REPORT OF AN INTERNSHIP WITH THE U.S. FISH AND WILDLIFE SERVICE
AT THE PEA ISLAND NATIONAL WILDLIFE REFUGE,
HATTERAS ISLAND, NORTH CAROLINA

By Sara Fegel

I interned at the Pea Island National Wildlife Refuge on Hatteras Island in North Carolina. Pea Island is operated by the U.S. Fish and Wildlife Service and is a sister refuge to the Alligator River National Wildlife Refuge, located on the mainland of eastern North Carolina. The Pea Island National Wildlife Refuge follows the mission of the National Wildlife Refuge system, which is to provide, maintain, and protect wildlife and their habitat. The refuge is located along the Atlantic Flyway and emphasizes the protection of habitat for migratory bird species.

The focus of my internship was on public use and its role in refuge management. Intern responsibilities are discussed in three specific areas of refuge management, focusing on public use involvement but also touching on biology and maintenance activities. An evaluation and critique of the overall internship experience will also be presented.
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An Internship Report

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by

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INTRODUCTION

The Master of Environmental Science program through the Institute of Environmental Sciences strives to provide students with a broad understanding to environmental problems facing society (IES 2001). Such an understanding is influenced by the interdisciplinary approach of the graduate program. The graduate program exposes students to not only natural sciences but also social sciences and instills in its students leadership, team building, and problem solving skills. With the solid base provided, students will be able to enter environmental professions in government, education, non-profit, or public service organizations (IES 2001) with an increased awareness, professionalism, and receptivity to the work of such organizations.

As part of the Master’s degree program, students have a number of requirements that need to be successfully completed. These requirements include a set of core classes and concentration classes, a year-long public service project (PSP), a comprehensive examination, and either a defense of a thesis research project, a practicum, or a six-month internship. The subject of the thesis, practicum, or internship is related to the concentration of the student (IES 2001).

I chose to pursue a concentration in biological conservation with an emphasis on community environmental outreach. In order to further my involvement in environmental outreach, I participated in an internship offered through the U.S. Fish and Wildlife Service (USFWS). By working with this agency, I acquired a sense for how a governmental organization operates and its involvement with community outreach. My position was as a public use intern at the Pea Island National Wildlife Refuge, located on Hatteras Island in North Carolina. This internship provided me with experience as an environmental educator. Through the internship I increased my proficiency in developing and implementing public education programs. I also gained experience in writing press releases, participating in public outreach events, and increased my public communication skills.
The Institute of Environmental Sciences (IES) has been an important part of my graduate education. If I had to pin point what I got out of the program, I would say the ability to understand group dynamics and to be a team player, as well as the ability to problem solve. However, IES provided me with a number of other experiences and knowledge that I will be able to draw from in the future.

The Master of Environmental Science program offered through IES is an interdisciplinary program that I feel is “real world” based. At the beginning of the program students are introduced to a variety of environmental settings including environmental consulting, a chemical corporation, state and federal agencies, education centers, and landfills. The field trips represent the broad field of environmental science and the range of interests involved. These trips also serve as examples of the types of organizations students may find themselves working in or partnering with in a future profession.

The program provides the academic foundation students need for understanding the various environmental issues facing society. It also provides its students with tools to successfully meet the challenges of a professional world, but inevitably these tools also carry over into everyday life. I was attracted to the graduate program because of its broad focus and flexibility in allowing students to reach their professional goals. After completing the required core classes in the program, students choose an area of concentration that fits with their career interests. This area of concentration introduces course work in other disciplines as well as opportunities for independent study. Independent study experiences allow students to work with other organizations that are involved in projects related to the student’s area of concentration.

Environmental problems are interdisciplinary. By taking courses in other disciplines, students are exposed to a broad range of interests and ideas, which help IES students expand their range of view. Through core and concentration classes as well as independent study opportunities, students are encouraged to broaden their focus in order to see all sides of a
situation before coming to a conclusion. These opportunities also allow students to find their
niches in the field of environmental science.

IES has an interdisciplinary approach that not only is seen in the structure of the program
but also in the students it accepts. Students entering the program come from a variety of
disciplines including political science, biology, environmental science, education, geology,
chemistry, and geography and bring with them different viewpoints. IES encourages discussion
and learning from one another. Teamwork is heavily stressed in the program and is found
throughout all aspects of the program. Students are always involved in group discussions and
group projects. In fact, in the first year of the program, students are quickly formed into teams to
accomplish a yearlong public service project. During this particular project students learn first
hand the importance of teamwork and group dynamics. This project also gives students
applicable experience by working closely with an environmental organization. In collaboration
with the organization, students come up with realistic and effective strategies for projects these
organizations are involved.

In terms of how IES prepared me for my internship, the course work I took through IES
was helpful. Specific course work included Principals and Applications in Environmental
Science, Environmental Methodology, my Public Service Project, Environmental Policy, and
independent study opportunities. These courses provided me the background knowledge related
to science, problem solving, political decisions, and working as a team. However, a number of
other core courses and concentration courses provided me with teamwork and problem solving
skills. My degree program provided me with a broad range of knowledge and the skills to
perceive ideas and issues from different angles. Having this background gave me a new
perspective and has changed me for the better. IES provided me with the skills, knowledge, and
experience to make informed decisions, as well as to successfully transition in to the professional
world and help create positive environmental change.
PEA ISLAND NATIONAL WILDLIFE REFUGE

The Pea Island National Wildlife Refuge (PINWR) was established in 1937 (U.S. Fish and Wildlife Service 2002) and has since been part of a national wildlife refuge system boasting 538 national wildlife refuges nationwide (Marine Protected Areas of the United States 2001). PINWR is located on North Carolina’s Hatteras Island, which is one of the islands within the chain of islands making up the Outer Banks (Figure 1). Hatteras Island is a coastal barrier island, and like much of the Outer Banks, was historically flat, sandy, and wide. It was not until the late 1930’s that vegetation and sand dunes began to exist. The Civilian Conservation Corps, the U.S. Army Corps of Engineers, and the Department of the Interior vegetated the islands and created the sand dunes seen today. Vegetating the islands was a way of stabilizing the constantly changing environment of barrier islands in order to encourage development. Before PINWR became a refuge, members of private waterfowl hunting clubs owned the land. Even then, this area was well-known for the numbers of migratory bird species, predominately waterfowl, that sought this area out during migration. One predominant waterfowl species to the area was the greater snow goose. PINWR was named after the small plant, known as the beach pea, which produced flowers that formed beans. These beans provided a valuable food source to the geese (U.S. Fish and Wildlife Service 2002).

Hatteras Island is surrounded by the Pamlico Sound to its west and the Atlantic Ocean to its east. The refuge is located on the northern end of the island and extends southward 12 miles (Figure 2). At its widest point, PINWR is approximately two miles wide. It has approximately 5,834 acres consisting of ocean beach, barrier dunes, salt marshes, and fresh and brackish water ponds and impoundments. The impoundments, which include North Pond, New Field Pond, and South Pond (Figure 2), are the heart of the refuge’s management program. Its ponds and marshes are man-made to re-create a “natural” environment for many avian species (U.S. Fish and Wildlife Service 2002).

Approximately 2.5 million visitors visit PINWR yearly, partially because it is a “Birder’s Paradise.” The refuge is part of the Atlantic Flyway. Also, the refuge is on the way to popular tourist destinations such as Cape Hatteras and Ocracoke Island (U.S. Fish and Wildlife Service 2002). PINWR is a haven for a number of shorebirds, migratory waterfowl, raptors, and sea
turtles. Due to the intensive growth and development of the Outer Banks area, the refuge plays an important part in helping to maintain vital habitat for a number of species, which would otherwise be homeless. The refuge also takes a role in wildlife conservation through public education efforts (U.S. Fish and Wildlife Service 2002).

The management of PINWR is unique in that it is administered by the Alligator River National Wildlife Refuge (ARNWR) (Figure 3). Refuge headquarters is located in Manteo, North Carolina (Figure 1) (U.S. Fish and Wildlife Service 2002). Both ARNWR and PINWR are part of the National Wildlife Refuge System (NWRS). Similar to other national wildlife refuges across the United States, both ARNWR and PINWR are managed first to provide for a diversity of wildlife and second for public enjoyment. A wide number of reptiles, mammals, birds and a few amphibians call PINWR home for at least part of the year (United States Fish and Wildlife Service 1995). The NWRS is operated by the USFWS. This refuge system is the largest system of land areas and water areas in the United States managed for the benefit of wildlife. The National Wildlife Refuge System Act explains that each refuge is managed to uphold the mission of the Service but also the purpose for which the refuge was established. The mission of the USFWS is to:

“...work with others to conserve, protect, and enhance fish, wildlife and plants and their habitats for the continuing benefit of the American people” (U.S. Fish and Wildlife Service n.d. Who We Are).

The mission of the NWRS is:

"to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans" (Marine Protected Areas of the United States 2001)

Each refuge follows the missions of both the USFWS and the NWRS, but also has specific objectives related to the purpose of the refuge. PINWR’s objectives are to:
• “Provide nesting, resting, and wintering habitat for migratory birds, including the greater snow geese and other migratory waterfowl, shorebirds, wading birds, raptors, and neotropical migrants.

• Provide habitat and protection for endangered and threatened species.

• Provide opportunities for public enjoyment of wildlife and wildlands resources. Public use programs focus on interpretation, environmental education, wildlife observation, wildlife photography, and fishing” (U.S. Fish and Wildlife Service n.d. Pea Island National Wildlife Refuge).
Figure 1. Map illustrating the Outer Banks to provide a location reference of Pea Island National Wildlife Refuge on Hatteras Island and Manteo, North Carolina (Insider’s Guide. 2003. Map of the Outer Banks)
Figure 2. Map illustrating the Pea Island National Wildlife Refuge on the northern end of Hatteras Island (Insider’s Guide. 2003. Map of Northern Hatteras Island)
Figure 3. Map illustrating the Alligator River National Wildlife Refuge (North Carolina's Outer Banks 2003)
During my internship at PINWR, I was a public use intern. As a public use intern I had a number of responsibilities, many of which varied day to day. On average a portion of every week involved education program work, canoe tours, roving interpretation, and staffing the Visitor Center. Once a month I went to refuge wide staff meetings, which provided an opportunity to see the administrative portion of refuge management. Often I would also do various miscellaneous tasks, such as helping inventory newly received Visitor Center merchandise, taking an inventory of the refuge canoe paddles and life jackets, redoing Visitor Center brochures into fact sheets, updating contact lists, and running errands in town. Also, both on-site and off-site special events would occur.

One smaller project I was involved in was creating a kiosk panel on endangered species (Appendix 1). Creation of the panel was a group effort with two other PINWR interns and I. We worked on a panel for the South Kiosk, which would inform visitors of the threatened and endangered species found at the refuge, including the piping plover and loggerhead and green sea turtles. I also labeled a laminated aerial map of the local refuges in the area for the Refuge Manager.

Towards the end of my internship my supervisor introduced interns to Dreamweaver, and grantwriting. For two days, we spent the morning addressing each topic. I was glad to have been introduced to the process of grantwriting and developing a website. I wish it had occurred earlier into my internship in order to use the knowledge throughout my internship. Also irregular staff meetings with PINWR staff occurred where interns were able to discuss ideas, clarify various issues, and receive project information from our supervisor. We also reviewed various refuge vehicle procedures such as maintaining gas logs, keeping gas tanks half full, and the care of government vehicles.
Education Programs

At PINWR, I was responsible for on-site educational programs, assisting with local school programs, and developing a new refuge program. At the start of my internship, I had an introductory period of about two weeks where I observed my supervisor during on-site and off-site programs. General observation gave me an idea of the process that was used in relaying the information to the audience. By the end of the two-week period, I had full responsibility for refuge program implementation.

There were three main public summer programs interns were responsible for from the beginning of June to the end of August: Sound Side Discovery, Raptor Rapture, and Turtle Talk (Appendix 2). Group sizes ranged from two people to 18 people. However, large numbers greater than four were rare, and I found out quickly that the weekly programs often had three or four people or were cancelled because there was no audience. Because of the low attendance rate I created a flyer advertising the programs (Appendix 3). My supervisor allowed me to post them at local campgrounds on the seashore as a trial period. The fliers did not appear to help; program attendance was still low. I also typed up short sentences about the programs, which were given to my supervisor who forwarded them to the local paper (Appendix 4).

School programs were scheduled with my supervisor in advance. Some programs involved going to the school. Other programs involved school groups coming to the refuge and wanting either all three refuge programs or they would choose one program. If class sizes were large, they were split into two smaller groups and two refuge programs were done with each group.

