

# Climate Change: Transforming our Wetlands?

By Elaine Friebele

**I**magine visiting the Sanctuary, walking to the observation deck, and lo and behold, there's a time machine! You enter it and close the door. Before you is a dial indicating future time. You set the dial to the year 2100. After hesitating, you press the button labeled "Start." The machine makes a humming noise, vibrates violently for a seemingly endless period of time, and then becomes silent. Warily, you emerge from the machine, viewing a new scene from the river bluff. What an usually high tide! Where are the marsh plants? Has there been a major flood?

You walk down to the boardwalk, perspiring a little more than usual in the heat. Where cattails once grew are water-loving spatterdock plants. Waves lap near the planks on which you walk. Soon, your progress is stopped as water engulfs the boardwalk. Fish swim around your ankles. This scene resembles the aftermath of Hurricane Isabel in 2003, when the Patuxent endured a four-foot storm surge and the Railroad Bed became a kayak trail.

What has happened? You are witnessing the effects of global warming—the slow, steady increase in the temperature of the Earth's atmosphere and oceans. This warming is linked to an increase in greenhouse gases, such as carbon dioxide, resulting from fossil fuel combustion and from deforestation. These gases act like a greenhouse, trapping heat close to the Earth and not letting it escape. Increasing temperatures cause sea levels to rise as oceans expand and glaciers begin to melt.

This sci-fi scene—though hypothetical—corresponds with scientific predictions by dozens of the world's scientists, summarized in the recent United Nation's Intergovernmental Panel on Climate Change (IPCC) report. The report documents how global warming has begun to transform the planet and predicts how it is likely to affect it in the future.

Calculating the effects of global warming is an inexact science. Mathematical models that predict climate change require assumptions about complex feedback



**In one hundred years, sea level rise is likely to inundate the Railroad Bed trail, much as the 2003 storm surge from Hurricane Isabel did.**

Photo by Peggy Brosnan

loops involving solar radiation, the oceans, and the behavior of atmospheric gases, clouds, water vapor, snow, and ice. There is no certainty to the predictions produced, but rather, ranges of potential climate change, given likely trends in the global population, economy, and fuel consumption.

## What We Know, What's Probable

What scientists have documented with certainty is a steady rise in carbon dioxide levels since the beginning of the Industrial Revolution. Atmospheric CO<sub>2</sub> concentrations have increased from pre-industrial levels of 280 parts per million (ppm) to current concentrations of 383 ppm—a rise unprecedented in the last 650,000 years. If the world's population continues to drive automobiles and burn coal to produce electricity at the same rate, average CO<sub>2</sub> levels will reach 541 to 970 ppm by the year 2100, the IPCC scientists estimate.

The global average air temperature near the Earth's surface has also risen an average of 0.74° C (a little over one degree Fahrenheit) during the past century. In fact, five of the hottest years in recorded history have occurred in the past decade. "Most of the observed increase in globally averaged temperatures since the mid-20th century is

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Jug Bay Wetlands Sanctuary is operated by the Anne Arundel County Department of Recreation and Parks. It was established in 1985 with the goals of wetlands research and environmental education. The Sanctuary is a limited-use park. Visitors are requested to make a reservation by calling the office before planning a visit.

Jug Bay Wetlands Sanctuary is a member of the Chesapeake Bay - National Estuarine Research Reserve system, which promotes scientific research, public education, resource management and stewardship in estuarine reserves across the nation.

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Continued from page 1

very likely due to the observed increase in anthropogenic greenhouse gas concentrations," the IPCC report concludes. The average global temperature is likely to rise 1.8° C to 6.4° C (3 to 12 degrees Fahrenheit) by 2100, with 4° C most likely if the world continues to burn fossil fuels at the same rate, according to the IPCC.

The past century's one-degree rise in average global temperatures seems rather small, but it was sufficient to expand ocean waters and melt ice sheets, raising average sea levels by 1 to 2 mm/yr, or about 10 cm (4 inches). More worrisome is the Chesapeake Bay's rise of 3 mm per year (twice the global average)

during the same period. As it turns out, sea level rise in the Chesapeake Bay is compounded by land subsidence. As glaciers crept down to New York, New Jersey, and Pennsylvania during the last Ice Age, their weight depressed the area underneath. When the ice melted, the area previously buried began to bounce back, while land outside the ice sheet—the Bay area—began to sink.

