ANAHUAC NATIONAL WILDLIFE REFUGE

Anahuac, Texas

ANNUAL NARRATIVE REPORT

Calendar Year 1991

U. S. Department of the Interior
Fish and Wildlife Service
NATIONAL WILDLIFE REFUGE SYSTEM

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REVIEW AND APPROVALS

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Calendar Year 1991

William E. Gardner
Refuge Manager

Tom Ciccone — 3/27/92
Project Leader — Date

Billy J. Hawkins — 5/7/92
Associate Manager Review — Date

Regional Office Approval — 5/19/92
Date

I N T R O D U C T I O N

NAME

Anahuac National Wildlife Refuge
P. O. Box 278
Anahuac, TX 77514
(409) 839-2680 (Commercial)
527-2680 (FTS)

LOCATION

The refuge is located on the north shore of East Galveston Bay about 18 miles southeast of the town of Anahuac in Chambers County, Texas. Anahuac is at the mouth of the Trinity River 50 miles east of Houston and 45 miles west of Beaumont.

LEGISLATIVE DISTRICT

9 Texas

CURRENT CONGRESSMAN

Jack Brooks

LEGISLATIVE MANDATE

None

LAND ACQUISITION

UNIT	YEAR	ACREAGE
Original Refuge	1963	9,900
Mitigation Area (16)	1978	185
Pace Tract (17)	1979	1,509
East Unit - Barrow (18)	1982-85	12,842
Mueller-Roberts (23)	1989	3,070
Donation/Galveston County	1989	167
Jackson/Granberry Tract (19)	1990	576
Barrow (22)	1991	315
TOTAL REFUGE ACREAGE		28,564

Anahuac NWR administers the Anahuac Refuge Complex that includes McFaddin, Moody, and Texas Point National Wildlife Refuges.

CLIMATE

Subtropical. Average rainfall: 51 inches. High susceptibility to hurricane or tropical storm damage. The entire refuge is in the floodplain.

TOPOGRAPHY

Flat and low. All the marshland is below one foot MSL elevation. The highest point on the refuge is only 11 feet above MSL.

HABITAT

About 19,200 acres of the refuge are in intermediate/ brackish marsh dominated by the plants marshhay cordgrass and seashore paspalum. The marsh is heavily utilized by waterfowl, muskrats, and water birds.

An additional 3,500 acres of the refuge are in farm fields where rice is grown by local cooperative farmers.

The remaining 5,864 acres are composed of salty prairies, administrative sites, and managed reservoirs. There are three fresh water reservoirs which total 610 acres.

WILDLIFE USE

The refuge is not critical habitat to any wildlife, but it is nevertheless heavily utilized by a wide variety of wildlife. Below are 1991 use figures:

Species	Peak
Total geese	60,000
Total ducks	106,253

In addition, Anahuac NWR supports a large population of American alligators and an impressive number of passerine, shore and marsh birds and raptors.

PUBLIC USE

Anahuac NWR is a popular birdwatching spot. Birdwatching accounts for most of the non-consumptive visitation. January and April are the most popular months.

Saltwater fishermen use the refuge for access to East Galveston Bay. Late summer and early fall are usually the most popular months for fishing. Fishing accounts for the majority of public use.

Public waterfowl hunting is permitted on the East Unit and the Pace Tract. The refuge opened the Pace Tract to hunting in 1980. The East Unit opened for refuge controlled hunting in 1982. Both units are open during the state waterfowl season.

FACILITIES

The refuge office is in the town of Anahuac. The field headquarters consists of four steel maintenance/storage buildings. There is also an equipment storage building on the East Unit.

1) SHOVELER POND

2) 480-FIELD

3) FIELD HEADQUARTERS

4) BOAT RAMP AND CHANNEL

5) MITIGATION AREA

6) COON CREEK

7) SALT CEDARS

8) TEAL SLOUGH

9) GATOR TRAIL

10) OYSTER BAYOU

11) DEEP MARSH

12) PACE TRACT

13) ONION BAYOU

14) LAGOW RANCH AND HUNTING LODGE

15) ONION BAYOU IRRIGATION PUMP

16) SHOP BUILDING

17) SEVENTEEN PONDS

18) OIL FIELD ROAD

19) JACKSON DITCH

20) Y OF ROAD

21) GOOSE ROOST SLOUGH

22) EAST BAY BAYOU

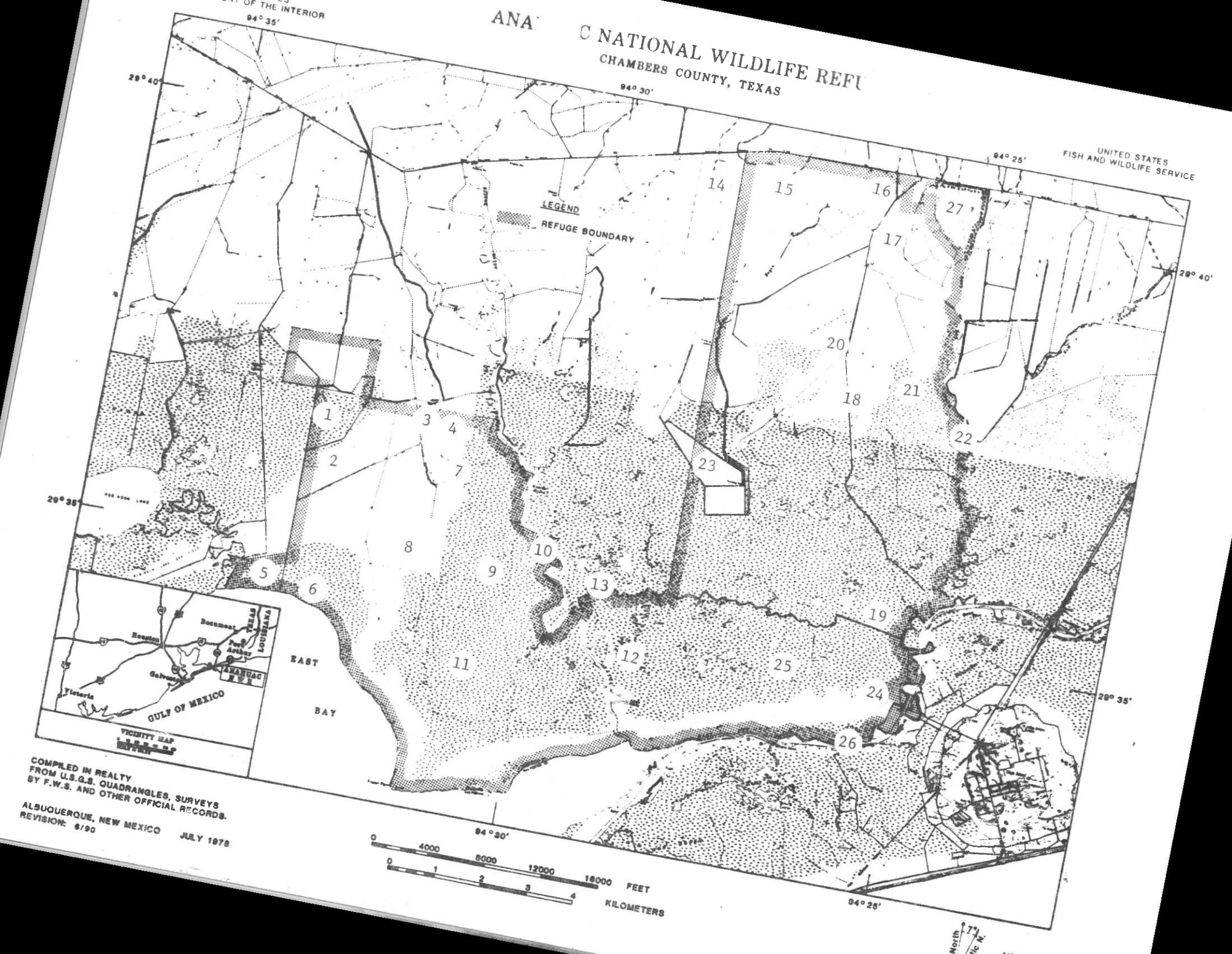
23) EAST UNIT RESERVOIRS

24) OIL FIELD

25) MUELLER/ROBERTS TRACT

26) GULF INTRACOASTAL WATERWAY

27) TRACT 22


ANA C NATIONAL WILDLIFE REFU
CHAMBERS COUNTY, TEXAS
UNITED STATES
FISH AND WILDLIFE SERVICE
LEGEND
REFUGE BOUNDARY
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EAST
BAY
GULF OF MEXICO
TEXAS
LOUISIANA
Houston
Galveston
Victoria
Beaumont
Port Arthur
ANAHUAC
VICINITY MAP
COMPILED IN REALTY
FROM U.S.G.S. QUADRANGLES, SURVEYS
BY F.W.S. AND OTHER OFFICIAL RECORDS.
ALBUQUERQUE, NEW MEXICO
REVISION: 6/90
JULY 1978
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0 1 2 3 4 KILOMETERS

I N T R O D U C T I O N

F. HABITAT MANAGEMENT

G. WILDLIFE

H. PUBLIC USE

I. EQUIPMENT AND FACILITIES

J. OTHER ITEMS

A. HIGHLIGHTS

1) Persistent rains make this a record wet year. (Section B.)
2) 315.33-acre Tract 22 added to refuge in August. (Section C.1.)
3) Heart attack claims refuge waterfowl hunter. (Section H.8.)
4) Contract repair of eight water control structures. (Section I.2.)

B. CLIMATIC CONDITIONS

A total of 70.89 inches of rainfall was recorded in 1991--the wettest year in Anahuac's history. This record rainfall exceeded our 14-year average by 19.71 inches. None of the rainfall received in 1991 was hurricane or tropical storm related. Drainage of this large amount of water was accomplished through our series of water control structures. The Refuge did not suffer any significant amount of flood damage as did the residents of the Trinity River basin.

Ambient air temperatures remained normal throughout the year with our winter season being a mild one, although, our waterfowl hunters were greeted on opening day by ice-covered rice fields. November 23 was the only below freezing day recorded in 1991.

	1991	1990	1989	14-YR AVG.
JAN	8.88	4.55	7.60	4.90
FEB	5.63	3.03	0.30	3.30
MAR	1.05	2.95	3.50	2.90
APR	4.34	3.75	2.30	2.18
MAY	7.92	8.69	3.48	5.10
JUN	7.93	1.34	20.05	5.64
JUL	7.56	6.63	11.26	5.55
AUG	5.68	0.00	2.98	4.17
SEP	9.92	6.52	3.00	6.01
OCT	3.13	3.94	8.67	3.24
NOV	4.04	3.09	5.10	4.43
DEC	4.81	2.31	.58	3.18
TOTALS	70.89	46.80	68.82	51.18

C. LAND ACQUISITION

1. Fee Title

On August 22, the refuge was enlarged by the addition of the 315.33-acre Tract 22 which had been purchased from Mr. Wesley Barrow. This purchase smooths out the northeast boundary of the East Unit. There is a relatively new 40 by 100-foot steel storage building and three older structures on the property. There are approximately 230 acres of rice farmland on the east side of East Bay Bayou. The Government did not obtain a rice acreage base with the purchase, so the existing 1,715-acre rice base and associated USDA support payments must be shared between seven farmers instead of six.

The bayou banks hold great potential for bank fishing and nature trail development with relatively little investment.

Several other parcels of land were being considered for acquisition in 1991. Three Laura Jackson Howe Tracts including one adjoining the refuge north boundary are for sale but of limited interest to the refuge. The Jackson family land which adjoins the refuge west boundary contains extensive wetlands of great interest to the refuge.

Project Leader Ciccone met with Claude Lard and Ric Riester of Realty on November 6 to discuss land acquisition opportunities and visit potential acquisition sites.

Project Leader Ciccone met with Tom Smith, Claude Lard, and Jeb Stuart of Realty on December 4 and 5 to discuss land acquisition and mineral reservations.

2. Easements

Several aerial observations of Moody Refuge detected no easement violations.

D. PLANNING

5. Research and Investigations

The Texas Water Commission was granted a special use permit for collection of aquatic organisms as indicated in their proposal for the development of a rapid bioassessment method and index of biotic integrity for coastal environments located in southeast Texas.

On June 5, Dr. Frank Fisher of Rice University collected a series of shallow soil core samples along the west boundary of the refuge to study organisms, sea level, and land elevation changes of the marsh.

6. Other

Project Leader Ciccone and Biologist Neaville were active in the Gulf Coast Joint Venture of the North American Waterfowl Management Plan.

Biologist Neaville attended a Gulf Coast Joint Venture monitoring and evaluation team meeting of the North American Waterfowl Management Plan on August 23 and 24 in Hackberry, Louisiana. Its purpose was to develop final guidelines for prioritizing management projects, to develop a listing of evaluation research projects, and to rate a recently submitted research proposal.

Project Leader Ciccone travelled to the Portland Regional Office on June 3-5 to serve as a member of the Compatibility Chapter Working Group. The group reviewed the Refuge Manual chapter and made recommendations to the Washington Office regarding proposed changes.

E. ADMINISTRATION

1. Personnel

NAME OF EMPLOYEE	TITLE	SERIES/ GRADE
Domenick R.(Dom) Ciccone	Project Leader	GM-0485-13
William E. (Ed) Jackson	Refuge Operations Specialist	GS-0485-11
Daniel M. (Dan) Alonso	Refuge Operations Specialist	GS-0485-07
Jim E. Neaville	Wildlife Biologist	GS-0486-11
Ilene W. Manuel	Office Assistant	GS-0303-06
Diane C. Cox	Maintenance Worker	WG-4749-08
Eddie E. (Ed) Bass	Engineering Equipment Operator	WG-5716-09
Earl Henry, Jr.	Engineering Equipment Operator	WG-5716-08
Bill W. Meeks	Automotive Mechanic	WG-5823-10
Robert Larranaga	Student Trainee	GS-0499-04

The only personnel change which occurred in 1991 was the addition of Student Trainee Robert Larranaga to the staff from July 1, through December 6.

JACKSON HENRY BASS NEAVILLE
MANUEL COX ALSONSO CICCONE

BILL MEEKS

Refuge Operations Specialist Alonso was promoted from GS-5 to GS-7 on June 7, 1991.

Project Leader Ciccone was selected for the Upper Level Management Development Program. He participated in training programs in Denver, Colorado, October 21 through November 1, and in Arlington, Virginia, December 9-13.

4. Volunteer Program

Our only active volunteer, Loda Gibson, stopped working at the office on April 15, 1991, to spend more time working on the family farm.

Shoreline erosion work continued in 1991 with the aid of numerous Galveston Bay Foundation volunteers.

