chipmunks, groundhogs, and bats hibernate. But what happens to the turtles, frogs, and insects at Jug Bay? Where do they go and how do they cope with freezing temperatures? Come for a hike to learn where dormant animals go during the cold winter months. All ages welcome.

Woodpeckers
Saturday, February 21; 1-3 pm
These birds sporting a dash of red brighten our winter days. Come learn about the seven species of woodpeckers that live here. We’ll explore their fascinating adaptations and go outside to identify them and observe their behavior. Bring binoculars if you have them. Adults and children age 7 and older.

Sky Dance
Saturday, March 7; 5:45-6:45 pm
Late winter is the time for the annual courtship display of the American woodcock, a.k.a. timberdoodle. You can watch this dazzling aerial show right from your car! Male woodcocks should be performing their mating ritual at dusk over the meadow in front of the Wetlands Center parking lot. Binoculars are not necessary, but it’s always a good idea to bring them along, just in case some other interesting creature wanders past. You might even see a woodcock on the ground after it has landed. Dress for the weather. Appropriate for adults and children at least 10 years old. No entrance fee.

Owl Prowl
Saturday, February 28; 5-7 pm
Come learn about owl adaptations and go on a short night hike. We will bring along a tape to play owl calls and see if we get any owls to respond! We’ll return in time to enjoy a campfire and marshmallows. Please bring a flashlight and dress for the weather. For all ages.

Aquatic World
Wednesday, February 11; 10 am-Noon
We know the earth is composed of 72-75% of water. Have you ever wondered how much of that water is considered potable fresh water? We will talk about the importance of water as a finite resource as well as simple ways we can conserve water everyday. Our activities will include a discussion of the many interesting aquatic animals that are found here, and a fun interactive craft.

Vernal Pools
Wednesday, March 25; 10 am-Noon
Vernal Pools area forested wetlands that are present in the early spring. They provide critical habitats for several species of amphibians and reptiles. Come join us as we explore the vernal pool habitat and search for the interesting animals that live within this unique environment including: salamanders, frogs. Please bring a lunch, wear wading boots, or shoes that can get wet (plus a change of shoes & socks) and dress for the weather.

Home School Series
For children ages 8 - 12. To register, complete the home school registration form on our website and send with fee to the Sanctuary.
Cost: $3.00 per child per program. Family discount: $2.00 per additional child.

Keys to Winter Tree ID
Saturday, February 28; 9:30 am-Noon
If winter tree identification mystifies you, this program is the answer! We’ll learn the basics of plant identification using keys and field guides, then take a hike to use our knowledge. This program is designed for those with little or no experience and will focus on twigs, buds and bark.
Co-sponsored by the Native Plant Society. For adults and teens.

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www.jugbay.org
How to Use GPS
Saturday, March 14; 1-3 pm
If you want to learn how to use a Global Positioning System device, this activity is for you! We’ll practice finding locations by latitude and longitude; determine where on earth we are, and learn about other features of a hand-held GPS. We provide the GPS units. Designed for adults and children ages 8 and older accompanied by an adult.

March Equinox Hike
Saturday, March 21, 5-7:30 pm
The March (Spring or Vernal) Equinox marks the first day of spring. We’ll meet at the Wetlands Center and take a moderate hike, watching for signs of the new season. We’ll end by watching sunset from the Marsh Boardwalk, and return to the Wetlands Center for a snack. Participants should be prepared to walk at least two miles on natural surface trails through the Sanctuary. All ages welcome. No entrance fee.

Introduction to Geographic Information Systems (GIS) Part 2: GIS and GPS
Sunday, March 22; 1:30-4:30 pm
$5 per person
Building on November’s GIS workshop, this time we will combine GPS (global position system) data with existing GIS map data. Learn how to transfer data from the GPS and convert it to a usable format for use in MapWindow, free GIS software. This program is for adults involved in field work at Jug Bay. You may bring your laptop to use during the workshop but ask for details when you register.

Waterbirds at Blackwater
Wednesday, February 25; 7 am-5 pm
Join Director Chris Swarth for a birding foray to the Blackwater Wildlife Refuge. We’ll spend the day observing the large flocks of waterfowl and other species that use the wetlands and open bay. Bring binoculars, scopes and warm clothes. Meet in Annapolis at the US Naval Academy parking lot adjacent to Tawes Boulevard at 7 am. We will leave from Annapolis in a van, so space is limited.