The information below offers an individual discussion of each education program I was involved in during my internship.
**Sound Side Discovery**

Sound Side Discovery was tailored to younger children. The program introduced the type of ecosystem the Pamlico Sound was through a natural history discussion and a hands-on exploration activity. This program was held on Thursdays from 10:00am until 11:30am. The program was introduced by comparing the sound to the ocean; the ocean being dynamic with constant wave action and the sound being calm offering a haven for a number of aquatic species. The natural history portion continued with the explanation of the sound being an estuary with a salt marsh ecosystem at its edges. The program focus was on the various aquatic and terrestrial species that could be found in the sound. To illustrate this point, children would take turns pulling out various dead organisms from the ‘mystery box’ such as whelk and conch shells; whelk and skate egg cases; horseshoe crabs; barnacles; marsh periwinkles, a type of gastropod; clams; oysters; mussels; pictures of herons, crabs, egrets, and ibis; and a sea star.

![Illustration 1. What’s in here?! A participant reaches into the mystery box during a Sound Side Discovery program.](image)

The children would guess what it was, and we would talk about the organism’s special adaptations and its importance in the sound. The hands-on activity involved using the seine net and hand held nets. Organisms found in either net were placed in pans filled with water for viewing. The nets were a way for the children to get an up close look of the organisms that were in the ‘mystery box,’ as well as others found in the sound such as juvenile fish, grass shrimp, and jellyfish.
This program had on average between five and 14 people, with the exception of school groups. If groups were large they would be split up having one half doing natural history and the other seining and using hand nets, then they would switch. We found by doing this, groups were more easily managed and less distracted. The challenge I found with this program was that I did not know the age group of the children until the start of the program. Flexibility was important.

**Raptor Rapture**

Raptor Rapture was for any age group and was regularly held on Wednesdays from 2:30pm-3:30pm. The audience I normally had was a group of two to four adults. At the beginning of the summer this program began at the Visitor Center with an introduction to PINWR. The introduction included basic history of the national wildlife refuge system such as when and where the first refuge was started, mission of the USFWS, PINWR facts, and types of habitats found within the refuge. A reading of a Native American story, *Flight of Fantasy* would follow. As part of the story, the audience was asked to close their eyes and visualize being a raptor flying in the air. Afterwards they discussed how they felt and what they liked about being a raptor. This discussion segued into how raptors differ from other birds such as songbirds. The audience explained what differences they observed between the two. The Visitor Center had an osprey on display, which the group would circle around and discuss DDT and how birds were an important indicator of human influences. There was a mounted spotting scope in the Visitor Center.
Center, which the audience was also able to look through to see the live pair of ospreys nesting in North Pond.

This program varies in sequence depending on the audience. Scheduled programs were normally school-aged kids and resulted in the program beginning with the story and having them draw what they saw as a raptor. A discussion of raptor adaptations would follow with the conclusion being the benefit of raptors. I only observed school groups.

By the middle of the summer, Raptor Rapture was reorganized and presented differently. I worked on improving our Rapture Raptor program with a fellow public use intern. It was a slow process, involving much on-line researching and going through raptor information in the office. We were trying to find more natural history and physical attribute information on raptors. Visual aids also lacked for the program, so we spent time trying to find skulls, talons, and wings of various raptor species to use as visual aides in the program. We found some skulls and talons in a science company’s catalog. I was in contact with a staff member of the Carolina Raptor Center who could provide us wings, skulls and talons. However, because we ran out of time we never were able to order the items. I did however create life-size wingspans for an osprey and peregrine falcon out of newsprint and cardboard, which were used during the program.

When the program was presented it took place on the Visitor Center porch and involved audience interaction through using questions. An introduction of the refuge system and PINWR were given. The adapted Raptor Rapture program focused on the main adaptations of raptors: the talons, the feather structure, the bill, and the eyes. A mounted osprey was found in one of the education containers at the office so it was used as a visual aid. When feather structure was explained, each audience member was given a feather, which illustrated how bird feathers were held together. The program also addressed general natural history of raptors as well as the importance of raptors in the ecosystem, the threats to them, how they can be protected, and how PINWR helped raptors. The challenge of this program was making it interesting with the small number of visuals available.
The Turtle Talk program was a primary way of educating the public, who are primarily tourists, about the importance of protecting sea turtles. This program, held on Tuesdays from 2:30pm-3:30pm, was the most popular of the three refuge programs and had groups between 10-20 people, including both children and adults. Turtle Talk was presented on the porch of the Visitor Center. The refuge had three different turtle carapaces, one from a loggerhead, green, and hawks bill turtle, as well as a preserved loggerhead hatchling, loggerhead egg, and products made from sea turtles such as soap, soup, boots, and jewelry. These items were used during the program to give the audience a hands-on experience, as were pictures of turtle crawls, nests, hatchlings, protection techniques, and threats. Like all refuge programs, an introduction to the refuge system as well as to PINWR was given. The program involved general natural history of sea turtles and included sea turtle behavior characteristics related to North Carolina.

Illustration 3. A Loggerhead sea turtle makes its way back into the Atlantic Ocean

Natural history included time of year for nesting and hatching, number of eggs laid per nest, survival rate of hatchlings, hatchling behaviors, adult turtle behaviors, threats to turtles, ranges of sea turtles, food of sea turtles, public’s involvement in sea turtle protection, and PINWR’s role in sea turtle protection. Characteristics to North Carolina included most common sea turtles inhabiting the beaches, where nesting usually occurs, how many nests occur on the refuge, and influence of temperature on sea turtles.

The challenge of this program was the range of questions audience members asked about sea turtles. The audience was usually very excited about this program and wanted to know everything they could, however I was limited in the answers I could provide. I tried to direct them to an answer or provide an answer the best I could.
School programs

School programs began in the spring and went until the end of May. They were scheduled with my supervisor. I observed two school visits; one was an 8th grade class and one was a 7th grade class. Class sizes ranged from 15-30 students. The programs were done multiple times through the day in the same classroom but to different classes of students. Topics included bird sound and the red wolf reintroduction effort in ARNWR. Bird Sound involved a discussion on how birds hear and communicate in their environment. The lecture portion was followed by bird song bingo where various bird songs would be played from a Compact Disc and students would identify the bird on the bingo sheet.

The red wolf reintroduction program was centered on the red wolf project at ARNWR. A discussion began the program and introduced such terms as endangered, biodiversity, and values. Lecture was followed by an activity involving students representing different stakeholders. Students were broken up into teams of two to three and were assigned stakeholder groups such as birds, farmers, coyotes, tourists, and homeowners. The students had to decide how they as that stakeholder would feel about the reintroduction of the red wolf to their area, why they felt that way, and what value they had for the wolf. I felt it was a great exercise in getting students to understand the various viewpoints in society. What was good for one person or animal was not always good for another.

Individual Program

In regards to educational programs, interns were required to develop their own program related to either PINWR or ARNWR. We included research, thematic and conceptual development, a program outline, and presented it to an audience. I did my program on the salt marsh ecosystem of the Pamlico Sound that borders the refuge on the west. My program was entitled ‘Secrets of the Sound’ and introduced the concept of watersheds, identified the term estuary, discussed wetlands, and related all information back to the Pamlico Sound. The program also narrowed to the theme of salt marsh ecosystems, their importance in the ecosystem, threats to them, and how the public can help. I presented my hour long program to two fellow interns.
and my supervisor. My program outline can be found in Appendix 4 as well as handouts and activity sheets to the program.

I also completed an outline to a program I was beginning to develop called ‘Barrier Island Ecology’ (Appendix 5). The program focused on the development of barrier islands, their role in the ecosystem, coastal dunes, threats to barrier islands and dunes, and how barrier islands and dunes could be protected. I was unable to develop a completed program due to time constraints.

**Canoe Tours**

PINWR canoe tours were held four days a week throughout the summer and two days a week from the beginning of September until the middle of October (Appendix 2). All tours had to have a minimum of four people and a maximum of 24 people. Reservations were required before the day of the trip. Tours were only cancelled if a small craft advisory was issued for the sound or if lightning was present. A small craft advisory referred to wind speeds greater than 20 miles per hour. Interns rotated tours throughout the week. Canoe tours occurred on the Pamlico Sound, which bordered the refuge on the west (Figure 1), concentrating around the small islands around Wreck Creek illustrated in Figure 2. We traveled primarily in salt marsh habitat with some small areas of open water.

There were two types of tours offered. One tour was a family tour, which was a two-hour trip and one was a general three-hour trip. The family tour was for children. A portion of this tour involved getting out of the canoes and using hand held nets to explore the marsh looking for crabs, fish, snails, and anything else that was found.
Illustration 4. Look at that! A group examines an Atlantic blue crab after being caught in a hand net during a family canoe tour.

The three-hour tour was all paddling unless visitors wanted to get out of the canoes for a short time. Approximately a third of the way into the tour an introduction to the refuge was given to the group. Tours varied in size from four people to 22 people. Both the family tour and the general tour began with basic canoe instructions including safety procedures and canoe strokes such as the J stroke.

Before each trip, I had to fill out a float plan (Appendix 7). The float plan was a refuge safety procedure, which was faxed over to ARNWR where the main dispatch was for both PINWR and ARNWR. I also had to attach the canoe trailer to a refuge truck and pull out the appropriate number of personal floatation devices (PFD’s) and paddles. On each trip I was required to bring emergency bottled water, a radio, a cell phone, and a first aid kit all in a waterproof bag. After each tour, canoes and PFD’s had to be rinsed off and all equipment properly stored.

I not only gave PINWR tours but also had the opportunity to participate in two ARNWR canoe tours. ARNWR only had three-hour tours twice a week. I only guided these tours if no one else was available. On one tour I was the only guide and on the other I went with my supervisor. My tours ranged between two and three hours, had between three and six adults, and three and four children. The ARNWR trips were always much different than those at PINWR. Both areas were unique and enjoyable; however, ARNWR was forested having such trees as the Bald
Challenges were common during canoe tours. I learned to bring extra equipment in order to accommodate extra people who showed up the day of the trip. Although reservations were required we did not discourage last minute additions. The weather and wind were another challenge. As guides, interns had to be very aware of incoming bad weather and had to use their best judgment when making the decision to cancel a trip if needed. The sound was very open and wind could make a trip uncomfortable. Days when the wind was strong I had to do my best to make sure each canoe had at least one strong paddler. Most of the time paddling was easy even for those who had never paddled.

Dealing with parents on canoe tours was also a challenge. Many visitors did not realize that for small children paddling on the sound could be very tiring, very early in the trip. I had to make sure parents understood the demand of paddling so they would not rely on having a young child paddle. I also had to balance between slow paddlers and fast paddlers and make sure everyone was together. Only one intern guided each trip. In situations where I needed to be of assistance to individual boats, I had to rely on other paddlers to maintain the group and keep everyone together until I could direct my full attention to the group again. Large groups greater than four were the most challenging. I had to trust that paddlers were following the regulations such as keeping PFD’s on while in the boat and that they were trying to maintain the pace of the group. Canoe tipping was the last main challenge. The canoes were stable, however if paddlers turned their bodies the wrong way, the canoe could easily tip. I had this happen twice on my trips. However because the sound was shallow, the paddlers only had to drag the boat towards the shore and dump the water out.

Roving Interpretation

In the middle of the summer, my supervisor introduced a new outreach activity, roving on North Pond trail. During the morning hours, usually four times a week, interns were scheduled
on a rotating daily basis to rove. Roving involved walking up and down the main portion of North Pond trail with a bird field guide and a pair of binoculars.

Illustration 5. North Pond trail. View from the observation platform towards the Visitor Center.

The trail was a half mile one way, ending at an observation platform. While on the trail, I would answer visitor questions, point out wildlife to those interested, and help visitors identify wildlife as best I could. By roving I interacted with visitors and improved my bird identification skills.

Visitor Center

I was scheduled to work once a week at the Pea Island Visitor Center. The Visitor Center was actually operated by the Coastal Wildlife Refuge Society (CWRS) members. CWRS is a nonprofit organization that works closely with the refuge.


Although CWRS members operated the center, a USFWS employee was actually responsible for running the center, ordering merchandise, depositing money, and bookkeeping. While on duty at the Visitor Center, I was responsible for opening and closing the center, money handling, some
inventory pricing, cleaning displays, answering questions, stocking shelves, and knowing where reference information was located such as pamphlets, maps, distances to various destinations, various phone numbers, and inventory. I offered information from everything related to both PINWR and ARNWR to the entire outer banks area.

Illustration 7. Inside the Pea Island Visitor Center. An intern assists visitors with their purchases.

