



Luing Family Internship Program

Intern Symposium

Monday, August 2, 2021



**Thank you for joining us to celebrate the accomplishments of
The Wetlands Institute
2021 Luing Family Internship Program!**

The Wetlands Institute Staff

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Lisa Ferguson, Ph.D., Director of Research and Conservation
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Coastal Conservation Research Program Interns

Laura Cammarata, *West Virginia University*
Cameron Forehand, *Clemson University*
Nicole Fox, *Stockton University*
Samuel Hermanstorfer, *University of Wisconsin*
Brandon Ross, *University of Connecticut*
Autumn Turney, *Lenoir-Rhyne University*

Environmental Education Program Interns

Heather Bariso, *Stockton University*
Grace Fanning, *University of Pittsburg*
Olivia Hogan, *Eckerd College*
Callie Knudson, *Unity College*

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
Barbara and Jim Summers

PROGRAM SCHEDULE

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

INTERN PRESENTATIONS

Comparing Macroinvertebrate Communities between Disturbed and Undisturbed Locations in Southern New Jersey Saltmarshes – Laura Cammarata, West Virginia University

Bringing the Wetlands Back to Wetlandia: Designing Posters to Educate the Public on Marsh Ecosystem - Heather Bariso, Stockton University

The Phenology of Diamondback Terrapin (*Malaclemys terrapin*) Creek Use During the Nesting Season - Brandon Ross, University of Connecticut

The Original Environmentalists: Learning about Lenape Culture, Traditions, and History in New Jersey - Grace Fanning, The University of Pittsburgh

Investigating Diamondback Terrapin (*Malaclemys terrapin*) Salt Panne Use at The Wetlands – Cameron Forehand, Clemson University

INTERMISSION WITH LIGHT REFRESHMENTS

How Do Weather Conditions, Tides, and Nesting Season Progression Influence Flight Line Counts of Black-crowned Night Herons? - Autumn Turney, Lenoir-Rhyne University

Getting Up Close to the Fish Hawk: Revitalizing the Osprey Learning Station - Callie Knudson, Unity College

Using Headcount Surveys to Understand Northern Diamondback Terrapin (*Malaclemys terrapin terrapin*) Distribution in the Delaware Bay - Nicole Fox, Stockton University

I'm Hooked: Creating a Video for the Secrets of the Salt Marsh Aquarium
Olivia Hogan, Eckerd College

“Waste Management Consultants”: Quantifying the Impacts of Fish Crow Behavior in Southern New Jersey Salt Marshes - Samuel Hermanstorfer, University of Wisconsin- Madison

ABSTRACTS

Comparing Macroinvertebrate Communities between Disturbed and Undisturbed Locations in Southern New Jersey Saltmarshes

Laura Cammarata, *West Virginia University*

Macroinvertebrates play a vital role in ecosystem structure and food web dynamics within saltmarsh habitats and have the potential to impact species on both higher and lower trophic levels. An understanding of species density in relation to disturbance is essential for monitoring overall system health and may inform future saltmarsh management and restoration decisions. This study compared above-ground macroinvertebrates between disturbed (bare ground, dredge placement areas) and undisturbed (natural, vegetated marsh) areas with known and unknown causes of disturbance at three saltmarshes surrounding Stone Harbor: Ring Island, The Wetlands Institute, and Gull Island. I randomly selected six points within each site (three disturbed, three undisturbed) and estimated the density of above-ground macroinvertebrates within a 1 m² quadrat for each point on three occasions in June-July 2021. Species richness was most strongly affected by disturbance ($\chi^2_4=19.2$, $p<0.01$) when examined in a model that included distance to water (m) and site (both $p>0.05$) and was significantly higher in undisturbed areas compared to disturbed areas ($p<0.01$). Richness was correlated with an increase in vegetative cover ($\chi^2_1=5.0$, $p<0.02$). Exact counts of individuals, taken within a 0.25m² quadrat, were higher at disturbed locations ($\chi^2_4=56.2$, $p<0.01$) and differed between sites ($p=0.01$) when compared with distance to water ($p>0.05$). Results from this project indicate that dredged material placement, undetermined disturbances, and vegetative cover can significantly affect saltmarsh macroinvertebrate communities. This information can help quantify macroinvertebrate responses to dredged material placement or other disturbance causing loss of vegetation within these saltmarshes, and better inform restoration practices.