5. Funding

FUNDING RECORD (In thousands)

	FY 91	FY 90	FY 89	FY 88
1132	.5			
1230	61.0			
1261	300.0	357.3	279.0	302.7
1262	193.0	304.0	149.0	152.4
6860	3.0	3.0	3.0	3.0
9120	42.7			
TOTAL	600.2	664.8	431.0	458.1

6. Safety

One serious accident occurred on May 1, 1991. Maintenance Worker Diane Cox was driving the John Deere 302A tractor when it stopped moving. The refuge mechanic could not locate the problem and decided to tow the tractor back to the shop building where he had the proper tools and equipment to locate and repair the malfunction. Diane remained on the tractor to provide steering and braking during the trip to the shop. Suddenly the right rear wheel and axle came off the tractor. Diane's

seat belt prevented her from being thrown from the tractor, but the speed and angle at which the tractor fell caused Diane to injure her hip. She seemed okay after the fall, but was advised to see a doctor. She saw a doctor on May 2 with back pains which lead to the beginning of physical therapy on May 15. Therapy and doctors' visits resulted in a considerable amount of lost time for the next three months. By late August she was able to return to work in a limited light duty status where she remained at year's end. The doctors have advised Diane that the 60% loss of mobility in her right hip may be permanent. The tractor axle had been worked on by professional mechanics in February 1991. The nut retainer which, if properly installed, would have prevented the axle from coming off the tractor was never found.

Three other accidents in 1991 did not involve loss of time. Refuge Operations Specialist Jackson burned his arm with a cup of hot tea water on February 11. Engineering Equipment Operator Bass was hit in the leg with a sliver of steel on April 10, and Equipment Operator Henry got dirt in his eye on June 7. These accidents were thoroughly addressed in the May and June safety meetings.

Employees Alonso, Bass, and Cox completed First Aid and CPR Training on March 27. Alonso, Bass, Meeks, and Henry obtained hearing tests on June 6. Bass and Henry attended the 2-day U. S. Forest Service chain saw safety training on May 16. Biologist Neaville and Project Leader Ciccone attended the mandatory 8-hour aviation safety training in Albuquerque on August 14.

7. Technical Assistance

On July 2, Biologist Neaville met with Texaco Chemical Company biologist Marty Briggs regarding technical assistance on construction of a 50-acre marsh impoundment and to provide management recommendations to enhance waterfowl and associated wildlife. Staff Biologist Neaville traveled to Port Acres to meet with Texas Parks and Wildlife and Corps of Engineers biologists to discuss wildlife concerns in regard to physical design criteria for the Salt Bayou water control structure located on the Gulf Intracoastal Waterway.

Staff Biologist Neaville attended an August meeting between Texas Parks and Wildlife Department, Corps of Engineers, and Fish and Wildlife Service concerning specific design, operation, and maintenance requirements for Salt Bayou at its confluence with the Gulf Intracoastal Waterway.

On August 22, Biologist Neaville traveled to Creole, Louisiana, and provided assistance to Cameron Prairie NWR Manager Paul Yakupzack regarding collection of needed baseline range condition information on selected parts of the refuge. All data was gathered as baseline information in order to submit a proposal to use controlled livestock grazing as wildlife/waterfowl management practice on areas where noxious plants are in need of control.

Biologist Neaville met with Middleton Ranch Manager Pete Barbeau on September 10 regarding the Lower Trinity River Project, a private lands' enhancement effort funded under the North American Waterfowl Management Plan. On September 17, Neaville, Project Leader Ciccone, and representatives of the Galveston Bay Foundation and Soil Conservation Service met with Mayes-Middleton family members to discuss the project and finalize a cooperative agreement. A new agreement was prepared and sent out for signature.

On September 12 and 13, Biologist Neaville assisted members of the National Wetlands Inventory field team in spot checking the vegetative signatures of various habitat types within the Trinity River delta, the Lake Charlotte cypress swamp, and various intermediate/brackish marshes on the Anahuac NWR and adjacent private ranches. Team members included Bill White, Texas Bureau of Economic Geology; Larry Handley, National Wetlands Research Center; Todd Mecklenborg and Melvin Furhmann, Geonex-Martel; and Curtis Carley, Fish and Wildlife Service.

F. HABITAT MANAGEMENT

1. General

The general condition of the refuge habitat remains healthy. None of the ponds or marshes have dried up since 1988 so the trend remains wet and fresh.

2. Wetlands

FRESHWATER WETLANDS

The flooded rice fields continued to be the most intensively managed wetlands on this refuge in 1991. After the cooperative farmers harvest the rice crop, the refuge uses its Case 450 dozer to repair field levees and then flood the fields with 6 to 12 inches of water purchased from the Chambers-Liberty Counties Navigation District at $10.00 per acre. In 1991, all 752 acres of refuge rice, 130 acres of rice on Tract 22 and 254 acres of fallow rice field/moist soil unit fields were flooded in September, October, and November. Timely flooding of Fields 69 and 70 allowed for good blue-winged teal use during their September migration. Snow geese were slow to find the flooded rice, but then hit Fields 51, 64, 72, and Tract 22 where up to 60,000 geese ate the fields out in two weeks. Then on November 13 most of the geese left and did not return to the rice fields. Large quantities of food remained in Fields 13, 67, and 68 at year's end. Even when the waterfowl use stops, the flooded rice fields receive heavy use by white-faced ibis, shorebirds, and blackbirds.

Shoveler Pond remained full through 1991, but the dense cattail, Phragmites, and seashore paspalum greatly restricted the public viewing of wildlife in the pond. In November, the drains were opened to lower water levels so that the vegetation could be burned. The lower water level actually increased duck use in the reservoir. Thousands of herons and egrets continue to use the west side of Shoveler Pond as a night roost. A few nutria have been seen in this pond which could prove the best solution to the cattail problem.

The two East Unit reservoirs remained at or near full pool level throughout 1991 contributing to a rapid change in vegetation. The Sesbania and tallow trees are gone and the bulrush island is almost gone, replaced by alligatorweed, cattail, and American lotus. The once firm bottom is now boggy, but the submergent vegetation still thrives. The reservoirs still receive heavy coot use, but the ring-necked and scaup were conspicuously absent in 1991. Many pintails, shovelers, and teal used these reservoirs.

Field 201 was drained in early summer so it could be plowed to create a moist soil unit, but persistent rains permitted the plowing of only part of the north and east sections of this field in October. After this field was flooded the plowed portions became a great wildlife viewing area utilized by hundreds of ducks, geese, ibis, herons, and shorebirds.

Field 208 south of the boat ramp was again covered with a dense growth of longtom grass, but livestock grazing made the area accessible to geese. Goose use of this field was very high after the geese stopped using the flooded rice fields.

The Salt Cedars impoundment levee was repaired in 1991 and this area supported several thousand ducks and geese in late 1991.

The 480-field was burned and flooded in November. The goose use in this shallow impoundment was very high in late December.

BRACKISH/INTERMEDIATE WETLANDS

High rainfall throughout 1991 kept the marshes full and fresh--conditions which favor bulrushes and cattail while suppressing marshhay cordgrass.

The increase in Olney bulrush since 1989 has finally brought muskrat back to the marsh. Both the Deep Marsh and the East Unit marsh have more muskrat than at any time since 1982. Nutria are still scarce on the refuge.

With the record rainfall, the marsh stayed full of water throughout the year. The salinities in the marsh remained fresh until October when portions of the marsh measured as high as 9 parts per thousand.

Conditions did not favor a black water fish kill and none occurred.

Most of the waterfowl use in the Deep Marsh was west of New Ditch where livestock grazing had cropped the vegetation. Most of the waterfowl use in the East Unit marsh was on the burn south of goose roost slough or near the cattlewalk in the middle of the marsh where the ponds were fresh enough to grow thick stands of American lotus, Chara, and pondweeds. The Mueller-Roberts Tract waterfowl use was impressive again in 1991, but down from 1990. The high goose use of 1990 never took place on this tract in 1991.

Obviously the water control structure repair work of 1991 has a direct impact on the refuge intermediate/brackish marsh. See Section I.2. for a discussion of this work.

Salinity, turbidity, oxygen content and depth measurements were taken monthly at various locations on the Old Anahuac and East Unit marshes. Six vegetative transects in the East Unit marsh were run twice in 1991.

4. Croplands

The five cooperative rice farmers on the East Unit moved to Farm Unit A in 1991. This is the smallest of the three units with only 682 acres available for farming. All except 23-acre Field 54 were farmed this year. The persistent rains delayed planting on most fields until near the June planting deadline. The farmers were forced to "mud in" the crop which involves disking the fields wet and planting pre-sprouted rice in the mud. It is a messy operation, and the fields do not look well managed, but it was the only option in 1991. "Mudding in" may become routine on the refuge because of the side effect of a reduced need for herbicides.

As had happened in 1990, the delayed planting put harvest off until September and October which worked out perfectly for waterfowl utilization. Fields 53 and 69 which were the only fields harvested in early September experienced almost no waterfowl use because of rapid plant regrowth.

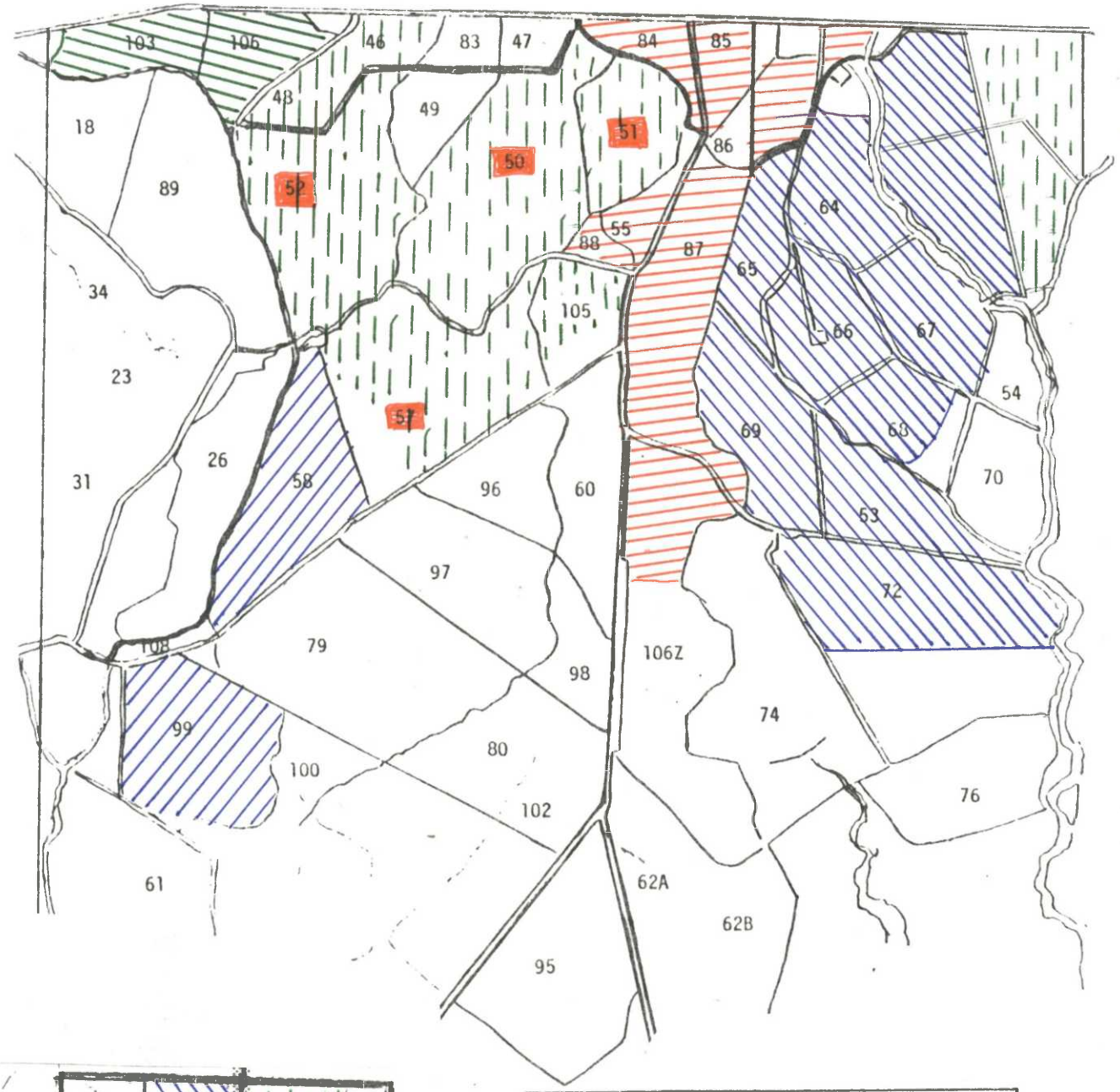
A new farmer, Dalton Edmonds, was selected to farm the Ralph Jackson Tract in 1991. Wet weather forced him to plant Field 13 for the second year.

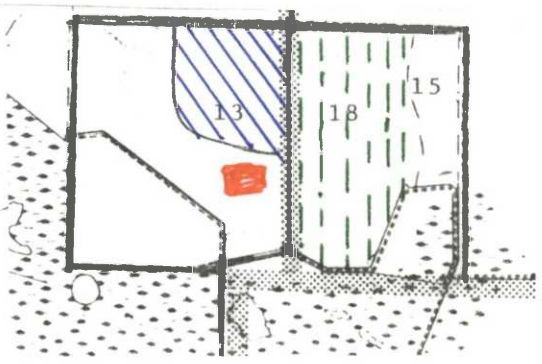
All the fields were remeasured by the Agricultural Stabilization and Conservation Service (ASCS) this year resulting in several small acreage changes. The total refuge rice acreage contained 752.8 acres in 1991.

The rent charge remained $25.00 per acre farmed in 1991. The first half of the rent was in refuge receipts, while the second half was used to purchase irrigation water for red rice control.

The refuge successfully flooded all 752.8 acres of rice grown on the refuge in 1991. One 95-acre field was flooded twice. Another 130 acres of rice stubble on the newly-acquired Wesley Barrow Tract 22 and 254

ANAHUAC REFUGE FARM MAP





FARM MAP

- Rice fields flooded in fall
- Conservation set-aside fields
- Flooded moist soil fields
- Rye grass
- Mowed grasslands
- Plowed

acres of fallow rice/moist soil unit fields were also flooded. Snow goose response was spectacular in early November with a peak population of 60,000. Mid- and late-season use of the flooded fields was very light.

Refuge cooperative farmers are still totally dependent on the USDA deficiency payment which was approximately $185,000 in 1991. As always, participation in the program involves close coordination with the ASCS and Soil Conservation Service (SCS) offices. In 1991, the refuge designated 655.8 acres CU/PAY and 85.6 acres ACR set aside acres (See refuge farm map).

Wet weather and conflicting projects limited refuge farming to the partial plowing of Fields 99, 201, and the roadside across from Salt Cedars.

