

PERFORMANCE REPORT

As Required by

ENDANGERED SPECIES ACT, SECTION 6

TEXAS

Federal Aid Project No: E-1-3

ENDANGERED AND THREATENED SPECIES CONSERVATION

Job No. 9.1: Piping Plover and Peregrine Falcon Coastal Habitat Use

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January 3, 1992

ABSTRACT

Seven surveys were conducted from September through March on East Matagorda Peninsula, San Jose Island, South Padre Island, and in South Bay to record the number of Piping Plovers and Peregrine Falcons utilizing bayside habitat.

Tidal height and substrate type were important factors relative to Piping Plover use of habitat. On East Matagorda Peninsula, the peak number of Piping Plovers recorded was 53 in September. Habitat association was classified as sand/silt. On San Jose Island, the peak number of Piping Plovers observed was 209 occurring in January. Primary habitat association was classified as sand/silt and accounted for 88.5% of Piping Plovers observed throughout the survey period. On South Padre Island, the peak number of Piping Plovers recorded was 387 occurring in September. Primary habitat association was classified as algal mat and accounted for 83% of Piping Plovers observed throughout the survey period. On South Bay the peak number of Piping Plovers was 48 occurring in September. Primary habitat association was classified as algal mat and accounted for 66% of the Piping Plovers observed.

Significant use of the bayside by Peregrine Falcons on any survey route was not observed.

Additional surveys were performed in various habitats in the Corpus Christi Bay system, in the South Laguna Madre, and in South Bay. Piping and Snowy plovers tended to utilize sand or sand/silt substrate in the Corpus Christi Bay area. In the lower Laguna Madre use was restricted to the predominate sand substrate, primarily on wind- or tide-exposed algal mats. Sites in general were characterized by a very gradual slope. Results of these supplementary surveys confirm the importance of the south Laguna Madre to these two species and point to variability in evidence of species' use according to wind and tide conditions.

Initial work began on research designed to examine the characteristics of Piping Plover and Snowy Plover habitat, including its selection and use. Nine study sites have been selected, spanning from Galveston county to Cameron county.

PERFORMANCE REPORT

STATE: Texas PROJECT NO.: E-1-3

PROJECT TITLE: Endangered and Threatened Species Conservation.

PERIOD COVERED: September 1, 1990 - August 31, 1991

JOB NUMBER: 9-1

JOB TITLE: Piping Plover/Peregrine Falcon winter habitat status survey.

JOB OBJECTIVE: To identify winter coastal habitat areas used simultaneously by Piping Plovers and Peregrine Falcons.

SEGMENT OBJECTIVES:

1. Conduct systematic surveys to delineate location and timing of diurnal use of Piping Plover and Peregrine Falcons on coastal habitats.
2. Assist with the Piping Plover Recovery Team midwinter plover survey scheduled for January 1991.
3. Summarize survey results.
4. Identify habitat characteristics that are predictive of Piping Plover and Snowy Plover site use and density on the Texas coast.
5. Determine foraging efficiency and body condition of Piping Plovers and Snowy Plovers as each relates to habitat type, geographic location, and time.
6. Determine Piping Plover and Snowy Plover movements within and among wintering sites along the Texas coast.

ACCOMPLISHMENTS

Objectives were carried out through three different research efforts. Objectives 1 and 3, which are ongoing from previous segments, were addressed primarily by an airboat survey of the bayside margins of Matagorda Peninsula, San Jose Island, South Padre Island, and South Bay (Appendix I). Results were supplemented by a compilation of survey efforts by the National Audubon Society from Aransas County south to Cameron County (Appendix II).

Objective 2 was accomplished through the Department's participation in the midwinter Piping Plover census, coordinated by the U.S. Fish and Wildlife Service and National Audubon Society in Texas.

Results of this census in its entirety are available in a summary report elsewhere.

Objectives 4 through 6 will be accomplished under contract to the University of Missouri. Only preliminary steps were taken toward accomplishing the objectives during this segment. The majority of this work will be accomplished during future segments.

The majority of effort on objectives 4 through 6 during this report segment was spent locating study sites. Nine sites were located, spanning the entire Texas coast. On the upper coast, Bolivar Flats, Big Reef, and San Luis Pass were selected. On the coastal bend two sites were selected on Mustang Island, with a third site on the western edge of Baffin Bay. On the lower coast, sites were selected on the algal flats south of Port Mansfield, on northern Laguna Atascosa National Wildlife Refuge, and on a portion of Brazos Island/South Bay.

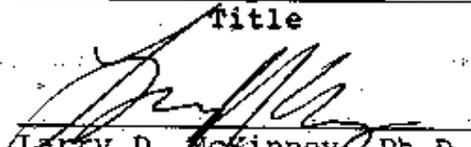
Field work began on July 8, 1991 on Galveston Island. The first Piping Plover arrived on Galveston Island on July 12. Initial field work included mapping habitat variables (soil characteristics, invertebrate infauna, vegetation, and shorebird use) on the Galveston Island. Efforts were also initiated to conduct shorebird censuses and measure foraging efficiency and time activity budgets. Preliminary attempts to capture plovers for banding were unsuccessful.

SIGNIFICANT DEVIATIONS

An amendment to the job description for this project called for airboat surveys and all-terrain vehicle surveys of the lower coast to be conducted simultaneously. A decision was made instead to supplement the airboat survey by consolidating information for times and locations not covered by the airboat effort.

PREPARED BY: Lee Ann Johnson Linam 12-31-91
Date

Endangered Species Biologist
Title

APPROVED BY:  1-2-91
Date
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APPENDIX I

PIPING PLOVER AND PEREGRINE FALCON COASTAL HABITAT USE

Mark Mitchell
Texas Parks and Wildlife Department
Fisheries and Wildlife Division

August 31, 1991

I. Objective:

Identify the extent of Piping Plover and Peregrine Falcon use of bayside marsh and flats habitat on coastal barrier islands.

II. Background:

Recovery planning efforts for the Piping Plover (Charadrius melodus) and Peregrine Falcon (Falca peregrinus tundris) are deficient because knowledge of the extent and characteristics of their use of coastal habitat in Texas is limited. Field studies to obtain habitat use data for both these threatened species can be conducted concurrently.