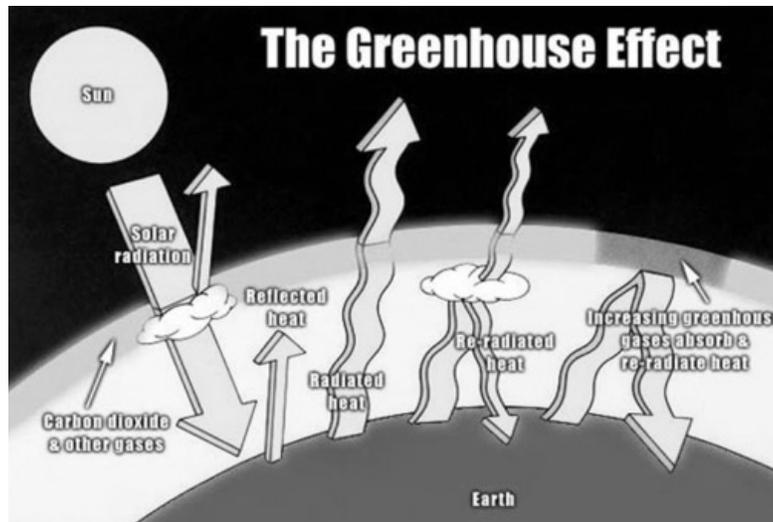
The IPCC report predicts that by 2100, sea level is likely to rise from 18 to 59 cm (7.8 inches to two feet). The top of the range corresponds to a fossil-fuel intensive future. The Chesapeake Bay, with nearly 12,000 thousands of miles of shoreline, is especially vulnerable to rising waters, which could increase by one meter in the next century.

### Changes at Jug Bay?

Global climate change is a fuzzy idea offering only a vague image of how our world might be transformed. By narrowing the focus, we can wrap our minds around a more comprehensible—though troublesome—local picture.

The good news: Chesapeake Bay's freshwater tidal marshes may not be as vulnerable as salt marshes to sea level rise. The larger influx of riverine sediments and organic matter received by freshwater marshes could partially compensate for increasing water depth.

Increased CO<sub>2</sub> levels could also reduce some of the flooding effect of sea level rise. High CO<sub>2</sub> levels may cause an increase in wetland plant production that



Source: [virtuallsciencefair.com](http://virtuallsciencefair.com)

results in larger amounts of carbon being stored below ground.

Still, rising sea levels are likely to shrink tidal freshwater marshes because steep valley slopes will limit the migration of wetland plants toward the land. Up-river migration of marsh plants will also be limited by increasingly narrow channels. As the rising ocean intrudes into Chesapeake Bay, saline waters will reach farther into tributaries. At the same time, greater precipitation could increase freshwater flows and shift tidal freshwater marshes downstream, putting a biological squeeze on organisms unable to tolerate either higher or lower salinities.

Mid- to high-latitude regions will see up to 20% more rain and snow, due to greater evaporation rates caused by warming, according to the IPCC report. Increases in precipitation will increase tributary flows. A 10% increase in precipitation translates to a 20% greater flow reaching the Bay. There is no place for that much water to be stored.

It is a simple fact that water quality degrades as stream flow increases. Greater

flows dump higher nutrient loads into rivers, stimulating plankton production. Bacteria and other detritivores breaking down algal masses consume additional oxygen. Higher flows also carry greater sediment loads that cloud the water, reducing light available to submerged aquatic vegetation (SAV), which is vital in providing oxygen to the water. This slowing of photosynthesis exacerbates the oxygen shortage.

*The Chesapeake Bay, with nearly 12,000 thousands of miles of shoreline, is especially vulnerable to rising waters, which could increase by one meter in the next century*

The water will be warmer, of course, and warmer water holds less oxygen. For each degree Centigrade rise in water temperature, its capacity to hold dissolved oxygen decreases by about 2%. To make matters worse, bacteria and cold-blooded aquatic animals will consume more oxygen because of increased metabolic rates in warmer waters.

Studies by Dr. Pat Megonigal of the Smithsonian Environmental Research Center and colleagues indicate that more productive plants (i.e., larger plants with enhanced photosynthesis) release more methane, another greenhouse gas, into the air, contributing to further global warming.

One hundred years into the future, the whole watery medium of wetland organisms is likely to change. Warmer air and water temperatures, rising waters, elevated nutrient and sediment levels, and a scarcity of dissolved oxygen may exclude some species and welcome others. With higher carbon dioxide levels available to plants, more carbon could end up in wetland soils, but more could also be emitted into the air as methane. How will changes in precipitation, hydrology, atmospheric chemistry, and water quality transform the diversity and abundance of wetland organisms? Stay tuned.



