Wintering Piping Plover Surveys 2006

Marco Island, FL to Matagorda County, TX

March 6 – March 24

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Cover photo: Canadian Great Plains Piping Plover observed on the Gulf beach west of San Louis Pass, TX, on March 14, 2006. For higher resolution files of the pictures in this report or for permission to reproduce the pictures separately, please contact the author.

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Summary

Surveys to locate banded Piping Plovers (*Charadrius melodus*) were conducted on the Gulf Coast from March 6 to March 24, 2006. Twenty-nine locations were visited from Marco Island, Florida, to Matagorda County, Texas, with 24 of the locations designated by the U.S. Fish and Wildlife Service as wintering range critical habitat for the Piping Plover.

There were 628 observations of Piping Plovers, including 374 in Texas, 141 in Florida, 75 in Mississippi, and 38 in Alabama. There were 78 observations of banded Piping Plovers, including 49 in Texas, 20 in Florida, 6 in Mississippi, and 3 in Alabama.

The breeding population could be identified for 92% (n=72) of the banded Piping Plovers: 46 were from the Canadian Great Plains (2 observed twice in the same state, different locations), 16 were from the United States Great Plains (1 observed twice, in different states), 9 were from the Great Lakes, and 1 was from Atlantic Canada.

Surveying for banded Piping Plovers on the wintering grounds can be challenging. However, the results of this survey effort suggest that experienced observers can efficiently locate and accurately identify banded Piping Plovers.

Introduction

The Piping Plover (*Charadrius melodus*) is a small shorebird (11-18 cm long, 43-63 g) with a short, stout bill, pale upperparts, and orange legs (Haig 1992). Piping Plovers spend eight months or more on the wintering grounds (USFWS 2003), with the known wintering range including the U.S. Atlantic and Gulf Coasts from North Carolina to Texas, northern Mexico, Cuba, the Bahamas, and other Caribbean islands (Ferland and Haig 2002, Haig 1992).

Piping Plovers can be difficult to locate in winter as they are cryptic, found interspersed with other wintering plovers and shorebirds, and are widely distributed at low densities (Stucker et al. 2003). Of 118 sites where Piping Plovers were found during the 2001 International Census, 56.8% contained 1-10 birds, 35.6% had 11-50 birds, and less than 8% of sites had more than 50 birds (Ferland and Haig 2002). Despite intensive winter census efforts that were conducted in 1991, 1996, and 2001, a large proportion (35-60%) of the overall breeding population of Piping Plovers has not been tallied in previous census efforts (Ferland and Haig 2002).

Over the last decade, scientists in Canada and the United States have conducted studies of Piping Plovers on the breeding grounds that include banding adults, chicks, or both, with various combinations of color bands, color flags, or metal bands. While banding programs provide helpful demographic data, such programs also provide valuable data on migration timing and stopover locations, wintering locations and site fidelity, and movements within the wintering home range of individual birds. This survey effort is a continuation of a series of surveys on the wintering grounds initiated by the Canadian Wildlife Service (CWS) in December 2002 (Stucker et al. 2003).

Methods

This survey effort specifically focused on finding and identifying banded Piping Plovers at known wintering habitats on the Gulf of Mexico in Florida, Alabama, Mississippi, and Texas. Due to extensive infrastructure damage from Hurricane Katrina and limited time, surveys were not conducted in Louisiana.

Survey locations were selected based on the number of Piping Plovers seen during the International Winter Census in 2006 (Elise Elliot Smith, pers. comm. 2006), 2001 (Ferland and Haig 2002), or 1996 (Plissner and Haig 1997) and wintering range critical habitat designations (USFWS 2001a). Critical habitat refers to locations in the United States that were designated using a formal

rulemaking process by the U.S. Fish and Wildlife Service (USFWS) pursuant to the Endangered Species Act of 1973. These specific geographic areas are essential for the conservation of a threatened or endangered species and may require special management consideration or protection. "Designating critical habitat is a tool to identify areas that are important to the recovery of a listed species. It is also a tool used to notify Federal agencies of areas that must be given special consideration when they are planning, implementing, or funding activities. Federal agencies are required to consult with the Service on actions they carry out, authorize, fund, or permit, that may affect critical habitat. A critical habitat designation has no effect when a Federal agency is not involved" (USFWS 2001b). In addition, recommendations from people who were familiar with particular areas were considered in selecting survey locations.

Twenty-nine locations were searched during 16 full or partial survey days. Twenty-two of the 29 locations were surveyed on foot. Three locations were surveyed by vehicle and four locations were surveyed by combining vehicle and foot searches. Of the 29 survey locations, 14 were at barrier islands that were accessible only by boat.

Of 16 full or partial survey days, I conducted surveys by myself on 12 of the days. On March 14 and 15 in Texas, Steve Liptay of the Coastal Bird Conservation Program of the National Audubon Society assisted. On March 10 in Florida, Brad Smith of the Florida Fish and Wildlife Conservation Commission assisted at Lanark Reef. On March 9 in Florida, Wilf Yusek assisted.

Due to limited available time, surveys were conducted under a range of conditions, some of which were not optimal. Surveys were conducted regardless of tidal stage and at any time during daylight hours. Surveys were conducted under a range of weather conditions including windy days, but were not conducted in heavy rain.

In determining survey boundaries at specific locations, I considered not only critical habitat boundaries, but also which areas were more likely to contain Piping Plovers based on a quick assessment in the field of the presence of high quality foraging and roosting habitats. Suggestions from individuals who had local knowledge of sites where Piping Plovers were more likely to be found also were considered. For example, at the Mississippi barrier island locations, surveys were focused near the passes and did not include the middle parts of the islands. Thus, in some locations, the entire critical habitat area was not searched.

On all surveys, a Swarovski 80 mm spotting scope with 20-60 zoom eyepiece and tripod and 10 x 42 Leica binoculars were used. A Trimble Geo-XH unit was used to obtain global positioning

system (GPS) locations using a Universal Transverse Mercator (UTM) map projection and the WGS84 datum. A GPS location was taken of the general area where a banded Piping Plover was seen. If multiple birds were observed together, one location was taken. A Speedtech Instruments SM-18 was used to record wind speed in knots and temperature in Fahrenheit degrees, which were converted to Kilometers/hour (km/hr) and Celsius (C) degrees. A Silva 515 Ranger compass was used to obtain wind direction.

The primary purpose of this survey was to locate and accurately identify banded Piping Plovers. Thus, I did not attempt to maximize the number of Piping Plovers that I saw, nor did I count the total number of birds over the entire survey route first and only afterwards return to observe banded birds. Instead, each time a Piping Plover or a group of Piping Plovers was observed, an attempt was made to scan the legs using a spotting scope before the survey continued. However, it was not always possible to see and record the full color band combination. The Piping Plover might have been roosting with the bands not visible, or on busy beaches, the bird could be flushed by others before the band combination could be determined. For some banded birds, it could take five or ten minutes or more to approach slowly and successfully observe the band combination. For all observed banded birds, band color, type, and location on the leg were recorded on data sheets.

At certain points during the survey, digital photography was used to record relevant information. Where conditions allowed, a photograph was taken of the bands to document band colors. Usually, the picture was taken after the Piping Plover had been observed in the spotting scope and all data had been recorded. However, in two instances at Bolivar Flats, Texas, banded Piping Plovers that had not been previously seen moved into the area where I had been taking pictures of another bird and these additional birds also were photographed. The photography equipment for this survey included a Canon 1Ds Mk II body and either a Canon 600 mm f4 lens with a 2X teleconverter (effective length 1200 mm) or a Swarovski 80 mm spotting scope with a Swarovski camera adapter (effective length 1100mm). However, it was not always possible to take a picture given appropriate buffer distances or other factors.

At certain locations, additional photographs were taken of habitat conditions, Piping Plover habitat use, or management measures using a Canon 35 mm f1.4 lens. The CR.2 digital file was opened using Adobe Bridge, downsized using bicubic resampling to 6 X 4 inches, 140 pixels/inch to produce a .jpg file, sharpened using unsharp mask, and dust spots were removed using the healing brush tool.

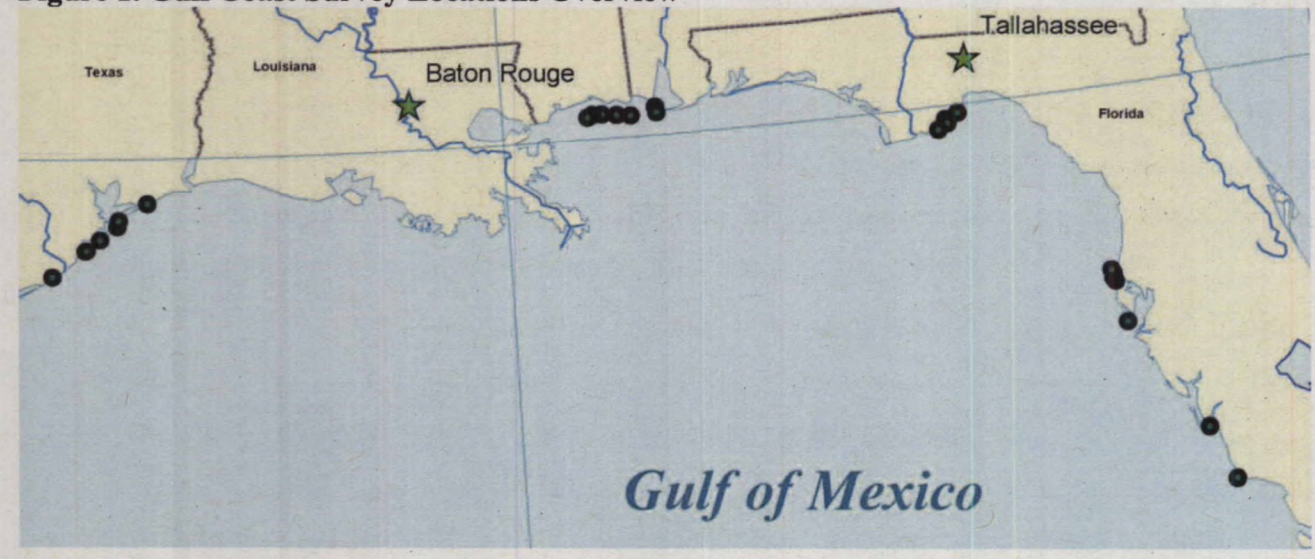
The Survey Route maps were constructed using Google Earth Pro satellite photography. The satellite photography provides a general illustration of the survey locations and site conditions. However, the photography may illustrate conditions that are slightly different from conditions during the survey; if so, such differences are noted in the site discussion. The approximate survey route is illustrated with a blue line. During the survey, start, turn, and end locations were noted using either GPS locations or observed or photographed based on local features.

Ownership status for land above the mean high tide line at the survey locations is categorized as: federal, state, county, city, private, and private conservation. Ownership status was determined by consulting the wintering range critical habitat rule (USFWS 2001a) or by speaking with state or federal officials or other professionals who are familiar with the status of the particular area.

Results

Twenty-nine locations were searched for Piping Plovers. Of these survey locations, 15 were in Florida, 7 were in Texas, 5 were in Mississippi, and 2 were in Alabama. Twenty-four of 29 survey locations were within designated critical habitat units. The general locations of the survey areas are shown in Figure 1. Due to the scale of the map and the close proximity of some of the survey locations, all 29 locations are not visible, but they are listed by state and survey location in Table 1.

Figure 1. Gulf Coast Survey Locations Overview



During the survey, 628 Piping Plovers were observed. As this survey emphasized locating and accurately identifying Piping Plovers that had color bands, this total number is conservative for the locations that were surveyed. There were 374 observations of Piping Plovers in Texas, 141 in Florida, 75 in Mississippi, and 38 in Alabama. The date, location, critical habitat unit number, ownership status above mean high tide line, total number of Piping Plovers and number of banded Piping Plovers are listed in Table 1. ND means critical habitat was not designated.

Table 1. Observations of Piping Plovers and Banded Piping Plovers

Date	Location	Ownership Status	Unit	Total number of PIPL	Number of banded PIPL
	Florida				
3/6/06	Marco Island	County, City, State	FL-27	47	6
3/6/06	Bunche Beach	County, Private	FL-25	0	0
3/7/06	Fort De Soto	County	FL-20	0	0
3/7/06	Shell Key	County	FL-20	22	3
3/8/06	Caladesi Island	State	FL-19	0	0
3/8/06	Honeymoon Island, North End	State	FL-17	0	0
3/8/06	Three Rooker Bar (South Island)	State	FL-16	3	0
3/9/06	Three Rooker Bar (North Island)	State	FL-16	3	0
3/9/06	Sandbar South of Anclote Key	State	ND	0	0
3/9/06	Anclote Key, South End	State	FL-15	14	1
3/9/06	Anclote Bar	State	FL-15	6	3
3/10/06	Lanark Reef	State and Private	FL-12	3	0
3/10/06	Dog Island, East End	Private Conservation	ND	16	2
3/11/06	Phipps Preserve	Private Conservation	FL-13	23	5
3/11/06	St. George Island, East End	State	FL-9	4	0
	Texas				
3/14/06	San Louis Pass and West	Private	ND	89	14
3/15/06	Galveston Island S.P. and West	State and Private	ND	23	1
3/15/06	Big Reef	City	TX-35	28	4

Date	Location		Unit	Total number of PIPL	Number of banded PIPL
3/15/06	San Louis Pass and East	Private	TX-34	32	6
3/16/06	San Bernard NWR and West	Federal and Private	TX-31	24	2
3/17/06	Bolivar Flats and East	Private Conservation and Private	TX-36	178	21
3/18/06	High Island to Gilchrist beaches	Private	ND	0	0
3/19/06	Bolivar Flats	Private Conservation	TX-36	NA	1 (new)
	Mississippi				
3/21/06	Horn Island, West End	Federal	MS-14	24	2
3/22/06	Horn Island, East End	Federal	MS-14	11	0
3/22/06	Petit Bois Island, East End	Federal	MS-14	1	1
3/23/06	East Ship Island, East End	Federal	MS-14	14	0
3/23/06	West Ship Island, East End	Federal	MS-14	25	3
	Alabama				
3/24/06	Little Dauphin Island, North End	Federal	AL-2	38	3
3/24/06	Pelican Island, Southwest End	Private	AL-2	0	0
Total	29 locations (30 surveys)			628	78

There were 78 observations of banded Piping Plovers. Forty-nine banded Piping Plovers were observed in Texas, 20 in Florida, 6 in Mississippi, and 3 in Alabama. For the six banded Piping Plovers that were seen on March 17 at Bolivar Flats and resighted on March 19 at the same location, each was counted only once in the total number of 78 banded birds and in the following tables and discussion. However, in the site specific discussion of Bolivar Flats, the individuals that were resighted are noted.

