REVIEW AND APPROVALS

MATAGORDA ISLAND NATIONAL WILDLIFE REFUGE

Austwell, Texas

ANNUAL NARRATIVE REPORT

Calendar Year 1998

Refuge Manager	**Date** 3-27-99	**Geographic ARD TX/OK Ecosystems**	**Date**
Project Leader (ACTING) Aransas NWRC	**Date** 4-20-99		

Introduction

Matagorda Island National Wildlife Refuge and State Natural Area encompasses 56,668 acres on the coastal barrier island in Calhoun County, Texas. The island is approximately 38 miles long and varies between .75 and more than four miles in width. The island is located approximately six miles off the coast between Port O'Connor and Fulton, Texas. Matagorda is bounded on the southeast by the Gulf of Mexico and on the northwest by Mesquite, San Antonio, and Espiritu Santo Bays. Natural passes separate Matagorda from San Jose Island to the southwest and Matagorda Peninsula to the northeast.

Matagorda Island is an actively accreting barrier island. Offshore currents carry sand from river deltas to the Island's beach. Physiographic zones are oriented parallel to the Gulf edge across the island; swash zone and beach, stabilized dunes, barrier flats, and tidal flats. Wildlife numbers are often impressive, particularly migratory birds; however diversity is much less than on the mainland. Graminae species are dominant from the dunes to the upper edges of tidal flats. Climatic influences, including winds, storms, rainfall and tidal changes create a dynamic island and refuge.

The northern end of the Island (19,000 acres) was transferred to the Service in 1971 from the Department of Defense. The Service managed the area until 1982 when management authority was transferred to Texas Parks and Wildlife Department. The Service purchased the south end of the Island (11,502 acres) through the Texas Nature Conservancy from the Wynne Family in 1987 and 1988. In addition to Service lands, the State of Texas owns approximately 26,166 acres of marsh and beach on the Island. In 1990 a Comprehensive Management Plan was prepared by the Service, Texas Parks and Wildlife Department and Texas General Land Office. The plan, along with a memorandum of agreement between these agencies, brings the island under a unified management strategy and provides for a new name: Matagorda Island National Wildlife Refuge and State Natural Area. In November 1994 the plan was signed by the Governor of Texas. The U.S. Congress has not ratified the agreement and plan. Even without the formal agreement signed, all agencies involved in the island have continued to cooperate and let the goals and strategies outlined in the plan guide operations.

Six management goals have been established for the island.

- Protect, conserve, and enhance the population and habitats of endangered and threatened species,
- Fulfill international treaty obligations, especially migratory birds.
- Preserve the components of a coastal barrier island ecosystem and encourage natural diversity of wildlife species.
- Provide biological, archeological, and other appropriate research opportunities.
- Provide interpretive and environmental education activities for visiting public so they can better understand the coastal barrier island ecology and their role in the environment.
- Provide high quality, safe, wholesome, and enjoyable recreational experiences for increasing visitation.

INTRODUCTION

TABLE OF CONTENTS

F. HABITAT MANAGEMENT (cont.)

G. WILDLIFE

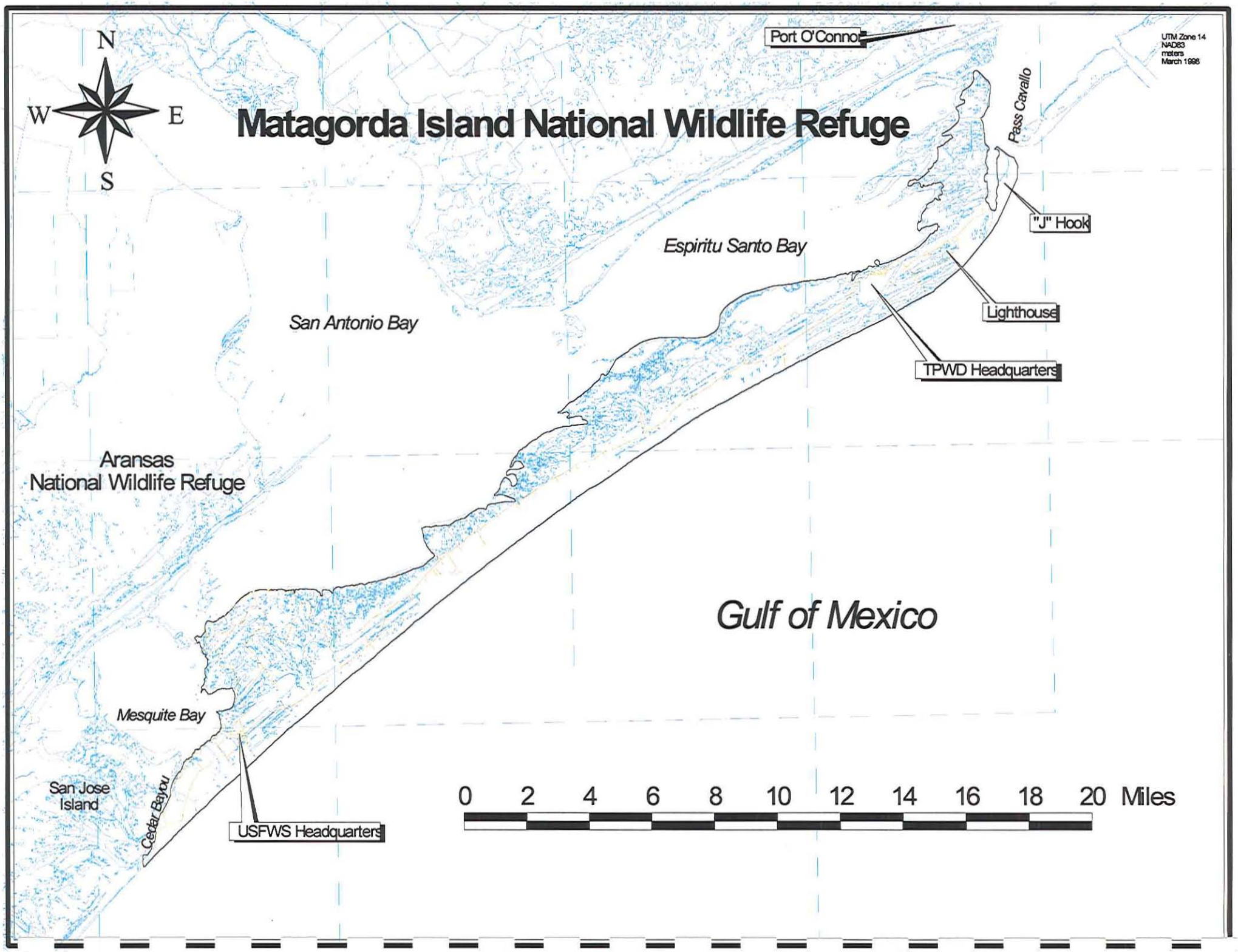
H. PUBLIC USE

H. PUBLIC USE (cont.)

I. EQUIPMENT AND FACILITIES

J. OTHER ITEMS

K. FEEDBACK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Matagorda Island National Wildlife Refuge
UTM Zone 14
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Port O'Connor
Pass Cavallo
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Lighthouse
San Antonio Bay
TPWD Headquarters
Aransas
National Wildlife Refuge
Gulf of Mexico
Mesquite Bay
San Jose
Island
Cedar Bayou
USFWS Headquarters
0 2 4 6 8 10 12 14 16 18 20 Miles

A. HIGHLIGHTS

The 1998 Coastal Weather Report:
Drought, Tropical Storms and Floods
Section B

APLOMADO FALCONS ARE RELEASED ON THE ISLAND FOR THE THIRD YEAR
Section G

Refuge Biologist, Felipe Prieto, Returns to the Island after Completing his Master Thesis titled: "Selenium and Water Quality in Three Wetland Types along the Lower Colorado River - Imperial NWR, AZ"
Section E

Disaster Funding Request for Nearly 1 Million Following Tropical Storms Charlie and Frances
Section I

Oil and Gas Development Drills Short of Expectations
Section J

The Enron Environmental Education Center Continues to Provide a Unique, "Hands On" Educational Experience for Students
Section H

B. CLIMATIC CONDITIONS

Matagorda Island is subtropical with mild winters and long, hot, humid summers. Climatic influences include not only direct rainfall and temperature but also tidal changes both over time and those enhanced by storms. Unfortunately long-term climate data for the island does not exist as a comparison for this year. Because of the length of the island (38 miles) and varying width (1-5 miles), precipitation on the island varies greatly. Island winds and precipitation are influenced by the surrounding Gulf and Bay waters. Temperature differences between the water and mainland create local weather patterns that cross the Island. Based on limited Island data and adjacent areas, average annual precipitation is approximately 38 inches and the average temperature 70°.

Total rainfall for 1998 was 41.81 inches. Although this is near average, there was a drought period and a flood period during the year. Figure 1. shows average temperatures and monthly rainfall on the Island during 1998. The year started with mild temperatures and typical heavy fog. Temperatures fluctuated from a low of 42° to a high of 74° with an average of 61°. A total of 5.34 inches of rain fell. February was a carbon copy of January. Temperatures continued above average as only one cool front affected our weather. Temperatures ranged from 44° to 74 degrees with a total of 4.03 inches of rainfall recorded. March produced more variety in the weather, as three strong cool fronts moved through. A total of 1.01 inches of rainfall was recorded, but none fell after mid-month.

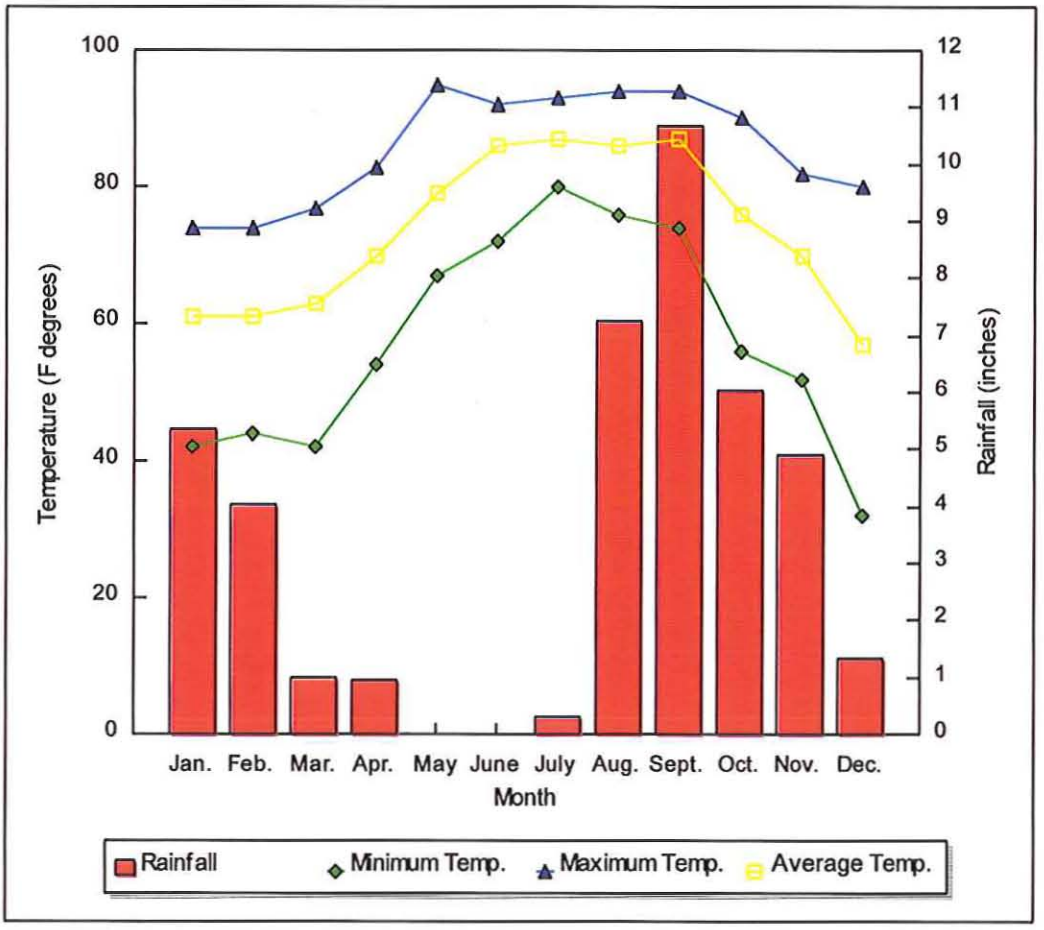
For the next three months rainfall was recorded on only one day; April 18, with .95 inches recorded. The uplands, which had held water since October, dried up, and, by the end of May, fresh water was available only in the more identifiable "ponds" and dugouts. Temperatures rose in April with an average temperature of 70° but ranged from 54° to 83°. A late cool front on April 28 held up migrating songbirds and a large fallout occurred. May continued to warm up and daily highs were all above 80°. A record high for the month of 95° was recorded on May 9. A low over the southeast U.S. brought warm winds from Mexico. Along with the warm winds came smoke from wild fires in Mexico. June temperatures averaged 86°. A cool front on June 6 brought lower 70's temperatures as a welcome change to the 80+ temperatures the remainder of the month. The lack of rainfall had one up side and that was the lack of mosquitos.

The drought situation continued until after mid August when tropical storms began influencing our weather. A high temperature of 95° for the year was recorded on July 7 (also recorded in May). This wasn't that bad when you consider the mainland recorded temperatures of 106°. A total of .32 inches of rainfall was recorded during July. By the end of the month many of the dugouts were reduced to puddles. An over flight the first week of August was done to GPS all remaining fresh water on the Island. See section F for additional details.

Tropical Storm Charlie blew across Matagorda Island about 1:30 am on August 22. Winds

gusted up to 50 mph and a small twister traveled across the east side of the compound. The center of the storm came ashore just south of Matagorda, near Port Aransas. Shingles from the lodge were blown off, the wind mill was pushed into a leaning position, and the trailer house was completely turned over. Other damage included the loss of the back door on the hangar and an additional panel torn loose, a john boat and motor were completely turned over on the runway. The Aransas work boat partially sank on the mainland. All in all, we didn't fare that badly, what was important was fixable.

Figure 1. Temperature and Rainfall Data for Matagorda Island, 1998



A total of 7.24 inches of rain fell during August, with the majority of this associated with the tropical storm. Temperatures were moderate with an average high of 91° and a low of 80°. Tropical Storm Frances arrived on September 11. Although the storm tracked similar to Charlie, the effects were very different. Winds were light as the storm approached the mainland, but the tides rose. The drilling crew on the north end of the Island evacuated on September 10. The road above Panther Point and the road to the boat house were under water. The storm tracked north of the Island and came ashore near Palacios, Texas. Once

ashore, strong west winds created problems along the bay side of the Island. Bulkheads and culverts were ripped apart and levees were eroded. Frances caused considerable more damage to real property and access.

A total of 10.67 inches of rain fell during September, with 5.37 inches recorded on September 16. By the end of the month, the Island climate became miserable. Days and nights were stagnant as very little wind blew. The mosquitos were horrendous and humidities remained above 80% throughout the day and nights.

With Tropical Storm Frances just off-shore, the runways made good loafing areas as tides rose and waves slammed into the dunes. WM 9/98

October brought relief as the first cool front delivered north winds on October 5 and dropped the temperature to 56°. October continued wet, with over 6 inches of rainfall recorded. Although the Island wasn't impacted, heavy rains inland caused considerable flooding on area rivers. Roads were closed for days, and personnel were unable to get to work from Port O'Connor. The bay and marsh salinities decreased as flood waters flowed into the bays. By months end, salinities in Stilt Flats was 14 ppt which compares to average salinities of 32 ppt. A total of 6.02 inches of rainfall was recorded during the month.

Several cold fronts during November dropped air and water temperatures, although several 80°+ days were recorded. The average temperature was 70° and 4.89 inches of rain fell. A

single frost during the only major cold front of the year occurred on December 26. This was not enough to kill vegetation, and we ended the year with comfortable 68° days. A total of 1.34 inches of rain fell.

High tides and waves (the boat house is set at 4' above mean high tide) caused considerable damage during TS Frances. WM 9/98

C. LAND ACQUISITION

1. Fee Title

The Matagorda Island Light Reservation consisting of 15.29 acres was put up for excess via GSA by the U.S. Coast Guard (USCG) on November 6, 1998. This is a federal "inholding" on the refuge, and has had refuge management overlay since the establishment of the refuge in 1971. The USCG decommissioned the light in 1996. Effort was made by the USCG to lease the lighthouse to Calhoun County for its maintenance and operation and use for historical interpretation and tourism. However, after working for over a year on a lease agreement acceptable to the USCG, TPWD, USFWS, and the County, interest lagged in 1998. This may have led to the excessing of the property by the USCG as a means to limit liability, especially the O&M costs.

The Refuge recommended acquisition of the lighthouse property. The 15.29 acres are found in three parcels at the north end of the island: 10 acres around the current lighthouse location; 5 acres at the former lighthouse location; and .29 acres at the former lifesaving station. It is the land that is of primary interest to the Refuge, acquisition of the lighthouse structure is incidental. However, it is hoped that interest in the operation and maintenance of the lighthouse can be revived in the County and a support or friends-type group established to enable its upkeep and historic interpretation. The refuge is waiting for Region response and support for acquisition.

D. PLANNING

4. Compliance with Environmental Resource Mandates

The refuge continued the cleanup work begun in 1997. The remaining debris, consisting primarily of metal, was hauled off in April and May. In April, debris was loaded into trucks, hauled to the north end, and unloaded into two 40-yard roll-off containers on the barge. A total of 70 cubic yards of debris was removed in this manner. Only debris light enough to be handled by hand could be removed. The remaining debris, which consisted of larger, heavier pieces of scrap metal, was loaded onto trailers and hauled off the Island to a recycler in May.

Three propane tanks and an above ground fuel tank were hauled off and transferred to Texas Federal Surplus Property in San Antonio. A contract to clean the five remaining above ground fuel tanks, dispose of sludge and fuel, and remove pressurized cylinders in the staging area was awarded in December. Work is scheduled for February 1999.

Debris from the ranch and Refuge and rehabilitation of buildings awaiting disposal at the staging area. JS 3/98

A meeting was held March 8, in Austin, Texas, to further a cooperative agreement between the Texas Natural Resource Commission (TNRCC), Texas General Land Office (GLO), and

USCG to facilitate scheduled and emergency barrel clean-up on the beaches of barrier Islands. The agreement as of yet had not been signed.

An emergency barrel clean-up was initiated by TNRCC on June 16, following the appearance of numerous drums on Matagorda Peninsula, Matagorda Island, and San Jose Island. Drums on Matagorda Island were located with GPS coordinates by Jimmy Hawkins and information provided to TNRCC (see figure 2). Of the 57 drums with contents picked up during the clean-up, 24 drums came off the Matagorda Island beach. Eight of the 57 barrels contained hazardous materials, two contained seawater and the rest contained hydrocarbons. An additional 13 empty drums were picked up by the contractor from Matagorda Island. The Service is reviewing the billing on the empty barrels.

5. Research and investigations

In 1998, two doctoral graduate students at Texas A&M University-Kingsville each continued their second year of field work on Matagorda Island, and a third master's student was writing up his results.

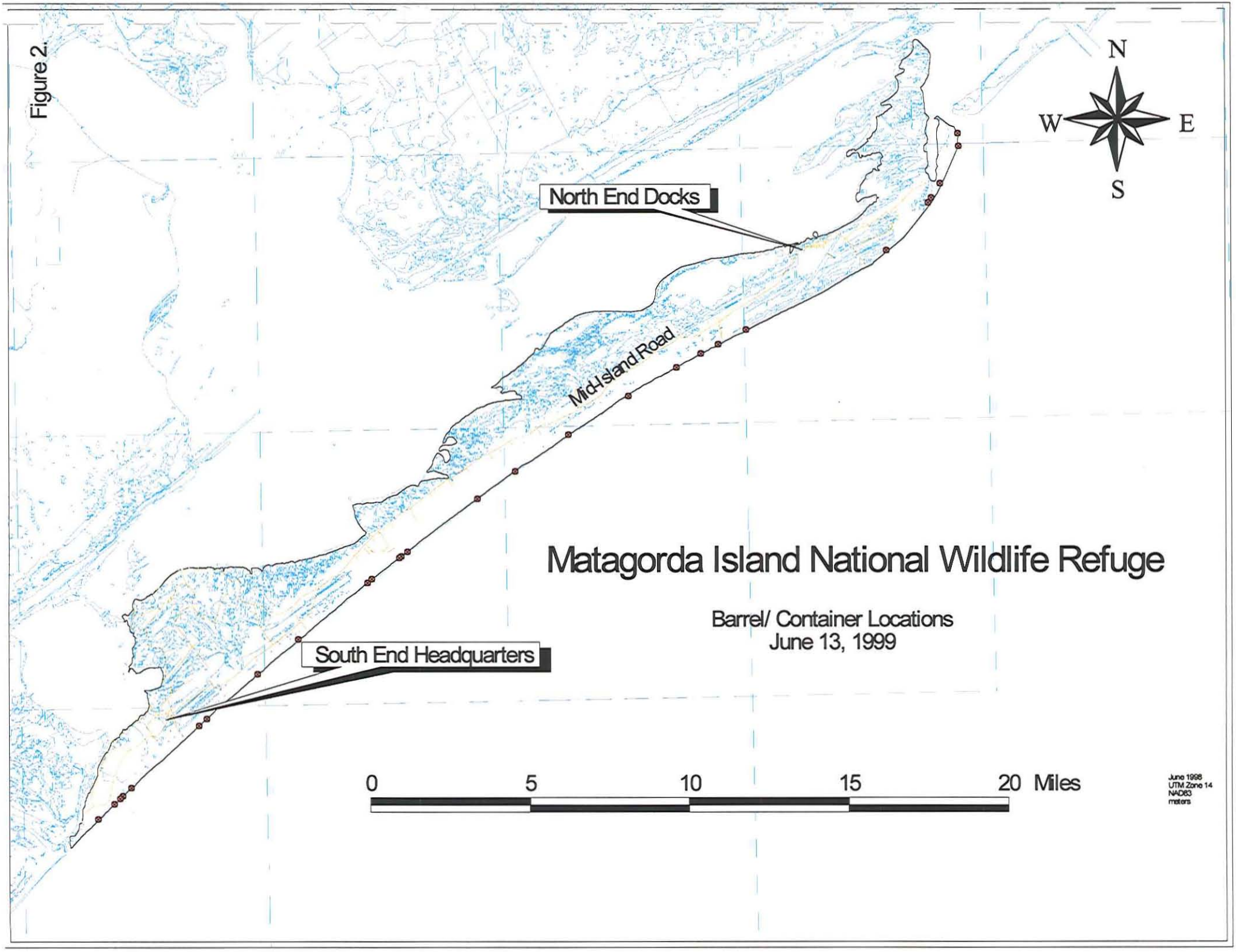
- Dawn Sherry is studying the foraging ecology of wintering wading birds along the Gulf coast. She is examining patterns of habitat and food resource partitioning and investigating the influence of mixed-species foraging aggregations on behavior and foraging success. Dawn visits the island monthly from October-March. She spends her time afield observing and video taping the birds and taking fish samples to correlate bird foraging behavior with prey type, size, and availability. She is doing comparable work at two other sites: Laguna Atascosa NWR and the Los Ebanos ranch in Tamaulipas, Mexico.

- Dan Kim is doing a comparative study of the relationships among wintering raptors on Matagorda Island and the King Ranch. On the island, he has focused his attention on interspecific interactions between these birds (including loggerhead shrikes) on a series of plots provided with artificial perch sites. Dan is also studying site fidelity by following banded individuals. He visits the island bi-monthly from September-April.

On 28-30 January, Dr. Geoffrey L. Holroyd, research scientist with the Canadian Wildlife Service, visited the island with a student assistant. They were looking for burrowing owls, especially birds they had banded in Canada. After two long nights of searching by spotlight and two days of tramping the dunes looking for burrows, they saw three owls (none banded) and found several active burrows (recognized by regurgitation pellets at the entrance). Although there is no clear indication of where our birds come from, apparently Matagorda is a routine stopping-off place for at least a few wintering burrowing owls.

In July & August, the Peregrine Fund released 18 northern aplomado falcon chicks on Matagorda Island in the third year of a captive release program designed to reintroduce the species to its native Texas habitat. More details are given in the Wildlife section.

Figure 2.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North End Docks
Mid-Island Road
South End Headquarters
Matagorda Island National Wildlife Refuge
Barrel/ Container Locations
June 13, 1999
0
5
10
15
20 Miles
June 1998
UTM Zone 14
NAD83
meters

WM Coppock assisting Dan Kim with banding a young caracara. JS 3/99

Our Refuge staff was engaged in several research projects during the year.

