

Warming to Stir Up Wetland Ecosystems

By Elaine Friebele

In the last Marsh Notes issue, we peered 100 years into the future to experience the global warming-induced changes predicted by hundreds of scientists serving on the United Nation's Intergovernmental Panel on Climate Change (IPCC). We felt the heat: the average global temperature had increased two to six degrees Celsius (4 - 11°F), and the air contained twice as much carbon dioxide as it does now. Sea level was up by one meter in the Chesapeake Bay region due to melting glaciers and the expansion of warmer oceans.

It is no longer necessary to launch ourselves into the next century to discover the effects of global warming because we are experiencing them now. This summer, the Earth lost a record-breaking 27 percent of its Arctic ice cover. At Blackwater National Wildlife Refuge, on the eastern shore, thousands of acres of marshland that harbored fish, crabs, and waterbirds are now an expanse of open water, thanks to sea level rise.

Around the world, scientists report that climate change is already altering natural ecosystems. A recent analysis of research on nearly 1,600 species showed that 60 percent had changed their distribution or the timing of migration, blossoming, mating, or other behaviors in response to an average global warming of 0.6°C (1°F) over the past 100 years. With this change in phenology comes a potential disruption of timing between life cycles of predators and their prey, insects and their host plants, parasites and their host insects, and insect pollinators with flowering plants. Global warming may cause hundreds of species to retreat toward the poles. In the process, unconventional new communities—similar to the odd assemblages that gathered as the last glaciers retreated over 10,000 years ago—will be formed.

Chesapeake Bay ecosystems are a blend of southern, heat-tolerant species and northern, cold-



Photo courtesy National Fish and Wildlife Service

Ducks like the Shoveler may be less frequent at Jug Bay as their nesting wetlands in the Mid-west dry up.

tolerant ones. Warming could force heat-sensitive organisms out of the region. For example, eelgrass, which provides crucial brackish water habitat for young blue crabs and fish, cannot grow in water warmer than 27°C (80°F). How will climate change affect the intricate web of wetland ecosystems at Jug Bay?

Gains and Losses

Some plants—including trees, sedges, and emergent macrophytes in wetlands—will get a boost from greater CO₂ levels in the atmosphere. Because of the way these plants assimilate carbon from the air, they can take advantage of elevated CO₂ levels and increase photosynthetic rates. Moreover, this effect of extra CO₂ on photosynthesis actually *increases* with temperature, according to experiments performed at the Smithsonian Environmental Research Center. On the other hand, grasses (including salt marsh grasses), sugar cane, corn, and rice will not respond to higher CO₂ levels. Thus, the species composition of plants in estuarine marshes may be tilted toward emergent aquatic macrophytes such as Spatterdock, Pickerelweed, Arrow Arum, Arrowhead (if they are not submerged), while wild rice and salt marsh grasses will not fare as well.

According to the IPCC, the tree composition of our forests could shift over decades so that we'll be living in longleaf and loblolly pine forests much like those now growing in the southeastern United States.

Climate change presents a golden opportunity to invasive species. Since these species are resilient during a variety of disturbances, climate change, in concert with other stresses, might reduce populations of rare

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Jug Bay Home page:
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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 Maryland system, which promotes scientific research, public education, resource management and stewardship in estuarine reserves across the nation.

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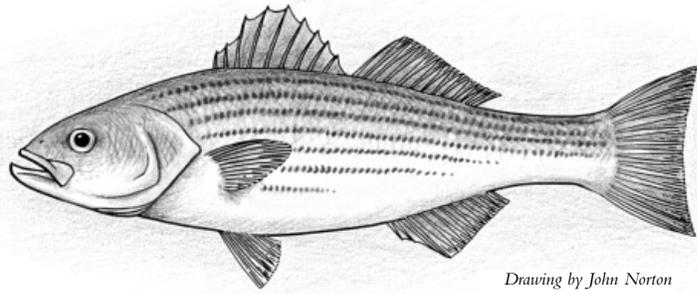
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Drawing by John Norton

Striped bass cannot tolerate warm waters.

and endemic species while allowing invasives to increase. Imagine kudzu and other non-native species that are currently damaging ecosystems in the southeast migrating to the Mid-Atlantic region.

Parasites may thrive as well. In 1991, a year with above-average winter temperatures, the oyster parasite, *Perkinsus marinus*, extended its range northward from Chesapeake Bay to Maine—a 500 km shift. What southern parasites might appear in our area?

Increases in water temperature are likely to have important effects on phytoplankton communities, which will affect zooplankton abundance. Several species of toxic phytoplankton expand their range during warmer periods.

Striped bass cannot tolerate water temperatures higher than 24°C (76°F). When water warms near the surface, they dive to the bottom, where they are likely to find oxygen-depleted zones. On the positive side, David Kimmel, of the University of

Maryland Center for Environmental Science observed that wet winters and high spring flows, caused by climate change, produce conditions favorable to a zooplankton species that is a major food source for striped bass larvae.

Butterflies have become an indicator of climate change as they shift their distributions northward and toward high elevations in concert with warming temperatures. The Sachem Skipper butterfly, which frequents Jug Bay, has expanded the western part of its range from California to the state of Washington (420 miles) in just 35 years. Laboratory and field manipulations showed that winter cold extremes dictate the northern edge of the butterfly's range. If warming continues, Jug Bay could become home to southern species of butterflies and other insects as the climate grows warmer. However, when the timing of host plant growth is out of phase with the butterfly life

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Warming Affects Gender Balance

In order to understand how climate change might impact box turtles, this summer we began a collaborative study with Dr. Kathy Szlavecz, a soil ecologist at Johns Hopkins University. Herpetologists are concerned about turtles because gender is determined by the temperature at which the embryos develop within the nest, not by sex chromosomes. Turtles provide no parental care for their offspring; eggs are laid in a ground nest and the warmth of the soil incubates the eggs. For box turtles, males develop from eggs incubated at 25-28°C, whereas females develop in eggs that are 28-30°C. Global warming could mean warmer soils, and warmer soils mean more female box turtles. Gender ratios are normally stable within a population. The Hopkins team has devised special micro-probes that record soil temperature and moisture. We placed these probes in the ground at three box turtle nests that were discovered last summer. Data are collected continuously and are stored in a microchip at the nests. From there, the data are downloaded onto a laptop computer. We will also be investigating the soil temperatures where adults and juveniles spend the winter. Box turtles burrow into the soil in the forest, usually where there is a thick layer of leaves. In November we will place additional sets of probes at the sites where 10 turtles overwinter.