Of the 78 banded birds that were observed, the general location (population and country) could be identified for 72. Forty-six were from the Canadian Great Plains, 16 were from the United States Great Plains, 9 were from the Great Lakes, and 1 was from Atlantic Canada. Additional details about the banding locations and the survey observation locations are provided in Table 2.

Table 2. Observations of Banded Birds by Banding and Survey Locations

Breeding Population	Florida	Alabama	Mississippi	Texas	Total Each Population
Great Plains Canada	5	1	4	36	46
Great Plains U.S.	7	0	1	8	16
Great Lakes U.S.	6	0	1	2	9
Atlantic Canada	1	0	0	0	1
Unknown	1	2	0	3	6
Total Each State	20	3	6	49	78

While 78 banded Piping Plovers were observed during this survey effort, the total number of individuals was lower. Due to the various possible combinations of individually marked re-sighted birds and observations of non-unique brood marker birds that could have been either resighted or different birds, from 69 to 73 individual banded Piping Plovers were observed. While each sighting of a banded bird was counted once in Table 2, three uniquely banded birds were observed at two different locations. A United States Great Plains Piping Plover was observed March 7 at Shell Key, Florida and March 22 at Petit Bois Island, Mississippi. A Canadian Great Plains Piping Plover was observed March 15 at Big Reef, Texas on the west side of the shipping channel and March 17 at Bolivar Flats on the east side of the channel. Another Canadian Great Plains Piping Plover was observed on March 21 at Horn Island and March 23 at West Ship Island, both at Gulf Islands National Seashore in Mississippi. In addition, there were two instances where the same brood marker was observed on a Piping Plover at different locations. However, due to the same brood maker being used on different birds, it is unknown if these observations were of the same individuals or different birds.

The 78 banded birds that were observed are listed in Table 3 with information about date, location, critical habitat unit number, breeding population, band combination, and UTM coordinates. The following abbreviation system identifies the band combination:

- Band location on the leg is listed as: left tibia, left tarsus: right tibia, right tarsus.
- If there were two bands on a tibia or tarsus, the band combination is presented as top band first and bottom band second, with no coma in between the bands.
- Band or flag colors are: R = red, G = dark green, g = light green; B = dark blue, b = light blue, W = white, A = gray, S = salmon, P = Pink, O = orange, Y = yellow, and L = black. If a faded

band was observed, the color as observed in the field is listed first, and the original, non-faded color is listed in parentheses.

- A split band is indicated with a forward slash and a triple split band has two forward slashes; the colors of the split are listed from the top to bottom of the band on the leg. For example, L/W means a black over white split band.
- Band types are: X for metal band, – for no band or no observed band; a single letter means a plastic band unless f is added after the letter, which means flag (e.g., Of = orange flag).

As an example of a full band string observed at Marco Island, Florida, on March 6, 2006, X,L:Of,Yg/O/g indicates: left tibia metal band, left tarsus black plastic band; right tibia orange flag, right tarsus yellow plastic band over light green/orange/light green triple split band.

In the table below, banding location is given with the following abbreviations: GP US is Great Plains United States, GP C is Great Plains Canada, GL is Great Lakes, At C is Atlantic Canada, and blank is unknown. ND means that critical habitat was not designated for the survey location.

Table 3. Location, Critical Habitat Unit, Population, Band String, and GPS Coordinates

Date	Location	State	Unit #	Pop.	Band String	UTM Zone	E	N
	Florida							
3/06/06	Marco Island	FL	27	GP US	Gf,-:-,LA	17 N	425172	2870217
3/06/06	Marco Island	FL	27	GL	-,O:X,b/O/b	17 N	425159	2870227
3/06/06	Marco Island	FL	27	GL	-,LO:X,B	17 N	425712	2869694
3/06/06	Marco Island	FL	27	GP US	AA,-:Gf,-	17 N	425664	2869782
3/06/06	Marco Island	FL	27	At C	-,-:-,X	17 N	425224	2870103
3/06/06	Marco Island	FL	27	GL	X,L:Of,Yg/O/g	17 N	424613	2870779
3/07/06	Shell Key	FL	20	GP C	Lf,O:X,RG	17 N	327925	3061373
3/07/06	Shell Key	FL	20	GL	Of,RO:X,Y	17 N	327926	3061361
3/07/06	Shell Key	FL	20	GP US	-,RR:Gf,LG	17 N	327928	3061981
3/09/06	Anclote Key	FL	15	GP C	L/Y (faded G/g),X:Bg,-	17 N	318660	3116803
3/09/06	Anclote Bar	FL	15	GP US	-,LL: Gf,LL	17 N	319523	3124387
3/09/06	Anclote Bar	FL	15	GP C	Lf,Gg:X,Y	17 N	319398	3124444
3/09/06	Anclote Bar	FL	15		-,-;-,GX	17 N	319461	3124445
3/10/06	Dog Island	FL	ND	GP C	W,-:-,X	16 N	734538	3302430
3/10/06	Dog Island	FL	ND	GP US	-,AR:Gf,LL	16 N	734538	3302430

Date	Location	State	Unit #	Pop.	Band String	UTM Zone	E	N
3/11/06	Phipps Preserve	FL	13	GL	-,-;X,O/g	16 N	748168	3311321
3/11/06	Phipps Preserve	FL	13	GP US	-,AA;Gf,LA	16 N	748129	3311334
3/11/06	Phipps Preserve	FL	13	GP C	Lf,gO;X,B	16 N	747582	3311705
3/11/06	Phipps Preserve	FL	13	GL	O,-;X,O/B	16 N	747046	3312359
3/11/06	Phipps Preserve	FL	13	GP US	-,WW;Gf,LL	16 N	747046	3312359
	Texas							
3/14/06	San Louis Pass W	TX	ND	GP C	Lf,gL:X,G	15 N	292669	3217230
3/14/06	San Louis Pass W	TX	ND	GP C	X,RG:Lf,L	15 N	288055	3213721
3/14/06	San Louis Pass W	TX	ND	GP US	Gf, LR:-,-	15 N	287418	3213248
3/14/06	San Louis Pass W	TX	ND	GL	O,-:X, B	15 N	285642	3211872
3/14/06	San Louis Pass W	TX	ND	GP C	Lf,gB:X,Y	15 N	285037	3211396
3/14/06	San Louis Pass W	TX	ND	GP C	X,G:Wf,Rg	15 N	284655	3211096
3/14/06	San Louis Pass W	TX	ND	GP C	L/Y (faded G/g),X:O,W	15 N	284148	3210694
3/14/06	San Louis Pass W	TX	ND	GP C	W,X:YY,-	15 N	284077	3210637
3/14/06	San Louis Pass W	TX	ND	GP C	Lf,g:X,LY	15 N	283186	3209920
3/14/06	San Louis Pass W	TX	ND	GP C	Lf,g:X,OG	15 N	279415	3206646
3/14/06	San Louis Pass W	TX	ND	GP C	Lf,-:X,-	15 N	279415	3206646
3/14/06	San Louis Pass W	TX	ND	GP C	Lf,RG:-,GX	15 N	279415	3206646
3/14/06	San Louis Pass W	TX	ND	GP C	X,GR:Wf,P (faded O)	15 N	279415	3206646
3/14/06	San Louis Pass W	TX	ND	GP C	Lf,Rg:X,g	15 N	279415	3206646
3/15/06	Galveston Island SP	TX	ND	GP C	Lf,O:X,gB	15 N	309111	3230296
3/15/06	Big Reef	TX	35	GP US	Gf YL	15 N	332448	3246121
3/15/06	Big Reef	TX	35	GP C	X,-:Wf,-	15 N	332236	3246260
3/15/06	Big Reef	TX	35	GP C	X,Og:Lf,B	15 N	332236	3246260
3/15/06	Big Reef	TX	35	GP C	Lf,Rg:X,B	15 N	332236	3246260
3/15/06	San Louis Pass E	TX	34	GP C	Lf,R:X,BO	15 N	295431	3220387
3/15/06	San Louis Pass E	TX	34	GP US	Gf,-:A,G	15 N	295306	3220243
3/15/06	San Louis Pass E	TX	34	GP C	Lf,GG:X,Y	15 N	295131	3220030
3/15/06	San Louis Pass E	TX	34	GP C	Lf,-:X,-	15 N	295131	3220030
3/15/06	San Louis Pass E	TX	34	GP US	-,YY:Gf,LG	15 N	295040	3219938
3/15/06	San Louis Pass E	TX	34	GP C	Lf,OX:-,YG	15 N	295131	3220030
3/16/06	San Bernard NWR	TX	31	GP US	-,LY:Gf,LR	15 N	253992	3191003
3/16/06	San Bernard NWR	TX	31		X,R:?,?	15 N	253957	3191050

Date	Location	State	Unit #	Pop.	Band String	UTM Zone	E	N
3/17/06	Bolivar Flats	TX	36		X,-:-,-	15 N	331677	3249841
3/17/06	Bolivar Flats	TX	36	GP C	X,Og:Lf,B	15 N	331439	3249856
3/17/06	Bolivar Flats	TX	36	GP C	X,-:Lf,-	15 N	331439	3249856
3/17/06	Bolivar Flats	TX	36	GP C	X,Y:L/W,-	15 N	331439	3249856
3/17/06	Bolivar Flats	TX	36	GP US	-,GG:Gf,LA	15 N	331383	3249896
3/17/06	Bolivar Flats	TX	36	GP C	X,g:Wf,S (faded O) G	15 N	331231	3249878
3/17/06	Bolivar Flats	TX	36	GP C	X,B:Wf,YG	15 N	331231	3249878
3/17/06	Bolivar Flats	TX	36	GP US	-,WG:Gf,LG	15 N	331210	3249839
3/17/06	Bolivar Flats	TX	36	GP C	X,gL:Lf,L	15 N	331210	3249838
3/17/06	Bolivar Flats	TX	36	GP C	Lf,B:X,BO	15 N	331210	3249839
3/17/06	Bolivar Flats	TX	36	GP C	W,BX:-,-	15 N	331210	3249839
3/17/06	Bolivar Flats	TX	36	GP C	Lf,O:-,G	15 N	331263	3250012
3/17/06	Bolivar Flats	TX	36	GP C	W,YR:-,X	15 N	331263	3250012
3/17/06	Bolivar Flats	TX	36	GP C	W,-:O,X	15 N	331263	3250012
3/17/06	Bolivar Flats	TX	36	GP US	-,X:bf,-	15 N	331263	3250012
3/17/06	Bolivar Flats	TX	36	GP C	Wf,RX;-,RB	15 N	331263	3250012
3/17/06	Bolivar Flats	TX	36	GP C	X,GB: Wf,Y	15 N	331263	3250012
3/17/06	Bolivar Flats	TX	36	GP C	Lf,-: X,-	15 N	331263	3250012
3/17/06	Bolivar Flats	TX	36	GL	O,-:X,B	15 N	331263	3250012
3/17/06	Bolivar Flats	TX	36		O,W:L,RX	15 N	331263	3250012
3/17/06	Bolivar Flats	TX	36	GP C	X,S(faded O)g:Wf,g	15 N	332229	3250144
3/19/06	Bolivar Flats	TX	36	GP C	Lf,O:X,gG	15 N	331952	3250064
	Mississippi							
3/21/06	Horn Is. W end	MS	14	GP C	X,R:Wf,S (faded O) B	16 N	330676	3346688
3/21/06	Horn Is. W end	MS	14	GP C	X,G:Wf,S(faded O) B	16 N	330447	3346730
3/22/06	Petit Bois Is. E end	MS	14	GP US	-,RR:Gf,LG	16 N	364195	3342917
3/23/06	West Ship Is. E end	MS	14	GP C	-,R:Wf,OB	16 N	313096	3344567
3/23/06	West Ship Is. E end	MS	14	GL	-,O:X,g	16 N	313254	3344523
3/23/06	West Ship Is. E end	MS	14	GP C	Lf,B:X,BL	16 N	313096	3344567
	Alabama							
3/24/06	Little Dauphin Is.	AL	2	GP C	W,Y:B,X	16 N	392762	3349980
3/24/06	Little Dauphin Is.	AL	2		X,-:-,W	16 N	392762	3349980
3/24/06	Little Dauphin Is.	AL	2		-,-:-,GX	16 N	392762	3349880

Two of the 78 banded Piping Plovers that were observed were missing part of the tarsus. The Piping Plover at Bolivar flats had a single metal band on the left tibia; this bird was not observed closely enough to view the break location in detail or to determine the population. The Piping Plover at Marco Island, Florida, had a single metal band on the right tarsus and was from Atlantic Canada; the break location on the left tarsus was covered over by skin. Both birds were moving and feeding in what appeared to be a normal manner other than the slight limp from the shorter leg.