## Greetings!

We are in a severe drought, so I'm not sure about the moisture source, but it's been a very steamy summer at Jug Bay. Sort of the opposite of last year, when we had a very dry spring, followed by a wet summer. And unlike the grass in my lawn (which has not been mowed in six weeks and crinkles loudly when walked on), the wild rice seems to be doing well despite the drought. It is in full bloom now and is something you really must see if you have not been out at this time of year.

Other sights you may be missing here now are the flowering pickerel weed, and many other marsh plants that provide a wonderful deep green carpet along Jug Bay, as well as increased activity by some "water" birds. Great Blue Herons and Forster's Terns are dispersing from their nests elsewhere and can easily be seen now at Jug Bay. Both can be very fun to watch. Although the "dog" (slow) days of summer are here, a lucky birdwatcher was rewarded today (August 1) with a great find—a pair of rare Black-bellied Whistling Ducks, seen flying down Jug Bay early in the morning. When I heard about it, I went to look for them myself—and although I did not find any whistling ducks, I saw a beautiful Least Bittern instead!

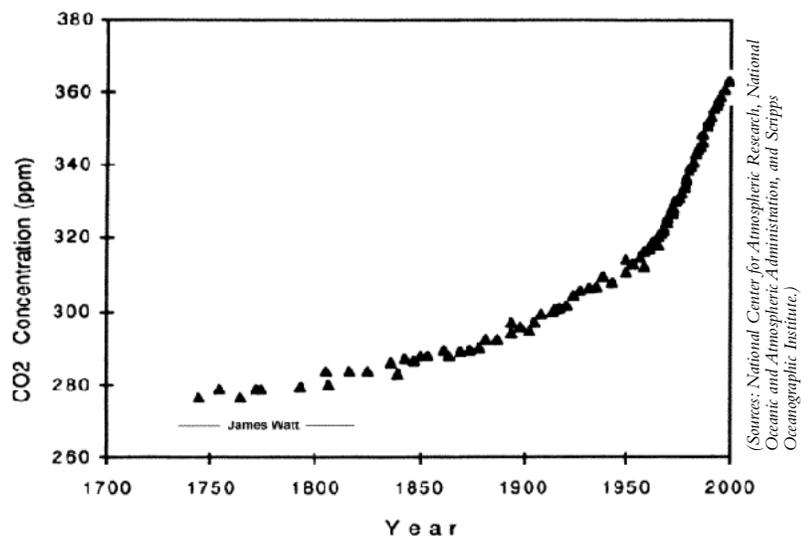
So far, the Sanctuary has been lucky and has not been hit by gypsy moths. The rascals are on the rampage this year in Maryland, so let's hope they don't find the lovely oaks in the Sanctuary. I recently saw a couple of areas that were hit by them, and I read that Maryland is currently experiencing the worst gypsy moth outbreak in a dozen years. Despite spraying more than 50,000 acres of public and privately owned land in May by the Maryland Department of Agriculture (MDA), wooded areas of Cecil, Harford, Baltimore, Anne Arundel, Howard, Montgomery, Carroll, Frederick, Washington, Allegany and Garrett counties have been hit (defoliated) by the gypsy moth. Please keep a watch for them in your neighborhood, and if you notice them, please contact either the Maryland Department of Natural Resources or MDA. For most FOJB members, try the MDA's Southern Regional Forest Pest Management Office (301-782-7155) to ask for assistance on how to deal with the moths.

Meanwhile, please come out to the Sanctuary to enjoy the splendor of its summer beauty, and perhaps to escape from some of the heat this summer is throwing at us. Sure, August is often a lethargic time for both people and wildlife, but it can still be very exciting at Jug Bay. Give it a try—if nothing else it's always peaceful! Otherwise, we'll see you this fall!

Cheers!

Jeff Shenot, President

**Graph showing rise of CO<sub>2</sub>, from measurements in Antarctic ice cores and measurements from Mauna Loa, Hawaii, since the time of James Watt, inventor of the steam engine.**



# Tigers in Trouble: Jug Bay Provides Sanctuary for Rare Beetles

By Jonathan R. Mawdsley  
Research Associate,  
The Heinz Center

Some of Jug Bay's most ferocious predators (and rarest species) are colorful little beetles less than an inch long. "Tiger beetles" received their common name because many species are boldly marked with stripes or spots. Virtually all species are rapacious predators. The adult beetles are often quite beautiful, with bright iridescent colors and intricate patterns on their wing covers. Unlike many other beetles, tiger beetles are fast runners and also readily fly when disturbed, making it a challenge to approach them closely for purposes of photography or identification. The adult beetles also have long, scythe-like mandibles and spend much of their time chasing and eating smaller insects. Even the larvae of tiger beetles are accomplished predators, lurking in burrows in the ground and ambushing unsuspecting insects which they capture in their powerful jaws.