**FRIENDS OF
JUG BAY
PRESIDENT'S
LETTER**

Greetings!

I just watched a beautiful sunrise at Jug Bay—wow! It was a spectacular sensory experience from the splash of pastel colors on a mostly sunny sky, a symphony of birdcalls from the marsh and surrounding lands, and the cool air filled with the crisp smell of autumn. Does it get any better? I am wondering how our FOJB members are doing, and what the upcoming change of seasons will bring for the Sanctuary. While you are enjoying the Sanctuary, please consider how you can contribute as a “Friend” to support it in your own way. As your President, I never know how, when, or what I may get asked to do to support the FOJB and the Sanctuary. Sometimes it can be an easy task and others times, very challenging. But it is generally a very rewarding experience to be the President of such a wonderful and active Friends group!

The FOJB is a nonprofit organization that supports and enhances Sanctuary activities.

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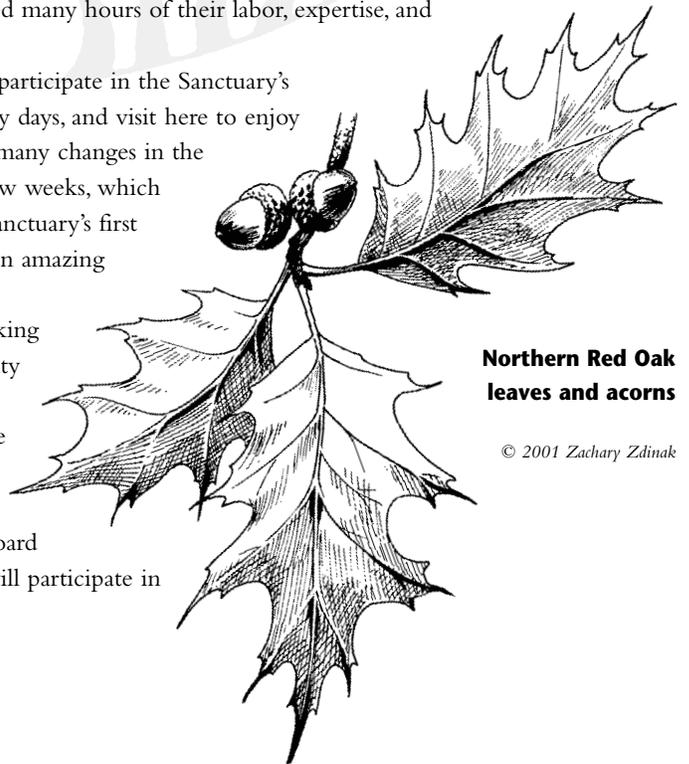
I have a request, and will introduce it with a side story. This October I was fortunate enough to be able to assist a neighbor in need. Twice we received a call in the middle of the night, each from a different family. One needed help with a horse and one needed help with a person. In doing this I became better acquainted with these neighbors, which I mention because often when you lend assistance the unexpected result can be a mutual benefit to both. Right now we (FOJB) are very fortunate and have no urgent issues to resolve at the Sanctuary, so perhaps it is a good time to reflect on what we can do to strategically help the Sanctuary. I ask you all to creatively think about what you can do to benefit the Sanctuary; do you have any ideas how to enjoy the Sanctuary and perhaps help yourself in the process? If you have no immediate idea, perhaps you could simply take a moment to contact the County Executive, the County Department of Recreation and Parks Director, or other officials and tell them how much you care for the Sanctuary, and THANK them for their leadership and support of it! It really helps!

As for current events, after one of the worst droughts on record we had three straight days of rain to reverse it last week. It seems we have to be careful what we ask for; I just heard that the Plummer House had more rain water than it could handle, resulting in a flooded basement. This was one of the many challenges to address for Sanctuary staff and FOJB volunteers this fall, but the Plummer House renovation is nearly complete now. In addition to the planned work, we accomplished some nice finishing touches to make it a more pleasant office setting and work place, such as adding a front porch with planter boxes and painting the entire interior with nice colors (it was previously all white). We hope that the facility will be open by December, and I want to thank our Friends members Mickey Taylor, Jim Harle, and everyone else who volunteered many hours of their labor, expertise, and camaraderie to make this a reality.

This is such a beautiful time of year with many opportunities to participate in the Sanctuary's activities. I hope many of you will find a time to break from your busy days, and visit here to enjoy the change of the seasons at the Sanctuary! As usual, there have been many changes in the endless cast of characters (wildlife and plants found here) in the last few weeks, which makes Jug Bay an amazing place to experience in the Autumn. The Sanctuary's first BioBlitz, held in September, was a huge success. In a mere 24 hours, an amazing variety of flora and fauna were documented.

Whether you are boating out on the Patuxent River here or walking the trails through fields and woods, you can easily engage your curiosity with the Sanctuary's bounty of natural distractions. Don't wait too long to get out here - the days are getting shorter quickly now. Before you know it you will be thinking about what you want to do the next time you get to visit! Please note: We currently have two vacancies for FOJB Board Members. If you are interested in becoming a Board Member, please contact one of us and let us know! I hope that you will participate in some great activities here this fall ... see you at the Sanctuary!

Jeff Shenot, President



**Northern Red Oak
leaves and acorns**

© 2001 Zachary Zdinak

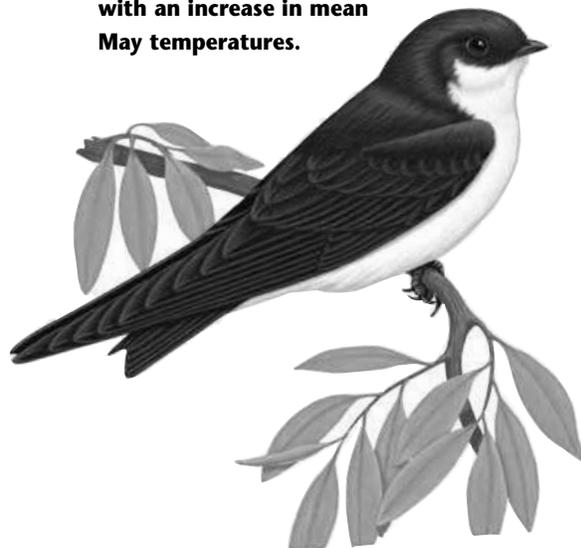
cycle, population crashes and extinctions could occur.

