



Luing Family Internship Program

Intern Symposium

Monday, July 29, 2024



**Thank you for joining us to celebrate the accomplishments of
The Wetlands Institute
2024 Luing Family Internship Program!**

The Wetlands Institute Staff

Lenore Tedesco, Ph.D., Executive Director
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Lisa Ferguson, Ph.D., Director of Research and Conservation

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Mary Castellani, *Rutgers University*
Kaycee Doherty, *Catawba College*
Abigail Hemric, *Catawba College*
Logan Stewart, *University of Delaware*

Environmental Education Program Interns

Emily Cook, *Bucknell University*
Kaelin Drey, *Stockton University*
Paige Jarocki, *University of Delaware*
Gregory Maccarone, *Rowan 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
Sturdy Bank

PROGRAM SCHEDULE

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

INTERN PRESENTATIONS

Investigating barnacle occurrence and effects on Diamondback Terrapins (*Malaclemys terrapin*) at The Wetlands Institute – *Darby Brant, Stockton University*

Identifying Common Beach Treasures: Creating a Take-home Guide to Seashell Sunday – *Emily Cook, Bucknell University*

Effects of elevation and vegetation on Diamondback Terrapin (*Malaclemys terrapin*) nest site selection and density – *Abigail Hemric, Catawba College*

Investigating avian use and nest site selection throughout natural and enhanced marsh areas – *Kaycee Doherty, Catawba College*

What You've Been Wading For: Introducing a New Conservation-themed Programming Day to Complement Totally Turtle Tuesday and Horseshoe Crab Mania Thursday – *Gregory Maccarone, Rowan University*

INTERMISSION WITH LIGHT REFRESHMENTS

Getting Birdy With It: Introducing a New Conservation-themed Programming Day to Complement Totally Turtle Tuesday and Horseshoe Crab Mania Thursday – *Paige Jarocki, University of Delaware*

Investigating prevalence of the parasitic trematode *Pleurogonius malaclemys* in the guts of road-killed Diamondback Terrapins (*Malaclemys terrapin*) – *Logan Stewart, University of Delaware*

Bay for breeding: The other side of life and foraging for American Oystercatchers (*Haematopus palliatus*) – *Mary Castellani, Rutgers University*

Conservation Conversation: Creating a Dialogue to Implement Positive Change – *Kaelin Drey, Stockton University*

ABSTRACTS

Investigating barnacle occurrence and effects on Diamondback Terrapins (*Malaclemys terrapin*) at The Wetlands Institute

Darby Brant, Stockton University

Diamondback Terrapins (*Malaclemys terrapin*) are considered a keystone species in the salt marsh and are a species of special concern in New Jersey. Barnacles are crustaceans that are motile as larvae and as adults attach to hard substrates such as terrapin shells. Heavy infestations of barnacles on terrapins can cause shell erosion and reduce mating and nesting success. There is a lack of current research examining barnacles on terrapins despite their potential negative effect. This study therefore investigates the occurrence of barnacles over time and the potential impact they may have on terrapins. I analyzed terrapin photos from 2020, 2023, and 2024, recorded barnacle count and infestation classes (absent, low, moderate, heavy, extremely heavy). I found there to be a significant increase in barnacle occurrence ($X^2_2 = 55.8$, $P < 0.01$) as well as barnacle infestation ($X^2_2 = 51.7$, $P < 0.01$) in 2024. Additionally, in 2024, I found there to be greater odds of barnacles being located on an infested terrapin's carapace ($F_{1,125.5} = 114.8$, $P < 0.01$) and posterior region ($F_{1,123.4} = 15.9$, $P < 0.01$) compared to the plastron and anterior region, respectively. Results indicate that the occurrence of barnacles as well as level of infestation has increased over time, and that barnacles tended to be located posteriorly, where they may impact mating and nesting. This suggests that barnacles may be a growing threat to terrapins in our study area. More research needs to be conducted locally in order to determine what environmental factors may be increasing barnacle infestations, and how they may continue to affect terrapins.