Bringing the Wetlands Back to Wetlandia: Designing Posters to Educate the Public on Marsh Ecosystem

Heather Bariso, *Stockton University*

Every day, The Wetlands Institute's Education staff conduct Salt Marsh Safari interpretive tours which offer an insightful look into the ecology and species located around the marsh. During this tour, local flora and fauna species are pointed out and the public is given the opportunity to experience the marsh ecosystem up close. Depending on weather, as well as other accessibility factors, it is sometimes difficult for visitors to see all of the creatures discussed during the tour.

Unlike plant species, salt marsh animals can be elusive and often tricky to spot, this project aims to bring our most common marsh animals inside The Wetlands Institute for identification and education, and seeks to revitalize a popular education space known as *Wetlandia*, which is located off the Marshview Hall and adjacent to the covered back deck. These project goals are achieved through the creation of two large 4'x4' educational posters featuring the most commonly seen animals in the marsh ecosystem, both above and below the waterline. One poster features terrestrial marsh creatures and the other features aquatic marsh creatures. These posters include names and educational facts about each animal and are intended for usage in *Wetlandia* as either wall, floor or table posters. Additionally, a Food Web Matching Game supplements these posters to give guests a hands-on experience which allows them to link the animals on the posters to how each one interacts with another. Together, these components bring the Salt Marsh Safari tour inside in a fun and engaging way.

The Phenology of Diamondback Terrapin (*Malaclemys terrapin*) Creek Use During the Nesting Season

Brandon Ross, *University of Connecticut*

Diamondback terrapins are one of the few reptiles that reside in salt marshes and coastal habitats throughout their lives. Terrapins have been documented to have high site fidelity, but these findings are inconsistent throughout scientific literature. The phenology and behavior of the local nesting population is well studied, but less is known about terrapin use and transit through the surrounding marsh during the nesting season. I hypothesize that female terrapins utilize the marsh creeks as causeways to access nesting sites and wait in these creeks during times of sub-optimal nesting conditions. To examine how terrapins navigate the surrounding marsh, I surveyed a creek on The Wetlands Institute property throughout June and July using daily fyke net captures as a measure of abundance. The creek approaches known, high density nesting habitats, 90m away from the fyke. I captured 164 terrapins over 17 trap-days (median=5, Female:Male = 13.9:1, 83.3% gravid). Terrapin abundance in the fyke net was best explained by tidal range ($p < 0.01$) and date ($p < 0.01$) in a model that also included precipitation ($\chi^2 = 64.7$, $df = 5$, $p < 0.001$). Abundance decreased as the nesting season progressed and with increasing tidal range. Research on the local population has demonstrated that nesting activity peaks during the highest tides and total nesting activity tapers off in July. The decrease in captures as tidal range increased can be explained by the increase in terrapin nesting during high tides. These results suggest terrapin activity in this creek is tied to nearby nesting activity.

The Original Environmentalists: Learning about Lenape Culture, Traditions, and History in New Jersey

Grace Fanning, The University of Pittsburgh

The Lenni-Lenape were the native people of New Jersey, however their history is often erased and forgotten due to colonialism. The indigenous people of New Jersey lived here for thousands of years before colonists arrived. The Lenni-Lenape were both agriculturalists and hunter-gatherers, cultivating the land with deep respect, generation after generation. The Lenape believe that humans have no right to own the land as any one person- rather the earth is a gift that we must share and show dignity to all living things. Rather than overharvesting or overhunting resources, the Lenape preserved the land for future generations.

In the off-season, from September-March, Science Feature programs offer older children and adults a guided look at interesting subjects related to coastal ecosystems. These programs typically involve an informative presentation followed by a hands-on activity which helps participants grasp the subject material. This project will create a new Science Feature so that members of the public can learn about Lenape culture and practices and what happened to the indigenous people of New Jersey. In addition to the presentation, visitors are invited to participate in a tracking and identification game, to test the knowledge of local species of plants and animals. Learning about the Lenape culture will not only provide the public with a new perspective of American history, but it may also alter views on how we treat the land in a fast moving, ever changing world.

