

We thank members of the Friends of Jug Bay for supporting summer intern research at the Sanctuary—a valuable source of knowledge for conserving and managing Jug Bay!

Evaluating the Potential for Upland Marsh Migration of Jug Bay Tidal Freshwater Wetlands, Patuxent River

By Nora Howard, 2019 JBWS Summer Research Intern and M.S. Candidate, Johns Hopkins University

Marshes are a vital component of coastal communities, both human and natural, and they are threatened by, among other things, increasing sea level rise trends. Marshes have two main adaptation strategies to persist through sea level rise. They can build vertically by trapping sediments and depositing organic material, and they can expand or migrate inland as waters rise. During my research internship at Jug Bay this summer, I investigated the potential for marshes in the

tidal freshwater region of the Patuxent River to migrate inland. This required examining the slope of the land from the marshes to the uplands to determine its suitability for facilitating marsh migration.

In an effort to first evaluate areas potentially suitable or unsuitable for marsh upland migration, I looked at a terrain map of the entire study area (Figure 1) that showed the slope (color coded by steepness) of the land next to marsh zones.



Figure 1. Map showing the tidal freshwater portion of Jug Bay wetlands along the Patuxent River and study sites (study site code labels are defined in Tables 1 and 2). Red lines indicate areas not suitable for marsh migration. Green lines indicate areas likely suitable for marsh migration.

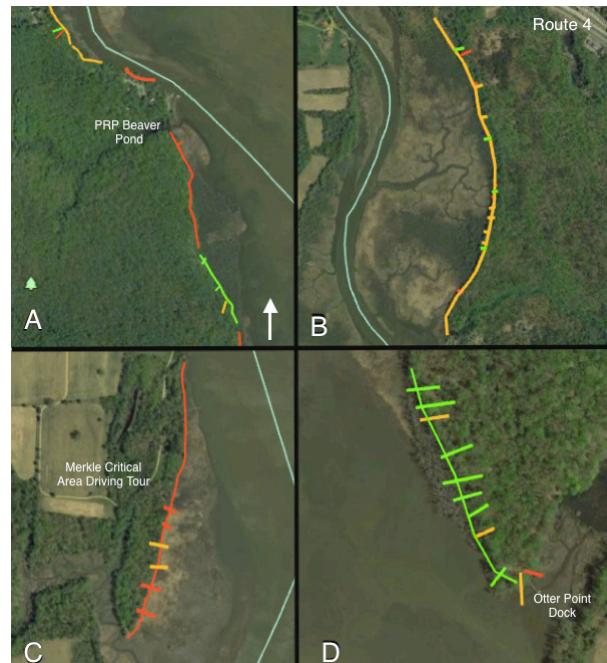


Figure 2. Examples of transects and study sites ranked by their average transition zone slope. Red lines indicate areas not suitable for upland marsh migration. Orange lines indicate areas potentially suitable for upland marsh migration. Green lines indicate areas likely suitable for marsh migration. A) PRP South and Railroad West. B) Chris Swarth Boardwalk and Glendening. C) Merkle/Lookout Creek. D) Otter Point.

After field corroboration, sites showing steep slopes bordering the marshes were classified as not suitable for marsh migration (Table 1). In those nine study sites where the terrain map showed the overall slope to be conducive to marsh migration, we used a laser level to measure the slope along transects that extended across the marsh zone, marsh-upland transition zone, and the upland zone (Figure 2). The average slope of the transition zone was used to rank each study site for its suitability to marsh upland migration (Table 2).

Of the study sites that showed potential for marsh

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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, environmental education, and protection. The Sanctuary is a limited-use park. Groups are requested to make a reservation by calling the office before planning a visit.

Jug Bay Wetlands Sanctuary is a component of the Maryland Chesapeake Bay National Estuarine Research Reserve, which along with 27 other Reserves around the country promotes scientific research, public education, resource management and stewardship in estuaries across the nation.

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Comments and suggestions are welcome.

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Intern Research—Upland Marsh Migration, continued from page 1

Table 1. Sites not measured due to excessive transition zone slope.

Site	Map Code
Billingsley	BL
Western Branch	WB
House Creek	HC
Mataponi	MP
Landing Lane	LL
Nottingham	NH
Swan Lane	SL
River Airport	RA
Chew Creek	CC
Opposite Merkle	OM

migration, Patuxent River Park (PRP) South and Otter Point had the lowest average transition zone slopes, meaning that marsh migration is most likely to occur there. Based on the slope around these two sites, I was able to estimate that about 1.4 acres at PRP South and 7.3 acres at Otter Point may be potentially available for marsh migration before the upland slope increases. The average transition zone slopes measured at the Glendening, Railroad West, and Chris Swarth Boardwalk study sites were more moderate and thus only potentially suitable for marsh migration. The terrain map revealed that there is not a notable amount of acreage available at these sites for marsh migration before the upland slope increases. The average transition zone slopes measured at Aquasco Farm, Merkle/Lookout Creek, and Full Mill Branch were the greatest and thus least suitable for potential marsh migration.