Local farmer Wayne Morris was contracted to plow Fields 103 and 106 in preparation for ryegrass planting. These two 40-acre fields were planted in ryegrass on October 28. Germination was slow so geese did not start using these fields until December.

A relatively dry October permitted all farmers to fall plow most of the fields which will be farmed in 1992. These fall-plowed fields usually receive steady use by geese, shorebirds, and a few ducks. These plowed fields are choice goose hunting areas for refuge hunters.

5. Grasslands

Most of Anahuac's wetlands are also grasslands with Gulf cordgrass, marshhay cordgrass and seashore paspalum the dominant plants. These 21,000 acres are thought of and managed as wetlands. Another 6,800 acres are blackland and loamy prairie range sites treated as grasslands although some are on hydric soils. It is on these prairie sites that the 3,400 acres of croplands are located. Only about four acres of undisturbed prairie grasses remain, leaving 3,400 acres of old farm fields in various stages of recovery to native prairie grasslands. The three small unnumbered fields adjacent to Highway 1985 are rapidly reverting to little bluestem prairie. Continued mowing of Fields 84, 85, 87, and 106Z has stimulated a dense growth of intermediate succession grasses which will soon be able to be burned.

6. Other Habitats

The East Bay shoreline erosion continued its slow but steady march inland in 1991. Several steps were taken in 1991 which will slow the erosion rate. On March 23, April 20, June 22 and June 29, refuge staff in association with the Soil Conservation Service using labor volunteered by members of the Galveston Bay Foundation erected 750 feet of wave energy absorption fence in three locations on the East Bay shoreline. The double row fences were placed 20 to 40 feet offshore.

THIS LITTLE BLUESTEM REPRESENTS THE PROGRESS MADE IN RESTORING NATIVE PRAIRIE ON UNUSED FARM FIELDS

SMOOTH CORDGRASS BEING PLANTED BEHIND PARTIALLY COMPLETED WAVE ENERGY ABSORPTION FENCES ON THE SHORELINE OF EAST BAY

Smooth cordgrass was planted between the fence and shoreline. Once the grass becomes firmly established the plastic mesh fences will be moved to another location to help get another plot of cordgrass established.

In places, the erosion is so severe that only a stone wall will cut the wave energy enough to allow the cordgrass a chance to survive. In October, the refuge purchased 1,610 tons of 12- to 18-inch riprap rock for shoreline protection which is expected to be put in place in 1992.

7. Grazing

The beneficial effects of controlled grazing on waterfowl use were dramatically visible in 1991. The absence of summer grazing allowed the marsh vegetation to grow rapidly throughout the marsh. The cattle were put back in the marsh in early fall with most of the grazing concentrated on the more accessible west side of New Ditch. By mid-December, there were over 50,000 ducks on the west side of the Ditch and nearly all of the Deep Marsh snow goose use took place west of the Ditch. A Peregrine falcon spent the winter with this flock of ducks. By year's end, many of the cows had shifted to the lush vegetation on the east side of the Ditch and waterfowl use was rising here in response to the grazing.

The grazing plan for the times and level of grazing pressure desired for various grazing units was completed and put into use in 1991.

Mr. W. S. Edwards grazed 220 cows on the Mueller-Robert Tract from January 1 to April 30 and from November 1 to December 31.

Mr. Bill White grazed up to 967 cows on various grazing units of Old Anahuac and the East Unit throughout the year with 3,600 Animal Use Month (AUM'S) on Old Anahuac and 3,300 AUM's on East Unit pastures.

The grazing rates were $3.60 per AUM until April 15 when the rate became $3.80 per AUM.

9. Fire Management

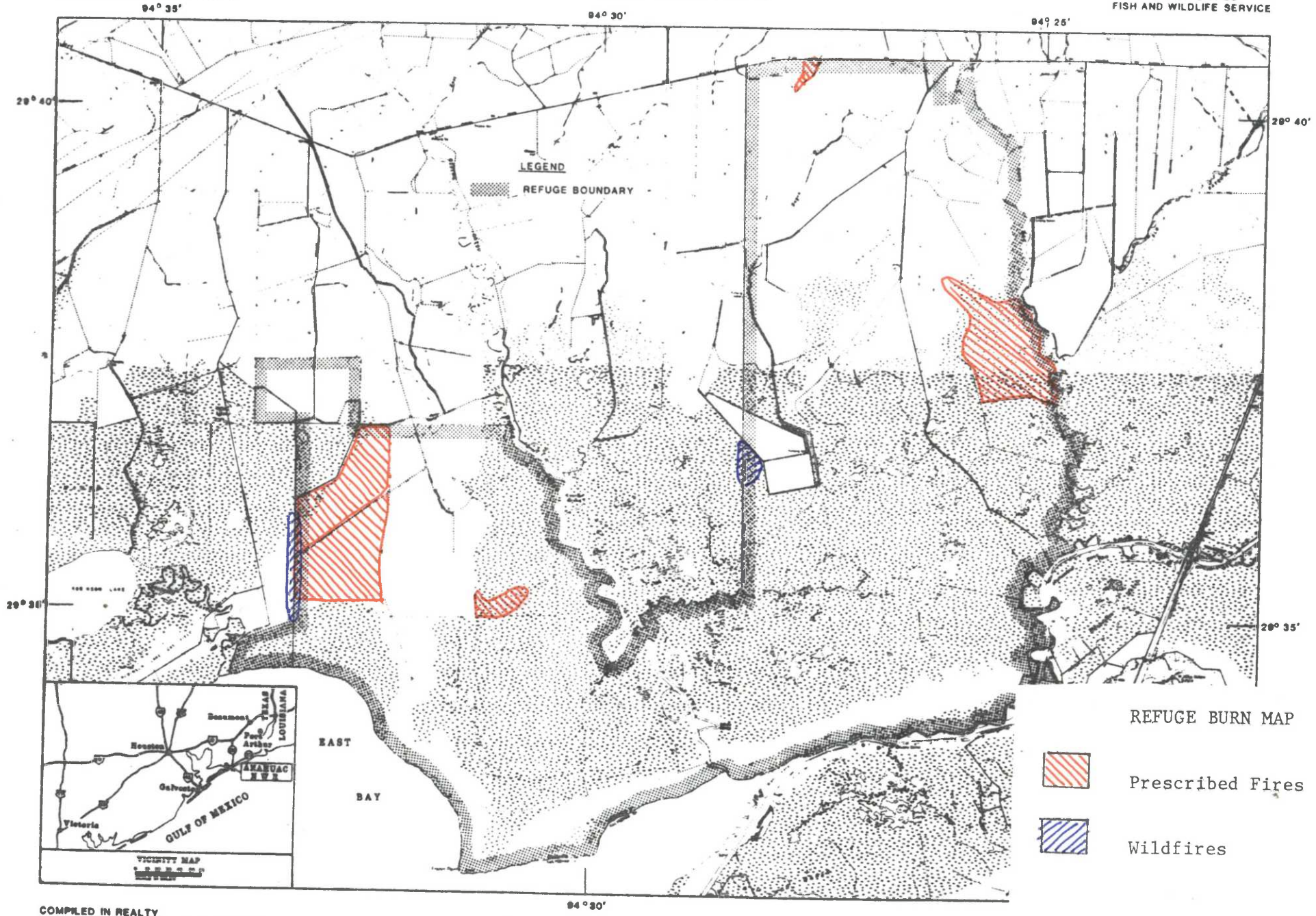
One of the side benefits of a record rainfall year was the reduced danger of wildfires. The two reported wildfires were really neighboring landowner prescribed fires which entered the refuge. The refuge staff was prepared for the November 6 fire near the East Unit reservoir and took necessary action to contain that fire to 20 acres of marsh grass and no structural damage. While most of the staff was occupied on the East Unit fire, another fire was spotted burning on private land west of Old Anahuac. All available refuge staff rushed to the Westline fire, but the fire had already burned several sections of the refuge boundary fence. The refuge staff extinguished the fire along the fence row and on private land near the refuge but about 12 fence posts and one-half acre of grass had been burned.

ANAHUAC NATIONAL WILDLIFE REFUGE

CHAMBERS COUNTY, TEXAS

UNITED STATES
DEPARTMENT OF THE INTERIOR

UNITED STATES
FISH AND WILDLIFE SERVICE



COMPILED IN REALTY
FROM U.S.G.S. QUADRANGLES, SURVEYS
BY F.W.S. AND OTHER OFFICIAL RECORDS.

ALBUQUERQUE, NEW MEXICO

The refuge had plowed a fireline along the fenceline in October, but the fire crossed the plowed line in two places.

Five employees were fully qualified to perform burning work by November 1, so the staff took advantage of favorable weather to burn as much as possible in 1991. The highest priority burn unit was the Goose Roost Slough marsh which is the site of two East Bay Bayou marsh vegetative transect lines. This was a complex burn procedure which prompted the use of a seasonal firefighter stationed at McFaddin who assisted with the November 5 ignition. The fuel was not as flammable as anticipated and only 340 of the 650 acres burned. The unburned portion of this unit was ignited on December 4 when an additional 250 acres burned for a combined 90% burn coverage. Upward of 4,000 snow geese were using this unit by year's end.

The 480-field was burned on November 21. The new refuge terra-torch was first used to ignite this fire. It did a great job of allowing a small burn crew to light a large fire from the safety of a road outside the unit. This fire achieved almost 100% coverage. That day the drains in the 480-field were closed so rainwater would flood the unit, which it did by late December. The burn, plus the 480-grit pad, attracted up to 10,000 snow geese per day by mid-December. Wading bird use was very high on this flooded burn site as well.

The refuge biologist recommended that the marsh north of Gator Trail be burned, which was attempted on December 23. The initial ignition was so erratic that the fire was put out before it became unmanageable. The burn crew then shifted to the backup plan of burning Yellow Rail Prairie. The north half of this unit was ignited, but the decision was made that it was too late in the day to burn the south half. The north half of Yellow Rail Prairie burn achieved 100% coverage on 400 acres. The wildlife response was immediate with very high goose use by year's end.

There was quite a significant amount of fire training given to the staff in 1991. Project Leader Ciccone attended Fire Management for Line Officers on January 14-17, and Fire Behavior (S-390) February 25-28. ROS Jackson attended S-217 Interagency Helicopter Training on March 4-7 and Pumps and Engines Training on July 22-26. ROS Alonso and Student Trainee Larranaga attended S-130, S-190, and Terra-Torch Training on October 22-25. Equipment Operator Bass attended S-130 and S-190 on November 18-21, 1991.

G. WILDLIFE

2. Endangered and Threatened Species

There are four Federally-endangered species of wildlife which occur on the refuge and one threatened species. They are as follows:

SPECIES	FEDERAL	STATE
Bald Eagle	E	E
Peregrine Falcon	E	E
Brown Pelican	E	E
Piping Plover	E	E
Alligator	T	-

No bald eagles or piping plovers were observed on the refuge in 1991. Brown pelicans were not observed on the refuge, but they are common in East Galveston Bay adjacent to the refuge. At least one Peregrine falcon was associated with the Deep Marsh duck concentration in December. Alligators are very common and seen by the majority of refuge visitors.

3. Waterfowl

The 1991 waterfowl population peaked during the months of December with 106,253 ducks and in November with 60,000 geese. The following graph illustrates the duck and goose numbers for 1991.

The three most abundant species of duck on the refuge are green-winged teal, gadwall, and shoveler. The most abundant goose is the snow goose.

Waterfowl continue to utilize all the habitat types provided within the refuge intermediate to saline marshes, moist soil units, fresh water impoundments, rice fields, plowed and mowed prairie and planted ryegrass fields. There is also heavy utilization of grit sites.

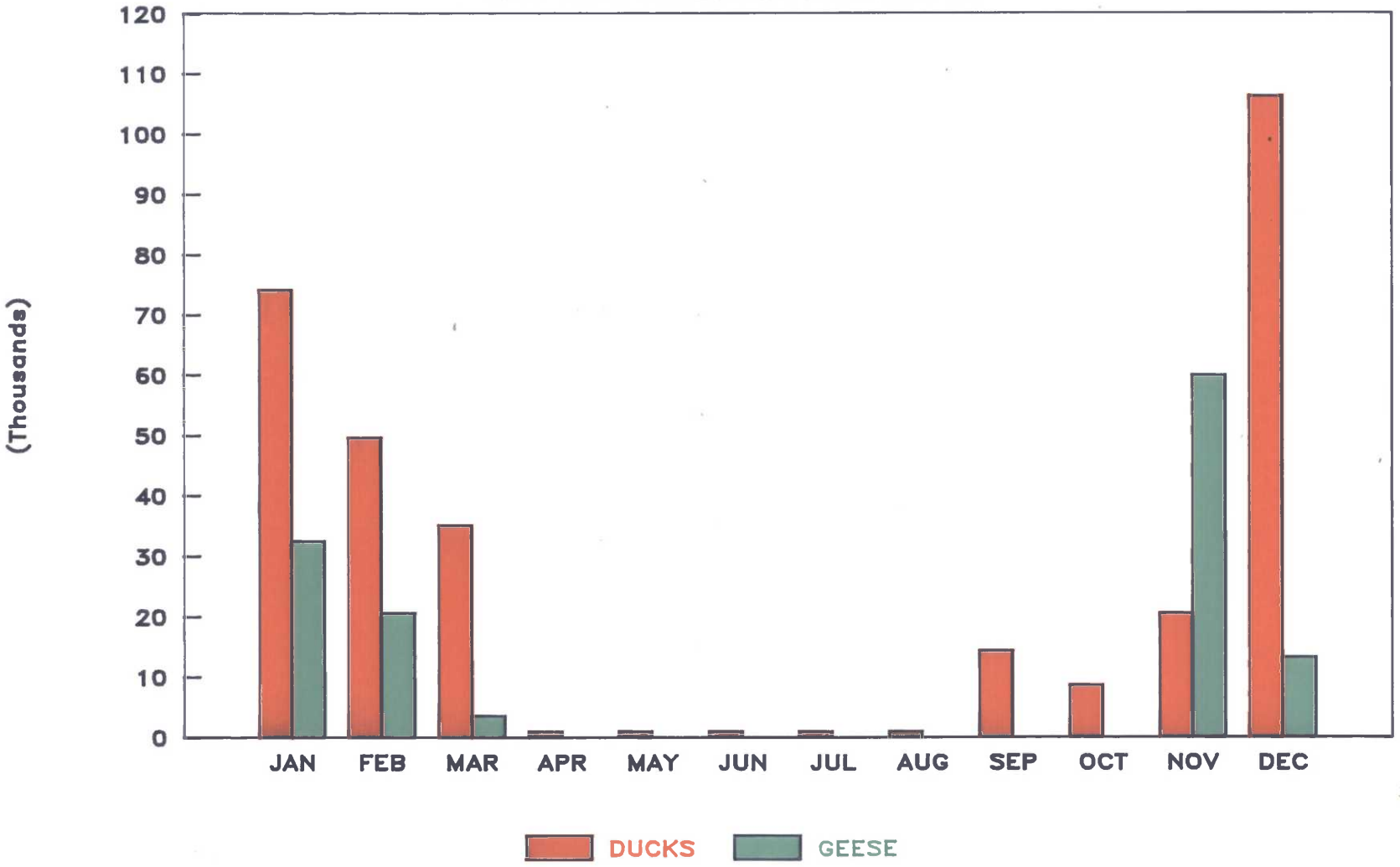
The mottled duck breeding pair census was again conducted in 1991 and revealed a tremendous increase in the number of mottled ducks. The aerial census conducted by Biologist Jim Neaville and Pilot John Winship revealed 89 indicated pairs on Anahuac. The ground truthing or visibility index was determined to be 1:3.42 ratio (for every one pair seen from the air, 3.42 pairs were seen from the ground).