III. Procedures:

- a. Coordinate and plan survey routes on San Jose Island, South Padre Island, and South Bay in September. Compile maps of potential survey areas for record keeping and navigation by September 30. Once each month on each site, during October-May, conduct an eight-hour traverse from 30 minutes after sunrise for four hours and for four hours preceding 30 minutes before sunset. Survey to be conducted by airboat of as much bayside habitat as possible to record numbers of Piping Plovers and Peregrines Falcons, specific habitat where seen, and times seen. Intracoastal waterway and other boat channels in vicinity of study sites also will be examined during surveys. A two-person crew is to be used in each area for safety and observation purposes.
- b. Prepare maps for use of sites, summarize Piping Plover and Peregrine Falcon numbers, and tabulate time of day relative to habitat type for birds detected by July 15.
- c. Develop a qualitative habitat profile by August 1 to focus future survey and site management.

IV. Findings:

EAST MATAGORDA PENINSULA

Piping Plovers: Surveys of East Matagorda Peninsula began at the delta of Caney Creek and continued southwest to the town of Matagorda, a distance of approximately 38 miles (Figure 1). Five surveys were completed beginning in September and continuing through January. High use of bayside habitat occurred during low tides, regardless of time of day. Primary substrate use was classified as sand/silt. Two major use areas were identified (Figure 1).

The peak number of Piping Plovers observed was 53, occurring in September (Table 1). No survey was conducted during February due to other Department obligations. No survey was completed during March due to extreme high winds causing dangerous boating conditions and high tides.

Peregrine Falcons: Significant use of East Matagorda Peninsula was not observed. No Peregrine Falcons were seen during any of the surveys.

Other Plover Observations: In addition to Piping Plovers, Snowy Plovers (*Charadrius alexandrinus*), Semipalmated Plovers (*Charadrius semipalmatus*), and Wilson's Plovers (*Charadrius wilsonia*), were also counted. The peak number of Snowy Plovers, Semipalmated Plovers, and Wilson's Plovers was 13 in September, 14 in December, and 2 in September respectively.

Additional Data: During the January survey, which was in conjunction with the National Piping Plover Winter Census, a concurrent and adjacent beach survey was conducted. The beach survey counted 14 Piping Plovers, 8 Snowy Plovers, and no Semipalmated Plovers or Wilson's Plovers.

One Piping Plover with color-bands was observed and recorded (Table 2).

SAN JOSE ISLAND

Piping Plover: Surveys of San Jose Island began at the Aransas Ship Channel and then northeast to Cedar Bayou, a distance of approximately 40 miles (Figure 2). Seven surveys were completed beginning in September and continuing through March.

Habitat substrate used by Piping Plovers was found to be sand/silt and sand/mud. Sand/silt substrate accounted for 85.1% of the birds observed.

Peak number of Piping Plovers observed was 209 during the January survey (Table 1). Seven high use areas were recorded (Figure 2). Two areas identified as sand/mud substrate were in the Vinson Slough area and were only found exposed during extreme low tides during January and February.

Peregrine Falcons: Peregrine Falcon sightings consisted of 1 during December and 2 during January.

Other Plover Observations: In addition to Piping Plovers, Snowy Plovers, Semipalmated Plovers, and Wilson's Plovers were also counted. The peak number of Snowy Plovers, Semipalmated Plovers, and Wilson's Plovers was 54 in December, 32 in November, and 2 in March respectively.

Additional Data: During the January survey, which was in conjunction with the National Piping Plover Winter Census, a concurrent and adjacent beach survey was conducted. The beach survey counted one Piping Plover and 72 Snowy Plovers. No Semipalmated Plovers or Wilson's Plovers were observed on the beach.

No Piping Plovers with color bands were observed on San Jose Island (Table 2).

SOUTH PADRE ISLAND: MANSFIELD SHIP CHANNEL NORTH TO THE LANDCUT

Piping Plover: The survey route began at Port Mansfield, then east along the spoil islands of the Mansfield Ship Channel to South Padre Island, then north along the Bayside of South Padre Island to the Intracoastal canal at the Landcut (Figure 3). The survey route was approximately 40 miles.

Five surveys were completed beginning in September and continuing through February. The survey was not conducted during January due to obligations with the National Piping Plover Winter Census. The survey was not completed in March due to high winds causing extremely hazardous boating conditions.

Habitat used by Piping Plovers was classified as algal mat and sand/silt. Algal mat substrate accounted for 75.7% of the plover observations. High use occurred at lower tides, and 4 high use areas were identified (Figure 3). It was also observed that Piping Plover use of South

Padre Island was not as confined to high use areas as surveys through the mid-coast. Peak number of Piping Plovers observed was 298 during September (Table 1).

A total of 784 Piping Plovers were observed during the survey period with 55% being associated with the Mansfield Ship Channel and adjacent spoil islands.

Peregrine Falcons: Four Peregrine Falcons were observed; 2 during November, and 2 during December.

Other Plover Observations: In addition to Piping Plovers, Snowy Plovers, Semipalmated Plovers, and Wilson's Plovers were also counted. The peak number of Snowy Plovers, Semipalmated Plovers, and Wilson's Plovers was 395 in November, 12 in December, and none respectively.

Additional Data: Four color banded Piping Plovers were observed and recorded (Table 2).

SOUTH PADRE ISLAND: SOUTH PADRE NORTH TO THE MANSFIELD SHIP CHANNEL

Piping Plovers: The survey route began at the northern edge of the town of South Padre Island and continued northward along South Padre Island to the Mansfield Ship Channel (Figure 4). The survey route covered a distance of approximately 50 miles. Six surveys were completed beginning in September and continuing through March. The January survey was not conducted due to obligations with the National Piping Plover Winter Census.

Habitat used was classified as algal mat and sand/silt substrate with algal mat accounting for 82.4% of the Piping Plovers observed. Highest use occurred during the lower tides. Four high use areas were identified although Piping Plovers were often observed in small clusters throughout the survey route (Figure 4). Peak number of Piping Plovers observed was 287 in March (Table 1).