This study revealed that marsh

migration constitutes a very limited adaptation strategy for combating sea level rise for the marshes in the tidal freshwater portion of the Patuxent River. Even in some areas where the initial transition zone slope was low, the slope increased sharply once it reached the upland zone. In the few sites that have potential for upland marsh migration, successful migration may also depend on the rate of sea level rise compared with the rate of migration. The rate of marsh migration can be influenced by factors such as plant community composition and soil type. It will be important to conduct further monitoring in these study sites to determine whether marsh migration could outpace sea level rise.

If the tidal freshwater marshes in the Patuxent River are to persist under the threat

Studies like the present one are important for evaluating the different strategies marshes may have at their disposal to cope with sea level rise.

of sea level rise, adaptation strategies other than upland migration will also need to occur. While the surface elevations of some marshes in the Patuxent River have been shown to increase at rates that are able to cope with estimated rates of sea level rise, others have not. For example, the marsh south of the railroad bed is gaining elevation at a higher rate than the rate of sea level rise, but the contrary is the case for the marsh north of the railroad bed. Continuing the

Table 2. Study sites ranked by average transition zone slope ± 1 SE.

Site	Map Code	Average Transition Slope ± 1 SE	Rank	Potential New Marsh (acres)
Marlboro Meadows Park	MMP	NA	1	175
PRP South	PRP	-0.13 ± 0.03	1	1.4
Otter Point	OP	-0.14 ± 0.02	1	7.3
Glendening	GL	-0.17 ± 0.03	2	0
Railroad West	RRW	-0.17 ± 0.1	2	0
Chris Swarth	CS	-0.18 ± 0.02	2	0
Aquasco Farm	AF	-0.20	3	0
Merkle/Lookout Creek	MLC	-0.21 ± 0.01	3	0
Full Mill Branch	FMB	-0.30	3	0

Continued on page 11



Dear Friends,

Three billion birds lost in North America since the 1970s, raging wildfires, massive flooding—the dismemberment of our natural environment knows no bounds and, with over 85 federal rules and regulations being rolled back, the very basis of our livelihood and future is at stake. Too strong? The fact is that it is all too true.

Jug Bay Wetlands Sanctuary is testimony of what can be done at the local level. Studies on bird populations, climate change, and phenology, along with education and stewardship conducted by staff and volunteers, help assess the status and trends of species and their habitats and forge adaptive strategies. While these are substantive contributions to science and environmental management, the challenge is how to scale up and inform decision making and craft as policy.

The Friends of Jug Bay (FOJB) board has been hard at work to see how this may be achieved. Committees on strategy, funding, communications/outreach, advocacy and membership have met, exchanged ideas, and targeted programs to help sustain the work of JBWS over a 3-year period. Progress is being made, and we have confirmed and consolidated program support and identified opportunities for future funding at a board retreat. Naturally, much will depend, as always, upon our splendid volunteers, the often unheralded Friends who help conserve our natural environment.

I will report the major findings of the retreat in the spring issue of *Marsh Notes* and at the FOJB annual meeting. In the meantime, let me thank the FOJB board, members, volunteers, and others who have given so much time to making the world a better place.

Colin Rees, FOJB President

We welcome new and returning FOJB members:

Joe Acton	Ben and Vanessa Meeks
Chas Argent	Katherine Nelson
Chuck Barnes	Thomas Petzwinckler,
William Burnett	Anna Rose and
James Cawood	Jake Boeson
John Christmas Jr.	Richard and Laura Price
Evelyn Dolan	Barbara Saffir
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Stan and Becky Fredericks	Pete Touhey
Eric Frere	Elissa Weidaw
Anita Hagan	Betty and Chuck
Carol Hamilton	Weinkam
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Monitoring and Documenting Trash at Jug Bay Wetlands Sanctuary Through Citizen Science

By Hadijah Lawal, *Chesapeake Conservation Corps Member*

Trash and dumping at Jug Bay Wetlands Sanctuary has been a significant environmental problem for many years. Just a few weeks ago trash was dumped on our Glendening Nature Preserve property, and the perpetrator went through the hassle of breaking the fence in order to do it. We at the Sanctuary believe that more public education, awareness, and action is necessary to tackle this problem. However, to support such efforts we need to clearly understand and document the magnitude of the issue. My capstone project as a Chesapeake Conservation Corps Member will be designed to address questions such as: Where are the Sanctuary's hot spots for trash? Is there a difference between the amount and kinds of trash collected along the shoreline versus upland? What are the most common types of trash?