Identifying Common Beach Treasures: Creating a Take-home Guide to Seashell Sunday

Emily Cook, Bucknell University

Seashell Sunday introduces The Wetlands Institute's General Admission visitors to seashells and the animals that live in them, using a presentation style format that highlights local and nonlocal shells, artifacts, and live mollusks. While Seashell Sunday allows for visitors to learn about these shells and their inhabitants, it can be difficult for children to recall specific shell names and distinguish the differences between similar types. This can be discouraging when collecting shells during beach walks. Creating a kid-friendly identification guide to commonly found beach items sparks more engagement and participation from our visitors both during and after the Seashell Sunday program.

The purpose of this project is to enhance the Seashell Sunday program by introducing a new identification guide titled, *Seashell Sunday: Common Beach Finds*. Using Canva, a graphic design software platform, this booklet will be distributed at the end of the Seashell Sunday presentation and be available for download as part of the Virtual Wetlands Experience on The Wetlands Institute's website. The booklet will include photos, names, and descriptions of items commonly found on the beach, including different types of shells, crabs, sea plants, and egg cases. The descriptions and pictures contained within the guidebook will assist children and adults in identifying the differences between similar shells, as well as identifying commonly found items often unknown to the public. This educational resource encourages further self-guided exploration into species that can be found on the beach.

Effects of elevation and vegetation on Diamondback Terrapin (*Malaclemys terrapin*) nest site selection and density

Abigail Hemric, Catawba College

The Diamondback Terrapin (*Malaclemys terrapin*) is considered a keystone species in salt marsh ecosystems, yet we are still improving our understanding of nest site selection at local scales. This study aims to identify factors influencing nest site selection at The Wetlands Institute. Previous research suggests elevation may play a critical role in nesting behavior, while impacts of vegetation coverage are less clear. By mapping protected nest locations and conducting vegetation surveys, I sought to identify environmental parameters that guide terrapin nesting choices. I gathered GPS and elevation data for identified nests and utilized ArcGIS Pro for spatial analysis. In addition, I examined the relationship between nest density and substrate, as well as percent vegetation coverage. Further, I investigated effects of substrate and vegetation cover on nest predation. Within the study site, terrapins demonstrated selection for specific elevations ($X^2_3 = 93.1$, $P < 0.01$), preferentially nesting at elevations of 4-5 ft ($P < 0.01$) and elevations greater than 6 ft ($P < 0.01$). In addition, terrapins tended to nest where there was approximately 0-19% total percent vegetation coverage ($n = 41$ of 85 nests), and terrapins most frequently chose to nest in sand substrate ($n = 37$ of 85 nests). Patterns in nest site selection related to substrate and vegetation characteristics may influence predation rates, hatchling sex ratio, and overall nest success. Moreover, selection for nest elevations within a certain range may have implications for flooding, particularly as historic nest sites are impacted by sea level rise. These results will help inform future restoration projects to maintain suitable environmental parameters for terrapin nesting.

Investigating avian use and nest site selection throughout natural and enhanced marsh areas

Kaycee Doherty, Catawba College

Beneficial placement of dredged sediment can be a valuable practice to augment habitat critical to marsh-nesting birds at risk from sea level rise. As beneficial re-use of dredged sediment becomes a more established technique, it is essential to assess the effects of placement on biological communities. This study aims to establish a baseline for avian use and nest site selection in a potential placement site. I conducted intensive nest searching and monitoring at the proposed placement site, adjacent marsh, and a nearby site that has previously received sediment placement. Moreover, I monitored avian behavior and habitat use in a subset of the targeted placement area. In 2024, nest success for Clapper Rail (*Rallus crepitans*) and Willet (*Tringa semipalmata*) did not differ by species or site ($X^2_2 = 1.9$, $P = 0.38$), and more visible nests were more likely to fail ($X^2 = 5.5$, $P = 0.02$). Nest depredation and abandonment was inversely related to proximity to creek edge ($X^2 = 3.9$, $P = 0.05$). For Clapper Rails, nest height was significantly related to ground elevation, with lower ground elevations resulting in taller nests ($F_{1,39} = 104.3$, $P < 0.01$), showing adaptability in nesting strategy depending on site characteristics. Foraging was more common than other behaviors, accounting for 67.5% of observations. This study contributes to our understanding of current site use and avian response following sediment placement. This information will help to inform decisions in creating and maintaining more resilient avian habitats in the face of sea level rise.