Winter Wildlife & Craft Activity
Saturday, January 10; 1-3 pm
Have you ever wondered how our year-round wildlife species find food and stay warm during the wintertime? Join us and learn more about native wildlife and backyard habitats. We’ll show you what types of bird food and feeders you can use to make your backyard habitat more inviting for native wildlife species. We’ll also create & decorate pencil holders using soup cans and colored seeds. Things to bring: A clean, round aluminum soup can. Children should be at least 7 years old.

December Solstice Hike
Sunday, December 21; 3:30-5:30 pm
Greet the arrival of winter on the shortest day of the year. We’ll look for signs of the new season at the Sanctuary’s Glendening Nature Preserve and hopefully catch a glimpse of the setting sun. We’ll finish with some light refreshments. Be prepared to hike two to three miles. Children should be at least 10 years old.

Give Your Yard a Bay-friendly Makeover
Saturday, January 7; 10 am-2 pm
Phase 1: Overview/Design Workshop
Saturday, March 7; 10 am-2 pm (rain date Mar 14)
Phase 2: Installation Day
Experience hands-on the techniques required to design and install your own Bay-friendly Garden. Working in conjunction with the staff of the Chesapeake Bay National Estuarine Research Reserve (CB-NERR), participants will learn about rain gardening, native plants, habitat improvement, and low maintenance approaches to maximize your property’s potential and lessen our impact on local waterways. Hosted at the Plummer House, this demonstration site will serve as an educational tool during the design and installation phase, and as a model for future programs. Lunch will be provided both days. Bring work gloves and a shovel on installation day.

Hike the Glendening Preserve
Saturday, Feb 21; 10 am-12:30 pm
Relieve cabin fever by exploring a beautiful forest, a beaver pond along Galloway Creek, and other interesting habitats at the Preserve. Bring a snack or lunch and dress for the weather. Children should be at least 10 years old.

Nature Writing
Sunday, March 8; 1-3:30 pm
Sharpen your pencils and your observation skills! We’ll take a walk and spend some time seeing with fresh eyes and feeling with all our senses. Then we’ll describe our observations on paper, exploring and reflecting on our past and present connections to nature. Bring a journal or notebook. Adults and children at least 8 years old.

Spring is Here & Creating Honeysuckle Wreaths
Saturday, March 21; 10 am-noon
Come join us as we search for the first signs of spring. We will listen for spring peepers, and search for the first signs of skunk cabbage as it emerges to fill the flood plain with its bright green leaves. Along our walk we will keep our eyes peeled for a non-native visitor to our forests: Japanese honeysuckle. We will collect honeysuckle vine and create spring wreaths. Children should be at least 7 years old.
Most of our projects require no experience, come to learn!

To sign up or for more information, call 410-741-9330

Scouts and other groups must call to arrange a separate event.

Please note age limits for each event.

**Winter Waterbird Survey**

*Thursdays: January 8, 22; February 5, 19; March 5, 19; April 2*

Help identify and count waterbirds for our biweekly survey, which has been carried out for more than 15 years. Observe the flocks of waterfowl that winter in the Patuxent wetlands, including diving and dabbling ducks, coots, geese, swans, herons, and raptors. Surveys occur 7:30 - 9:30 am. For adults. No experience necessary.

**Trail Monitors Annual Meeting**

*Saturday, December 13; 1-3 pm*

With 12 miles of trails to maintain, we can use all the help we can get! This workshop is for existing Trail Monitors and new volunteers interested in the program. Existing Trail Monitors will have a chance to share their experiences, and renew their adopted trail for another year. New volunteers will have a chance to learn about the program and adopt available trails of their own. For adults.

**Naturalist Training – Winter Programs**

*Saturday, January 10; 2-4 pm*

Though winter is much quieter, there is still plenty to do outside! Meet us at the Glendening Nature Preserve’s Plummer House to learn about a variety of family-oriented programs that can be led during the dormant months. For teens and adults.

**Stream Monitoring**

*Saturday, January 24; 12:30-4 pm*

Volunteers are needed to help collect, identify, and count stream invertebrates that are used to evaluate stream health. Please bring waterproof shoes or boots and dress for the weather. Free admission to the Sanctuary. For teens and adults.

**Vernal Pool Monitoring Workshop**

*Saturday, January 31; 1-3 pm*

In the spring, vernal pools become alive with breeding amphibians, and later, their larvae. Volunteers are needed to help estimate the number of egg masses and larvae in the Sanctuary’s largest vernal pool as spring progresses. At this workshop, you’ll learn more about vernal pools, their inhabitants, and the methods used to monitor them. For adults and children over 12. Meet in the Plummer House at the Glendening Preserve.