Maryland is home to 22 species of tiger beetles, many of which have highly specialized habitat requirements. For example, the Puritan Tiger Beetle is found on exposed bluffs along the shores of the Chesapeake Bay, while the Northeastern Beach Tiger Beetle lives only on large, open sandy beaches. Many tiger beetle species are sensitive to human disturbance, and thus the beetles can be useful "indicators" of habitat quality. Human activities that interfere with the beetles' habitats can easily reduce or eliminate entire populations. In the mid-Atlantic and northeastern states, suburban sprawl and commercial beach development have been responsible for extirpating numerous populations of tiger beetle species in recent decades. Consequently, many of



**Tiger beetles have long, scythe-like mandibles.**

our tiger beetles are in serious trouble: of the 22 species in Maryland, seven are listed as "endangered" by the state, with another four species considered "vulnerable." Two of our state-listed species are also protected under the federal Endangered Species Act.

The Glendening Nature Preserve is a tiger beetle "hotspot." Eight species are found on the property, including two considered vulnerable by the state of Maryland. In 2004 and 2005, I conducted surveys at the preserve in order to characterize the size and condition of the beetle populations and develop management recommendations that would insure the long-term health of these populations. The good news is that the beetle populations at the preserve appear robust, and with proper management they should persist well into the future.

The Sanctuary provides excellent opportunities for viewing some common (and not-so-common) species of tiger beetles. The most frequently encountered species is the Six-Spotted Tiger Beetle (*Cicindela sexguttata*), named for the small white spots on its iridescent green back). If you've ever walked a woodland trail in

spring or summer, and seen a bright green insect running along the path in front of you, you've seen this species. The Six-Spotted Tiger Beetle is found in most upland areas of the Glendening Preserve and is also common on the trails around the visitor's center at Jug Bay. It also does well in urban parks and suburban developments, and is one of the few tiger beetles that is still common throughout the Washington, D. C. metro area.

The Glendening Preserve also provides habitat for populations of a much less common green species, the Festive Tiger Beetle (*Cicindela scutellaris rugifrons*). Although similar to the Six-Spotted Tiger Beetle, the Festive Tiger Beetle is more yellowish- or purplish- green and often has more extensive white markings on its wing covers. The Festive Tiger Beetle is considered vulnerable in Maryland, due to the fact that many populations have already been lost to suburban sprawl. This species requires open areas of bare sandy soil and quickly disappears if its habitat is built over or becomes too overgrown with vegetation. It is most often associated with pine barrens, sandy grasslands, and other early successional habitats.

Another rare tiger beetle found at the Glendening Preserve is the One-Spotted Tiger beetle (*Cicindela unipunctata*), a large brown beetle with small white spots that is not often seen, even by the most die-hard tiger beetle enthusiasts. The adults of the One-Spotted Tiger Beetle are active mostly at night, meaning that special techniques such as pitfall trapping must be used in order to locate and study the adults. As with the Festive Tiger Beetle, this species is associated with pine barrens and other dry woodland habitats.

Two other brownish-black tiger beetles are likely to be seen by visitors to the Glendening Preserve. The Punctate Tiger Beetle (*Cicindela punctulata*) is small, slender, and almost entirely brownish-black above. It can be found in most of the open areas of the preserve from mid-summer to early fall. The Oblique-Lined Tiger Beetle (*Cicindela tranquebarica*) is a larger, brown or black species with narrow white lines and markings on its back. It is found in open sandy areas in spring and fall. Both of these species are still fairly common in central Maryland, although the Oblique-Lined Tiger Beetle has been extirpated from many areas around Washington, D.C. as a result of suburban development.

While there are significant conservation concerns about many tiger beetle populations in Maryland, the long-term outlook for the beetles at Jug Bay and the Glendening Preserve is generally optimistic. Annual mowing and other management activities should help to maintain open areas of barrens habitat, essential for populations of both rare and common species. Protective ownership and wise management will help insure that populations of these beetles continue to thrive well into the future.



**Above: The Punctate Tiger Beetle can be found in open areas of the Glendening Preserve from mid-summer to early fall.**



**Right: The green metallic sheen of the Six-spotted Tiger Beetle makes it easy to spot at the Sanctuary.**

## To Learn More About Tiger Beetles

Knisley, C. B. and T. D. Schultz. 1997. *The Biology of Tiger Beetles and a Guide to the Species of the South Atlantic States*. Virginia Museum of Natural History, Martinsville, Virginia. 210 pp.