The main goal of my project is to create a citizen science program at Jug Bay to help monitor, quantify, and better understand the trash issue. I would like to adapt an existing volunteer-driven program developed by the Ocean Conservancy to use here at Jug Bay. Participating volunteers will be trained to collect and report the data into an app called Clean Swell, which connects to an international database. Therefore, the data



Volunteers at a Patuxent River clean-up by canoe at Jug Bay.

collected at Jug Bay could support not only local but national and international efforts as well. Volunteers are crucial for this effort to succeed, so any level of participation is welcome, from coming out on designated data collection dates or noticing trash and informing staff on your leisure hike through the Sanctuary.

I also want to incorporate a couple of public programs for those interested in repurposing items that are generally thought of as trash. Even if you are not able to go out and monitor the trash you can come out and have fun with it! The combination of collecting, monitoring, documenting, and

repurposing will hopefully promote a more aggressive management and educational approach to address the trash issue at Jug Bay. If this project is successful, I will pitch this idea to other parks in the county in hopes that they see the value in implementing such a program.

I will be hosting an information session in January to kick off the project, so keep an eye out for more details. If you are interested or know anyone who would be, please contact me at rplawa00@aacounty.org. Any help would be greatly appreciated!

Did You See That Tree?

By Cynthia Bravo, *JBWS volunteer*

People come to Jug Bay to see the birds, the salamanders, the turtles, and the river otters. But what about the plants? Did you know that Jug Bay has Needleleaf Rosette Grass (*Dichanthelium aciculare*), a plant rare to Maryland? Or how about the Red Hickory (*Carya ovalis*), which looks like other hickories but for its unique nut?

Although Jug Bay is known for its wetlands, it also has forest and meadow habitats, which support different kinds of plants. In addition, it has the less common habitats of the pine barrens and sand barrens. Even in disturbed areas new plant species can be found—such as the Riverbank Grape (*Vitis riparia*), a vine found on the entrance road to the Plummer House at the Glendening Nature Preserve.

Through more than 30 years of work by volunteers and staff, Jug Bay has identified 658 trees, shrubs, vines, grasses, ferns, mosses, and herbaceous plants.



Red Hickory (*Carya ovalis*) herbarium specimen from Jug Bay. Photo by Cynthia Bravo.

Watershed Stewards Academy Capstone Project Creates Pollinator Habitat at the McCann Wetlands Center

By Lynnette Fullerton, JBWS volunteer, Anne Arundel County Watershed Steward

About a year ago I started out on what would prove to be a very busy year. I was accepted into Class 11 of the Anne Arundel County Watershed Stewards Academy, a year-long program that teaches about stormwater management practices and ways to engage and educate community members on stormwater issues. The final piece of the training was the installation of a capstone project in Anne Arundel County. Having been a volunteer at Jug Bay for over 20 years, I immediately knew I had to do my project there! I joined forces with another Steward candidate, Keli Stambaugh, and together we came up with a conservation landscaping plan to revitalize the area just in front of the McCann Wetlands Center, through a combination of invasive vine removal and planting of native pollinator-friendly plants, as well as the installation of a rain barrel. To make that happen, we applied for, and received, a grant from Unity Gardens.

Our first official work day was a scorcher, but we had a great turnout—about 20 kids (10–12 years old) from the Centro de Ayuda in Annapolis and a Girl Scout troop—another 15 girls and some adult volunteers. We managed to make light work of removing several bags of invasive vines, trimming several trees, and clearing out a

small walkway through the middle of the garden. Two weeks later we were back again for the planting day. With the help once again of the kids from the Centro de Ayuda, as well as several other stewards—including Jug Bay's own Volunteer & Program Coordinator Debra Gage, who is herself part of Class 2 of the Watershed Stewards

asked if they could come back next summer to check on their plants. I certainly hope so! It should be stunning next spring, when everything starts greening up again!

Keli and I are so grateful for all the support we have received from Noelle Chao and Josh Clark from the Watershed



Lynnette (far left) and volunteers pose near the conservation landscape they planted near Jug Bay's McCann Wetlands Center.

Academy—we planted over 200 native flowers and grasses, including Swamp Milkweed (*Asclepias incarnata*), New England Aster (*Aster novae-angliae*), Columbine (*Aquilegia* sp.), and many others. One of my favorite moments from that day was when one of the girls from the Centro de Ayuda

Stewards Academy. They were both there for each of the workdays. Noelle even served as the official photographer! I'm looking forward to doing more planting next year, as well as installing some interpretive signs. I hope you'll stroll through the next time you're at Jug Bay!