Survey Site Reviews

In this section, each survey location is discussed in more detail. Information is provided on the survey route, habitat conditions, ownership status, and management. Pictures illustrating habitat conditions are included for certain sites. For most sites, a satellite photograph is included that shows the general survey route; however, for some sites, an adequate photograph was not available.

Marco Island, FL, Critical Habitat Unit FL-27

Photograph 1. Marco Island, FL, looking north (January, 2005).

Total Piping Plovers seen: 47

Banded Piping Plovers seen: 6

- Left tibia green flag, left tarsus no band; right tibia no band seen, right tarsus black over gray (Great Plains US)
- Left tibia no band, left tarsus orange; right tibia metal, right tarsus light blue over orange over light blue triple split (Great Lakes)
- Left tibia no band, left tarsus black over orange; right tibia metal, right tarsus dark blue (Great Lakes)
- Left tibia gray over gray, left tarsus no band; right tibia green flag, right tarsus no band (Great Plains US)
- Left tibia no band, left tarsus broken and no band; right tibia no band, right tarsus metal band # 1401-792?9 (Atlantic Canada).
- Left tibia metal, left tarsus black; right tibia orange flag, right tarsus yellow over light green over orange over light green triple split band (Great Lakes)

Survey Date: March 6, 2006

Description of survey area: Starting north of Tigertail Beach, following the tidal lagoon south, turning north to the northeast tip of Sand Dollar bar; the Gulf beach intertidal area from the northeast tip to the densely vegetated area just north of the crossover location from Tigertail Beach also was surveyed.

Ownership Status: County (Tigertail Beach Park), City (Marco Beach Park), and State.

Survey type: Walking

Weather: Not recorded, but conditions excellent

Description of habitat: Gulf beach with sandy shoreline and interior tidal lagoon with mud/sand substrate that has large intertidal feeding habitat available at low tide.

Comments and observations: Dogs and recreational off-road vehicle (ORV) use are prohibited. High levels of pedestrian use and disturbance were observed on the Gulf beach (Sand Dollar) and east part of the tidal lagoon area that is known as Tigertail Beach. Lower disturbance was observed in other areas of tidal lagoon, perhaps due to the muddier substrate. Boats were observed landing on beach at the northeast end of Sand Dollar. One symbolically fenced area protects feeding habitat at mid and low tide in the lagoon, but does not provide a sufficient buffer between roosting birds and pedestrians. Two areas that previously were protected by symbolic fencing several years ago were not fenced

during this visit. A tractor raked the beach in front of the condominiums and in front of Tigertail Park; three other management vehicles were observed during the visit.

For the metal band only bird, all the numbers of the full string but one could be observed in photographs; the metal band 1401-792[?]9 matches the full string of 1401-79259, which I saw on a Piping Plover in 2005 at the same location which had an Atlantic Canada (Newfoundland) color band red over blue with alpha code A over B on the left tarsus; this bird was the only one where an A over B alpha code had been placed on a band on the left tarsus (Diane Amirault, pers. comm. 2005). On November 14, 2005, at the same location, I saw a Piping Plover with a very swollen left tarsus, Atlantic Canada color band faded red top, bottom color faded, alpha code A over B, with visible numbers on the metal band of [???]1-7[???]9. When I saw this Piping Plover on March 6, 2006, the tarsus was broken off, the break location had healed over, and there was no color band. The bird was walking fine, except for a slight limp caused by the shorter tarsus length.

Figure 2. Marco Island, FL, Survey Route

Bunche Beach, FL, Critical Habitat Unit FL-25

Total Piping Plovers seen: 0

Banded Piping Plovers seen: 0

Date: March 6, 2006

Description of survey area: From the parking area southeast and then northwest to where the sand beach ends with dense vegetation at the water's edge. Part of the designated area on the northwest side of the critical habitat unit was walked in the water, but the entire unit was not surveyed due to high tide covering the habitat.

Ownership Status: County (San Carlos Bay-Bunch Beach) and private (lands to northwest).

Survey type: Walking

Weather: Clear sky, wind calm, temperature 22.8° C.

Description of habitat: Narrow Gulf sandy beach adjoining dense vegetation.

Comments and observations: There was a high level of pedestrian disturbance on the beach at the south end of the survey route. A sandbar to northwest that had roosting birds was not surveyed due to deep water, so Piping Plovers could have been present that were not counted due to the observation distance. The central and north parts of the critical habitat unit had water to the edge of dense vegetation at the time of the survey.

Figure 3. Bunche Beach, FL, Survey Route

Ft. De Soto (Northwest End), FL, Critical Habitat Unit FL-20

Photograph 2. Ft. De Soto, FL, looking northeast across the tidal lagoon.

Total Piping Plovers seen: 0

Banded Piping Plovers seen: 0

Date: March 7, 2006

Description of survey area: From tidal cove on the north end of Ft. Desoto to the south end of the beach just north of the inlet to the southern tidal cove.

Ownership Status: County (Fort De Soto Park. (Pinellas County)).

Survey type: Walking

Weather: Clear, wind 28 km/hr, 14.6° C.

Description of habitat: A pass is at the north end of the unit, with a small tidal cove just east of the Gulf beach. The beach near the cove is narrow for several hundred yards and further south, there is a large open sand area suitable for roosting with an intertidal feeding area in a larger tidal cove.

Comments and observations: A closure at the north end of the survey area did not protect Piping Plovers, as the closed area was mostly in dense vegetation that made the habitat unsuitable. Moderate

to high levels of pedestrian disturbance were observed in the southern part of the survey route. People were observed repeatedly chasing roosting terns and gulls at this location. There was suitable roosting habitat on beach, with good quality feeding habitat at the north and south tidal coves. Installation of limited symbolic fencing in the south tidal cove area and adjoining open sand habitats could protect feeding and roosting habitats while still allowing recreational activities on a majority of the beach. In a winter 2005 survey, I observed Piping Plovers flying from sandbars east of the southeast end of Shell Key towards Ft. De Soto. Future survey efforts should consider that the home range for some Piping Plovers in this area may include Ft. De Soto and Shell Key.

Figure 4. Fort De Soto, FL, Survey Route

Shell Key, FL, Critical Habitat Unit FL-20

Photograph 3. Shell Key, FL, looking northeast towards bay side flats.

Total Piping Plovers seen: 22

Banded Piping Plovers seen: 3

- Left tibia black flag, left tarsus orange; right tibia metal, right tarsus red over dark green (Great Plains Canada)
- Left tibia orange flag, left tarsus red over orange; right tibia metal, right tarsus yellow (Great Lakes)
- Left tibia no band, left tarsus red over red; right tibia green flag, right tarsus black over dark green (Great Plains US)

Date: March 7, 2006

Description of survey area: Southeast corner of island, west to Gulf, north along Gulf beach, with observations at interior flats area, then north to northwest corner of the island. Due to insufficient time, the north end of the island was not surveyed.

Ownership Status: County (Shell Key Preserve (Pinellas County)).

Survey type: Walking

Weather: Clear, wind 29.8 km/hr, temperature 12.6 ° C.

Description of habitat: An undeveloped barrier island with excellent habitats including large bay side sand/mud bars and flats, roosting habitats in old washover fans that are undergoing succession, and Gulf beach roosting and feeding habitats.

Comments and observations: Center section of island, including bay and Gulf sides, is closed to the public with signs, but two unauthorized pedestrians were observed in closure. The bay side has limitations or prohibitions on motorboat use depending on the location and the north side of the Gulf beach has a closure that protects some roosting habitat near the dunes but not roosting habitat on the mid beach. There was limited or no pedestrian disturbance on the day I visited, though the weather was windy at the time. On other days, the northeast corner of the island (motorboat landing area) can have high levels of disturbance. No Piping Plovers were seen on the southwest side of the island at the beginning of the day, but by the end of the day, birds were observed roosting there, where they were partially shielded from the wind. A sandbar area off the southeast corner of the island where large numbers of Piping Plovers were observed in 2005 was underwater at the time of the survey.

Figure 5. Shell Key, FL, Survey Route

Caladesi (North End), FL, Critical Habitat Unit FL-19

Total Piping Plovers seen: 0

Banded Piping Plovers seen: 0

Date: March 8, 2006

Description of survey area: North end of Caladesi, from south of boat closure on Gulf to south of boat closure on the bay side

Ownership Status: State (Caladesi Island State Park).

Survey type: Walking

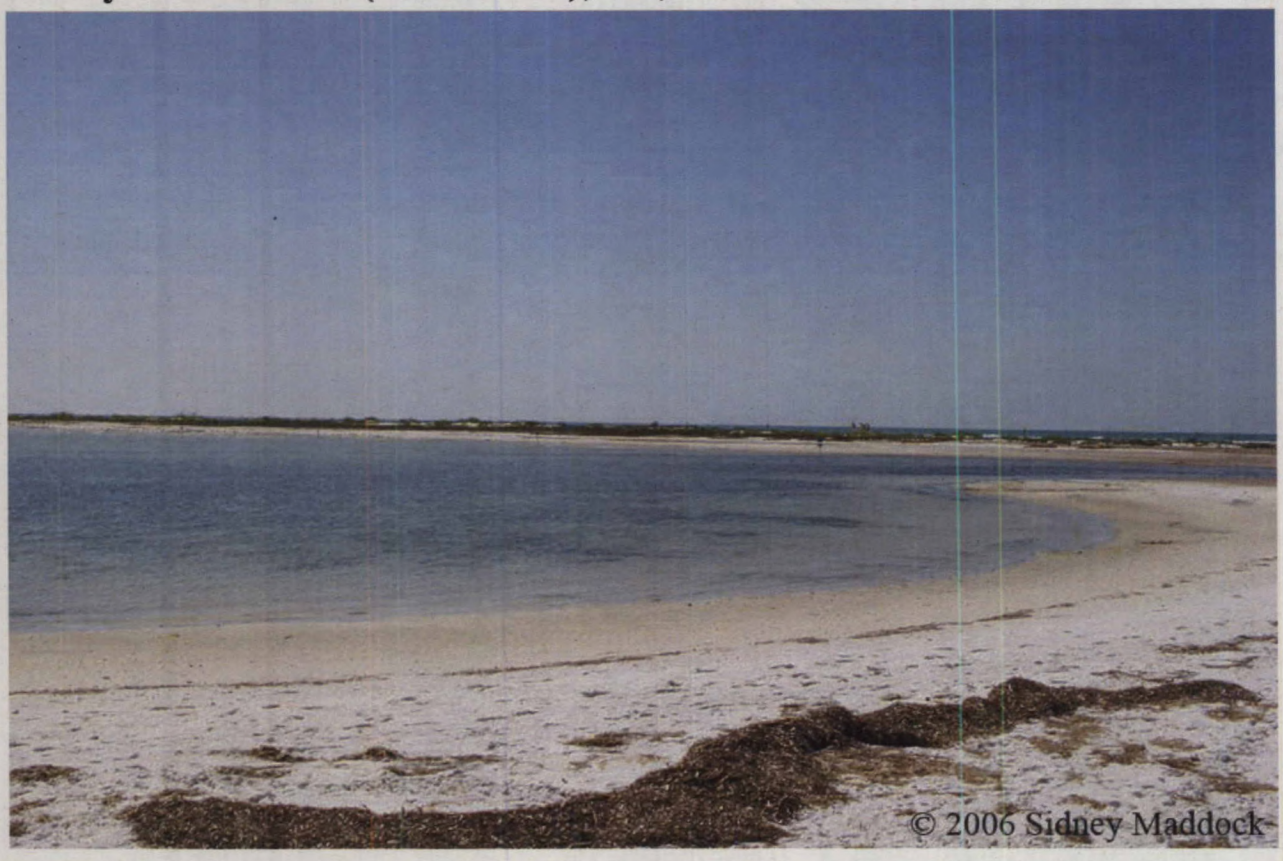
Weather: Clear, winds SE 15.4 km/hr, temperature 15.9° C.

Description of habitat: A barrier island with feeding habit on the bay side and roosting habitat on the Gulf side. A small sandbar to the north (which appears to have split apart from the point that is shown in the survey route picture) also has feeding and roosting habitat.

Comments and observations: There is a closure in the interior of the island around dense vegetation that does not protect Piping Plover habitat, and a motorboat prohibition on the north end of the island. A low level of pedestrian disturbance was observed on the day of visit, though areas to the south of the survey route had higher numbers of pedestrians. A Bald Eagle (*Haliaeetus leucocephalus*) was present on the sandbar to the north at the time of visit.

Figure 6. Caladesi (North End), FL, Survey Route

Honeymoon Island (North End), FL, Critical Habitat Unit FL-17



Photograph 4. Honeymoon Island, FL, bay side, looking southwest towards bird closure.

Total Piping Plovers seen: 0

Banded Piping Plovers seen: 0

Date: March 8, 2006

Description of survey area: North tip of island south to no boat area on bay side, then west to Gulf side, and north to north tip of island

Ownership Status: State (Honeymoon Island State Park).

Survey type: Walking

Weather: Clear, winds WSW 9.3 km/hr, temperature 18.9° C. (taken at Three Rooker later in day)

Description of habitat: A barrier island with narrow roosting habitat and a limited feeding area on the Gulf side and a larger intertidal feeding habitat on the bay side; area between Gulf and bay sides densely vegetated except near the north end of the island.