Pearson, D. L., C. B. Knisley, and C. J. Kazilek. 2006. *A Field Guide to the Tiger Beetles of the United States and Canada: Identification, Natural History, and Distribution of the Cicindelidae*. Oxford University Press, New York. vi + 227 pp. + 24 pls.

## Thanks for Your Donations

**Mike Quinlan** for *Amazing Ospreys*, *Fishing Birds of the World* by Donna Love, illustrated by Joyce Mihran Turley.

**Susan Ellis and Joe Rothrock** for *Aliens Among Us*, a photograph book of local insects and quotes.

## Scenes from Summer 2007 Science Camp



# NOAA Volunteers Spend a Day Helping Patuxent



On June 12, hundreds of NOAA employees and partners participated in the fourth annual NOAA Restoration Day at two sites in Maryland and in Virginia. The Maryland event was held at the Jug Bay component of the Chesapeake Bay National Estuarine Research Reserve in Maryland, which includes the Wetlands Sanctuary and Patuxent River Park.

At Jug Bay, more than 150 NOAA volunteers joined about 30 staff members from partner agencies to restore a portion of the Patuxent River. Volunteers planted underwater grasses grown in tanks in NOAA offices, transplanted wild rice, performed fish seining and sampling, mapped and removed invasive plants, monitored water quality, removed an old boardwalk, completed digital elevation mapping, and built wood duck boxes.



**Above & left: Restoration Day participants prepare to plant wild rice. Right and below: Fish surveys were conducted at Jug Bay several sites.**



# CBNERR Internship Provides Variety of Experience

By Matt Wagner

Through the Governor's Summer Internship Program (GSIP), I have had a unique and rewarding experience this summer at the Maryland Department of Natural Resources in the Chesapeake Bay National Estuarine Research Reserve program.

The Governor's Internship is designed to give college students in Maryland the real life experience of working in Maryland State Government. The program accepts applications from all undergraduates who are entering their junior or senior year, carry a 3.0 GPA or higher, and are attending college in Maryland or are residents of Maryland attending an out-of-state college. Students accepted into the program choose the agency in which they wish to work based on proposals submitted from across the scope of state government. An important aspect of this program is that each student is paired with a professional working in their desired field of government who serves as a mentor for the duration of the ten-week program. I chose to intern at the Department of Natural Resources' Coastal Training Program, which works with the three components of the Chesapeake Bay National Estuarine Research Reserve System, including Jug Bay Wetlands Sanctuary.

As a junior at the University of Maryland majoring in government and journalism, I have enjoyed the program most because it has exposed me to a wide variety of new experiences and people. For example, I attended a Bay Cabinet meeting, where the secretaries of the various state agencies meet and craft policy. I waded into the Patuxent River with legendary state senator Bernie Fowler in an annual test of water clarity in his beloved river. Working in the field, I kayaked and planted wild rice with hundreds of employees from the National Oceanic and Atmospheric Administration at Jug Bay Wetlands Sanctuary. I have also compiled an extensive database of county and local officials that the

Coastal Training Program will target for education and training. Working in the Department of Natural Resources has also enabled me to interview experts on Maryland's response to rising sea levels—the topic of my policy paper (a paper co-written by GSIP participants that will be presented to the Governor). Throughout the experience, I have enjoyed the encouragement, assistance, and good humor of my coworkers. They have treated me as part of the team from the beginning and have been receptive to my ideas and opinions.

Recently, my internship allowed me to attend a lecture given by Sir David King, the Chief Scientific Advisor to the United Kingdom Government, at the American Association for the Advancement of Science in Washington. King, one of the foremost and influential scientists in the world, spoke about the challenge posed by climate change and the British government's efforts to reduce carbon emissions and mitigate the effects of climate change. I hoped that he would give me information for my policy paper, and he did not disappoint when he emphasized "the need to spend much more on flood and coastal defense programs" to combat the rising sea levels that climate change is causing. King also outlined the British plan to reduce carbon emissions to 40 percent of current levels by the year 2050. He spoke with energy and optimism on the promise of renewable energy, nuclear power, energy efficiency, and carbon sequestration technology. For me, the lecture proved a unique opportunity to learn from an expert scientist and policy maker.

Finally, I am working to develop a public education workshop about the financial feasibility of making green improvements to residential homes. After this program is presented at the Anita C. Leight Estuary Center this fall, it will also be offered at the Sanctuary. Be sure to look for it on the CBNERR web page and the Jug Bay calendar.