**Project WET Workshop**

*Saturday, February 21; 9:30 am-4 pm*

Whether you’re a teacher, ranger, or a budding naturalist the Project Wet Workshop includes interactive activities that encompass a wide variety of water related topics including: the water cycle, watersheds, ground water, water conservation and much more. Trained Project WET Facilitators will present & lead example activities that may be incorporated into a formal or informal classroom settings. Please dress for the weather and be prepared to engage in these fun, indoor & outdoor hands on activities. All Project WET Participants will receive a Copy of The Project WET (K-12) Curriculum & Activity Guide, and a certificate of completion for participating in this workshop. Space is limited. To sign up for this workshop please call the sanctuary at: 410-741-9330 or e-mail Susan Matthews at: rpmatt08@aacounty.org to request a registration form. A $5 registration fee will be used to help cover lunch expenses.

**Non-Native Plants: Adopt-a-Plot Training**

*Saturday, March 14; 9:30 am-12:30 pm*

Alien plants are invading our forests, crowding out native plants upon which wildlife depends. Want to do something to help the Earth? Need community service hours? Come to this workshop and adopt your very own plot, keeping it free of those unwanted invasives! Individuals and groups welcome.

**Water Quality In-field Training**

*Saturday, March 21; 2-4 pm*

Since 1988, volunteers have monitored nutrient pollution, dissolved oxygen levels, pH and water clarity in Jug Bay’s waters. We will refresh those skills and train new volunteers. Additional training is provided during the sampling dates. The workshop is recommended for all volunteers, new and experienced. Free admission to the Sanctuary. For adults and teens.

**Spring Stewardship Day**

*Saturday, March 28; 10 am-3 pm*

Volunteers will remove trash in wetlands, remove invasive plants, and complete other projects as weather permits. Please dress in work clothes (long sleeves and long pants), including boots or shoes that can get wet, and bring work gloves, a bag lunch, a change of clothes and a towel. Free admission to the Sanctuary. Children should be at least 6 years old. Scout troops and community groups are encouraged to participate. Rain or shine.

**Upcoming Volunteer Opportunities**

**Save the Date**

**Volunteer Appreciation Social**

*Sunday, February 1, 3-6 p.m.*

Quiet Waters Park, Blue Heron Room
**Take a Closer Look…**

**By Sara Levin,**
**volunteer contributor**

This “creature feature” style column comes from *The Volunteer* newsletter and is devoted to things small and/or easily overlooked. Each edition reveals the answer to the last feature and offers a new mystery to intrigue. E-mail volunteers@jugbay.org to make your best guess!

Many of you have probably guessed the last issue’s photo as MILKWEED! Scientifically known as *Asclepias incarnata*, there are over 20 varieties of milkweed across the USA. Certain milkweed species are considered noxious in some states because they can be poisonous to cattle and other livestock. But what is death to some is life to others. Milkweed sustains the glorious monarch butterfly by passing chemical compounds that make them poisonous to potential predators. Milkweed contains a cardiac poison that is toxic to most vertebrates, but does not hurt the monarch caterpillar. Some milkweed species have higher levels of these toxins than others. Besides the bright colors that serve as a warning, predators only need to taste a butterfly or larva once to learn not to eat them again.

Milkweed is a bio-indicator. When plants are exposed to ground-level ozone (smog), they display stiples (dark dots) on the leaves, lose leaves, or have stunted growth. Studies have determined that ozone injury to milkweed leaves may affect monarch larvae and their life cycle.

Milkweed is a beautiful native plant. If you don’t have any growing on your property, it can be safely transplanted. Be sure that the plant stock originates from within 20 miles of your garden site. Or if you prefer, collect seed pods just before they burst and separate seeds from their “fuzz” immediately. (When collecting seeds from the wild, always ensure that a large majority of the seeds remain at the location of collection. Many plants, even so-called “perennial” wildflowers depend heavily on annual distribution of seeds for continuation of a colony). The seeds require at least 30 days of stratification. That entails duplication of natural conditions by subjecting them to moist, cold conditions for a period of time. The easiest way to “stratify” seeds is to plant them in pots during the late fall or winter. Moisten the soil and place the pot inside a sealed bag. Keep the pot in an outdoor location, out of the sun, until the seeds germinate. After several leaves appear transplant to individual pots.

*Pass the word – pass the seeds – save the milkweed!*

Below, please find the next newsletter’s mystery. Good luck!

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**Staff Note:**

Lindsay Hollister is taking over for Elaine Friebele as the Marsh Notes editor. The contents of *The Volunteer* will merge into the quarterly editions of *Marsh Notes* and will be discontinued as a separate newsletter. Volunteers will continue to receive monthly updates by e-mail.
How does your research relate to climate change issues?