To be sure, warming has a significant effect on cold-blooded (ectothermic) animals such as amphibians and reptiles. A long-term study compared recent records of the calling of six frog species in New York with a study begun in 1900. Frog calling now occurs 10 to 13 days earlier than in 1900, an advance associated with a 1.0 - 2.3°C rise in temperature during critical months over the last century.

With wetlands losing ground to rising sea level, wading birds will probably lose intertidal habitat. The Chesapeake Bay region's wintering duck populations have already declined in part because of a widespread loss of submerged aquatic vegetation (SAV). Warming Bay waters, increasing streamflow, and burgeoning coastal populations are likely to cause declines in water quality and therefore SAV, leading to further declines in SAV-dependent waterfowl, according to Pennsylvania State University oceanographer Ray Najjar and his colleagues.

Factors outside our area will also play a role. Many of the ducks that winter in the mid-Atlantic region, including the Ruddy Duck, Shoveler, and Gadwall, breed in prairie potholes—small temporary wetlands located in central North America. Climate models predict that with a doubling of

The egg-laying date of North American Tree Swallows advanced by up to nine days in 32 years—a change associated with an increase in mean May temperatures.



CO₂, the prairie pothole region of the mid-West will dry up, thus reducing the number of ducks that are able to nest there.

As temperatures rise, bird migration could become a kind of mistimed dance: birds may arrive and lay their eggs too late to take advantage of the abundance of insects becoming available weeks earlier each spring. For example, Pied Flycatcher nestlings feast on caterpillars hatching out in the spring. Dutch researchers observed that in areas where caterpillars peak earlier in the spring, flycatcher populations declined by up to 90 percent in two decades.

Butterflies have become an indicator of climate change as they shift their distributions northward and toward high elevations.

Bird species that respond to weather cues may be able to adapt somewhat to warming. The egg-laying date of North American Tree Swallows advanced by up to nine days between 1959 and 1991—a change that is associated with a long-term increase in mean May temperatures. A similar advance was observed for the Mexican Jay in the mountains of southern Arizona. But there is no reason to expect migrants and their food sources to coordi-



Global warming has allowed the Sachem Skipper butterfly to expand its range 420 miles northward in just 35 years.

nate their migration and hatching dance.

According to Camile Parmesan, a University of Texas biologist who reviewed thousands of studies, there is no evidence to suggest that species would evolve new climatic tolerances in order to preserve their geographic distribution in the face of climate change. During the Pleistocene glaciation—which represents climate shifts five to 10 times the magnitude of twentieth-century warming—species appeared to shift their geographical distributions as though tracking the changing climate, rather than remaining stationary and evolving new forms. At Jug Bay, that means shuffling the species deck, with some new species arriving and others leaving or becoming extinct, making it difficult to predict what the ecological balance in our future wetland communities will be.

Brooke Meanley: Friend of the Patuxent Marshes Passes Away

(Based on the memorial written Matthew C. Perry, USGS Patuxent Wildlife Research Center, appended by Chris Swarth)

Last August, ornithologist and naturalist Brooke Meanley passed away. Brooke loved the Jug Bay wetlands and devoted many years to the study of the waterbirds and songbirds that live in the Wild Rice marshes here. His book, *The Patuxent River Wild Rice Marshes*, is a treasure trove of interesting natural history information about the marshes at Jug Bay.

Brooke Meanley was born at Riderwood, in Baltimore County, on January 19, 1915. In 1934, when just 19 years old, he and his friend, Tom Gilliard drove a motorcycle on a two month trip to study and photograph birds at Bonaventure Island at the end of the Gaspé Peninsula, Quebec. Brooke later studied natural history at the University of Maryland, where he received his BA degree and MA.

While serving in World War II, Brooke was responsible for rehabilitating soldiers in Atlanta and Macon, Georgia. The activity he enjoyed most was taking recovering soldiers on nature hikes in the woods and wetlands of the surrounding areas. When telling friends

Bio Blitz Tallies Over 450 Species

What brought more than one hundred people to search with nets, binoculars, and magnifying glasses through the wilds of the Sanctuary? Why were people walking trails in the dark, searching for night-flying insects and owls? It was the first annual Jug Bay Bio Blitz—a 24-hour inventory of all living organisms at the Sanctuary held in mid-September. Call it a snapshot of biodiversity, a gathering of data that will help us conserve and protect the plants and animals that are found here.

More than twenty scientists from the Smithsonian Institution, the Maryland Entomological Society, the College of Notre Dame, U.S. Department of Agriculture, and U.S. Geological Survey lead teams of volunteers to find and identify the organisms. The search for species included earthworms, ants, spiders, birds, snakes, turtles, frogs, and butterflies, as well as mushrooms, vines, meadow plants, and trees. Jug Bay, already known for its diversity of organisms, tallied more than 450 different species for the day.

Participants made several unusual findings. Sam Droege, a bee expert with the U.S. Geological Survey, discovered the Metallic Solitary Bee, which has never before been reported in the state of Maryland.

Entomologist Timothy Foard reported that the “ant faunal composition [at the Glendening Preserve] is very unusual for

central Maryland and contains a number of species more common in drier habitats, such as the southern part of the Eastern Shore.”

Dr. Kathy Szlavecz of Johns Hopkins University located *Diplocardia patuxensis*, a completely new native earthworm species she and her colleagues discovered five years ago.

Some observations were incidental to the immediate goal. While searching for dragonflies, entomologist Richard Orr was very impressed with the diversity of crickets and katydids in the river marsh areas. He noticed that the insect songs from the wild

rice areas were distinctly different than along the marsh-brush and spatterdock areas.