What You've Been Wading For: Introducing a New Conservation-themed Programming Day to Complement Totally Turtle Tuesday and Horseshoe Crab Mania Thursday

Gregory Maccarone, Rowan University

Throughout the summer months, The Wetlands Institute offers two weekly conservation-themed programming days intended to educate visitors about Northern Diamondback Terrapins and Atlantic Horseshoe Crabs, both a focal species of *in situ* conservation efforts. Each day includes theme-oriented Creature Features, a special craft, and a hands-on activity during the noon Salt Marsh Safari. To highlight coastal nesting birds, a third pillar of The Wetlands Institute's conservation efforts, fellow Environmental Education Interns Gregory Maccarone and Paige Jarocki have collaborated on separate projects guided by this central theme.

Structured similarly to two existing conservation-themed programming days, Totally Turtle Tuesday and Horseshoe Crab Mania Thursday, implementing

World of Wings Wednesday rounds out The Wetlands Institute's conservation-themed educational programming, shining a light on another important area of animal study. In addition to developing the overarching theme from concept to reality, the highlight of the day is the specialty Salt Marsh Safari, which features a unique tool, the Swarovski dG. This device is a combination monocular and camera that captures photos of coastal nesting birds spotted during the Salt Marsh Safari tour. Photos are uploaded to the Virtual Wetlands Experience - Community Showcase for visitors to download, keep, and share with others. Finally, eight (8) alternating bird crafts provide education and enjoyment to children during their visit, including hand wading birds, origami cranes, paper plate birds, birds' nests, cardboard-winged birds, toilet-paper-roll birds, clothespin birds, and craft stick birds.

Getting Birdy With It: Introducing a New Conservation-themed Programming Day to Complement Totally Turtle Tuesday and Horseshoe Crab Mania Thursday

Paige Jarocki, University of Delaware

Throughout the summer months, The Wetlands Institute offers two weekly conservation-themed programming days intended to educate visitors about Northern Diamondback Terrapins and Atlantic Horseshoe Crabs, both a focal species of *in situ* conservation efforts. Each day includes theme-oriented Creature Features, a special craft, and a hands-on activity during the noon Salt Marsh Safari. To highlight coastal nesting birds, a third pillar of The Wetlands Institute's conservation efforts, fellow Environmental Education Interns Gregory Maccarone and Paige Jarocki have collaborated on separate projects guided by this central theme.

From mid-June to Labor Day, Creature Feature programs run ten times per week and focus on a different group of organisms every day. Each Creature Feature features both live animals and educational artifacts related to that day's organism or group of organisms. One group of animals not touched upon in a Creature Feature, but extremely prevalent at The Wetlands Institute and surrounding area, are coastal nesting birds. Creating a coastal nesting bird Creature Feature will give the public the opportunity to learn about the birds they see along the beaches and in the salt marsh.

This new Creature Feature focuses on the coastal nesting birds that are commonly found during the summer and is the premiere Creature Feature on World of Wings Wednesday, a new conservation-themed programming day. In efforts to highlight the birds in a more hands-on way, birds included in the Creature Feature will be grouped according to their hunting technique and

corresponding prey items. While the use of living birds is not an option for this Creature Feature, to enhance the interactive nature of the program, the presentation will include an interactive PowerPoint Presentation, a variety of bird artifacts and live prey animals available in the Secrets of the Salt Marsh Aquarium at The Wetlands Institute.