Comments and observations: Symbolic fencing with no-entry signs protects a feeding area on the bay side and additional signs provide information on Piping Plovers and other shorebirds. Other signs

prohibit entry into a densely vegetated area. Moderate to high levels of pedestrian disturbance were observed on the Gulf beach; low disturbance was observed on the bay beach or no disturbance in the closed area. Due to time limitations, the south or central beach areas of Honeymoon Island State Park were not searched. It is unknown why the number of Piping Plovers at this location dropped from previous survey efforts; it may reflect Piping Plovers being missed due to movements between the nearby islands during the survey effort.

Figure 7. Honeymoon Island (North End), FL, Survey Route

Three Rooker Bar (South Island), FL, Critical Habitat Unit FL-16

Photograph 5. Three Rooker Bar, FL, north end, looking north towards roosting habitat.

Total Piping Plovers seen: 3

Banded Piping Plovers seen: 0

Date: March 8, 2006

Description of survey area: Entire island, from south to north ends, bay and Gulf shorelines.

Ownership Status: State (Anclote Key Preserve State Park).

Survey type: Walking

Weather: Clear, wind WSW 9.3 km/hr, temperature 18.9° C.

Description of habitat: An undeveloped barrier island, accessible by boat only, with very large roosting habitat, narrow, sandy Gulf side intertidal area, and wide bay side feeding habitats with slightly muddy/sandy substrate.

Comments and observations: A closure existed around dense vegetation areas, but this does not benefit Piping Plovers due to the lack of suitable habitat in the closed areas. The sharp decline in Piping Plover numbers observed during this survey from a 2004-2005 winter survey may be a chance

event, reflecting the tendency of birds to move around within the mosaic of their wintering home range habitats. However, while visitation levels were not high when the survey was completed, pedestrians did flush a flock of small, light colored shorebirds that flew towards Honeymoon Island before they could be identified. Also, on the north end of the island, pedestrians flushed a large roosting flock that contained three Piping Plovers and several hundred other shorebirds. As the site was visited at high tide, it is unclear if the hurricanes from the summer of 2005 altered the quality or reduced the availability of feeding habitat on the bay side. Roosting habitat has increased since the 2005 survey. It would be helpful if limited closures were instituted to protect prime feeding and roosting habitats at this historically critical location. Limited closures would allow protection of key habitats while still allowing recreational activities to occur on most of the island

Figure 8. Three Rooker Bar (South Island), FL, Survey Route

Three Rooker Bar (North Island), FL, Critical Habitat Unit FL-17

Total Piping Plovers seen: 3

Banded Piping Plovers seen: 0

Date: March 9, 2006

Description of survey area: Entire island, from north to south ends, Gulf and bay shorelines.

Ownership Status: State (Anclote Key Preserve State Park).

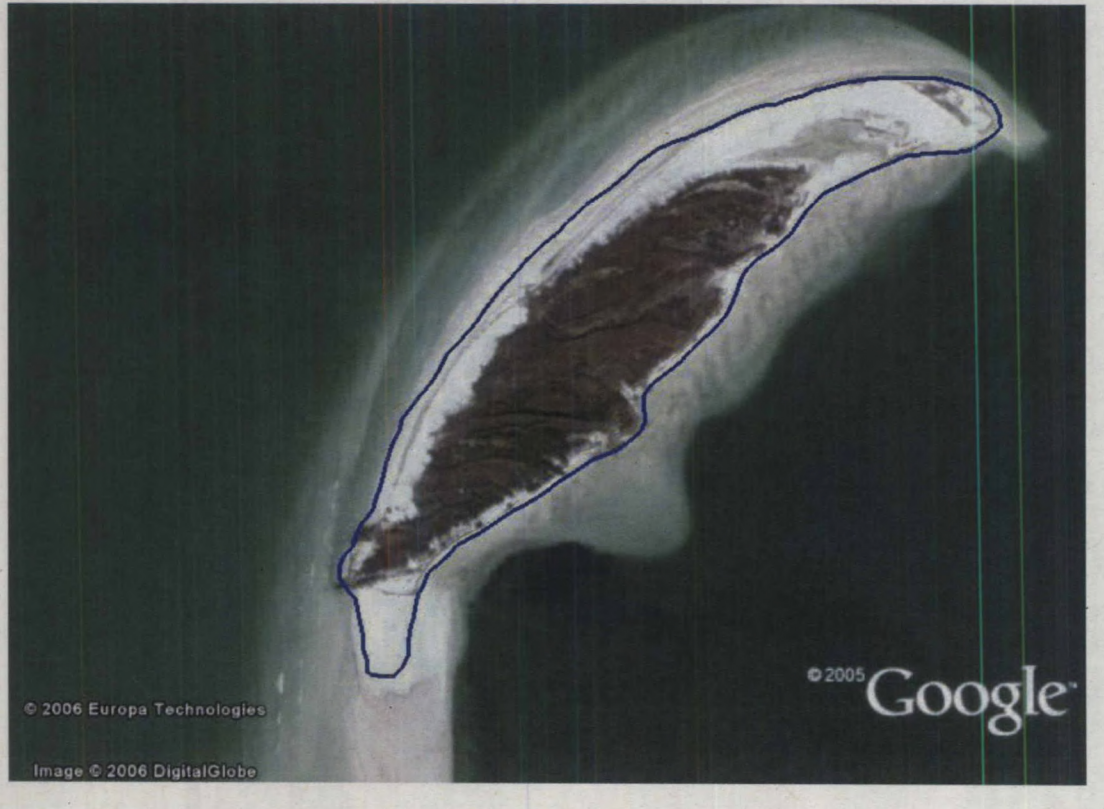
Survey type: Walking

Weather: Partly cloudy, wind SSE 37.1 km/hr, temperature 13.3° C.

Description of habitat: An undeveloped barrier island, accessible by boat only, with a narrow intertidal area on Gulf side, vegetated interior areas, and wider intertidal feeding habitats on bay side.

Comments and observations: A closure existed around dense vegetation areas, but this does not benefit Piping Plovers due to the lack of suitable habitat in the closed areas. Good feeding habitat on bay side and roosting habit on the northeast end was observed. Despite a prohibition on dogs, dog tracks were observed on the island.

Figure 9. Three Rooker Bar (North Island), FL, Survey Route



Sandbar South of Anclote Key, FL

Total Piping Plovers seen: 0

Banded Piping Plovers seen: 0

Date: March 9, 2006

Description of survey area: Entire sandbar

Ownership Status: State (Anclote Key Preserve State Park).

Survey type: Walking

Weather: Partly cloudy, wind ESE 25.7 km/hr, temperature 15.6° C.

Description of habitat: An uninhabited, small sandbar accessible by boat with large amounts of wrack.

Comments and observations: Sandbar area was almost flooded at high tide. Wilf Yusek conducted the survey.

Anclote Key (South End), FL, Critical Habitat Unit FL-15

Photograph 6. Anclote Key, FL, looking south on spit towards wrack and roosting area.

Total Piping Plovers seen: 14

Banded Piping Plovers seen: 1

- Left tibia black over yellow split band (faded from dark green/light green), left tarsus metal band; right tibia dark blue over light green, right tarsus no band (Great Plains Canada)

Date: March 9, 2006

Description of survey area: East end of the island, starting at the northeast corner on the bay side, walking west to small spit, then north along interior of lagoon area to west end of lagoon, and then returning south on Gulf beach.

Ownership Status: State (Anclote Key Preserve State Park).

Survey type: Walking

Weather: Partly cloudy, wind S 29.6 km/hr, temperature 18.9° C.

Description of habitat: A barrier island accessible by boat only, with a large lagoon area that provides a low energy intertidal habitat and flat and a moderately sized peninsula with extensive wrack.

Comments and observations: No disturbance was observed during the visit. The south end of the island had high quality foraging and roosting habitat, including a lagoon that provided a low energy intertidal foraging area. The picture below does not illustrate a sand spit and bar that were present during the survey.

Figure 10. Anclote Key (South End), FL, Survey Route

Anclote Bar, FL, Critical Habitat Unit FL-15

Total Piping Plovers seen: 6

Banded Piping Plovers seen: 3

- Left tibia no band seen, left tarsus black over black; right tibia green flag, right tarsus black over black (Great Plains US)
- Left tibia black flag, left tarsus dark green over light green; right tibia metal, right tarsus yellow (Great Plains Canada)
- Left tibia no band seen, left tarsus no band; right tibia no band seen, right tarsus dark green over metal (possible Great Lakes brood marker, but not confirmed; a bird with a similar brood marker that was confirmed as Great Lakes due to the metal band number was observed at this location the previous winter).

Date: March 9, 2006

Description of survey area: Entire island, Gulf and bay sides, north to south ends.

Ownership Status: State and private.

Survey type: Walking

Weather: Partly cloudy, wind SSE 33.4 km/hr, temperature 16.7° C.

Description of habitat: Uninhabited barrier island accessible by boat only, with overwash fans, narrow Gulf side beach in center of island with larger roosting areas on ends and good ephemeral pond and bay side intertidal feeding habitats on the northeast side.

Comments and observations: There was low disturbance at the time the area was surveyed, but Anclote Bar can be subject to high levels of disturbance by boaters in the summer (Monique Abrams, pers. comm. 2005). Limited expansion of the closure to include bay side feeding habitats and additional adjoining roosting habitats would provide additional protection for nonbreeding Piping Plovers while still allowing the Gulf side of the island and much of the bay side of the island to be open to recreational activity.

Lanark Reef, FL, Critical Habitat Unit FL-12

Photograph 7. Lanark Reef, FL, looking east (December 2005).

Total Piping Plovers seen: 3

Banded Piping Plovers seen: 0

Date: March 10, 2006

Description of survey area: Entire island and bar area, with eastern island surveyed by Brad Smith of Florida Fish and Wildlife Conservation Commission (FFWCC) as he posted the island.

Ownership Status: State and private

Survey type: Walking

Weather: Partly cloudy, winds SE 18.9 km/hr, temperature 16.7° C.

Description of habitat: Uninhabited, narrow but long small barrier islands and sand bars, accessible by boat only, with large intertidal feeding habitat between the islands and to the south.

Comments and observations: On the day the island was visited, FFWCC officials were erecting symbolic fencing to protect breeding birds. Excellent intertidal feeding habitat was observed.

However, roosting habitats are at a low enough elevation to be overwashed by moderately strong winds. Due to the proximity to Dog Island and Phipps Preserve, survey efforts should attempt to count all three areas on the same day to reduce the chance of birds being missed due to possible movements between these areas

Figure 11. Lanark Reef, FL, Survey Route

Dog Island (East End), FL

Photograph 8. Dog Island, FL, looking south towards roosting location.

Total Piping Plovers seen: 16

Banded Piping Plovers seen: 2

- Left tibia white, left tarsus no band; right tibia, no band seen, right tarsus, metal (Great Plains Canada)
- Left tibia no band seen, left tarsus gray over red; right tibia green flag, right tarsus black over black (Great Plains US)

Date: March 10, 2006

Description of survey area: East end of island, including bay side, interior intertidal area (flooded), and beach on the southeast end of island.

Ownership Status: Private Conservation (The Nature Conservancy).

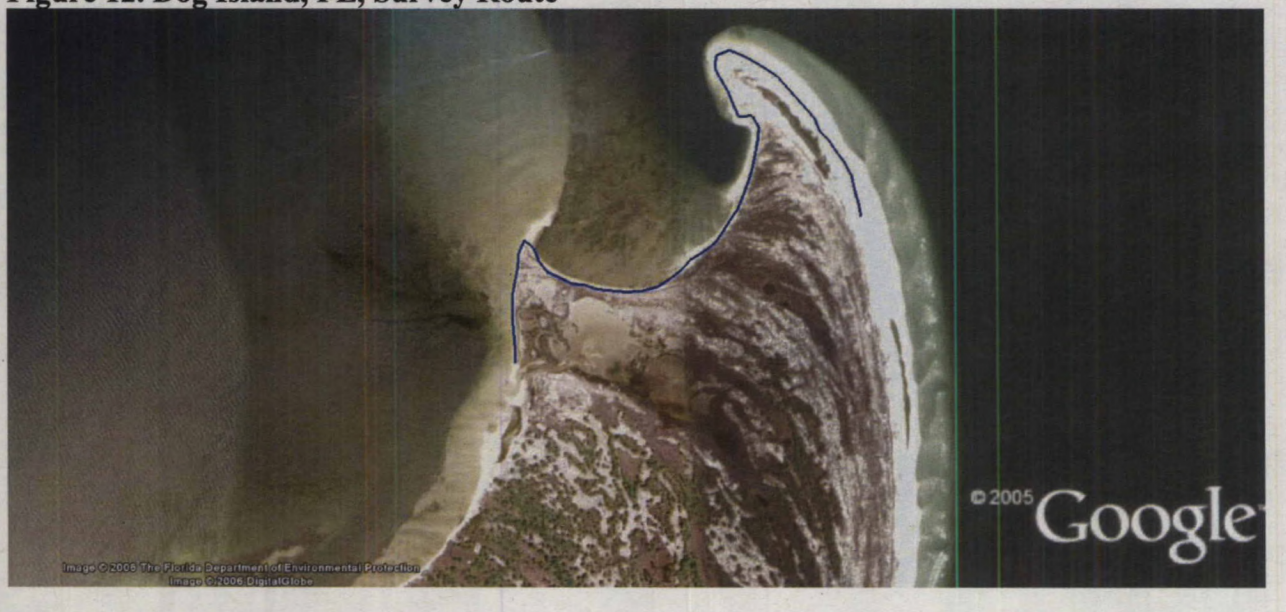
Survey type: Walking

Weather: Cloudy, winds S 6.9 km/hr, temperature 19.4° C.