Peregrine Falcons: A total of a 6 Peregrine Falcons were observed during the survey period. One falcon was seen during the months of September, October, February, and March. Two Peregrine Falcons were observed during November. One Peregrine Falcon was observed with a black band on the left leg and a silver band on the right leg.

Other Plover Observations: In addition to Piping Plovers, Snowy Plovers, Semipalmated Plovers, and Wilson's Plovers were counted and recorded. The peak number of Snowy Plovers, Semipalmated Plovers, and

Wilson's Plovers were 92 in December, 10 in December, and 4 in March respectively.

Additional Data: No Piping Plovers with color bands were observed (Table 2).

SOUTH BAY

Piping Plovers: The survey route began at the South Padre Island Causeway and then south across the Brownsville Ship Channel to Clark Island, then southward along Brazos Island and then westward as the waterline turned. The route continued along the waterline Northwest to the Brownsville Ship Channel (Figure 5). Four surveys of South Bay were completed beginning in September and continuing through March. No surveys were conducted during December and February due to high winds which caused high tides and made boating extremely hazardous. No survey was conducted in January due to obligations with the National Piping Plover Winter Census.

Habitat used by Piping Plovers was classified as algal mat and sand/silt with algal mat accounting for 65.8% of the Piping Plovers observed. The peak number of Piping Plovers observed was 48 in September (Table 1).

Peregrine Falcons: One Peregrine Falcon was observed during March.

Other Plover Observations: In addition to Piping Plovers, Snowy Plovers, Semipalmated Plovers, and Wilson's Plovers were also counted. The peak number of Snowy Plovers, Semipalmated Plovers, and Wilson's Plovers was 16 in September, 20 in October, and none respectively.

Additional Data: No Piping Plovers with color bands were observed (Table 2).

V. **Recommendations:**

1. Surveys should be continued to accomplish the job's objectives.
2. Surveys should be conducted at low tides to survey maximum exposure of habitat.
3. Surveys should not be conducted during high winds when birds are inactive.

4. Additional studies should be initiated to determine site fidelity and movements between high use areas identified.
6. Surveys should begin 30 minutes after sunrise and end 30 minutes before sunset for best visibility.

Table 1. Number of Piping Plovers Observed

East Matagorda Peninsula						
September	October	November	December	January	February	March
53	2	9	8	12	+	**

San Jose Island						
September	October	November	December	January	February	March
195	117	140	37	209	109	68

South Padre Island - Mansfield Ship Channel to the Land Cut						
September	October	November	December	January	February	March
298	68	206	108	*	104	**

South Padre Island - Port Isabel to the Mansfield Ship Channel						
September	October	November	December	January	February	March
89	58	133	119	*	25	287*

South Bay						
September	October	November	December	January	February	March
48	34	37	**	*	**	1

-
- * - Not run due to National Winter Piping Plover Census
 - ** - Not completed due to high winds
 - + - Not run due to other Department obligations

Table 2. Color-Banded Piping Flowers Observed During 1990-1991 Surveys

East Matagorda Peninsula

<u>Date</u>	<u>Right Leg</u>	<u>Left Leg</u>
09/28/90	Green	-----

San Jose Island

<u>Date</u>	<u>Right Leg</u>	<u>Left Leg</u>
-----	-----	-----

South Padre Island

<u>Date</u>	<u>Right Leg</u>	<u>Left Leg</u>
09/24/90	-----	White
09/24/90	-----	White
09/24/90	-----	Green
11/14/90	Yellow	Yellow

South Bay

<u>Date</u>	<u>Right Leg</u>	<u>Left Leg</u>
-----	-----	-----

South Padre Island Beach

<u>Date</u>	<u>Right Leg</u>	<u>Left Leg</u>
11/14/90	Yellow-Black-Yellow	Green-Silver