- On 14-15 May, Jennifer Sanchez conducted our annual breeding bird survey. The survey was conducted a week later than the 1997 survey. This appears to be an ideal timing. Comparisons between burned and unburned plots were not done because only seven points were located on burned areas. Several species, including bobwhite quail, that had suffered from the 1996/1997 drought were able to rebound during the year. Additional information can be found in Section G.

- On 18-22 May, eight members of the Aransas/Matagorda staff helped conduct the local Colonial Waterbird Count by surveying traditional rookeries on bay shores and oyster shell islets from San Antonio Bay through upper Aransas Bay. A grand total of 4,649 estimated breeding pairs of 19 species was tallied. This compares with an estimated 3,577 pairs of 16 species last year. Although only a few nests were involved, this year we added little blue heron, cattle egret, yellow-crowned night-heron, and white ibis to the list of nesting species; and we dropped one species recorded last year—American oystercatcher. The rookery on the Second Chain of Islands was the most active site; 15 of the 19 species and 40% of the estimated breeding pairs were seen there. Last year's top spot—Long Reef/Deadman's Island—came in a distant second. It is not unusual for

favored rookery sites to shift from year to year. The three most common kinds of nesting birds were laughing gulls (25%), black skimmers (16%), and royal terns (10%). As last year, tri-colored herons were the most common nesting long-legged wader. Other significant details from these data are presented in the Wildlife section.

- Felipe Prieto is beginning a long-needed study of the feral hogs on Matagorda Island. He will try to estimate their numbers, determine their ecological impact, and recommend a management plan for these exotics.

- Felipe Prieto has resumed his periodic census of raptors on the island, which includes keeping tabs on the aplomado falcons that are still in residence.

- Doc McAlister maintains an updated annotated list of the vascular plants of Matagorda Island. This year he added six new plants to the compilation which currently encompasses 449 species belonging to 88 families, by far the most extensive plant list for any Texas barrier island. Many of these plants are represented by herbarium specimens expertly put up by a volunteer.

- Doc McAlister was forced to bring his study of ground-living invertebrates to a premature halt in September of this year. Tropical storms with their attendant heavy rains and flooding completely inundated several of the pitfall-and-drift fence sites and washed out roads making others inaccessible. So, the investigation, which was in its third year, was terminated. Although the final summary report is yet to be written, this study definitely enhanced our knowledge of the little-known invertebrate fauna resident on the island, and it suggests how invertebrate biodiversity and biomass vary among the major insular habitats. This information should be useful in our ecosystem approach to island management.

- At least once a month Doc and Martha made a bird survey along a 2-mile transect of Gulf beach and a comparable transect through the salt marsh. These data were used as a basis for writing much of Section 5 of the Wildlife portion of this narrative, and the final graph given there summarizes the results.

- Martha McAlister made a weekly survey of the entire island beach during the year. She tallied and documented stranded marine mammals and sea turtles and kept notes on brown pelican mortality. When their duties take them to the beach, the entire staff helps with this stranding-watch. Martha's data are incorporated into the Wildlife section.

- This year we tried to judge whether native/imported fire ants were numerous enough to present a potential threat to nesting birds on the oyster shell islets in Mesquite and San Antonio bays. Doc and Martha surveyed the reefs composing the Second and Third Chains in August and again in October. Conditions during August were so hot and dry that if ants were present, they were quiescent underground and could not be detected.

Although the sites had been over-washed recently by tropical storm Frances, the October survey revealed imported fire ants on Carroll Island in the Second Chain—one of the major rookery sites. Late in the month, Jennifer Sanchez treated the ant mounds with Logic.

- Doc McAlister continued to mark and release box turtles in the vicinity of HQ. This was a slow year, even by turtle standards. The first sighting was on 22 March. The animals quit moving during the hot, dry summer, and then they were inhibited by the flooding that began in August and left the island swimming for the rest of the year. Only six animals were notched, bringing the total of marked specimens around HQ to 68. Two recoveries confirmed earlier results—the turtles do not wander much, and they grow very slowly. In late April and early May, the distinctive trails of three box turtles were seen on the open Gulf beach. What were they doing there? One of these trails was followed to the turtle itself, which was found right at water line gazing out into the surf. Was he considering a launch?

- Doc began preliminary work on a project to investigate aerial plankton (small airborne creatures and seeds wafted on the coastal winds). Riding on air currents is probably an important means of dispersal for many small organisms and plant propagules. Three tall poles were erected, one on the bay side, one at mid-island, and one on the Gulf beach. Atop each pole a container filled with sea water with a few drops of detergent was exposed. This device traps wind-driven creatures which can then be collected, counted, and identified. If the technique looks promising, the traps will be activated for a standard length of time each month for a year.

- Doc contributed to the annual Monarch Watch by maintaining a daily log of butterfly sightings on the island from September-November and forwarding the data to the Texas Monarch Watch program in Austin. Last year we had very few of the butterflies passing through until 23 October. This year was a repeat, but with less impressive numbers. A major passage of monarchs again arrived on 23 October, when we recorded about 25/hour moving down the island. Thereafter, their numbers fluctuated from about 5/hour to about 3/hour on most days to the end of the recording period on 20 November. It has been several years since we had a heavy passage of monarchs with clusters roosting overnight in the palm trees at HQ.

- Doc and Martha were all geared up to participate in the Audubon CBC held on the Aransas Refuge on 29 December. However, work replacing culverts along the levee road rendered inaccessible the small portion of the island inside the designated count area. So, Matagorda Island did not get into the count this year.

E. ADMINISTRATION

1. Personnel

Matagorda Island is a satellite station of the Aransas NWR complex. The island has a six-person staff including a Manager (RM), Refuge Operations Specialist (ROS), Environmental Education Specialist (EES), Refuge Biologist (RB), Small Craft Operator (SCO), and a Maintenance Worker (MW). Except for the Environmental Education Specialist, who resides on the island, personnel travel to and from the island by boat on a daily basis.

RM Chris Pease received a promotion to GS 0485-12 effective March 29. ROS Jennifer Sanchez received a promotion to GS 0485-11 effective November 8, 1998.

Refuge Biologist Filipe Prieto returned to Matagorda Island following an extended leave, during which time he received his Master's degree from the University of Arizona.

MW Coppock, SCO Stringo, and ROS Sanchez received day-off awards for their efforts in providing a safe working environment. RM Pease, ROS Sanchez, SCO Stringo, and MW Coppock received Star awards for their accomplishments during the Year. EES McAlister was nominated for the National Wildlife Refuge Association's Employee of the Year award.

Matagorda Island Staff:

Chris S. Pease	Refuge Manager, GS 0485-12
Jennifer L. Sanchez	Refuge Operations Specialist, GS 0485-11
Wayne H. McAlister	Environmental Ed. Spec., GS 1701-09
Filipe H. Prieto	Refuge Biologist, GS 0485-09
J. David Stringo	Small Craft Operator, WG 5786-09
G. Will Coppock	Maintenance Worker, WG 4749-08

The Refuge receives support for fire and administration from Aransas NWR.

Aransas Fire Crew

Doug Broce	FMO, GS 0401-11
Carl Schmidt	Forestry Tech, GS 0462-05
Steve Jones	Range Tech, GS 0462-05
David Tysdal	Range Tech, GS 0462-05

Aransas Administrative Staff

Susie Perez	Office Assistant, GS 030-06
Sue Forbis	Office Clerk, GS 0303-04

From left to right: Jennifer Sanchez, Chris Pease, David Stringo, Will Coppock, Wayne McAlister, Filipe Prieto

2. Youth Programs

The Aransas NWR YCC crew worked on the Island for two weeks during their 8-week session. The crew of five, a youth leader, and crew leader constructed about 120 feet of boardwalk at the lighthouse. The boardwalk will eventually cut through the salt cedars between the lighthouse and lighthouse pond. The walk will provide excellent birding opportunities and environmental interpretation within the historical setting.

4. Volunteer Program

Martha McAlister continues to put in numerous hours of assistance to the refuge each year. She assists with all environmental education classes providing a second knowledgeable teacher during learning activities. She completed turtle and marine mammal stranding surveys throughout the year. She no longer maintains a record of her hours but it exceeds 1000 hours annually. Martha was nominated for the National Wildlife Refuge Associations Volunteer of the year.

Several winter resident volunteers from Aransas volunteered on Matagorda Island this year. Vern and Sherry Metzger from Wisconsin each volunteered 72 hours to the refuge. They assisted with maintenance activities.

Vern and Sherry Metzger assisting with pouring a concrete slab for the Convault. MM 12/98

Marty Cribb from Maryland volunteered 99 hours to the refuge. He assisted the maintenance staff in the rehabilitation of the north end building, installation of generators and PV/pressure pump systems, and barge runs.

John Billard from Texas donated 45 hours on the Island. John assisted with the construction of the kiosk and assisted the maintenance crew.

Kevin Ellsworth, who resides part-time in Rockport, began volunteering for the refuge in May. By the end of the year, he had a total of 320 volunteer hours. Kevin assisted with installing the

kiosk at Cedar Bayou, the spraying of Macartney rose, maintenance, and worked with YCC on the Island.

The annual Matagorda Island volunteer weekend, supported by the Texas chapter of the Sierra Club, was held on the island on December 5 and 6. Eight volunteers removed wire from 4 miles of pasture fence. This group has volunteered for the past seven years. In that time they have removed all the wire from miles and miles of fence lines on the south end of the Island.

The semi-annual beach clean-up was once again canceled in April due to rough weather. The September clean-up was postponed until October. Volunteers picked up about 30 cubic yards of debris on the north end beach.

5. Funding

Base funding allocations for 1998 were on par with previous years, only enough to cover salaries with no funding for fixed and operating costs. Initial confusion over Aransas/Matagorda Island funds resulted in the complete funding of the five Island FTE's; approximately 349K. This left about $5,000 for operations. Aransas received $274,000 in MMS and provided $60,000 for use on Matagorda Island.

Mid-year, the refuge was contacted about availability of recreational fisheries money. A proposal to rebuild the fishing pier at the north end was prepared and subsequently funded. Materials and a portable compressor were purchased with the funds. Along with partners, the pier will be constructed next year.

The refuge requested $5,000 from the TX Gulf Coast Ecosystem for a boardwalk at the lighthouse. Materials were purchased with these funds to construct about one-third of the walkway.

Matagorda Island NWR 1998 funding:

1261	Operations	$254,200
1261	C28Z Recreational Fisheries	$25,000
1262	MMS	$60,000
1124	Coastal Ecosystem Funds	$5,000
	TOTAL	$344,200

Because the 1262 MMS funding was provided from Aransas and without Regional guidance, we identified our priorities and used the funds on these projects:

- The drain field for the Pilot House was replaced for 2K.
- About .3 miles of road just north of the Wynne property line were reworked. Ditches were pulled and the roadway built up and then capped with a mixture of shell/asphalt mix off the run ways. This project cost 12K.
- Three buildings were demolished and removed at a cost of 4K.
- The engines on the gray cabin boat and the Aransas work boat each required complete tear down and rebuilding following emersion in salt water. Total cost of repairs was 9K. This was a cost savings for the Refuge because we have skilled workers that could perform this task—replacement of the engines would have been 16K.
- 110 cubic yards of debris were removed from the headquarters area at the south end. Employees loaded trucks and unloaded them into dumpsters on the barge. Cost of debris removal was 4K.
- Solar panels, batteries, water pumps, and lighting were installed at the Pilot House and in the EEC at a cost of 3K.
- Several pieces of equipment from Aransas were repaired and brought to the Island. The John Tractor cost 2K to repair. The John Deere track loader was repaired and converted to a dozer at a cost of 5K.
- Replaced equipment included the John Deere Gator at a cost of 7K and the 5-foot-wide mower at a cost of 1K.
- The remaining 11K was carried over into the next fiscal year to have a new well drilled for the headquarters.

6. Safety

Matagorda Island holds its safety meetings in conjunction with the Aransas National Wildlife Refuge. Jennifer Sanchez was the CDSO and Will Coppock joined the Safety Committee in September for a 1-year term.

A Safety Review by the Regional Safety Officer was completed on January 24, 26 & 26. The Complex received 33 Hazard Notices. All but five were corrected by the end of the year.

The most significant safety accomplishment this year was the removal of debris from the south end. See Section D for additional information.

There were no lost time accidents on the refuge this year.

7. Technical Assistance

SCO Stringo provided instruction for two Motorboat Operator Certification Courses during the year. He gave a program for five Aransas NWR Complex employees on May 19 thru 21. He gave a second course on September 22 thru 24 to employees from Laguna Atascosa NWR, Brazoria NWR, and Aransas NWR.

SCO Stringo assisted the Audubon Society in mowing and treating fire ants on Sundown Island on October 29 and 30 and November 1. EES McAlister and Martha McAlister surveyed the islands in the Second and Third chains for fire ants. ROS Sanchez and Aransas FT Carl Schmidt treated Carrol Island for fire ants on November 4.

8. Other Items

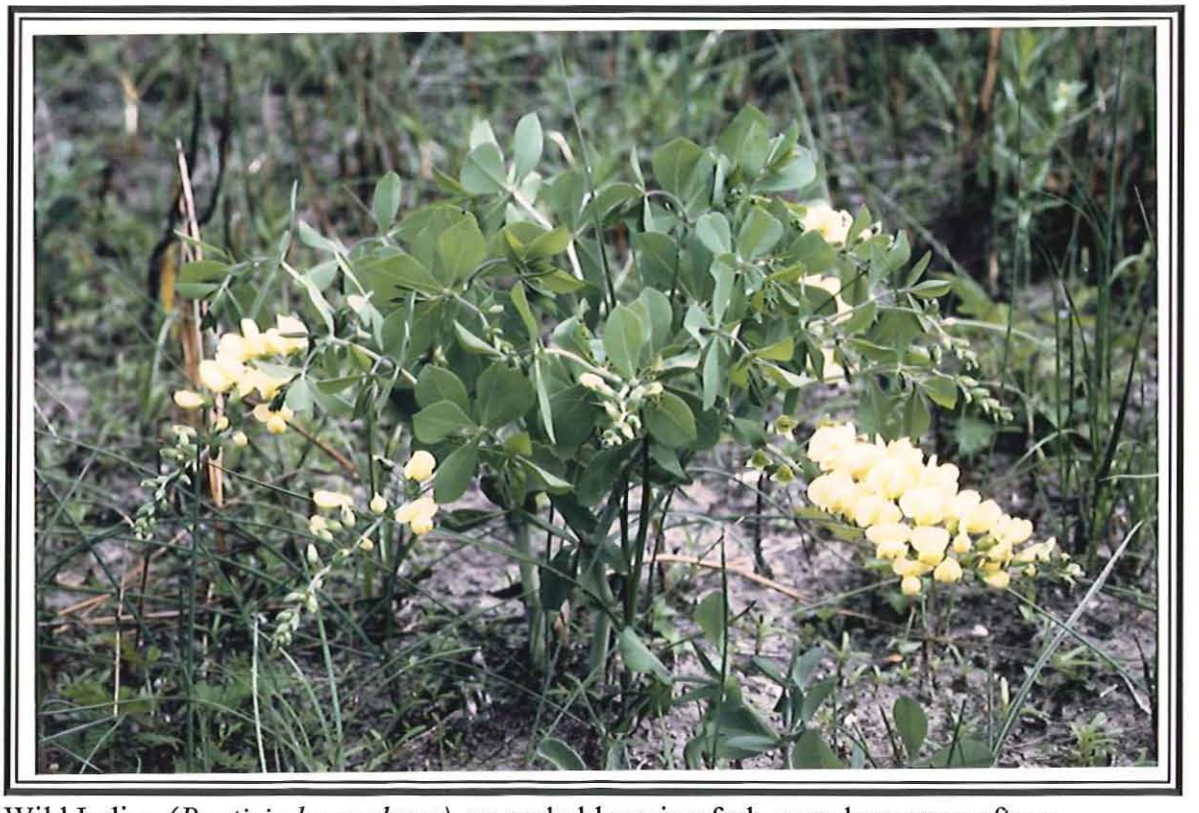
Training during the year:

Jan. 27-31	Chris attended LE In-service
Feb. 18-22	Jennifer attended LE In-service
May 11-16	David attended the Mercury/Mariner Training for Government. Agencies
June 8-12	Will attended excavator training at San Bernard
June 8-12	Chris attended IMPAC training at NCTC
Aug. 10-14	Chris attended Basic Supervisory training at Atlanta, Georgia
Aug. 20	MI staff attended the Oil Boom Deployment Training at Aransas NWR, presented by TGLO and US Coast Guard
Nov. 16-20	Chris attended "Managing Performance and Conduct" supervisory training at Okefenokee NWR, Georgia

F. HABITAT MANAGEMENT

1. General

Coastal barrier islands are relatively simple ecosystems due to their youth, as well as heavily influenced by natural processes. Tropical storms, tidal surges, lightning fires, and drought have created a mosaic of habitats on the island. These natural processes will continue to influence the island. This year's drought followed by heavy rains created several notable influences on the Island's habitat. Swales remained flooded from the October 1997 heavy rains until March. Followed by months of drought, plants were stressed during the hot summer months. Five-foot high *baccharus* plants were dying, assumedly due to a lack of moisture in the sandy soil. Vegetation in the swales remained sparse, as vegetation did not have enough time to adapt to the changing conditions.



Wild Indigo (*Baptisia leucophaea),* an early blooming forb, seen here soon after a prescribed fire. WM 4/99

Habitat management on Matagorda Island is an evolving process. The principle management concept is to maintain the Island's undisturbed natural barrier island environment, dominated by coastal prairie. Today, prescribed fire is being used as the primary management tool. Research into the effects of burning on island wildlife and habitat continues. This one topic

has been the focus of much of the research being done on the island and many questions remain unanswered. This year was the fourth year of scheduled burning in a planned 5-year rotation.

2. Wetlands

Wetlands encompass over 25% of the island. Under the Comprehensive Management Plan, the GLO-owned marshes and beach are included within the refuge as a cross easement arrangement to unify management strategies. The beach and marshes are rich habitats in terms of wildlife diversity. Vast quantities of invertebrates found in the beach or marsh mud, as well as fish nurseries, support migratory and resident wildlife.

The storm tide created by Tropical Storm Frances inundated the highest margins of the marsh. Culverts installed in 1996 on the south end of the Island worked well and allowed the marsh to maintain levels close to the bay levels. Some damage to the culverts at Shell Reef and Little Brundrette occurred because of the tides and high west winds. These were all repaired before the end of the year. Erosion of the levee occurred at both these locations, but again it was the result of heavy winds rather than pressure from differences in the water levels between the inside and outside. Two additional culverts were installed to encourage water movement within the marsh.

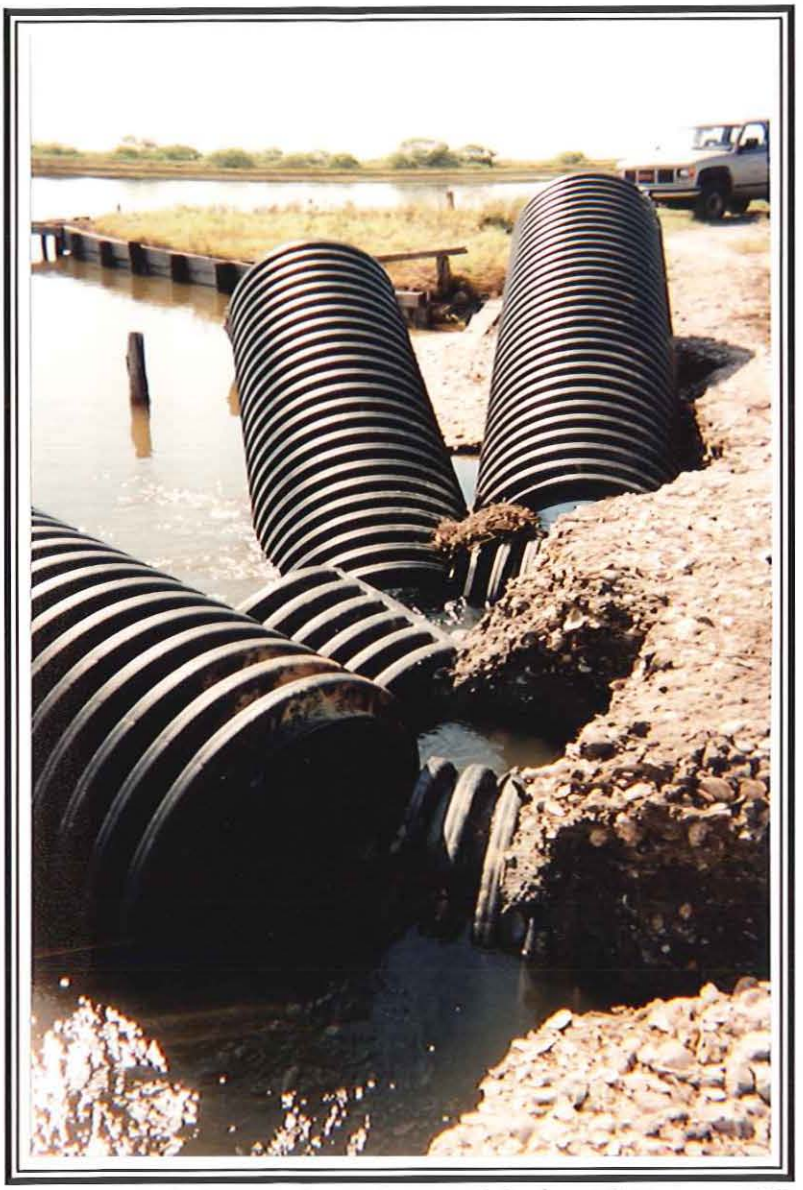
Freshwater wetlands are considered an important limiting factor for wildlife populations on Matagorda Island. Freshwater can be found seasonally in swales, dugouts, and ditches that penetrate the shallow aquifer. From several consecutive seasons (6 months at a time) of flooding, the vegetation within the swales has changed. The typical vegetation complex dominated by Gulfdune paspalum and marshhay cordgrass retreated to all but the higher ridges while American bulrush, flatsedge, spikesedge, smartweed, and even rushes have invaded the lowest areas. During the late spring and summer drought, these species died back and a nearly homogeneous community of Gulfdune paspalum has reinhabited the swales.

Concern over the amount of freshwater available for wildlife following months of drought prompted an overflight on August 4. The entire island was surveyed and all remaining surface water was identified using a PLGR. The data was then plotted using ArcView and a map produced (see figure 3). The surprise was the amount of water still present following four months of drought. The majority of water was located at the south end (primarily due to the presence of all the dugouts). If water projects are initiated, we need to look at the north end of the Island first.

5. Grasslands

The barrier flats extend from the dunes to the bay side marshes comprising the interior of the island. Predominantly Coastal Prairie grasslands, the flats are interspersed with fresh water

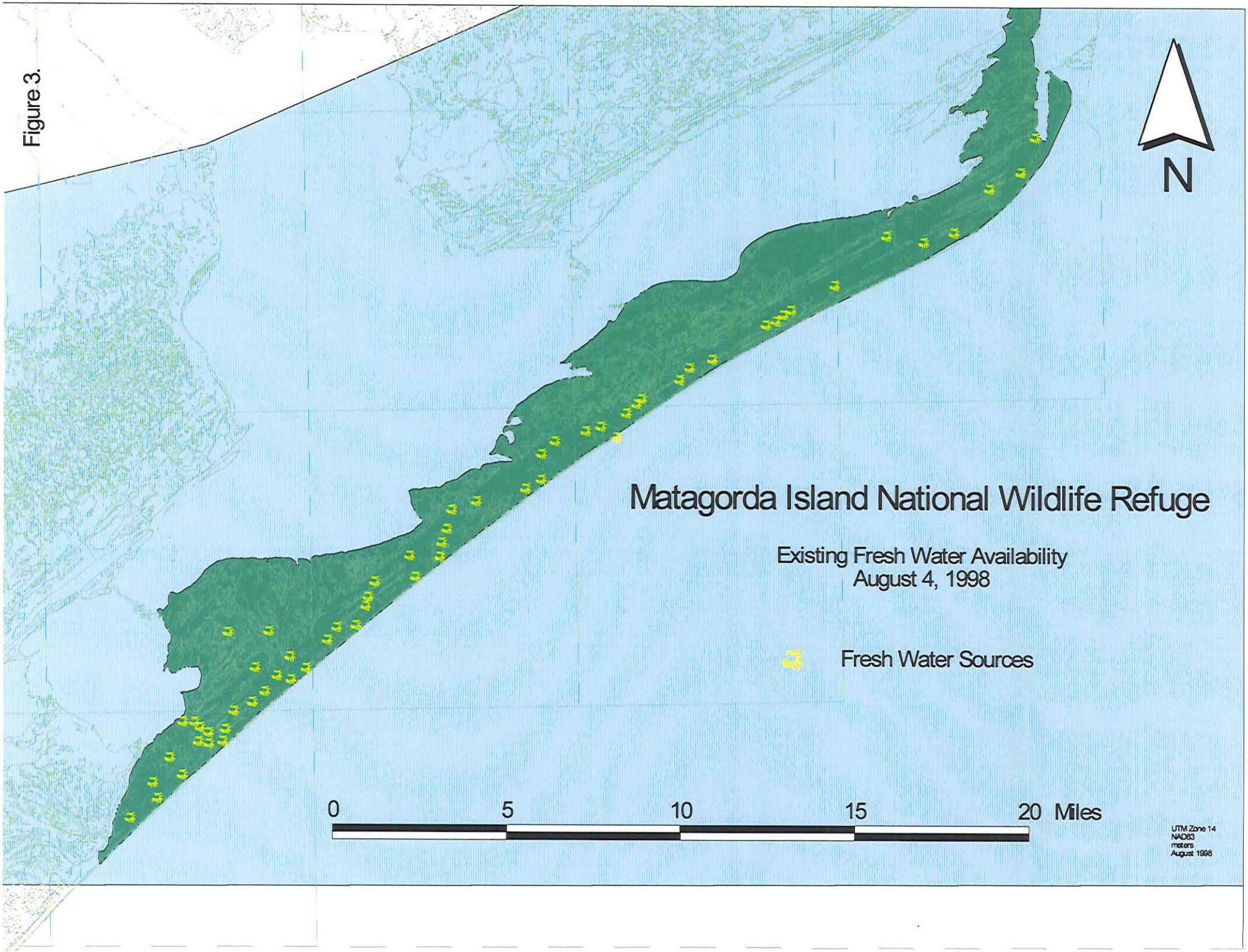
ponds. When the rains finally arrived in August and September, the swales filled up, and much of the Island was flooded with freshwater through the end of the year. Only a few washouts occurred where the dune line could not hold the pooled freshwater.