PD: Sea level rise in addition to high rates of subsidence in the Chesapeake Bay may increase the duration of tidal flooding and salt intrusion. These would have impacts on the intertidal marshes, which could include drowning, species composition change, marsh migration, and invasion of non-native species. Our research would help detect early changes to the system and could provide general information to better understand the impacts of sea level rise on fresh tidal environments around the world.

What have you discovered so far?

PD: According to an earlier study by Larsen, rates of relative sea level rise in the Chesapeake Bay range from 2.7 - 4.5 millimeters per year. Significant differences in surface elevation were found between the marshes of the north and south side of the railroad dike. Our data suggest that North Glebe Marsh will not be able to keep pace with local sea level rise. South Glebe Marsh appears sustainable in the face of current rates. Surface elevation change among 12 sites ranged from a loss of 2.06 mm/yr to a gain of 11.1 mm/yr over a nine year period.

How does your research relate to climate change issues?

CS: If air temperatures rise as predicted, turtle populations in eastern North America may become gender-biased. Cooler nests produce more males and warmer nests produce more females. Adult turtles may be impacted too. Warming temperatures mean that turtles will enter overwintering sites later in the season and will emerge earlier. During cool spring days stored fat reserves are an energy source to turtles getting re-oriented. Warmer winter soil temperatures could cause the fat to be metabolized, leaving turtles depleted when they need the reserve. By using remote, automatic data loggers and sensors to monitor nests and overwintering turtles, we can discover patterns that can be evaluated and shared with others. Because of the great variety of turtle species and the large populations, this is an ideal area to investigate turtle ecology.

What have you discovered so far?

CS: Box Turtle nests are difficult to find! We were more successful at finding the overwintering sites. Overwintering adult box turtles choose sites in the forest where they rarely experience below-freezing temperatures. The soft, loamy soil and thick layer of deciduous leaves provide insulation.

When asked what our staff and department can do to preserve the integrity of our habitats the responses tended to compliment each other.

AB: Set up long-term, permanent monitoring stations for plant species composition and salinity to provide a baseline against which to judge changes in response to rising sea level. Monitoring elevation, water level, invertebrates, and other physical, chemical, and biological factors may also prove useful. If changes are imminent, then mitigative measures may be possible, such as sediment thin-layering to maintain elevation.

AS-G: Once we understand the controls on methanogenesis, we can use this information around the world with the hope of reducing natural sources of methane.

Resource managers should attempt to maintain the key functions native diversity provides by reducing and preventing non-native invasions, and reducing human activities in sensitive habitats. Also, eroded sediment, and chemical nutrient laden runoff negatively affects wetland plant, animal, and microbial communities. Educating the community about what they can do to reduce pollution in their backyard and neighborhood is critical.

PD: We should continue with ongoing restoration efforts to preserve the health and stability of the wild rice community; promote targeted research to answer specific management questions; continue to purchase land around the estuary, continue monitoring water quality and different habitats for early detection of impacts from climate change and other anthropogenic or natural impacts; continue education efforts at all levels to stimulate awareness of the great importance of our estuarine habitats; continue with the incredible work that the Friends of Jug Bay do to advocate for our system, particularly to higher level decision makers, stakeholders, and developers.

CS: Most importantly, land managers need to preserve and protect natural habitats as much as possible. By recognizing the habitats that animals require for their basic life functions, and how these areas could be impacted by rising air temperatures, managers may be able to take steps that could make a difference.

On the upland, one study can be seen in the form of small plastic boxes with transmitters and wires. Director Chris Swarth was interviewed but the article on page 5 explains the full collaboration.

What is the primary objective of your study?

CS: To characterize the natural variation in the soil temperature and moisture where Box Turtles overwinter and where Box Turtles and Red-bellied Turtles lay their eggs.
New Estuarine Reserve Website is Resource for Students, Teachers

Compiled by Bart Merrick

Over the past year and a half, CBNERR has been part of the development of a new science curriculum, Estuaries 101. This on-line curriculum from NOAA’s National Estuarine Research Reserve System provides powerful ways for students to learn fundamental concepts in science, develop scientific thinking skills, and explore the nation’s biologically rich and economically important estuaries.

From flying over an estuary with “Google Maps” to tracking the path and impact of a hurricane, Estuaries 101 modules feature hands-on learning, experiments, field-based activities and data explorations.