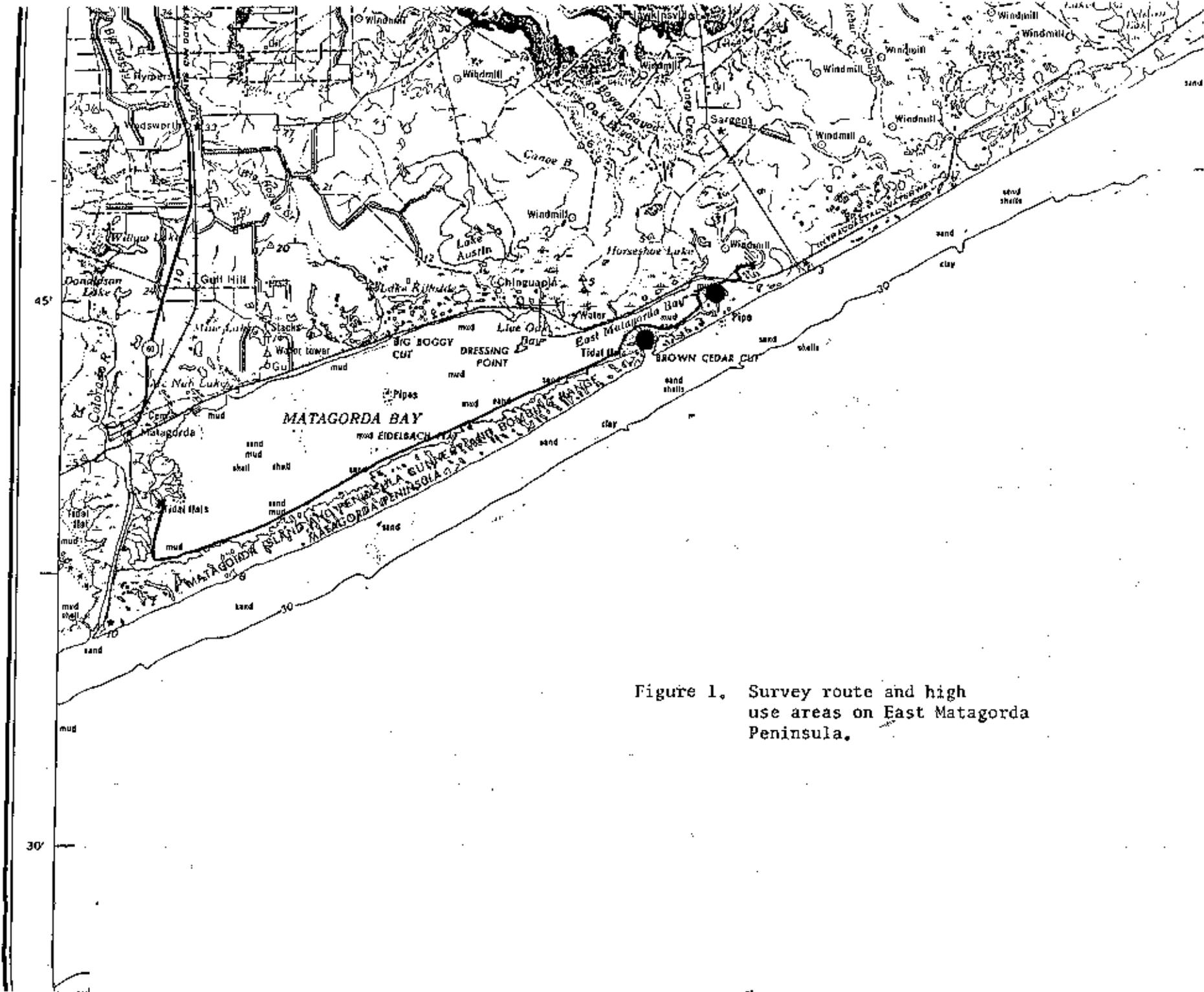


Figure 1. Survey route and high use areas on East Matagorda Peninsula.