Culverts at Little Brundrette damaged during TS Frances. JS 9/98

Spot application of Grazon P+D to control Macartney rose occurred on 25 acres in April, May, and June on Burn Unit D1. This was the second year of application. Application occurs during the growing season following burning during either the previous summer or winter.

Figure 3.


N
Matagorda Island National Wildlife Refuge
Existing Fresh Water Availability
August 4, 1998
Fresh Water Sources
0
5
10
15
20 Miles
UTM Zone 14
NAD83
meters
August 1998

The primary role of burning is to remove the large amounts of litter and reduce the thigh-high tangle of southern dewberry, American snoutbean, and hoary milkpea allowing access to the rose by foot or 4-wheel ATV. Application was moderately successful in killing the plants, however it is a time consuming process. A spray boom was constructed for the small tractor. Although chemical use will increase, increased plant coverage and ability to treat more area within a given time frame should make up the difference.

One of the goals for the prescribed burning program on the Island is the reduction/maintenance of invasive woody vegetation. *Baccharus* is the primary species targeted. This native invasive plant is found on the entire Island. The thickest stands are in the center of the Island (burn zones B & C). The stands are generally targeted with late summer fires to increase the rate of kill.

9. Fire Management

The use of prescribed fire is the primary habitat management tool used on Matagorda Island. The program was initiated in 1995 following three years of study on the affects of fire on the barrier island habitat and wildlife. Past research has only indicated that there is no clear detriments nor benefits to burning. In an attempt to remain receptive to differing opinions, burning continues as a priority for research projects.

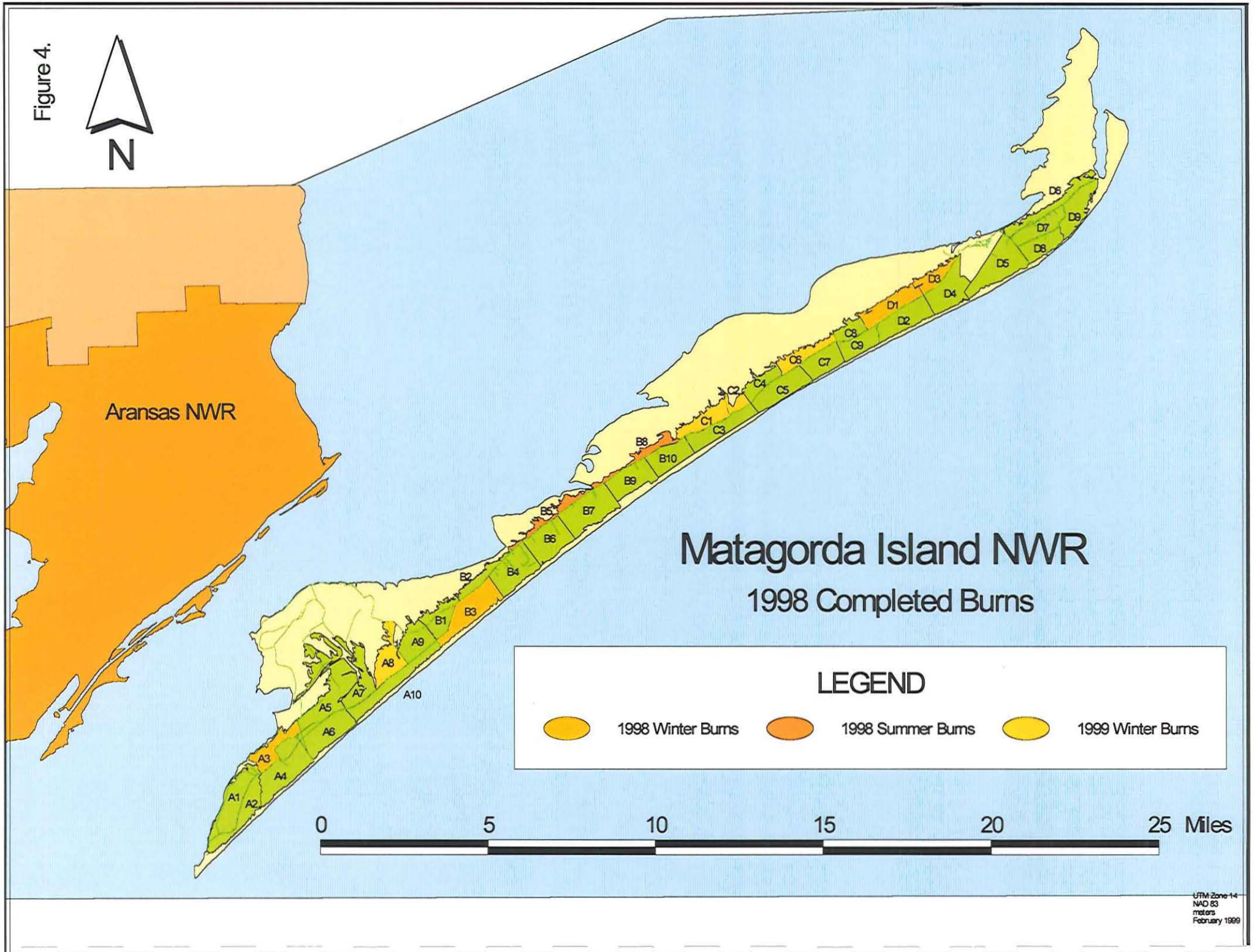
The Island is divided into 38 burn units ranging in size from 300 to 1200 acres. Permanent firebreaks are not maintained between units. During the month prior to burning, the firebreaks are mowed, raked and/or disked. A rome fire plow was modified to fit on a 3-point hitch. The plow is heavy and able to cut through dense stands of cord grass. The offset disk previously used, required numerous passes before a clean break could be established. The new plow greatly reduces preparation time for a burn.

Ten units were burned this year totalling 4403 acres (Figure 4). Burns are organized by fiscal year and season burned. The first burn of the year was unit A3. The units boundaries were extended to include the grasslands behind the shop complex. The unit was burned with light north winds. Fire carried across the grasslands burning approximately 85 percent of the unit. Standing water in the lower areas resulted in a mosaic pattern and alot of partially consumed plant material.

Units D1 and D3 were burned on February 11. The burn was conducted with a NNW wind up to 15 mph. Backing fires were used to protect the south line and mid-island road. Large head fires were ignited by personnel walking in from the north and south ends. Ninety-five percent of the unit was burned. Macartney rose is very common on these units and was killed to ground level.

Unit B3 was burned with north winds on March 6. Having never been burned, the dense grass and litter carried spot head fires. The fires, approximately 25 feet wide, were ignited at

Figure 4.


N
Aransas NWR
Matagorda Island NWR
1998 Completed Burns
LEGEND
1998 Winter Burns
1998 Summer Burns
1999 Winter Burns
0
5
10
15
20
25 Miles
A1
A2
A3
A4
A5
A6
A7
A8
A9
A10
B1
B2
B3
B4
B5
B6
B7
B8
B9
B10
C1
C2
C3
C4
C5
C6
C7
C8
C9
D1
D2
D3
D4
D5
D6
D7
D8
D9
UTM Zone 14
NAD 83
meters
February 1999

1/10-mile intervals along the mid-island road. Two ditches crossing the unit stopped head fires, but flank fires were able to burn into the night resulting in 95% burn coverage. The drier ground and hot fires enabled the fire to consume nearly all above ground plant matter. The growing season was slow, due to the drought, but by October the benefits of increased bluestem density were visible.

Late summer burns were delayed because of weather. The County was under a burn ban until late August due to drought conditions. Burning on the Island during less than ideal conditions (ie. during a drought) is not recommended due to the damage caused to plant and animal populations. Units B5 and B8 were burned on September 30. Due to their bay side location, the units could be burned soon after being inundated with storm tides, as the water quickly ran off. The high ground moisture and narrow depth of the units enabled us to burn using a line headfire. Surprisingly the units burned well and some *baccharus* is expected to have been killed.

Unit A8 was burned on October 30 with SE winds. Once again the soils were moist but using a headfire compensated and 90% of the unit burned. Fire was able to get into *baccharus* and mesquite brush that was over ten feet high. Deer, hogs, and sandhill cranes were observed using the burn during the months following burning.

Units C1 and C2 were burned on December 2. Unit C6 was burned 10 days later. All three burns were only moderately successful. Several days of additional "burn outs" had to be done to obtain even a 75% unit burn. The main problem was moisture. Small acreage with burnable material could only be reached after crossing acres of wetter prairie that would not carry a fire. All units were burned using a SE wind partially because cool fronts with north winds were not making it to the Texas Coast. These do not make for ideal burning conditions because humidities remain high (65+%) and the smoke heads toward the mainland. Even with clear skies, smoke from winter burns remains low to the ground as it crosses the cooler bay waters.

The Matagorda Island NWR Fire Plan was completed and sent into the Regional Office in September. The status and where abouts of the document could not be determined by the end of the year.

Baccharus on burn unit B8 prior to burning. DB 9/98

Photo point on burn unit B8 following burning. Although the unit was wet, fire carried to and through the *baccharus.* JS 11/98

Texas thistle (*Cirsium texanum)* can only be found on the shell ridges on the south end of the Island. WM 4/98

G. WILDLIFE

1. Wildlife Diversity

The diversity of wildlife on Matagorda Island is typical for a Texas barrier ecosystem—it is much reduced compared to the adjacent mainland, and it is attended by a biomass that fluctuates markedly with the seasons.

According to our best information, the table below shows the discrepancy in diversity among vertebrates and higher plants between the 58,000 acre mainland refuge (four units) and the 56,000 acre Matagorda Island Unit, and it compares these two protected areas with published biotic lists for the local Coastal Bend of Texas.

Table 1. Wildlife Diversity (# Recorded Native Species)

	Aransas NWR	Matagorda Is. NWR	Coastal Bend
Mammals	35	8	45
Birds	390	320	495
Amphibians	17	5	21
Reptiles	48	20	56
Freshwater Fish	14	0	79
Flowering Plants	850	450	1411
Trees	20	8	51
Grasses	119	84	220

The case for reduced insular diversity is easily made. The number of kinds of native mammals on the island is severely restricted, and their scant array includes only three sorts of rodents and no insectivores. Matagorda is home to fewer than half the kinds of reptiles that occur on the mainland; it has, for instance, only 10 species of snakes compared to 33 species on the Aransas. The salt-sensitive, dehydration-prone amphibians are understandably poorly represented on the barrier island, with salamanders entirely absent. It is not surprising that there are no fresh water fishes on the island at all. Fewer than a third of the kinds of flowering plants known from the Coastal Bend and only half those that occur on the Aransas grow on Matagorda Island; among these the island sports only eight kinds of trees and just one tree species that is common. The top four flowering plant families on the island are Gramineae (84 kinds), Compositae (56 kinds), Leguminosae (33 kinds) and Cyperaceae (19 kinds). Although not listed in the table, Matagorda is equally poor in cryptogams—no ferns,

few lichens, fewer mosses, one liverwort, a small scatter of mushrooms. Only the variety of insular birds and grasses make a decent showing.

Of course, in some biotic categories the faunal diversity of the island surpasses that of the mainland, especially if the surrounding shallows are included in the purview. Although comprehensive tallies have not been made, coelenterates, cnidarians, echinoderms, crustaceans, polychaete worms, marine gastropods and bivalves, protochordates, and marine fishes surely all occur in greater variety in the offshore shallows around the island than along the perimeter of the mainland. The same is probably true for marine microbiota.

The "sole crab" adding to Matagorda Island's diversity. WM 10/98

It is a fact that no one knows, and very few can make even an educated guess, about how many species of living things there are jostling with each other in this barrier ecosystem. Even less is understood about the ecological relationships among these denizens, especially those that lack backbones or do not produce flowers. For example, there is no good estimate of the welter of kinds of terrestrial invertebrates that must be critical to the spartan insular food chains: spiders, mites, millipedes, springtails, beetles, grasshoppers, crickets, planthoppers, dragonflies, butterflies, moths, true flies, true bugs, wasps, bees, ants. The Corpus Christi Bay and Estuary Program lists 2,342 kinds of mostly aquatic organisms within its area of concern which focuses on Corpus Christi Bay. We have no comprehensive list for comparison from the waters surrounding Matagorda Island. Likewise, pathetically

little is known about the seething masses of bacteria and fungi that set the detrital food base to churning and so succor the phenomenal productivity of the bayside marshes and tidal flats. Nor is attention given to the mats of blue-green algae that cover, protect, and nourish the sprawling acres of mud flats that border the bay side of the island. Too bad, because data from undeveloped Matagorda Island could serve as a valuable baseline for judging the impact of human activity on our other barriers.

But the numbers that we have come up with are as they should be. Matagorda Island really is not very large. It is isolated by five miles of open bay, making it difficult or impossible for some types of creatures (mice, salamanders, fresh water fish, land snails) to gain access by natural dispersal. For more vagile kinds, the crossing is easy (birds, flies, ballooning spiderlings, parachuting seeds); and for many aquatic forms the sea rather than the island proper is their natural home, so they experience no obstacle unless they attempt to move from the water onto the sand. The barrier island presents a relatively hostile, windswept environment devoid of the heterogeneity afforded by forests, logs, rocks, loams, or significant topography. It exists at the mercy of the elements, including the constant threats of saltwater overwash and redistribution of sand. So it is not an easy place for an immigrant to dig in and establish a viable population. In addition, the island is only 5,000 years old, so there has not been much time for natural landfalls by castaways from elsewhere and few generations to perfect survival tactics. Finally, Matagorda Island is way too small and too young to expect many life forms to have evolved *en situ*. So, in this isolated, difficult place, we should expect a relative paucity of kinds of living things; and that is exactly what we do find.

In addition to its diversity of creatures, Matagorda Island routinely experiences tremendous fluctuation in the abundance of many resident and migrant species. The most spectacular examples are migrating birds. Because the island is a critical staging area on the Central Flyway, each spring and fall thousands of hurrying birds pause for food and rest. Their numbers can change by several magnitudes in a few hours. For many other birds the island serves as a winter refuge or a summer feeding and nesting haven. Less evident but equally important are the tremendous silent pulses of crustaceans, fishes, and other marine life that move through the tidal passes from the Gulf into the bays and back again as they pursue critical phases in their life cycles. There are many other examples, most of which pass unnoticed: fluttering waves of migrating monarch butterflies, periodic eruptions in the population of cotton rats, quiet explosions of marine plankton, billowing clouds of flying ants celebrating a summer rain shower, a thousand uninterrupted acres turned silver by the matured seedheads of seacoast bluestem, the seasonal appearance of uncountable millions of juvenile striped anchovies in the surf, the emergence on a single moonlit night of tens of millions of egg-laden polychaete epitokes in the bays. The heat of summer or the thrashing of a hurricane can quench these fountains of life and for a time the island seems nearly lifeless by comparison. Then the cycles begin again.

Does Matagorda Island harbor *exceptional* biodiversity? As barrier islands go, probably not;

but we really do not know. However, it is certain that the mix and abundance of insular life forms is a fascinating natural assemblage well worth our astute stewardship. Refuge management is supposed to be moving toward an ecosystem focus. It is past time to heed Aldo Leopold's caveat: "The first rule of intelligent tinkering is to save all the parts." At this point we cannot even list all the parts. Obviously, there is much to do as well as much that we should *not* do until we understand how this stripped-down barrier ecosystem works.

Although 1998 was a year of weather contrasts, the fluctuations were not severe enough to cause noticeable gains or losses in the natural biodiversity of the island, although there were minor shifts in abundance and distribution. Winter began wet and mild; we never did experience a hard freeze. But then the rains quit and the temperature soared to produce a dry spring and a withering summer. Dry windblown sand piled so deeply in our road that it was difficult to gain vehicle access to the beach. As the water table dropped, the fresh water ponds were drastically reduced but few of them dried up entirely. Perhaps thanks to our new system of culverts, there were no major die-offs of aquatic creatures in the system of levees. Salinities in the bay spiraled up to 37 ppt. Everything changed in August when the first of two tropical storms brought torrential rains, flooded flats, produced a bay salinity of practically 0 ppt and a wet cycle that hung on through November. By the end of the year all the swales were ponded, the water holes were brimming, and one could not go across country by foot or vehicle without bogging down. Windrows of drifted styrofoam and lumber reminded us of how high the flood tides reached. Despite the vagaries in the weather, the native inhabitants seemed relatively unperturbed. For some reason, beach amaranth and wooly honeysweet barely made an appearance on the beach, and all of the vegetation on the back beach got pruned by the storm surf. The dry-then-wet weather apparently struck cudweed just right, for this usually unassuming plant appeared all over the barrier flat right into December. Cattails, bulrushes, spikesedges, and umbrellaworts clogged the swales . Blue-green algal mats flourished across acres of wet tidal flats. The deer dunked for algae in the swales as much as they grazed on greenery on the uplands . Groundsels took advantage of the wind and moisture to advance across the barrier flat. Alligators were on the move. Southern leopard frogs enjoyed a riotous, months-long reproductive season, and hordes of salt marsh mosquitoes bedeviled every creature with red blood. But nothing really changed.

2. Endangered and/or Threatened Species

The following table updates the current status of Federal and State endangered/threatened species that occur or may be reasonably anticipated on Matagorda Island during at least part of their life cycle . Both the arctic peregrine falcon and brown pelican are candidates for downlisting. We have no known listed terrestrial mammals, fishes, amphibians, invertebrates or plants.

Table 4. Federal and State endangered/threatened species.

	Federal Listing	State Listing
Birds		
Whooping crane	E	E
Brown Pelican	E	E
Northern aplomado falcon	E	E
Arctic peregrine falcon	T	T
Piping plover	E	E
Interior least tern	E	E
Reddish egret		T
White-faced ibis		T
White-tailed hawk		T
Amererican Swallow-tailed kite		T
Wood stork		T
Roseate tern	T	
Sooty tern		T
Reptiles		
American alligator	T	
Kemp's ridley seaturtle	E	E
Hawksbill seaturtle	E	E
Leatherback seaturtle	E	E
Loggerhead seaturtle	T	E
Green seaturtle	T	T
Texas horned lizard		T

Whooping Cranes

The last of the 40+ whooping cranes that called Matagorda Island their winter home departed unceremoniously during the first two weeks of April. While they were on their nesting grounds, our salt marshes were flushed by two tropical storms and had regained their normal salinity and their bounty of juvenile blue crabs, razor clams and wolf berries before the whoopers' fall arrival. Actually, there was no rush. The cranes began to filter in considerably later than their average 16 October date. According to systematic aerial surveys flown by Tom Stehn, whooping cranes started appearing on Matagorda in late October. However, we did not spot birds from the ground until 2 November. Throughout the remainder of the year the usual number of cranes was consistently located from the air even though we seldom saw them during routine ground patrols. Apparently the birds were finding an abundance of blue crabs on the margins of the bays, where they were not easily visible from the roads and levees. Two families and two pairs of adults could usually be seen far out in the salt marsh beyond the observation platform five miles north of HQ. One family settled in the marsh near Bray Cove, and adults were occasionally seen in their usual haunt near Cedar Lake. However, the pair of adults that traditionally staked claim to Stilt Flats near our observation platform at HQ did not make an appearance. We could not visit several favored whooper feeding grounds because of bad roads. Through December, we never did see cranes using burns or coming in to drink at fresh water ponds.

Brown Pelicans

Brown pelicans continue to be gratifyingly abundant year round. Individuals dive-bombing in the bay and strings of birds sailing low between the breakers along the beach provide never-ending fascination for groups in our environmental education program. Loafing aggregations of pelicans are common on the beach and in the vicinity of Cedar Bayou, while solitary individuals adorn channel markers in the bays. We routinely see high-flying flotillas of brown pelicans traveling from roost sites on islets in the bays to feeding areas over the offshore shallows of the Gulf. We presume that most of these birds derive from the patrolled nesting site on Sundown Island in Matagorda Bay just off the north end of Matagorda Island. No nesting birds were seen on islets in Mesquite and San Antonio bays during our Colonial Waterbird Count in May.

Although we did not keep a headcount last year, we did find brown pelicans dead or wounded on the beach during our weekly beach surveys. Most were juvenile birds with broken wings, and we concluded that they had run afoul of rigging on shrimp boats while diving for fish around the shrimp nets. This year we kept a tally that confirmed our suspicions. Between 12 July and 5 September, when the shrimp fleet was just offshore, 17 dead or dying brown pelicans were found on the beach. All but one were juveniles and three of these had broken wings. One juvenile and the lone adult had been shot in the breast.

Northern Aplomado Falcon

This was the third consecutive year that the Peregrine Fund has released northern aplomado falcons on Matagorda Island. After catching a commercial flight from Boise, Idaho to Corpus Christi, Texas, the first installment of seven young birds arrived aboard a Coast Guard helicopter on 15 June. Four college-age kids had moved onto the island only three days previously, and they were anxious to take care of their charges. Eleven more falcons were delivered on 10 July for a total of eighteen. The grand total of releases on the island since 1996 is now 59. The attendants judiciously tended the aplomados at two separate hack sites, feeding them frozen quail and monitoring their gradual progress toward independence. Despite the killing of one bird by a determined raccoon and the early disappearance of three others, by 26 August when the hacking crew left, we had fifteen beautiful young falcons on the island. These were in addition to one banded bird from a previous year's release and several unbanded ones that were probably spawned by the slowly-increasing wild population.

Although they were proficient flyers and frequently swooped on small birds, the falcons seemed to subsist almost entirely on green darner dragonflies which they easily caught in midair with their talons. For the remainder of the summer and autumn we were graced by visits from one or more (sometimes four at a time) of these pretty, graceful birds at HQ, where they favored perching on the radio antenna or atop the palm trees. The falcons enjoyed high speed aerial chases with each other, and a pair was seen dive-bombing a surprised osprey; another risked harrying a peregrine falcon; yet another engaged in playful maneouvers with an American kestrel. However, the favorite game of all the aplomados was the grackle pursuit—swooping over a flock of boat-tailed grackles and pursuing the frightened birds to cover. One falcon cornered a grackle beneath a wagon and repeatedly zipped from side to side as the terrified bird tried to gain more secure shelter. Although the falcons could easily have consumated their grackle game with a kill, we never saw one attempt to do so. Aside from being a delight in their own right, the aplomados were admired by groups of birders and by students who got a firsthand lesson in problems of reinstating endangered species. By December the falcons had ceased to put in an appearance at HQ, and only an occasional individual was spotted on the island. Presumably the birds had dispersed. The Peregrine Fund plans another release here in 1999.

Arctic Peregrine Falcon

Arctic peregrine falcons were seasonally present on Matagorda Island in their usual numbers this year. They gradually disappeared from their customary snag perches along the beach in April, and the first bird of autumn was recorded on 30 September on Stilt Flats. Through the end of the year about half a dozen of these raptors were seen leaving perches during our weekly beach surveys. Sometimes an individual would make a loop out over the surf, but invariably all disappeared in low altitude flight heading inland over the dunes. On one occasion an adult peregrine was seen engaged in playful aerobatics with a young aplomado falcon high over HQ. On 6 October the fresh carcass of a pied-billed grebe with its breast freshly plucked and stripped was found on the Cedar Bayou road. Less than a quarter-mile down the road a contented-looking peregrine falcon was preening atop a mesquite.

