



Luing Family Internship Program

Intern Symposium

Monday, July 31, 2023



**Thank you for joining us to celebrate the accomplishments of
The Wetlands Institute
2023 Luing Family Internship Program!**

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Lisa Ferguson, Ph.D., Director of Research and Conservation
Brooke Knapick, Director of Educational Program Development

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Darby Brant, *Stockton University*
Kaycee Doherty, *Catawba College*
Rachel Helt, *Lebanon Valley College*
Rebecca Miller, *Stockton University*
Oliver Puckett, *Texas A&M University, Corpus Christi*
Carly Shaw, *Flagler College*

Environmental Education Program Interns

Fiona Buck, *Stockton University*
Julia Dahms, *Eckerd College*
Hannah Delahaye, *Towson University*
Hannah Drahusz, *Millersville University*

We would like to thank the following supporters who are helping to ensure internships and early career training opportunities are a part of our programs:

The Larry L. Luing Family Foundation
The Barbara and Jim Summers Intern Endowment Fund
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PROGRAM SCHEDULE

Welcome and Introductory Remarks – Lenore Tedesco
Coastal Conservation Research Intern Program – Lisa Ferguson
Environmental Education Intern Program – Brooke Knapick

INTERN PRESENTATIONS

Effects of Vegetation Management within Maritime Forests on Gray Tree Frog (*Dryophytes chrysoscelis*) Populations – *Darby Brant, Stockton University*

Modernizing the Bev Henry Salt Marsh Rubbing Trail: Using Riddles and Clues to Educate on the Salt Marsh – *Hannah Delahaye, Towson University*

Comparing Avian Habitat Use and Nesting within Enhanced and Natural Marsh Areas Surrounding The Wetlands Institute – *Kaycee Doherty, Catawba College*

Integrating Inclusivity: Captioning Educational Videos for The Wetlands Institute – *Fiona Buck, Stockton University*

Understanding Diamondback Terrapin Activity on an Elevated Nesting Habitat in a Southern New Jersey Salt Marsh – *Carly Shaw, Flagler College*

INTERMISSION WITH LIGHT REFRESHMENTS

Analysis of Avian Habitat Use and Behavior Within Recent Dredged Material Placement Sites – *Rebecca Miller, Stockton University*

Marine Debris: How Does Our Trash Affect Marine Life? – *Julia Dahms, Eckerd College*

Understanding Intraspecific and Interspecific Interactions of Black-crowned Night-Herons at Key Nesting Colonies – *Oliver Puckett, Texas A&M University, Corpus Christi*

Art is All Around Us: Identifying Patterns and Colors at The Wetlands Institute – *Hannah Drahusz, Millersville University*

Hotspot Analysis of Diamondback Terrapin Encounters on Sea Isle Boulevard – *Rachel Helt, Lebanon Valley College*

ABSTRACTS

Effects of Vegetation Management within Maritime Forests on Gray Tree Frog (*Dryophytes chrysoscelis*) Populations

Darby Brant, Stockton University

Amphibians play an important role in the ecosystem as they act as indicators of ecosystem health due to their sensitivity to environmental change and their biphasic lifestyle. Habitat loss and degradation threaten amphibian species including Cope's Gray Tree Frog (*Dryophytes chrysoscelis*), a species listed as endangered in New Jersey due to its limited population size and habitat availability. Understanding how tree frogs respond to restoration practices is necessary to guide management practices and protect populations. In this study, we monitored Cope's Gray Tree Frog presence and distribution of tree frogs within artificial refugia. We considered an experimental plot in an area that was treated with herbicide and ploughed to remove invasive vegetation as well as a nearby control plot. Data was collected for two years before and after management. To gain an additional sense of tree frog distribution within treatment and control plots, I also conducted evening call surveys. My results indicate that year, relative humidity, and plot significantly affected frog occupancy ($X^2_5=202.3$, $P<0.01$). Furthermore, frog occupancy was significantly greater in 2021 prior to restoration ($P<0.01$). Years prior to restoration showed lower frog occupancy in the control plot, which is less favorable habitat, compared to the experimental plot (2020: $X^2= 32.2$, $P<0.01$; 2021: $X^2= 4.3$, $P<0.05$). In 2022 after treatment there was no significant difference in frog occupancy between plots ($X^2=0.4$, $P=0.50$). These results suggest restoration approaches at the site should be modified in the future to reduce impacts to the tree frog population.