Working at the center was a great opportunity to interact with both local residents and tourists and to increase my own knowledge of the area. Although I was not responsible for training new volunteers to work the Visitor Center, I did help acquaint new interns to the center and I got to train one of the new volunteers.

Special Events

Englehard Seafood Festival

The Englehard Seafood Festival took place in Englehard, North Carolina (Figure 1) the weekend after I arrived at PINWR to start my internship. The USFWS staff from various refuges in the state set up displays ranging from fire management, biological activities, and sea turtles, and had a bird call activity and an activity that involved casting animal foot molds. I was at the sea turtle display and interacted with visitors as they came by. It was a great opportunity for me to become acquainted with the sea turtle program since I was responsible for presenting Turtle Talk during the summer.
**Crab and Fish Rodeo**

The Crab and Fish Rodeo was at PINWR and involved opening North Pond (Figure 2) up to the public for fishing and crabbing. The public use program of the refuges sponsored it. The public was able to catch as many crabs and fish as they wanted within a four-hour period. At the end of the rodeo kids were able to have their names entered into a drawing where they could win prizes. Prizes were donated by area businesses. I was at the registration table, which became the prize table. Other interns worked the Visitor Center and took pictures of the participants during the rodeo.

**Wings Over Water**

The Wings Over Water festival (WOW) held from October 14th through the 19th, 2003 was the largest public outreach project of the refuges. The mission of the festival was to increase community awareness towards the importance of conserving the Outer Banks’ natural resources (Wings Over Water 2003). Various workshops, interpretative programs, and field trips offered visitors a chance to explore nature unique to Eastern North Carolina. The opportunities included birding; paddling; outdoor recreation such as archery, surf fishing, and game management; and interpretive programs including beach ecology, owl prowl, refuge at night, tree hikes, coastal geology, red wolf howlings, and mammal tracking. This year the festival was in its 7th year and was a collaborative effort between the U.S. Fish and Wildlife Service, the National Park Service, the Outer Banks Chamber of Commerce, the Coastal Wildlife Refuge Society, and the Carolina Bird Club. There was also a great amount of local support from area businesses and organizations.

The WOW festival extended out all over the United States and abroad. Registration booklets were mailed out months in advance to those seeking inquiries via the internet website www.wingsoverwater.org. Booklets were also distributed at various national parks, wildlife refuges, and area businesses. Interested individuals sent in a registration fee of $10 and a registration sheet of activities they were interested in participating. Participants were to pick up their registration packets the day before the festival or throughout the festival. These packets included name tags, a pen, various Outer Banks activity guides, and festival information such as
directions to and from activity sites. Participants were also invited to the *Sense of Wonder* performance, the keynote of the WOW festival. This performance was a two-act play written and performed by Kailulani Lee based on the life and works of Rachel Carson. I had the opportunity to see this play and thought it was a wonderful performance.

My involvement in the WOW festival included a range of activities. Pre-festival activities included designing a rotating exhibit advertising WOW, designing a WOW T-shirt logo, and writing press releases on the programs offered during the festival. During the festival I made coffee at six in the morning, a job I rotated with other interns throughout the week. I was also available at the PINWR headquarters to answer phones and visitor questions. I also roved on North Pond trail, helped out on two of the Refuge at Night programs, led two PINWR canoe trips, sold Wings Over Water paraphernalia at the *Sense of Wonder* performance, and worked on general office work.

I took responsibility for designing the traveling exhibit that was rotated throughout the summer and fall around the local area advertising the WOW festival. I chose a salt marsh ecosystem to be the theme. The display was three dimensional with a flat background, which I drew. I included some of the festival’s program topics such as fishing, paddling, and birding into the background, and used sand, shells, dead grass stalks and other dried organisms in front of the background.

*Illustration 8. The Wings Over Water traveling exhibit displayed in the local library.*

My fellow interns helped color the background made dragonflies and butterflies. The exhibit was first located in the local library’s display case, moved to the YMCA where it evolved into a touch table, and lastly it was placed in the local post office’s display case.
Before moving the exhibit to the YMCA, the background had to be mounted on foam core. The background was approximately 65” wide and approximately 36” high and drawn on newsprint. Because of its fragility it was mounted on a more stable surface. This was no easy task. Once the newsprint was laid down onto the adhesive sheeting covering the foam core there was no turning back. The mounting process took about a week to do because my supervisor and I needed additional hands to help lay the newsprint.

After completing the WOW exhibit, I was asked to design a logo for the WOW T-shirt. The year, 2003, marked the 100th year for the National Wildlife Refuge System and the first flight of the Wright brothers. The WOW committee therefore, wanted a special T-shirt that incorporated both events as well as the WOW festival. I worked with a member of the WOW committee who was in contact with the graphic design company making the shirts. Once I came up with two designs I took them to a WOW committee meeting for feedback on which design the committee preferred. The majority idea was used and I gave my contact a copy of the logo design (Appendix 8). She in turn gave it to the graphic design company, which, using computer programs, adapted the design to make it more dynamic for a T-shirt. They also added text.

I also helped my supervisor set up a temporary WOW exhibit at the senior center in Kill Devil Hills. Similar to the traveling exhibit, this exhibit also had a salt marsh theme using waders, dip nets, a seine net, shells and toy crabs. These items were placed around a mounted display with pictures and text related to WOW.

Writing WOW press releases was another responsibility of mine for the festival. I had five press releases to write, which served as a means of advertising for the festival (Appendix 9). The topics included Owl Prowl, identifying the types of owls found at the Alligator River National Wildlife Refuges and understanding their behavior; Leaders choice, local paddling guides picked their favorite areas and the participants did not know where they were going until launch day; Shallowbag Bay trips, participants sail on a sail boat around the bay and learn about the uses of sailboats both past and present; Discounted Programs for Locals, a way to encourage local participation in the event; and the Dare County Arts Council’s involvement. The
Shallowbag Bay press release was not written due to the trip being cancelled because of hurricane damage.

Some miscellaneous tasks came along with the WOW festival preparation. To encourage more participants from the local community, my supervisor and I designed coupons for discounted WOW programs. These coupons were advertised in the Discounted Programs press release. My supervisor showed me how to use page maker to design the coupons. A fellow intern and I also met with a woman involved with getting WOW information out across the country using websites and listservs. We emailed various outdoor listservs, such as birding sites and paddling sites, asking them if they would put the WOW website on their sites.

Leading canoe tours during the festival was also a responsibility of mine. My canoe trips were all successful having two and four participants. Both had beautiful, clear, sunny days, which were the best because you could see the sound bottom well. We saw 5 skates the first trip, which was rare, and on the second trip we saw 2 skates. To clarify, the regular refuge canoe trips were finished the week before WOW and the rule of having a minimum of four participants did not apply to the festival.

Along with canoe trips, I participated in the Refuge at Night program during the festival. This was a great opportunity to drive around the Alligator River National Wildlife Refuge after sunset spotlighting the fields and forests for animals. Normally the refuge was closed after sunset to visitors. The first night of the program I was the spotlighter. There were about nine participants on this trip. Unfortunately we did not see anything due to the rain. The second night of the Refuge at Night program was a huge success. There were about nine participants, and we ended up seeing 15 black bears in the farm fields at the Alligator River Refuge. We also saw a great horned owl and heard an assortment of screech and great horned owls calling in the night. It was completely quiet that night and all you could hear were the owls calling.

Also during the festival week I participated in the leaders’ dinner. This dinner was for all leaders of various trips during the festival. It was an opportunity for them to get briefed by the heads of each general section, birding, paddling, and interpretive programs, and find out about
changes to the itineraries. Due to the hurricane some paths were blocked off and some trips were cancelled.

After the festival was over, there was cleanup to be done. Most of the cleanup involved organizing leftover registrant packets, taking down signs at various locations around the area, and picking up litter. I also took the traveling festival exhibit down from the post office.

**Boy Scout Camporall**

The Boy Scout Camporall was a weekend long scouting event and included local and regional scout troops from North Carolina. A conservation trail was part of this event and involved the refuge’s participation. A staff member from PINWR organized the conservation trail. The trail was one day activity and had nine activities presented by different organizations including the National Park Service, Marine Fisheries, North Carolina Aquarium, Native American Museum, Coastal Wildlife Refuge Society, National Wildlife Refuge System, U.S. Fish and Wildlife Service, and Fire Management. Each scout needed a conservation trail passport, which listed the participating organizations. Upon completion of the activity scouts would get a stamp in their passport. Once a stamp was collected from all nine activities the scout received his badge.

I represented the National Wildlife Refuge System on the trail and had a *Feathered Friends* activity. The topic of this activity was bird beak adaptation. All scouts from Tiger Scout to Boy Scout came up to the table where I presented basic information on what adaptations were and the importance of them. I showed the group a picture of a pelican and a tern. The scouts had to determine the adaptations of each bird, which led into discussing reasons for the differences between the two bird species. The scouts then participated in an activity where five different “habitats” with food sources in them were set up on the table. They would choose a habitat, and I presented them with “bill” choices.
Illustration 9. Eeney, meeny, miny, mo? Boy scouts decide which bill to pick at the Feathered Friends program during the Boy Scout Camporee.

The “bills” were tweezers, ladle-type spoon, strainer, pliers, chopsticks, teaspoon, and a nutcracker. Out of the selection of “bills,” I would choose three depending on the habitat. The scouts had to determine which of the three would be the most efficient in obtaining the food source. A total of approximately 1200 scouts came through the trail. My perception of the trail was that of a scavenger hunt. Many of the scouts would just run up to the booth and want a stamp.

Wanchese Christian Academy

My supervisor and I spent a morning at the Wanchese Christian Academy in Wanchese, North Carolina (Figure 1) with 2nd and 4th grade students. We brought the blue goose, the USFWS’s mascot, to the presentation of two maintenance crew members from the Alligator River National Wildlife Refuge. The crew members, who also were on the fire crews out west, demonstrated what life was like at fire camp. They brought gear, food, and tools used on the fire line. As part of this presentation, the blue goose was there as a means of support and publicity for this education program. I took pictures of the crew members presenting to the students and of the blue goose interacting with them. The goose handed out coloring books at the end of the presentation to the students. The pictures were sent to an electronic paper called E-grits.
Fun and Safety Day

Fun and Safety Day was a festival held in late November focusing on educating the public about hunting and fishing safety. Although I was not at the refuge for the event, I worked on an exhibit that was used at the festival. I collected pictures dealing with hunting, fishing, and birding and contacted the USFWS’s photo information specialist at the USFWS image center, who sent me pictures to use. The pictures I found were all on slides, but were changed into photographs and mounted on foam core. The completed exhibit illustrated hunting and fishing safety, wildlife observation, and the USFWS’s involvement in these activities. I also found quotes and phrases related to the topics, which were mounted and arranged amongst the pictures on the traveling exhibit board.

North Carolina State Fair

The North Carolina State Fair, held in Raleigh, North Carolina took place at the end of October. The USFWS had a booth celebrating the 100th anniversary of the refuge system and included mounts of waterfowl, a Great Blue Heron, a Hawksbill sea turtle, and live pitcher plants and venus fly traps on display.
I was at the fair for two days representing the USFWS with my co-worker and other USFWS employees. We were available to answer questions from visitors, which varied from the display mounts to “How can I get these Canada geese out of my yard?” I also heard a number of stories involving snapping turtles. These stories resulted from people associating the displayed sea turtle with snapping turtles. Although at times it was slow, it was interesting to see how much information people knew and how much they lacked. Many of the children were very educated on topics related to the mounts and visual aids at the booth and often taught their parents new information.

It also was interesting to see the difference between a local fair, such as the Englehard Seafood Festival, and a state fair. I kept reminding myself that I was in Raleigh and not on the Outer Banks. Therefore I could not tailor my response as I normally did to Pea Island and the seashore. Most visitors lived inland and asked about ponds and lakes and the geese that were bothersome there. Every so often I would get a question about the hurricane or a coastal question.

**Hurricane Isabel**

Hurricane Isabel added some spice to my internship. Both PINWR and ARNWR were shut down days before the hurricane hit the area. Shut down included taking refuge vehicles as well as canoes over to ARNWR, boarding up all building windows, moving all office computers to the headquarters in Manteo, and relocating anything that could be thrown or damaged by wind
or salt water. Interns as well as the entire county had to evacuate two days before the hurricane was projected to hit.