Piping Plover

Piping plovers are winter residents on Matagorda Island, although it is not unusual to find a few individuals on the beach in any month of the year. Post-nesting birds begin to appear in early August and their numbers peak in Nov-Dec. During this interval, we record about 20 individuals along a 2-mile beach census. Pipers decrease during the coldest months of Jan-Feb, when they may slide further southward. They become evident again in March and have mostly left for their nesting grounds by mid-April. These birds are most often seen on the beach, running in short spurts just above waterline. They also feed and rest along with flocks of snowy plovers at the Gulf mouth of Cedar Bayou. When the surf is high, pipers fly across the island and forage on open tidal flats and in shallow saline pools.

Least Tern

Least terns first appeared on the beach at Cedar Bayou on 15 March and their numbers rapidly escalated. Because they lack distinguishing field marks, we could not determine if any of these birds belonged to the endangered interior variety. Since our terns seem to remain through the nesting season, they are probably all of the nonlisted coastal subspecies. On 18 May during our Colonial Waterbird Count, we tallied 170 adults and estimated 85 breeding pairs on the lightly-trafficked sandy wastes on the north end of St. Joseph Island. As the count continued through 22 May, we tallied an additional 157 least tern nests on various oystershell islets in the surrounding bays. This total of 242 least tern nests constituted 19% of the total of six species of tern nests recorded on the survey and represented a 35% increase over nesting at the same sites last year. On 19 May, we checked the terns' traditional nesting sites on the abandoned airstrips at the north end of the island. Only four active nests were found, compared to 15 last year. Perhaps encroachment of grass onto these ageing strips of asphalt is discouraging the birds.

Reddish Egret

Because of their interesting, nearly comical feeding strategy, reddish egrets are a popular component of our large complement of long-legged waders. About a tenth of our population is either piebald or white-form. In 1998 these egrets maintained their usual sparse numbers. During weekly surveys across a 2-mile sector of prime marsh and bayside habitat, reddish egrets accounted for 7% of the foraging long-legged waders. In our Colonial Waterbird Count conducted in May, reddish egrets were found nesting primarily on the Second Chain of Islands, where their 80 nests (up dramatically from only 10 last year) comprised 12% of the wader nests tallied there.

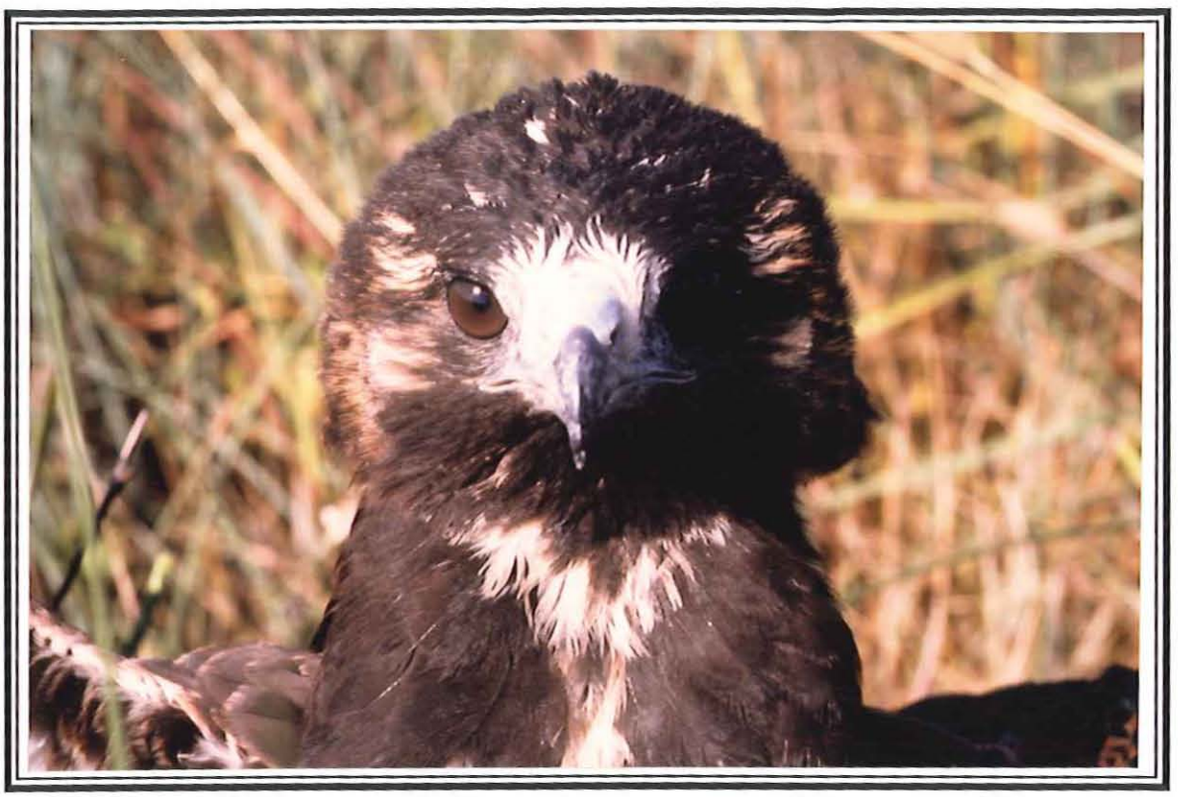
White-faced Ibis

White-faced ibis are not common on Matagorda Island, although there is a rookery on Sundown Island in Matagorda Bay. No nests were found on our local Colonial Bird Count. Small, fast-flying flocks of birds were occasionally seen crossing Mesquite Bay. A group of about a dozen birds was seen feeding in a flooded swale near HQ on 25 April. These ibis lingered for about a week before moving on.

White-tailed Hawk

White-tailed hawks were present in their usual numbers and nested on schedule this year. In March six nests were discovered on the southern half of the island; five had pairs of eggs and the sixth contained freshly broken egg shells. One of these nests built in a yaupon shrub was known to have been used by a crested caracara two years previously. In April six young hawks were banded in three of these nests. Fledging success from the five nests was not documented, but we frequently observed juvenile white-tails out on their own during the summer, so the species apparently enjoyed a successful season.

Nestling white-tailed hawks in one of five nests located in 1998. WM 4/98



Juvenial white-tailed hawk found of June 14, was not able to fly but appeared healthy. WM 6/98

Wood Stork

The first three wood storks set down at Mesquite Pond on 29 May. Soon thereafter a flock of about 50 birds was seen routinely at Shell Reef Dam and small groups frequented Stilt Flats. These birds should have enjoyed their summer visit with us, since the ponds were drawing down and trapped aquatic life was easy to come by. During July about 50 storks transformed our turkey roost into a stork roost beside Mesquite Pond. In August a flock of at least 100 storks was seen at Shell Reef Dam. Soon thereafter tropical storms swamped the entire bay side of the island, and before we realized it our wood storks were gone for the year.

A turkey roost provides great roosting for a group of wood storks right off the runways. WM 7/98

Roseate Tern

On 15 March a group of experienced birders spotted four terns with noticeable pale pink breasts amidst a large group of royal, Forster's, and sandwich terns resting on a sand bar at Cedar Bayou. Although the birds were at a distance, the morning light was good and we all got a prolonged look with binoculars and spotting scope. The consensus was that these were roseate terns, a pelagic species rarely seen here.

American Alligator

Our local population of American alligators pretty much rocked on through what was for them an unremarkable year. The very dry spring and early summer apparently inhibited nesting activity. On 13 June a systematic search was made of known nesting sites but only one nest was found at a pond on the Cedar Bayou road. On 16 October this nest was discovered to have been scratched open and destroyed by a predator. We saw no newly hatched young anywhere. As summer progressed and the ponds drew down, alligators were easy to observe sprawled on the muddy banks. In early August we counted 20 individuals of assorted sizes in the several ponds around HQ. In addition to harvesting mullet and red-eared sliders trapped in the dwindling ponds, several alligators moved to the levee system bordering Mesquite Bay. There they easily glutted on fishes passing through the culverts.

When the rains came we began to see alligators everywhere, moving from one flooded site to another.

Texas Horned Lizard

The first Texas horned lizard of the year was seen on 29 March in one of the creature's favorite haunts—the oyster shell road leading to Cedar Bayou. As further evidence of our warm spring, this sighting is almost a month earlier than the first observance in the same vicinity last year. Although we didn't happen to see young this year, one pair of adults was observed in seeming premating ritual on 6 May. During the summer these animals appeared on the roads in their usual moderate abundance. We frequently collect an individual for show-and-tell to education groups and use them as a lead-in for discussion of state-threatened species. After being held overnight, the animals are carefully released at the point of capture.

Sea Turtles

Refuge staff and volunteers survey the 38 mile long beach looking for turtle strandings throughout the year. Twentyfive sea turtle strandings were reported on Matagorda Island during 1998. This is down significantly from 1997's total of 55 strandings. Table 5 shows annual strandings since 1990. Three strandings were live animals. The first was a Kemp's Ridley found on March 29 with cuts on his neck and front flippers. The animal was taken to the UT Marine Center at Port Aransas and later released. The second was a green seaturtle found on July 3. Again the animal had cuts on the underside of his neck. The animal was released into the surf and swam away. The third live-turtle stranding was a hawksbill found on August 23. The animal's front right flipper was caught in a mass of discarded plastic rope. The rope was cut off the the animal released into the surf. A turtle track up to the dune was found on July 7 north of the Darlington. This is the first documented track on Matagorda Island in recent history.

This years 25 strandings is the lowest in five years and may point to the success of turtle-excluder devices in decreasing mortality. Another factor and probably more significant change contributing to the decrease was that the State did not publish "Shrimp Locations" as they have done in past years. In previous years, a hundred plus boats could be found trawling off the coast. This year, only 35 boats were noted following the opening of the July season.

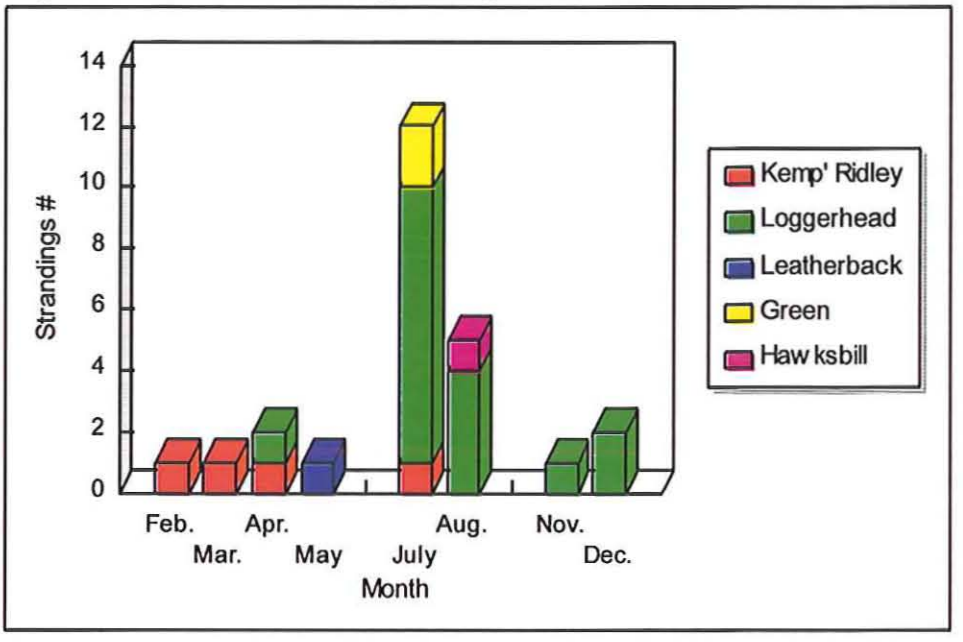
Table 5. Turtle Strandings on Matagorda Island during the past nine years.

Year	CC	CM	DC	EI	LK	UN	Total
1990	10	2		1	10		23
1991	3	1		1	8		13
1992	9				3	3	15
1993	9		3		2	4	18
1994	43	3			12		58
1995	29	2			2		33
1996	24			1	2	1	28
1997	33	2	1		17	2	55
1998	17	2	1	1	4		25

Species

CC= Loggerhead
CM=Green
DM=Leatherback
EI=Hawksbill
LK=Kemp's Ridley
UN=Unknown

Figure 6. Sea turtle strandings during 1998.



Matagorda did not receive the sharp increase of turtle strandings during March and April that were noted at Padre Island National Seashore. There were 55 strandings in March; which is five-times that recorded in March of 1997. By April 10 there was a $50,000 reward for information on turtle deaths. It is believed that many of these turtle deaths were caused by humans.

3. Waterfowl

Among the bay ducks, we had our usual rafts of lesser scaups and large dispersed flocks of buffleheads in Mesquite Bay from January through the end of March. All waterfowl were late returning in the fall. Postnesting buffleheads first appeared on 17 November, and their numbers rapidly swelled until by the end of the year the bay was sparkling with the white heads of male buffleheads riding the waves. However, through December we had only a scattering of lesser scaups. On 28 November large rafts of redheads were seen in Matagorda Bay and at Cedar Lake, but these quickly pushed on south. Throughout the winter a few pairs of common goldeneyes could be found in Mesquite Bay and at Cedar Bayou. On March 19, one pair of canvasbacks put in a rare appearance at Bray Cove.

Except for a shift in relative numbers, the dabbling ducks followed their usual seasonal patterns. One of our index species, blue-winged teal, appeared on schedule in large flocks just offshore, hurrying north in mid-March and postnesting birds began settling on Stilt Flats in late September prior to pushing on south. Compared to last year, relatively few blue-wings held over on the island during the winter and this summer we had no known nesting birds. Green-winged teal never did appear in their usual numbers on the island. (A FWS aerial survey on 19 March only documented 225 green-wings on the island.) The complement of northern pintails, American widgeon, gadwall and northern shovelers hauled out as usual in March. All were late in returning and when they finally did straggle in during November, their proportions were somewhat abnormal: lots of shovelers, abundant widgeon, numerous scattered gadwall but very few pintails. During December we saw relatively few puddle ducks of any kind, although they may simply have been widely scattered because of the abundance of fresh water.

Although resident mottled ducks were present in their usual abundance, we did not observe a single brood. The very dry spring and summer probably inhibited nesting and cut down on survival of young. By the time the rains came, it was too late.

We did not see any black-bellied whistling ducks at all this spring, and the species almost surely skipped breeding on the island. One flock of about 20 birds was seen on 6 October flying around HQ. In November what may have been the same group was seen at a fresh water pond in South Pasture. If fulvous whistling ducks made their usual brief transit over Matagorda this year, we missed them.

Red-breasted mergansers were here in moderate numbers from Jan-Mar; when they returned

this November, they were abundant. Flocks of 20 or more birds were commonly seen moving in united fronts and diving repeatedly in the shallows of Mesquite Bay. As usual, hooded mergansers appeared only in groups of half a dozen in protected waters behind the levees.

The first common loons appeared in Mesquite Bay on 25 November.

We had many eared grebes on Mesquite Bay in Jan-February. Rafts of these actively feeding birds were often attended by "water-walking" Bonaparte's gulls taking advantage of prey in the roiled water. By early April the grebes were hauling out. They returned in force in November. Through the end of the year they were common in the bay and small flotillas braved the crashing surf. Almost any time we scanned birds in the bay closely we could pick out a few horned grebes among them. Pied-billed grebes were seen in their usual abundance, although none were known to nest this year. There were no sightings of least grebes.

We heard the first sky calls of southbound geese on 22 October. Over the next few days high ragged flights of white-fronted and snow geese were sighted. However, we saw no geese on the ground until a small flock of Canada geese settled down near Cedar Lake. Through the end of the year only scattered small groups of snow geese came down. Despite reports of snow goose overpopulation, we did not see evidence of it on Matagorda Island.

4. Marsh and water birds

All of the kinds of long-legged wading birds native to North America spend time on Matagorda Island. Most nest on emergent oyster reefs in the bay, while some utilize swamps on the mainland. There are a few small rookeries on the island itself, some of which are not used every year. All species forage on the island, and many freshly fledged young follow their parents to the insular food basket. Judging by the numbers of adults and young, our several resident species experienced a routine nesting season this year. Apparently we get a considerable influx of birds from the south each year. In March large, obviously weary flocks of great-blue, little-blue and tricolored herons as well as many cattle egrets appear onthe beach and soon disperse inland.

As we did last year, we used two means to estimate wading bird numbers: a count during a monthly (often bimonthly; a total of 16 surveys) 2-mile drive through prime bayside salt marsh habitat; a nest count among oyster shell islets in the local bays during our Colonial Waterbird Count conducted on 18-22 May. We chose six common species as indicators: great-blue, little-blue and tricolored herons and great, snowy and reddish egrets. Based on a total annual headcount of 708 indicator birds seen on the marsh transect, the pie graph below shows the proportion of each of the six species. It is interesting that last year the total number of birds seen on the bay transects was twice the current total, yet the relative contribution of each species was almost identical both years. (Note: Each observation was recorded, although almost surely some of the same individual birds were counted more than

once in different surveys. Therefore, the 708 total probably overestimates the actual number of individuals on the marsh during the year.).

Figure 6. Index birds in Marsh, 1998

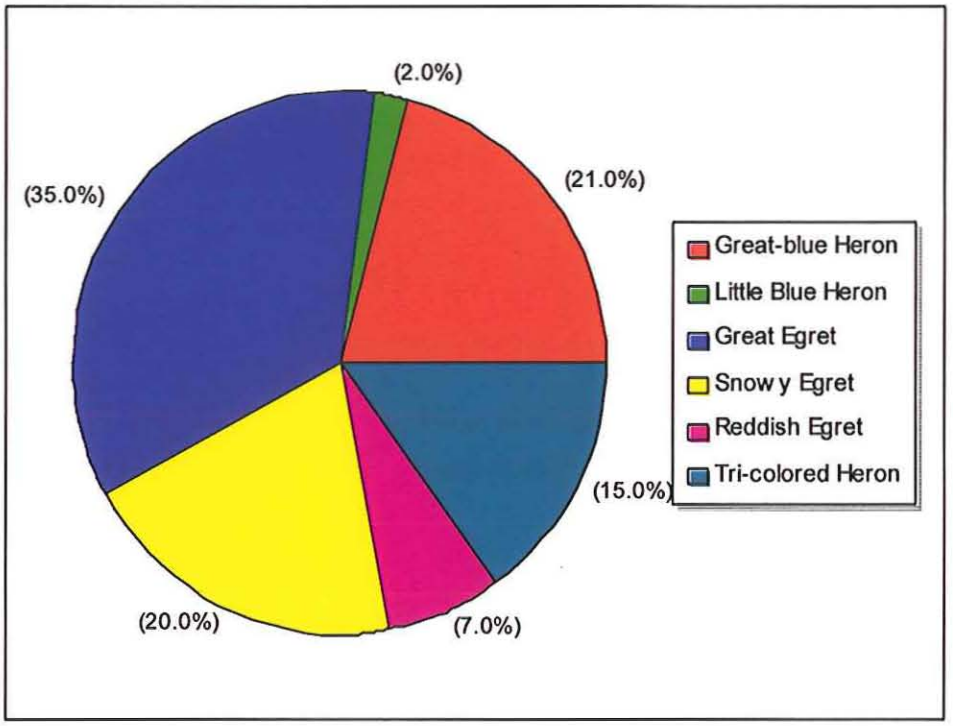
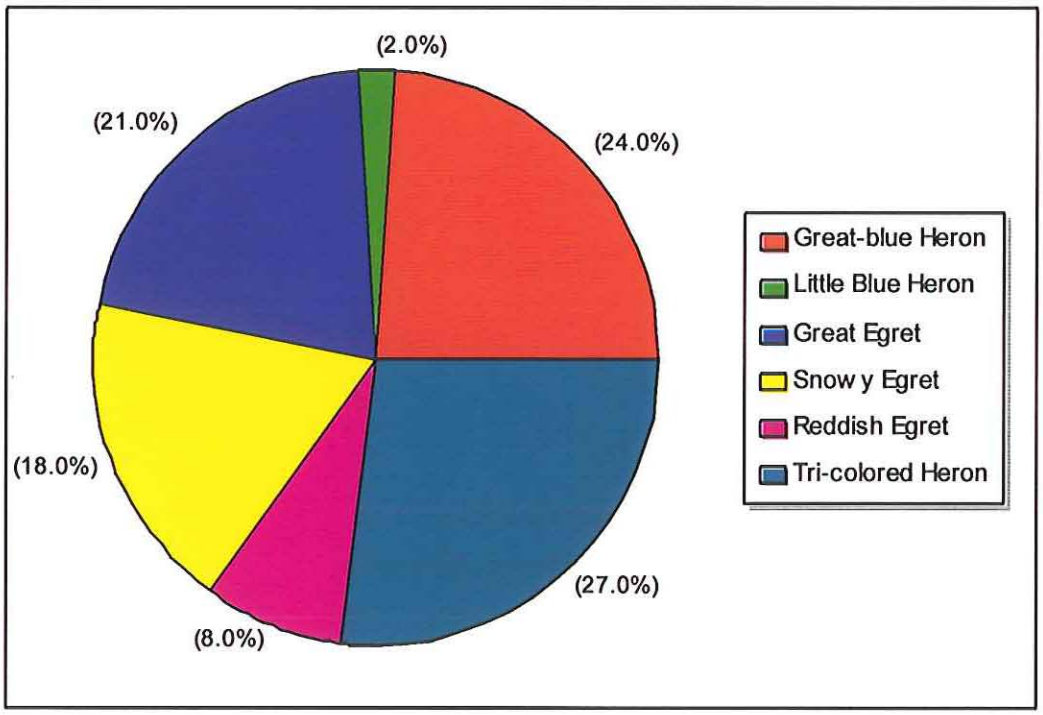


Figure 7 shows the nesting abundance of the indicator species. Compared to last year, the data show that while great egrets and tricolored herons still dominate this coterie of six kinds of waders, their lead was somewhat diminished. In turn, snowy egrets claimed a larger share and the proportion of great blue heron nests more than doubled. Nests of reddish egrets and little blue herons remained in a distant minority.

This year there were two known small wader rookeries on the island itself. On 18 May five active great-blue heron nests were visited in the salt cedars bordering Cedar Pond; all contained pairs of large young close to fledging. On 24 May a larger rookery was visited in a motte of prickly ash trees on a small upland beside Arrowhead Lake in the Conservation Area, but the birds had already finished at the site. Egg shells revealed that both great-blue herons and great egrets had used the grove, but we could not estimate the number of active nests. We hope to visit this spot earlier next year. Once again, a pair of great-blue herons (perhaps the same individuals as last year) managed to fledge young from the battered nest atop the mast of a sunken vessel in the surf. After the birds were done, a tropical storm washed the nest away. It will be interesting to see if the herons rebuild next year.

We apparently set a record for Matagorda Island by discovering three active nests of green-backed herons side-by-side in a mesquite beside Mesquite Pond on 14 June. This species has not been recorded nesting here before.

Figure 7. Wader Nests, Colonial Bird Count, 1998



The first two cold and miserable cattle egrets were seen humped in a wet ditch bordering the lawn at HQ on 9 March. A flock of these weary birds was resting in company with newly-arrived little blue herons on the beach on 3 April. By 14 April, many cattle egrets up from the south were settling on the beach. Most were exhausted and many individuals were sound asleep. Northbound egrets usually pass rather quickly onto the mainland, and we do not often see them again until they push back south in the fall. This year southbound migrants began coming through on 29 Aug.

As usual, we saw and heard clapper rails in the salt marsh near the Boardwalk off and on during the warm months. At sunset on 22 July six of these elusive birds showed themselves at the edge of the smooth cordgrass; one was tending two black fuzzy chicks. At this late date the chicks may have been a second brood. During April several sora rails were seen around the fresh water ponds along the airstrip. This species winters locally, but apparently it prefers the mainland to the island. Although we surely hosted both black and yellow rails, none spooked into view this year.

American coots and common moorhens were observed around the fresh water ponds at HQ with cute little bald-headed chicks tumbling for cover by late June. We saw a few juvenile moorhens living independently in August, but apparently the rainless summer caused considerable chick mortality. There were no sightings of purple gallinules this year.

Our wet autumn seemed to suit our winter resident American bitterns well, for they repeatedly flushed from roadside pools and were doubtless abundant across the interior of the island. One least bittern was seen on 6 June. Responding to water-water-everywhere, common snipe were abundant throughout the winter.