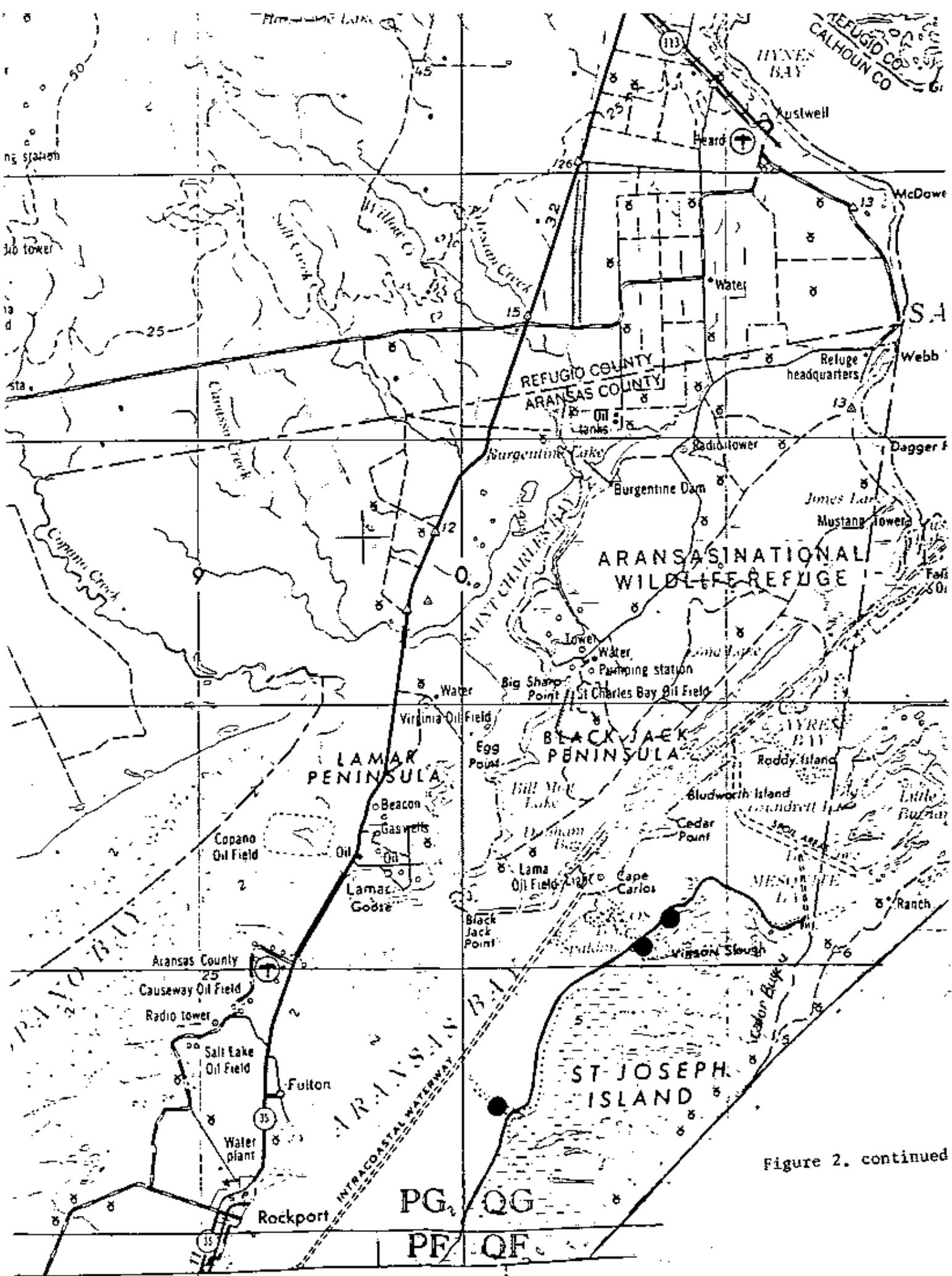


Figure 2. continued

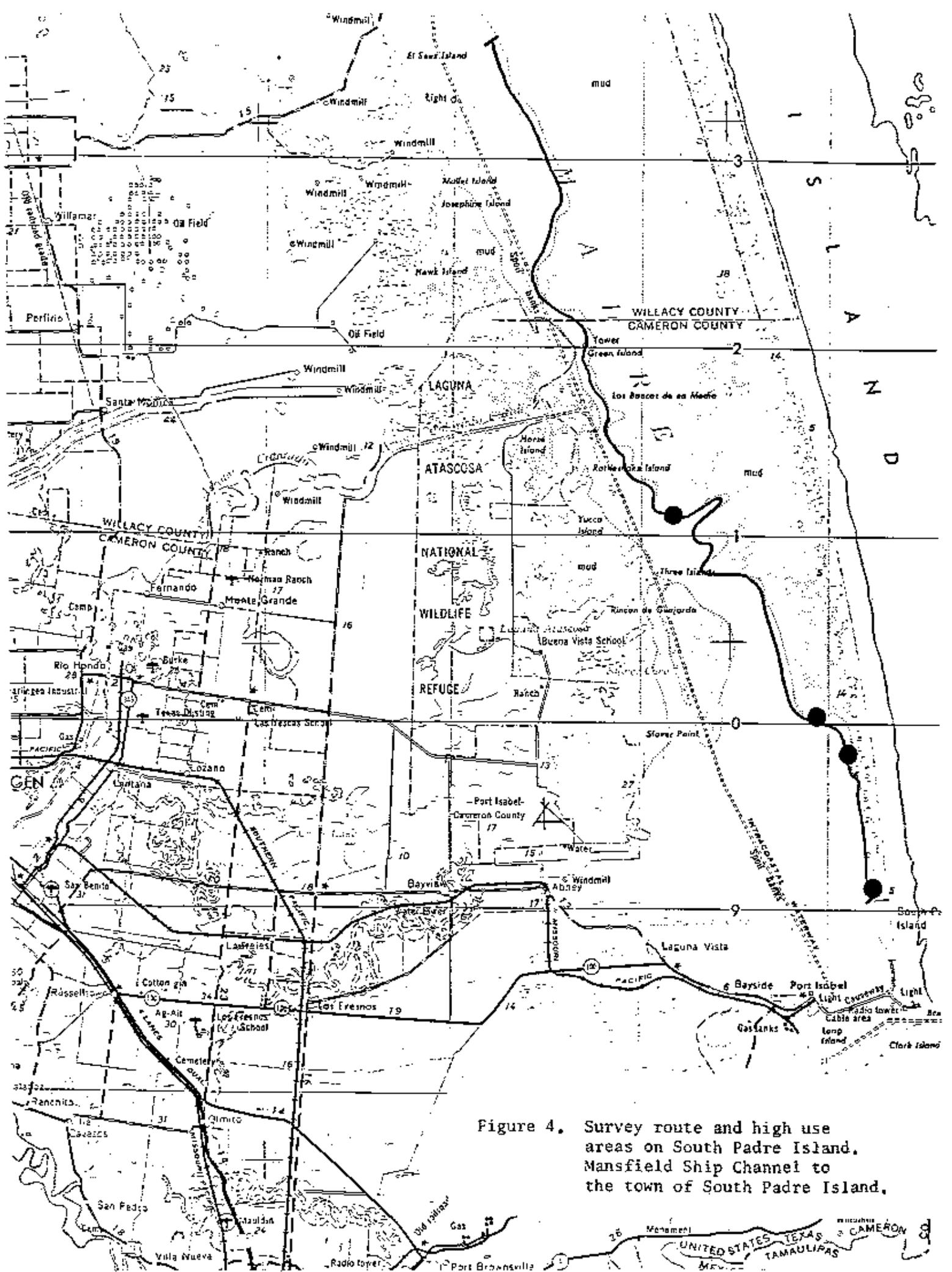


Figure 4. Survey route and high use areas on South Padre Island, Mansfield Ship Channel to the town of South Padre Island.