And, as a bonus, three quarters of those species are in an herbarium collection in the loft of the Wetlands Center. Leaves, seeds, and flowers are beautifully mounted to museum-quality specifications. The list includes 21 species that are rare or threatened in Maryland.

How did this collection come about? Many people have contributed, including, for more than two decades, volunteer David Laughlin. During the growing season David will spend up to 4 hours, 3 days of the week, walking the entire Jug Bay property to find new plants. He relies primarily on his knowledge of plants and memory of what has already been identified at Jug Bay. After he collects the samples, he takes them home to identify and mount them. When they are mounted and he has thrown out all the useless stuff, he takes them to the Smithsonian's National Herbarium for verification.

This summer, David identified 36 plant species that had not

been discovered earlier at Jug Bay, and he mounted specimens to add to the herbarium. His findings ranged from the meadows to the river. They include Wild Basil (*Clinopodium vulgare*), found in the Sanctuary meadow; and Wild Potato-vine (*Ipomoea pandurata*), found in the pine barrens.

These are now on the master plant list, which can be viewed on the Jug Bay website through the Species Lists link, under Research. The database includes not only each plant's habitat but where it was found, who found it, and when. The website also has technical reports analyzing plant species diversity, distribution, and abundance.

In whatever season you come to Jug Bay, you can find plants with interesting features. And for ideas of what to look for, you can take a look at the "Now Blooming" board at the Wetlands Center.

Jug Bay Wetlands Sanctuary Open Hours

Sanctuary Wetlands Center: Wednesdays, Fridays, Saturdays, and (Mar-Nov) Sundays 9:00 am - 5:00 pm

Glendening Nature Preserve: Wrighton Road entrance daily, gate open 9:00 am - 5:00 pm; Plummer House entrance Monday to Saturday, gate open 9:00 am - 5:00 pm (trails, Butterfly Garden, dogs on leash)

Patuxent Wetland Park: daily, dawn to dusk (fishing, hand-carried boat launch)

Wootons Landing Wetland Park: daily, dawn to dusk (fishing, loop trail, hand-carried boat launch)

Sanctuary Wetlands Center admission fee:
\$6/vehicle

- Free for current Friends of Jug Bay members, active volunteers, and active military and their immediate families.

- There are no fees to visit our other sites.

Visit www.jugbay.org for directions, information and updates to our schedule.

Registration is required for all programs.
Please call 410-741-9330 or e-mail programs@jugbay.org to register, or, in the case of ActiveNet programs, register online at <https://apm.activecommunities.com/aarecparks>. All programs meet at the Wetlands Center at 1361 Wrighton Road unless otherwise noted. An adult must accompany children under 13.

**Visit www.jugbay.org
and follow links to
public programs
offered at JBWS.**

Photo by Cynthia Bravo.



Bee visiting wild rice (*Zizania aquatica*). Photo by Hope Corbin.

Characterizing the Native Bee Populations of Jug Bay Tidal Freshwater Wetlands

By Hope Corbin, 2019 JBWS Summer Research Intern

Tidal freshwater wetlands, like other wetland counterparts, are known for their ecological, cultural, and economic value. Tidal freshwater wetlands, particularly, are recognized for their high plant diversity and productivity. The role of pollinators in these highly diverse ecosystems, particularly native bees, is not well studied. The main pollinators found in natural areas include butterflies, moths, beetles, and wasps, but bees are considered the most efficient due in part to their unique way of extracting pollen from flowers called "buzz pollination." By shaking flowers at a certain frequency, more pollen is released, thus allowing for more efficient pollination. Bees are also often considered a bioindicator of the power of pollination. Therefore, understanding and characterizing the ecological value of bees as pollinators in tidal freshwater wetlands is important to help maintain the health of these ecosystems, especially under current environmental and human threats.

The main goal of my research project was to characterize the native bee population found at Jug Bay tidal

freshwater wetlands, transitional marsh-upland, and upland habitats and to determine their pollination relationship to any of the various plant species. To do this, surveys to determine plant and pollinator species presence and plant blooming times were conducted along transects covering three main foraging zones: marsh (low marsh and mid-high marsh), transitional marsh-upland, and upland zones. The pollinator (bee) inventory started in June of 2018 and continued until June of 2019, while the plant blooming study was done during the summer of 2019. For the pollinator study, two types of traps (bee bowls and blue vane traps) were used to ensure that both large and small bees were collected. Specimens were then sorted, labeled, and identified to genera. All bee data is stored in the Discover Life Database of the U.S. Geological Survey Native Bee Inventory and Monitoring Lab at the Patuxent Wildlife Research Center (identification is still ongoing). For the plant blooming study, species noted in bloom along sampling transects were identified and their means of pollination identified based on published literature.