Six year comparison of indicated Mottled Duck Breeding Pairs.

YEAR	AERIAL SURVEYS (Pairs)	GROUND TRUTH RATIO
1985	67	1:4.28
1986	44	1:7.29
1987	74	1:3.95
1988	56	1:3.69
1989	25	1:2.72
1990	53	1:4.06
1991	89	1:3.42

ANAHUAC NWR

1991 PEAK WATERFOWL POPULATIONS



4. Marsh and Water Birds

Marsh and water birds comprise a large percentage of the bird life on the refuge and it appears the population is rather healthy. There is presently a total of 26 species of marsh and water birds which can be found on the refuge. Of the 26 species there are six species of herons, four species of egret, six species of rails, two species of gallinules, two species of ibis, two bittern, one spoonbill, one stork, one crane and one coot. The species which nest on the refuge are green-backed heron, black-crowned night heron, yellow-crowned night heron, least bittern, king rail, Clapper rail, purple gallinule and American coot.

5. Shorebirds, Gulls, Terns, and Allied Species

A large variety of shorebirds, gulls, and terns can be seen on the refuge at most any time, but the quantity and variety is greatest during the fall migration. There are nine species of terns, four species of gulls, and 34 species of shorebirds which occur on the refuge. Of these 47 species present, four species nest on the refuge (black-necked stilt, killdeer, willet, and least tern).

6. Raptors

There are various species of raptors which frequent the refuge. At last count there were 21 species. These 21 species are still being seen today, although some are being sighted with greater frequency. Both black-shoulder kites and osprey were sighted with greater frequency by visitors and refuge staff. The more common raptors are marsh hawks, red-tailed hawks and turkey vultures.

On March 2, 1991, an adult golden eagle was seen by refuge staff on the East Unit of the refuge feeding on a snow goose. This eagle is believed to be the same eagle which was seen soaring over the refuge in 1990.

8. Game Mammals

Feral hogs are becoming a common sight on the refuge. They were first sighted on the refuge in 1990. Their numbers appear to be greater on the East Unit of the refuge.

10. Other Resident Wildlife

The number of nutria and alligators is on the increase in Shoveler Pond. It is believed the increase is a result of increased monitoring and water level manipulation.

11. Fisheries Resources

The fresh water fisheries resource on the refuge remains healthy despite threats of "black water" during the summer months. Fishermen have reported respectable catches of gar and catfish from refuge ditches and bayous.

The saltwater fisheries resource remains an excellent one providing fishermen with a large variety of fish which include speckled trout, redfish, croaker, and flounder.

14. Scientific Collections

The Anahuac staff again collected mottled duck and goose gizzards from waterfowl harvested on the East Unit for analysis of shot ingestion. This study was first started in 1981 by the Texas Parks and Wildlife Department.

ANAHUAC NWR MOTTLED DUCK SHOT INGESTION STUDY

YEAR	SPECIES	NUMBER SAMPLES	NUMBER WITH LEAD OR BOTH	%	NUMBER WITH STEEL ONLY	%	TOTAL WITH SHOT	%
91-92	Mottled	75	13	17	15	20	28	37
90-91	Mottled	47	11	23	12	25	23	49
89-90	Mottled	36	20	55	2	5	22	61
88-89	Mottled	24	3	12	8	33	11	46
87-88	Mottled	68	16	24	22	32	38	56
86-87	Mottled							
85-86	Mottled	70	17	24	13	19	30	43
84-85	Mottled	58	14	24	10	17	24	41
83-84	Mottled	156	23	15	10	6	33	21
82-83	Mottled	179	51	28	22	12	73	41
81-82	Mottled	17	4	24	1	6	5	29

The analysis of the 1991-92 sample of mottled duck gizzards revealed that of the 75 gizzards collected, 17% had lead shot and 20% had only steel shot. See the table above for an eleven-year comparison.

Of the 75 snow goose gizzards collected 5% had lead shot and 9% had only steel.

H. PUBLIC USE

1. General

The refuge continues to stay open to the public seven days a week, 24 hours per day including holidays. Visitors are not charged a user fee but are required to stop and sign in at the visitor registration booth. The booth is stocked with refuge leaflets and birdlists.

Visitation to the refuge for the year totaled 32,495. Fishing was by far the number one activity engaged by visitors. The pie chart on the following page shows the breakdown of visitor activities.

Birdwatching is the activity responsible for attracting visitors from all over the world. We had visitors from 22 foreign countries and every state including the District of Columbia. The top five foreign countries were Canada, Mexico, England, Germany, and France.

6. Interpretive Exhibits/Demonstrations

On February 13 through March 3, 1991, Anahuac NWR, U. S. Forest Service, and the National Park Service cooperatively manned an exhibit at the Houston Livestock Show and Rodeo at the Astrodome Complex in Houston. The theme of the exhibit was "Caring for the Land and Serving the People." An all-time record number of 1.4 million people attended the Livestock Show and Rodeo.

The third annual Texas GatorFest was held at Fort Anahuac Park on September 13 and 14. Project Leader Ciccone and Student Trainee Larranaga manned the Refuge exhibit which was well received by the public. An estimated 30,000 people attended the event.

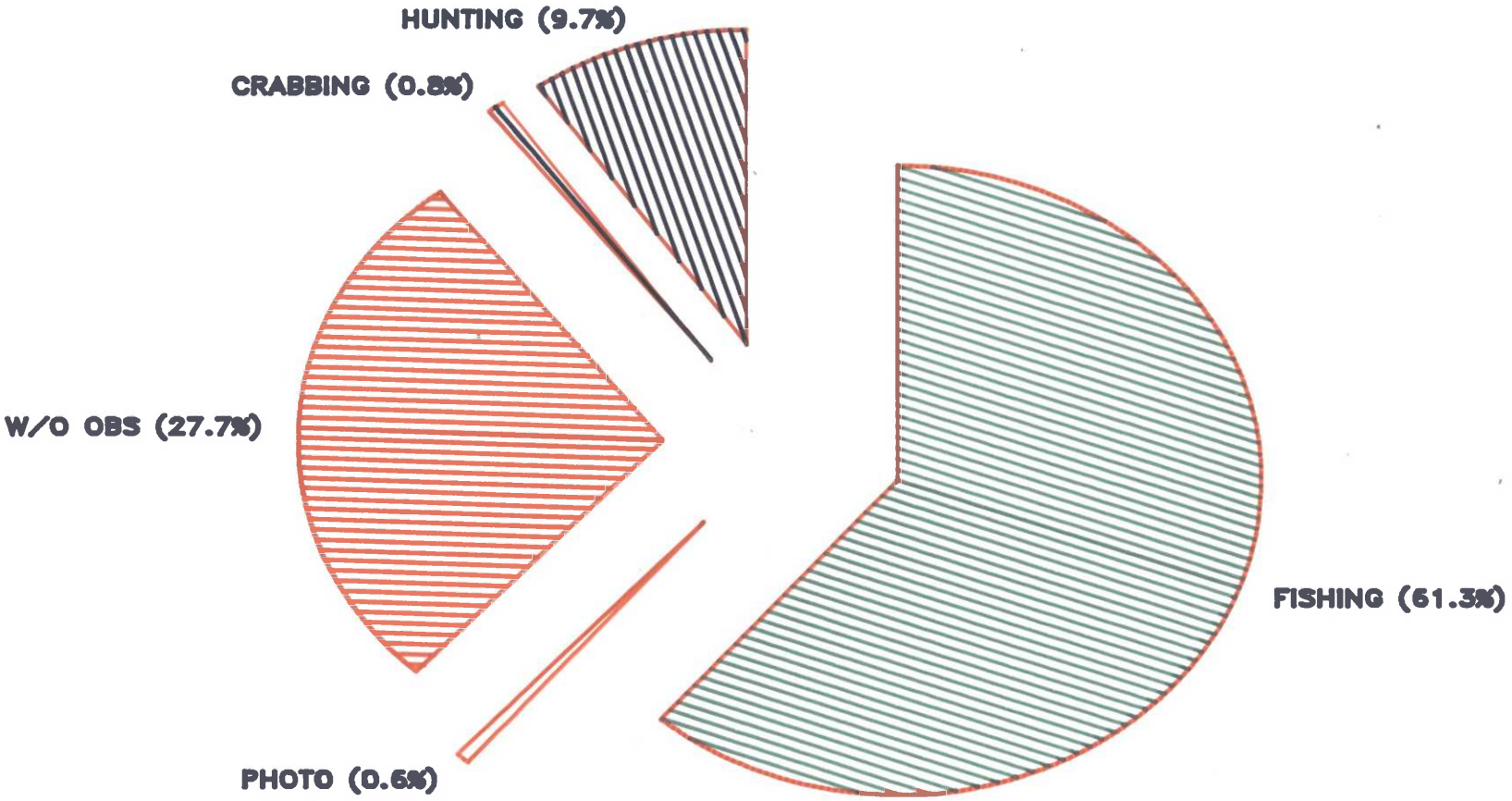
The 22nd annual Rice Festival was held in Winnie on October 4 and 5. ROS Ed Jackson, ROS Dan Alonso and Student Trainee Robbie Larranaga manned the exhibit which featured National Wildlife Refuges.

On June 6, Project Leader Ciccone and Brazoria Complex Project Leader Bisbee spoke to approximately 200 members of the Houston Chapter of the Sierra Club regarding Management of Texas Coastal Refuges. Ciccone discussed the marsh loss problem and the corrective measures proposed in the Federal/State Water Management Plan.

During the month of June, National Fishing Week was supported and promoted through the posting of posters, distribution of stickers and Anahuac NWR literature, and encouraging outdoor writers to publicize National Fishing Week. Other promotional activities included sending faxes and mail with the "Take A Friend Fishing" logo and providing Anahuac NWR personnel with National Fishing Week literature. During this week an estimated 831 people visited Anahuac Refuge to fish East Galveston Bay and interior ponds and ditches.

ANAHUAC NATIONAL WILDLIFE REFUGE

1991 Public Use



Project Leader Ciccone and Brazoria Complex Project Leader Bisbee presented a joint program on management of the Upper Texas Coast Refuges to 16 people at the University of Houston Clear Lake on September 30. The public program was sponsored by the Galveston Bay Foundation.

8. Hunting

The refuge continues to offer both alligator and waterfowl hunting.

The 1991 alligator season started on September 10 and ended September 30. Ten hunters were randomly selected to hunt throughout the refuge (excluding Shoveler Pond). One hundred and one alligators were taken with an average length and weight of 7'8" and 115.89 pounds. The largest gator taken was 11'10" and weighed 405 pounds. The smallest gator taken was 5'6" and 47 pounds. The market prices ranged from $22.00 to $36.14 per foot. The refuge received $11,236.72 as its 50% share of hide sales. (See Table 2 for additional information).

The 1991-92 waterfowl season started on November 9, 1991, and ended on February 16, 1992. As in previous years, both the East Unit and the Pace Tract were open to hunting. A $5.00 user fee was collected for the first time from all hunters accessing the East Unit through the main gate at FM 1985. Hunters accessing the East Unit by boat via Jackson Ditch and Pace Tract hunters were exempt of the fee. A total of 2439 hunters hunted the East Unit and an estimated 490 hunters hunted the Pace Tract. A total of 867 ducks and 839 geese were taken on the East Unit and an estimated 378 ducks and 155 geese were taken on the Pace Tract. Table 3 summarizes the 1991-92 East Unit waterfowl season.

On December 26, 1991, James Morgan of Nederland, Texas, suffered a heart attack while waterfowl hunting on the East Unit. Despite CPR efforts performed by a friend of Mr. Morgan and ROS Dan Alonso, Mr. Morgan passed away. The autopsy report revealed that Mr. Morgan had suffered a massive heart attack.

9. Fishing

Fishing accounted for 19,896 visitors to the refuge in 1991. This figure is slightly lower from last year and may be due to the large amounts of rainfall which lowered the salinity of East Galveston Bay. Saltwater game fish prefer saline water and fishermen tend to stay abreast of bay water conditions.

The peak fishing month again occurred in October when the salinity in East Galveston Bay reached 15 parts per thousand (ppt). The following graph reflects the number of fishermen per month for 1991.

Fishermen continue to fish refuge interior ditches, bayous, and ponds for alligator gar, catfish and panfish. Spring and summer fishing in Shoveler Pond was nearly impossible due to the overgrowth of submergent vegetation.