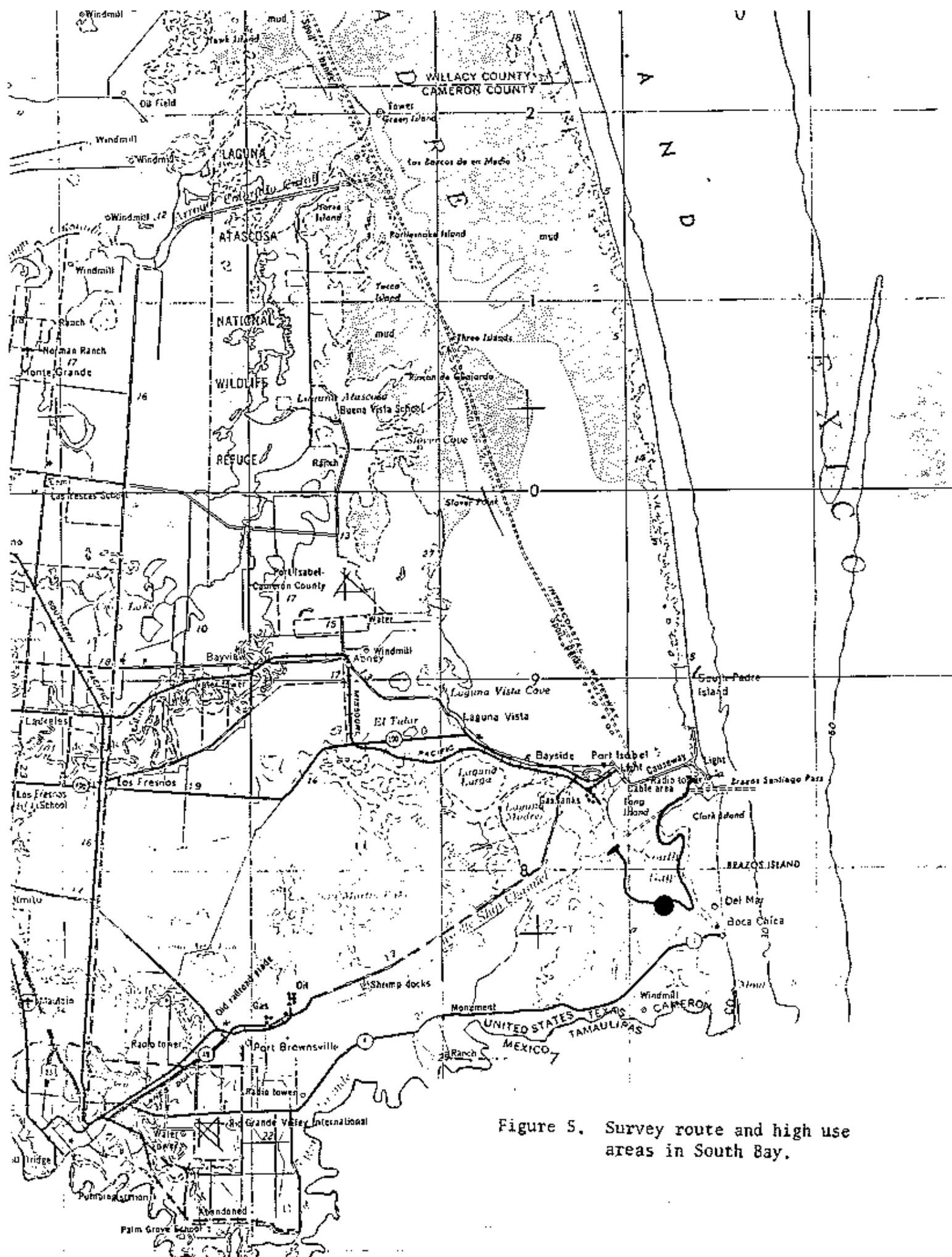


Figure 5. Survey route and high use areas in South Bay.

APPENDIX II

PIPING AND SNOWY PLOVER USE OF SOUTH TEXAS BAYS

By Rex Wahl and Mike Farmer
National Audubon Society
Oct. 1991

Introduction

The Piping Plover (Charadrius melodus) is listed as threatened by USFWS, and Texas Parks and Wildlife Dept. (TPWD). The Snowy Plover (Charadrius alexandrinus) is federal category 2 (information suggests listing as threatened or endangered) (Fed. Reg., 1989). The Texas gulf coast is an important migration route, and wintering area for the Great Plains populations of both species (USFWS 1988; Eubanks, pers. comm., 1991). During migration, both species forage on sand and mud flats in the intertidal zone. They are often found together, or in close association, especially in the Laguna Madre of TX (Farmer, 1991 pers. obs.).

Methods

Observations of Piping and Snowy Plovers were made in conjunction with general bird surveys and Reddish Egret surveys conducted by the observers. Observations were made with 8x30 or 10x30 binoculars, or a 20x - 60x variable power spotting scope. Observations were made under a variety of conditions (tide, time of day, weather) which were noted at the time. Other species in close association with plovers were also noted.

Observers traveled by boat, off-road-vehicle, or on foot. Observations were made from stopped vehicles, or by drifting slowly in a boat. Large concentrations of the appropriate guild (associated species) were searched with binoculars to locate the plovers. Salinity was measured with a refractometer (AO instruments).

Results

Observations are listed by bay and locality. The USGS 7.5 min. map name, on which locations are marked, is given at the head of each series of observations. Capitol letters (A, B, ...) correspond to the mapped locations. (Copies of maps are available upon request.)

Redfish Bay

Estes Quad:

- A. Big Bayou: S. end of Traylor Island, Aransas Co., TX. 1-16-91 Obs. Rex Wahl (RW), 3 Piping Plover, 0 Snowy Plover. Sand Flat exposed at low tide.
- B. Corpus Christi Bayou: N.E. corner of Harbor Island, Nueces Co., TX. 1-16-91 Obs. RW, 5 Piping Plover, 0 Snowy Plover, over 1,000 shorebirds on a sand flat exposed at low tide. Associates: Short-billed Dowitcher, Western Sandpiper, Dunlin, Sanderling.
- C. Aransas Channel: Small, unnamed island E.NE. of Stedman Island on N. side of Aransas Channel, near oil well. Nueces Co. TX. 1-16-91 Obs. RW, 10 Piping Plover on exposed flat with seagrass at low tide. 0 Snowy Plover.

Port Ingleside Quad

- D. S. end Dagger Island, Nueces Co., TX: Pass between Redfish Cove and Redfish Bay, exposed sand flats at low tide, some seagrass exposed. 1-16-91 obs. RW. at least 15 Piping Plover on exposed flats on Redfish Bay side (east side). 0 Snowy Plover.
- E. Spoil Island North of Dagger Point, Dagger Island, Nueces Co., TX: Spoil island exposed at low tide, sand and shell. 1-14-91 obs. RW, Carol Beardmore (CB). 10 Piping Plover, 5 Snowy Plover. Arctic Peregrine Falcon seen perched on piling ca. 1/2 mile NE. of this locality.
- F. N. Side Corpus Christi Ship Channel, Harbor Island. Sand spoil from ship channel. Extensive sand flat at low tide, with high wave action and ship wakes. 1-16-91 Obs. RW. 0 Piping Plover, 36+ Snowy Plover, over 1000 shorebirds (Short-billed Dowitcher, Sanderling, Western Sandpiper, Dunlin, Black-bellied Plover). Snowy Plover roosting behind flotsam (primarily dead seaweed and seagrass) high on the beach (relative to the other species), on dry sand.
- G. Submerged, and emergent spoil islands on East side of Gulf Intracoastal Waterway from Marker 65 to Marker 53 (Junction of GIWW and Corpus Christi Ship Channel to Dredged channel N. of Dagger Island). Sand substrate, some with exposed seagrass at low tide. 1-12-91 PM, Obs. RW, Paul Turner (PT).

Piping Plover 29, Snowy Plover 5: (roosting in wrack line, some feeding) Scattered on series of islands in

groups from 11 to 2. Associates: Semipalmated Plover, Sanderling, Semipalmated Sandpiper, Dunlin.