Both black-crowned and yellow-crowned night-herons occur on the island. The former is the more common species. Throughout most of the year both kinds of night-herons can be found roosting in shrub thickets on oyster shell ridges along the bayside, and this year a flock of about twenty-five black-crowns used the mesquites fringing Mesquite Pond. The night-heron rookery at Lighthouse Pond was not visited this year. On our Colonial Waterbird Count, we found 93 nests of black-crowned night-herons (a whopping increase over the three nests a year ago) and one yellow-crown nest. The latter species prefers to nest on the mainland.

The first double-crested cormorants were not seen until 21 October, nearly a month behind their usual schedule. However, once they started to arrive their numbers rapidly swelled. By mid-November several of their large, tightly packed aggregations could be found loafing on the beach, and flocks of birds were continually flying over the island from bay to Gulf and back again. Despite their omnipresence, they seemed to be less numerous than last year. Although they are here the entire time, our smaller complement of neotropical cormorants fades into the background until the horde of their larger cousins hauls out in March and April.

On 11 July, in the middle of our summer heat wave, the first postnesting long-billed curlew appeared on the lawn at HQ. Thereafter we began to see more individuals foraging for ghost shrimp and fiddler crabs in the salt marsh while others searched for something (young ghost crabs?) on the back beach. These winter residents eventually reached their normal moderate abundance on the island. As if to keep us from getting contrite in our bird identification, an occasional whimbrel mixed with the curlews during November and December.

White ibis are residents on Matagorda Island, and at least small flocks of these birds can usually be found foraging in the salt marsh at any time of the year. They move to offshore islets to nest, although they mostly shun our local sites. We did record two white ibis nests on the Second Chain of islands during our Colonial Waterbird Count. White ibis do consistently use comparable islets in Matagorda Bay and points north up the coast. Perhaps they are following tradition rather than ecology when they pass the local islets by. Nonetheless, in July postnesting adults and juveniles begin to appear in large numbers on the Matagorda marshes and they remain common thereafter.

Willets remain one of our most common residents. They are so generalized in feeding habits that willets are as often seen on the bayside as on the Gulfside of the island. They are among the few larger birds that habitually gamble against the raccoon and coyote odds to ground nest on Matagorda Island. This year we stumbled upon fewer willet nests and saw fewer willet chicks than usual. Perhaps the birds were struck by the dry conditions during the nesting season.

The first flock of six black-necked stilts arrived from points south on 16 March. The birds attained normal abundance, but they--like so many other kinds--seemed to have an off-year for reproduction. Several cute, long-legged young were seen in June, but their season was nothing like last year when this species spawned numerous broods in the wetlands around HQ.

Roseate spoonbills seemed to be more abundant this year than last. Eighty-six nests (up from 22 last year) were found at their traditional rookery on the Second Chain of Islands and at two nearby sites during our Colonial Waterbird Count. The number of adults and juveniles increases on our marshes in late summer when nesting is done, and a few birds can usually be seen throughout the year. During July and Aug, when the freshwater ponds were at their lowest, about 50 spoonbills daily visited the sites along the airstrip. Each afternoon after they were done feeding, the spoonbills shared our turkey roost with a complement of wood stork—a beauty-and-the-beast contrast.

5. Shorebirds, gulls, terns etc

A significant number of long-billed dowitchers, dunlin and western sandpipers remain on the Matagorda tidal flats as winter residents. Flocks of these birds ordinarily briefly increase dramatically in late March as northbound migrants push through. In early April, the numbers of dowitchers, dunlin, western and and least sandpipers, semipalmated plovers, pectoral sandpipers,and lesser and greater yellowlegs, along with a few whimbrels, marbled godwits and stilt sandpipers did increase on Stilt Flats, but the birds filtered through without staging a major passage. Southbound migrants begin moving back through as early as July. Although the first wave of short-billed dowitchers settled down on Matagorda on 11 July, sky calls of upland sandpipers on 6 Aug heralded the onset of serious shorebird fall migration this year. Our tropical storms, flooded marsh and generally unsettled weather may have caused many Aug-Sept migrants to overfly the island, for we had only scattered, sparse observations of their passage this fall.

We saw the first Wilson's plovers on the beach on 15 March, two days earlier than last year. Only three days later the birds were already common on the island and many were appearing on the bayside. The first cute fuzz-ball chicks were seen scampering and huddling on the back beach on 25 May. This is one of the few species that did not seem to experience a reduced reproductive effort as a consequence of the very dry summer. Over a hundred Wilson's were massed at the Gulf mouth of Cedar Bayou on 4 September preparatory to heading south.

On 16 March, a burn in the central barrier flat on the island was covered with a silent crowd of foraging golden plovers. As abruptly as they appeared, they disappeared. Although this species does not ordinarily come across the island in the fall, one lone bird with a disoriented air about it was seen on a levee in Stilt Flats on 28 September.

American avocets appeared on schedule in October at Cedar Bayou, and by early November several thousand birds resided there, subsisting on larval fishes and crustaceans gleaned at the mouth of the pass. A small flock lingered until 20 May, and then they were gone. As far as we could tell, no avocets stayed the summer to attempt nesting this year.

On 25 April and again on 1 May we saw scattered groups of Wilson's phalaropes pirouetting in our tidal pools and fresh water ponds. In one case it was verified that the birds were harvesting water boatmen and shoreflies.

Small flocks of red knots were seen on the beach during May; we probably missed earlier northbound migrants, which barely set down for food and brief rest before they hasten on their way. Southbound birds appeared on 26 Aug. Although they were probably not the same individual birds, red knots lingered on the beach for longer than usual this year. We saw small foraging groups as late as 23 October.

We had a heavy spring passage of ruddy turnstones this year. The first birds appeared on the beach on 28 March; they peaked in May and were last documented on 28 June. Postnesting turnstones began arriving on 1 Aug. The main southbound passage occurred in September, but a few winter residents were present through the end of the year.

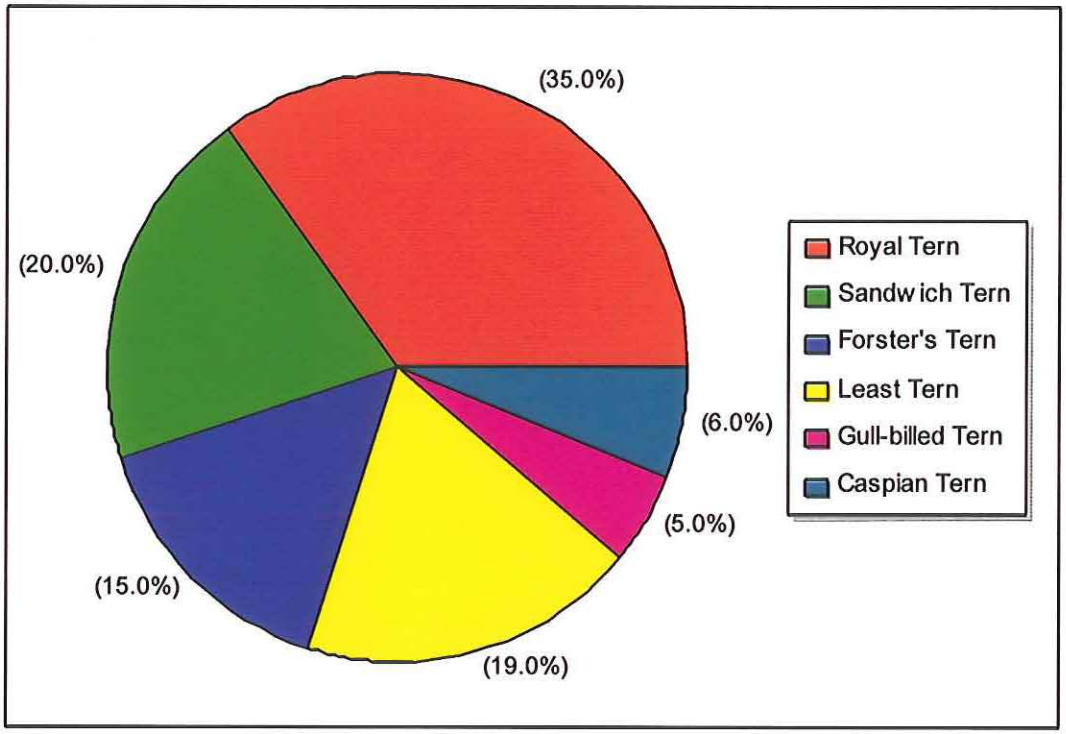
What happened to our killdeers this year? We saw few of the birds and discovered not a single nest. Usually we have flags all around HQ warning of killdeer nests.

Bonaparte's gulls appeared as usual in moderate numbers at Cedar Bayou in January. On several occasions we saw these agile birds "water-walking" as they plucked prey from water roiled up by feeding eared grebes in Mesquite Bay. Our common resident gull, the laughing gull, began to get vocal on 18 March and bred in its usual numbers on the offshore islets in the local bays (1169 nests on our Colonial Waterbird Count, by far the most numerous nesting species). At times we had thousands of these birds loafing on the beach after feeding around the shrimp trawlers in the shallow Gulf. In early March, the numerous winter resident ring-billed and herring gulls began to cluster in premigration flocks on the beach. By the first week in April only a few herring gulls remained. Both these species reappeared on 8 Aug and soon swelled to their usual concentrations. On 10 September, with the surf raging into the dune line, thousands of gulls and terns moved to the airstrip runways at HQ as a surrogate resting site.

Our common species of terns were present in their usual abundance. Least terns are discussed under endangered/threatened species. Northbound black terns showed up on 5 May and were gone by the end of the month. Southbound birds appeared on 28 June and leisurely built to a peak in mid-August before moving on.

The figure below shows nesting of resident species of terns on the local islets in the bays according to our Colonial Waterbird Count conducted on 18-22 May.

Figure 8. Tern Nests, Colonial Bird Count, 1998

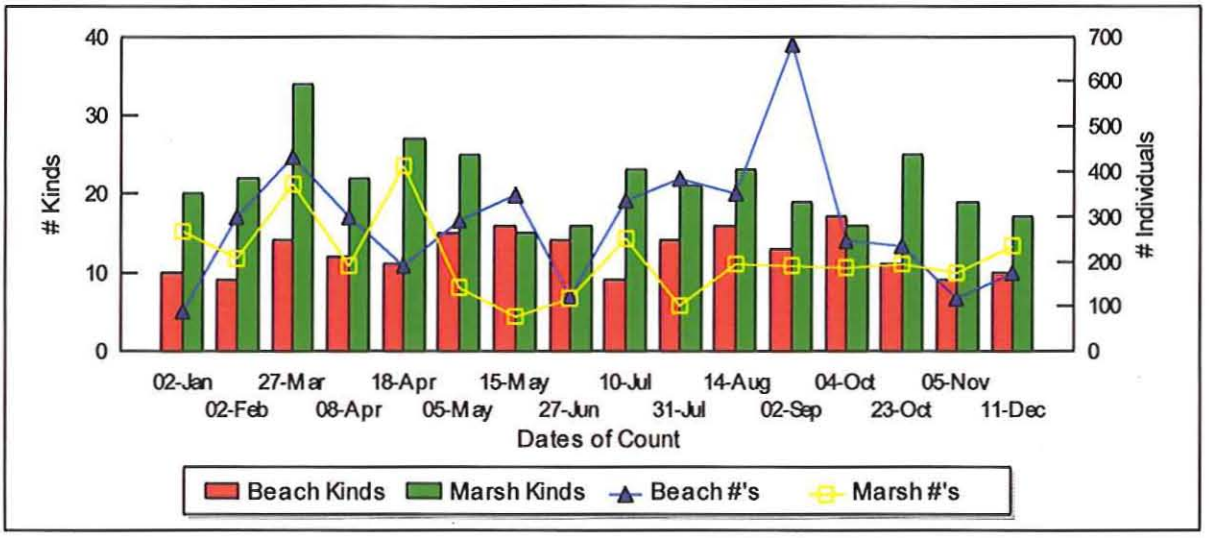


Although a few linger in the vicinity, many black skimmers move south down the coast in the winter time, but they begin to return in March. During our Colonial Waterbird Count at the end of May, we found an astonishing 748 active skimmer scrapes (way up from 197 a year ago) on the oyster shell islets. While surveying for fire ants on the islets on 13 Aug, we discovered an estimated 25 skimmer nests, a few with eggs and most with young about ready to fledge. At this late date, this must have been a second brood.

American oystercatchers are year round residents, but they are always relatively uncommon. We did see winter groups of a dozen or so birds feeding on coquinas in the intertidal zone, and in general the birds seemed more abundant than last year. However, on the Colonial Waterbird Count we did not discover any oystercatcher nests.

The figure below summarizes the results of sixteen bird censuses performed during the year. On each date birds were tallied from a vehicle on a designated 2-mile stretch of Gulf beach and immediately thereafter birds were counted on a designated 2-mile levee road in the salt marsh. The data reveal the spring and fall passage of migrants. With a near-miss in May and again in October, the diversity of bird species is greater (often far greater) on the marsh than on the beach. On all but two censuses the number of individual birds was higher (with an exceptional peak in September) on the beach.

Figure 9. Kinds and numbers of birds on the beach and marsh surveys, 1998.



6. Raptors

The white-tailed hawk, northern aplomado falcon and arctic peregrine falcon are discussed under endangered/threatened species.

Off and on this autumn we had one red-tailed hawk sailing around HQ. Although common on the mainland, this species seems content to leave the island to the white-tails.

On 5 September we "officially" ushered in the change of the seasons by sighting the first two northern harriers. By October these fine birds had achieved their usual abundance, and they continued to skim the grass canopy in search of prey for the remainder of the year.

There may have been only one pair of white-tailed kites on the island this year. They were seen several times on the north end and a solitary bird (perhaps a member of the pair) spent several days in the vicinity of HQ. The birds have been more common here in the past and they have nested on the island. But no more, and we are not sure why.

Crested caracaras are frequently observed residents on Matagorda Island. Four nests were found this year, two in the tops of low huisache trees, one atop a wild rose clump and a fourth in a yaupon shrub. One of these nests was discovered on 4 March, but the two eggs were lost to predation. We think that a second nest begun nearby in another huisache was the work of the same pair of birds; its fate was not followed. The nest in the yaupon had three eggs, all of which hatched and the three chicks were banded on 24 March just before they fledged. The nest in the rose hedge fledged two young which we banded on 21 April. Subsequently we saw both these latter banded youngsters following a pair of adults that was

surely their parents for the rest of the year. On 6 December, an adult caracara was spooked off a decapitated yellow mud turtle so freshly assaulted that its heart was still beating.

As usual, migrating ospreys passed over the island and stopped for a brief visit. The first northbound bird roosted on top of the tall radio antenna on the night of 6 March. The first southbound osprey showed up on 21 September. By 9 October we had two fine adult birds, one roosting on the tall antenna and the second on the low antenna associated with our weather station. These (or similar individuals) stayed for longer than usual. These birds apparently lead a rather easy life while here. They cruise out over Mesquite Bay and take large striped mullet almost at will. Our ospreys departed about 15 November. A lone osprey was seen perched on the mast of a ship wreck at Pass Cavallo on 13 December.

The first American kestrel was seen on 23 September, and by 11 October the merlins had slipped in amongst us. Both maintained their usual sparse populations for the rest of the year. A Cooper's hawk was seen around HQ on 9 October, dodging the playful antics of a young aplomado falcon. Turkey vultures manned their routine beach patrols, and they were joined by a few black vultures at carrion in the grassland.

Barn owls are the commonest owl on Matagorda Island. They seem limited by the availiability of nesting sites. Several pairs used to nest in our outbuildings. Since closing up most of these buildings, we have put up two barrel nests for the owls and they took to them immediately. This year two broods were reared in both barrels. In one of these there were six eggs on 8 March and by 15 March two had hatched. We did not follow the broods closely, but we did periodically extract a beautiful owlet before the amazed eyes of visiting students. Later we had lots of fledged barn owls around HQ, but as usual several of these were eventually found dead without a mark on them. Apparently the juveniles have a hard time getting started. We occasionally spook barn owls from brushy thickets on oyster shell ridges and even from Gulf cordgrass clumps on the open barrier flat, so the birds probably occur island-wide despite a lack of convenient nest sites. On 9 May, an owlet that fell from a high nest in the hangar was placed into one of the barrel nests containing two owlets. Half an hour later inspection revealed that the resident owlets had killed the orphan. Apparently our good intentions were misdirected.

Great horned owls are rare winter visitors to Matagorda Island. Only one was seen this year, perched picturesquely in a dead mesquite against a beautiful sunset.

Short-eared owls are apparently routine winter residents on the island, but they are not often observed. This year we saw only two individuals, one sitting on a clump of Gulf cordgrass on 19 February and the second flapping over the barrier flat at dusk on 27 November.

We are becoming aware that burrowing owls are also consistent winter residents on Matagorda. One or more individuals have been seen here over the past several years. This year researchers from Canada visited the island in January and located several burrows and

saw three owls. On 4 November, a burrowing owl flushed from beside our incinerator at HQ. It flew to a nearby mound of shell and peered at the observer awhile before flying out across the grassland. What was almost surely a second individual was reported from the north end of the island in December by TPWD personnel. According to our experience and that of the Canadians, the best way to encounter a burrowing owl on the island is to cruise the roadways at night using a spotlight to reveal the owls foraging for insects along the mowed roadside. We have never seen these birds sitting on posts or promontories by day.

7. Other Migratory Birds

This years breeding Bird Count was completed on May 14 and 15, which was closer to the dates of the count in 1996. From count results over the past three years, these dates appear to be the optimal count dates. In comparison, the 1997 count which was completed a week earlier, produced less than optimal results for several species but primarily for dickcissels. Sixty-eight dickcissels were counted this year compared to 30 last year and 78 the year before. Although the birds arrived on the Island in late April (numerous flocks held up by a late norther on April 28 and 29) they appear not to be actively calling until the second week of May.

A total of 42 species were counted this year including four species still migrating through. This compares to twelve species in migration last year. Only seven of the points were on burned areas, so comparisons between burned and unburned areas were not completed.

A total of 22 bobwhite quail were heard calling. This compares to 15 last year and 42 in 1996. It appears quail were adversely affected by the extreme drought conditions in 1996 more than the extreme wet conditions in 1997.

As expected duck numbers were lower than last year. Black-bellied whistling ducks went from 15 to five. Blue-winged teal and mottled ducks went from six to four and seven to four respectively. A single aplomado falcon was seen on the count. Although the exact number of birds residing on the Island is not known, at least three falcons are regularly seen.

Mourning dove numbers were higher than during the past two years counts (22 compared with 6 and 16 during 87 and 86). Red-winged blackbirds were also counted in higher numbers than previous years (134 compared with 103 and 110).

15 Mar--last of our sandhill cranes hauled out.
16 Mar--one northern waterthrush; no wood warblers yet. Right on their traditional schedule, the first scissor-tailed flycatcher appeared.
31 Mar--first yellow-headed blackbird w/a flock of brown-headed cowbirds.
1 Apr--flocks of chipping and lark sparrows suddenly everywhere; eastern kingbirds arrived. Where are our LeConte's sparrows? After many last year, they never arrived.
7Apr--One juvenile orchard oriole; one dead male indigo bunting.
8 Apr--huge wave of sparrows: vesper, Lincoln's, lark.
9 Apr--blue-grey gnatcatchers, ruby-crowned kinglets, one great-crested flycatcher, several orchard orioles, more eastern kingbirds.
11 Apr--first summer tanager. Many blue grosbeaks and indigo buntings. Still no warblers; they're late.
13 Apr--early dickcissels; first common nighthawk.
17 Apr--more passerines passing through, but still no wood warblers.
18 Apr--first two ruby-throated hummers. First few warblers: blackpolls, worm-eating and Canada. One red-eyed vireo.
19Apr--first rose-breasted grosbeaks and a wave of catbirds. One wood thrush, a black & white warbler and one hooded warbler.
20 Apr--least flycatchers, pyrrhuloxias and a scad of chipping sparrows.
25 Apr--two white pelicans still on Stilt Flats, the rest long gone.
26 Apr--passerine wave: Baltimore & orchard orioles; indigo & painted buntings; scarlet tanagers; blue grosbeaks; yellow warblers; yellowthroats; eastern wood peewees; a few common nighthawks. Still no big push of wood warblers.
27 Apr--first yellow-billed cuckoos.
29 Apr--gray-cheeked thrushes, first chuck-will's-widows.
1 May--large passage of Swainson's thrushes; they're everywhere.
3 May--birds dead in the beach strand: 2 yellow-billed cuckoos, 2 dickcissels, 1 Swainson's thrush, 1 lesser yellowlegs.
5 May--chestnut-sided warblers. Painted buntings singing lustily on oyster shell ridges.
6 May--many indigo buntings passing through. Relatively few blue grosbeaks this year. Only a scattering of scarlet tanagers. Huge passage of Baltimore orioles.
9 May--finally, a significant wave of wood warblers: Connecticut, chestnut-sided, black-throated green, yellow, blackburnian, magnolia, Wilson's; also ovenbirds, yellow-throated and Philadelphia vireos; least flycatchers, western kingbirds and Baltimore and orchard orioles. Also, several white-winged doves.
30 May--first frigatebird.
31 May--two more frigatebirds.
9 June--first six white pelicans of the season.
13 Aug--second brood of barn swallows are fledging.
30 Aug--a wave of southbound blue-grey gnatcatchers.
12 Sept--Baltimore orioles passing through; eastern kingbirds have come back; several yellow warblers.
13 Sept--a yellow-headed blackbird among the grackles on the lawn at HQ.

we have to be strict about nonfeeding rules to keep the two apart. Although we do not manage white-tailed deer on the south end, the herd does not appear to be beyond carrying capacity. Matagorda Island is not prime white-tail habitat, but the animals have adapted well to the general absence of browse and cover. They lead an antelope-like life style. It is our impression that coyotes serve as effective population control predators on the island deer herd.

Compared to deer on the Aransas refuge, those on Matagorda have duller coats and the does seldom drop twin fawns. This may be a direct result of the absence of live oak acorns and adequate browse on the island. However, the insular bucks develop magnificent racks, the animals seem generally healthy, they follow a typical rutting schedule and there is a normal sex ratio and doe/fawn ratio. The herd this year seemed to be in good physical shape. Deer were seen feeding repeatedly in the thick growth of green algae and water penny in and around the flooded swales. They often forage with their muzzles entirely submerged.

Right on schedule, the first pair of bucks was seen locking antlers on 26 September. By the first week in November the bucks were following the does continually. The first two fawns were seen on 23 May, almost two weeks later than the same event last year. We did not see twin fawns this year.

It is not known whether bobwhite quail are native to the island; many were introduced for hunting by the Air Force. There is now a moderately abundant resident population. The birds are mostly restricted to roadways and openings, as the grass is too thick for them across the interior of the island. Several pairs live around Headquarters where we heard the cocks calling on 11 March and observed pairs of adults avidly plucking the greenery of chickweed. On 13 June we saw the first covey of 13 fresh-hatched chicks. A pair of adults with a solitary chick was seen on 15 June. On 22 June a male bobwhite challenged a mower in the yard until he could lead a covey of 8 tiny chicks to safety. Despite our dry summer and flooded autumn, the bobwhite population seemed to hold its own.

Wild turkeys were introduced onto Matagorda by the Air Force and carefully tended for hunting. When the military left the island in 1977, about 200 turkeys remained. These birds were definitely not in favorable turkey habitat; they lacked roost sites, reliable water, mast and browse. The flock dwindled and moved toward the working ranch on the south end. Currently we have 4 gobblers and an assorted group of about 20 hens and jakes (juvenile males) around Headquarters, where they roost in or atop the outbuildings and wander about with semidomestic indifference. They delight visitors. A hen was discovered in deep grass on a nest on 3 April. On 3 May what was probably a different hen led 9 fresh-hatched poults across the yard at HQ. As best we could tell, this turkey managed to bring three of her offspring to near adult-size by the end of the year.Our small flock of turkeys may or may not be a remnant of the Air Force introduction; there are turkeys on neighboring St Joseph Island and they have relatively easy access to Matagorda across Cedar Bayou.

Mourning doves are common residents on Matagorda and their numbers increase significantly in November as southbound flocks pause to feed on sunflower and croton seeds. Nesting doves have adapted to the general lack of woody growth, building their flimsy platforms atop clumps of Gulf cordgrass, in mesquites and prickly pear clumps, and around Headquarters on everything from swaying palm fronds to the abandoned mud platforms of barn swallow nests. This year a dove built a nest on a protruding pipe high up on the side of the metal hangar, where she managed to withstand the blazing afternoon heat and bring off a pair of fledglings. TPWD did not conduct a dove hunt on the island this year.

Feral hogs are classed as exotics, but they are usually discussed along with game animals. TPWD allows deer hunters to take hogs without limit, and that agency held special hog hunts on two weekends in January this year. Eighty-six deer hunters managed to bag 11 hogs, while 32 hog hunters failed to kill a single animal. On the south end we occasionally try to live trap and dispose of nuisance hogs around HQ, and we shoot hogs on sight that we encounter during routine field work. Despite the planned hunts and incidental kills, the feral hogs on Matagorda Island are flourishing. It is commonly accepted that we have killed the dumb animals and allowed the smart ones to proliferate!