Investigating Diamondback Terrapin (*Malaclemys terrapin*) Salt Panne Use at The Wetlands Institute

Cameron Forehand, Clemson University

Coastal wetlands provide important habitat for the diamondback terrapin (*Malaclemys terrapin*). The saltmarshes in Stone Harbor, New Jersey contain numerous salt pannes, depressions in the marsh that collect tidal water. A previous study by The Wetlands Institute (TWI) found gravid female terrapins spent significant time in pannes, suggesting pannes may be staging areas for nesting females as they travel to upland nesting areas. To investigate salt panne use and nesting behavior, I conducted headcount surveys of terrapins in pannes and captured terrapins present using a dip net. I measured, sexed, and marked terrapins for later identification, and measured panne characteristics (water depth, mud and water temperature). I surveyed two salt pannes at three sites: along the TWI trail and Stone Harbor Boulevard (adjacent to nesting habitat), and marsh west of the TWI trail (farther from nesting habitat). I surveyed each panne

twice a week from June through July. All captured terrapins were adult females, and the majority (80%) were gravid. Site ($p<0.001$), water depth ($p<0.05$), and date ($p<0.05$) were significant indicators of terrapin presence ($\chi^2=38.0$, $p<0.001$). Odds of terrapin presence increased with water depth and dropped off in late July, corresponding with the end of nesting season. Terrapins were only caught in pannes adjacent to nesting habitat and many exhibited nest site fidelity before or after salt panne activity. Future surveys may determine if terrapins are returning to the same pannes in addition to nest sites. Pannes along roadways may indicate potential road crossing hot spots, helping guide conservation efforts.

How Do Weather Conditions, Tides, and Nesting Season Progression Influence Flight Line Counts of Black-crowned Night Herons?

Autumn Turney, *Lenoir-Rhyne University*

Black-crowned Night Herons were listed as a threatened species in New Jersey in 1999 after facing decades of population decline. Gull and Sturgeon Islands, located near Stone Harbor, are key nesting areas for Black-crowned Night Herons and other wading bird species in New Jersey. These islands are estimated to provide habitat for approximately 36% of all Black-crowned Night Herons nesting in the state. Standard approaches to survey these nesting areas (i.e., aerial surveys, direct ground counts) may underestimate populations of Black-crowned Night Herons, or disrupt nesting and disturb the colony. Flight line surveys conducted during peak nesting activity may provide an alternative method to estimate breeding populations. I conducted flight line surveys of two nesting areas on Gull and Sturgeon Island to examine the relationship between tide level, nesting stage, site, and date with counts of Black-crowned Night Herons. More birds were detected at Gull Island compared to Sturgeon Island ($P=0.01$), with more detections occurring at high tide earlier in the nesting season ($P=0.02$). I also investigated directionality of detections and found the directionality of incoming detections differed with wind direction at Gull Island ($\chi^2_3=9.7$, $p=0.02$), but did not vary for outgoing detections. Wind direction also affected outgoing detections for Sturgeon ($\chi^2_4=15.1$, $p=0.005$). This study offers insights for optimal times and conditions to conduct flight line surveys to estimate breeding populations and minimize disturbance to sensitive species of colonial nesting wading birds. Future flight line surveys of these key nesting areas may also inform wading bird response to restoration efforts.

Getting Up Close to the Fish Hawk: Revitalizing the Osprey Learning Station

Callie Knudson, Unity College

The salt marsh ecosystem provides the perfect place for diverse wildlife spanning from terrapins to crabs to shorebirds. One of these shorebirds is the Osprey (*Pandion haliaetus*). Also known as the fish hawk, the Osprey is a master at catching fish and navigating the marshy terrain. For over fifty years, The Wetlands Institute (TWI) has been “promoting [the] appreciation, understanding & stewardship of wetlands and coastal ecosystems”. As part of fulfilling this mission, live-stream cameras were introduced and attached to an Osprey nest on TWI’s property. This allows for the public to get up close and personal with these large birds. The public can view them either on our website or in The Marshview Hall. The Osprey cams are a highlight of every visit to TWI and this project aims to enhance that encounter.

The Osprey Learning Station is designed to build an interactive education experience with unique posters, crafts, and activities based on the season. Year-round, two large posters will explain why the Osprey sits atop of the food chain, as well as current threats facing their survival. In the spring, the Learning Station demonstrates nest making with a hands-on nest building activity. The summer brings new chicks and a unique age-based guessing game, and, in the fall, the public can learn about the amazing feat of migration. Lastly, winter features an Osprey reading activity and bird bookmark craft so children can take home their own osprey experience. This project strives to showcase the importance of these magnificent birds.