Investigating prevalence of the parasitic trematode *Pleurogonius malaclemys* in the guts of road-killed Diamondback Terrapins (*Malaclemys terrapin*)

Logan Stewart, University of Delaware

Diamondback Terrapins (*Malaclemys terrapin*) are a species of turtle native to coastal brackish-water marshes. They are primarily carnivores and consume a multitude of different prey, which can contain parasites that use terrapins as a host. *Pleurogonius malaclemys* is a trematode parasite that dwells in the guts of terrapins. These parasites require multiple hosts to survive, including terrapins and Mud Snails (*Ilyanassa obsoleta*), which are a prey species commonly consumed by terrapins. Little is known about the effects of *Pleurogonius malaclemys* on terrapins. In this study, I investigated the prevalence of this parasite in the guts of road-killed terrapins in different locations throughout the marshes of southern New Jersey. I also examined relationships between plastron length and clutch size of road-killed terrapins and parasite load to gain insight into potential impacts to terrapin health. Results showed there was not a significant relationship between infection status, site, and plastron length ($X^2_3 = 2.6$, $P = 0.46$), nor between infection status, site, and clutch size ($X^2_3 = 1.0$, $P = 0.81$). However, there was a relationship between parasite prevalence and year, with significantly more parasites found in 2015 than 2024 ($X^2 = 4.9$, $P = 0.03$). This study helps to establish a baseline for parasite prevalence in known terrapin nesting populations, providing context for possible health implications caused by the parasite. Future studies may benefit from monitoring fitness in live specimens to better understand how the parasite may affect terrapin health.

Bay for breeding: The other side of life and foraging for American Oystercatchers (*Haematopus palliatus*)

Mary Castellani, Rutgers University

American Oystercatchers are a valuable indicator species of suitable nesting habitat and conditions to raise young. The species is well studied on Atlantic Coast beaches, but not on the Delaware Bay. Many oystercatchers spend the breeding season on Delaware Bay beaches foraging and raising young. In collaboration with Conserve Wildlife Foundation of NJ and U.S. Fish and Wildlife Service, I developed a web-based interactive map to inform general audiences

about oystercatchers and ongoing conservation efforts for the Delaware Bay population. In addition, I conducted a pilot study to examine location, duration, prey items, and microhabitat selection by oystercatchers on the Delaware Bay. I did not detect significant relationships between presence of foraging oystercatchers and environmental conditions including tide ($X^2_2 = 0.45$, $P = 0.80$) and temperature ($X^2 = 1.4$, $P = 0.24$). Results from foraging observations ($n = 13$) show that oysters were the most common prey item. Foraging microhabitat and water level were related ($F_{1,11} = 5.0$, $P = 0.05$), indicating that higher tide levels were associated with foraging on sand. By identifying patterns including preferred foraging sites, my research on habitat use informs future work and management actions within the broader Delaware Bay Oystercatcher Project. The ArcGIS StoryMap that I have developed supports the project, raising awareness about the species and conservation efforts. More broadly, this project contributes to shorebird conservation as global populations face dramatic losses.

Conservation Conversation: Creating a Dialogue to Implement Positive Change

Kaelin Drey, Stockton University

Science Feature programs, which occur in the off-season from September-March, engage older visitors in tactile learning opportunities to discover topics concerning wetland and coastal ecosystems. Generally, these programs involve an informative presentation followed by a hands-on activity that encourages visitors to apply what they learn to make a positive difference in their communities. This project showcases a set of two updated Science Features in which visitors can learn about keystone species in need of conservation.

Conservation Conversation, a two-part Science Feature series, will focus on two keystone species present in salt marsh ecosystems, the Northern Diamondback Terrapin and the Atlantic Horseshoe Crab. Created using *Prezi*, an interactive presentation software, Conservation Conversation aspires to influence visitors to create a positive impact on our ecosystems. In addition to the presentations, both Science Features are followed by an interactive activity; a terrapin crossing activity, or a mock spawning survey and reTURN the Favor Walk, respectively. These activities highlight the current conservation methods and practices employed by The Wetlands Institute Research and Conservation Department to address the known and emerging threats to each of these critical species. Learning about the conservation of these critical species will not only spread awareness of the research and conservation at The Wetlands Institute, but also prompt the public to take small steps towards contributing to healthier, more stable wetland and coastal ecosystems.

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!



2024 Environmental Education interns (L to R): Emily Cook, Paige Jarocki, Kaelin Drey, Gregory Maccarone



2024 Coastal Conservation Research Program interns (L to R): Mary Castellani, Abigail Hemric, Darby Brant, Kaycee Doherty, Logan Stewart