During 1997, TPWD held 18 day-hunts for waterfowl on the northern end of the Island. With flooded ponds and abundant birds, 256 hunters participated. They harvested 507 waterfowl of 15 species. Northern pintail, northern shoveler and green-winged teal collectively accounted for 52% of the kill, while gadwall, American wigeon, redheads and lesser scaups made up 32%. These numbers reflect not only species abundance and accessibility, but hunter preference.

9. Marine Mammals

Other than incidental observations of bottle-nosed dolphins in the bays and near-shore Gulf, our main contact with marine mammals is when their carcasses strand on the Gulf beach. This year we were pleased to find only a solitary juvenile dolphin stranded. Without tell-tale marks of any sort, we could not determine the cause of death. No necropsy was performed, although the incident was reported to TMMSN.

10. Other Resident Wildlife

The following is a chronological sequence of excerpts of wildlife observations from Doc's Monthly Activity Reports for 1998.
3 Jan--on prolonged tides, raccoons are foraging on exposed oyster reefs, rolling clumps of oysters aside to get at mud crabs or anything else that wiggles.
3 Jan--first spring wildflowers: stinging nettle and chickweed.
4 Jan--DOR diamondback rattler containing a marsh rice rat.
5 Jan--tremendous chorus of southern meadow frogs.
6 Jan--more spring flowers: rabbit lettuce, pellitory, woodsorrel.

9 Jan--dug up two kinds of acorn worms on the tidal flats at the boathouse.
25 Jan--first Spanish daggers sending up flower stalks.
3 Feb--sea rocket is greening in the dunes; first peppergrass.
8 Feb--eastern meadowlarks starting to sing.
9Feb--first seaside sparrows singing in the marsh.
15 Feb--first pink evening primroses.
20 Feb--spring flowers going beserk earlier than usual this year.
5 Mar--huisaches starting to bloom.
16 Mar--occasional monarch butterfly fluttering around.
17 Mar--first chorus of green tree frogs.
23 Mar--first massasauga on the road.
27 Mar--a large boar feral hog feeding on three piglets that he had apparently just killed.
28 Mar--first baby jackrabbit.
6 Apr--Texas prickly pears beginning to bloom.
14 Apr--coralbean in good bloom; many species of sedges & rushes in flower.
20 Apr--a den with three coyote pups.
26 Apr--raccoon with three young in a box in the wood shop.
4 May--our local bull alligator pursuing a reluctant female in a pond near HQ.
5 May--red-eared sliders digging nest holes on the roadside.
6 May--two large diamondback rattlers coiled around each other in apparent mating ritual. Male tarantulas starting to move.
7 May--dunce cap mushrooms sprinkled over the yard at HQ.
8 May--a few ladies tresses blooming on the roadsides.
9 May--first tiger beetles on the beach; they had a very poor year.
19 May--a few purple pleatleafs blooming in the wet grassland.
1 June--fresh water ponds loaded with critters: mosquito fish, predaceous diving beetles, whirligig beetles, water boatmen, dragonfly larvae, damselfly larvae, mayfly larvae, and loads of fat meadowfrog tadpoles.
5 June--clouds of tiny striped mullet hovering at mouths of culverts.
16 June--first blue land crab on the beach in a long time.
20 June--many killifishes and juvenile brown shrimp in the marsh.
24 June--the track of a sea turtle on the beach, but no nest.
26 June--loads of tennis ball-to-golf ball sized cabbageheads in the bay.
6 July--a new ant species for the island; our list now includes 27 kinds.
12 July--long stretches of beach littered with massive by-kill from offshore shrimp trawls.
19 July--second baby jackrabbit of the year.
1 Aug--Mediterranean geckos seem to be getting more common around HQ.
15 Aug--after a scant rain shower, the air is full of tiny flying insects.
16 Aug--one adult badger sighted in the dunes, the first in ages.
17 Aug--one small flying fish stranded on the beach.
22 Aug--narrow-mouth and Gulf coast toads celebrating recent rains.
23 Aug--live hawksbill sea turtle entangled in a net on the beach.
28 Aug--a common raven around HQ for several days, probably blown in on tropical storm Charlie's winds.

29 Aug--saltmarsh mosquitoes are ruling Matagorda Island!
31 Aug--first and only buck dead on the beach, a victim of mosquitoes. No giant blue land crab migration this year; in fact, few land crab sightings at all. Are they holding their own?
4 Sept--deer, grackles and quail harvesting palm seeds.
8 Sept--great egrets spending much time stalking and catching cotton rats in the grassland.
17 Sept--saltmarsh mosquitoes still holding strong.
18 Sept--deer and coyotes loafing on the beach to escape mosquitoes.
3 Oct--island turning to gold and silver with composite blossoms and grass seed heads.
9 Oct--a vast flotilla of adult cabbageheads in Mesquite Bay. Pink-spotted hawk moths visiting yellow evening primroses in the dunes.
10 Oct--a raptor morning at HQ: 3 aplomados, 2 ospreys, 3 northern harriers and 2 caracaras in view at once.
11 Oct--scad of dragonflies abroad: green darners, black-mantled gliders, spot-wing gliders, violet-masked gliders, variegated meadowflies.
13 Oct--massive emergence of fall armyworms, immediately noticed by boat-tailed grackles.
23 Oct--monarchs passing over routinely.
24 Oct--first titan sphinx moth for the island list.
25 Oct--a new plant, duck potatoe, in a roadside ditch.
28 Oct--first tersa sphinx moth for the island list.
8 Nov--on a warm sunny day, 16 species of butterflies abroad.
24 Nov--stinging nettle thinks its already springtime; blooming in the yard.
25 Nov--many large cabbageheads stranding on the beach, probably a normal seasonal dieoff.

Coyote pups found near the northern hack towers. WM 6/98

11. Fisheries Resources

We got through the summer without an attack by red tide. On 12 July we had a massive stranding of fishes--mostly juvenile Atlantic croakers and Gulf menhaden--compliments of the shrimp fleet.

12. Wildlife Propagation and Stocking

One of eighteen aplomado falcons released in 1998 on Matagorda Island. DK 11/98

15. Animal Control

Nuisance feral hogs are occasionally live trapped and shot around HQ, and we routinely shoot hogs on sight when they are incidentally encountered in the field. Nuisance raccoons and rodents at HQ are live trapped and released elsewhere on the island.

16. Marking and Banding

Dan Kim, a graduate student at Texas A&M University is in the second year of his doctoral research project on raptors on the island. As part of his work, he banded three crested caracara fledglings on 24 March, and two nestling caracaras and six nestling white-tailed hawks on 21 April, and one adult white-tail on 4 December. All of the aplomado falcons released by the Peregrine Fund were banded.

H. PUBLIC USE

1. General

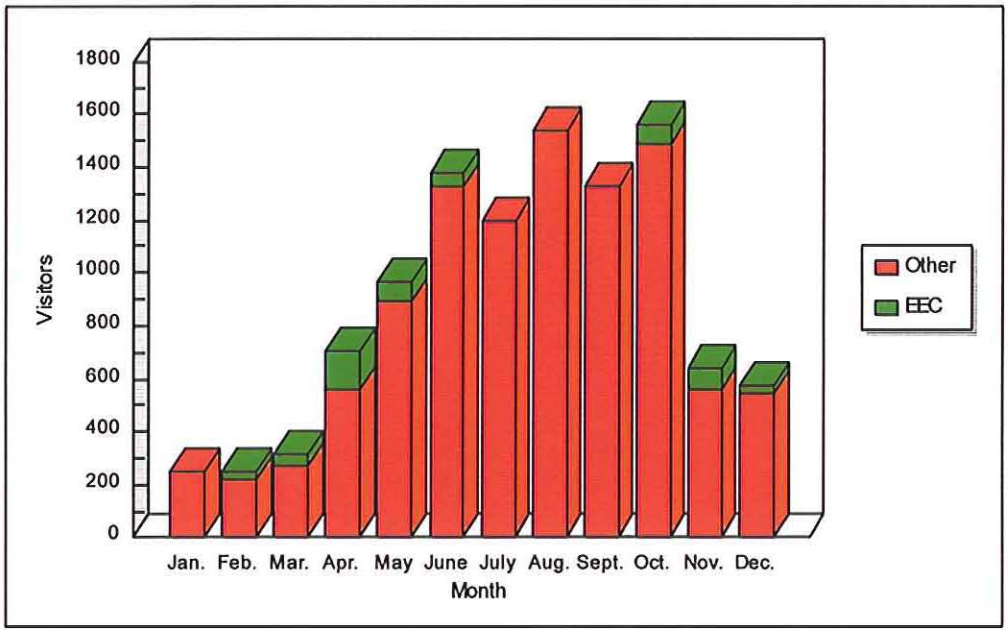
Public access to and use of Matagorda Island during 1998 was about the same as in the previous year. Management is still operating under an interim CMP that has been signed by state and federal authorities but not ratified by Congress. Therefore, there were no major changes in policies to accommodate visitors.

TPWD operated the public ferry four days a week and on holidays to bring recreational visitors to the state park on the north end of the island and continued to make available two camping areas and a bunkhouse for overnight use. In addition, throughout the year state personnel scheduled special tours for holders of Texas Conservation Passports and conducted public school groups through exercises in environmental education. In December, TPWD monitored public hunts for white-tailed deer, wild hogs, and waterfowl on the wildlife management portion of the island. USFWS and TNCT continued joint operation of the Enron Matagorda Island Environmental Education and Research Center (EEC) on the south end of the island. Visitation at this facility is by appointment only and is strictly oriented toward formal classes in environmental education and the support of professional field research.

Visitors to the EEC sign a guest register, which permits an accurate tally. Because our docking facilities are still not approved for general public use, we do not accept drop-in visitors. However, people can and do use their own boats to gain access to the bayside margin of the island and to Cedar Bayou and the adjacent beach. We estimate the numbers of these recreationists with periodic headcounts. We keep visitation records for the south end of Matagorda Island according to the Refuge Management Information System (RMIS) format, which excludes enumeration of staff, other government workers, volunteers, researchers, contractors and special use permitees. According to our estimates for 1998, we hosted just over 10,000 visitors. The bulk of these were fishermen; a few were beach combers; 521 attended the environmental program. Monthly visitation is shown in the bar graph below. Although we wish for a better balance, it is obvious that the big calling on Matagorda Island is recreation rather than education.

TPWD keeps separate records for visitation to the north end. Estimated visitation is 38,000. 18,000 visitors rode the ferry and the remaining used private transportation.

Figure 10 Monthly visitation to the south end of Matagorda Island.



EEC

On 9 Oct 97, President Clinton signed the landmark National Wildlife Refuge System Improvement Act which formally declares the primary mission of the Refuge System: *To conserve and protect the fish, wildlife and plants, along with their habitats, within its 93 million acre jurisdiction.* Although the act effectively says, "wildlife first, people second", it by no means seeks to exclude visitors from refuges. Rather, the legislation recognizes and actively encourages "compatible priority public uses" on national wildlife refuges. Environmental education and interpretation--one of the two designated objectives of the EEC on Matagorda Island NWR--ranks high on this use list. So, the president's signature gave us an inspiring shot in the arm. Someone at the top thinks our job is important.

We were further encouraged by *Fulfilling the Promise* (second draft for the National Wildlife Refuge System Conference, Keystone, Colorado, September 18, 1998). In the People section, we find spelled out the best available answer to the growing dilemma of conserving wildlife while hosting a large influx of visitors: *Persuasively teach the visiting public wildlife management values so they will understand and be motivated to help.* In other words, kill two birds with one stone. To wit:

> "The idea took hold that a better informed public could be a positive force in shaping conservation awareness, and thus policy and practice." (p. 24)

> "The future of wildlife is best assured by raising the public's awareness and understanding in wildlife conservation. This can be done effectively on national wildlife refuges where visitors can see for themselves the connections between wildlife, habitat, and land management." (p. 25)

So, we find that giving primary attention to wildlife is best achieved over the long term by involving an informed public. Good for wildlife and good for people; also good for the EEC, which is dedicated to forging a symbiotic relationship between the two. We are delighted to find ourselves an important cog in "the vision" that will guide the Refuge System into the 21st century.

Finally, *Closing the Achievement Gap* validated another reason for our being. This is a 1998 report by a consortium of 12 state education agencies (including the Texas Education Agency) that investigated the value of using the environment as an integrating context for learning among K-12 students. As explained in the executive summary, the endeavor was not primarily directed toward learning about the environment, nor was it limited to developing environmental awareness. Rather, its focus was to determine whether the environment could be used as a rallying point for the basic process of learning--boosting general knowledge, enhancing thinking and problem-solving abilities, and broadening basic life skills such as cooperation and interpersonal communications. Said another way, the educators wanted to see if the environment could supplement the classroom in motivating kids to learn. What they found was not surprising to us. In an intensive study involving 40 schools, those students taken out-of-doors performed better in every way than students deprived of such exposure. So the EEC has another reason for being. We can not only deliver our conservation message to a crucial segment of our audience, we can merge our goal with that of educators. Together we can produce more informed, more aware, more responsible citizens. There is no better way to prepare future land stewards.

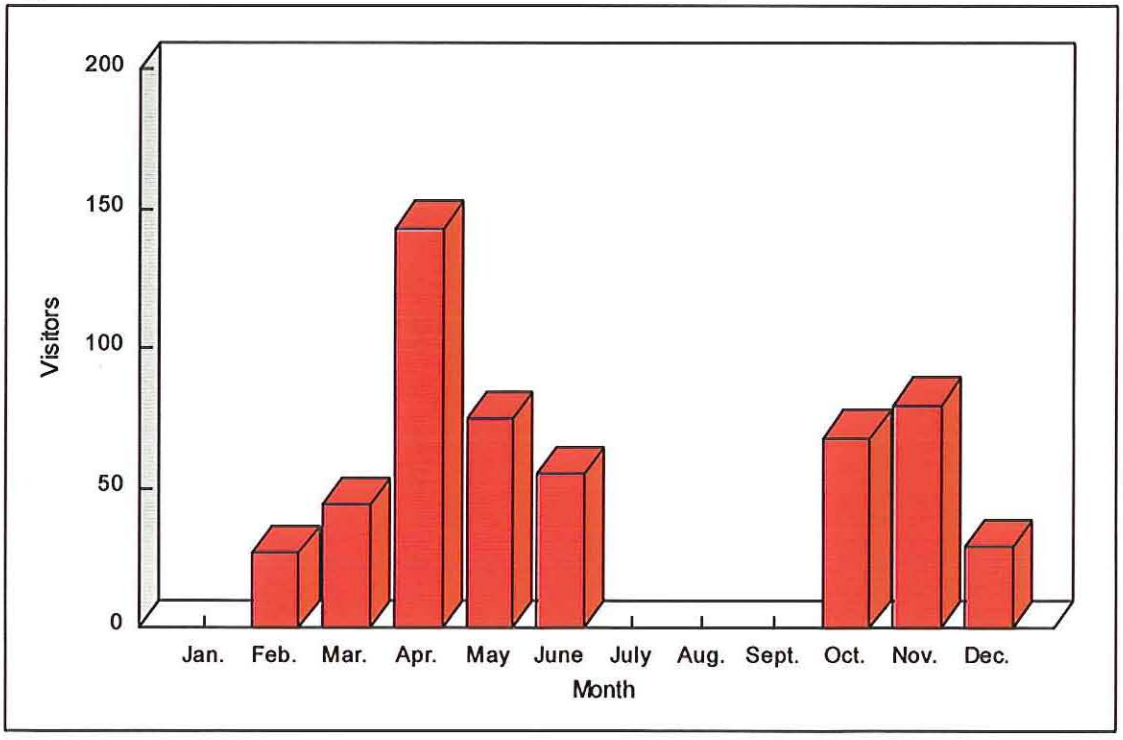
Matagorda is not called a "barrier" island because it throws up an obstacle in the way of environmental education programs, but at times this year it did seem that way. After a withering summer, we labored under constant threat from a superactive hurricane season. Happily, we were spared a major blow, but we did experience two tropical storms, one of which totaled our beloved Conestoga wagon and put a permanent tilt in our boardwalk. Uncommonly low tides forced the cancellation of some scheduled visits, because the boat could not navigate our shallow approach. In other instances, storm-whipped waves on the bay forced the boat to stay in port. For awhile in May we were socked in by a massive smoke cloud from Mexico. In October, bad weather marooned one group on the island an extra day; then record-setting local floods isolated us from the rest of the universe for over a week. Meanwhile, we were constantly bedeviled by balky electrical generators and a fickle water supply. There were times when overnighters got a real adventure complete with oil lamps, no flush toilets, and a "shower" from a gravity-fed yard hose. To their everlasting credit, everyone took these limitations in stride. In the end, when we closed our fourth year of operation, we felt exhausted but as proud of our achievements as ever. We spent a lot of rewarding time with a lot of deserving people. We look forward to next year.

This year we hosted 521 visitors, 9% fewer than the 567 who arrived last year. Cancellations accounted for part of the decrease. Of 42 trips planned, 9 (21%) failed to materialize either because of inclement weather or because the parties could not firm up their plans. Also, this year we tried to avoid weather extremes by officially closing the EEC during January-February and July-August. However, we make no apologies for numbers. Our 521 participants enjoyed quality outings in small, congenial groups constantly accompanied by knowledgeable guides and at minimal cost. Equally important, Matagorda Island did not suffer from the pounding of too many feet. It now appears that a reasonable annual visitation projection for our program is about 600 people. That's 600 well-served people and an island that retains its full dole of wildness. A good balance.

As figure 11 shows, the monthly visitation to Matagorda Island displays its usual bimodal pattern with peaks in spring and fall. In part this may reflect our closure during midwinter and midsummer, but these intervals are traditionally times of low use or nonuse. (We did allow a couple of groups under the bar in late February during an irresistible stretch of unseasonably good weather.) Top visitor months coincide with the biannual migration of birds, pleasant weather, and the public school calendar. The absence of reservations in September, when we were open for business, is probably best accounted for by the back-to-school furor and this year's threatening hurricane season.

Figure 12 shows the year's visitation by group category. In general we are pleased with the distribution, except we would like to hold more teacher workshops. Teachers are, of course,

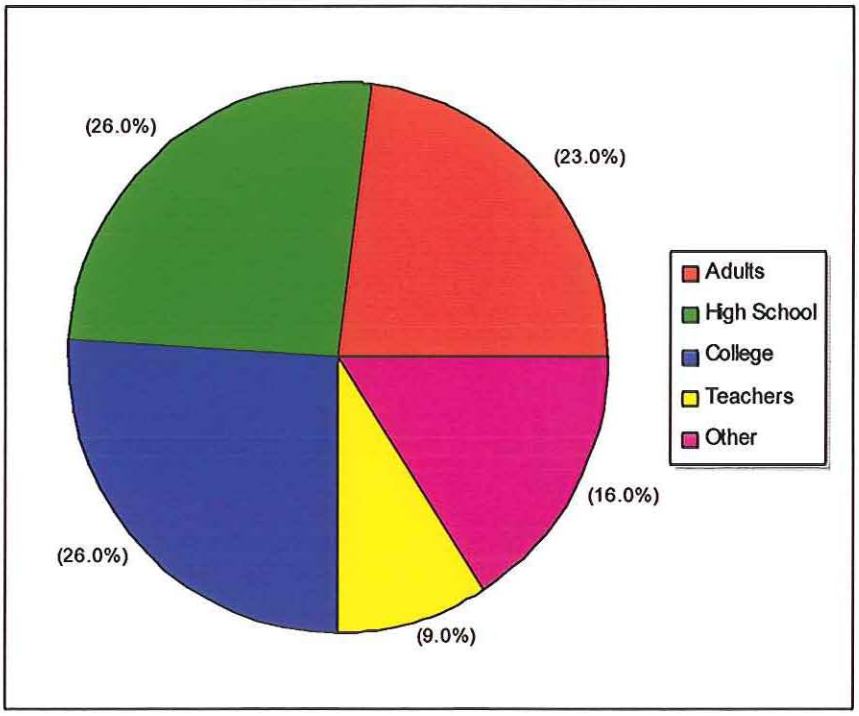
Figure 11. Visitors to Environmental Education Center, 1998



our main conduits to students. Teachers not only pass on the information we present to them, they initiate the tortuous proceedings necessary to bring their students to the island. This year we once again hosted teachers attending a TEEAC summer workshop. We worked with two groups of science teachers from Houston, and we managed to get on the field trip agenda for a state-wide convention of science teachers held in Corpus Christi in November. To indicate the caliber of our attendees and our own determination, the science teachers from Corpus Christi arrived on a blustery day with intermittent cold rain showers. Without a whimper, everyone clipped arm and head holes in garbage liners and in these impromptu and grotesque "raincoats," we all marched out to study the ecology of a wet beach.

Although Texas teachers still receive scant incentive from their administrations to take students afield, this situation may change. The TEEAC meeting scheduled for January, 1999 includes a session on the demonstrated value of the out-of-doors as a teaching tool. If school administrators get caught up in the mood, public school teachers may find it easier and more rewarding to plan field trips, and the stock of the EEC should rise. None of this applies to private schools. Several of these institutions are "regular customers" on our reservation list. They consistently bring us top-level teachers and well-motivated students. These kids arrive with notebook and pencil in hand, anxious to learn.

Figure 12. Categories of visitors to the Environmental Education Center



College students continue to be among our most responsive participants. This year we worked with groups with a variety of interests. A geology class studied the dynamics of sand dunes. An advanced biology class focused on the feeding strategies of shorebirds. A

freshman class got a firsthand introduction to the role of a national wildlife refuge in protecting and managing a barrier island. Members of a freshman science club not only studied beach fauna, they grappled with the problem of beach litter. A class from Kansas spent an entire week learning about Gulf coast ecology and staring in amazement at more water than they had ever seen in one place in their land-locked lives.

Students from Garden City College in Kansas measuring black beach beetles during their 5-day stay at the EEC. WM 5/98

Adult groups come to Matagorda Island NWR both to learn and to experience the splendid isolation. Even members who are primarily interested in birds are easily swayed toward other subjects and topics, and they accept our conservation/preservation message without question. Elder hostels have proved to be exceptionally well-informed, pleasurable, inquisitive, and, incidentally, physically fit seniors. These "winter Texans" hale from across the nation, and their interest in the local out-of-doors is boundless. This year we enjoyed consorting with members of the Texas Nature Conservancy who held a 3-day meeting tinctured with Matagorda's unmatchable ambiance and the EEC's fickle utilities.

The "Other" category in the pie graph covers sundry youth groups. Among these is our annual 4-day visit from the high-energy 4-H Summer Ocean Awareness Retreat (SOAR) youth group in Bay City and the kids who enroll in the summer program sponsored by the

Victoria Zoo. Youths in these programs are usually slightly below our lower age limit (13 years), but they are well monitored by counselors and we enjoy working with them. They run us ragged, but they also give us some of our most rewarding moments. It's never too early to start molding healthy attitudes, and these kids are prime targets.

Last year we firmed up a sequence of 20 mini-courses covering diverse aspects of the natural and cultural history of Matagorda Island. These have stood the test of time, and we have not substantially altered their content except for updating. Most of these exercises follow the same fundamental pattern: hands-on field work, an investigative approach, and a discussion follow-up. Hands down, our triumvirate of beach habitat, salt marsh habitat and sand dunes habitat are the most requested topics. Star-struck (viewing the constellations) and Karankawa Country (discussion/demonstration on local Indians) come in close seconds. Although they might not seem to lend themselves to conservation/management messages, even these latter two mini-courses are not pure entertainment. (One reason we can see the stars is the absence of all-night lights. What is the impact of the dark on the well-being of wildlife? The Karankawas lived on this coast for several thousand years without noticeably degrading it. Why can't our current civilization do the same?) At one time or another, we have offered all or parts of the remaining exercises, always with good results.

Looking toward the coming year we have several concerns:

a. Getting visitors to and from the island remains a major headache. TNCT has assumed major responsibility for this aspect of our logistics They made a heroic effort and went to considerable expense to meet our needs this year by contracting with a boat captain in Port Aransas on a trip-by-trip basis. (The boat involved is actually our old *Miss Enron*, now sold, remodeled and renamed *Duchess*). The arrangement worked, but it was nerve-wracking for all concerned. On the day of a trip, we were never quite sure that all parties involved were on the same page. Happily, we never missed or lost a group!

When the *Duchess* was not available, our visitors were ferried to the island aboard a small boat which had to make two trips to get the group across (and two more to get them back again). This meant frustrating delays while awaiting turns, and it threw our protocol out of kilter, since we had only a half-group to work with at a time.