I evacuated with two other interns to a town just east of Raleigh. We were there for close to a week and a half before returning to PINWR. When I returned to the seashore and the refuge it was quite a scene. It was amazing to see the changes that the hurricane caused. Sand dunes had either been blown or washed away or in some cases shortened. The ocean, which normally was blocked by dunes, was visible while driving on the highway. Sand was everywhere! I spent my first day back shoveling sand out of the office complex parking lot all day and also setting up the office computers. A fellow intern and I also canoed the PINWR canoe route to identify obstructions.

The hurricane caused a great deal of tree damage throughout ARNWR. Cutting crews from Florida came up to assist in the clearing of refuge roads. The week after I returned, I worked over at ARNWR to clean up the red wolf pens. ARNWR had seven captive red wolves kept for the breeding program. The area was closed to everyone except red wolf staff and the red wolf caretaker. Due to the extent of damage in the enclosure, interns and other staff worked for a week clearing tree debris away from pens and out of main walk areas. Machinery removed damaged pens and larger trees and logs that could not be moved by hand.

MAINTENANCE

Although at PINWR I was primarily a public use intern, I was scheduled to help out with maintenance tasks around the refuge once a week. Various activities I was involved in varied from week to week depending on the weather and priorities passed down from head supervisors. During the summer months of my internship painting was a common task. I painted everything from building trims, garage doors, building doors, parking lot lines, handicapped signs, and yellow curbs.
Illustration 12. Wet Paint! An intern paints the fuel tanks at the Pea Island office complex.

I also weed trimmed and mowed around the Visitor Center parking lot, North Pond trail, and the refuge office complex. Maintaining refuge kiosks was a twice a week duty of interns, which involved picking up litter around the three main kiosk areas and brushing off any sand that formed a layer on the plexi-glass exhibit coverings. On rainy days I cleaned the maintenance shop, vacuumed and wiped down the interior of refuge vehicles, and cleaned and organized the office. One other weekly task was lubricating the locks and keyholes of refuge building doors and padlocks. The weather on the island was very harsh and sand and salt spray easily got into these small crevices causing keys not to work, or locks not to turn if the proper care was not taken to avoid the problem.

Throughout the summer and fall months I was involved in a number of miscellaneous tasks that would arise. Such tasks included taking an inventory of the refuge sign room, removing government decals from vehicles that were no longer in use, dropping off materials to the local scrap yard, installing no parking signs along the highway, moving wood and signage materials out of a pole shed, and removing tree branches from under the canopy of North Pond trail. I also shoveled sand after the hurricane passed through.

Many of the maintenance activities I was involved in were not always completed in one day. The assigned tasks were completed by a joint effort between other interns and refuge volunteers. I would either start a project and then someone else would finish it, or I would come in on a project that was still being completed. We all worked together to get whatever was needed finished.
One last maintenance task I was involved in was refuge recycling. I was in charge of all recycling at the refuge including the office, the Visitor Center, and the residence. Twice a month during my maintenance days, I organized all recycling and dropped it off at the local recycling center in the town of Manteo. At the beginning of my internship, I created an office recycling protocol that I posted near recycling bins in the office to help make it easier and cleaner for me to organize the materials. From the office and residence, I would take the full bags of recyclables to another building in the complex where large trashcans were housed containing sorted materials.

BIOLOGY

Biological activities at the refuge focused on protecting wildlife habitat in order to provide a safe haven for the many plant and animal species seeking PINWR as a refuge. The key species that were protected at the refuge include the sea turtles, piping plovers, terns, and migratory bird species. There were three ponds on PINWR, North Pond, New Field Pond, and South Pond. These ponds were carefully regulated to the season. In the spring the levels were lowered to accommodate the wading birds. During the fall and winter the water was usually heightened for waterfowl. Bird counts both for the ponds and for the beach were regularly taken as were pond salinity levels.

Unlike maintenance, I was not regularly assigned to biological tasks. If a special project was being undertaken and extra help was needed, then I was asked to help out. Much of my knowledge on biological activities was through my interactions with biology staff during their field breaks and through other interns who worked with the biologists.

During my internship I did have the opportunity to participate in a few biological activities. Such activities included bear hair traps, pelican and tern banding, turtle patrol training, and turtle watch training.
**Bear Hair Traps**

ARNWR (Figure 3) had a large American black bear population, which made it an ideal location for bear studies. For two days I helped construct bear hair traps in the refuge as part of a graduate student’s thesis project. I was part of a team that chopped its way through the forest to a precise location, found four trees within the area that were approximately of some equal distance between each other, yet large enough for a black bear to fit into, and strung barbed wire between them creating a square-type shape. In the middle of this square, bait would be added to attract the bears. The general idea behind these traps was that the bear would go under or over the wire in search of the bait and leave behind tufts of hair that would then be collected and analyzed for DNA. The project was studying the population of the refuge’s black bears.

**Pelican and Tern Banding**

One of my favorite experiences during my internship was being involved in pelican banding. A group of approximately 20 people, made up of refuge staff, interns, and volunteers, went out to an island in Pamlico Sound were a colony of pelicans nested. Although there was not a research project going on related to pelicans, these birds were banded to monitor their migration patterns. Babies and juveniles were targeted for the banding, and adults with bands were caught to record the number on the band. In order to either record a band number or to put a band on, the bird had to be caught. Either you grasped the pelican at its wing base or herded them together and then grasped at their wing base. Pelicans had a tendency to huddle in groups, which made it easy to round them up.

Illustration 13. Juvenile pelicans huddle together as banders attempt to catch them.
The trick when picking these birds up was to gently grasp the bill and then pick them up at the base of their wings. They were pretty feisty animals and could easily pierce your skin or even regurgitate on you if you were not careful. Once they were secure in your hands they were docile. A total of ~1500 pelicans were banded. With the pelican banding there were designated banders and holders. All of the banders were experienced and would allow volunteers a chance to put a band on if they wished. The bands had to go on a specific way in order to protect the bird from future injury. For example as the young bird grew, the band had to allow for growth in order to avoid cutting off leg circulation.

Tern banding was not quite as exciting for me as pelican banding. For terns a group of approximately 15 refuge staff, interns, and volunteers went out to another island in Pamlico Sound and banded juvenile Caspian terns, Royal terns, and a few Sandwich terns. For the Caspian terns we had to basically run after them and grab them up into our hands. The Royal terns tended to form a flock, which enabled us to drive them into a little make shift corral made out of chicken wire. Once in the corral you picked them up, banded them, and let them go. We banded ~100 baby terns. Everyone was responsible for banding the terns.

Turtle Patrol

Sea turtles were one of the main species protected at the refuge. There were two refuge procedures used to ensure the success of sea turtle survival, turtle patrol and turtle watch. Although I was not a biological intern and was not primarily responsible for turtle patrol, I received training from the biologists in the event the intern on call was unable to assist in the patrol. Turtle patrol took place everyday from the end of May until the end of August. This was the time period when turtles dug their nests. Approximately 11 volunteers rotated the morning shift of driving an ATV the length of the refuge beach, 12 miles, beginning around sunrise looking for signs of a turtle crawl. A turtle crawl indicated the possibilities of a nest. In the event of a crawl, volunteers and interns received training on how to identify the difference between a false crawl and an actual nest, how to set up stakes when marking a nest, where in the nest the egg chamber is located, and how to properly handle hatchlings. All volunteers and interns received ATV training.
Turtle Watch

The end of August brought the end of turtle patrol and the start of turtle watch. PINWR had two nests that were monitored for hatchlings. Turtle watch training involved biologists instructing volunteers on how to put a predator guard over the nest, how to set up a trench going around the nest and to the ocean for hatchlings, how to recognize depressions in the sand indicating hatchlings near surface, and on minimizing movement around the nest. Turtle hatchlings sense vibrations in the sand it was important to minimize movement near the nest. If hatchlings emerged a shield was constructed around the nest and a trench was made down to the ocean. The trench was made out of a type of plastic. The trench was to protect against ghost crab predation, which were main predators of hatchlings. A group of two to six volunteers sat on the beach near the nests an hour before sunset until midnight. They watched for any movement or depressions in the sand indicating hatchling emergence. After the incubation time period was over, refuge biologists excavated the nest to determine how many eggs had actually hatched. One turtle nest was found to have hatched, however no one saw it hatch. About 40 eggs were found empty. The second nest was destroyed during Hurricane Isabel, eggs found in the nest had been drowned.

ANALYSIS OF INTERNSHIP

In this analysis I have addressed the differences between a good and poor experience related to how well the public use program at PINWR prepared for and utilized graduate students. I also identified solutions to problems I discovered, which could help a future graduate student intern benefit from an internship with the public use program at the refuge. One last discussion addressed the appropriateness of the public use internship for undergraduate students rather than for graduate students.

Although overall I had a good experience during my internship, in terms of the preparation for and use of graduate students in the public use intern program I felt it was poor. I felt as a graduate student I offered a level of maturity, responsibility, and knowledge to the
internship. I thought I would have been given opportunities to work at the higher level I was capable of performing, and also be given projects that would challenge my skills and help further me in the profession of environmental education. However, graduate students were given the same level of work as undergraduates and not provided with challenging projects. Much of this was attributed to the lack of organization and communication in the public use program.

Two of the main inhibitors to the internship were the lack of communication between supervisors and interns and the disorganization of supervisors. There was not an introductory period where I could discuss one-on-one with my supervisor what my goals and expectations were for the internship, or what she expected from interns. Some of my goals were briefly addressed during a midterm evaluation; however, they were not fully understood until a discussion with my supervisor at the end of my internship. My supervisor also did not clarify the boundaries, if any, of my role or responsibilities as an intern. There were a number of projects that would have been great opportunities to participate in, but my supervisor had wanted to do them herself. Instead of completing the projects as a team, working with her as she provided interns guidance, interns were assigned basic projects. Because my supervisor was immersed in a number of her projects, she often forgot what our purpose as interns was at the refuge. I felt that my supervisor’s view of interns was that we filled in and picked up the smaller less demanding work that the staff could not complete. Although she may not have actually felt that way, that was the general impression she sent to me.

Currently, undergraduates benefited well from the organization of the internship. The internship program at the refuge normally had undergraduate students rotate every week between the three refuge programs: biology, maintenance, and public use. It was uncommon to have a specific intern for an individual program. The rotation gave interns an overview for the different programs involved in refuge management and a chance for interns to have multiple experiences to find where their niche might be. The 6-month internship I had at the PINWR was the first time the public use program had either a graduate student or a 6-month intern. A fellow classmate and I both went down to the refuge to participate in the public use internship; we were the first graduate students of the public use program. As a graduate student, I wanted to be more than just a helping hand, filling in a spot. I was willing to help with facility upkeep because I
knew it was also an important part of refuge management. However, if public use graduate students were given more challenging projects such as working on a short term project with school groups, planning outreach events instead of only participating in them, writing regular articles for area newspapers, recruiting volunteers, or writing grants, the internship experience would offer better preparation for a future outreach career.

If all the poor qualities of the internship were reversed, it would have made for a good experience. Solutions I would offer to help reverse poor qualities would include a number of things. Many interns at the refuge arrived on different days; therefore, an introduction to interns on an individual basis at the beginning would prevent many misunderstandings. An introduction would include discussing the goals and expectations of the intern, the academic and professional background of each intern, expectations of the supervisor, and the responsibilities and boundaries of the interns. Weekly staff meetings and consistent communication between supervisor and interns throughout the internship would also be beneficial. Training sessions at the beginning and middle of the internship with topics including education program development, canoe protocol, grant writing, and web design would be helpful as well.

I mentioned I had an overall good experience during my internship. I came to understand that my supervisor had never had graduate student interns before and was also new to the refuge as well as to the responsibilities of a supervisor. After discussing my internship experience with my supervisor before I left, I felt I was able to offer my supervisor suggestions to better prepare her for future graduate students. The entire staff at the refuge was great to work with and they meant well in wanting to provide a good internship for interns.

In retrospect, I felt that the internship experience was not appropriate for me in the career direction I was working towards, which was environmental community outreach. In going into this internship I had expected many things. I was ready to be actively involved in the organization’s processes including the planning, developing, and implementation phases of educational programs, policies, and events. I was ready to take on projects involved with organizing partnerships with area schools and community groups, planning and organizing outreach events, and obtaining and maintaining volunteer support. These experiences would have
helped prepare me for future work in community outreach. However, the refuge’s public use program was not directly focused on outreach. I felt I had expectations that the refuge was not able to provide because of the nature of the refuge. PINWR was involved in public education and wanted to increase community awareness related to wildlife conservation and the role refuges play in conservation. However grassroots organizing was not a focus of the refuge, which I discovered was my focus.