Using Headcount Surveys to Understand Northern Diamondback Terrapin (*Malaclemys terrapin terrapin*) Distribution in the Delaware Bay

Nicole Fox, Stockton University

While terrapins are commonly seen along the Delaware Bay in New Jersey, characteristics of these populations are not well understood. Terrapin populations face several risks, however accidental drowning as bycatch in crab traps is the main threat to terrapins in the region, including relatively unknown populations in the Delaware Bay. To increase our understanding of this population, headcount surveys of terrapins were conducted from points along the high tide line at three survey locations along the Delaware Bayshore. Survey points (4-5 per survey location) were selected approximately 350 m apart, resulting in 14 points. Each point was visited three times, for 42 unique point-visit surveys. At each survey location, terrapins within 100 m of the point were counted during five, two minute surveys separated with one minute breaks. The

AIC model selection approach was used to determine the best fit model among 14 candidates that tested factors influencing abundance and detection probability. In the best fit model, detection probability improved with calmer water conditions ($p < 0.01$), and the likelihood of observing terrapins increased over time in areas closer to creeks and decreased in areas farther from creeks ($p < 0.01$). Abundance varied significantly with survey location, ($p < 0.01$) and was highest at Moores Beach compared to other locations. The results of this study have improved our knowledge of factors influencing terrapin distribution in the bay. Continued headcount surveys can inform ongoing threat assessments and changes in crabbing regulations to reduce bycatch impacts on poorly known terrapin populations.

I'm Hooked: Creating a Video for the Secrets of the Salt Marsh Aquarium

Olivia Hogan, Eckerd College

The Secrets of the Salt Marsh aquarium is a popular attraction at The Wetlands Institute. With well-attended programs such as A Night at the Aquarium and Aquarium Feedings occurring weekly during the summer season, a large portion of guests visit the Aquarium. Since these Aquarium visits are popular and crowded, lots of information must be provided in a short period of time. Enhancing the audio and visual components of an Aquarium visit allows The Wetlands Institute to reach even more guests during their visit, as well as enhance the atmosphere of the Aquarium.

Final Cut Pro, a powerful video editing software program, allows multiple clips of The Wetlands Institute's aquatic organisms to be combined into a video for public education. *A Day in the Aquarium* is a fifteen minute video that showcases sophisticated video editing techniques and shares information about local species through narration, while providing pleasant background music as visitors enjoy the exhibits. The videos length reflects the average time a guest spends in the aquarium and the attention span of our youngest visitors. Through this video, the audience can get a closer look at local aquatic organisms and be exposed to events and behaviors that might not have occurred during their visit. This video project spreads knowledge and appreciation for our local marine life.

“Waste Management Consultants”: Quantifying the Impacts of Fish Crow Behavior in Southern New Jersey Salt Marshes

Samuel Hermanstorfer, *University of Wisconsin- Madison*

Since 1970, bird populations in North America have declined by three billion individuals. In a similar timeframe, Fish Crow (*Corvus ossifragus*) (Crows) populations increased in the Piedmont Region- including New Jersey- by 10.5% per year. The habitat surrounding The Wetlands Institute (TWI) in New Jersey has potential to sustain a relatively high number of Crows because of its proximity to resources, low levels of potential predators, and a moderate amount of urban disruption; ultimately causing imperiled species more stress. A suite of methods were used to explore baseline behaviors and conditional predictions of Crow activity, including ethogram analyses, passive observations, food cache monitoring, and supplemental camera trap utilization. Crows showed no detectable change in activity around tides, time, or date ($X^2=7.3$, $p=0.4$; $X^2=3.4$, $p=0.3$), suggesting Crows do not rely on changing tides or time to perform key survival functions. Crows nesting on TWI property travel to Ring Island or Avalon Marshes (>1 km) to forage, but also find food frequently nearby based on the dominance of Diamondback Terrapin (*Malaclemys terrapin*) eggs found at the cache. Throughout different sampling methods, Crows seemed to congregate in areas with higher perch availability. Results suggest removing perches may help reduce foraging opportunities at habitats for sensitive species like Ring Island ($t=-5.6$, $df=59$, $p<0.001$). Future efforts should continue to monitor Crow caches, activity levels on Ring Island, and test alternative methods to sign postings, which alert humans of beach-nesting bird presence, but the potential cost of Crow predation may outweigh the benefit to these species.

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!



Coastal Conservation Research Interns:
Brandon Ross, Cameron Forehand, Autumn Turney, Nicole Fox, Laura Cammarata, and Samuel Hermanstorfer



Environmental Education Interns:
Olivia Hogan, Callie Knudson, Heather Bariso and Grace Fanning