The data will be shared with the Maryland Department of Natural Resources and posted on the Sanctuary website.

Expect the Bio Blitz to become an annual event. Mark your calendar for June 7 and 8, 2008. Searching in the spring could well turn up another suite of species!

Below: Sue Riccardi and butterfly expert Richard Smith examine a specimen captured in the meadow.



Above: Bioblitz participants Kim Elliot, Naturalist Lindsay Hollister, and bee expert Sam Droege gather before going out in the field.



Above center: Botanist Joe Metzger and CBNERR stewardship coordinator Candace Morrell



Right: Dragonfly expert Richard Orr prowls the meadow with his net.



Brooke Meanley, continued

of his military experiences, he would comment on his unbelievable good fortune to get paid and to fulfill his military requirement by taking soldiers on bird walks.

Brooke worked as a research biologist for the U.S. Fish and Wildlife Service at Denver, Colorado, and then from 1957 to 1977, he was employed by the Patuxent Wildlife Research Center in Laurel. His fieldwork gave him many opportunities to explore the wetlands of the Southeast, which became the focus of his first book, *Swamps, River Bottoms, and Canebrakes*. He loved the Patuxent Wildlife Research Center and his colleagues. Often he would stick his head in an office and yell, “Ornithology! Never leave Patuxent!”

During this period, he also conducted extensive studies of rails and published the classic *North American Fauna No. 67 (1969)*, *Natural History of the King Rail*. In 1971 he published the *Natural History of the Swainson’s Warbler*.

Brooke was a prolific writer and published over 125 articles about his research and natural history observations. In 1977, Brooke retired and took up residence at his wife’s family homestead in Staunton, Virginia. Here he spent his time analyzing old field notes and photographs. These became the basis of a series of books, including *Birds and Marshes of the Chesapeake Bay Country (1975)*, *Blackwater (1978)*, *Birdlife at Chincoteague (1981)*, *Waterfowl of the Chesapeake Bay Country (1982)*, and *The Patuxent River Wild Rice Marsh (1992)*.

Brooke enjoyed being informed of news of the birds and the biologists at Patuxent Wildlife Research Center, Patuxent River Park, and at the Sanctuary. He continued to mentor young biologists and naturalists well into his retirement years. He was always interested to hear new information on the behavior of birds and discussed such with great enthusiasm. All those who had the good fortune to know Brooke and to spend time with him in the field will miss him.

Winter 2007/08 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 & Saturday (Open Sundays, March-November).
- Glendening Preserve open to the public 9 am-5 pm every day for hiking. (Closed Sundays, December-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.

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.

Birding at Jug Bay

Saturday, January 5; 8:00-11:00 am

Saturday, February 2; 8:00-11:00 am

Saturday, March 1; 8:00-11:00 am

Saturday, April 5; 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.

Help a Hungry Bird

Saturday, January 12; 10:00 am-noon

What do birds do in winter? How do they keep warm and what do they eat? We will explore bird behavior, search for birds, and then make bird feeders so you can help feed a hungry bird. Dress warmly. All ages.

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.



Nature Kids

Friday, January 18; 10:30 am-noon

Animal Sleepers

Friday, February 15; 10:30 am-noon

Animal Tracks

Friday, March 28; 10:30 am-noon

Frogs and Toads

Friday, April 18; 10:30 am-noon

Signs of Spring

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.

Aquatic Insect Ecology

Saturday, January

19; 1:00-3:00 pm

Bundle up and come explore a stream!

Winter is the best

time to study and identify aquatic insects. We will learn how to differentiate between the larvae of mayflies, stoneflies, caddisflies, true flies and other stream invertebrates. The role of invertebrates in monitoring stream health will be discussed. For adults and children over 10.



Vernal Pool Workshop

Saturday, February 9; 1:00- 3:00 pm

Vernal pools are special temporary ponds that host particular types of animals that have evolved to use them. First we'll enjoy a slide show to learn about the types of animals that use our vernal pools, discuss how we collect data, then we'll take a trip to see where the magic happens! Bring warm clothes and shoes that can get wet for the site visit. For adults and teens.

Keys to Winter Tree ID

Saturday, February 16; 9:30-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. For adults and teens.

Nocturnal Animals of Jug Bay Series

Thursday, February 21; 6:00-8:00 pm

Thursday, March 13; 7:00-9:00 pm

Thursday, April 10; 7:00-9:00 pm

Join us for an evening under the stars with our nighttime critters. Each program focuses on a different nocturnal animal that can be found at Jug Bay. We'll learn about their special adaptations, then take a sensory hike to search for signs of their presence. We'll also hike past one of our amphibian hot spots to look and listen for the active frogs, salamanders and toads of the season. Dress for the weather and bring a flashlight. For adults and children over 10 years old.

Stalking the Wild Timber-doodle

Friday, March 7; 5:30-6:30 pm

Late winter is the time for the annual courtship display of the American woodcock, a.k.a. timber-doodle. 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 Wetland 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 the bird on the ground after it has landed. No entrance fee. For adults and families with children at least 10 years old.

Welcome Back, Ospreys

Sunday, March 30; 1:00-3:00 pm

One of the largest populations of Ospreys is right here at Jug Bay, although they are only summer residents. Learn about their migration and their life history during a brief lecture, and then head outdoors to observe their behavior. For adults.

Spring Peepers

Saturday, April 12; 6:30-8:30 pm

Learn about the amazing amphibians that breed in Jug Bay's ponds. We'll take an evening hike to the listen and look for Spring Peepers, Wood Frogs and other amphibians that call in early spring. Dress for the weather, with footwear that can get wet, and bring a flashlight. All ages.

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Bringing Back Bluebirds

Sunday, April 6; 1:00-4:00 pm

Come learn about bluebirds and how they live. Each participant will assemble a nest box to take home and put up, hopefully to welcome bluebirds into your yard. We'll provide all the materials. Bring hammers and rechargeable drills and screwdrivers, if you have them. To reserve a space, mail the program fee of \$10.00 per box (including FOJB members), in advance, to the Sanctuary. All ages welcome.