Corpus Christi Bay (Port Ingleside Quad)

- H. Pelican Island, Nueces Co., TX. Large spoil island. Embayment on South Side of island: large sand flat exposed at low tide.
- 10 Piping Plover, 3 Snowy Plover. 1-12-91 AM. Obs. RW, Paul Turner (PT).
- H1. Sand Flat on N. side of Pelican Island.
3 Snowy Plover. 1-12-91 AM. Obs. RW, PT.
- I. North shore of Ingleside Point, Nueces Co., Tx. Pass between Point and spoil island to N.: Sand flats, gradual slope, exposed at low tide.
- 1-13-91, obs. RW, PT.
- 6 Piping Plover, 0 Snowy Plover.
- J. Spoil island North of Ingleside Point, La Quinta Channel, Corpus Christi Bay, Nueces Co., TX.
- 1-13-91 PM. Obs. RW, PT.
- Large sand flat on S. end of island (across from I. above): 1 Piping Plover, 22 Snowy Plover.
- Narrow sand beach on East side of spoil island, from S. end to ca. 1/2 mi. N.: 3 Piping Plover, 3 Snowy Plover.

Portland Quad

- K. North end, La Quinta Channel, spoil island of shell and sand.
- 1-13-91 AM, obs. RW, PT.
- 1 Piping Plover, 0 Snowy Plover.
- L. N. shore Corpus Christi Bay, from Wildcat Street, Portland to Sunset lake. A ca. 1 mile transect along the bay edge. 12-13-90 PM (low tide). Obs. RW. 21 Short-billed Dowitcher, 3 Sanderling, 7 Black-bellied Plover, 7 Willet, 2 Black-necked Stilt, 3 American Oystercatcher, 1 Godwit, 2 L. Yellowlegs, 69 Western Sandpiper, 2 Spotted Sandpiper, 1 Snowy Plover, 1

Piping Plover, 7 Semi-palmated Plover, 2 Long-billed Curlew.

- M. Indian Point. Shell and sand, with fine silt (< 1 cm.) over shell.

10-20-90. Obs. RW, CB. 1 Piping Plover.

11-17-90. Obs. RW, CB. 2 Piping Plover.

Nueces Bay (Portland Quad)

- N. Sunset Lake, sand flats on N. end of Sunset Lake. 9-11-90 PM. Obs. RW, CB. 3 Piping Plover, Sanderling, Short-billed Dowitcher, Ruddy Turnstone, Black-bellied Plover.

10-20-90. Obs. CB. 1 Piping Plover, 1 Snowy Plover.

10-23-90 AM. Obs. RW, CB, Tom Grehl, Mary Ellen Vega (MEV) only extensive search of area. 15 Piping Plover, 20 or more Snowy Plover, Semipalmated Plover, Black-bellied Plover, Sanderlings, Sandpipers, and many more waders.

11-7-90 PM. Obs. RW, CB. 2 Piping Plover, 1 Snowy Plover roosting in lee of vegetation tufts on flat, strong north winds.

11-14-90. Obs. RW, CB. 1 Piping Plover (on bay side), 10 Snowy Plover.

Other winter observations of this site, not recorded, detected from 3 to 15 Piping Plover, and up to 20 Snowy Plover during high tides in the bays. When tides are low, plovers disperse to near tidal areas to forage.

Lower Laguna Madre

- O. Laguna Atascosa NWR sand/mud/algal flat: South of Horse Island and due west of Yucca Island. Piping Plovers usually grouped on north, west, and/or south of a shallow pool that exists for over 9 months of the year. East side of pool was not surveyed. The pool is flooded through the summer low water period of the semi-annual tidal cycle by persistent southeast winds. The pool goes dry in winter due to north fronts and low winter water levels of semi-annual tidal cycle. Hypersaline (>45ppt) (Farmer 1991).

date	location	Piping	Snowy	salinity
9-24-89	west edge pool	15	3	
10-1-89	west	13	15	
10-10-89	west	50	24	60 ppt
10-17-89	north and west	1	6	53
10-19-89	west	19	1	68
3-13-90	west	31	23	40
3-22-90	west	14	2	55
4-6-90	north and west	66	12	73
4-10-90	west	4	28	44
4-30-90	west and south	16	14	46
5-31-90	west	0	0	45
7-23-90	south	8	40	54
7-26-90	west	3	0	56
7-31-90	west	33	10	83
8-10-90	south	20	15	
8-23-90	north, west, south	74	165	65
9-14-90	north	62	45	64
9-28-90	north	72	23	85
10-4-90	north	18	32	54
10-19-90	west	17	10	
10-29-90	north and west	34	2	55
11-9-90	dry	0	0	
11-30-90	north and west	110	52	43
12-10-90	dry	0		
12-13-90	dry	0		
1-6-91	dry	0		
1-18-91	dry	0		
2-1-91	dry	0		
2-5-91	dry	0		
2-8-91	dry	0		
2-11-91	dry	0		
2-14-91	dry	0		
2-22-91	dry	0		

P. Laguna Atascosa NWR sand/mud flat. Begin just north of crossing to Horse Island, along tidal-flats east edge to north tip of Horse Island.

Date	Pipers	Snowys
9-24-89	0	0
10-1-89	0	0
10-10-89	0	0
10-17-89	0	0
10-19-89	0	0
3-13-90	2	0
3-22-90	0	0
4-6-90	0	0
4-10-90	1	19
4-30-90	13	10

5-31-90	0	0
7-23-90	0	0
7-26-90	4	0
7-31-90	0	0
8-10-90	0	0
8-23-90	2	4
9-14-90	1	21
9-28-90	0	0
10-4-90	0	0
10-19-90	10	11
10-29-90	2	4
11-9-90	0	0
11-30-90	0	0
12-10-90	0	0
12-13-90	42	110
1-6-91	0	0
1-18-91	0	0
2-1-91	11	3
2-5-91	0	0
2-8-91	1	1
2-11-91	0	0
2-14-91	1	7
2-22-91	0	0

- Q. Bayside of South Padre Island. Northeast of Three-islands. Where sandflat widens significantly. Algal Mat. Good hydrology? Algal mat often wet even during low water periods due to persistent and strong southeast winds.