CONCLUSION

Having completed my internship at PINWR, it was an overall positive experience. I was able to obtain a general understanding of the workings of a governmental organization as well as the various aspects involved in a public use program. As an intern I was given opportunities not only to participate in public use duties but to also participate in biological and maintenance opportunities. I gained a new appreciation for the roles wildlife refuges played in wildlife conservation and the importance of educating the public on these roles. I enhanced my public communication skills and my proficiency in presenting and developing education programs. Although I was not able to fulfill many of my interests while at the refuge, I was able to redefine the direction I wish to head in my career.

Illustration 14. Pea Island…it’s a “Birder’s Paradise." Visitors birdwatch at one of platforms on North Pond trail.
REFERENCES


Appendix 1: Endangered Species Kiosk Panel

IN DANGER OF DISAPPEARING…

Over hundreds of species throughout the world are threatened and endangered. An endangered species is in danger of extinction in all or a significant portion of its range. A threatened species is in danger of extinction in the foreseeable future in all or a significant portion of its range if no protective measures are taken.

Common threats that result in a species becoming threatened or endangered are numerous. Such threats include habitat fragmentation and destruction due to development and human activities, beach erosion, ocean pollution, beach litter, and invasive and exotic species competition. In some instances only one threat may be problematic, but for many species multiple threats increase their susceptibility to becoming threatened or endangered.

Pea Island National Wildlife Refuge is a unique environment, which hosts a number of plant and animal species throughout the year including those which are threatened or endangered. The piping plover (Charadrius melodus), the loggerhead sea turtle (Caretta caretta), and the green sea turtle (Chelonia mydas) are all threatened species found at the refuge. In general, these species face multiple threats including recreational and commercial activities and habitat modification from both development and sand dune stabilization. The increase in visitors to the beach intensifies beach-front home development, foot traffic, and vehicle traffic. Such human disturbances can interfere with habitat availability, nesting behaviors and can crush eggs. Specifically with piping plovers, human interference can impede territory establishment, courtship, and incubation of eggs. Sea turtles are impacted by human interference through commercial fishing nets without TEDs (Turtle Excluder Devices), as well as bright lights from beach development. At night bright lights can interfere with a turtle’s sense of direction.

WHAT’S the PEA ISLAND NATIONAL WILDLIFE REFUGE DOING?
To help minimize threats to these valuable species, the refuge takes measures to manage vital habitat to ensure the success of the piping plovers and sea turtles. Driving is not allowed on
refuge beaches, visitors are discouraged to walk on sand dunes where a path is not clearly marked, and enclosures are constructed around identified nesting sites. Sea turtles also benefit from refuge volunteer programs such as turtle patrol and turtle watch. These programs help identify nesting areas and also ensure that hatchlings get to the ocean successfully. Educational programs related to the turtles are also given as a means of increasing public awareness.

HOW YOU CAN HELP
As interested and concerned individuals, there are a number of ways you can help both piping plovers and sea turtles on coastal beaches as well as other species in jeopardy. When beach walking avoid areas that are marked off. Minimize beach driving and do not disturb animals at night by walking up to them or using bright lights. If a light is absolutely necessary, use a red light as an alternative to a bright light. Also, participate in programs and organizations that work toward protecting plant and animal species. Write to your legislators and representatives informing them of your position on protecting endangered species. Above all, be informed and aware of what is going on. Share your knowledge with others; awareness is the key to change.
Appendix 2: 2003 Spring and Summer Interpretive Programs at Pea Island National Wildlife Refuge (adapted from original version)

2003 Spring/Summer Interpretive Programs
Pea Island National Wildlife Refuge

Sound Side Discovery

What lived in those shells? What is that slimy stuff? What’s it like to be a crab? Kids can discover the answers to these questions and many more, through hands-on exploration of the Pamlico Sound. Come help pull the seine net and see what we catch! Wading shoes required, sunscreen and hats recommended for this wet and wondrous activity. Children must be accompanied by an adult.

Thursdays June 5th to August 28th
10-11:30am at New Inlet; 2 miles south of Visitor Center

Bird Walks

Pea Island is for the birds-literally! Pea Island National Wildlife Refuge is home to nearly 400 species of birds. Come out and meet our summer residents. We welcome all bird lovers on our walks. Whether you’re a beginner or an expert, you’ll enjoy this casual stroll around North Pond. Field guides, binoculars, sunscreen, and insect repellant recommended.

Wednesdays, Thursdays and Fridays from April 2nd to October 10th
8-9:30am at Pea Island Visitor Center

Family Canoe Tour

Designed especially for kids, this tour includes lots of wading and hands-on exploration. $20 for adults and $10 for children 12 and under. Children must be accompanied by an adult. Wading shoes are required. Hats, sunscreen and drinking water are recommended. Reservations are required. Call 252-987-2394. Sponsored by the Coastal Wildlife Refuge Society.

Fridays May 2nd to October 10th
Wednesdays June 4th to August 27th
10am to 12pm at New Inlet; 2 miles south of Visitor Center

Turtle Talk

Why are sea turtles endangered? What can you do to help save these gentle giants? Learn more about sea turtles conservation at this presentation for all ages.

Tuesdays June 3rd to August 26th
2:30-3:30pm Pea Island Visitor Center
**Raptor Rapture**

Take a peek at various kinds of birds of prey that call the Outer Banks home. Depending on the season, we will be looking for osprey, hawks, peregrine falcons, and northern harriers. Throughout the summer, we’ll be paying close attention to the mating, incubating, hatching and fledging of refuge osprey. A great opportunity to learn more about the Outer Banks most popular summer residents.

Wednesdays June 4th to August 27th  
2:30-3:30pm Pea Island Visitor Center

**Pea Island Canoe Tours**

Visit the quiet side of Pea Island. Explore the marshes, islands and creeks of Pamlico Sound. Look for birds, crabs, terrapins, skates, and more!! $30 for adults and $15 for children 12 and under. Wading shoes are required. Hats, sunscreen and drinking water are recommended. Reservations are required. Call 252-987-2394. Sponsored by the Coastal Wildlife Refuge Society.

Thursdays May 1st to October 9th  
Tuesdays June 3rd to August 26th  
9am to 12pm at New Inlet; 2 miles south of Visitor Center
Get WILD on Pea Island!!

Pea Island National Wildlife Refuge, located on the Cape Hatteras National Seashore, offers a series of free educational programs for all ages through the end of August.

**Bird Walks** – Wednesdays, Thursdays, and Fridays 8:00am-9:30am
*Sharpen your skills while you observe some of the 365 bird species found on the refuge!*

**Turtle Talk** – Tuesdays 2:30pm-3:30pm
*Learn all about your sea turtle neighbors and their importance in the ecosystem.*

**Raptor Rapture** – Wednesdays 2:30pm-3:30pm
*Fly away with our feathered friends and uncover the mysteries of raptor behavior.*

**Soundside Discovery** – Thursdays 10:00am-11:30am
*What’s in a sound…Pamlico Sound that is! Hands on exploration of a salt marsh ecosystem.*

**WAIT** there’s more!...

CANOE trips available leaving from New Inlet:
- Tuesdays and Thursdays 9am-12pm ($30 over 12 and $15 under 12)
- Wednesdays and Fridays 10am-12pm ($20 over 12 and $10 under 12)

MUST call to reserve your spot!
(252) 987-2394
Appendix 4: Public Use Program Write-up for Local Paper

Continued from Page 43

Known for great fishing, and you can learn the basics of fishing and how to identify your catch in this program sponsored by the Outer Banks Center for Wildlife Education. Meet at 2 p.m. at the picnic pavilion at the Whalehead Club. Pre-registration is required. Fee, and all equipment is furnished. 453-0222.

Raptor Rapture. All ages are invited to learn about the mysteries of birds of prey who live or visit the Outer Banks. 2:30 to 3:20 p.m. at the Pea Island National Wildlife Refuge Visitor Center. 987-2394.

Children’s Show. The Professional Theatre Workshop program at “The Lost Colony” will pay homage to Virginia Dare in a production of “Where the Sidewalk Begins” of 2:10 p.m. in the Maritime Waterfront Center. This show is a fun-filled journey through many familiar poems from Shel Silverstein’s classic works. A suggested donation of $3 is requested. 475-2127.

“Blood Red Mary & the Virgin Queen.” This musical comedy highlights some of the zanier moments between Queen Elizabeth I and her half-sister, Queen Mary. Current political and topical humor will also be thrown in to delight the audience. 3:30 p.m. in the Fringe Theatre at Roanoke Island Festival Park. Tickets cost $10. 473-1001.

Video Presentation, Visitors to Jockey’s Ridge State Park can see an Emmy award-winning video that displays a natural wonder in beauty and detail. Bring the entire family to see “Seashore.” 4 p.m. Free. 441-7132.

Judy Collins of Volunteer Fire Department opens at 5:30 p.m. and games begin at 6:30 p.m. on the beachfront at the pavilion west of 115.5 Oregon Inlet. Free. 987-7118.

Breakfast with the Rays. You can learn a lot about the stingrays and what they like to eat because you will be feeding them at 8:30 a.m. at the touch tank at the North Carolina Aquarium. After they gobble down their morning feeding, enjoy a light breakfast of “people” food. The cost is $8 for ages 6 and up, and advance registration is required. 473-3494.

Day Camp. Children ages 7 to 12 can enjoy a three-hour morning or afternoon camp at Jennette’s Pier. The kids may teach their parents a few fishing tricks when they complete the pair fishing camp. They will learn how to cast, catch bait and where to look for the best catch. 9 a.m. to noon and 1 to 5 p.m. The cost is $25 per session per day or $100 per session per week. Advance registration is requested. Beach Road, milepost 16.3. 441-0829.

Kayaking. At 9 a.m. join a park ranger and head out to the Roanoke Sound in a kayak. You can get some exercise while you learn about the waterways of Jockey’s Ridge. No experience is necessary, but children under 13 must paddle with an adult. Jockey’s Ridge State Park. Free, but pre-registration is required. 441-7132.

Track Casting for Beginners. Adults and older children can discover how to track animals at Jockey’s Ridge State Park and learn to identify them through their tracks. 9 a.m. $5. Other clues may be found behind. A plastic cost of your favorite animal’s track will be a souvenir to take home. Free, but pre-registration is required. 441-7132.

Endangered Species. Help keep the Outer Banks a safe home for our endangered species. The program identifies the species and teaches participants how to protect them. 10 a.m. at the picnic pavilion at the Whalehead Club. Pre-registration is required. Free. 433-0221.

Soundside Discovery. Bring your mud shoes because you will need them when you participate in a hands-on exploration of the Pamlico Sound. All ages. 10 to 11:30 a.m. at the Pea Island National Wildlife Refuge. New Inlet parking lot. 987-2394.

Children’s Seaside. The entire family will enjoy “The Dinosaur and the Ant,” a musical fable for modern times. The children will get a thrill when the 9-foot tall glow-in-the-dark dinosaur interacts with the industrious ant. 10:30 a.m. in the Film Theatre at Roanoke Island Festival Park. $5 at the door, or free with paid park admission. 473-1500.

Hanging in the Wind. Have you ever wanted to fly? Meet in the auditorium at Jockey’s Ridge State Park at 11 a.m. to see some breathtaking video footage. Models will also be used to demonstrate the forces of flight. Adults and older children. Free. 441-7132.

Children’s Hike, Jockey’s Ridge State Park offers the “I Spy” hike for children 3 to 5 years old. While walking through the dunes, a member of the park interpretive staff will help children pick out objects in the natural environment by using shapes, colors, textures and smells. 11 a.m. Free, but pre-registration is required. 441-7132.

Outer Banks History. Roanoke Island Festival Park will share the history of the Outer Banks with visitors at 11:30 a.m. The Freedom’s Colony, first powered flight, invention of the shadboat, famous lighthouses and more are exhibited in the Roanoke Adventure Museum.

Please see following page
Appendix 5: Secrets of the Sound Education Program

Secrets of the Sound

Title: Secrets of the Sound! Uncovering the secrets of Pamlico Sound’s salt marsh ecosystem through hands-on exploration and discussion

Goal: To increase individual understanding of the importance of salt marshes in the environment and in turn Pea Island National Wildlife Refuge.