Table 1. Genera of bees found and the number of species found within each genus in Maryland.

Family	Scientific Name	Common Name	# of species found in MD
Apidae	<i>Bombus</i> spp.*	Bumble Bee	11
Apidae	<i>Apis mellifera</i> ‡	European Honeybee	1
Apidae	<i>Sphecodes</i> spp.†	Cuckoo Bee	17
Apidae	<i>Xylocopa virginica</i> ‡	Large Carpenter Bee	1
Apidae	<i>Ceratina</i> spp.*	Small Carpenter Bee	5
Apidae	<i>Ptilothrix bombiformis</i> *	Hibiscus Bee	1
Halictidae	<i>LasioGLOSSUM</i> spp.*	Sweat Bee	83
Halictidae	<i>Melissoides</i> spp.†	Sweat Bee	12
Halictidae	<i>Halictus</i> spp.†	Sweat Bee	5
Halictidae	<i>Eucera</i> spp.†	Sweat Bee	5
Halictidae	<i>Agapostemon</i> spp.†	Sweat Bee	3
Halictidae	<i>Dufourea novaeangliae</i> †	Pickerel Bee	1
Megachilidae	<i>Megachile</i> spp.†	Leaf Cutting Bee	22
Megachilidae	<i>Osmia</i> spp.‡	Mason Bee	11
Andrenidae	<i>Andrena</i> spp.†	Mining Bee	85

*Species in high occurrence (1000+); †species in mid occurrence (500–1000); ‡species in low occurrence (less than 500).

Table 2. Specialist bee species found at Jug Bay tidal freshwater wetlands.

Specialist Type	Bee Scientific Name	Bee Common Name	Plant Scientific Name	Plant Common Name
Oligoleptic	<i>LasioGLOSSUM nelumbonis</i>	Sweat Bee	<i>Nuphar avena</i>	Spatterdock
Oligoleptic	<i>Ptilothrix bombiformis</i>	Hibiscus Bee	<i>Hibiscus moscheutos</i>	Crimson-eyed Mallow
Monolectic	<i>Dufourea novaeangliae</i>	Pickerel Bee	<i>Pontederia cordata</i>	Pickerelweed

All bee specimens collected during the duration of the study were classified within 15 genera and 4 families (Table 1). Although most of the bees observed were considered generalists (polylectic, or species that collect pollen from multiple plant genera and multiple families), three of them were either oligoleptic (species that visit few plant species in related families) or monolectic (species that only visit one plant species) (Table 2 and Figure 1).

Overall, about 72% of the 82 blooming plant species observed in this study are pollinated or experience enhanced pollination by bees. Enhanced pollination refers to plants that can be both wind and insect pollinated. On the upland zone, 93% of the blooming plants observed were exclusive to that area alone, and the most common bee genus collected was *Bombus*, a

group commonly referred to as bumble bees. On the transitional marsh-upland zone, 41% of the blooming plants were exclusive to that zone and the most prevalent bee genus collected was

Understanding and characterizing the ecological value of bees as pollinators in tidal freshwater wetlands is important to help maintain the health of these ecosystems.

LasioGLOSSUM due to the fact that the most common plant species found in this zone was Spatterdock (*Nuphar avena*). Finally, the overall marsh zone studied only showed nine plant species in common with the

transitional zone, and the most common bee genus collected varied in each marsh site sampled (Western Branch, Railroad Bed, Chris Swarth Boardwalk) depending on the dominant marsh plant blooming at the time: the bee *Agapostemon* spp. at Western Branch, where Water Hemlock (*Cicuta maculata*) was in bloom; *Lasioglossum* spp. at Railroad Bed, dominated by blooming Spatterdock (*Nuphar advena*); and *Ptilothrix bombiformis* at Chris Swarth boardwalk, dominated by blooming Crimson-eyed Mallow (*Hibiscus moscheutos*).



Figure 1. Crimson-eyed mallow (*Hibiscus moscheutos*) visited by a native bee species, probably the specialist *Ptilothrix bombiformis* (Hibiscus Bee). Photo by Hope Corbin.

Preliminary results obtained from this study give a solid indication of the importance of native bees in the pollination of Jug Bay tidal freshwater wetlands and adjacent transitional and upland zones. These habitats in turn seem to provide a healthy environment to a diverse bee population, hence the importance to continue their protection and conservation. Further research to expand our knowledge of native bee populations, their habitat interactions, and their economic and ecological value should be promoted.