Estuaries 101 is the central feature of the Reserve System’s newly designed estuaries.gov Website, recently launched to help mark National Estuaries Day (September 27). Estuaries.gov was originally created to host the annual EstuaryLive Webcasts, virtual field trips to estuaries around the country led by scientists and educators at the reserves. The success of that series led to increased requests from teachers for more estuarine educational materials.

The Estuaries 101 curriculum comprises four 2-3 week modules. Each module tells the estuary story through one of three domains: earth, life, or physical science. With the emphasis on these domains, teachers can weave the study of estuaries into existing earth, life, or physical science courses, which can be used together or separately, according to Atziri Ibañez, National Education Coordinator for the reserve system.

Designed for grades 9-12, with the flexibility to adapt, Estuaries 101 meets key National Science Education Standards and can be readily aligned to all state standards.

Our goal was to enable a student to explore and discover our nation’s estuaries and, at the same time learn how to use real data to support their investigations.

The new estuaries.gov site, is a hub for exploration and discovery. In addition to Estuaries 101, students and educators can access:
• Videos: A series of complementary videos bring to life the different concepts taught in the Estuaries 101 Curriculum.
• Animated interpretations of water quality and weather data from the NERRS System-Wide Monitoring Program to help students understand concepts and visualize processes and changes in an estuarine system.
• A database of teacher training opportunities offered at the National Estuarine Research Reserves.
• Fish fact sheets that provide useful information on species, including a picture, range map, quick facts, conservation notes and life history information for each species.
• A news section featuring current events and activities in the reserve system.
• A new Estuaries Professional Development section with links to resources that have been evaluated and aligned to the National Science Education Standards.

In coming months, additional features will be added. Website visitors can query the reserve system’s real time and archived water quality and weather data from the entire reserve system. Pre-packaged virtual field trips will also feature archives of past EstuaryLive shows.

If you have any questions about this curriculum and www.estuaries.gov contact Bart Merrick (bmerrick@dnr.state.md.us)

Jug Bay is one of the three components in the Chesapeake Bay National Estuarine Research Reserve, Maryland. The purpose of CB-NERR is to manage protected estuarine areas as natural field laboratories and to develop a coordinated program of research and education as part of a national program administered by National Oceanic and Atmospheric Administration (NOAA).

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Check out the CBNERR-MD web page at www.dnr.state.md.us/bay/cbnerr
Volunteer Statistics:
Between August and October, volunteers logged 1319 hours

Lawrence Ash
Colin Barnett
Sandy Barnett
Marty Barron
Susan Blackstone
Cynthia Bravo
Peggy Brooks
Judy Burke
Jennifer Burroughs
Gordon Burton
Mary Burton
Jeff Campbell
Emmett Carstens
Karen Caruso
Kathleen Chow
Harry Coulombe
Linda Coulombe
Kaitlin Creamer
Brian Davis
David Davis
Maria Day
Mark DelFi
Natalie Dubois
Eric Duce
Kim Elliott
Ric Foster
Robert Frezza
Rosemary Frezza
Lynette Fullerton
David Gillum
Joyce Gillespie
Diane Goebes
Brandon Greene
Kathy Grow
Jim Harle
Valerie Harrell
Darcy Herman
Ben Hollister
Lynn Kenny
Peter Kenny
Dave Larrabee
David Linthicum
Woody Martin
Susan Matthews
Bill Miles
Louise Miles
Christina Mohs
Karyn Molines
Dave Mozurkewich
Anne Muecke
Manfred Muecke
Dotty Mumford
Jennifer Muro
Susan Nugent
Molly Olexia
Jan Owings
Dave Perry
Willey Persaud
Val Pfeiffer
Mark Priest
Carol Quinlan
Michael Quinlan
Megan Reiser
Tim Reiser
Gordon Reynolds
Rogard Ross
Jeff Shenot
Mary-Stuart Sierra
Les Silva
Bob Smith
Marc Steinberg
Al Sutherland
Liz Sutherland
Satoshi Tasumi
Yuka Tasumi
Mickey Taylor
Sandy Teliak
Ellen Thayer
Janet Touse
Denny Townsend
Al Tucker
Peter Uimonen
Sara Van Schaik
Nancy Weber
Bruce Weidele
Bob Williams III

Join the Jug Bay Journal Club

We are pleased to announce this new drop-in program for our members, volunteers and guests.

On the third Thursday of each month we will discuss a scientific article that is pertinent to the goals of the Sanctuary. If you would like to be included in our e-mail contact list to receive notice when the new article is available, please send a note to volunteers@jugbay.org

Thank You for Your Donation:

Sandy Barnett for “A Practical Guide for the Amateur Naturalist” by Gerald Durrell

Thank You!