**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 new  
CBNERR-MD web page at  
[www.dnr.state.md.us/bay/cbnerr](http://www.dnr.state.md.us/bay/cbnerr)**

My time spent at the Department of Natural Resources has been educational, challenging, and rewarding thus far. It has given me insight into the world of environmental policy and science, as well as the workings of state government. For anyone considering a career in public service, the Governor's Summer Internship Program deserves your consideration.



DEPARTMENT OF RECREATION AND PARKS

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**1361 Wrighton Road**  
**Lothian, MD 20711**  
**410-741-9330**

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2007**

## Summer Volunteers (May - August, 2007)

Morgan Angus	Laura Ek	Judy Mauriello	Jeff Shenot
Ramona Sampsell	Kathy Ellett	Eugene Meyer	Matt Shryock
Sandy Barnett	Kim Elliott	Bill Miles	Lisa Siciliano
Marty Barron	Sam Farmer	Louise Miles	Mary-Stuart Sierra
Susan Blackstone	Maureen Fine	Rob Mitchell	Les Silva
Jack Boesch	Shalom Fisher	Hannah Moore	Bob Smith
Jess Boesch	Robert Frezza	Taylor Morris	Jacob Sprecher
William Braisted	Rosemary Frezza	John Morton III	Seth Sprechter
Cynthia Bravo	Amandine Girousse	Dotty Mumford	Bill Steiner
Nelson Brooks	Diane Goebes	Jennifer Muro	Al Sutherland
Peggy Brooks	Brandon Greene	Janis Oppelt	Evan Swarth
Peggy Brosnan	Kathy Grow	Jan Owings	Satoshi Tasumi
Judy Burke	Julia Hagemeyer	Dave Perry	Yuka Tasumi
Gordon Burton	Tasha Hagemeyer	Willey Persaud	Mickey Taylor
Mary Burton	Jim Harle	Elizabeth Quimba	Sandy Teliak
Danny Bystrak	Ami Hazell	Carol Quinlan	Mina Truzerls
Jeff Campbell	Ben Hollister	Michael Quinlan	Al Tucker
Betty Chaney	Lynn Kenny	Megan Reiser	Peter Uimonen
Ginger Chaney	Peter Kenny	Gordon Reynolds	Alex Varga
Kathleen Chow	Jerry Kickenson	Cathy Rickards	Nancy Weber
Antonio Cordero	Elizabeth Kurgansky	Frank Rickards	Bruce Weidele
David Curson	David Linthicum	Rogard Ross	Bill Wilkerson
David Davis	Anne Logie	Matt Salo	Bob Williams III
Fae Davis	Kyle Maduro	Jack Schultz	Sea Williams
Mark Delfs	Woody Martin	Chris Seitz	Dick Worth
Eric Duce	Dave Mauriello	Patty Seitz	

**Green Tree Frog**



Photo by Lindsay Hollister

# Fall 2007 Education 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](mailto:programs@jugbay.org)
- Check out [www.jugbay.org](http://www.jugbay.org) for information, directions and updates to our schedule.
- Open to the public 9 am-5 pm Wednesday, Saturday and Sunday (Closed Sundays, December-February).
- Glendening Preserve open to the public 9 am-5 pm every day for hiking.
- 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

## Birding at Jug Bay

*Saturday, September 1; 8:00-11:00 am*

*Saturday, October 6; 8:00-11:00 am*

*Saturday, November 3; 8:00-11:00 am*

*Saturday, December 1; 8:00-11:00 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.

## Discover Wetlands by Canoe

*Saturday, September 8; 9:30 am-1:30 pm*

*Saturday, October 6; noon-4:00 pm*

Enjoy a leisurely paddle through the Patuxent River wetlands and open a new window into the natural history of Jug Bay. Canoe instruction and all equipment provided. Pre-registration is necessary; no phone or fax reservations are taken. To reserve a space, mail your payment of \$5 per person (including FOJB) in advance to the Sanctuary, using the registration form, including first and second choice of dates. Children must be at least 7 years old, unless noted otherwise. Please bring a lunch and plenty of water.

## Fall Flowers

*Saturday, September 8, 1:00-4:00 pm*

Asters, goldenrods, and bonesets should be plentiful in our open meadows. These "confusing composites" can be a challenge to identify. Learn some field identification techniques while enjoying the beauty of the fall fields. Co-sponsored with the Maryland Native Plant Society. For adults and children over 12 years old.

## Nature Kids

*Fri., Sept. 21; 10:30 am-noon-Meadow Magic*

*Fri., Oct. 19; 10:30 am-noon-Woolly Bears*

*Fri., Nov. 16; 10:30 am-noon-Pop, Stick, Glide*

Come learn about nature as we take a short nature hike and make a nature craft. We'll end the program with a snack. If families have food concerns, they may bring their own snack. For families with children 3 to 6 years old.