Description of habitat: Barrier island with nice roosting habitat, moderately sloping beach, and interior intertidal feeding habitats.

Comments and observations: All birds were roosting on the east end of the island at or just above the high tide wrack line near a small bulge in the beach. Dog tracks were observed on the beach.

Figure 12. Dog Island, FL, Survey Route



Phipps Preserve, FL, Critical Habitat Unit FL-13

Photograph 9. Phipps Preserve, FL, looking northwest, towards dried ephemeral pond.

Total Piping Plovers seen: 23

Banded Piping Plovers seen: 5

- Left tibia no band seen, left tarsus no band; right tibia metal, right tarsus orange over light green split (Great Lakes)
- Left tibia no band seen, left tarsus gray over gray; right tibia green flag, right tarsus black over gray (Great Plains US)
- Left tibia black flag, left tarsus light green over orange; right tibia metal, right tarsus dark blue (Great Plains Canada)
- Left tibia orange, left tarsus no band; right tibia metal, right tarsus orange over dark blue split band (Great Lakes)
- Left tibia no band seen, left tarsus white over white; right tibia green flag, right tarsus black over black (Great Plains US)

Date: March 11, 2006

Description of survey area: East end, bay side, starting at the densely vegetated area, then west on bay side to northeast tip, then west on Gulf side to starting point.

Ownership Status: Private Conservation (The Nature Conservancy).

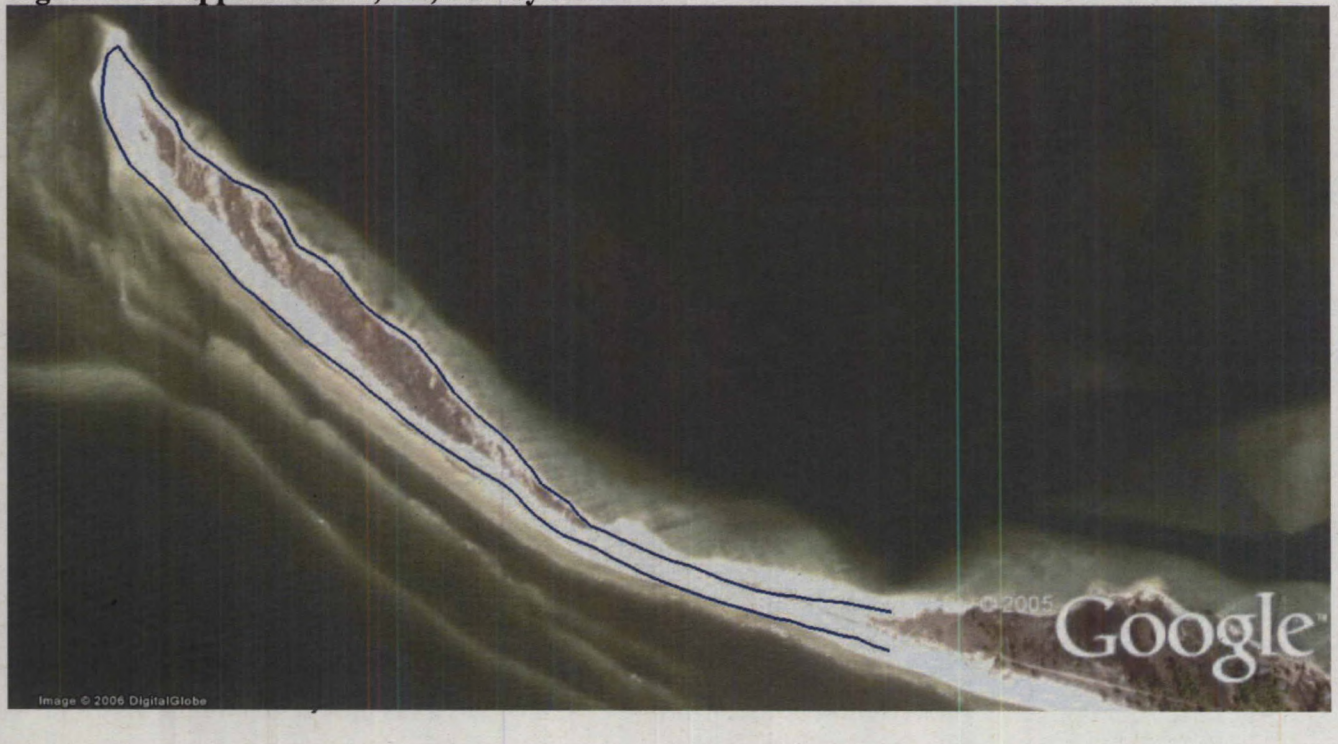
Survey type: Walking

Weather: Cloudy, winds SSE 7 km/hr, temperature 21.1° C.

Description of habitat: An undeveloped section of peninsula with excellent quality Gulf and bay feeding and roosting habitats including overwash fans, ephemeral ponds, and a long wrack line.

Comments and observations: The area is posted and fenced at the east end of the Preserve indicating it is closed to unsupervised visits by the public. However, no signs were seen on the west or central part of the island which would give notice to boaters of such restrictions. No disturbance was seen during the survey, but several boaters were observed landing on the northwest corner of the spit as I was leaving. East of the survey area, the Gulf beach has a rock revetment.

Figure 13. Phipps Preserve, FL, Survey Route



St. George Island (East End), FL, Critical Habitat Unit FL-9

Total Piping Plovers seen: 4

Banded Piping Plovers seen: 0

Date: March 11, 2006

Description of survey area: Bay side of island east to pass, south to Gulf side, then west on Gulf beach.

Ownership Status: State (Dr. Julian G. Bruce St. George Island State Park).

Survey type: Walking

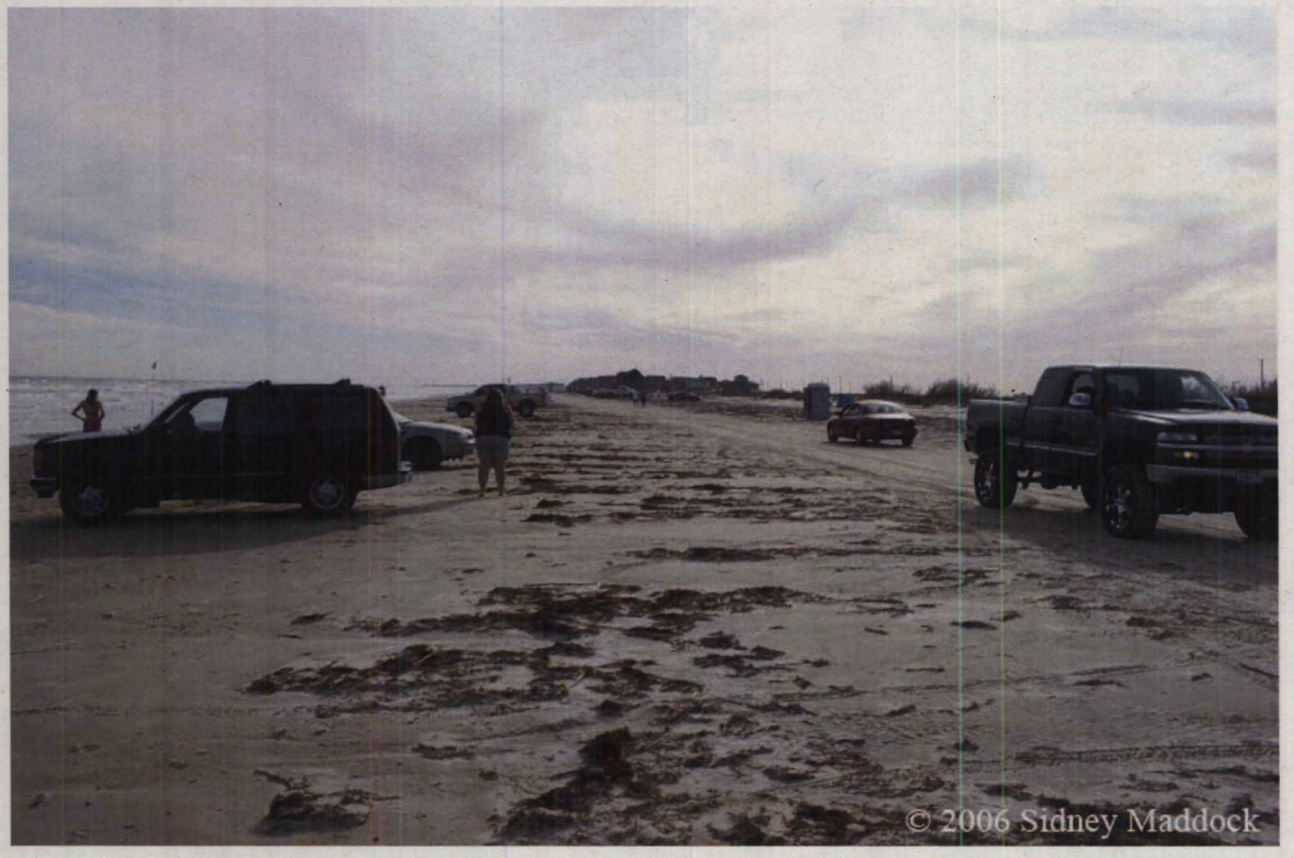
Weather: Partly cloudy, winds 10 km/hr, temperature 21.1° C.

Description of habitat: A barrier island with a wide beach at the east end, moderately sloping intertidal feeding area on east and south sides and a narrow beach on the north side.

Comments and observations: No disturbance was observed on the day I visited. A bridge connects the barrier island to the mainland. In the past, there has been ORV access during the winter but at the time of the survey, damage from Hurricane Dennis had temporarily closed the trail (Tony Tindell, pers. comm. 2006).

Figure 14. St. George Island (East End), FL, Survey Route

San Louis Pass (West from Pass), TX



Photograph 10. San Louis Pass, TX, looking west, showing disturbance and crushed wrack.

Total Piping Plovers seen: 89

Banded Piping Plovers seen: 14

- Left tibia black flag, left tarsus light green over black; right tibia metal, right tarsus dark green (Great Plains Canada)
- Left tibia metal, left tarsus red over dark green; right tibia black flag, right tarsus black (Great Plains Canada)
- Left tibia green flag, left tarsus black over red; right tibia no band, right tarsus no band (Great Plains US)
- Left tibia orange band, left tarsus no band; right tibia metal, right tarsus dark blue (Great Lakes)

- Left tibia black flag, left tarsus light green over dark blue; right tibia metal, right tarsus yellow (Great Plains Canada)
- Left tibia metal, left tarsus dark green; right tibia white flag, right tarsus red over light green (Great Plains Canada)
- Left tibia black over yellow split band (faded from dark green/light green), left tarsus metal band; right tibia orange, right tarsus white band (Great Plains Canada)
- Left tibia white, left tarsus metal; right tibia yellow over yellow, right tarsus no band (Great Plains Canada)
- Left tibia black flag, left tarsus light green; right tibia metal, right tarsus black over yellow (Great Plains Canada)
- Left tibia black flag, left tarsus light green; right tibia metal, right tarsus orange over dark green (Great Plains Canada)
- Left tibia black flag, left tarsus no band; right tibia metal, right tarsus no band (Great Plains Canada)
- Left tibia black flag, left tarsus red over dark green; right tibia no band seen; right tarsus dark green over metal (Great Plains Canada)
- Left tibia metal, left tarsus dark green over red; right tibia white flag, right tarsus pink (faded orange) (Great Plains Canada)
- Left tibia black flag, left tarsus red over light green; right tibia metal, right tarsus light green (Great Plains Canada)

Date: March 14, 2006

Description of survey area: West side of San Louis Pass north of the bridge, south to the Gulf. A section of eroded beach just west of the Pass that did not contain suitable habitat was not searched. After the narrow eroded area, the survey continued to the west on the Gulf beach.

Ownership Status: Private

Survey type: Driving

Weather: Clear to partly cloudy, wind N 28.3 km/hr, temperature 19.9° C.

Description of habitat: Privately owned beach, with small tidal cove north of the bridge at the Pass, and Gulf beach with large amounts of wrack and relatively flat intertidal feeding habitat. A section of beach near the pass (shown by a gap in the blue survey route line) was not surveyed due to its very narrow width, buildings, and the lack of suitable habitat.

Comments and observations: Recreational ORV use is allowed, with high levels of pedestrian and ORV disturbance in some areas. The Piping Plovers were seen in areas of low disturbance that were located in gaps between the high disturbance areas. On this day, the north wind direction would have flooded bay side feeding habitats, making it more likely that birds would be seen on the Gulf beach that was surveyed. The Piping Plovers were using the ocean intertidal and wrack habitats for feeding, and roosting in fresh wrack and old wrack. Mortality (take) of adult Piping Plovers on this beach is foreseeable due to high vehicle speeds that were observed and the close proximity of roosting and feeding birds to vehicle use.

Figure 15. San Louis Pass (West from Pass), TX, Survey Route

Galveston Island State Park, TX, and Private Lands to the West

Photograph 11. Galveston Island, TX, looking east, showing beach stabilization efforts.

Total Piping Plovers seen: 23

Banded Piping Plovers seen: 1

- Left tibia black flag, left tarsus orange; right tibia metal, right tarsus light green over dark blue (Great Plains Canada)

Date: March 15, 2006

Description of survey area: Starting at the east boundary of state park west through the park and continuing west in front of houses.