Reptiles and Amphibians

Saturday, April 26; 1:00-3:00 pm

Snakes, turtles, lizards, frogs, toads and salamanders will be the stars of this program. We'll explore the forest and ponds to learn more about the similarities and differences between reptiles and amphibians. Wear waterproof boots or shoes that can get wet. All ages welcome.



5-lined Skink

© 2001 Zachary Zdinak

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 fieldwork 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; 1:00-4:00 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, 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.

Stream Monitoring

Friday, January 11; 12:30-4:00 pm

Volunteers are needed to help collect, identify, and count stream invertebrates that are used to evaluate stream health. Wear shoes and clothes that can get wet and muddy. Bring a change of clothes and a towel. For adults and children over 12 years old.

Habitat Survey Party

Wednesday, January 16; 1:00-4:00 pm

It's time to evaluate what we discovered about the Virginia Pine forests of the Glendening Preserve. Join us for this social event to reminisce about our favorite plot, observations about tree species distribution, and how to improve the study. We'll discuss our plans for exploring the Riggelman Preserve. In addition, volunteers can suggest questions to investigate using our data. This party is open to everyone who has helped with this study, as well as anyone who would like to learn about what we accomplished, and those interested in helping next year. Drinks and refreshments provided.

Become a Volunteer Workshop

Saturday, January 26; 2:00-3:00 pm

From conducting ecological field research, to leading education programs, analyzing data, and being a steward of the forests, meadows and wetlands, the volunteer opportunities at Jug Bay are nearly endless! Join us for an overview of the volunteer program and how you can get involved. For first time volunteers, as well as existing volunteers who want to learn more. For teens, adults, and families with children at least 7 years old.

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Parris N. Glendening Nature Preserve at Jug Bay

The Glendening Preserve encompasses over 620 acres of tidal marshes, upland forests, stream valleys and open meadows. Come explore these habitats and search for a diversity of plants and animals. Parking is available daily at the Wrighton Road entrance (closed on Sundays during the winter and on holidays.) The Plummer House will be open to the public; call or check web site for specific dates and times. No entrance fee.

Glendening Preserve programs meet at the Plummer House (Plummer Lane entrance).



Beavers Celebrate Groundhog Day

Saturday, February 2; 3:30-5:30 pm

We will learn how these two mammals have different adaptations for living in two very different habitats. We will hike to the beaver ponds and the meadows in hopes of catching a glimpse of these secretive animals. Dress warmly, and wear footwear that can get muddy. All ages.

Mystery Hike

Saturday, March 1; 1:00-3:00 pm

Join a volunteer naturalist on a difficult hike through never-before-visited sections of the Sanctuary. You will see a beaver dam and lodge "up close and personal" and visit four of our largest trees. Learn how proposed developments adjacent to the Sanctuary could harm our natural resources. The route will require traversing rough terrain, steep hillsides, a flood plain and small streams. Bring your binoculars, cameras, and walking sticks. Sturdy, preferably waterproof footwear recommended. For adults and teens.

Vernal Equinox Hike

Saturday, March 15; 4:30-6:30 pm

The Vernal Equinox marks the first day of spring. We'll take a hike to look for signs of the new season. We'll end with at sunset with a light snack. No entrance fee. All ages welcome.

Trail Maintenance Workshop

Saturday, February 23; 1:00-3:00 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. 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: Tips & Tricks

Saturday, March 8; 1:00-4:00 pm

Volunteers are needed to lead weekend programs for families. This workshop will focus on the "fun"-damentals of creating programs that introduce families to the wonders of nature. Educational and engaging activities along with tips for creating successful trips will enable volunteers to lead a variety of hands-on programs. Some natural history knowledge is useful. For adults or older teens.

Water Quality In-Field Training

Saturday, March 15; noon-3:00 pm

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 encounter our wetland habitats through all seasons, record data, conduct field work and 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.

Patuxent River Clean Up

Saturday, March 22; 10:00 am-3:00 pm

Saturday, April 5; 9:00 am-4:00 pm

Volunteers will pick up trash that has floated into the marsh, fallen into stream beds, and littered our roadsides. We'll also remove non-native invasive plants in the afternoon. Please dress in work clothes (long sleeved shirts and pants), including boots or shoes that can get wet, and bring work gloves, a bag lunch, a change of clothes and a towel. Children should be at least 6 years old. Scout troops and community groups are welcome.

Non-native Invasive Plant Removal

Saturday, April 5; 1:00-4:00 pm

Join our team to remove the non-native invasive plants from our forests before they threaten the Sanctuary's habitats. You can also adopt your own plot to manage the invasives. Wear long sleeves, long pants, and sturdy work shoes. Bring water, and if you have them, work gloves and hand pruners. Children should be at least 8 years old.

Scout Projects Enhance the Sanctuary By Lindsay Hollister

Scorching Heat for a Stellar Garden

Diligently beginning his preparation in last winter, Eagle candidate Ryan Pater intended to install for us a native butterfly garden in the spring, when rains would help nurture the plants, and mild temperatures would make for easy installation. Fast-forward to August, when approval came down through the ranks of the Boy Scout Council, and installation was headed for the dog days of summer.

Not to be discouraged, Ryan scheduled a weekend to install the much-anticipated garden. As the date approached, the forecast was grim. Installation Saturday arrived, and Ryan appeared with many helpers to get to work. As the morning ticked away to the afternoon they worked steadily. As the scouts planted each section, someone was right on their heels to water our new arrivals, and by 4 p.m. they were packing up the shovels and rakes and patting themselves on the back. Visitors began commenting on the new addition right away, as it is a very eye-catching display.



Ryan Pater installed a native butterfly garden for his Eagle Scout project.

Ryan knew that the work was not finished. His mother works at a nursery so he was well aware that new gardens need special care. For the next two months Ryan regularly appeared several times a week to soak the freshly planted garden, and was pleased to see that bees and monarch butterflies were already seeking food there. The added care has paid off and not one plant was lost during the drought. Though the garden has gone dormant for winter, the insects will find it again, and we look forward to using it as a focal point during future programs.