Objectives:
Upon completion of the program individuals should be able to:

1. Recognize the interconnectedness of terrestrial and aquatic systems
2. Define and identify a salt marsh habitat
3. List at least one function of a salt marsh
4. Draw conclusions on how they can reduce their impact of non-point source pollution on salt marshes
5. Understand the importance of salt marshes and their impact on Pamlico Sound by observing the effect a rain event has on an aquatic environment

Audience: Can be adapted for all ages

Location: New Inlet grassy area by the trail leading to the water

Supplies: Marsh metaphors; boating map of the Outer Banks; crossword and word find activities; Lamotte estuarine water testing kit; pictures of salt marsh birds, crustaceans, and fish; salt marsh in a pan activity

One other possible activity would have the audience broken up into groups such as tourists, local residents, wildlife, and fisherman. Each group would have to decide how a wetland would be a value to them. Such values include economics, recreation/aesthetics, ecological
I. Introduction
   a. Welcome to PINWR
      i. Explain refuge system, started 1903, and mission
      ii. Introduce PINWR, formed on 1937, other refuge facts
   b. Introduce Pamlico Sound - refer to boating map
      i. Albemarle/Pamlico Sound is the second largest estuary in the Eastern United States
      ii. What is an estuary?
          1. An area where salt water mixes with fresh water
          2. Important habitat for 92% of the fish in North Carolina
      iii. Part of the Albemarle-Pamlico Sound watershed – over 3 million people live in it

**Segue into wetlands – Can anyone guess what type of environment we are in?**

II. Introduction to wetlands
   a. What are wetlands?
      i. Transitional areas between land and water
      ii. Areas where water table is at or above the surface at least part of the year
   b. Found everywhere (cities, fields etc) except Antarctica
   c. Some are man-made, some are natural
   d. Estimated to be 2.8 million acres of wetlands along the coast
   e. Can vary in size
      i. Hundred square feet to hundred square miles (length of Pea Island to the causeway, 64,000 acres)
   f. Common types * see Wetland Types fact sheet
      i. Bogs, swamps, marshes
         1. Bogs – peat deposits, acidic waters
         2. Swamp – standing water all the time
         3. Tidal salt marsh – brackish water, flooded daily
g. Defined by and interaction of factors separates one type from another
   i. Soil – hydric (formed under water-logged conditions)
   ii. Water
   iii. Specialized plants (hydrophytes)
       1. Live with roots in the water

h. Two general categories
   i. Coastal
      1. Adjacent near coast
         a. Marine
            i. Along open coast in undiluted salt water
            ii. Can include mangrove swamps, shrub wetlands, slat marshes
         b. Estuarine
            i. Areas where fresh and salt water mix
            ii. Can include salt marshes, mangrove swamps, shrub wetlands

**Use salinity test in Lamotte estuarine kit to demonstrate salinity levels in ocean, sound, and fresh water

2. Determined by the following vegetation types (not all have to be found, but these plants are the common species that identify a coastal marsh from an inland marsh)
   a. Salt marsh cordgrass
   b. Blackneedle rush
   c. Glasswort
   d. Salt grass
   e. Sea lavender
   f. Bulrush
   g. Saw grass
   h. Cattails
   i. Giant cordgrass
j. Salt meadow grass

ii. Inland – fresh water
   1. Periodically submerged by standing or inflowing water from surrounding areas
   2. Types of vegetation
      a. Cattails
      b. Sedges
      c. Bulrushes
      d. Water lilies
      e. Arrowhead
      f. Duckweed
      g. Pickerel-weed

** Use *Marsh Metaphors* to demonstrate functions of salt marshes

III. Salt Marsh
    a. Type of wetland
    b. Transitional area between land and water
    c. Along shores of estuaries and sounds
    d. Salt marsh covers ~198,000 acres along coast
    e. One of the most productive ecosystems in the world and most critical for marine species
    f. Formation
       i. *Spartina*, cordgrass, seed arrives and colonizes in sediment
       ii. Spreads asexually through a rhizome system
       iii. Grass becomes thicker and deposition of fine particles and organic matter begins to occur, causing a rise in the sediment surface = terrestrial habitat
       iv. Less salt-tolerant grass begins to colonize
    g. Zones
       i. Low marsh
          1. Characterized by *Spartina* cordgrass
a. Tall form – 9 feet tall found along banks
b. Short form – 2 to 3 feet tall found in interior

ii. High marsh
   1. Characterized by several grass species
      a. Blacknneedle rush
      b. Short form smooth cordgrass
      c. Salt meadow cordgrass
      d. Eventually short shrubs
         i. Wax myrtle
         ii. Red cedar

h. Productivity
   i. Influenced by salinity
   ii. Estuaries collect nutrients
   iii. Nutrient rich water from oceans and streams meet and wash over salt marshes at high tide and deposit nutrients
   iv. Nutrients cycled through animals = ribbed mussel, siphon a gallon of water in an hour

i. Marsh flora
   i. Halophytes – salty, wet environment
   ii. Have salt excretion glands
   iii. Store salt in tips or areas that can be broken off
   iv. Tolerant of continuous submergence and low oxygen levels
      1. Hollow passages connecting stomata to roots for air flow
      2. Chemical reaction between roots and soil producing iron oxide and ferrous sulfate (light brown color around roots = oxidation process)

v. Producers
   1. Phytoplankton
   2. Algae
   3. Diatoms
   4. Blacknneedle rush
   5. Glasswort
6. Salt grass
7. Sea lavender
8. Bulrush
9. Saw grass
10. Salt meadow grass
11. Red cedar
12. *Spartina* – smooth cordgrass
   a. Dominate plant due to adaptations
      i. Narrow, tough blades (withstand high heat)
      ii. Salt excretion glands (withstand salt exposure)
   b. Not a main food source, but is significant in decomposition
   c. Good habitat source for salt marsh organisms
13. Wax myrtle

** Suggestion here would be to collect some samples of fish and mollusks, crabs etc in the plastic tubs before presentation and then show them to audience during this section

j. Fauna
   i. Microscopic organisms
      1. Feed on detritus and help recycle nutrients back into the marsh
      2. Stabilize sediments
      3. Food source for others
      4. Contribute to enrichment of sediments
   ii. Invertebrates
      1. Numbers depend on changes in salinity, temperature, and exposure (all stressful conditions)
      2. Species
         a. Fiddler crabs
            i. Shred dead plant material = helping decomposition
            ii. Burrows and aerates soil
         b. Blue crabs
c. Marsh snails – shred dead plant material = helping decomposition
d. Oysters – one can filter 50 gallons in a day
e. Clams
f. Marsh mussels
   i. Enhances growth of *Spartina* possibly through pseudofeces
   ii. Form colonies
   iii. Byssal threads held against erosion
   iv. Can filter one gallon of water in an hour
g. Insects
   i. Very abundant
   ii. Eat living plants/secreted fluids of plants/detritus
   iii. Most important role is as a food source for birds

iii. Vertebrates

1. Species
   a. Mammals
      i. River otters
      ii. Nutria
         1. Exotic and invasive species from South America
         2. Destroys marshes through overeating vegetation and contributing to erosion
      iii. Mink
      iv. Deer
      v. Raccoon
   b. Fish
      i. Flounder
      ii. Spot
      iii. Red Drum
      iv. Croaker
c. Reptiles
   i. Diamond-backed terrapin
   ii. Snakes

d. Birds - contribute nutrients with feces (fertilizer)
   i. Great blue heron
   ii. Great egret
   iii. Ibis –white and glossy
   iv. Red-winged black bird
   v. Little blue heron
   vi. Waterfowl

** Use *Salt Marsh in a Pan* activity to demonstrate the functions and benefits of salt marshes

k. Functions/Benefits - * see attached sheet
   i. Flood control
   ii. Storm buffers
   iii. Water Storage
   iv. Filter
      1. Can be overburdened by excessive pollutants
   v. Nurseries
   vi. Habitat
   vii. Recreational/Aesthetics
   viii. Economics

IV. Threats to Wetlands (refer back to *Salt Marsh in a Pan* to point out threats)
a. Historically viewed as useless land
b. More than half of the U.S. wetlands have been gone since the 1600’s
c. Wetlands covered 11 percent of the U.S. 200 years ago
d. Today they only cover ~5 percent of U.S.
e. Most salt marshes were destroyed between 1950’s-1970’s
f. In North Carolina approximately 500,000 acres of critical wetlands have been destroyed.

g. 100 acres of wetlands yearly are legally allowed to be drained and filled in North Carolina.

h. Past and present actions contributing to wetland loss:
   i. Drained for agriculture primary reason
   ii. Filled for development
   iii. Dredged for waterways

i. Current threats:
   i. Loss of quality and function
      1. Water flow modifications
         a. Ditching for mosquito control
            i. Causes bypass of nutrient rich water to wetlands
            ii. Decrease bird habitat
         b. Building canals for flood control
            i. Increases surface water levels = kills marsh grass
      2. Pollution
         a. Threatens economic, aesthetic, and recreational value
         b. Nonpoint source pollution
            i. Combined sources cause increase in pollutant concentration
            ii. Hard to monitor due to multitude of sources
            iii. Precise effects are unknown
            iv. Disrupt food web – some species die, others increase
            v. Stormwater runoff is currently the largest cause of pollution to aquatic systems
      vi. Solutions
         1. Changes in land use practices locally
         2. Using methods to minimize runoff
3. Individuals can change everyday behavior and be active participants in making change
4. Federal, state, and private agencies provide information on regulations and conservation

3. Global climate change
   a. Frequency and intensity of storms
   b. Sediment loads
      i. Reduction in load results in reduced salt marsh
      ii. Loads determine ability of coastal marshes to elevate themselves with an increase in sea level
   c. Sea-level rise
      i. Alter plant community composition
         1. Possible plant submergence
      ii. Alter surface area of seagrass beds

V. Status
   a. Section 404 of Clean Water Act
      i. Regulates all wetlands
   b. 1987 North Carolina and the EPA started Albemarle and Pamlico Estuarine Study – cooperative effort to restore and protect sound
   c. North Carolina’s Coastal Area Management Act
      i. Defines coastal wetland as any marsh subject to regular or occasional flooding by wind or lunar tides.
      ii. Marshlands must contain some of the 10 particular wetland plants discussed
   d. North Carolina’s Coastal Habitat Protection Plan- great way for citizens to take an active role in the protection of coastal areas

VI. What the public can do
   a. Become more aware of the importance of wetlands
   b. Realize the impact individual actions have on the Sound and in general wetlands
c. Support wetland friendly legislation

d. Participate in environmentally friendly behavior
   i. Purchase environmentally friendly products
   ii. Conserve water and electricity
   iii. Reduce amount of fertilizer and pesticides used
   iv. Reduce use of toxic household cleaners

VII. Pea Island salt marshes
   a. Protected under refuge mission
   b. No industry or agriculture in area – minimal pollution
   c. What type of impacts could occur on the refuge to the salt marsh?
      i. NC 12
         1. Litter
         2. Oil/leaks from automobiles
      ii. Hurricane impact (overwash)
      iii. Global climate change – sea level rise

Handout 1:

**Common plant species found in a coastal wetland**

10. *Spartina alterniflora*: **Salt Marsh Cordgrass (Smooth Cordgrass)**

Salt marsh cordgrass is the most common plant and prime indicator of a coastal wetland. It forms 1-foot- to 8-foot-tall meadows that grow just up to the open water’s edge. Lush and green in the warmer months, salt marsh cordgrass becomes golden-brown in the fall and dies back in the winter. Salt marsh cordgrass is frequently flooded.

2. *Juncus roemerianus*: **Black Needlerush**

Black needlerush has tall (3 to 5 feet) needle-like blades in shades of dark green or gray with sharp blackish tips. It grows in the higher areas of the marsh, or where salt water completely covers the land only during unusually high tides. In these higher elevations of the marsh, needlerush replaces cordgrass as the most common plant species.
3. *Salicornia spp.*: **Glasswort**

Glasswort is found throughout the marsh, mixed in with cordgrass or on the mud flats. Glasswort grows low to the ground (rarely over 2 feet tall) and has short fleshy green stubby spikes extending from a main stem. Glasswort looks like long green pipe cleaners attached to a long stem. Three species are found in coastal marshes, and one turns pink in the fall.

4. *Distichlis spicata*: **Salt (or Spike) Grass**

Salt grass is a short, green, wiry grass that lives among the salt meadow grass above the high tide line.

5. *Limonium spp.*: **Sea Lavender**

Sea Lavender grows at the fringe of the upper intertidal marsh. The plant looks delicate, with long, skinny leaves that sprout small stems as they grow upward. These stems are covered with tiny purplish-white flowers in the summer and fall.

6. *Scirpus spp.*: **Bulrush**

With its roots immersed in the mud or water, the bulrush grows into large, thick colonies. The plants can reach up to 10 feet tall, and the tops are crowned with spikelets.

7. *Cladium jamaicense*: **Saw Grass**

Saw grass grows to about 6 or 7 feet tall, with long, slender, narrow leaves that look like tall blades of grass. These leaves are stiff and tough, with tiny saw teeth around the edges. The top of saw grass has many branches and branchlets.