TABLE 2

ALLIGATOR HARVEST RESULTS BY YEAR

	1988	1989	1990	1991
Sex Ratio (Males)	71%	59%	59%	59%
Sex Ratio (Females)	29%	41%	41%	41%
Average Length	8′ 4"	7′ 10"	7′ 5"	7′ 8"
Average Weight (Lbs)	137.97	116.98	99.52	115.86
Average Lbs/Ft	16.54	14.90	13.48	15.09
Total Alligators	105	121	128	101
	(Out of 110 Tags)	(Out of 121 Tags)	(Out of 130 Tags)	(Out of 103 Tags)
Largest Alligator	11′ 8" 450 lbs	11′ 10" 383 lbs	12′ 6" 515 lbs	11′ 10" 405 lbs
Smallest Alligator	5′ 10" 35 lbs	5′ 4" 25 lbs	4′ 4" 20 lbs	5′ 6" 47 lbs
Average Male	8′ 8 1/2"	8′ 3"	<7′ 10"	8′ 2"
Average Female	7′ 4 1/2"	7′ 3"	6′ 9"	<7′ 0"

ANAHUAC ALLIGATOR HARVEST RESULTS

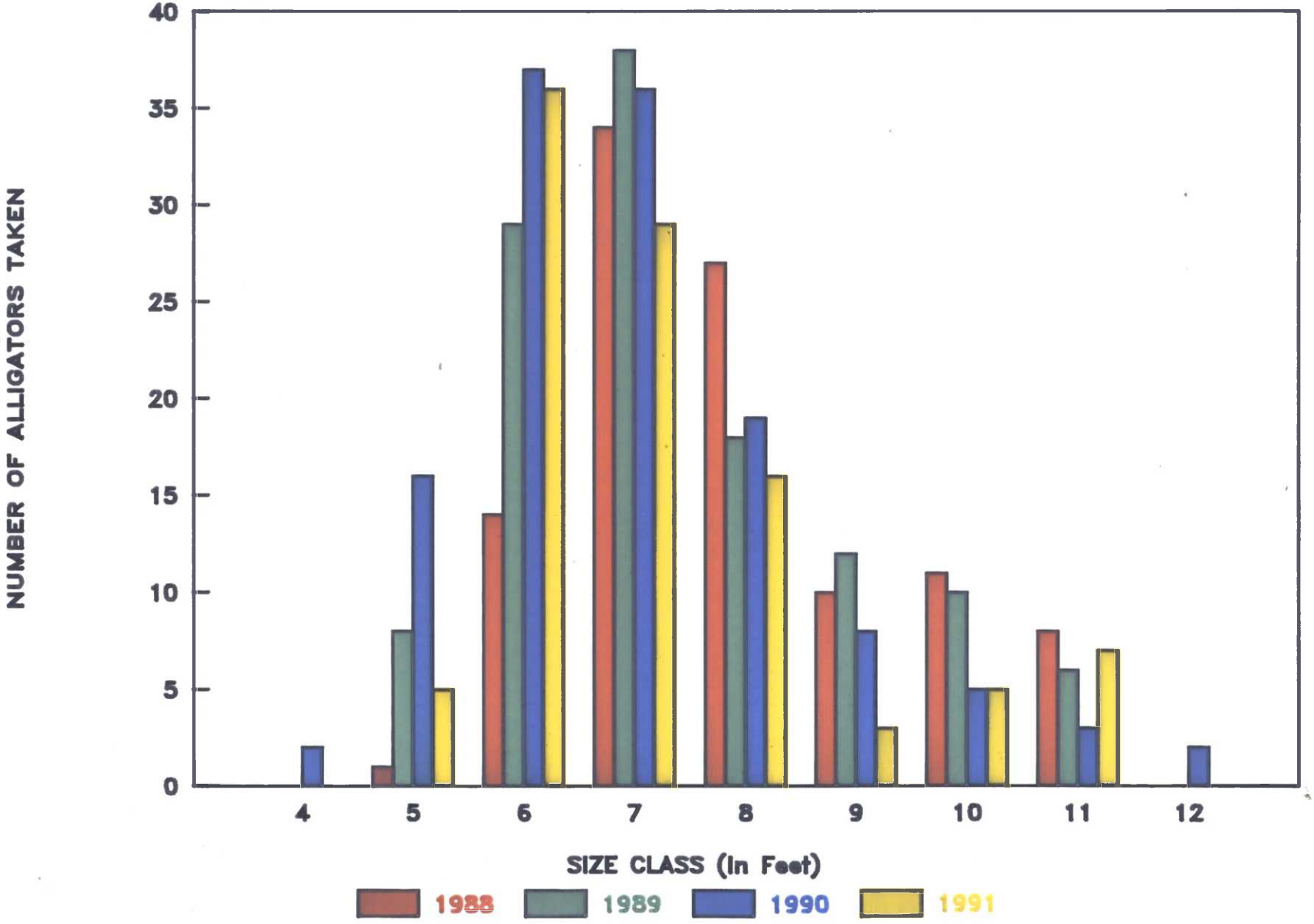


TABLE 3

EAST UNIT WATERFOWL HARVEST

	1989-90	1990-91	1991-92
# HUNTERS	2655	2714	2439
# CHECKED	2602	2692	2439
# DAYS HUNTED	57	56	57
# DUCKS TAKEN	1405	1443	867
# GEESE TAKEN	958	852	839
TOTAL BIRDS	2363	2295	1358
BIRDS/HUNTER	.91	.85	.56
DUCKS/HUNTER	.90	.81	.60
# DUCK HUNTERS	1564	1788	1452

Top Duck Species Taken

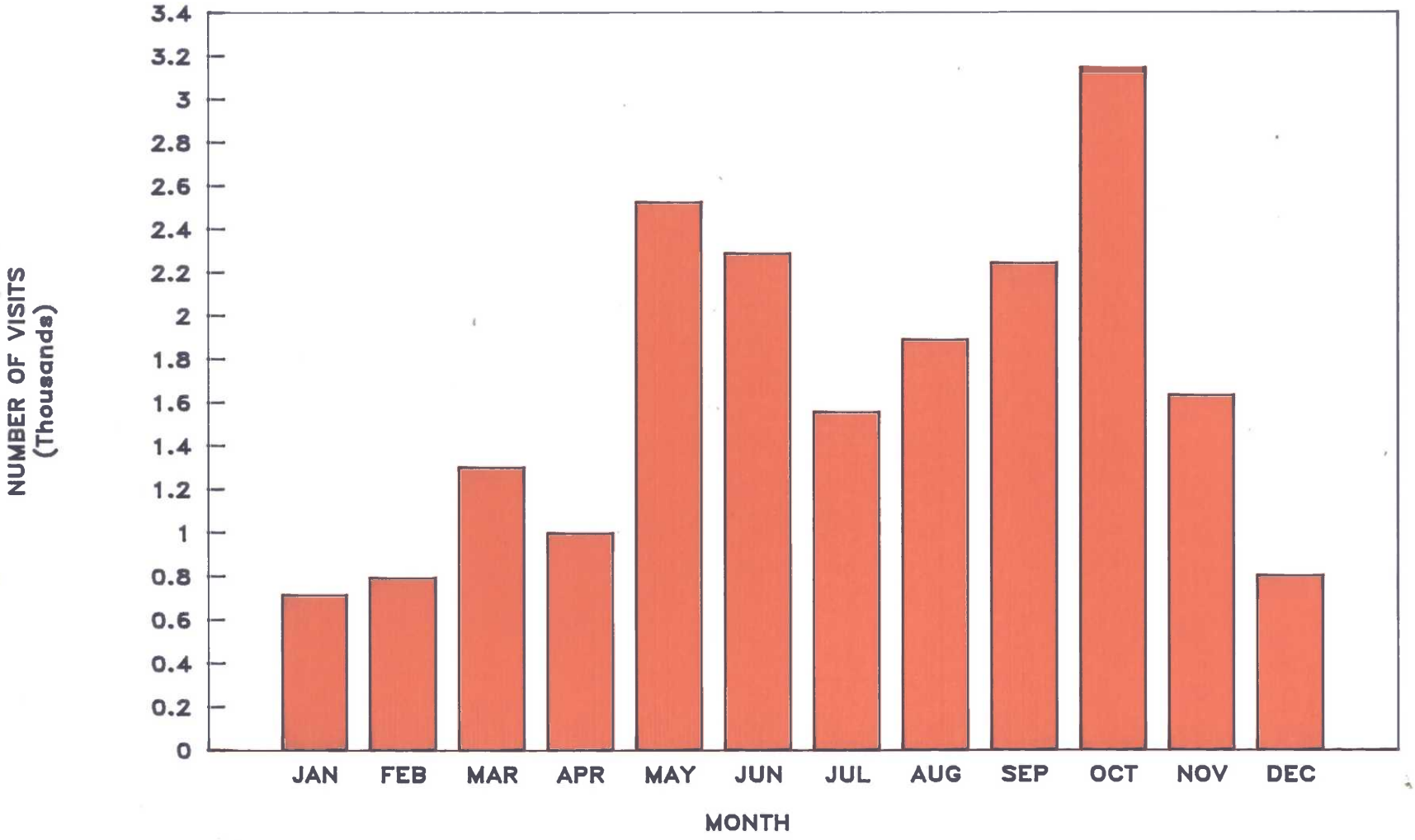
#1	G-W Teal 509	G-W Teal 388	Gadwall 200
#2	Gadwall 214	Gadwall 256	G-W Teal 163
#3	Shoveler 194	Shoveler 177	Mottled 143
#4	Mottled 99	Mottled 161	Shoveler 139
#5	Mallard 85	Ring-neck 146	Widgeon 50

Geese Taken

Snows/Blues	749	630	633
White-fronted	166	198	195
Canada	38	22	9
Ross's	5	2	2

The refuge boat ramp continues to receive heavy use and is showing greater need of repair. Fishermen continue to utilize the make shift boat ramp they have made for themselves on the Westline Road. This area shows great potential for the development of a boat ramp and parking facility to be utilized by the public.

1991 FISHING USE BY MONTH



11. Wildlife Observation

There were 8,985 registered visitors who visited the refuge in 1991 as wildlife observers. These visitors are primarily attracted to the refuge to observe migratory waterfowl in the winter, neotropical migrant birds in the spring, alligators in the summer and again migrant birds in the fall. The largest number of wildlife observers to the refuge occurred in April with a total of 1742 visitors.

17. Law Enforcement

Refuge Operations Specialist Dan Alonso attended the basic law enforcement training academy at Glynco, Georgia.

There is still some use of refuge roads to gain access to East Galveston Bay for various illegal fishing activities. A refuge officer found two illegal gill nets and almost caught the violator in December. State Game Wardens are applying steady pressure on the illegal fish trade.

Years of strict enforcement on the refuge public hunt may be yielding benefits. The enforcement effort remained intense but only two violation notices were issued in 1991. Both tickets were for hunting in closed areas and both were pending at year's end. No lead shot cases were made in 1991 indicating a high level of compliance with the regulation.

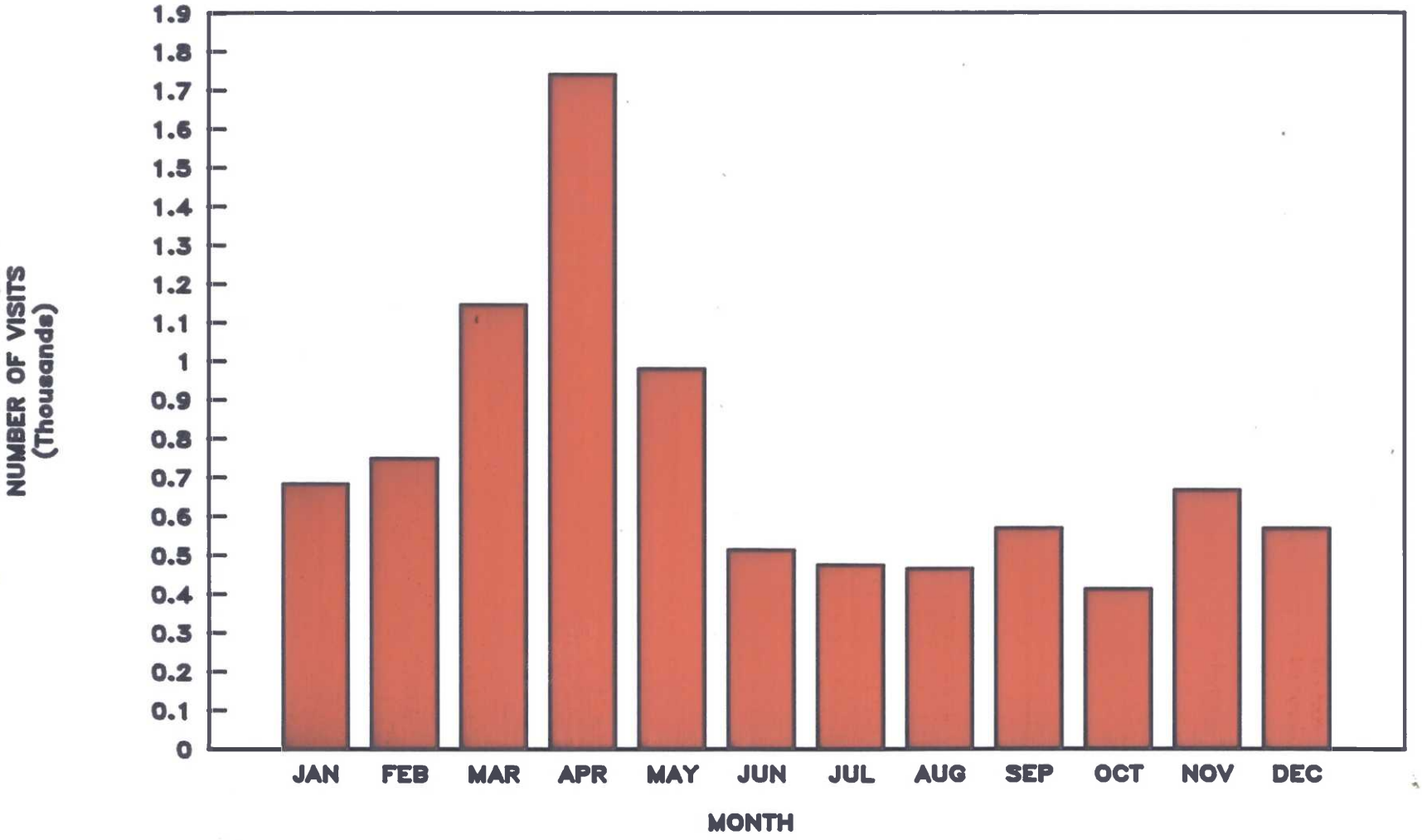
I. EQUIPMENT AND FACILITIES

2. Rehabilitation

One major rehabilitation job of 1991 was the completion of the underground storage tanks begun in December 1990. When the four 520-gallon tanks were dug up in mid-December, the soil under one of the diesel tanks was found to be contaminated. Persistent rains and scheduling difficulties postponed this project until early summer. On June 19 and 20, Allied Equipment Services, Inc., returned to the site and dug up and hauled an estimated 65 yards of contaminated soil to the County landfill. The newly-excavated hole was sampled and found to be well within tolerance. The hole was filled with new soil and surfaced with gravel. This ended our involvement with underground storage tanks.

The other carryover project from 1990 was the water control structure rehabilitation project. On September 21, 1990, Galveston Bay Land and Marine, Inc., was given a $111,591.04 contract to rebuild four water control structures on Oyster Bayou, one structure on Coon Creek, one structure on New Ditch, and an aluminum pipe structure on Gator Trail. By the time the Corps of Engineers permit was received on November 2, 1990, it was too late in the year to commence work on the contract. The

1991 WILDLIFE OBSERVATION BY MONTH



refuge was responsible for supplying all materials to the worksite. Since the aluminum structure on Gator Trail had been destroyed while hauling materials in 1990, the first thing to be done in 1991, was to amend the contract to replace rather than repair the structure. This was done on January 30 at an added cost of $3,700.

The contractor wished to begin work in January, but continuous rains delayed the beginning of work until March 11. Work was begun at the Coon Creek site. The refuge staff soon learned the difficulty of getting materials to an isolated worksite on a contractor's work schedule. Both the refuge and the contractor also learned the many problems of working in a wet hole when a high tide could stop work. A major leak was discovered on the west side of the Coon Creek structure which had to be repaired. The Coon Creek structure was not finished until March 27.