Modernizing the Bev Henry Salt Marsh Rubbing Trail: Using Riddles and Clues to Educate on the Salt Marsh

Hannah Delahaye, Towson University

In part, The Wetlands Institute's mission is to promote the appreciation and understanding of wetlands and coastal ecosystems through educational programming. With thousands of visitors coming to see what The Wetlands Institute has to offer, there are times when people may struggle to learn within large group settings, specifically children or others with shorter attention spans. Currently, visitors of all ages can take self-guided or guided tours along our Salt Marsh Trail to learn more about wetlands ecology. One such tour, The Bev Henry Salt Marsh Rubbing Trail, is a self-guided children's activity featuring 12 rubbing tile stations that allow children to create a unique crayon rubbing of a Northern Diamondback Terrapin, while exploring the salt marsh.

This project is aimed at creating a more modern interpretation of the Salt Marsh Rubbing Trail. The original Salt Marsh Rubbing Trail questions have been converted into more challenging riddles and/or clues that participants must solve to get to specific locations around the property. At each location, they are rewarded with a lock box containing one of 12 tiles needed to make a complete photograph, which when combined together will highlight an animal species important to The Wetlands Institute's research and conservation efforts. These photographs will rotate monthly from June – August, encouraging repeat participation. By revitalizing the Bev Henry Salt Marsh Rubbing Trail in a more modern, interactive, and engaging way, children will be able to see everything The Wetlands Institute has to offer, while learning new and interesting things about the salt marsh.

Comparing Avian Habitat Use and Nesting within Enhanced and Natural Marsh Areas Surrounding The Wetlands Institute

Kaycee Doherty, Catawba College

Historic and recent placement of dredged material has played a significant role in shaping marsh landscapes. Many marsh areas enhanced with dredged materials have become important nesting habitats for sensitive marsh birds and may become increasingly valuable as sea level continues to rise. This study investigated how marsh enhancement through the placement of dredged material influences species diversity, abundance, and nest site selection to help inform future conservation and management efforts. Results show a significant difference in species diversity by site ($X^2_2=11.3$, $P<0.01$), with habitat surrounding a historic placement area having significantly higher species richness compared to habitat surrounding a more recent placement area ($P<0.01$) and a natural marsh area ($P<0.01$). I observed more foraging within the historic placement area compared to the recent placement area ($P<0.01$) and natural marsh ($P<0.01$), and more nesting behavior within both the historic ($P=0.03$) and recent placement ($P=0.03$) areas when compared to natural marsh ($X^2_2=6.2$, $P=0.04$). Throughout the study period, the control plot had two total nests (2 species), the recent thin-layer placement had ten (3 species), and the historic site had thirty total nests (5 species), with significant differences in species nesting at each site ($X^2_{10}=39.1$, $P=<0.01$). This study contributes to our understanding of biological succession associated with marsh restoration and how these changes may affect the species using each habitat type. Furthermore, this information will help inform decisions in creating and maintaining more resilient avian habitats in the face of sea level rise.

Integrating Inclusivity: Captioning Educational Videos for The Wetlands Institute

Fiona Buck, Stockton University

Education is an integral part of The Wetlands Institute's three-pronged mission focused on research, conservation, and education. At The Wetlands Institute, there are three main education videos used during programs and/or broadcast in different exhibit spaces throughout the building and on the Virtual Wetlands Experience portion of the website. These videos include the *Secrets of the Salt Marsh* video shown as an introduction to our General Admission Salt Marsh Safari Program; the *Terrapins in the News* video shown on loop in Terrapin Station; and the *Secrets of the Salt Marsh Aquarium* video shown on loop in the Secrets of the Salt Marsh Aquarium. As an organization, we believe that all aspects of our public education programs should be accessible to all and strive to increase the accessibility of our programs as the need arises.

With a focus on physical accessibility to the marsh and building, the lack of closed captioning on media shown to the public is often overlooked since it is not a necessity for hearing people. This project focuses on increasing the accessibility of The Wetlands Institute's programs and displays for members of the deaf, deafened, and hard of hearing communities by using *Final Cut Pro*, a video-making software, to add closed captioning on the three aforementioned educational videos. The closed captioning on videos will not only aid people who are deaf or hard of hearing, but also anyone who may not be able to hear the videos because of noise levels from surrounding visitors or proximity to the sound output.