Ownership Status: State (Galveston Island State Park) and private land to the west.

Survey type: Walking (state park) and driving (beach in front of houses)

Weather: Partly cloudy, wind E at 34.8 km/hr, temperature 11.7° C.

Description of habitat: A Gulf beach with relatively low slope, sand substrate, low to high levels of disturbance depending on location, and old and fresh wrack.

Comments and observations: No recreational ORV use is allowed in the Park, but there was ORV use in front of the ramp area west of the Park and houses to the west. Beach stabilization efforts have been implemented in certain areas of the Park by building artificial dunes using snow fencing and dead trees and branches. Low to moderate levels of pedestrian disturbance were observed, depending on distance from the camping/parking area and ORV ramp area, with higher disturbance was observed in the ORV area. All birds were observed in the Park area.

Figure 16. Galveston Island State Park, TX, Survey Route

Big Reef, TX, Critical Habitat Unit TX-35

Photograph 12. Big Reef, TX, looking southeast towards intertidal area.

Total Piping Plovers seen: 28

Banded Piping Plovers seen: 4

- Green flag, yellow over black (Great Plains US) (full string not seen because bird was flushed by a pedestrian)
- Left tibia metal, left tarsus no band; right tibia white flag, right tarsus no band (Great Plains Canada)
- Left tibia metal, left tarsus orange over light green; right tibia black flag, right tarsus dark blue (Great Plains Canada)
- Left tibia black flag, left tarsus red over light green; right tibia metal, right tarsus dark blue (Great Plains Canada)

Date: March 15, 2006

Description of survey area: From the west end of ORV area east to the no ORV area, then north to the vegetation/water boundary where the beach narrows.

Ownership Status: City (Park Board of Trustees of the City of Galveston).

Survey type: Walking (non-ORV area) and driving (ORV area)

Weather: partly cloudy, wind ESE 35.9 km/hr, temperature 12.7° C.

Description of habitat: A wide Gulf beach, with intertidal feeding habitat and roosting habitat in the no-ORV flats area east of the jetty; to the north of this area, the beach narrows. A large jetty stabilizes the beach.

Comments and observations: ORV use was observed on the south-facing beach. An area to the east (facing the ship channel) had signs marking the flats as "closed" to vehicles but there were multiple ORVs (9) using the area. Drivers gained entry through a gap between the signs. All Piping Plovers were seen in the "closed" ORV area. A fee is charged to drive on the beach. Nice roosting habitat and adjoining intertidal feeding habitats were observed in the "closed" area, which had moderate ORV and pedestrian disturbance on the east end. Higher levels of disturbance were observed in the area open to ORVs. Due to the proximity to Bolivar Flats, survey efforts should consider movements between the two locations.

Figure 17. Big Reef, TX, Survey Route

San Louis Pass (East from Pass), TX, Critical Habitat Unit TX-34

Photograph 13. San Louis Pass, TX, looking northeast, showing old wrack roosting habitat.

Total Piping Plovers seen: 32

Banded Piping Plovers seen: 6

- Left tibia black flag, left tarsus red; right tibia metal, right tarsus dark blue over orange (Great Plains Canada)
- Left tibia green flag, left tarsus no band; right tibia gray, right tarsus dark green (Great Plains US)
- Left tibia black flag, left tarsus dark green over dark green; right tibia metal, right tarsus yellow (Great Plains Canada)
- Left tibia black flag, left tarsus no band; right tibia metal, right tarsus no band (Great Plains Canada)
- Left tibia no band seen, left tarsus yellow over yellow; right tibia green flag, right tarsus black over dark green (Great Plains US)

- Left tibia black flag, left tarsus orange over metal; right tibia no band seen, right tarsus yellow over dark green (Great Plains Canada)

Date: March 15, 2006

Description of survey area: From ORV ramp west to Pass then north along Pass to just north of bridge. Bay habitats were not searched due to insufficient time.

Ownership Status: Private

Survey type: Driving

Weather: Cloudy, ESE 29.1 km/hr, temperature 14.4° C.

Description of habitat: A Gulf beach with low slope in the intertidal areas, old wrack roosting habitat, and fresh wrack.

Comments and observations: The survey area had moderate to high pedestrian/ORV disturbance in certain locations. One all-terrain vehicle (ATV) was observed driving through the dunes and wrack roosting habitat. Due to high speed at which ORVs were observed driving on beach, mortality (take) of roosting or feeding Piping Plovers is foreseeable. A large housing development was under construction on Gulf and bay side. Onshore winds might have resulted in birds being missed due to their use of more shielded, bay habitats that were not surveyed.

Figure 18. San Louis Pass (East from Pass), TX, Survey Route

San Bernard NWR and West, TX, Critical Habitat Unit TX-31

Photograph 14. Southwest of San Bernard NWR, looking northeast towards overwash fans.

Total Piping Plovers seen: 24

Banded Piping Plovers seen: 2

- Left tibia no band, left tarsus black over yellow; right tibia green flag, right tarsus black over red (Great Plains US)
- Left tibia metal, left tarsus red; right tibia and tarsus not visible

Date: March 16, 2006

Description of survey area: The Gulf beach including overwash fans west of the inlet, the recurved spit on the west side of the inlet, flood tidal delta sandbars, and east side of the inlet.

Ownership Status: Federal east of the inlet (San Bernard National Wildlife Refuge) and private to the west of the inlet.

Survey type: Walking and driving

Weather: Not recorded, but conditions excellent.

Description of habitat: A Gulf beach with extensive washover fans, a narrow intertidal area that included areas of peat covered with thin layer of sand, and large flood tidal delta sandbars near the inlet.

Comments and observations: An ORV permit from Matagorda County is required to drive on the beach west of the inlet. Away from the inlet, the Gulf side feeding habitat was limited due to the narrow beach width. ORV and ATV use on the west side of the inlet with moderate disturbance. ATV tracks were seen on the east side of the inlet but disturbance was not observed on the east side during the survey. The driving corridor on the west side of the inlet was through overwash fans that otherwise would provide good roosting habitat. Piping Plovers were observed at the east and west sides of the inlet and the flood tidal delta sand bars.

The critical habitat designation for Unit TX-31, which includes part of this survey area, was recently vacated as a result of litigation.

Figure 19. San Bernard NWR, TX, Survey Route

Bolivar Flats, TX and East, Critical Habitat Unit TX-36

Photograph 15. Bolivar Flats, TX, intertidal feeding habitat and Great Lakes brood marker.

Total Piping Plovers seen: 178

Banded Piping Plovers seen: 22

- Left tibia metal, left tarsus no band; right tibia no band, right tarsus no band
- Left tibia metal, left tarsus orange over light green; right tibia black flag, right tarsus dark blue (Great Plains Canada)
- Left tibia metal, left tarsus no band; right tibia black flag, right tarsus no band (Great Plains Canada)
- Left tibia metal, left tarsus yellow; right tibia black over white split, right tarsus no band (Reflex Lakes, Alberta/Saskatchewan border, Great Plains Canada)
- Left tibia no band seen, left tarsus dark green over dark green; right tibia green flag, right tarsus black over gray (Great Plains US)(resighted 3/19/06)
- Left tibia metal, left tarsus light green; right tibia white flag, right tarsus salmon (faded orange) over dark green (Great Plains Canada)(resighted 3/19/06)

- Left tibia metal, left tarsus dark blue; right tibia white flag, right tarsus yellow over dark green (Great Plains Canada)
- Left tibia no band seen; left tarsus white over dark green; right tibia green flag, right tarsus black over dark green (Great Plains US)
- Left tibia metal, left tarsus light green over black; right tibia black flag, right tarsus black (Great Plains Canada)
- Left tibia black flag, left tarsus dark blue; right tibia metal, right tarsus dark blue over orange (Great Plains Canada)
- Left tibia white, left tarsus dark blue over metal; right tibia no band seen, right tarsus no band (Great Plains Canada)(resighted 3/19/06).
- Left tibia black flag, left tarsus orange; right tibia no band seen, right tarsus dark green (Great Plains Canada)
- Left tibia white, left tarsus yellow over red; right tibia no band seen, right tarsus metal (Great Plains Canada)(resighted 3/19/06)
- Left tibia white, left tarsus no band; right tibia orange, right tarsus metal (Great Plains Canada)
- Left tibia no band seen, left tarsus metal; right tibia light blue flag, right tarsus no band (Great Plains US) (resighted 3/19/06)
- Left tibia white flag, left tarsus red over metal; right tibia no band seen, right tarsus red over dark blue (Great Plains Canada)
- Left tibia metal, left tarsus dark green over dark blue; right tibia white flag, right tarsus yellow (Great Plains Canada)
- Left tibia black flag, left tarsus no band; right tibia metal, right tarsus no band (Great Plains Canada)
- Left tibia orange, left tarsus no band; right tibia metal, right tarsus dark blue (Great Lakes)
- Left tibia orange, left tarsus white; right tibia black (?), right tarsus red over metal (unknown) (O, W; -, RX seen 3/19, but the right tibia was not visible).
- Left tibia metal, left tarsus salmon (faded orange) over light green; right tibia white flag, right tarsus light green (Great Plains Canada)
- Left tibia black flag, left tarsus orange; right tibia metal, right tarsus light green over dark green (Great Plains Canada)(resighted on 3/19/06)

Date: March 17 and 19, 2006

Description of survey area: Just east of the drain area on the ORV beach west to near the west end of the flats in the sanctuary.

Ownership Status: Private conservation (Houston Audubon Society) and private.

Survey type: Walking (sanctuary) and driving (lands to the east).

Weather: Not recorded first day, but conditions excellent. Second day, cloudy, winds ESE 28 km/hr, temperature 18.7° C.

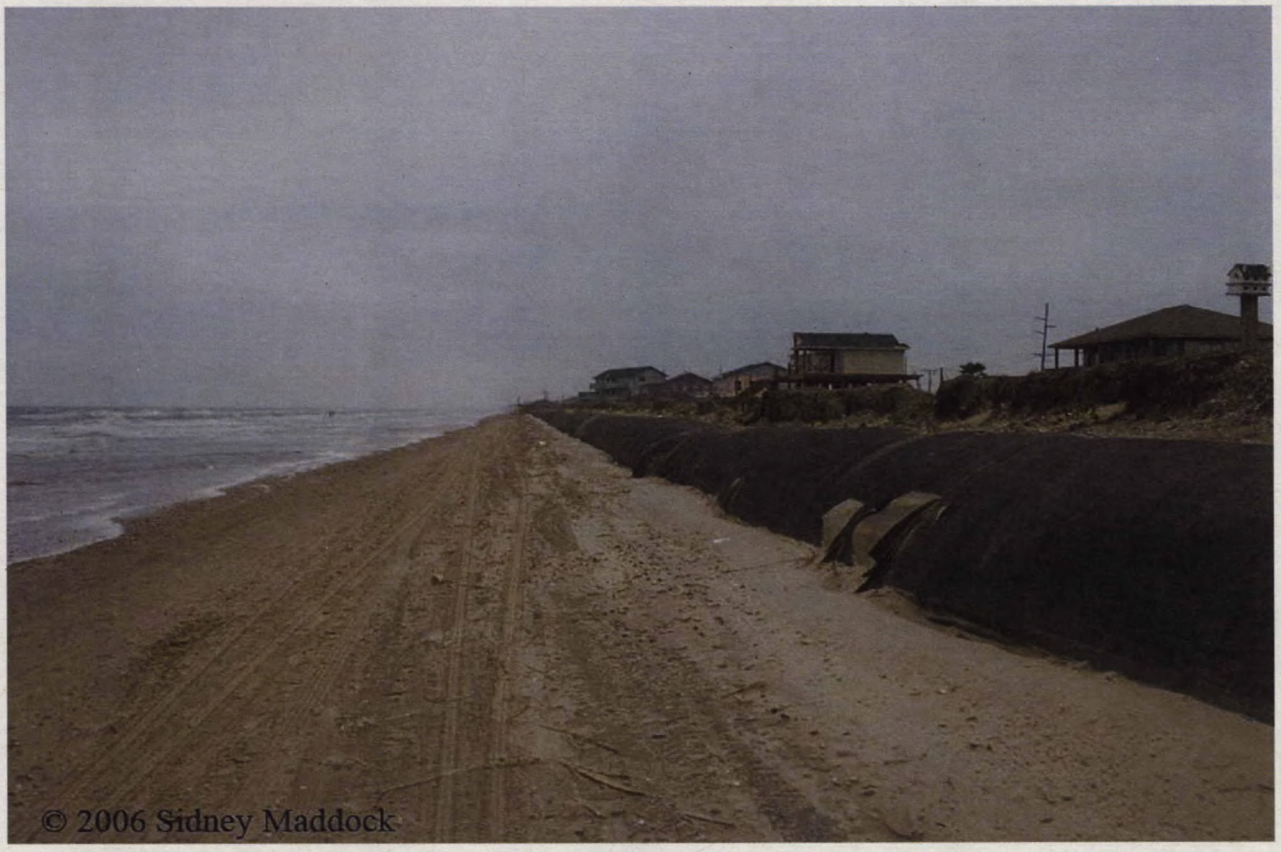
Description of habitat: Gulf beach, with very large intertidal flats habitat at mid-low tide inside Houston Audubon sanctuary area, but limited high tide roosting area; the area to the east outside the sanctuary had a larger roosting habitat area and fresh wrack in the intertidal area on the second day but not the first day.