8. *Typha spp.*: **Cattail**

Cattails are easily recognizable by their flower spikes, or cat tails. Cattail spikes can grow up to a foot long and are densely packed with tiny brown flowers. The cattail plant can grow to 10 feet tall. Cattails also commonly grow outside coastal wetlands along freshwater ponds, lakes, rivers and ditches.
9. *Spartina patens*: **Salt Meadow Grass (or Hay)**

Salt meadow hay is a low- to medium-height perennial wire-like grass, 1-foot- to 3-feet-tall. It forms dense mats of plants just above the high tide line.

10. *Spartina cynosuroides*: **Salt Reed or Giant Cordgrass**

Salt reed is a member of the same family as salt marsh cordgrass, and they have similar features. As its name might suggest, this grass grows taller (up to 10 feet) and thicker than *Spartina alterniflora*.

**Handout 2:**

**Benefits of salt marshes/wetlands**

*Water-quality protection*

During rainstorms, runoff from farm land, highways and urban areas washes into rivers and sounds. This runoff may contain toxins, bacteria, sediment or nutrients that can harm aquatic life and contaminate drinking water. Stormwater runoff is a major contributor to water-quality problems in coastal North Carolina.

Wetlands are natural buffers between uplands and waterways. By trapping sediment, removing nutrients and detoxifying chemicals, wetlands act as efficient and cost-effective filtration systems. When runoff enters a wetland, many of the harmful components are removed before the water enters a stream.

Wooded wetland corridors along headwater creeks are the most important filters of agricultural runoff in the coastal area. Bottomland hardwoods and swamp forests along rivers remove sediments, nutrients and toxic chemicals from the river when floodwaters run through them. Wetlands are vital for protecting the quality of coastal sounds because they remove upstream pollutants from the water.
Wetlands help purify runoff waters which carry pollutants. Silt and soil, which choke aquatic life, settle out. Wastes are broken down and absorbed by aquatic plants, as are many harmful chemicals.

**Flood protection**

Wetlands minimize the danger of damaging floods by storing and preventing rapid runoff of water. Large pocosin wetlands can store enormous amounts of water and slow runoff of freshwater into brackish estuaries. Bottomland wetlands along streams provide holding basins for floodwaters and slow the water to reduce flood damage.

Wetlands store water after rains and release it gradually into groundwater or through surface outflow. This function of wetlands helps maintain more constant water levels in streams.

Excess water from heavy rains is slowed by wetland plants and stored in the low-lying areas of wetlands, preventing the waters of nearby rivers and streams from overflowing and damaging property.

Wetlands hold water during the wet season. This water seeps through the soil and into our underground water supplies.

**Shoreline-erosion protection**

Wetland vegetation is often very dense, both above and below ground. This plant cover can absorb energy from floods and wave action. By dissipating energy, binding soil and encouraging sediment deposition, wetlands stabilize shorelines along coastal streams, lakes and sounds.

Along our coast, wetlands take a beating from high winds and waves, yet remain intact. The thick vegetation buffers the forces of storms and protects the land from erosion.

**Fish and wildlife habitat**

Wetlands provide essential habitat for many diverse species -- fish, wildlife and plants. In North Carolina, more than 70 percent of the species listed as endangered, threatened or of special...
Many common species of waterfowl, fish, birds, mammals and amphibians live in wetlands during crucial stages of their lives.

Coastal marshes provide nursery areas for finfish and shellfish. These marshes are among the most productive natural systems in the world, and this productivity makes the adjoining sounds some of America's richest fisheries.

Bottomland hardwood wetlands provide abundant food, nesting sites, resting areas and escape cover for many wildlife species. Many fish species use spring-flooded bottomlands as spawning and feeding locations.

Large pocosins are a refuge for wilderness animals, such as black bear and bobcat. Carolina bays are critical habitat for many uncommon amphibians and reptiles. Pine savannas are host to numerous rare plants, such as insectivorous species, and to the endangered red-cockaded woodpecker.

Without its wetlands, coastal North Carolina would have much less biological diversity and would be a far less interesting place to live or visit.

Wetlands are so productive, many animals depend on them for food. Many migrating birds stopover in wetlands each spring and fall to rest and feed before continuing their trip, and some will spend the winter in the wetlands.

**Recreational Opportunities**

Wetlands provide us with places to watch birds and animals, and to fish, boat, and hunt.

**Economic importance of wetlands**

Numerous economically important products and activities depend on wetlands. Fish, shellfish, blue crabs and shrimp -- vital to our commercial and sports fisheries -- use coastal salt marshes for habitat and food. Inland freshwater wetlands also affect estuarine water quality and productivity; thus they too influence fisheries.
An important use of freshwater wetlands in coastal North Carolina is timber production. Many wetland areas, if managed properly, can produce forest products without substantially detracting from their other wetland functions.

Other traditional wetland uses of economic importance include hunting, fishing and trapping. The water-filtration and flood-protection roles of wetlands are also of economic value, since they save money that would otherwise be spent on runoff control, water treatment and property preservation.

In addition to hunting and fishing, many wetlands offer opportunities for birdwatching, canoeing and photography. Almost all of the public recreation areas in the coastal area include significant wetlands. Visits to wetland wildlife refuges are an important part of the tourist economy in some coastal counties.

Salt marshes perform many functions valuable to human beings. As previously mentioned, they are a major producer of detritus and provide nursery grounds for numerous commercially and recreationally important species. In addition, salt marshes serve as filters to remove sediments and toxins from the water. Marsh plants break down many pollutants into less harmful forms. Uptake by sediments and burial in the marsh minimize the toxic effects of pollutants. There is a limit to this capacity to serve as a waste treatment center. Excessive pollutants can overburden the cleansing capabilities of marshes. Marshes also act as buffers for the mainland by slowing and absorbing storm surges, thereby reducing erosion of the coastline. In addition to all this, they provide a scenic vista in our state.
Activities

**Wetland Inhabitant Word Search**

*Search for the types of animals found in wetlands. See if you can find:*

(from Albemarle-Pamlico Environmental Education Activity Kit)

- beaver wood
- duck crab
- mosquito heron
- frog dragonfly
- turtle shrimp
- flounder
- clam
- crayfish
- raccoon bear
- egret
- sunfish mink
- salamander
Wetland's Crossword (from Albemarle-Pamlico Environmental Education Activity Kit)

Test your wetlands knowledge by completing this wetlands crossword puzzle.

Across
2. ____ are wetlands that are flooded with water for most or all of the year, and are vegetated with trees and shrubs.
3. A use of wetlands for food and cover by young fish and other animals.
6. A wetland type found along streams and rivers. They are flooded for part of the year and dry for part of the year.
7. The type of soil often found in pocosin wetlands. It is made up of decayed plants.
9. Peat soil feels out, pollutants from water.
11. Many kinds of ____ use wetlands for sources of food, resting sites, and cover.
12. Wetlands along the coast may lessen the damage caused by storms, and protect land from erosion since they function as a ____.

Down
1. A use of wetlands by people.
2. Commercial fishermen depend on wetlands to supply us with ____ to eat.
4. Bottomland wetlands are often ____.
5. A ____ marsh does not contain salty water.
8. A wetland type with evergreen trees and shrubs. This word means "swamp on a hill" to the Algonquin Indians.

10. Wetlands have the ability to remove, or ____ out, pollutants from water.

Key:
Across -2. swamp, 3. nursery, 6. bottomland; 7. peat, 9. spongy, 11. wildlife, 12. buffer Down -1. recreation; 2. seafood; 4. forested; 5. freshwater; 8. pOCOSill; 10. filter
SALT MARSH IN A PAN

OVERVIEW

Students create a model of a salt marsh to discover the impact of pollution and human activities on water-based habitats including bays and the ocean. Model may also be used to demonstrate salt marsh functions, non-point source pollution and watershed concepts.

OBJECTIVE

Following completion of this lesson, students will be able to:

- Recognize the relationship between natural and developed areas and the impact human activities have on those areas;
- Understand watershed concepts by observing what happens to an aquatic area during a rain event;
- Draw conclusions about what they can do to help reduce, reuse and recycle products in everyday use;
- Name several salt marsh functions (optional extension).

GRADE LEVEL

4th - 12th grades

N.JCC STANDARDS

Science Indicators:
5.1: End of Grade 4: A1, A2, B1, B2, End of Grade 8: A2;
5.3: End of Grade 4: A1, End of Grade 8: A1;
5.4: End of Grade 2: C2, End of Grade 4: B1;
5.5: End of Grade 2: B1, End of Grade 4: B1, B2,
End of Grade 8: B2, B3; 5.7: End of Grade 2: A2,
End of Grade 4: A1, A2, 5.8: End of Grade 2 - A3, B1,

Mathematics Indicators:
4.1: 6C3; 4.2: 4D5, 8A5, 12A4; 4.3: 6Cl, 12D3;
4.4: 2A1, 4A1, 6A1, 6Bl, 12A5, 12Cl3; 4.5A: 1, 2, 3, 4, 5;
4.5B: 1, 2, 4; 4.5D: 1, 2, 3, 5, 6; 4.5E: 1; 4.5F: 5

Visual and Performing Arts:
1.6;

Language Arts:
3.4, 3.5;

Social Studies:
6.R, 6.9;

Cross-Content Workplace Readiness:
2, 3

MATERIALS

To make model you will need:
- One paint roJer pan, non-hardening modeling clay to fill the roJer pan;
- Sponges to fit across the width of the tray (optional);
- Supplies to make a road, houses, birds;
- and anything else found in a neighborhood including trees and grasses.

To complete demonstration you will need:
- Watering can, Green food coloring, Soy sauce or oil, Bits of paper;
- Ground coffee, Chocolate sprinkles.
Procedure

Spend about 5 minutes discussing the causes of water pollution and the possible origins of litter found on the beach, riverbank or salt marsh. Divide students three groups; Developers, Residents and Rainmakers. The Developers build the model in the roller pan by adding a half inch thick layer of clay to the shallow top third of the pan. This group should build creeks, a river, a storm drain, a road, houses, trees and plants into their clay terrain.

The low end of the tray represents a large body of water, such as the bay or the ocean. The Residents add pollutants to the landmass built by developers by adding few drops of food coloring to symbolize fertilizer, bits of paper to symbolize litter, chocolate sprinkles to symbolize pet waste, oil or soy sauce to symbolize motor oil dumped or leaked from automobiles and coffee grounds to represent loose sediment and topsoil which contribute to turbidity.

All students then make predictions about what will happen when the model terrain is rained upon. After predictions are recorded, the Rainmaker group uses the watering can to make it rain. Students observe where their pollutants went and compare what happened to the model when it rained to their predictions. Pour dirty water into a clear container so students can see just how polluted the rainwater became.

BACKGROUND

Salt marshes help protect our estuaries from the impacts of nature and humans. The special grasses that grow in the marsh can tolerate flooding from salt water. These plants are effective storm buffers because they dissipate wave energy and soak up tidal surges. Salt marsh plants are also a defensive against the erosive power of tides because they have deep roots that hold soil in place. Salt marshes plants and mud also hold and trap pollutants and excess sediment, which helps to improve water quality. When we develop an area along a waterway, effluents such as fertilizers, sewage, and storm drain runoff all enter the water. Left untreated or free-floating in the water, high levels of these nutrients cause eutrophication which causes an initial explosion of algal growth followed by decline in plant life and dissolved oxygen. Plants from the salt marsh help to handle pollutants in several ways. Marshes can take up and filter the pollutants while others settle into the soil strata and are chemically reduced over time. More are processed by bacterial action. When salt marshes are filled or lost, pollutants they could have rendered harmless remain in the water, free to move all over the water system and into the ocean. In addition to the great buffer zone and filtering capacity, the salt marsh is capable of absorbing and holding large quantities of water for use by wildlife in times of drought.

VOCABULARY

Effluents - waste material discharged into the environment.

Estuary - a place where salt water and fresh water meet and mix.

Eutrophication - the process by which a body of water becomes rich in dissolved nutrients either naturally or by pollution.

Turbidity - Thickness or opaqueness made by stirring up of sediment.

EXTENSIONS

Add a salt marsh to the pan by putting damp sponges across the open edge of the clay terrain. Repeat the demonstration. Before rain event, record student predictions about how this demonstration will be different than the first round without the sponges (salt marsh). To demonstrate the ability of a salt marsh to absorb excess water and prevent flooding, use the same, pre-measured amount of water for your "rainstorm" each time (with and without sponges in place). Record predictions and re-measure "polluted" water after each round. Observe changes (less water, less pollution with salt marsh in place).
SAL T MARSH IN A PAN-House Template
Note

A Wetland Metaphor Activity was also used however an example could not be provided.