## Autumnal Equinox

*Saturday, September 22; 5:00-7:00 pm*

The Autumnal Equinox marks the first day of autumn. Hike the Sanctuary's trails to look for signs of the new season. We'll end by watching sunset from the marsh boardwalk, followed by a snack in the Wetlands Center. All ages welcome.

## Nature Detectives

*Sunday, Oct 14; 2:00-4:00 pm*

Come explore the different habitats of the Sanctuary to search for animal clues. We'll hike in the forest, the meadow, and the wetlands to see what these clues tell us about the animals that left them. For families with children at least 8 years old.

## Halloween Hike

*Sunday Oct 28; 2:00-4:00 pm*

Join Jug Bay in celebrating this devilishly fun time of year. We'll read Halloween themed stories as well as take a short hike to enjoy the wetland's wonder of mid-Autumn. Afterwards we'll enjoy snacks and hot cocoa as we make a Halloween craft. All ages welcome.

## Make a Honeysuckle Wreath

*Saturday, November 17; 2:00-4:00 pm*

Using an exotic invasive plant that chokes our trees, we will make art. Join us to turn Japanese honeysuckle vines into beautiful holiday wreaths, then decorate them yourself. Gloves and decorating materials will be provided. All ages welcome.

## Squirrel Tales

*November 17, 2:00-4:00 pm*

Be a squirrel for the morning and learn about these clever mammals. We'll read a story, take a hike, make a craft and enjoy a squirrely snack. All ages welcome.

## Winter Trees

*Saturday, November 10;*

*1:00-3:00 pm*

The leaves may be gone, but the trees still stand tall! Join us as we learn to identify trees by their twigs and bark. Children should be at least 10 years old.

## Wild Uses of Plants

*Saturday, October 13, 1:00-3:00 pm*

Come learn to dye wool, make rope, and enjoy a wild smorgasbord — all from native plants! Ethnobotany, the science of how people use plants, is an exciting avenue for learning about the plant world. Children must be at least 8 years old and accompanied by an adult.

## Winter Solstice Hike

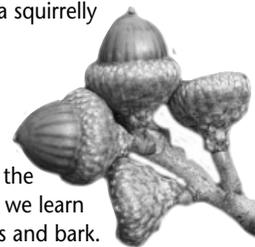
*Friday, December 21; 2:30-5:00 pm*

The Winter Solstice marks the longest night of the year and the start of winter. Celebrate the season while hiking the winter woods. We'll end the day watching sunset with a light snack. All ages welcome.

## Star Light Star Bright

*Saturday, January 12, 4:00-6:00 pm*

What are stars? Do they shine only at night? What constellations are visible throughout the night? We'll explore these questions and more, construct constellation projectors and learn how to tell time by the stars. Children must be at least 8 years old and accompanied by an adult. Please bring a tall Pringles can.



## SPECIAL EVENT

## Sanctuary Bioblitz

*September 15-16 (noon to noon)*

Join biologists on a "species search" at the Jug Bay Wetlands Sanctuary. Experts and volunteer searchers will work in teams to discover, identify, and document as many organisms as possible over a 24-hour period. Teams will search the wetlands, fields, and forests to find as many different species of insects, mushrooms, reptiles, birds and other groups as possible over a two-day period. Teams will work for four-hour shifts over a two-day period, from noon to noon. We will also make observations of nocturnal animals.

Please call 410-741-9330 to register. Additional volunteers are needed to help with event logistics, including helping to guide field expeditions, setting up before and cleaning up after the event, assisting with data entry and registration. Free admission

# Volunteer Opportunities

## Stream Monitoring

Friday, September 7; 9:30 am-noon

Volunteers are needed to help collect, identify, and count stream invertebrates that are used to evaluate stream health. For adults and children over 12 years old. Free admission.

## Marbled Salamander Research Workshop

Saturday, September 8; 9:30 am-noon

These workshops will teach the methods used to track marbled salamanders during their migration from September through November.

Designed for adults and older teens. Free admission.

## Fish Survey

Saturday, September 15; 4:00-7:00 pm

(Creeks)

Using dip nets, we monitor the fish populations living in Two Run Creek. Volunteers willing to get wet are needed to help catch, identify and measure (and then release) fish. Wear shoes that tie tightly and clothes that can get wet and muddy. Bring a change of clothes and a towel. Children must be at least 12 years old. Free admission.