The other structures went much faster with the aluminum pipe replacement completed on April 1.

The contractor spent from April 1 to April 8 at the boat canal structure where the contract had to be amended to repair a major leak in the existing southwest wingwall on this structure. The contractor then moved to the Gator Trail, Lone Tree, Otter Lake, and New Ditch structures completing the contract on May 16.

The work varied very little from structure to structure. Basically, the contractor excavated dirt from each side of the structure where piping has been a problem. He extended each wingwall from 10 to 15 feet and installed a new wingwall six feet out from the center sides of the pipes. Each inside surface was then covered with a layer of filter fabric and the excavated area refilled with a high clay content sand mixed with cement. The bulkheads were tied together with 1/2-inch stainless or 3/4-inch galvanized cable. The ditch banks and ditch bottoms next to the structures were then sloped, covered with filter fabric, a layer of 3-inch rock and a layer of 12-inch riprap. Repair of the flap gates and decks remain to be done by the refuge staff. Delivering materials to the contractor proved to be a real challenge. At least one employee worked every weekend trying to stay ahead of the contractor. A rented dump trailer proved to be the only way to haul sand and rock when roads were too wet for the refuge dump truck.

As this project was being completed, plans were being prepared for the FY 91 MMS project to repair the Boat Canal/Entrance Road water control structure. The Corps of Engineers permit application was submitted for this and the Bayshore Road culvert project on May 29. Even with no objections, the permit was not issued until November 18.

Meanwhile, Kiva Construction and Engineering, Inc., of Anahuac had been given the $22,918.00 contract to repair the Boat Canal structure. The refuge again provided all materials and supplies. The canal was cofferdammed and pumped dry. All bulkheads were replaced and secured with cables. New bulkheads were driven at each end of the culverts and

CONTRACTOR MOVING IN AT THE COON CREEK STRUCTURE SITE. THIS EXTENSIVE EROSION IS TYPICAL OF OTHER SITES.

CONTRACTOR INSTALLING NEW BULKHEADS 3" X 10" PILINGS AT COON CREEK STRUCTURE

NEW BULKHEADS WERE COVERED WITH FILTER FABRIC. EXCAVATIONS WERE BACKFILLED WITH CEMENT REINFORCED SAND.

THE GATOR TRAIL ALUMINUM PIPE STRUCTURE NEAR COMPLETION

attached to the side bulkheads. Filter fabric and two-sack mix stabilized sand were used in backfilling behind bulkheads and beside the pipes. Riprap was placed at each end of the structure. While the structure was exposed, the refuge staff replaced deteriorated boards and fasteners, and installed a stoplog structure on the west end of each pipe. Kiva Construction finished the riprap and removed the cofferdams on December 20.

Meanwhile a contract had been issued to Marine, Inc., of Kemah, Texas, to repair the Bayshore Road/New Ditch culvert structure at East Galveston Bay at a cost of $8,125.00. Work on this job started on December 31, 1991.

On October 9, 10, and 11, 1,610 tons of 12- to 18-inch riprap rock was delivered to the refuge and stockpiled near the bay shoreline. The delivery trucks damaged refuge roads, but a large quantity of rock is now on site ready to be placed on eroding shorelines.

3. Major Maintenance

A $1,267 contract was issued to replace the roof on the hunter check station which was accomplished on October 28.

The door facings on the vehicle storage building were replaced and then in June the two shop buildings and vehicle storage building were repainted with rust/mildew inhibitor, primer, and paint. This greatly improved the appearance of the shop area.

On January 17, the John Deere 302A tractor was taken to Stewart and Stevenson, Inc., with a broken transfer case. Two months and $4,481 later the tractor was returned with a replacement transfer case, new pump bearing and oil supply tube and rebuilt engine and P.T.O. clutch assemblies. On May 1, the right rear wheel and axle came off the tractor injuring Maintenance Worker Diane Cox as the tractor fell. The Stewart and Stevenson mechanic denied any responsibility, but repaired the wheel and axle at no cost. When the tractor was taken apart in October to repair a transmission seal leak, the refuge mechanic found no sign of the nut retainer which, if properly installed, would have prevented the axle from coming off the tractor.

The Case 2670 tractor transmission stopped working in early May. Since the engine was overdue for a major repair, the tractor was given a complete engine transmission and air-conditioning overhaul. The $10,500-job was completed and the tractor returned to service on July 23. This tractor also required one new tire in August at a cost of $862.

This refuge had to replace the damaged radiator on the borrowed McFaddin NWR John Deere 301A tractor in April.

The clutch on the WABCO grader was replaced and the old Rolligon injector pump was repaired this period. The left idler wheel, both track spring seals, and brake "O" rings were replaced on the Case 450 dozer this period.

The McFaddin NWR Case 450 dozer was moved to Anahuac in October to backup the Anahuac dozer working on flooded rice fields.

In July, 400 tons of gravel were placed on refuge roads.

In October, the 0.2-mile road into Field 72 was graded and given a gravel surface to provide hunters all-weather access to the field. The pump impellers on the Wajax Fire Slip-on Pumper were replaced in June.

4. Equipment Utilization and Replacement

New equipment received in 1991, included a Craftsman table saw, a refrigerator for the shop, portable generator, chain saw, two 35-mm Minolta cameras, a chain hoist, and 14 gates. The refuge fire management capability was improved with the purchase of a Terra-torch and a 1 1/2 inch portable pump.

6. Computer Systems

A new AST Bravo 386SX/20 and Hewlett-Packard LaserJet III printer arrived on October 29. This was the greatest time-saving tool to arrive this year.

J. OTHER ITEMS

2. Other Economic Uses

The refuge staff continued efforts toward understanding and promoting clean up of the Mueller-Roberts oil field.

On February 7, 1991, during a routine inspection of the Mueller-Roberts oil field, ROS Dan Alonso discovered an oil spill and attempted clean up of a 10 x 25 yard area approximately 50 yards from the S & S Energy (S&S) tank battery. Upon confronting S & S oil field foreman Johnny Andres, it was learned that one-half barrel of crude oil had leaked on February 5 from an AMOCO pipeline. AMOCO was then informed by refuge staff to report any incident of that nature to the refuge manager as soon as possible.

HOPE'S NEW NET-COVERED PIT

On that same day (2/7/91), ROS Alonso also discovered the oil-covered carcass of a king rail on the levee of an uncovered HOPE oil pit. The bird was photographed and transferred to USFWS Special Agent Jerry Monroe who later sent a notice of violation to Houston Oil Production Enterprise (HOPE). HOPE paid the $450 fine, bulldozed the problem pit, and replaced it with a smaller, net-covered pit.

On February 21, the Texas Railroad Commission (TRC), the State organization responsible for oil and gas-related activities, was contacted by refuge staff for assistance in managing the two problem oil lease operators (S & S and HOPE) on the Mueller-Roberts Tract.

On February 22, two representatives of TRC inspected the Mueller-Roberts oil field with ROS Alonso. The inspectors pointed out numerous TRC violations and recommended the mailing of formal letters of complaint to the lease operators. On February 26, TRC prepared and mailed the complaint letters which stated, "Failure to take the required action by the next reinspection date (March 3, 1991) will result in the lease being placed under a pipeline severance." On March 4, TRC returned and found HOPE to be in compliance and was placed under an observation status. S & S Energy was not in compliance and a pipeline severance was issued which prohibited them from selling or removing any oil and/or gas

products from their facility. On March 14, the pipeline severance was lifted and S & S Energy was placed under observation status.

As a result of these actions, both HOPE and S & S Energy have begun implementing corrective measures beyond those required by current Railroad Commission regulations to improve their operations and reduce hazards to wildlife.

On April 15-19, ROS Dan Alonso attended Oil Field Lease Operator Training in Odessa, Texas, as offered by the University of Texas Petroleum Extension Service. The course was taken to gain an understanding of oil field operations to better manage the private mineral activities on the refuge.

A pipeline break at AMOCO's High Island terminal at approximately 11 p.m. on September 5, resulted in the release of an estimated 42,000 gallons of crude oil, a portion of which entered the Gulf Intracoastal Waterway (GIWW). Refuge personnel responded the following morning after learning of the spill through news reports. Due to a delay in placement of booms, a considerable amount of oil entered the refuge marsh through Jackson Ditch. The GIWW was closed to barge traffic for at least two days. Although damage to the refuge resources appeared to have been minimal, a considerable amount of time was spent monitoring the spill and assessing its impacts. Clean up was completed on September 10.

On September 10, while monitoring the AMOCO oil spill clean up; USFWS personnel Ciccone, Neaville, Larranaga, and Roach observed a fish kill on Jackson Ditch and an adjacent pond located on Anahuac's East Unit. An estimated 183,480 menhaden, 500 mullet, 225 redfish, 50 ten-pounder and a smaller number of several other species were observed. The water in Jackson Ditch and the adjacent pond was extremely black, however oil sheen and oil-stained vegetation were present in both the ditch and the pond. It is believed that the fish kill was a direct result of the AMOCO oil spill. This spill occurred in almost the exact same place and with the same consequences as the June 24, 1987, AMOCO pipeline spill.

At least three cormorants were observed too oiled to fly and several egrets were observed with oil spots on their feathers. Impact of Clapper rails occurred, but was difficult to assess.

On October 17, 1991, a meeting was held at the Clear Lake Ecological Services office between AMOCO representatives and the trustees including Coast Guard, NOAA, DOI, NRDA, Solicitor, Texas General Land Office, Texas Parks and Wildlife Department, Texas Water Commission, Ecological Services and Anahuac NWR to decide on AMOCO retribution for the September 5 spill. It was agreed that AMOCO would replace the old Jackson Ditch pipe, which had permitted oil to enter the marsh, with aluminum pipes equipped with flap gates and flashboard risers which should help keep oil from entering the marsh from this route in the future. AMOCO would also replace an old screw gate drainage structure in the oil field road near the Jackson Ditch structure.

OIL SPILLED FROM THE AMOCO PIPELINE ACCUMULATED AT THE ENTRANCE OF JACKSON DITCH. THE WATER HYACINTH MADE A GOOD SPONGE WHICH AIDED IN CLEANUP.

THE OIL FIELD ROAD BLOCKED MOST OF THE OIL FROM ENTERING JACKSON DITCH, BUT THIS SHEEN FOULED FOUR MILES OF REFUGE SHORELINE CONTRIBUTING TO THE JACKSON DITCH FISH KILL.

On December 11, AMOCO submitted their itemized cost estimates for the two jobs as totaling $403,000. This figure was much higher than the $100,000 estimate discussed at the October 17 meeting, which of course concerned AMOCO. The year ended with the refuge negotiating with AMOCO to get the structures built at a more realistic cost.

On October 9, Project Leader Ciccone and Biologist Neaville met with Corps of Engineers and Texas Department of Transportation representatives regarding use of an old spoil pit on the Mueller-Roberts Tract for disposal of spoil during re-dredging of the Gulf Intracoastal Waterway. The Corps was agreeable to depositing spoil in a manner that would enhance the area for wildlife. However, a conflict over frequency of reuse of the area for spoiling needs to be resolved before the project can be implemented.

On April 19, 1991, Western Geophysical of Houston, Texas, submitted $9,150.00 as payment for a seismic survey line conducted on the East Unit and Mueller-Roberts.

Inland Geophysical Services also of Houston, Texas, submitted $1,350.00 on March 25, 1991, for a seismic survey line conducted on the northern portion of the East Unit.

Both survey companies were charged $150.00 per shot hole.

3. Items of Interest

Project Leader Ciccone attended the Zone Meeting in Clute, Texas, on January 28-30 and the Water Rights Training in Austin on February 12. He and Biologist Neaville attended the Alligator Farming Workshop in Baytown on February 19. He attended the Private Lands meeting in Victoria, Texas, on March 14 and the Gulf Coast Joint Venture Management Board, Delhomme Marsh, meeting on May 6-7.

Project Leader Ciccone manned an exhibit with the National Park Service at Big Thicket Day in Saratoga, Texas, on April 13 and attended the Interagency Tourism Subcommittee meetings in Lufkin on May 9-10 and in Orange on August 23. He attended the ground-breaking ceremony for Big Thicket National Preserve Visitor Center on August 22.

Project Leader Ciccone attended the Project Leaders' Meeting in Albuquerque on August 12-16.

Project Leader Ciccone and Biologist Neaville participated in the Gulf Coast Joint Venture MERT Team Meeting in Lafayette, Louisiana, on May 16. Ciccone attended the Galveston Bay Estuary Program meeting on April 22, the Ducks Unlimited Banquet in Baytown on April 24, the East Texas Wildlife Conference in Tyler, Texas, on June 19-21. Ciccone, Neaville, and Jackson attended the dedication of Candy Cain Abshier Wildlife Management Area at Smith Point, Texas, on June 25.

STUDENT TRAINEE LARRANAGA WITH SOME OF THE LARGER FISH KILL VICTIMS. MOST WERE SMALLER MENHADEN LIKE THE THREE IN THE WATER.

NOTE THE BLACK COLOR OF THE WATER ASSOCIATED WITH THE JACKSON DITCH FISH KILL. VERY LITTLE OIL SHEEN IS PRESENT AT THIS LOCATION.

BIOLOGIST NEAVILLE RECEIVES 20-YEAR PIN FROM
PROJECT LEADER CICCONE

EQUIPMENT OPERATOR HENRY RECEIVES HERO'S MEDAL
FOR COURAGEOUS DUMP TRUCK DRIVING

Project Leader Ciccone was guest speaker at the Bowie Elementary School Science Club on February 7 and the Houston Sierra Club on June 6.

Project Leader Ciccone attended the Oil Spill Prevention and Control Training in Corpus Christi on July 29-August 2.

Refuge Operations Specialist Jackson attended the Cedar Bayou Junior High School Career Day on April 3.

Anahuac's proximity to the Texas coastline has led to its involvement with the neotropical bird and coastal woodlot initiatives. One August 20, Project Leader Ciccone met with personnel from the Galveston County Parks Board, Houston Audubon Society, Texas General Land Office, Ecological Services and Realty regarding our potential involvement in protecting and managing the Bolivar Flats, a heavily utilized beach next to the north jetties of the Galveston Ship Channel.

The National Wetlands Research Center global climate change team visited the refuge on February 26 and December 11 to choose a permanent data collection site for their study.

On August 13-14, Biologist Neaville assisted National Wetland Inventory personnel in ground truthing aerial photograph data.

A daughter was born to Gloria and Dan Alonso on May 28, 1991.

On November 22, Pilot/Biologist John Winship and Patty Hoban photographed the Anahuac Complex using color infrared film.