Solid Gold—New Visitors Overview Guide

As the Scout Program here at Jug Bay slowly grows, I am pleased to report the completion of our first Girl Scout Gold Award, by Arin Shortz. Roughly equivalent to a Boy Scout earning Eagle, it is the highest honor a Girl Scout can achieve. Arin first came to Jug Bay as an elementary student on a field trip, then again during Teen Adventure. She enjoyed it so much that she decided this was the place to earn her Gold Award. After meeting to discuss the options and warn Arin that this was the first Gold Award I'd been part of, we plunged into the unknown together.

This was an intellectual and solo project—a different beast than the group construction-type projects of Eagle candidates. Arin decided to create a Visitors Guide binder summarizing what we are about in a colorful, and easy-to-read, one-page format. The impetus behind this project was two-

fold. Mainly, if no one is available to discuss nature sightings or answer questions in the office, visitors can look up their queries in the binder, but secondly it makes for a handy overview to newcomers. Arin visited often to study the Exhibit Displays, attend education programs, and read the available literature on the history of the grounds.

As the final product began to unfold, I was very pleased to see Arin's own creative input that went into the layout of the binder. One of the best things she included was a stack of comment cards stuck into the front pocket, so that she can continue to improve upon her work. I hope that you will take a minute the next time you visit to see her fine work and give your two cents.



Susan Matthews and Rachel Dickey

Ask Susan Matthews anything about the least-explored, most remote parts of the Sanctuary and she'll give you an answer. Susan, the 2007 Jug Bay Fellow, spent weeks radio tracking 15 female box turtles as they moved through forest, field, and wetland. Susan grew up in Burtonsville and earned her BA degree from Hood College (Environmental Science). This past summer she completed her MS in Environmental Science from Johns Hopkins University, using her work at the Sanctuary as her final independent project. Susan is a tireless and perceptive field worker, and last summer she spent hundreds of hours in the field (many at night searching for nests) helping with our on-going box turtle study. You may have seen her in the meadow near the Wetlands Center, antenna in hand, as she tracked female box turtles searching for places to excavate their nests.

Susan has a wealth of experience that made her a valuable intern. She spent a summer in Alaska teaching about the envi-

ronment at the Prince William Science Center in the tiny coastal town of Cordova. She filled her spare time kayaking on the fjords and exploring the rich marine life along shore. Then she spent a summer working for the Conservancy of Southwest Florida in Naples, monitoring the nests of loggerhead sea turtles. She cruised 3 miles of beach in an ATV and her shift kept her working to the wee hours of the night because the females often wait till midnight to crawl up onto the beach.

When asked where she would like to be in five years, Susan answered, "I'd like to be doing marine policy work for an NGO or for NOAA. But for now I want to get as much field experience as I can, perhaps entering a PhD program."

Susan says her best experience working with us was the chance to observe the complete life cycle of the box turtle: from observations of mating, to nest excavation, and finally to watching baby hatchlings emerge from their nest in the meadow.



Jug Bay Fellow Susan Matthews holds a Box Turtle.

Much to our delight, the Chesapeake Bay National Estuarine Research Reserve announced in August that they were hiring a recent college graduate to work with the Reserve on research studies. Enter Rachel Dickey. Rachel has a 10-month intern position and will work with us at the Sanctuary, at Patuxent River Park, and on other projects in Annapolis. Rachel grew up in Bowie and went to Roosevelt High, the science magnet school in Greenbelt. Last spring she graduated from McDaniel College with her BS in biology and says, "My favorite class was ecology."

Rachel spent a semester at the University of California's Bodega Bay Marine Lab on the coast north of San Francisco. There she investigated rocky intertidal algae and designed experiments to determine if the shape and size of the 'holdfast,' which grips the plant to the rocks, differed between exposed and protected locations. She actually got definitive results—a rarity for student projects! Rachel said she loved the shore at this time,

when mist was over the ocean, and she could hear the loud exhalations of harbor seals that watched her warily from out in the water. Rachel also spent a semester near Cairns, Australia, studying the little-known "Johnston River" turtle. For this project, she says, "I loved cruising the coastal rivers looking for likely places where we would snorkel in search of the turtles." Back at the lab at James Cook University she'd help remove a sample of tissue for DNA analysis, to investigate speciation and evolutionary relationships.

In five years, Rachel hopes to be in a PhD program involved with oceanography and documentary filmmaking.

She says her most interesting natural history experience at the Sanctuary was the opportunity to observe Red-bellied Turtle hatchlings as they emerged from their nest and marched off towards the wetlands over 100 meters away. Says Rachel, "I loved seeing their bright red bellies!" Come by this fall and meet our two super interns: Susan and Rachel.



Rachel Dickey is the CBNERR research intern.

Three Join Scientific Advisory Committee

We welcome three new members to our scientific advisory committee. **Dr. Kelton Clark** is the director of the Morgan State University Estuarine Research Center in St. Leonard, on the lower Patuxent River estuary. Kelly is an estuarine ecologist with a keen interest in experimental design, predator-prey interactions, and the effects of riprap on nearshore estuarine animal communities. As a research scientist with the Smithsonian Institution, he investigated the relationships between blue crabs and their prey, the Baltic clam.

Eugene Meyer is a newly retired biology professor from Loyola College in Baltimore. Gene is a herpetologist and animal ecologist with a wide-ranging interest in the behaviors used by animals to avoid detection. He's been a partner in several of our herp studies, and always provides useful and unique insights that enhance our projects. He has special interest in the role of deer, raccoons, and disease in structuring forested and suburban ecosystems

Dr. Jeff Campbell is an assistant research scientist in the Center for Urban Environmental Research and Education at the University of Maryland, Baltimore. Jeff has been helping with several studies at the Sanctuary and uses his expertise in ecological informatics to help "mine" our data for trends and patterns. In October, Jeff presented a paper at a National Science Foundation symposium on Data Mining and Cyber-Enabled Discovery for Innovation. His talk, "Data Mining for Ecological Research: Lessons Learned from Amphibian and Reptile Activity Analysis", made use of Jug Bay data.

Visit www.jugbay.org for the most up-to-date information on events and programs.