Meet the Friends of Jug Bay Board: Elaine Friebele

Growing up surrounded by the beauty of the southern Appalachians, I've always loved spending time outdoors—camping, hiking, birding, and taking my children (and now my grandchildren) and family outdoors. I felt very fortunate to discover the Sanctuary nearly 30 years ago when I brought my Freshwater Ecology students from the USDA Graduate School there for a field trip. Shortly afterwards, I became a volunteer canoe guide, introducing people to the wonders of the Patuxent River and surrounding wetlands from the water. In 1999, I joined the staff as a Naturalist and later, as Education Coordinator. I especially enjoyed sharing my love of nature with people of all ages. There was something new and exciting to learn every day, and I valued the chance to conduct research in the field—whether the topic was Spotted Salamanders, Red-bellied Turtle nesting, wild rice, or plankton. I retired in 2014 but I couldn't stay away from Jug Bay! I still lead canoe trips, participate in bird surveys, and help teach school field trips. Joining the Friends of Jug Bay (FOJB) board this year affords me the chance to play a different role in supporting the Sanctuary. I know first-hand the importance of FOJB sponsorship at the Sanctuary: providing bus transportation for students, camp scholarships, financial support for research and internships, and many other benefits. I look forward to serving on the board as we work to advance the Sanctuary's goals.



Friends of Jug Bay board member Elaine Friebele.



Jug Bay 2019 fall research intern Sydney Naughton.

Welcome Fall Research Intern Sydney Naughton!

My name is Sydney Naughton. I am currently a senior at Salisbury University, pursuing a degree in Environmental Studies with a minor in Biology. My interests within environmental studies are in wildlife conservation. Here at Jug Bay Wetlands Sanctuary, I am researching the long-term effects that climate change may be having on winter waterfowl. For my research, I am using bird sighting data collected by citizen scientists at Jug Bay since 1990. I am organizing and analyzing and will be reporting my findings based on 20-plus years of data. The question I want to focus on is how climate change is affecting seasonal migration patterns for these waterfowl. For example, I want to see if changes in seasonal temperatures are causing certain species to arrive earlier or later and depart earlier or later. Because I was given data for over 90 bird species, I am narrowing down my focus to about 10 species that were recommended by some of the birders who have contributed data. Some of the species include Osprey, American Black Duck, and Northern Pintail. I am excited to see the results and even more excited to have this research opportunity with such a wonderful group!



Call for Volunteers for Classrooms in the Field

The JBWS Classrooms in the Field environmental education program is getting ready for another spring season! We have a dedicated group of volunteers who lead small groups on our field trips—the program depends on them! And we are always welcoming more volunteers. Please join us!

Share your love of nature with school-age children by helping them catch critters in the stream, find treasures in the woods, and look for Osprey in the marsh. Field trips commonly run on weekdays from 10 am to 2 pm.

Come to our winter training, then pick the days you want to help out. Have a friend who might be interested? Share the possibility with others. It is a lot of fun! Contact Sarah Kempfer, JBWS Education Coordinator, at rpkemp00@aacounty.org or call 410-741-9330. Watch for the date of the next training!

Explore our volunteer opportunities online at www.jugbay.org/volunteer. For more information, call 410-741-9330 or e-mail **Volunteer & Program Coordinator Debra Gage** at rpgage00@aacounty.org.

Help Fund Visiting International Staff by Journeying to Costa Rica!

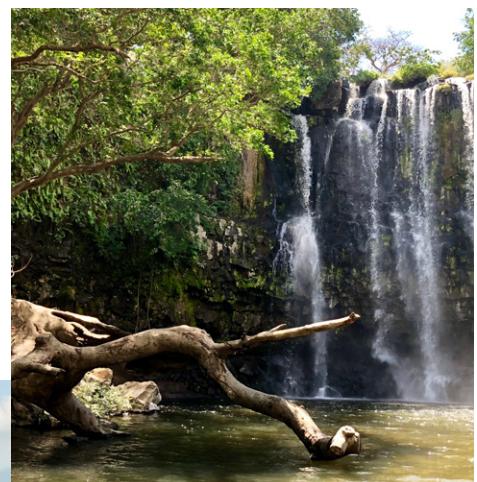
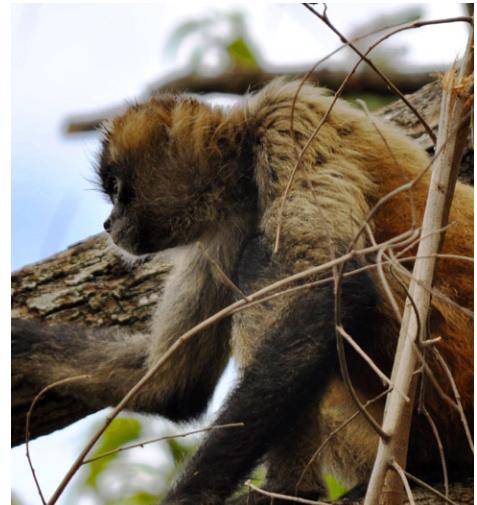
Travel to Palo Verde National Park in Guanacaste Costa Rica with the Friends of Jug Bay from March 1 through March 6, 2020, and spend a week immersed in astounding biodiversity. This all-inclusive* journey includes guided naturalist hikes, aquatic tractor rides surrounded by Jabirus, boat tours through the croc-filled Rio Tempisque, science lectures offered by expert park researchers, visits to 100+ foot waterfalls and more!