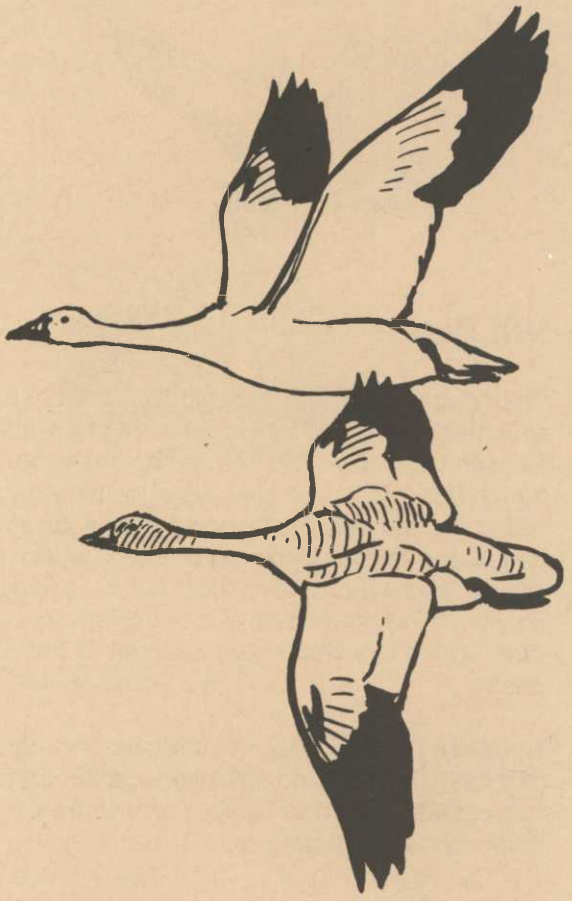
4. Credits

The report was written by ROS William E. Jackson and Daniel M. Alonso. Typing and graphs are products of Office Assistant Ilene Manuel, the new AST Computer, the Hewlett-Packard LaserJet III printer, and the old Hewlett-Packard Plotter.

L. INFORMATION PACKET

ANAHUAC

National
Wildlife
Refuge



Texas

REFUGE HISTORY

ANAHUAC National Wildlife Refuge contains 27,506 acres of marshland on the upper Texas coast. The refuge was established in 1963. The area provides habitat for numerous ducks and geese of the Central Flyway which spend the winter months on the Texas coast. Anahuac is an important link in the chain of refuges extending southward along the Gulf coast of Texas. The refuge more than doubled in size in 1982 with the acquisition of the Anahuac Public Hunting Area. Federal duck stamp revenues provided funds for the acquisition of the refuge.

Mottled Duck

WILDLIFE

The refuge brackish marsh and wet prairie communities are utilized by a great variety of wildlife. Between October and March, as many as 20 kinds of ducks and 4 species of geese may be found on the refuge. Concentrations of snow geese, sometimes in excess of 50,000, utilize the refuge and surrounding rice fields. Anahuac serves as a prime nesting area for the mottled duck which is a year-round resident of the Gulf coast.

Numerous water birds, including herons, egrets and ibis, can be found on the refuge throughout the year. Muskrat and nutria are some of the common refuge furbearers.

Raccoon, opossum, mink, skunk, bobcat and river otter are present but are rarely seen during daylight hours.

ENDANGERED SPECIES

National wildlife refuges play an important role in the protection of endangered species. The red wolf was once common in the Anahuac area. However, because of hybridization with the coyote and loss of habitat, pure red wolves are no longer found in the wild. The remaining wolf hybrids are nocturnal and seldom seen by refuge visitors. Red wolves captured from the Anahuac area during the late 1970's are being bred at a zoo in Tacoma, Washington. In 1987, red wolves were reintroduced into the wild at Alligator River National Wildlife Refuge in North Carolina.

A more successful wildlife management program has been the protection afforded the American alligator. At a low level in the early 1960's, the threatened alligator population has increased dramatically and is now abundant on the refuge.

Nutria

MANAGEMENT

Refuge management operations that benefit wildlife include grazing, prescribed burning and water level manipulation. Burning and grazing practices clear away dense, old vegetation that is quickly replaced by new, green growth preferred by wildlife. Water level manipulation by the refuge manager can modify the habitat to provide food and cover for wildlife.

PUBLIC USE

Wildlife observation, fishing and waterfowl hunting are the popular activities on Anahuac Refuge. There is no admission charge. Visitors are asked to register at the information booth located at the refuge entrance.

WILDLIFE OBSERVATION

Marsh wildlife can be observed from any of the refuge roads. Wildlife viewing is best in the early morning and late evening, but it is possible to see wildlife at any time of the day.

Alligators are most easily seen during the spring but are often visible during the summer and fall. Visitors hoping to see alligators should visit Shoveler Pond in the northwest corner of the refuge.

The winter and spring months are best for birdwatching. Birders should be sure to visit Shoveler Pond and Teal Slough. During the spring migration, a walk along the salt cedar hedgerow north of Teal Slough can be productive for warblers and other passerines.

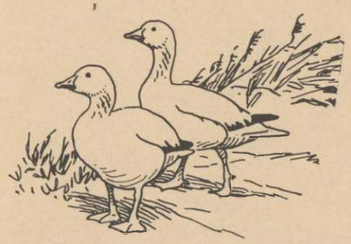
There are no photography blinds on the refuge. A special use permit must be obtained from the refuge office to erect a temporary blind.

AUTO TOUR

Twelve miles of graveled roads provide excellent opportunities to observe marsh wildlife. Main roads can accommodate buses and recreational vehicles. However, travel may be restricted during wet weather to prevent road damage. Road conditions are not suitable for bicycling. Visitors are cautioned that there are no gasoline stations located on or near the refuge. Off-the-road travel is prohibited.

HIKING

Visitors are welcome to walk on designated roads and trails, but are cautioned to watch out for poisonous snakes, fire ants and alligators. Visitors not wishing to feed the seemingly ever-present mosquitoes should bring insect repellent.



FACILITIES

Restroom facilities are provided at the refuge entrance and at two locations on East Galveston Bay. There is no drinking water on the refuge.

Camping is permitted only along the shore of East Galveston Bay and is limited to three days. There are no camping facilities provided, as camping is not encouraged. Public camping facilities are available at Fort Anahuac Park in Anahuac and White Memorial Park north of town along Interstate 10. Motel accommodations are available in Anahuac, Winnie and High Island.

FISHING AND BOATING

Fishing is permitted only in East Galveston Bay, bayous and other locations designated by refuge signs. Access to East Bay is permitted 24 hours per day along designated roads. Boating is not permitted in inland waters of the refuge except for the boat canal. All fishing and boating must be in accordance with State law. Boats may be launched at the shoreline of East Bay. A boat ramp near headquarters is open year round.

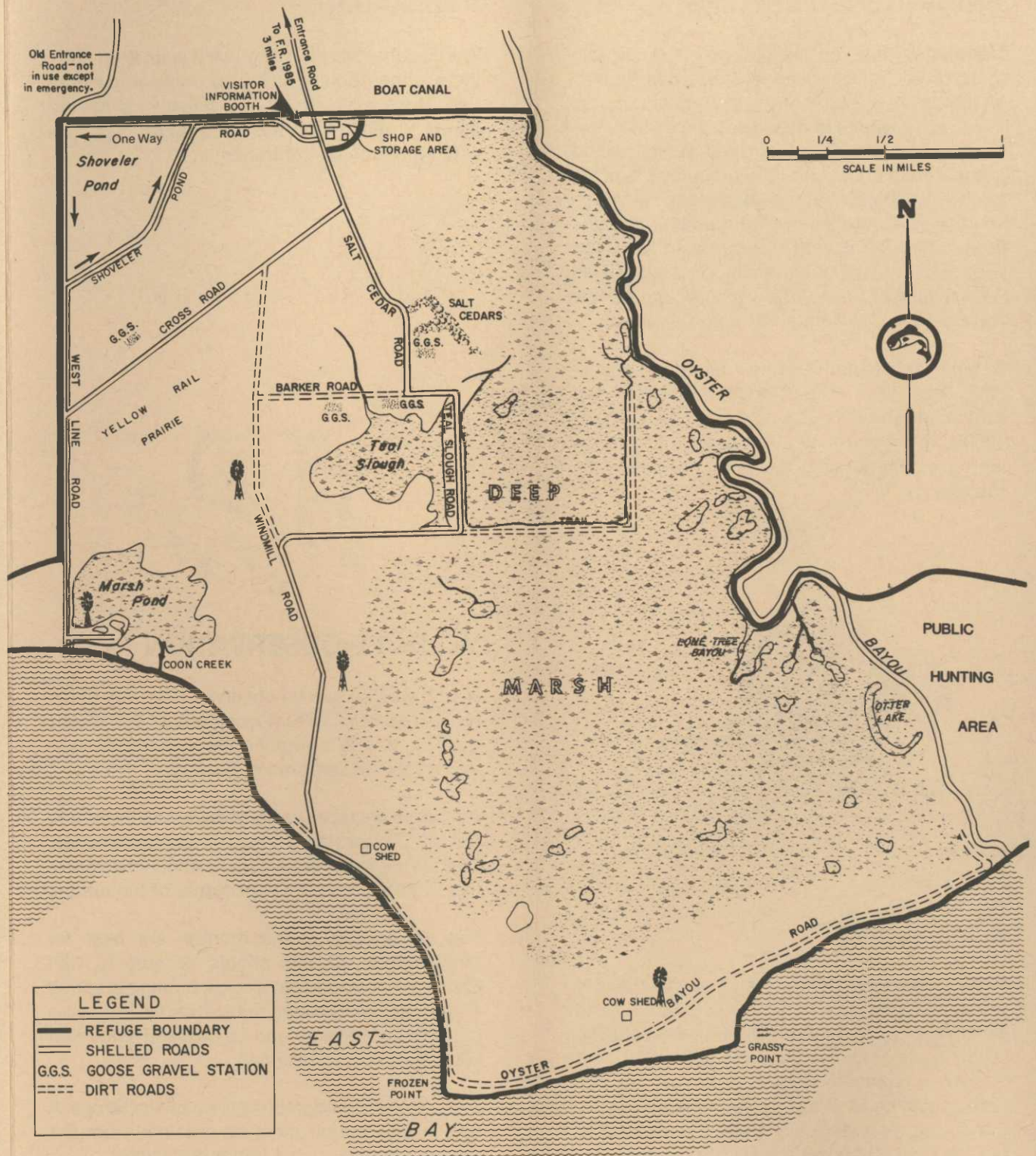
HUNTING

Waterfowl hunting is permitted on the Anahuac Public Hunting Area, which includes the East Unit and the Pace Tract. Hunters must contact refuge headquarters in the fall before waterfowl season to obtain hunting regulations. The Anahuac Public Hunting Area, located 7 miles east of the main refuge on FM 1985, is closed to the public except during hunting season. Possession of firearms on the refuge is unlawful except in designated areas during hunting season.

ADMINISTRATION

Anahuac is one of the more than 400 National Wildlife Refuges administered by the U.S. Fish and Wildlife Service. The refuge office is located in the town of Anahuac on the corner of Trinity Street and Washington Avenue near the County Courthouse. Office hours are from 8:00 a.m. to 4:00 p.m. The Anahuac office also administers the Texas Point and McFaddin National Wildlife Refuges. These two refuges are located along Highway 87 west of Sabine Pass, Texas. Inquiries for all three refuges can be made at the following address:

Refuge Manager
Anahuac National Wildlife Refuge
P.O. Box 278
Anahuac, TX 77514
(409) 267-3337



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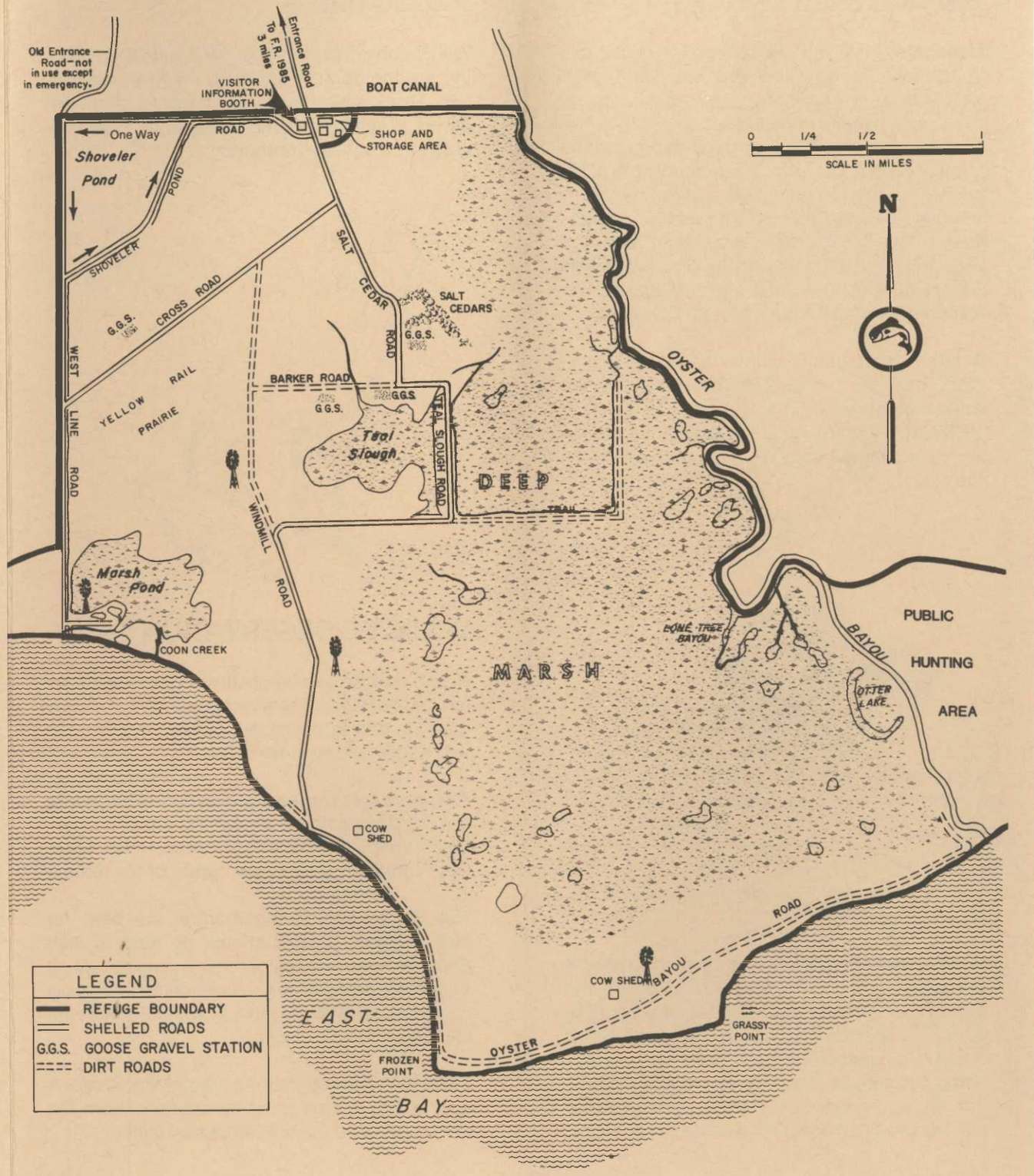
PLEASE DO NOT LITTER



BIRDS OF THE

ANAHUAC NATIONAL WILDLIFE REFUGE

ANAHUAC NATIONAL WILDLIFE REFUGE, ESTABLISHED IN 1963, CONTAINS 28,564 ACRES OF COASTAL MARSH LOCATED AT THE UPPER END OF EAST GALVESTON BAY, 18 MILES SOUTHEAST OF ANAHUAC IN CHAMBERS COUNTY, TEXAS.