Understanding Diamondback Terrapin Activity on an Elevated Nesting Habitat in a Southern New Jersey Salt Marsh

Carly Shaw, Flagler College

The diamondback terrapin (*Malaclemys terrapin*) is a candidate for Special Concern status in New Jersey, due to threats including road mortality, bycatch in commercial crab traps, coastal development, climate change, and predation. To mitigate risk from flooding and roads, elevated nesting habitats (ENHs) have been created in the salt marsh via the beneficial reuse of dredged materials. I analyzed terrapin activity on and around an ENH on Ring Island in Stone Harbor, New Jersey, including evidence of nest attempts and nest predation and live terrapin encounters, to better understand use of this site. All terrapins found (N=12) were scanned for passive integrated transponder (PIT) tags, and if untagged (N=8), were marked. I recaptured two terrapins last found in the 1990s, which suggests that they might have changed their nesting location to the ENH

after its construction. The number of terrapins found on the ENH was not correlated with tidal stage ($X^2=0.06$, $P=0.87$) or with the number of terrapins encountered on a nearby nesting site at The Wetlands Institute ($P=0.75$). I created ArcGIS maps to visualize where terrapins are most active on and immediately adjacent to the Ring Island ENH, and results show that the highest amount of activity was found at elevations from 1.2m-1.5m ($X^2_3=94.7$, $P<0.01$). This information helps to demonstrate the conservation value of ENHs to terrapin populations, as they are well-used by nesting terrapins and may be more suitable environments located farther away from road traffic and well above the high tide line.

Analysis of Avian Habitat Use and Behavior Within Recent Dredged Material Placement Sites

Rebecca Miller, Stockton University

With many tidal marshes deteriorating due to erosion, subsidence, and sea level rise, coastal birds have less available and suitable habitat for feeding and nesting. Within the Seven Mile Island Innovation Lab, dredged material placement has been used to increase marsh elevation to provide augmented nesting sites for wading birds near existing wading bird colonies. This study investigates how successful these dredge sites have been at creating nesting sites, as well as how other coastal birds respond to recent placement areas on Sturgeon, Gull Island, and a non-enhanced marsh. During this study, no instances of wading bird nesting were observed. However, results from this study suggest that dredged material placement may increase species richness ($F_{2,16}=32.0$, $P<0.01$) and abundance ($X^2_2=6.1$, $P<0.05$). Species richness was significantly higher for the Sturgeon placement compared to the Gull placement ($P<0.01$) and the control site ($P<0.01$). However, there were no significant differences in species richness between the Gull placement and the control site ($P=0.50$). Birds also exhibited fewer behaviors within the control site ($F_{2,16}=16.9$, $P<0.01$) compared to the Gull placement ($P=0.01$) and Sturgeon placement ($P<0.01$). Among recently enhanced sites, common behaviors varied in frequency, with more foraging and less alert birds on the Gull placement versus Sturgeon (foraging: $P<0.01$; standing: 0.05). These results can provide a baseline for understanding how coastal bird habitat use changes when marshes are enhanced through beneficial reuse of dredged material. This effort will help researchers to target marsh enhancement projects to increase habitat functionality for coastal bird species in the future.

Marine Debris: How Does Our Trash Affect Marine Life?

Julia Dahms, Eckerd College

The Wetlands Institute offers a variety of year-round programs that focus on many aspects of the salt marsh habitat. In some of these programs, it is easy to get caught up in the excitement of interacting with wildlife. However, learning about human impacts on the surrounding coastal ecosystem is crucial to taking measures to protect the animals we know and love. One man-made problem affecting local ecosystems is marine debris, and the best way to address this issue is through public education.

There are two components to this project. The first component is a tri-panel poster that will go behind the Aquarium Teaching and Touch Tank in the Secrets of the Salt Marsh Aquarium, highlighting the causes and effects of marine debris. The second component is a revamp of the Marine Debris Science Feature, which includes hands-on activities throughout the presentation. The marine debris poster display will tie the animals that the public sees in the Aquarium to the threats that these animals face from littering, while the Science Feature will provide additional information for older kids and adults to dive deeper into the subject at hand. Created using *Prezi*, an interactive presentation software, the Science Feature includes information and games that keep the public engaged, touches more on the types of marine debris in the ocean, and dives deeper into new topics such as microplastics. Together, both components emphasize ways that the public can take small steps toward preventing marine debris and contributing to a healthier coastal ecosystem.