On several occasions we had groups come across on the TPWD ferry. Doc drove to the state park and trundled them to the EEC aboard the TPWD bus. This not only meant lots of lost time in transport, but subjected everyone to a bone-jarring round trip over a bad road. At other times Doc and Martha tried conducting mini-courses at the state park, but the result was definitely inferior to that achieved at the south end (no Conestoga, no EEC, less familiarity with sites for exercises). In the end, nothing works so smoothly as bringing a group right to our dock.

Before we open this spring we hope to have a brain storming session to arrive at a more stable boating arrangement. Alternatives include a different charter agreement and the choice of a closer, more convenient departure site on the mainland.

b. We are still having trouble with utilities at the EEC. We're doing what we can. There is an attendant problem. Since the generator is only used intermittently in the EEC, we no longer have continual power to run the circulation pumps in our aquaria. We need to arrange a hookup to the solar panels so we can get the aquaria back on display.

c. Our Visitors Guide was updated in 1997. That version already needs emendations, but we are waiting until we firm up sundry policies. In the meantime, TNCT receptionists keep potential visitors informed when they make reservations.

d. In the flurry of getting this year started, we neglected to distribute evaluation forms to our early visitors. After that we fell into the bad habit of "meaning to start with the next group." Whether through inadvertent or deliberate forgetfulness, we never got back on track, and so we failed to gather valuable feedback this year. Returning to our routine post-trip evaluations is among our New Year's resolutions.

2. Outdoor classrooms—Students

"That which people discover for themselves generates a special and vital excitement and satisfaction."

This well-founded statement of human psychology governs our approach to visitors of all ages. For most of their stay, we keep them out-of-doors. We do not lecture; rather, we *interpret*, which means we try to provoke an answer from the audience instead of blurting out a solution. And above all, we urge people to handle, to inspect, to marvel, and to think and question. (And to put things back in their places, unharmed.) This is the "hands-on" approach (on a refuge it might be more appropriately called a "hands-on-and-then-hands-off" approach), and it works to perfection in a setting like an undeveloped barrier island. By modifying the level of discussion so that we neither go above nor speak down to a group, the same adventuresome approach is applicable to young and old. Kids can pull in a seine-load of critters from the salt marsh and elders can examine a handful of whip coral on the beach while our guides help them interpret their experience--sometimes with respectful silence. Without further prompting, each visitor will in his own way respond in some measure to confirm a second guiding principle of environmental education: "Through interpretation, understanding; through understanding, appreciation; through appreciation, protection." There is no better way to promote the conservation/preservation ethic than by this method of gentle persuasion.

Our curriculum includes 20 mini-courses, each designed to last about two hours and mostly conducted outdoors. Each course is listed in our Visitors Guide along with some thought-

provoking questions about the topic. Group leaders choose courses to suit their interests and needs. Every mini-course is designed both to educate and to entertain. We have included enough academic substance to satisfy the needs of public school and college classes as well as provide exposure to the principles of refuge management and good environmental citizenship. The format common to all of these presentations is designed to achieve six goals:

a. Provide direct outdoor experience on a barrier island
b. Promote creative, logical individual thinking
c. Impart factual information about Matagorda Island
d. Instill a conservation/preservation ethic
e. Urge contemplation about one's individual lifestyle and the natural environment
f. Offer an enjoyable excursion into the out-of-doors

If, by the above, we help fashion more informed and gentle stewards for our beleaguered planet, our main mission will be accomplished.

A special treat for one group of eager students was getting to watch Dan Kim (graduate student) handle and band an adult white-tailed hawk. WM 10/98

Interpretive Materials and Field Gear

When we opened the EEC it was amply stocked with low-tech, durable equipment. Other than routine maintenance and replacement, we have not had need to add to our inventory. The one outstanding exception is our Conestoga wagon--the specially constructed open-air trailer that we load with visitors and pull behind a truck to get to mini-course sites and to take wildlife tours. The superstructure of the Conestoga was demolished in a tropical storm this summer. Happily, FWS recognized the critical nature of our loss and readily provided materials for repairs during the summer hiatus. The refurbished Conestoga was ready for routine service by the time the first groups arrived this fall.

3. Outdoor classrooms—Teachers

Teacher workshops are given high priority in our environmental education program. Public and private school classes are our main avenue to reaching youngsters and the teachers are our principal liaison. We strive to convince teachers that we have something of value to offer their students and that they can overcome the inertia of logistics and administrative approval to enjoy a successful field trip to Matagorda Island. Teacher workshops are also a valuable testing ground for our program; we get constructive criticism from brainstorming sessions.

One man's junk is another man's treasures! Volunteers combed the beach for three days to collect "treasures" for the beach boxes to be provided to teachers. WM 10/98

We require that every potential group leader visit the island for an orientation session prior to bringing students. Usually several teachers from one school district schedule a trip together. The teachers get a chance to meet Doc and Martha, to see the physical facilities, to visit the sites where mini-courses are conducted, to discuss safety precautions and to ask questions. At the end of the session each teacher has a clear idea of what to expect, and he/she has been made to feel welcome and confident of being able to bring kids to Matagorda. The only exception we grant to the rule that a leader must visit the island before bringing a group is when the point of origin is far away. This most often involves a college class. In such cases we rely on the Visitors Guide and a telephone conversation to be sure that expectations are realistic. To date all such instances have worked out satisfactorily.

In addition to being among our most appreciative patrons, teachers become goodwill ambassadors for the program by spreading the word to others.

4. Interpretive foot trails

We have developed several trails for use by visitors to the EEC, and all of these will be available to drop-in guests when the general public is admitted. Since guides currently accompany environmental education groups along the trails, there is currently no need for brochures and only a few interpretive signs have been erected.

We have four trails within an easy Conestoga's drive of the EEC. Each is used repeatedly during our season of visitation.

a. Wetlands Trail (3 mi), which includes six interpretive signs, two boardwalks spanning the shallows between Mesquite Bay and the shoreline and a path that provides an excellent elevated view of a vast expanse of salt marsh. Along the way there is an observation platform which is a great site for general viewing and discussions of the importance of estuaries. For birding and general wildlife observation, this is our most popular route.

b. Bayside Trail (0.33 mi), which skirts the edge of the salt marsh and is ideal for observing halophytic vegetation.

c. Grassland Trail (0.75 mi) that takes the visitor deep into a waist-deep stretch of climax gulf coast prairie.

d. Sand Dunes Trail (0.33 mi), which gives visitors a closeup view of the unique geology and marvelously adapted xeric vegetation of a dune field and a good chance to see tracks and trails left by the previous night's scrambling fauna.

In addition to these formal trails, we routinely walk visitors along a stretch of beach while we do a show-and-tell about everything from shells and stranded marine life to plastic litter and blowing sand. For birders (and for youngsters who need to work off some energy) we use an informal route 2.5 miles long which takes them to the gulf mouth of Cedar Bayou where we can talk about the ecology of the tidal pass and take advantage of an interpretive kiosk.

On Shell Reef Bayou four miles north of HQ there is an elevated wooden observation deck that overlooks extensive wetlands. The site is used by guided groups transported aboard the Conestoga from the EEC and also by TPWD groups brought by bus from the state park. This is one of the best sites for visitors to view whooping cranes in the winter time and wood storks in the summer time, and it provides a great vista to view the salt marsh habitat.

6. Interpretive exhibits/demonstrations

We have a Canon single-lens reflex camera and the EEC is equipped with a slide projector and screen. We have amassed an extensive slide collection depicting all aspects of the natural history of Matagorda Island. Slides are used to illustrate special topics associated with mini-courses and for evening and inclement weather presentations. Doc also uses the slides during outreach presentations.

We have access to a Panasonic camcorder, a micro-video camera and a 20-inch color TV monitor with VCR and editor. With this apparatus we have made several short videos of island flora and fauna for presentation to groups. The micro-video allows us to exhibit small live creatures on the monitor. A popular activity is to let students collect plankton and then have the group view their catch on video. The technique is quick, effective and it eliminates the need for a battery of microscopes. We also have a small collection of commercial video tapes to show for special interest groups or during inclement weather.

Despite our color slide and video capability, we de-emphasize their use. Certainly these tools have their place in our program, but we put top priority on first-hand, outdoor experience. If visitors want to see ghost crabs or periwinkle snails, for instance, we prefer to take them to the beach or the salt marsh rather than show them pictures.

We have several terraria and cages in the EEC for temporary display of live reptiles, amphibians, and rodents.

We have shelves and cabinets loaded with bones, shells, teeth, exoskeletons, sea beans, and sundry other items relating to Matagorda Island. Most groups are treated to a show-and-tell session which stimulates endless questions and discussion. Other interest-getters include a mounted green sea turtle and Matagorda's very own mummy. (No details on the latter; you've got to come see for yourself!)

Our new museum, "The Blue Whale," is housed in a separate building and has already become a favorite with visitors. Shells, sea beans, messages in bottles, and an assortment of other interesting items collected on the beach are on display.

"THE BLUE WHALE" BEACH DEBRIS MUSEUM ON MATAGORDA ISLAND

Variety of shells, sea beans, and other natural items. MM 3/99

Hard hats, toys, and just about everything else that floats. MM 3/99

Collection of bottles with messages in them. MM 3/99

We use commercial posters, topographic maps, and aerial photographs to stimulate interest and orient visitors.

Although it is not complete, our herbarium is well started. The pressed specimens are available for study by research workers and they can be used as demonstrations for environmental education groups.

On our front lawn we have a display of provocative items that were found on the beach. These range from a hand-crafted West Indian pirogue to sea turtle shells and TEDs and a bag full of polyethylene resin pellets. All are excellent attention getters.

We recently erected an interpretive kiosk at Cedar Bayou near the camping shelters. This has been well-received by drop-in visitors, and we include it on the itinerary when we take groups from the EEC to observe the tidal pass.

Sand filled in around the base, but the new kiosk at Cedar bayou stood up to TS Charlie and Frances. WM 9/98

7. Other Interpretive Programs

A portable, table-top exhibit board was obtained this year to enable displays of the island programs at meetings and public facilities. A presentation was developed by Doc and Martha on the environmental education and research programs conducted on the island. This display was shown by RM Pease at the National Wildlife Refuge System Conference held in October in Keystone, Colorado. This was one of only 50 presentations selected for display. The exhibit was very well received by conference attendees.

Doc routinely gives outreach presentations to organizations in local communities on the mainland. He also gives guided tours and orientation presentations to any special groups that visit the island.

Poster presentation at Keystone by RM Pease. LG 10/98.

Each spring Doc and Martha conduct a field exercise for approximately fifty K-3 kids on the edge of Hynes Bay at Austwell. It is always an absolutely delightful experience.

Both Doc and Martha occasionally participate in environmental education events conducted by the mainland staff on the Aransas Refuge. This year they are helping to rewrite trail guides to the popular Heron Flats Trail.

8. Hunting

Most of the south end of Matagorda Island falls within the two environmental education/interpretive zones designated as off-limits to hunting (cf. CMP, Map 5). There is a provision that a public deer hunt might be allowed in this area if necessary for population control.

Despite the hunting restriction on the island-proper, the extensive bayside marshes—which include Bray Cove, Big Brundrett, Crane, and Yucca lakes and Shorebird Marsh and Shell Reef Bayou—are all open to waterfowl hunting according to regular State and Federal regulations. We simply monitor these areas to be sure the hunters are behaving themselves, especially when the whoopers are here. Considerable wildlife disturbance results when guides use air boats to transport duck hunters to hunting blinds along the bay shore.

TPWD is authorized at its discretion to conduct annual monitored public hunts for white-tailed deer, mourning doves, bobwhite quail, waterfowl and feral hogs on the Wildlife Management portion of the island. Both TPWD and FWS ensure that this activity is within refuge objectives.

9. Fishing

Saltwater fishing is, hands-down, the most popular recreational goal of visitors to Matagorda Island. The sport is pursued year-round along the entire bayside, at both tidal passes and the adjacent surf, and at the public beach on the north end. The CMP calls for two public fishing piers to be erected on the north end: one at Army Hole and the other off the public beach. Materials for the surf pier have been purchased, but we are awaiting fair weather to begin that demanding job.

Fishermen arrive by private vessel and via the TPWD pedestrian ferry. When the Gulf is calm, fishing boats cruise through Pass Cavallo and anchor just beyond the surf zone along the northern two thirds of the island. Cedar Bayou is a designated fish pass and is not open to boat traffic, so the surf on the southern third of the island is fished mostly within walking distance of the tidal pass. On any given day when the bay is not too rough, private boats and wade fishermen can be seen on the oyster reefs and around the margins of the bays. Many of these parties are served by professional guides. Some of them take advantage of our boardwalks and the Wetlands Trail to fish along the edge of the island. So far we have had no conflicts between the fishermen and classes using the same sites. During the summertime small boats ply the bayside shallows at night using powerful lights to locate flounder. Some fishermen moor their boats in Power Lake and walk across the island to fish at the Darlington shipwreck on the Gulf beach. They have been granted this access so long as they do not litter the area or disturb the whoopers. Of greater concern are the fishing parties who enter the bayside inlets in air boats. The roar and vibration from these craft disturb wildlife and any other recreationists in the vicinity. However, such ingress is entirely legal.

On the south end of the island our main contact with fishermen is at the Gulf mouth of Cedar Bayou. On weekends in peak months more than 100 people visit this site and as many as 15 groups may camp overnight on the tip of the island. In general the fishermen are well behaved and present no problem to our management program. By providing them with shade shelters (see Camping) we have enticed them off the islets used by birds. There is a minor trash problem around the shelters, and sometimes dogs are allowed to roam unleashed. A word from any uniformed personnel usually elicits willing compliance.

11. Wildlife observation

The CMP defines wildlife/wildlands observation as, "visitors observing wildlife or wildlands, not as part of another activity such as fishing, environmental education, interpretation, hunting, etc." (p. 7.48). Once we accept drop-in visitors who will arrive at our dock in their own vessels, we expect that the varied avian fauna of Matagorda Island will attract many groups of birders (individuals interested almost exclusively in observing birds in the field). Indeed, Matagorda Island is among the sites included in a coast-wide Great Texas Coastal Birding Trail intended to attract birders from afar and to boost ecotourism in the state. Presumably because of limited access to the island, most ecotourists will use the public ferry and, until a shuttle service is implemented, they will confine their activities to the vicinity of the state park on the north end. Such proved to be the case this year.

Generally birders are environmentally conscious, well organized and well disciplined. They usually go afield in groups with designated leaders. They will be prime candidates for using the self-guided Wetlands Trail. They could pick up maps and bird lists from the kiosk at the dock when we get those facilities established. As time allows, we could occasionally transport such parties to the observation tower at Shell Reef Bayou or to the Gulf beach to scan for pelagic species.

Another potential category is wildflower enthusiasts. The best wildflower viewing on the island can be done from the blacktop and shell roads in the vicinity of Headquarters, because plants bloom especially well where we mow the roadsides. We could provide a map and plant list at a kiosk for walking or biking groups. If we have not committed the Conestoga otherwise and we have the manpower, we could give an organized group an impromptu guided wildflower tour.

We may soon have sea kayakers on our doorstep. The activity is becoming more popular and both individuals and organized groups have docked and camped on the beach near the state park. We have found that these people are quite interested in marine life, shells and birds. If it is convenient, they might like to hike the Wetlands Trail or meet with a member of our staff for a show-and-tell session in the field.

12. Other wildlife recreation

When our dock is opened to the public we anticipate the arrival of visitors who desire to enjoy the outdoors by bicycling, day hiking and backpacking along the Gulf beach and on designated roadways and trails. Others will come to beachcomb. Our immediate commitment will be to provide maps and post regulations and safety warnings at a kiosk beside the dock. The need for outdoor toilets, designated campsites and a visitors' reception site complete with first aid center will inevitably follow. At the moment we have neither the materials nor the manpower to meet this obligation.

13. Camping

Primitive camping with access to shade shelters with tables, biodegradable toilets and an outdoor cold water shower is available for a $4 daily fee at the Army Hole and Public Beach at the state park. Free day and overnight use is permitted on the J-hook and at Cedar Bayou. Because of isolated location, vagaries of the weather, lack of fresh water and seasonal hordes of mosquitoes, most camping takes place during spring and fall.

A young visitor on the beach at Cedar Bayou. WM 6/98

On the south end of the island almost all campers are fishermen, sometimes accompanied by their families, who visit Cedar Bayou. In 1995, we erected eight shade shelters complete with picnic tables on a sandy upland inside the Gulf mouth of the pass. These were available free of charge to anyone desiring to camp at the site. The project was an immediate success; the sites are in almost daily use. There are no toilets, and we can manage only an occasional trash pickup. We have erected a kiosk nearby where we posted regulations, safety tips, ecological information and an emphasis on the value of voluntary caretaking of the site.

By the end of this year, the weather and the inherently unstable topography at the tip of the island had begun to take their toll on our camping area. Near the end of 1997 we had to dismantle two shelters which were eroding into the bayou. After our two tropical storms in 1998, two of the remaining six shelters are again threatened, another had its roof ripped off and one of our plastic tables has been washed onto an islet in the bayou. Fortunately, our new kiosk was spared. So the place is in bad need of maintenance. We will have to make an educated guess about the direction of further erosion before refurbishing the facilities.

14. Picnicking

There are no sites on Matagorda Island especially designated for picnicking. Visitors commonly picnic in shade shelters at several locations in the state park. Many erect makeshift awnings and picnic on the Public Beach.

On the south end, we have a large shade pavilion with two tables on a breezy upland within easy walking distance from the boat dock. This old ranch structure was renovated for use by environmental education groups, but it will be available for incidental visitors. If the level of drop-in visitation warrants it, we could erect standard shade shelters near the boat dock.

16. Other non-wildlife oriented recreation

We anticipate visitation by bicyclists and hikers whose goal is outdoor exercise and exploration rather than wildlife observation. We may play temporary host to sailboaters and kayakers who seek to dock or camp on the island during excursions. So long as they adhere to our general rules and regulations, these people should present no problem.

Several mini-courses offered at the EEC focus on aspects of the island other than its wildlife. We offer the topic of cultural history, which involves a tour of the Wynne ranch site (including a visit to the spots where the space satellites were launched) and a trip to the lighthouse and Confederate trenches. Another mini-course highlights the Karankawa Indians, the original human inhabitants of Matagorda Island. Other non-wildlife subjects include a study of the tides, the dune field, plastic beach debris, the stars and island geology.

Although several archeological sites have been identified on the island, none lends itself to public display. If such a site were discovered, it could be marked for guided visitation. Artifacts

could be put on display in the Visitors Center at the state park or in the museum at the EEC. For those interested in local history we routinely recommend a visit to the excellent museum in Port Lavaca. Exciting work has been completed by the state in salvaging one of La Salle's ships from Matagorda Bay. We might be able to capitalize on this historic find with displays, replicas and fascinating information.

17. Law enforcement

TPWD no longer keeps a game warden on routine duty on Matagorda Island. However, state game wardens for Calhoun and surrounding counties are on call. The general absence of wardens means that we must trust sportsmen to obey state and federal wildlife bag limits and other ordinances.

RM Pease and ROS Sanchez are Refuge Officers. Both officers began doing monthly weekend duty at Aransas NWR in March. Officers also patrol the deer hunts held at Aransas NWR. SA Marshall, out of Victoria, TX visits the Island many times during the year and utilizes available facilities.

During 1998 no instances of a controlled substance stranding on the beach nor any known violations of state or federal laws occurred.

18. Cooperating Associations

In January, 1991 FWS and TNCT entered into a five-year Cooperative Agreement which recognized the presence and assistance of TNCT on Matagorda Island as beneficial to the environmental education and research goals proposed for the south end of the island (cf. Appendix C, Department of Interior Environmental Assessment). The agreement worked to the benefit of both parties. In December, 1991, the Enron Foundation of Houston made a seven year, $1.956 million pledge to TNCT to provide funds for renovation of a ranch building into the EEC, to construct and operate the *Miss Enron*, and to start up the environmental education program. In 1993 FWS hired Dr. Wayne H. McAlister to develop and administer the environmental program. The joint operation officially opened in 1994. However, by the end of 1996 TNCT felt that its continued presence on the island and the upkeep of the Wynne lodge were too financially taxing. During 1997, although TNCT no longer had physical presence on the island, it continued to contribute to the environmental program by providing receptionist service, helping to maintain the EEC building and its appliances and by operating the *Miss Enron*. In 1998, TNCT sold the *Miss Enron*, then negotiated a contract with the new owner to use the vessel (renamed *Duchess*) to transport visitors to Matagorda Island. This arrangement proved less satisfactory than the original one, but the EEC managed to meet its transport obligations. In addition, TNCT continued to help with maintenance of the EEC building and provided receptionist service from its Mad Island Marsh Preserve.

For the last two years FWS and TNCT have been working together on a handshake rather than a formally signed Cooperative Agreement. We intend to have a face-to-face meeting of the principals involved before the environmental education program is due to start up on March 1, 1999. The major issue will be transport and how it will be funded.

During the year the environmental education program at the EEC continued to generate close working relationships, if not actual partnerships, with several organizations. We routinely offer mini-courses for students from the Palacios Marine Center and the Texas State Aquarium. We have become recurrent hosts for students in several local public and private schools and for local summer youth group organizations as well as with several community and senior colleges. We have been certified by the TEEAC to hold summer workshops for high school teachers, and we are sanctioned for visits by the Girl Scouts of America. We have enjoyed cordial relations and cooperative visits from members of the Audubon Society, the Sierra Club and several local conservation-oriented organizations.

Aransas were brought to the Island for a week in May. Over 350 cubic yards of topping material was hauled from the runway at the north end to cap the road.

Other roadwork was completed by Petro-Guard, Inc., following damage during the seismic operations in 1997 and drilling operations during 1998 on the north end of the Island. Eight culverts were replaced and numerous holes in the roadway fixed and refixed. Additional work, including the grinding of runway material, is scheduled in 1999.

Design work was completed by a contracted engineering firm, Merrick, Inc., to provide the drawings for rehabilitation of the north end dock, south end roads, and replacement of the primary beach access road on the north end. Permits were obtained for dredging and bulkhead work from the Corps of Engineers. Work is scheduled during the summer of 1999.

Damages from Tropical Storms Charlie and Frances during August and September 1998, were tallied and emergency funding requested. A total of $976,000 in damages occurred on Matagorda Island and mainland support facilities. Funds were appropriated by Congress but held up in Office of Management and Budget (OMB) for review prior to dispersement at years end. The following is a review of the damage report and funding requests:

Boat and Motors - $9,000	
16' Polar Kraft blown off the trailer	Engine destroyed
19' Monark sunk	Engine damage
Buildings - $280,000	
Wind damage to the hangar	Panel and doors blown off
Qrts. MI-1 (trailer house) blown over	Completely destroyed
Lodge wind damage	Composition roof severely damaged
Equipment - $2,000	
Conestoga blown over	Base damaged, top destroyed
Facilities - $564,000	
Levee/trail/culvert/bulkhead	Erosion & structural damage/destroyed
Docks (mainland and island)	Pilings & finger pier damage/destroyed

The damaged Conestoga identified above was fixed and ready for use when the education center reopened in September.

I. EQUIPMENT & FACILITIES

1. New Construction

The Aransas NWR YCC crew worked on the Island for two weeks constructing the initial segment on the Lighthouse Pond Boardwalk. The 5-foot wide boardwalk will eventually cross through the salt cedars between the lighthouse and Lighthouse Pond. Construction materials were purchased using Coastal Ecosystem Funds. Trying to take advantage of breaks in the vegetation, the boardwalk makes several twists and turns; which adds interest as well. Constructed out of wolminized lumber, the boardwalk traverses a seasonally flooded salt cedar marsh. The crew completed approximately 140 feet of walk way.

Construction materials were purchased for a new Gulf fishing pier. Materials to construct a 200 foot pier with a T-end cost $20,000. The remaining funds were used to purchase a portable compressor needed to construct the pier. Refuge personnel, along with partners, will construct the pier in 1999.