THIS FOLDER LISTS 255 SPECIES OF BIRDS CONSIDERED PART OF THE REFUGE FAUNA. ANOTHER THIRTEEN SPECIES HAVE BEEN SEEN ON THE REFUGE ONLY ONCE OR TWICE AND ARE CONSIDERED ACCIDENTAL:

Gannet	Ferruginous Hawk	Common Crow
European Wigeon	California Gull	Band-Tailed Pigeon
Old Squaw	Say's Phoebe	Townsend's Warbler
Black Scoter	Violet-Green Swallow	Lark Bunting
		Palm Warbler

THIS LIST IS IN ACCORDANCE WITH THE FIFTH A.O.U. CHECK LIST AS AMENDED. ACCEPTED NEW NAMES ARE USED.

THE FOLLOWING LEGEND INDICATES THE RELATIVE ABUNDANCE OF EACH SPECIES IN EACH SEASON:

A - ABUNDANT (SHOULD SEE)	S - MAR - MAY
C - COMMON (SHOULD SEE)	S - JUNE - AUG
U - UNCOMMON (MAY SEE)	F - SEPT - NOV
O - OCCASIONAL (MAY SEE)	W - DEC - FEB
R - RARE (NOT TO BE EXPECTED)	* - NESTS ON REFUGE

	S	S	F	W
___ COMMON LOON				u
___ HORNED GREBE				o
___ EARED GREBE	c		c	c
___ PIED-BILLED GREBE*	c	A	c	c
___ BROWN PELICAN	o		o	o
___ WHITE PELICAN	c		c	A
___ DOUBLE-CRESTED CORMORANT			c	c
___ OLIVACEOUS CORMORANT	u	u	u	o
___ ANHINGA	u	u	u	o
___ GREAT BLUE HERON	c	c	c	c
___ GREEN-BACKED HERON*	c	c	u	R
___ LITTLE BLUE HERON	u	u	u	u
___ CATTLE EGRET	A	A	A	o
___ REDDISH EGRET		o		
___ GREAT EGRET	c	c	c	c
___ SNOWY EGRET	c	c	c	c
___ TRICOLORED HERON	c	c	c	c
___ BLACK-CROWNED NIGHT HERON*	c	c	c	u
___ YELLOW-CROWNED NIGHT HERON*	u	u	u	o
___ LEAST BITTERN*	c	c	c	
___ AMERICAN BITTERN	c		c	o
___ WOOD STORK		c	c	
___ WHITE-FACED IBIS	c	c	A	C
___ WHITE IBIS	c	c	c	u
___ ROSEATE SPOONBILL	c	c	c	u
___ CANADA GOOSE	o		c	A
___ WHITE-FRONTED GOOSE	o		A	A
___ SNOW GOOSE	u		A	A
___ ROSS'S GOOSE	R		R	R
___ FULVOUS WHISTLING DUCK	o	R	c	U
___ BLACK BELLIED WHISTLING DUCK				R
___ MALLARD	c		A	A
___ AMERICAN BLACK DUCK			R	R
___ MOTTLED DUCK*	c	c	A	c
___ GADWALL	c		A	A
___ PINTAIL	c		A	A
___ GREEN-WINGED TEAL	c		A	A
___ BLUE-WINGED TEAL*	A	R	A	o
___ CINNAMON TEAL				u
___ AMERICAN WIGEON	c		c	o
___ NORTHERN SHOVELER	A		A	A
___ WOOD DUCK			u	u
___ REDHEAD	o		o	o
___ RING-NECKED DUCK	u		u	u
___ CANVASBACK	u		u	c
___ GREATER SCAUP				R
___ LESSER SCAUP	c		c	c
___ COMMON GOLDENEYE				o
___ BUFFLEHEAD	o			o
___ RUDDY DUCK*	c	R	c	u
___ MASKED DUCK*		R	R	
___ HOODED MERGANSER			R	R
___ RED-BREASTED MERGANSER	A			u
___ TURKEY VULTURE	c	c	c	c
___ BLACK VULTURE	c	u	u	u
___ BLACK SHOULDERED KITE			u	c
___ MISSISSIPPI KITE	o		o	
___ SHARP-SHINNED HAWK	o		o	
___ COOPER'S HAWK	o		o	

	S	S	F	W
___ RED-TAILED HAWK			c	c
___ RED-SHOULDERED HAWK	o	o	o	o
___ BROAD-WINGED HAWK	u		u	
___ SWAINSON'S HAWK	u		u	
___ ROUGH-LEGGED HAWK			R	R
___ GOLDEN EAGLE			R	R
___ BALD EAGLE			o	o
___ NORTHERN HARRIER	c	R	c	c
___ OSPREY	o		o	
___ CARACARA				R
___ PEREGRINE FALCON	o		o	o
___ MERLIN	R		R	
___ AMERICAN KESTREL			c	c
___ BOBWHITE*	c	c	c	c
___ RING NECKED PHEASANT	o	o	o	o
___ SANDHILL CRANE				o
___ KING RAIL*	c	c	c	c
___ CLAPPER RAIL*	c	c	c	c
___ VIRGINIA RAIL	u		u	u
___ SORA	u		u	u
___ YELLOW RAIL	u		u	u
___ BLACK RAIL	R		R	R
___ PURPLE GALLINULE*	c	c	u	
___ COMMON MOORHEN	c	A	c	c
___ AMERICAN COOT*	A	o	A	A
___ SEMIPALMATED PLOVER	u		u	
___ PIPING PLOVER		o	o	
___ SNOWY PLOVER		R		
___ KILLDEER*	c	c	A	A
___ LESSER GOLDEN PLOVER	A		R	
___ BLACK-BELLIED PLOVER	c		c	u
___ RUDDY TURNSTONE	o		o	o
___ COMMON SNIPE	c		c	c
___ LONG-BILLED CURLEW	c		c	c
___ WHIMBREL	o		R	
___ UPLAND SANDPIPER	c		c	
___ SPOTTED SANDPIPER	c		c	u
___ SOLITARY SANDPIPER	u		u	
___ WILLET*	c	c	c	c
___ GREATER YELLOWLEGS	A		A	c
___ LESSER YELLOWLEGS	A		A	c
___ RED KNOT	o		o	
___ PECTORAL SANDPIPER	A		A	
___ WHITE-RUMPED SANDPIPER	u			
___ BAIRD'S SANDPIPER	u		u	
___ LEAST SANDPIPER	c		c	u
___ DUNLIN	A		A	c
___ SHORT-BILLED DOWITCHER	u		u	u
___ LONG-BILLED DOWITCHER	A		A	c
___ STILT SANDPIPER	A		A	
___ SEMIPALMATED SANDPIPER	A		A	c
___ WESTERN SANDPIPER	A		A	c
___ BUFF-BREASTED SANDPIPER	o		o	
___ MARBLED GODWIT	c		c	u
___ HUDSONIAN GODWIT	o			
___ SANDERLING	u	o	u	u
___ AMERICAN AVOCET	u		c	u
___ BLACK-NECKED STILT*	c	c	c	
___ WILSON'S PHALAROPE	u		u	

	S	S	F	W
___ HERRING GULL	c		u	c
___ RING-BILLED GULL	c		c	c
___ LAUGHING GULL	A	A	A	c
___ FRANKLIN'S GULL			o	
___ GULL-BILLED TERN	c	c	c	o
___ FORSTER'S TERN	c	c	c	c
___ COMMON TERN	o		o	R
___ LEAST TERN*	c	c		
___ ROYAL TERN	u	u	u	u
___ SANDWICH TERN		o		
___ CASPIAN TERN	u	u	u	u
___ BLACK TERN	A		A	
___ BLACK SKIMMER	u	u	u	R
___ ROCK DOVE			R	
___ WHITE-WINGED DOVE	R		R	
___ MOURNING DOVE*	c	c	c	c
___ GROUND DOVE			R	
___ YELLOW-BILLED CUCKOO*	c	u		
___ BLACK-BILLED CUCKOO	o			
___ COMMON BARN OWL*	u	u	u	u
___ GREAT HORNED OWL	o	o	o	o
___ BURROWING OWL			o	o
___ SHORT-EARED OWL			u	u
___ CHUCK-WILL'S WIDOW	c		c	
___ WHIP-POOR-WILL	u		u	
___ COMMON NIGHTHAWK*	A	A		
___ CHIMNEY SWIFT	R		R	
___ RUBY-THROATED HUMMINGBIRD	u		u	
___ BELTED KINGFISHER	c		c	u
___ NORTHERN FLICKER			c	o
___ RED-BELLIED WOODPECKER	o	o		
___ YELLOW-BELLIED SAPSUCKER			o	
___ EASTERN KINGBIRD*	c	u	c	
___ WESTERN KINGBIRD	R		R	
___ SCISSOR-TAILED FLYCATCHER*	c	u	c	
___ GREAT CRESTED FLYCATCHER	u		u	
___ EASTERN PHOEBE			c	o
___ YELLOW-BELLIED FLYCATCHER	u		u	
___ EASTERN WOOD PEWEE	u		u	
___ OLIVE-SIDED FLYCATCHER	R		u	
___ VERMILION FLYCATCHER	o		o	
___ HORNED LARK*	c	u	c	c
___ TREE SWALLOW	A		A	
___ BANK SWALLOW	u		u	
___ NORTHERN ROUGH-WINGED SWALLOW	u		u	
___ BARN SWALLOW	A		A	
___ CLIFF SWALLOW	u		u	
___ PURPLE MARTIN*	c	c		
___ BLUE JAY			u	
___ BROWN CREEPER			u	
___ HOUSE WREN			u	
___ WINTER WREN			R	
___ LONG-BILLED MARSH WREN*	u	u	u	u
___ SHORT-BILLED MARSH WREN	c		c	c

	S	S	F	W
___ MOCKINGBIRD*	u	c	u	u
___ GRAY CATBIRD	c		u	
___ BROWN THRASHER	u		c	u
___ SAGE THRASHER			R	
___ AMERICAN ROBIN			o	o
___ WOOD THRUSH	u		u	
___ HERMIT THRUSH	u		o	o
___ SWAINSON'S THRUSH	c		c	
___ GRAY-CHEEKED THRUSH	u		u	
___ VEERY	o		o	
___ BLUE-GRAY GNATCATCHER	c		c	u
___ GOLDEN-CROWNED KINGLET			o	
___ RUBY-CROWNED KINGLET	c		u	o
___ WATER PIPIT	u		c	c
___ SPRAGUE'S PIPIT			R	R
___ LOGGERHEAD SHRIKE*	c	u	c	c
___ STARLING*	c	c	c	c
___ WHITE-EYED VIREO	u		u	
___ SOLITARY VIREO			o	
___ RED-EYED VIREO	u		u	
___ PHILADELPHIA VEREO	o			
___ BLACK-AND-WHITE WARBLER	u		u	
___ PROTHONOTARY WARBLER	u		u	
___ WORM-EATING WARBLER	o			
___ BLUE-WINGED WARBLER	o			
___ TENNESSEE WARBLER	c		c	
___ ORANGE-CROWNED WARBLER			u	o
___ NASHVILLE WARBLER	u		u	
___ NORTHERN PARULA	o			
___ YELLOW WARBLER	c		c	
___ MAGNOLIA WARBLER	c		c	
___ BLACK-THROATED BLUE WARBLER	R			
___ YELLOW RUMPED WARBLER	c	u	u	c
___ BLACK-THROATED GREEN WARBLER	c		c	
___ BLACKBURNIAN WARBLER	o			
___ YELLOW-THROATED WARBLER	o			
___ CHESTNUT-SIDED WARBLER	u			
___ BAY-BREASTED WARBLER	u			
___ PRAIRIE WARBLER			R	
___ NORTHERN WATERHRUSH	c		c	
___ LOUISIANA WATERTHRUSH	u		u	
___ KENTUCKY WARBLER	u			
___ COMMON YELLOWTHROAT*	c	u	c	c
___ YELLOW-BREATED CHAT	u		u	
___ HOODED WARBLER	u			
___ AMERICAN REDSTART	u		u	
___ HOUSE SPARROW*	c	c	c	c
___ BOBOLINK	R			
___ EASTERN MEADOWLARK*	A	A	A	A
___ WESTERN MEADOWLARK	o		o	o
___ YELLOW-HEADED BLACKBIRD	R		R	
___ RED-WINGED BLACKBIRD*	A	A	A	A
___ ORCHARD ORIOLE*	c	c	u	
___ NORTHERN ORIOLE	u		u	
___ BREWER'S BLACKBIRD				u

	S	S	F	W
___ BOAT-TAILED GRACKLE*	A	A	A	A
___ GREAT-TAILED GRACKLE		R		
___ COMMON GRACKLE	c	c	c	c
___ BROWN-HEADED COWBIRD*	c	u	c	A
___ SCARLET TANAGER	u			
___ SUMMER TANAGER	u		u	
___ CARDINAL	o		o	
___ ROSE-BREASTED GROSBEAK	c			
___ BLUE GROSBEAK	c		c	
___ INDIGO BUNTING	c		c	
___ PAINTED BUNTING*	u	u		
___ DICKCISSEL*	A	c		
___ AMERICAN GOLDFINCH				o
___ RUFOUS-SIDED TOWHEE				u
___ SAVANNAH SPARROW	A		A	A
___ LECONTE'S SPARROW	u			u
___ SHARP-TAILED SPARROW*	o	R	o	o
___ SEASIDE SPARROW*	A	A	A	A
___ VESPER SPARROW	u		u	
___ LARK SPARROW	o		o	
___ DARK-EYED JUNCO				o
___ CHIPPING SPARROW			o	
___ HARRIS' SPARROW			R	
___ WHITE-CROWNED SPARROW			u	
___ WHITE-THROATED SPARROW			u	u
___ LINCOLN'S SPARROW	u		u	u
___ SWAMP SPARROW	c		c	c
___ SONG SPARROW	u		u	o

REFUGE MANAGER
ANAHUAC NATIONAL WILDLIFE REFUGE
P.O. BOX 278
ANAHUAC, TEXAS 77514

RF-21520-2

FEBRUARY 1992

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