Comments and observations: ORV, dog, and hunting prohibition on the west end (Audubon Sanctuary), with large posts and cable to block traffic and signs requesting that birders stay a safe distance from roosting birds. ORV use was allowed on the east end of survey route. When visited on the second day, the large intertidal feeding habitats on the west end were almost completely flooded by the onshore wind, and observed Piping Plover numbers were much lower. Disturbance was low in the Sanctuary, but on both days, birders flushed roosting or feeding Piping Plovers. The area to the east outside of the ORV closure had moderate to high disturbance levels.

Due to many hours that were spent observing banded birds and the observed movements of many Piping Plovers during the survey, a total count would not have been accurate. Instead, a partial count of 178 was recorded, which is based on 169 that were observed at one time and 9 to the east in another location. This figure is very conservative, as additional birds were seen but not counted. On the second visit, the priority was attempting to find banded birds that had not been seen the previous day and a total count was not done. One Piping Plover was seen on 3/19 that was not seen on 3/17: Lf,O:X, gG. Seven Piping Plovers that were seen on March 17 were resighted on March 19; these birds are noted in the text above with: (resighted 3/19/06). The low percentage of resightings of banded Piping Plovers on the second day could be due to the poor weather conditions on that day, as the flats were almost completely flooded from the onshore winds and the number of Piping Plovers was much lower.

Figure 20. Bolivar Flats and East, TX, Survey Route

High Island to Gilchrist, TX



Photograph 16. Gilchrest, TX, looking west, showing geo-textile tube stabilizing beach.

Total Piping Plovers seen: 0

Banded Piping Plovers seen: 0

Date: March 18, 2006

Description of survey area: Gulf beach from west refuge boundary to the town of Gilchrist; a section of beach at Gilchrist was not searched due to the narrow width and lack of habitat.

Ownership Status: Private

Survey type: Driving

Weather: Rain, wind ENE 34.8 km/hr, temperature 12.6° C.

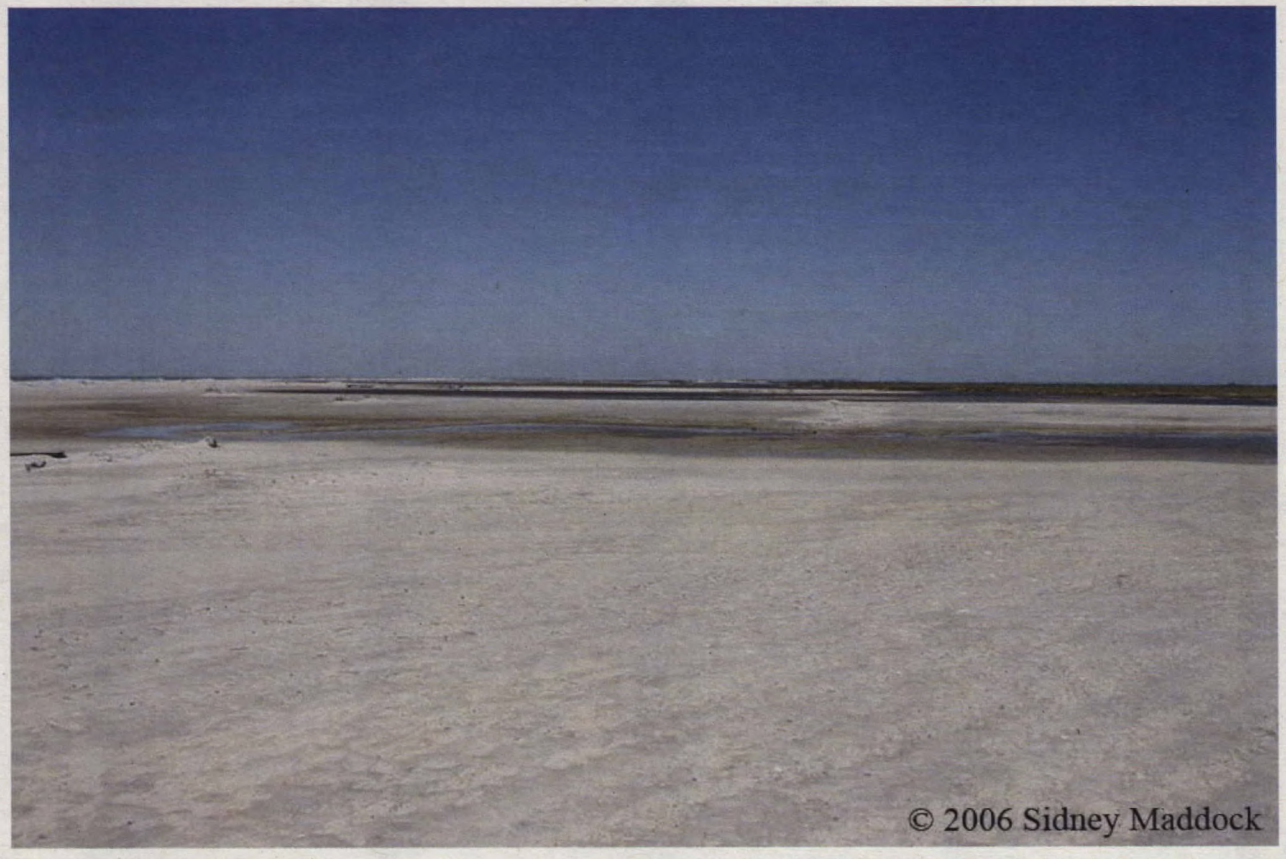
Description of habitat: A sandy, relatively flat Gulf beach with ORVs and camping on beach, and geotextile tube in front of certain buildings.

Comments and observations: This section of beach was selected for survey due to the observation of unidentified banded birds during the 2006 International Census. However, the strong onshore wind on the survey day may have caused birds to use bay side habitats that were not surveyed. The section of

beach that was not surveyed (shown by the gap in the blue survey route line) was narrow and not suitable habitat at the tide level during the survey.

Figure 21. High Island to Gilchrest, TX, Survey Route

Horn Island (West End), MS, Critical Habitat Unit MS-14



Photograph 17. Horn Island, MS, looking northwest, towards tidal and ephemeral pools.

Total Piping Plovers seen: 24

Banded Piping Plovers seen: 2

- Left tibia metal, left tarsus red; right tibia white flag, right tarsus salmon (faded orange) over dark blue
- Left tibia metal, left tarsus dark green; right tibia white flag, right tarsus salmon (faded orange) over dark blue

Date: March 21, 2006

Description of survey area: Bay shoreline west to the pass, then east on the Gulf shoreline

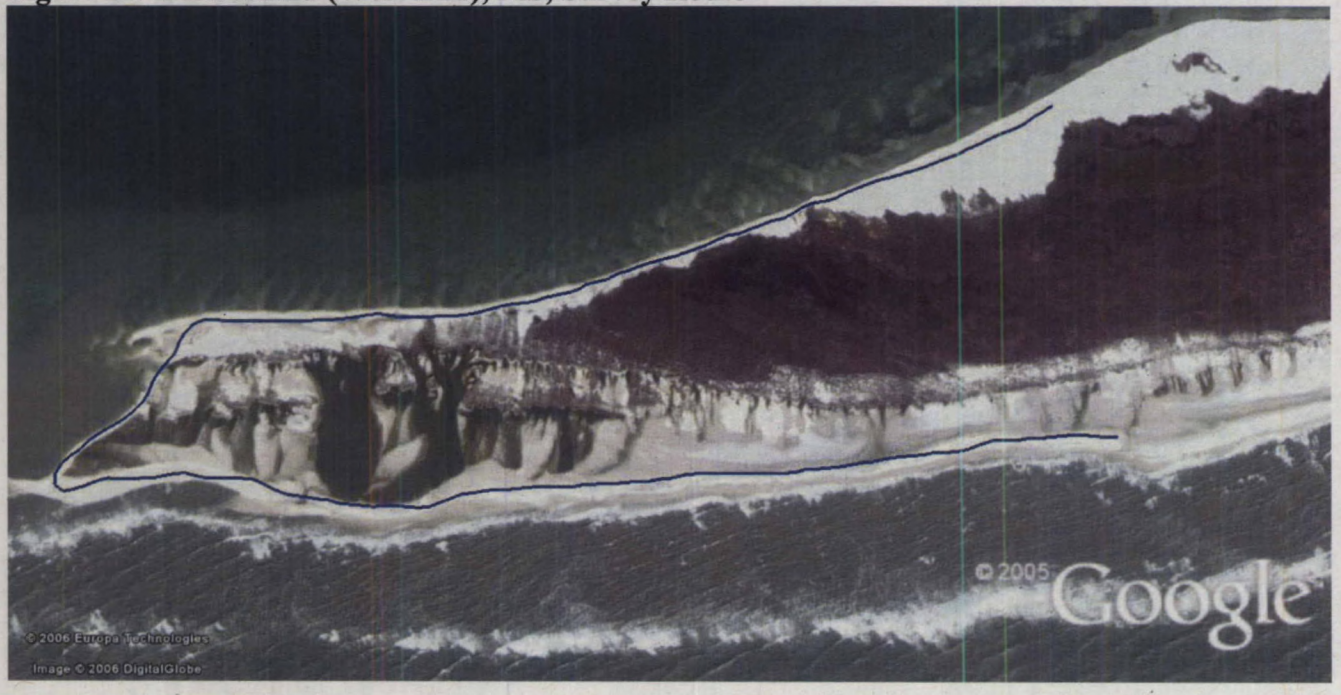
Ownership status: Federal (Gulf Islands National Seashore)

Survey type: Walking

Weather: Clear, wind WSW 18.7 km/hr, temperature 20.4° C.

Description of habitat: Barrier island accessible by boat only, with large tidal and ephemeral ponds and roosting habitat on the Gulf side east of the pass. The bay side has a narrow beach and feeding area, and the interior of the island is densely vegetated except in the Gulf- side overwash areas.
Comments and observations: All Piping Plovers were observed using the ponds or roosting just to the southeast of the ponds. No disturbance was observed on the day the area was visited. Large overwash areas from the 2005 hurricanes were observed.

Figure 22. Horn Island (West End), MS, Survey Route



Horn Island (East End), MS, Critical Habitat Unit MS-14

Total Piping Plovers seen: 11

Banded Piping Plovers seen: 0

Date: March 22, 2006

Description of survey area: Gulf side east to Pass, then west along Bay side

Ownership status: Federal (Gulf Islands National Seashore)

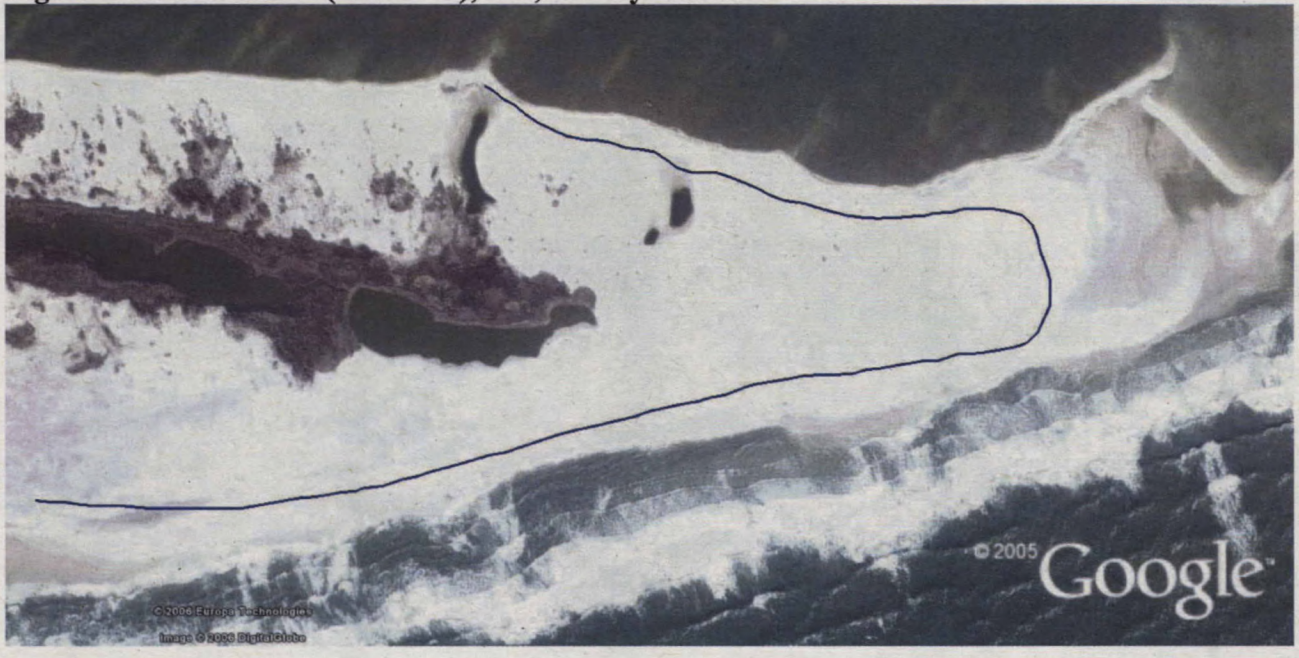
Survey type: Walking

Weather: Partly cloudy, wind NNE 6.3 km/hr, temperature 19.5° C.

Description of habitat: Barrier island accessible by boat only, with intertidal feeding habitats and roosting habitats on the east end of the island, and large overwash fans from the 2005 hurricanes.

Comments and observations: No disturbance was observed during the visit.