Proceeds from this trip will cover most if not all of the costs associated with bringing staff from Palo Verde National Park to Jug Bay Wetlands Sanctuary in fall 2020, part of an international learning exchange between the two wetland parks.

Price: \$1550 per person (10–12 participants)*
\$1350 per person (13–15 participants)*

*Airfare not included. Pay by check and receive an additional \$50 discount.

For more detailed information or to reserve your spot on the trip, visit fyrnweh.com/costarica.



 This fall, 88 Jug Bay volunteers donated 908 hours, a contribution equivalent to \$23,090! We thank all our fall 2019 volunteers for their valuable service!

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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Little Plastic, Big Problems: Microplastic Surveys at CBNERR-MD Otter Point Creek Site

By R. Kyle Derby, *Research Coordinator, CBNERR-MD*;
and Eric Amrhein, *Anita C. Leight Estuary Center Research Intern*

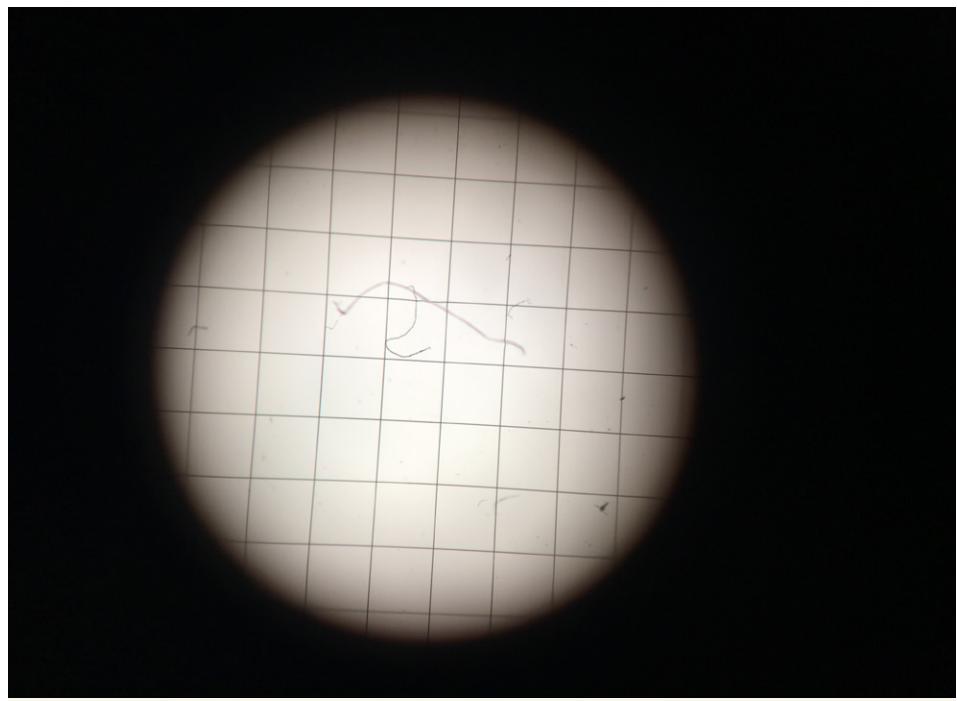


Figure 1. Two microplastic fibers collected from a developed shoreline site at Otter Point Creek. Fibers are shown under a dissecting microscope at 40x magnification. Each square on the grid shown is 1 mm in size.

Plastic is an undeniable part of our daily lives. It is found in nearly everything we use; its adaptability and low cost has cemented it as one of the most important materials in society. However, plastics last a very long time, often much longer than the useful life of products they were originally designed to be. Plastic is usually casually discarded, ending up in landfills, recycling centers, and unfortunately, the environment. These larger pieces of plastic never really degrade. Instead of decomposing, like a piece of cardboard or a bag of yard waste, plastic breaks up into smaller and smaller pieces. Eventually, these pieces reach such a small size that they are no longer easily visible to us, but they are still just as damaging to the environment. These small pieces, called microplastics, are just that: micro-sized, or less than 5 millimeters in size

(Figure 1). (For some perspective, note that a dime is just under 18 millimeters in diameter.) Research has shown that synthetic garments may be one of the primary sources of microplastic pollution, with one study reporting a single garment made of synthetic materials can release over 1900 microplastic fibers per wash. Microplastics have been found everywhere in our environment, from the waters of our lakes, rivers, bays, and oceans to the soil, and even the air.