Understanding Intraspecific and Interspecific Interactions of Black-crowned Night-Herons at Key Nesting Colonies

Oliver Puckett, Texas A&M University – Corpus Christi

The Black-crowned Night-Heron (*Nycticorax nycticorax*), a small, stocky heron species that nests in wetland ecosystems, is recognized as a threatened species in New Jersey. To better understand competition at one of the most important mixed-species colonies of wading birds in New Jersey, I investigated the intra- and interspecific interactions of night-herons at two nesting areas on Gull Island, a site of ongoing research and restoration activities. Results indicate that intra- and interspecific interactions may be influenced by both researcher presence ($X^2_9=24.3$, $P<0.01$) and site ($X^2_9=24.1$, $P<0.01$). While researchers were present, aggressive interactions were observed more than when researchers were not present ($X^2_1=4.13$, $P=0.04$). While disturbed, there were more intraspecific (58.3%) and gull (12.5%) interactions, while without disturbance, there were fewer intraspecific interactions (10%) and more with other wading birds (70%)

($X^2_9=24.3$, $P<0.01$). On the western site, interactions were higher with other night-herons (62.5%) and gulls (25%), while the eastern site saw less night-heron interactions (30.8%) and more with other wading birds (53.9%) ($X^2_9=24.1$, $P<0.01$). During researcher activity, fish crows were present around the colony for shorter amounts of time ($X^2_2=59.4$, $P<0.01$), indicating that risk of nest predation by fish crows may not be influenced by researcher presence. Future research may be necessary to better understand nest or chick vulnerability within important night-heron nesting areas, further refine methods that minimize disturbances of nesting birds while conducting monitoring efforts, and optimize monitoring design to improve our understanding of intra- and interspecific dynamics within key mixed-species colonies.

Art is All Around Us: Identifying Patterns and Colors at The Wetlands Institute

Hannah Drahusz, Millersville University

When guiding families down The Salt Marsh Trail it is challenging to maintain a child's focus, particularly among adolescents who seek a sense of independence and excitement. All children have a natural inclination to ask for identification of different animal tracks, eggshells, plants, and birds. This project is dedicated to using art to engage children with the environment and answer their commonly asked questions about the salt marsh. Art is very important for developing children. Being able to identify colors, patterns, or markings on plants and animals develops their cognitive connection skills and enhances their knowledge of nature. The ability to connect concepts one might learn here at The Wetlands Institute to everyday life shows high executive function, thus creating a successful learner, student, and child.

The components of this project include an interactive booklet that is easy enough for children to understand and complete independently, but also has factoids and immersive patterns and colors to help them understand the salt marsh flora and fauna. Inside the packet, there are small facts about the animal or plant they are looking for, a map that guides them along the trail, and artistic drawings for them to complete at each stop along the way – thus connecting the fact to the art they are creating. Overall, the booklet, holding impactful knowledge they learn, will not be as easily forgotten as lectures during the Salt Marsh Safari Tours due to the inclusion of independence, art, excitement, and science.

Hotspot Analysis of Diamondback Terrapin Encounters on Sea Isle Boulevard

Rachel Helt, Lebanon Valley College

The Diamondback Terrapin (*Malaclemys terrapin*) is a candidate species of special concern in New Jersey, and is the only turtle in North America that strictly inhabits brackish marshes. Each summer, female terrapins emerge from the water to nest above the high tide line, putting them at risk for road mortality during peak tourist season in coastal New Jersey. High rates of terrapin mortality were documented over decades of surveys on Sea Isle Boulevard, a heavily traveled coastal road in southern New Jersey. From 2015 to 2019, this boulevard underwent construction to elevate the roadway and install permanent wire fencing to mitigate terrapin road mortality. I examined changes in terrapin encounter hotspots along Sea Isle Boulevard pre- (2013-2014) and post-construction (2022-2023) using *Siriema* software. Additionally, I compared terrapin encounters for a subset of days and times when patrols were conducted every year. The results indicate that terrapin crossing hotspots shifted post-construction, and some hotspots increased in intensity from pre-construction. Moreover, a standardized proportion of terrapin encounters per patrol for Sea Isle Boulevard on Wednesdays and Thursdays did not significantly decrease after fence installation ($\chi^2_3=5$, $P = 0.18$). Overall, although the installation of the fencing on Sea Isle Boulevard may have been initially successful, lack of fence maintenance could lead to breaks in the fence, resulting in higher terrapin encounters and mortality along these areas due to the funneling of terrapins into them. This study highlights the importance of fence maintenance after installation to effectively reduce wildlife mortality on roads.

The Wetlands Institute staff and interns would like to extend a heartfelt *THANK YOU* to the many collaborators, volunteers, and docents who helped make our programs a huge success!



2023 Environmental Education interns (L to R): Julia Dahms, Hannah Delahaye, Hannah Drahusz, Fiona Buck



2023 Coastal Conservation Research Program interns (L to R): Rachel Helt, Carly Shaw, Darby Brant, Kaycee Doherty, Oliver Puckett, Rebecca Miller