Aquatic Research Draws Volunteer

Being wet and muddy is something that doesn't bother volunteer Yuka Tasumi. In fact, she's taken part in some of the coldest (and hottest), wettest, rainiest, muddiest activities here at Jug Bay! Yuka participates in nearly every research project at the Sanctuary, from the salamander study to winter bird census to fish surveys. She also helps with marsh clean-ups, invasive plant control, and even house painting! "I'm really hooked on activities in Jug Bay!" she says.

Yuka and her husband, Satoshi, came to the United States nearly three years ago from Tokyo, Japan, when Satoshi was employed by the University of Maryland Center of Marine Biology to work on a research project concerned with a parasite of Chesapeake Bay oysters.

Yuka grew up on Sado Island in the Japan Sea. Every summer, as she swam, she grew to love the ocean. In college, she majored in biochemistry and fish physiology and then went on to earn a Masters degree, studying serum protein level changes involved in thermal acclimation of Rainbow Trout and Mummichogs. Preferring fieldwork to the laboratory, she worked for a consulting company on projects such as vegetation mapping, environmental assessment, and riverbed restoration.

Finding a similar job in the U.S. was difficult. "To find Jug Bay's volunteer activities was a great pleasure for me because the Sanctuary does very professional wildlife research, and it's easy to join in," she says. "It's a way of getting more field work experiences."

Yuka first got her feet muddy helping with a restoration project at Poplar Island, sponsored by the National Aquarium. "We planted cordgrass seedlings at a tidal marsh site restored with dredge materials from Baltimore harbor," she says. "It was really muddy work and we wore water shoes or

Volunteer Yuka Tasumi helps set up fencing for the Wild Rice study.

Photo by Jeff Campbell



diver's booties and walked and planted in the mud and got muddy." When she recently traveled to Popular Island with the Sanctuary's volunteer excursion, she was able to see what had happened on the planting site. She participated in similar planting events at Barren Island and Eastern Neck, as well as clean-up events at Fort McHenry, and she also volunteers for the Jones Falls Watershed Association. Yuka worked as an

intern at Heathcote Community, an intentional, sustainable community in Freeland, Maryland. For their Natural Building project, she helped cover an exterior wall with lime plaster. It was there that she learned about Jug Bay from one of the other Heathcote interns.

"I came to the Sanctuary because I wanted to do the fish survey and to see a real wild Mummichog, which I studied in my Master's degree," Yuka says. "It was a great excitement to see them 10 years after! I really love aquatic studies like the fish survey, stream monitoring, SAV monitoring, and Wild Rice study. It is so adventurous and a lot of fun to untie a boat and go into the marsh. I hadn't experienced these kinds of activities in Japan, but I don't care about getting wet and muddy and it was so much fun!"

She also enjoyed learning about birds, amphibians and reptiles. "I didn't know anything about them before I came to the Sanctuary, but I read Sibley's and other guides and learned species one by one," she says. "Through these activities at the Sanctuary, I think I got a good global point of view of relationships among wildlife."

We will miss Yuka when she returns to Japan in the new year. "I'd like to continue these kinds of activities after I'll go back to Japan," she says, "and to work in aquatic ecology in the future."

An Inconvenient Truth, With Rather Convenient Solutions

By Rachel Dickey, CBNERR Intern

In the midst of Al Gore's success with *An Inconvenient Truth*, it seems the country is buzzing about melting ice caps, declining polar bears, flooding Asian countries, and many other catastrophic implications of global warming. Even the label "global warming" makes the problem feel insurmountable. At this point, the damage is being done, and it is up to us as individuals to change our lifestyle and fix it the best we can. The smallest changes will make a big difference if we all contribute in a small way as a large group of people. Why should we do it? We need our natural resources and if the environment changes too quickly, ecosystems may not be able to adjust. We have a lot to lose. We will only be able to make it better gradually.

1) Drive less.

One third of green house gases come from transportation. Taking public transportation is a great alternative to driving because you can lower your net green house gas emissions by 20 pounds per day (or more than 4,800 pounds per year!) and you can spend your travel time reading or catching up on work. Otherwise, you could combine a couple of trips into one, carpool, ride your bike, or walk instead of climbing into your car. Also, if you have a choice, don't drive your SUV or truck. If you're in the market for a new car, buy a hybrid. Your investment in a more fuel-efficient vehicle will pay off in the future.

2) This winter, lower your thermostat 2 degrees.

Buy a thermal shirt or invest in some fleece blankets. According to climatecrisis.net, this simple step would save 2,000 pounds of carbon dioxide per year per household. That's the equivalent of the amount of CO₂ your car would produce with 100 gallons of gas.

3) Turn off lights, stereos, and televisions when you're not using them.

Even when your electric devices are off, some appliances, including hairdryers, cell phone chargers and televisions, still consume

energy when they are plugged in. In fact, the energy used to keep display clocks lit and memory chips working accounts for 5 percent of total domestic energy consumption and spews 18 million tons of carbon into the atmosphere every year! We often forget that the electricity we use to power our homes does not simply come out of the wall; three quarters of our electrical power is produced by burning fossil fuel.

4) Inflate car tires to proper pressure for better mileage.

The Natural Resources Defense Council projects that if everyone followed this step, gasoline use nationwide would decrease two percent. Furthermore, a tune-up could boost your miles per gallon anywhere from four to 40 percent; a new air filter could get you 10 percent more miles per gallon.

5) Buy produce locally.

At <http://www.localharvest.org/csa/> you can subscribe to a farm near you and receive a regular share of their crops. This reduces the amount of fuel used in transporting food to grocery stores, and it supports the local organic farmers. Perhaps your food will even taste better.

6) Instill environmental values in your children.

The upcoming generation holds a lot of power when it comes to changing the course of global warming. Teach your children the value of recycling, conserving energy, and appreciating the outdoors. Teach them to live in a way that will not destroy the environment so that they can live in a clean and healthy world. The young generation is already showing promising signs of making the world better. At University of Maryland, College Park, today's youth came together at a rally called Powershift to learn how to make a difference: by establishing global networks of young people who want to help reverse global warming, by comparing notes with other students from their state on the changes they have made and future goals for their hometown, and by brainstorming



Chesapeake Bay
National Estuarine Research Reserve
MARYLAND

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**

about how to encourage more young people to become involved.