Since research into microplastics is still relatively recent, the effects of these pollutants are not well understood. Smaller microplastics have been found to impact the amount of water that filter feeders (like oysters) can process, make breathing for crabs more difficult, and negatively impact the growth and hatching rates of fish. Particles accumulate in these animals, and then in the

animals that eat them, and so on. The long-term effects of this cycle are not yet understood.

As research into these pollutants has grown, so have the methods to detect them. Because most methods require harsh chemicals to separate plastics from the water or soil, only facilities with adequate (and expensive) disposal and safety equipment are equipped to process samples in this way. This summer, our CBNERR-MD intern Eric Amrhein, at the Otter Point Creek (OPC) Component of the reserve, led an effort to test a new method to detect microplastics in the waters of the freshwater estuary. We used highly concentrated salt water solution to separate the lighter plastics from the heavier particles in the water (Figure 2). We collected water samples from a variety of habitats, including the vegetated wetland waterways and more urbanized and developed shorelines. Our methodology detected



microplastics in all samples. Since microplastic studies are so few, we are unable to determine if our concentrations are “high” or “low”; however, the results still show a presence of these materials across the varied habitats in OPC. Most of the particles found at OPC were fibers from synthetic clothing.

The success of this new method is very promising, as it will allow for easier sampling of microplastics across many different environments. CBNERR-MD is excited to continue this work to determine just how prevalent this pollutant is in our natural systems.

Figure 2. Density separator for isolation of microplastics from organic matter in a sample. The separator consists of a piece of plastic-free latex tubing connected to a glass funnel, with flow halted by a spring clamp.

Intern Research—Upland Marsh Migration, continued from page 1

current marsh surface elevation change studies in this region will allow scientists and land managers to closely monitor this relationship and alert them when it may be necessary to take necessary restoration, protection, or management actions.

Thin layering is a restoration technique that involves adding/dispersing dredged material over the marsh surface to raise its elevation and compensate for increased water levels. Although this method is costly (a project in Big Egg Marsh in New York City cost \$500,000 per acre), it has been successful in restoring and creating marshes in the Chesapeake Bay region, including Blackwater Wildlife Refuge and Poplar Island, respectively.

Studies like the present one are important for evaluating the different strategies marshes may have at their disposal to cope with sea level rise. Research can yield valuable information for scientists and natural resource managers to use to make informed decisions for restoring and conserving marshes and the services they provide. In the case of Jug Bay marshes within the tidal freshwater zone, it was determined that upland migration is not the most viable strategy to cope with higher water levels; instead alternate strategies such as thin layer application of dredged material may need to be considered.



Fall donations:

Wayne Bierbaum, Kim Kelly, and Barbara Saffir: presentations for Sunrise to Sunset (FOJB fundraiser); **WeCare Denali:** compost for Jug Bay Community Garden. Special thanks for the generous donations that made Taste of the Wild (FOJB fundraiser) possible—for food and wine and/or chef services: **Jane Ellen Bieberich, Elaine Friebele, JudithAnn Hartman, Ami Hazel, Debra Leifer, Anne and Manfred Muecke, and Floating Lotus Farmstead;** for silent auction items: **Anne Arundel County Department of Recreation & Parks** (2 tickets to Twist & Stout and wine glasses), **Wayne Bierbaum** (permission for photo printing), **Patricia Delgado and Philippe Hensel** (stained and wood-burned tobacco stake), **Dodon Vineyard** (wine tasting for 4 people), and **Coreen Weilminster** (in-home Pysanky class for 8 people).

W I N T E R

2019



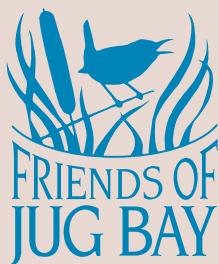
DEPARTMENT OF RECREATION AND PARKS

Jug Bay Wetlands Sanctuary
1361 Wrighton Road
Lothian, MD 20711
410-741-9330



Photo by Cynthia Bravo.

Save the Date!



Friends of Jug Bay Annual Meeting

Sunday, April 26, 2020

Join the Friends of Jug Bay at their annual meeting for refreshments, an update on FOJB activities, and a presentation by Anne Arundel County Executive Steuart Pittman.

Photo by Dan Levin.