Figure 23. Horn Island (East End), MS, Survey Route



Petit Bois Island (East End), MS, Critical Habitat Unit MS-14

Total Piping Plovers seen: 1

Banded Piping Plovers seen: 1

- Left tibia no band, left tarsus red over red; right tibia green flag, right tarsus black over dark green (Great Plains US)

Date: March 22, 2006

Description of survey area: East end of barrier island, Gulf and bay sides.

Ownership status: Federal (Gulf Islands National Seashore)

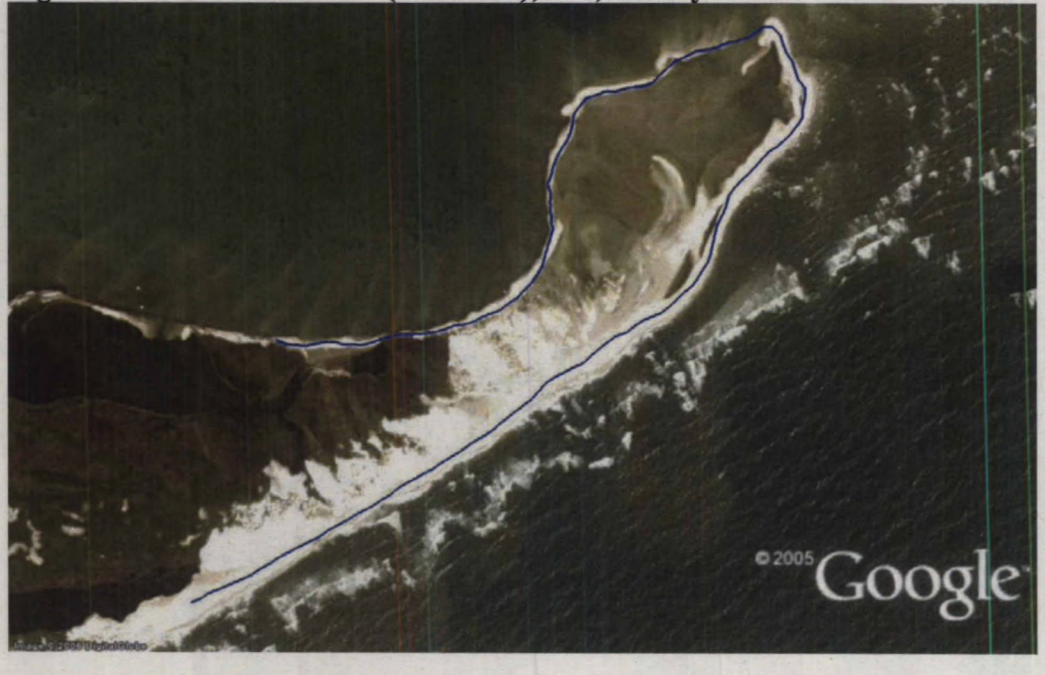
Survey type: walking

Weather: Partly cloudy, winds SSE 7.8 km/hr, temp. 17.7° C.

Description of habitat: A barrier island, accessible only by boat, with extensive bay side, lagoon feeding habitat, extensive roosting habitat, and large overwash areas from the 2005 hurricanes.

Comments and observations: A single Piping Plover that was observed and photographed at this location was seen previously and photographed at Shell Key, Florida on 3/07/06. One bird is a surprisingly low number given the apparent habitat quality and no observed disturbance; birds may have been missed at roosting habitats to the west that were not surveyed, or wintering birds may have migrated.

Figure 24. Petit Bois Island (East End), MS, Survey Route



East Ship Island (East End), MS, Critical Habitat Unit MS-14

Photograph 18. East Ship Island, MS, looking west towards intertidal feeding habitat.

Total Piping Plovers seen: 14

Banded Piping Plovers seen: 0

Date: March 23, 2006

Description of survey area: The east end of island, from the more densely vegetated area east to the pass, on the bay and Gulf sides

Ownership status: Federal (Gulf Islands National Seashore).

Survey type: Walking

Weather: Partly cloudy, wind WSW 7.4 km/hr, temperature 15.3° C.

Description of habitat: A barrier island accessible by boat only, with large overwash fans, extensive intertidal feeding areas on the bay side, and roosting habitat.

Comments and observations: No disturbance was observed during the visit.

Figure 25. East Ship Island (East End), MS, Survey Route

West Ship Island (East End), MS, Critical Habitat Unit MS-14

Photograph 19. West Ship Island, MS, looking south towards the roosting location.

Total Piping Plovers seen: 25

Banded Piping Plovers seen: 3

- Left tibia no band seen, left tarsus red; right tibia white flag, right tarsus orange over dark blue (Great Plains Canada)
- Left tibia no band seen, left tarsus orange; right tibia metal, right tarsus light green (Great Lakes)
- Left tibia black flag, left tarsus dark blue; right tibia metal, right tarsus dark blue over black (Great Plains Canada)

Date: March 23, 2006

Description of survey area: From the west end of the lagoon east to the pass, on both the bay and Gulf sides

Ownership status: Federal (Gulf Islands National Seashore)

Survey type: Walking

Weather: Clear, wind NW at 16.1 km/hr.

Description of habitat: A barrier island accessible by boat only, with a large tidal lagoon on the east side of the island that provided a low energy intertidal feeding habitat.

Comments and observations: Excellent feeding and roosting habitat. There were large overwash areas from the 2005 hurricanes.

Figure 26. West Ship Island (East End), MS, Survey Route

Little Dauphin Island (North End), AL, Critical Habitat Unit AL-2

Photograph 20. Little Dauphin Island, AL, looking southeast towards roosting habitat.

Total Piping Plovers seen: 38

Banded Piping Plovers seen: 3

- Left tibia white, left tarsus yellow; right tibia dark blue, left tarsus metal (Great Plains Canada)
- Left tibia metal, left tarsus no band; right tibia no band observed, right tarsus white
- Left tibia no band observed, left tarsus no band; right tibia no band observed, right tarsus dark green over metal (possible Great Lakes brood marker, but unconfirmed)

Date: March 24, 2006

Description of survey area: Northwest and northeast sides of island; the beach to the southeast was not surveyed but did contain suitable habitat.

Ownership Status: Federal (Bon Secour National Wildlife Refuge)

Survey type: Walking

Weather: Clear, wind NW 16.1 km/hr, temperature 7.9° C.

Description of habitat: A barrier island with extensive sandbars on the northwest side of the island.

Comments and observations: All birds were roosting together at a small spit on the northeast side of the island. No disturbance was observed.

Figure 27. Little Dauphin Island (North End), AL, Survey Route

Pelican Island (Southeast End), AL, Critical Habitat Unit AL-2

Total Piping Plovers seen: 0

Banded Piping Plovers seen: 0

Date: March 24, 2006

Description of survey area: Southeast end of the island, north and south sides.

Ownership Status: Private

Survey type: Walking

Weather: Clear, winds NNW 13.9 km/hr, temperature 13° C.

Description of habitat: A large, low elevation, narrow barrier island.

Comments and observations: Only the extreme southeast end of the island was searched on foot due to time limitations. Other areas of suitable habitat were visible to the northwest. While these areas were quickly scanned from the boat, Piping Plovers could have been missed. Low disturbance was observed on the day the island was visited.

Discussion

Piping Plovers can be difficult to locate on the wintering grounds (Stucker et al. 2003), and locating banded Piping Plovers and correctly identifying the band combination can be particularly challenging. Accurate observation of bands that are on the tibia can be blocked by feathers; bands on the tarsus can be blocked by wrack or a depression that the bird is using as a roost; and bands can be missing or faded or not identifiable due to the distance of the observer (Maddock 2005). However, with the increasing number of Piping Plovers that have been banded in Canada and the United States, the results of this survey suggest that experienced field personnel can efficiently locate and identify banded Piping Plovers, as 78 banded Piping Plovers were observed in 16 full or partial field survey days.

Of 78 banded birds, this survey identified the population origin for 92 % (n=72). Of these 72 birds, 76% (n=55) had either a black, white, green, light blue, or orange flag. As long as the tibia is not covered with feathers, it is relatively easy for a careful observer to see a flag and it helps considerably with identification of the population. For two birds that could not be identified as to population, brood markers were used that were probably from the Great Lakes, due to the type of metal band and the plastic band color. However, as the use of the same combination by other banders could not be definitively ruled out, both birds were listed as unknown in the total count.

This survey effort suggests several factors that may be helpful to consider in future survey efforts. One uniquely banded Piping Plover from the Great Plains was seen and photographed at Shell Key, FL and later Petit Bois Island, MS, suggesting that spring migration movements may have influenced the observations. Earlier surveys would provide information about wintering birds, while delaying the survey initiation date until mid-March or later may provide helpful data on the use of migratory stopover locations.

Consideration also should be given to how Piping Plovers may move within their wintering home ranges. Depending on factors such as tide and weather, wintering Piping Plovers move within a mosaic of habitats (USFWS 2003). In this survey, an individually marked bird was observed on both sides of Bolivar Roads, at Big Reef, TX and at Bolivar Flats, TX. A Piping Plover that was observed on the east end of West Ship Island, MS during this survey previously was observed during the 2006 International Census at Moses Pier, Gulfport, MS (Cheri Gratto-Trevor, pers. comm. 2006), an interesting movement between the mainland and the barrier islands. A third Piping Plover moved between two of the barrier islands at Gulf Islands National Seashore, from the west end of Horn Island

to the east end of East Ship Island, a distance over 11 kilometers; however, it is unknown if this Piping Plover was a wintering bird moving within its wintering home range or a migrant moving along the coast. Because of the potential for movements such as these, any single day survey effort may raise detectability issues. However, this may be addressed in part by considering how weather, tide, and disturbance may affect habitat use and cause shifts between habitats on either side of a pass or between the bay and Gulf locations.

To get a more complete picture of distribution of banded Piping Plovers, survey efforts should include remote locations that are difficult to access. Consistent with more comprehensive survey efforts (Ferland and Haig 2002), my much less intensive effort observed the majority of Piping Plovers in Texas, in locations that, by chance, happened to be relatively easy to access. However, my survey also found Piping Plovers in locations that were accessible only by boat. Of 628 Piping Plovers that were observed in this survey, 28.7% (n=180) were observed on offshore barrier islands or sandbars that were not accessible by vehicle. It cannot be said that this percentage is representative of overall wintering distribution, as the locations were not selected at random, nor were the survey locations complete. Nevertheless, the large number of Piping Plovers found on remote barrier islands suggests the additional effort to access these areas is worthwhile.

Under appropriate circumstances, taking digital pictures of banded Piping Plovers may be a helpful tool to assist with band identification. Photographs provide a record of specific colors, so field observations can be verified. In addition, pictures of faded bands may be viewed by the scientists who have experience with how the bands fade over time; such review can be very helpful if the band color is not easily identifiable. For example, in this survey, bands that appeared pink or salmon color were faded orange, and a band that appeared as a black/yellow split was a faded dark green/light green split. Photographs also may sometimes allow identification of bands that were not clearly seen with a spotting scope due to factors such as leg movement or feathers partially blocking a band. In this survey, even though the observer had considerable experience observing banded Piping Plovers and carefully observed the bands, photographs allowed correct identification of the full band combination for at least five banded birds that would not have occurred otherwise. For example, on one bird, a second band on the tibia that was covered by feathers and not seen in the field was observed in a photograph.

However, it should be emphasized that photography is not a substitute for careful observation of bands using a spotting scope. In some situations, it is not possible to take usable pictures of banded

Piping Plovers. The observer has to carefully and continually consider the potential risk of disturbance for every banded Piping Plover that is observed. Even using a very large telephoto lens, preferably 840 mm or larger, it may not be possible to safely approach close enough for the bands to be identified in a picture without disturbing the bird. Particularly in low disturbance locations where there are longer flush distances, a spotting scope such as the one used in this survey may be more suitable due to the relatively higher magnification. In addition, the use of photographic equipment poses disturbance concerns if the photographer is not skilled in observing Piping Plover behaviors and very cautious so as to not flush the bird. If misused, photography could raise serious disturbance concerns. Finally, taking pictures can add considerable time to conduct the survey and process the digital files, and suitable photographic equipment is very expensive, not waterproof, and fragile. As a result, this technique is not without additional costs.

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Résumé[1]

Des relevés ont été faits pour localiser des pluviers siffleurs (*Charadrius melodus*) rayés sur la côte du Golfe du Mexique entre le 6 et le 24 mars 2006. On a visité 29 endroits, de Marco Island en Floride, au comté de Matagorda au Texas. Le Fish and Wildlife des États-Unis a désigné 24 emplacements comme étant des habitats essentiels d'aires d'hivernage du pluvier siffleur qui a été observé 628 fois, dont 374 au Texas, 141 en Floride, 75 au Mississippi et 38 en Alabama. On a observé 78 pluviers siffleurs rayés, dont 49 au Texas, 20 en Floride, 6 au Mississippi et 3 en Alabama.

La population reproductrice du pluvier siffleur rayé peut être identifiée 92 p.100 (n=72) du temps : 46 provenaient des Grandes plaines canadiennes dont 2 ont été observées 2 fois à des endroits différents du même État; 16 venaient des grandes plaines américaines dont une observée deux fois dans différents États; 9 venaient des Grands lacs et 1 du Canada Atlantique. Effectuer les relevés des aires d'hivernage du pluvier siffleur rayé peut représenter un défi. Cependant, les résultats de ces efforts suggèrent que les observateurs expérimentés peuvent le localiser plus efficacement et l'identifier plus précisément.

[1] Added by Environment Canada (February 2009).

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Wintering piping plover surveys 2006: Marco Island, FL to Matagorda County, TX / Sydney Maddock Canadian Wildlife Service