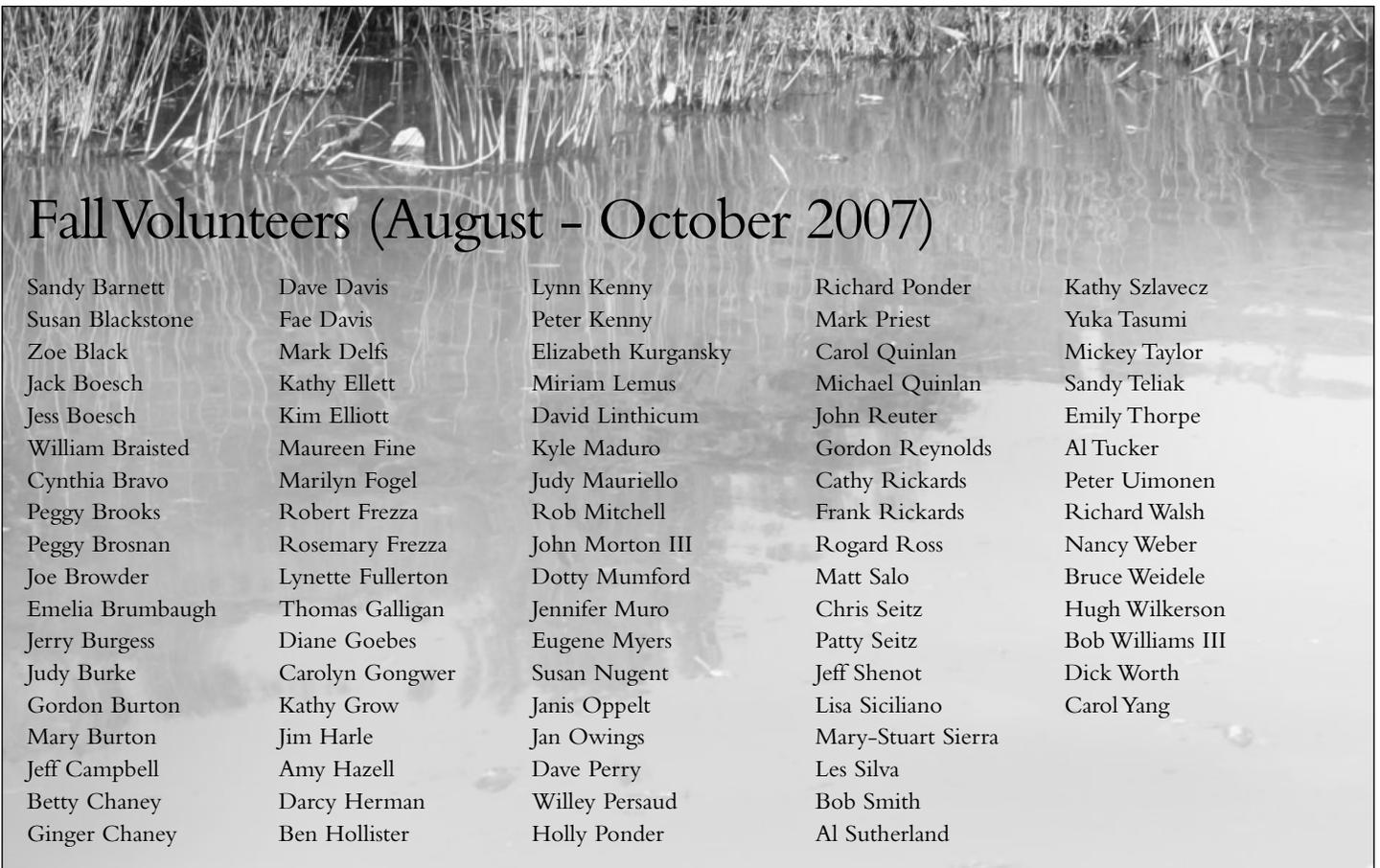
An Inconvenient Truth raised the alarm on our impact on the environment, but it was not meant to create panic. The solution is within our reach, and by gradually changing the way we live, we can avoid catastrophic problems in the future. Collectively, individuals like you and me hold the power to make real changes and set the course for future generations.

W I N T E R 2007 2008



DEPARTMENT OF RECREATION AND PARKS

Jug Bay Wetlands Sanctuary
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Fall Volunteers (August - October 2007)

Sandy Barnett	Dave Davis	Lynn Kenny	Richard Ponder	Kathy Szlavec
Susan Blackstone	Fae Davis	Peter Kenny	Mark Priest	Yuka Tasumi
Zoe Black	Mark Delfs	Elizabeth Kurgansky	Carol Quinlan	Mickey Taylor
Jack Boesch	Kathy Ellett	Miriam Lemus	Michael Quinlan	Sandy Teliak
Jess Boesch	Kim Elliott	David Linthicum	John Reuter	Emily Thorpe
William Braisted	Maureen Fine	Kyle Maduro	Gordon Reynolds	Al Tucker
Cynthia Bravo	Marilyn Fogel	Judy Mauriello	Cathy Rickards	Peter Uimonen
Peggy Brooks	Robert Frezza	Rob Mitchell	Frank Rickards	Richard Walsh
Peggy Brosnan	Rosemary Frezza	John Morton III	Rogard Ross	Nancy Weber
Joe Browder	Lynette Fullerton	Dotty Mumford	Matt Salo	Bruce Weidele
Emelia Brumbaugh	Thomas Galligan	Jennifer Muro	Chris Seitz	Hugh Wilkerson
Jerry Burgess	Diane Goebes	Eugene Myers	Patty Seitz	Bob Williams III
Judy Burke	Carolyn Gongwer	Susan Nugent	Jeff Shenot	Dick Worth
Gordon Burton	Kathy Grow	Janis Oppelt	Lisa Siciliano	Carol Yang
Mary Burton	Jim Harle	Jan Owings	Mary-Stuart Sierra	
Jeff Campbell	Amy Hazell	Dave Perry	Les Silva	
Betty Chaney	Darcy Herman	Willey Persaud	Bob Smith	
Ginger Chaney	Ben Hollister	Holly Ponder	Al Sutherland	