Program References

Albemarle-Pamlico Environmental Education Activity Kit

EPA – www.epa.gov

EPA Surf Your Watershed


New Jersey Marine Sciences Consortium

North Carolina Department of Natural Resources – Coastal Management Division

North Carolina’s Coastal Habitat Protection Plan


Wetland Losses in the United States: Scope, Causes, Impacts, and Future Prospects

Appendix 6: Barrier Island Ecology Program Outline

**Barrier Island Ecology**

**Goal:** To increase public awareness of barrier island ecology and the benefit of this ecosystem, with a focus on Pea Island National Wildlife Refuge

**Objectives:**

Audience members will be able to:

- Define a barrier island
- Identify at least one value of barrier islands
- Explain coastal dune formation once participating in activity
  - illustrating dune formation
- Identify at least one common dune plant and a plant adaptation
- Name at least one value and one threat of dune systems
- Identify one reason how Pea Island NWR benefits from coastal dunes

**Location:** Beach across from Visitor Center

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1. Introduction to Pea Island
   a. USFWS refuge system history
      i. Pelican Island – 1903 by Teddy Roosevelt
      ii. Mission of refuge system
         1. To conserve and protect wildlife habitat and the species that use this habitat
   b. PI founded in 1937
   c. General facts
      i. Named after Beach pea plant – source of food for migratory birds
      ii. Located on a barrier island
iii. Refuge is 12 miles long
iv. ~2 miles wide at widest point
v. man-made to be natural – water levels in ponds are regulated

II. Barrier Island
a. Definition
i. Narrow island that protects the mainland from ocean activity
ii. Basically a large coastal sand dune

b. Orientation
i. East/west direction is most stable (e.g. Buxton area)
ii. Parallel to dominant wind direction = poor dune ridge and vegetation development, less sand is transported from beaches to dunes = low, narrow island experience frequent washovers. (e.g. N/S islands of Currituck Banks, Hatteras Island)

c. Value
i. Protection of mainland from ocean activity/weather
ii. Protection of estuarine resources

d. Weakness
i. Unstable due to overwash, erosion, and sand movement

III. Coastal Dunes
a. Formation
i. Sand blows into vegetated areas on beach where it is held onto and eventually piles up into a dune
ii. Dunes can range from small hills to being 50 feet high

b. Movement of sand
i. Waves stir up sand, sand washes into ocean reducing energy of waves
ii. Sand suspended in water is deposited onto beach when water runs up the beach and is soaked into sand
   1. causes beach to heighten/steeple and become wider
iii. Large waves
1. Less water soaks into beach
2. Erodes sand into water = narrow beach, sand settles off shore to form a sand bar
   a. Sand bar builds up, waves break farther from beach
   b. Beach becomes less steep
iv. Erosion and deposition of sand creates a balance
   c. Dune plants
      i. Factors affecting plants
         1. Salt spray
            a. Most limiting factor of adaptability
            b. Waves crash, wind blows droplets inland, water evaporates, salt crystals drift to ground
            c. Inhibits growth
               i. Plants nearest ocean act as a shield
            d. Major source of nutrients – K, Na., Ca, Mg
2. Wind
   a. Transports salt
   b. Damage plants
      i. Sandblasting, uprooting, burying
   c. Hurricane can shred leaves, expose roots, destroy plant tissue
3. Temperature
   a. Plants are adapted to high temperatures
   b. Found that the bare beach surface of N. Carolina beaches were ~49° F higher than air temperature
4. Soil
   a. Low in nutrients, nitrogen
   b. Very permeable, becomes dry fast
   c. Little resistance to roots
5. Distance from ocean
   a. Closer to ocean more tolerable to wind and salt spray
b. Farther away less tolerable to ocean

6. Tides, waves

ii. Vegetation zones

1. Influenced by
   a. Width, stability of barrier island
   b. Soil salinity

2. Zonation
   a. Ocean beach
      i. Wave and tidal action
      ii. Plant establishment difficult
   b. Frontal dune zone
      i. Grasses – sea oats, beach grass
      ii. Sand accumulates above high tide
   c. Dune swales – depression between dune lines
   d. Back dune
      i. Trees, shrubs, vines, grasses
      ii. Sand accumulates above high tide
   e. Shrub thickets
      i. Minimal ocean exposure
      ii. Fresh water available – wax myrtles
      iii. Exposed branches killed – shrubs are stunted
   f. Maritime forest
      i. Farthest from ocean
      ii. Pines, hardwoods (live oak, loblolly pine, cedar)
      iii. Example is Nags Head Woods
   g. Salt marsh
      i. Along sounds between high and low tide line

iii. Types of plants
   1. Salt marsh cordgrass
   2. Sea oats
   3. Seashore paspalum
4. Beach bean (Beach pea plant)
5. Blanket flower (Indian blanket)
6. Pennywort
7. Live oak
8. Seagrape
9. Wax myrtle
10. Prickly pear cactus
11. Sea lavender
12. Beach morning glory

iv. Plant adaptations (plants are xerophytes)
1. Waxy, leathery leaves
   a. Resist salt damage
   b. Retain moisture
2. Hairy of leaves
   a. Trap/retain moisture
   b. Resist salt spray
3. Inrolled leaves
4. Vertical leaf positioning
5. Leaves flattened against sand
   a. Withstand high winds
   b. Trap sand
6. Flexible stems and blades
7. Succulent stems
8. Climbing growth
9. Rhizome system
10. Leaf stomata
11. Salt spray-provides nutrients
12. Nitrogen fixing bacteria

v. Value of Dunes
1. Estuarine resources
2. Receive main impact of ocean energy
3. Recreation/aesthetic
4. Habitat source
vi. Threats to dune ecosystem
   1. Development
      a. Reduces natural protection
      b. Frontal dunes are destroyed, vegetation vulnerable to salt spray
      c. Artificial means of beach stabilization
         i. Bulldozed dunes
         ii. Sea walls/jetties – greater loss of water
         iii. Replenishment of sand less likely to occur
    vii. Minimizing impact on dune ecosystem
        1. Access walkways
           a. Minimizes destruction to vegetation
        2. Sand traps
           a. Fences – reduces wind and travel of sand
    viii. Barrier ecology and Pea Island
       1. Pea Island (Hatteras Island) is a barrier island
       2. The dunes protect the refuge from wind, ocean overwash, tidal energy
       3. Salt spray provides nutrients to vegetation
       4. Dunes provide habitats for plovers, terns, gulls
       5. Dunes protect salt marshes from overwash, which can increase sedimentation to the marsh

References

*These books are available at the Pea Island Headquarters library*

Plants for Coastal Dunes of the Gulf and South Atlantic Coasts
A Guide to Ocean Dune Plants Common to North Carolina
Appendix 7: Float Plan for Pea Island and Alligator River National Wildlife Refuge Canoe Tours (adapted example)

FLOAT PLAN
Pea Island NWR
Alligator River NWR
(circle one)

Date: __________________________

Trip Leader: ______________________________________

Radio Call Number: ____________ Cell Phone Number:________________________

Starting Location: _________________________________ Time:________________

Destination: ______________________________________

Number of: canoes _______ adults (12+years) _______ children (under 12yrs.)_______

Expect to return by: ___________________

Emergency Action Plan Time: _________________________

Notes:

___________________________________

Trip Leader Signature
Appendix 8: Wings Over Water Logo Design (draft)
Appendix 9: Wings Over Water Press Releases

Dare County Arts Council

It’s that time of year again for the Wings Over Water festival! Each year the festival celebrates the Outer Banks’ abundance of wildlife and provides opportunities of exploring its natural environment. This year the 7th annual Wings Over Water festival will take place October 14th through October 19th and is delighted to be partnered with the Dare County Arts Council (DCAC) and the Beach Book.

The Dare County Arts Council supports the art work of local artists by sponsoring rotating art exhibitions throughout the year in the Sea and Sound Gallery. The Council’s community involvement extends this year into the Wings Over Water festival where they are taking part in the community effort of promoting awareness of the local natural environment through art expression. As Peggy Saporito, a DCAC representative, explained, “Nature is a gift to the world. Art is a recreation of this gift thru self-expression.” The DCAC and the Beach Book hold a yearly Beach Book cover competition where art expression is recognized. This year the theme is “A Celebration of Outer Banks Wildlife and Wildlands.” The winning piece of art is put on the front cover of over 55,000 editions of the 2004 Beach Book directory, and approximately 300 limited edition prints will be available. All art work is accepted as long as the theme is followed. Entered art work will be on display at the Sea and Sound Gallery, located at 104 Sir Walter Raleigh Street in Manteo, during the Wings Over Water festival. An application explaining guidelines is available at the Sea and Sound Gallery. Entries will be accepted Monday, October 6, Tuesday, October 7, and Wednesday, October 8 from 10am to 7pm at the Gallery and will be hung in the Gallery on October 8. The opening reception for the exhibition will be on Monday, October 13 from 4pm to 6pm. The exhibit will be open for viewing during regular business hours Monday thru Friday 10am to 7pm and Saturday and Sunday 12pm to 4pm. For more information regarding the Beach Book cover competition contact Peggy Saporito at (252) 449-8389.

The Wings Over Water festival is sponsored by the U.S. Fish and Wildlife Service, the National Park Service, the Coastal Wildlife Refuge Society, the Outer Banks Chamber of Commerce, and the Carolina Bird Club. The festival is also partnered with local area businesses and
organizations. For further festival information or to request a registration booklet contact the Outer Banks Chamber of Commerce at (252) 441-8144. You also can visit the Wings Over Water website at www.wingsoverwater.org.

**Discounted Programs for Locals**
Local residents, this one’s for you! The 7th annual Wings Over Water festival is offering a selection of discounted programs to local Outer Banks residents at this year’s festival. The Wings Over Water festival, to be held October 14th thru the 19th, is a great opportunity to explore nature and to participate in outdoor activities within the local environment. The available discounted programs include:

- Salt Marsh Safari
- Introduction to Archery
- North Pond Birding
- Pea Island Canoe Tour

If you are interested in registering or would like more information contact the Chamber of Commerce at (252) 441-8144 or visit www.wingsoverwater.org. These programs are offered on a first come, first serve basis.

Wings Over Water is organized by the collaborated efforts of the U.S. Fish and Wildlife Service, the National Park Service, the Outer Banks Chamber of Commerce, the Coastal Wildlife Refuge Society, and the Carolina Bird Club. These sponsors have also received support from a number of local organizations and businesses.

**Trip Leader’s Choice**
Ready for an adventure!? If you love being outdoors and enjoy paddling this one’s for you! For the first time the Wings Over Water festival, to be held October 14 through the 19, is offering a “Leader’s Choice” paddling trip. Each trip is chosen by the local guide who will decide the route based on the local weather conditions of the day. The weather decides the trip, and you won’t know where you are going until the evening before! You could end up in a cypress swamp, a maritime forest, a marsh or even a river. If you have your own boat and would like to learn how
you can take part in this adventure, contact the Outer Banks Chamber of Commerce (252) 441-8144. You can also visit www.wingsoverwater.org.

The Wings Over Water festival strives to increase community awareness of the local wildlife resources in the area and the importance of conserving this region. The event is organized by the collaborated efforts of the U.S. Fish and Wildlife Service, the National Park Service, the Outer Banks Chamber of Commerce, the Coastal Wildlife Refuge Society, and the Carolina Bird Club. These sponsors have also received support from a number of local organizations and businesses. If you would like more information or to obtain a registration booklet, contact the Outer Banks Chamber of Commerce (252) 441-8144. You can also visit www.wingsoverwater.org.

Owl Prowl
What goes ‘hoot’in the night? Come experience the mysteries of owls at the Alligator River National Wildlife Refuge during the Wings Over Water festival, October 14th through the 19th. During this evening excursion you may come across various owl species including the short-eared, barred, screech, and great horned owls. You also will have the opportunity to experience first-hand owl behavior and obtain a better understanding of this night-time species.

The Wings Over Water festival strives to increase community awareness of the local wildlife resources in the area and the importance of conserving this region. The event is organized by the collaborated efforts of the U.S. Fish and Wildlife Service, the National Park Service, the Outer Banks Chamber of Commerce, the Coastal Wildlife Refuge Society, and the Carolina Bird Club. These sponsors have also received support from a number of local organizations and businesses. If you would like more information or to obtain a registration booklet, contact the Outer Banks Chamber of Commerce (252) 441-8144. You can also visit www.wingsoverwater.org.