## SAV Monitoring

Wednesday, October 3; 8 am-noon

Thursday, October 4; 9 am-1 pm

Several species of submerged aquatic vegetation live in the shallows of the mid-Patuxent. Join us as we travel by boat to record species composition and abundance. No experience necessary. Dress in clothes that can get wet and dirty. For teens and adults.

## Water Quality In-Field Training

Saturday, December 8; 9:00-11:30 am

Since the Sanctuary's founding in 1985 we have been tracking the conditions of the water coursing along the river and through our wetlands. This year-round study gives volunteers a chance to experience our wetland habitats through all seasons, record data, conduct field work and perform lab analysis. Brush up on your water quality skills, or come learn about the study for the first time. This in-field training session will walk volunteers through a monitoring session to see the ins and outs of the study. For teens and adults.



## Behind the Scenes Volunteer Training Workshops

Saturday, January 5; 1-4 pm

### 1-2 pm Office/Administrative Workshop

With an office staff of one we can always use a hand around the Wetland Center! This workshop teaches volunteers how to welcome visitors, answer phone calls, collect entrance fees, and a whole host of other useful tidbits to keep our facility running smoothly. For teens and adults.

### 2-3 pm Animal Care Workshop

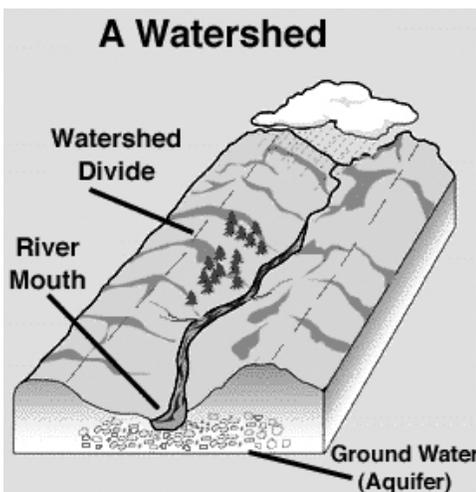
Fish, and turtles, and birds, oh my! Volunteers will learn how to feed and take care of our tank fish, painted turtle, and box turtles. You'll also learn about our different bird feeders and the feathered friends they attract. For teens, adults, and families with children at least 7 years old.

3-4 pm Artwork, Photography, and Writing Fun projects pop up often for artistic volunteers. Come learn about some upcoming drawing, photographing, and writing opportunities, as well as recurring opportunities to stretch that left brain. For teens and adults.

## How Watersheds Work

Saturday, October 20; 9:00 am-noon

Join us as we explore two small subwatersheds at the Glendening preserve. We will look at how land use in the watersheds impacts the health of the streams that flow through them. In both streams, we will monitor water quality, sample macroinvertebrates, study maps, and have fun following the water. Come prepared to get a little wet, a little dirty, and a lot curious! Wear old shoes that tie and clothes that can get muddy, and bring a change of clothes. Bring a lunch to eat at the end of the program. Ages 10 to adult. Meet at the Plummer Lane entrance.



## HOME SCHOOL SERIES

*Pre-registration required. To register, please call (410) 741-9330 or fill out registration form on our website and send it to the Sanctuary.*

*For ages 7 and up.*

*Fee: \$1.00 per child. (payment on arrival)*

*Parents are not required to stay with their children, but they are welcome if they choose to do so.*



## Marsh Ecology by Canoe

Wednesday, September 12

9:30 am-1:30 pm

Enjoy paddling through the Patuxent River wetlands and open a new window into the natural history of Jug Bay. Canoe instruction and all equipment provided. Pre-registration is necessary; no phone or fax reservations are taken. To reserve a space, mail your payment of \$5 per person in advance to the Sanctuary, using the registration form on our website. Children must be at least 7 years old. Children under 10 must be accompanied by an adult. Please bring a lunch, hat, sunscreen, and plenty of water.

## Wonderful Wetlands

Tuesday, October 2

9:30 am-noon

Explore our freshwater tidal marshes and get to know this exciting habitat up close. We'll find out what makes a wetland, discover the many plants that grow there, and explore this habitat for animals. Through hands-on activities, we'll learn how wetlands help the Patuxent River and the Chesapeake Bay.

## Life of a Dead Tree

Thursday, November 1

9:30-noon

A dead tree becomes a rich habitat—a garden—for many plants and animals, as well as soil for future trees. Discover the life teeming within logs lying on the forest floor. We'll end with a craft.

## Skulls and Bones

Thursday, December 6

10:00 am-noon

Have you ever found animal bones and wondered about the creature that they came from? Skulls and bones hold telltale clues about an animal's lifestyle. Learn more about identifying animals from their skeletal system.