Date	Pipers	Snowys	
7-13-90	5	12	
7-20-90	18	21	
7-26-90	45	17	
8-2-90	21	49	
8-10-90	22	53	
8-17-90	0	0	site flooded
8-24-90	0	0	site flooded
8-30-90	2	12	
9-7-90	0	0	site flooded
9-17-90	17	25	1 km east of waters edge feeding on a sandflat.
10-14-90	32	14	
10-30-90	41	35	
11-12-90	0	0	site flooded
11-21-90	18	8	
12-12-90	72	31	
2-6-91	53	22	
2-10-91	0	0	water very low

- R. Bayside of South Padre Island. From the "bend" (location Q above), north to line of spoils just northwest of Los Bancos de en Medio. Exposed sandflat at low water. Otherwise, extensive algal mat. Generally, plovers scattered along waters edge. Small groups only. But note that total numbers can be large.

Date	Pipers	Snowys	
7-13-90	0	0	
7-20-90	19	72	
7-26-90	0	10	
8-2-90	0	0	
8-10-90	0	3	
8-17-90	0	0	site flooded
8-24-90	0	37	
8-30-90	0	6	
9-7-90	0	0	site flooded
9-17-90	5	11	
10-14-90	1	20	far east of water
10-24-90	4	24	far east of water
10-30-90	20		
11-12-90	0	0	site flooded
12-12-90	0		
2-6-91	4	21	
2-10-91	94	110	water very low

- S. Bayside of South Padre Island. From location "R" above, north to Cameron county line. Exposed sandflat at low water. Otherwise, extensive algal mat. Generally, plovers scattered along waters edge. Small groups only.

Date	Pipers	Snowys	
7-13-90	0	0	
7-20-90	11	34	
7-26-90	0	13	
8-2-90	0	4	
8-10-90	5	55	
8-17-90	0	5	
8-24-90	2	21	
8-30-90	0	0	
9-7-90	24	46	
9-17-90	0	6	
10-14-90	0	0	
10-24-90	0	0	site flooded
10-30-90	11	4	
11-12-90	0	0	
11-21-90	0	28	
12-12-90	18	26	
2-6-91	0	0	
2-10-91	21	5	water very low

T. Bayside of South Padre Island. From Cameron county line, north to a point 3 kilometers south of the Port Mansfield ship channel. Exposed sandflat at low water. Otherwise, extensive algal mat. Generally, plovers scattered along waters edge. Small groups only.

Date	Pipers	Snowys
7-13-90		
7-20-90	15	
7-26-90	0	
8-2-90	42	
8-10-90	4	
8-17-90	0	
8-24-90	0	
8-30-90	6	
9-7-90	18	
9-17-90	2	10
10-14-90	8	45
10-30-90	2	
11-12-90	56	
11-21-90	0	
12-12-90	124	150
2-6-91	2	
2-10-91	368	525

U. Bayside of South Padre Island. Small cove 1.5 miles north of water tower on north end of town. Algal mat.

Date	Pipers	Snowys
9-3-89	16	0
1-3-90	54	4
2-3-90	18	3
2-15-90	60	2
3-23-90	55	10
		scattered from cove to points north and south
4-22-90	17	1
7-20-90	21	24
7-26-90	0	3
8-10-90	1	1
8-24-90	10	21
1-28-91	2	2
		water very low
5-8-91	0	1

- V. South Padre Island. Six lagoons on west side of park road 100 from end of road to water tower on north end of the town. Each lagoon is in the dune line. Count made around water's edge of each lagoons.

Date	Pipers	Snowys	
9-3-89	1	3	lagoon #1
	0	2	lagoon #2
	4	0	lagoon #3
	2	1	lagoon #4
	0	1	lagoon #5

COMMENT: There may be 20 to 30 such lagoons in the dune field from the town to Port Mansfield channel. That estimate is based on this sample of 5 lagoons in 6 miles of park road 100.

- W. South Bay. First 100 meters of Southeast edge of Verdolaga Lake starting from Highway 4. Sand/mud flat.

Date	Pipers	Snowys	
3-21-90	5	4	
4-5-90	0	2	
5-11-90 to 9-6-90	dry due to semiannual tidal-cycle		
10-16-90	5	0	
10-29-90	10	4	
11-10-90	0	0	
12-13-90	2	3	
1-7-91	dry		
1-10-91	0	2	
1-13-91	dry		
1-25-91	7	0	

COMMENT: This area represents a sample of the miles of tidal flat available in the South Bay area. It may or may not be a typical sample, however.

- X. Mexico. Washington beach (about 5 miles south of Rio Grande) to first pass (Boca de Sandoval). Distance of about 45 miles.

Date	Pipers	Snowys
11-12-90	3	6
2-24-91	0	0

DISCUSSION

It is clear that Piping Plovers can be found in small numbers, on suitable substrate, dispersed throughout the primary and secondary bays of the South Texas Coast in the winter and during migration. Piping Plovers appear to make considerable use of certain dredge spoil islands for foraging and roosting. Of the localities A-N in the Corpus Christi - Redfish Bay system all but one are derived from sand, or sand - silt substrates (White, et al., 1983). All of the sites in the Laguna Madre are sand, and sand is the most common substrate there (White, et al., 1986). Verdolago lake is likely silt substrate, with some sand, though this is not shown in White, et al., (1986).

All the sites are characterized by a gentle slope (or imperceptible slope in the Laguna Madre case) into the water. In only a few cases is there an erosional bluff or steep gradient near the areas used by plovers, and these are at least 30 M distant. We have noticed a trend toward creation of steep slopes with pronounced bluff near the water's edge on COE spoil areas in this region (diked disposal). It is likely that this will adversely effect the use of spoil area intertidal by Piping Plover and other shorebirds.

Mike Farmer's periodic observations (O - X) demonstrate that the probability of encountering plovers on any one visit to a site is low in his study area. Note the high degree of variability of plover occurrence and numbers. The periodic high numbers of plovers on these sites, correlated with specific water stages (wind tides), indicate that they are important to plovers locally. These observations suggest that the prevailing method of assessing Piping Plover use by just a few site visits, with little regard for tide stage, is inadequate. The chance of missing even large numbers of Piping Plover using an area with infrequent surveys is great. Thus, future surveys need to consider the tidal variation (lunar and wind), and be adequate in intensity to insure that plover use, if any, is detected (specific recommendations in this regard have been made to USFWS by us and others).

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