Initial segment of the lighthouse board walk constructed by YCC. MM 7/98

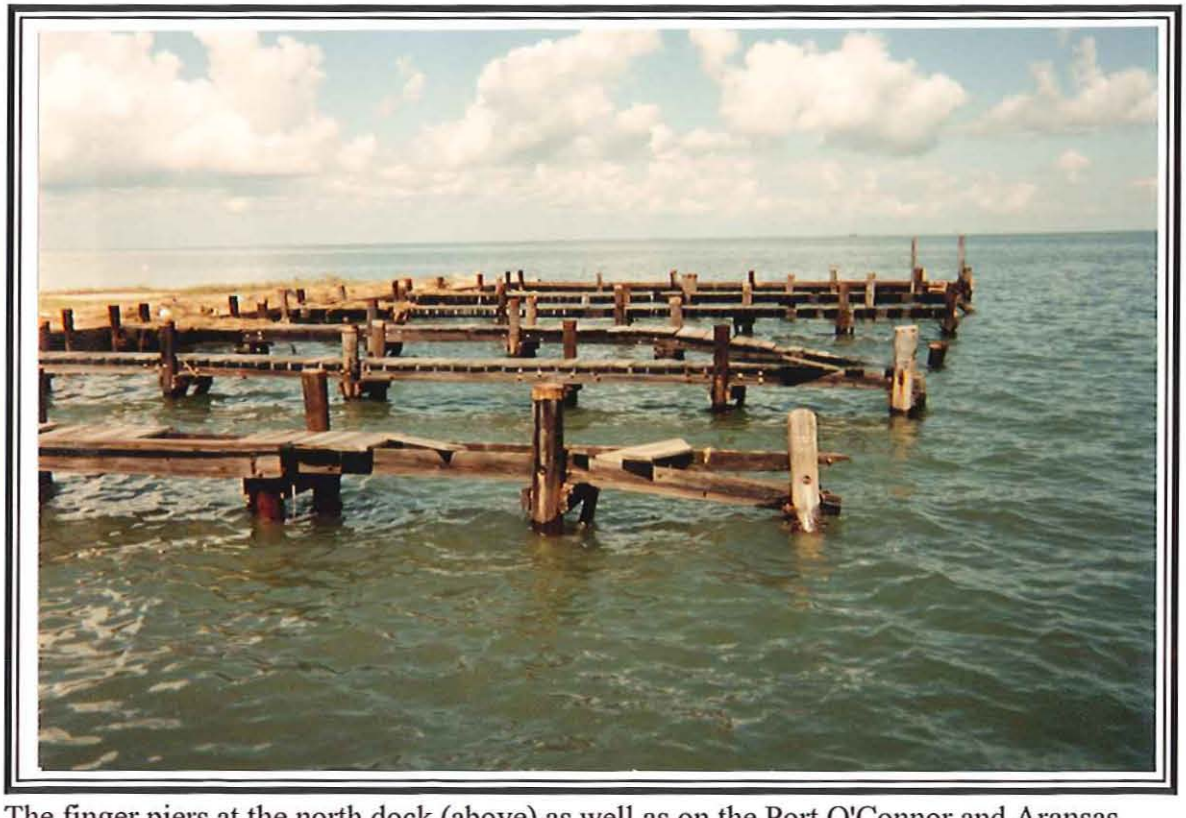
2. Rehabilitation

A .3-mile section of road just north of the old Wynne Ranch boundary was rehabilitated in April and May. The road suffered extensive damage from months of standing water in low areas. The ditches were repulled using a tractor/plow and maintainer. Personnel and equipment from

MI-Qrts-01 (trailer house) was completely destroyed during Tropical Storm Charlie. WM 8/98

The Conestoga appeared more like carrion at the end of the runway following TS Charlie. WM 8/98

Bulkhead at the north dock lost an additional 30 foot section during TS Francis but was already scheduled for repair. JS 9/98



The finger piers at the north dock (above) as well as on the Port O'Connor and Aransas Refuge docks were damaged during TS Francis. JS 9/98

3. Major Maintenance

Levees

Maintenance of the levees took considerable time and effort during the year. The new excavator purchased using drought funds for the Aransas NWRC was brought over to the Island twice during the year to repair the levees and culverts. Storm tides and high winds continually damage the culverts at Shell-Reef Bayou and Little Brundrette. One problem is the lack of a wave barriers, which have deteriorated through the years. A second aspect contributing to the problems may be the number of culverts installed. At both sites three and four, culverts were placed side by side. This allows for large quantities of water to flow under the levee and may create eddies at the side of the culverts. If the refuge receives the storm damage funding identified above, installation of breakwaters and levee protection will be a priority.

Generators

The Onan generators used to power the EEC and Doc's house were continually problematic. starter, regulators, and generator brushes were continually causing breakdowns. The generators were probably not meant for the use that we were asking from them. The second problem was the moist environment. The equipment was not built for environments where humidities at night were regularly above 90%. An additional part was installed on the generators at the end of the year to maintain a dryer environment at critical points.

Boats

Prior to 1998, the refuge had not had a boat sink since acquiring the south end of Matagorda Island, over 10 years ago. This was a bad year. We had three sinking incidents during the year. The first incident occurred in the boat house on Matagorda Island on February 1. The gray cabin boat, used primarily by the McAlisters, sunk during heavy northwest winds. There were, however, extenuating circumstances. The starboard side fuel tank and one of the oil reservoirs were empty when we found the boat. It is believed that some visitors, who were anchored offshore, came over during the weekend and emptied the tank and reservoir. The oil reservoirs are strapped down using a bungee cord. The cord found its way into the bilge and lay over the float. The heavier port side (windward side) caused the boat to rock more than normal, the bilge pump was not able activate, and the boat took on water. The boat was hauled out and towed to the mainland.

The second incident involved the Aransas work boat (19' open Monark) which sunk as a result of Tropical Storm Charlie on August 22. The boat was tied up at the Aransas dock. Wind and wave action caused the boat to begin taking on water. The boat was found just as it was taking on water; however, water did get into the carburetors.

The third incident occurred when the gray cabin boat sunk at the Aransas dock on November 13. Heavy rains and rough seas from a front that came through the area put water into the bilge. Once hauled out, the bilge pump was found to be faulty.

The up side of these three incidents was the ability of the staff members to deal with these events. Aransas MW G. Fletcher (hired in 1997) brought years of experience of working on boat engines and is a certified Mercury/Mariner technician. MW Stringo has years of experience working on boat engines and attended the Mercury/Mariner School in April, 1998. Together, they were able to tear the engines down and clean and rebuild them. Work was generally completed within two weeks of the incidents. Parts to rebuild the engines cost the refuge about $750 per engine. This is compared to replacing an engine at $4800 each. For six engines, a significant savings, thanks to talented staff.

Motor Grader
The grader engine was replaced with a rebuilt engine after it was found that one of pistons had broken. Cost for the replacement engine was $8700.

4. Equipment Utilization and Replacement

Due to the harsh island climate, the life of a vehicle on the island is short (average 2 years). The island acquires surplus and excess vehicles from other Service field offices to help with the rapid turn over. A 1988 Chevrolet 4x4 van was transferred from Buffalo Lake. The van was used at the nuclear energy plant for emergencies and makes a good research student or volunteer vehicle. A 1988 4x4 Chevrolet blazer was transferred from Tishomingo NWR. A 1988 Dodge Pickup was transferred from McFaddin NWR. Vehicles that left the Island include a 1983 Chevrolet pickup, a 1985 Chevrolet blazer, and a 1972 GMC dumptruck.

The John Deere wide track loader was repaired and taken out to the Island. The loader bucket was removed and a blade installed. The tracked vehicle allows us to work on levees and other heavily mesquite areas without the worry of punctures. In order to get it operating, replacement costs for parts totaled $3100. Once it arrived on the Island it was put to work immediately on levee repair.

Much of the equipment on the Island is aging fast. Rust and corrosion has a firm hold on the tractors, loader/backhoe, grader, loader, and dump trucks. We are looking to replace the dump truck now, but all equipment will require replacement soon. What are the minimal needs for equipment on the Island? Maintaining equipment or barging equipment on and off the Island; what is the best approach?

A 10 Kw Kohler generator was purchased for the pilot's house. 3500W and 5000W generators were purchased for the barge and field use. An Emglo portable compressor was purchased for the fishing pier project.

The 1973 John Deere track loader from Aransas was repaired and brought to Matagorda Island. There it was converted to a dozer for use on the levees. WM 10/98

5. Communication System

Finally a move forward on the communication front. Golden Crescent Communications out of Victoria, Texas, installed radios during January and February. A base station was installed in the office with a handset installed in the Pilot's House. A mobile unit was installed in the fire truck. All remaining vehicles have "slip-in" units installed. Unfortunately the giant step forward included a step backward; the "slip-in" units are problematic. The units break easily and collect sand and debris. A person must have a portable radio to slip into the vehicle mount. Three radios were initially signed out to the Island (for a six-person staff). Additional radios are available but cannot be programmed with current equipment.

7. Energy Conservation

The Island had made great strides in reducing its energy demand by eliminating the large diesel generators in December of 1997. This year required ingenuity to pull it all together. The large generators had provided electricity for all buildings and supported the water system. Doing without them proved challenging and frustrating at times at times, especially for residents.

The water system was and is the biggest challenge. A 220V down hole pump supplies the storage tank. Without the large generators, a small portable generator has to be moved onto the sight and run for a day every week to fill the tank. A wooden windmill was constructed in March. The windmill was an attempt to provide sufficient water for the headquarters area without having to use portable generators. The windmill was erected above an old well near the storage tank. Unfortunately, the well was not able to produce the volume of water necessary due to being abandoned for years. A new well near the storage tank is proposed.

From the tank, water is gravity fed to the buildings. At the Pilot's House and educational center, photo voltaic and DC pumps were set up to pressurize the water into the buildings. In addition to the pumps, wiring was installed to operate DC powered lights, fans, and telephones. In the education center lab, bait well pumps will be used to aerate two aquarium tanks. We have had one problem—two pumps have burned out because of low water volume in the storage tank.

The small propane generators have not worked well. With proper sizing and purchasing industrial grade equipment, we expect less headaches dealing with down generators. The 16kW generator for the shop area has been hassle-free once we got it on line. A concrete slab was constructed for a 500 gallon convault to feed the shop generator. The 5x11 foot slab was poured on elevated ground near the generator building. Fuel usage is estimated at 7 gallons of diesel and 20 gallons of propane to provide electricity to the facilities. This is compared to 65 gallons of diesel and a gallon of oil. Annual expenditures prior to the conversion was $26,000 annually. This year's expenditures totaled $12,500.

8. Other

What is historical—what does it mean? The answer to this questions remains open. The Service met with representatives from the State Historic Preservation Office (SHPO) in January to come to an agreement. After a site visit, SHPO cleared the way for demolition following appropriate documentation. Construction dollars appropriated from Congress were used to contract a photographic documentation on the buildings. A second contract to document the importance of the human aspect (who they were and what they did) was prepared and ready to go out on bid in December. The photo documentation was completed and turned over to SHPO. Prior to the release of the second contract, the Service was notified by SHPO that they were pulling out of the previous understanding and that the buildings could not be destroyed.

At year's end we still asked, "What is historical and what does it mean?" Guidance from the Regional Office has been to begin planning evacuation of what is left of the Murchison/Wynne Ranch Headquarters. An alternative construction site where a single building could be built to provide shop, vehicle storage, office, and crew room space is proposed. One interpretation is that the historic zone extends up to one mile from the complex. This includes the boat house and docks. The old boat house was torn down in 1984 and new facilities constructed. Only a rusting bulkhead and the remains of the barge ramp remain of the "way it was." The story gets farther from the truth as a visitor makes his way toward the Headquarters; a 3/4 mile journey. White

painted fences and corrals which once bordered the road and headquarters area are now gone. The sprawling headquarters, which housed ranch hands, servants, family, and friends, included at least 13 buildings—now down to seven buildings.

Today the Service utilizes and maintains four buildings.

a. The Pilot's House, which once housed the pilots and ranch hands, was remodeled in 1997. This building is home to the only Island resident.

b. The ranch house, once home to cowhands, was remodeled in 1994. Today the building is the Enron Environmental Education Center and provides education and overnight facilities for Center attendees, graduate students, and partners.

c. The shop facility continues to support refuge needs but has undergone renovation and repair.

d. The tack building, which included rooms for duck plucking, butchering, milking stations, a "walk-in cooler," and stored tack, is now storage and home of "The Blue Whale" (the only known beach debris museum).

One out building was destroyed in 1988. In 1989 the oldest building (the foreman's house) burned down following a propane leak explosion. This was the only building that predated the Murchison/Wynne Ranch period which began in the 1930's. In 193, the Kaufman barn and attached pens were demolished. In 1997, the generator building and two out buildings were destroyed because of safety concerns. Miles and miles of fences have been removed within this "historical zone" during the past 12 years.

The remaining buildings include the lodge, hangar, and duplex. The lodge is the most controversial. Parts of this building are 50+ years old and the key to the historical designation. The building was used and maintained by The Nature Conservancy of Texas from 1987 until January 1996. The furnishings in the building had been donated to them by the Wynne family upon their departure. Used as a lodge, TNCT brought visitors to the Island as a means of receiving donations for their program. By 1995, the building was in need of a new roof, releveling, and other repairs (estimated $250,000). They shut the lodge down and removed the furnishings. In the years since, the building has been left vacant and has continued to deteriorate. Tropical Storm Charlie did significant damage to the shingled roof. Today, estimated repairs exceed $500,000.

The hangar is still used for equipment and vehicle storage. However, the metal construction continues to deteriorate and heavy winds damage the structure. The building is a safety concern but without anywhere else to store vehicles and equipment, we continue to use it. This massive structure is not repairable. In fact demolition would cost over $100,000. Plans to demolish the structure and build a pole barn and shop were in place. With disaster funds, this looked probable. However with the historical designation in place, it's a "hands off" policy. The duplex is in fair shape but is without utilities. Without a facility plan that doesn't change yearly, we have been hesitant to put money into this rarely used building.

During the past years the refuge, cooperators, and partners have invested large amounts of time and money into maintaining and improving the facilities to meet refuge needs. Unfortunately old facilities cost a lot to maintain. This is increasingly true in the harsh island environment. New facilities are needed, but what is to become of the old? Without use, they will deteriorate even faster. We can not prolong the life of the Murchison/Wynne Ranch era. The fact is, it's already gone. But do we salvage the aura and intrigue or let it fall to ruin?

J. OTHER ITEMS

2. Other Economic Uses: Oil and Gas

Petro-Guard Production of Houston, Texas, followed up their 1997 3-D seismic project with two drilling locations on the island. Staff worked with the Petro-Guard drilling supervisor and engineers to select drilling locations which minimized impacts to the bayside marsh, heron rookeries, and freshwater wetlands. Petro-Guard's environmental consultant, Entrix, Inc., developed the: *Addendum Environmental Assessment for State of Texas No. 1 and No. 1 I-1 Proposed Exploratory Wells located on Matagorda Island, Texas.*

Special Use Permit M-9802 was issued to Petro-Guard on July 27, 1998, for access and drilling two oil and gas wells on the refuge. An additional surface easement was provided to Petro-Guard to access their leased mineral estate from a site on the refuge that required the actual drilling to pass through unleased mineral estate—a necessary action to avoid damaging wetlands This procedure was required by the State Railroad Commission in determining royalties to affected mineral owners, if any.

The drilling rig was moved to the southerly of the two tracts (State Tract I-1 #1) on August 17. A pad was cleared, ditched, and bermed, and a board road and drill site installed. The site was kept orderly outside of a few instances of trash being left along the periphery. Rain drainage water washed oil and fuel that had leaked from all the heavy equipment on the site into the ditches, which required pumping and hauling off-island for disposal.

The drilling progressed for almost a month, with fits and starts as the drill bit became lodged several times due to the steep angle and complexity of the drilling profile. The drilling was discontinued when the drill bit could not be recovered short of the target location of only 100 to 200 feet! None of the sands logged offered any natural gas worth developing, and the well was closed in. The rig was moved to the northerly location (State of Texas #1) and the process repeated. It was not stuck drill bits this time but tropical storms that pestered the drilling rig. Heavy rains and high winds required abandonment of the site at least twice, causing the drilling and recovery operation to be extended beyond the October 15 closure date.

This second well hit on some reserves of natural gas; however, there was not the commercial quantity to justify its development, especially when the existing delivery pipeline is in need of complete rehab. This well was shut in, equipment and board roads were hauled off the island, and the drill pads contoured back to their original condition. Road damage could only be temporarily patched due to time constraints. Petro-Guard will be back after April 15, 1999, to complete the road repair.

The other potential oil and gas operator on the island is Tower Oil, LLC, of Nashville, Tennessee. We issued a SUP in July 1997 to re-enter three existing wells on the island. Included in this SUP was the right to use the 4" collecting pipeline that is used to service these

wells. No one from Tower Oil has been on the island since September of 1997. Correspondence with Tower Oil in 1998 included a request on permits and procedures for drilling new sites on the refuge in April and a request by their law firm in September requesting the Service's policy with respect to oil and gas activity on Matagorda Island. Responses were sent to both requests. Tower Oil appears to be tied up in a law suit with Petro-Guard over the mineral rights on the island. The outcome of this suit has not been made known to the refuge at this time. There is a question as to whether Tower Oil has abandoned all rights to the minerals and associated structures since no development work has occurred for over a year. The refuge is pursuing the status of the mineral holders on the island.

Special Use Permit ARN-9808-1 was issued to ARCO Environmental Remediation, LLC, on August 20, 1998, for the purpose of removing an abandoned pipeline and the associated surface structures on Aransas and Matagorda Island refuges. Preliminary project assessment was performed by Shiner, Moseley, and Associates, Inc., Engineers and Consultants. The primary concern of the refuge was the pipeline structure that had eroded such that it was exposed in the GIWW and refuge boat channel. There existed the potential for a loaded barge grounding on this structure, causing chemical/oil spills on the refuge. The removal work was strongly supported by the refuge.

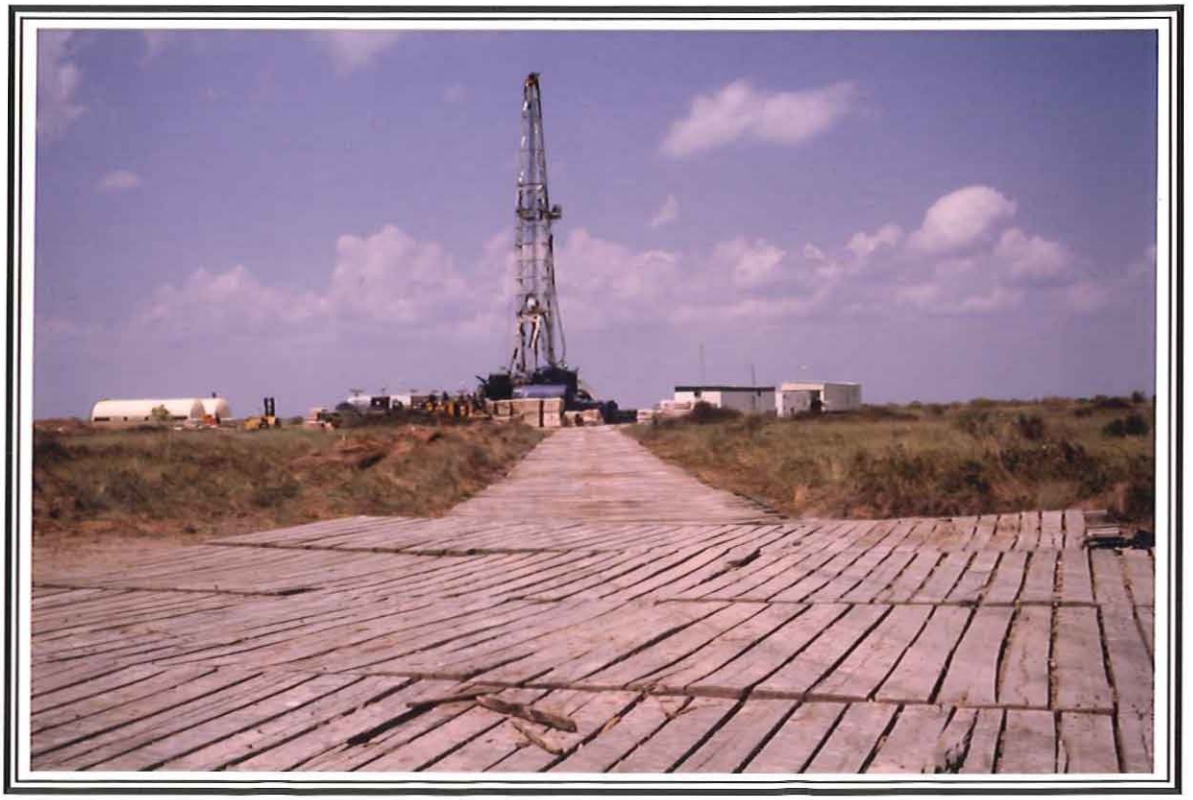
All went without a hitch until the pipeline was cleaned out on the Matagorda Island terminus. The initial pressure flushing showed little or no condensate; however, 20 minutes after the valve was opened, a slug of water and condensate sprayed out, coating the mesquite trees, prickly pear cactus, and cordgrass in the immediate vicinity. The contractors, Kingfisher Marine, washed down the site, including all the vegetation, with fresh water. They thought the spray was minimal and did not report the spill. Upon inspecting the site a couple of days later, RM Pease discovered the mesquite defoliating and the cactus had wilted in the project area and a strong petroleum odor. Investigation into the flushing project revealed the cause of the dying vegetation.

Kingfisher Marine owned up to the damage; they had thought the site was cleaned adequately to prevent any damage. The long-term damage may be minimal; however, the lack of notification and communication put the permit in jeopardy. The refuge decided to wait until spring green-up to determine total vegetation damage. In the mean time, a mitigation agreement with ARCO and Kingfisher Marine was reached wherein they would provide support of the Aplomado Falcon recovery project on the island. This consists of fabricating up to 20 artificial nest structures to be installed on the island. The design and specific locations will be provided by the refuge.

Seismic survey interest in the island continued, but thankfully never materialized. Petro-Guard notified us early in the year that they wanted to re-shoot part of the island, conducting new work into the Gulf with receiving lines to be re-laid over the previous grid. This did not go over well with staff, having felt that we had seen the last of seismic in this area. It may have partially been due to our reluctance; Petro-Guard decided to hold off any additional seismic for at least a year and proceed with exploratory drilling.

Western Geophysical shot seismic in the bays south of the Aransas and Matagorda Island refuges. They proposed shooting our shorelines and associated bays. However, once we met with Western Geophysical and outlined the permit process and access limitations, they decided to review the proposal and get back to us. This is purely a "spec" shoot; gathering seismic information to sell to oil development companies. The refuge sees no compelling interest to allow spec shoots on the refuge.

The last inquiry came from Mr. Robert Sinclair, an independent operator. He claimed to now hold the Wynne mineral rights on the island and wanted to conduct seismic surveys of the property. Other than a phone call, little is known of the standing of Mr. Sinclair, whether he is a legitimate mineral developer or purely a speculator. With the price of oil at historic lows, perhaps 1999 will be a quiet year in oil and gas activities on the island.



Petro-Guard well site #1. WM 8/98.

Deteriorated roads due to oil and gas activities on Matagorda Island. JS 9/98.

4. Credits

The following employees wrote sections and assisted with the editing of this narrative.

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Jennifer Sanchez - Sections: A, B, E, F, and I
Chris Pease - Sections: C, J, and K
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K. FEEDBACK

I am writing this section on March 15,1999, five days after completing eight years on the island and two weeks before my PCS to Sabine NWR in Louisiana and Region 4. I look back at all that has been accomplished, and all that is left to do. The undone part looms large, a cancerous growth fed by insufficient budgets, increasing bureaucracy, too few staff, politics, tropical storms and molecular breakdown. The best anyone can do about these forces is tweak them, limit their impact and try to take advantage of the brief benevolent periods.

Not to be intimidated by what's left to be done, there deserves a look at what has been accomplished, and nothing has been accomplished on the island without lots of help. The logistics alone will forever keep the island refuge joined at the hip with the Aransas mainland refuge. Vehicles, equipment, budgets and staff are shared to ensure operation and project completion. The lines between the two refuges keep blurring, which has proven a more effective means of getting the work done (however, the island org-code is still much needed for proper RMIS, MMS, RONS, budget, etc., reporting).

The inter- and intra-agency relationships also help pull the island programs together. The partnership with TPWD which gives them the lead in public use management allows the refuge to focus its limited resources toward habitat and critter management. The partnership with TNC on environmental education allows us to provide quality, educational field courses to an array of students and adult groups that could not otherwise occur. The working relationship with USFWS-ES, TGLO, TNRCC and USCG has established an invaluable partnership in coordinating response to oil spills and hazardous drum recovery.

The refuge has worked with the Peregrine Fund over the past three years, enabling three successful releases of aplomado falcons on the island with a fourth season scheduled for 1999. Participating in the Coastal Ecosystem Team has provided needed funding opportunities to address marsh enhancement, invasive species control and increased public use and environmental interpretation on the refuge. The growing relationship with Calhoun County, Petro-Guard and other potential partners on the development of the Lighthouse Interpretive Area will improve public use and overall acceptance of Service and TPWD programs on the island.

All the successes still rely most on dedicated staff. The current crew on the island cannot be topped for their commitment to the refuge, the wildlife resources and to each other. I wish the best for Jennifer, David, Will, Doc and Philip, and offer my friendship and support throughout their careers and life's travels. I hope to have the opportunity to work with such a fine cadre again in future assignments.

Chris S. Pease

At Days End...

WM 8/98