

# Geographic Information System (GIS) analysis of Piping Plover macro habitat on the Gulf of Mexico Coast

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Shorebirds depend on high quality (non-breeding) habitat and conservation should be a priority Saether et al. 1996



# Piping Plover Habitat Loss

- From 1780 to 1980, the total wetland loss for the five Gulf of Mexico states is estimated at 40 million km<sup>2</sup> (50%) EPA 1999
- Piping Plovers (PIPL) are gradually losing significant portions of their historic wintering habitat USFWS 2001

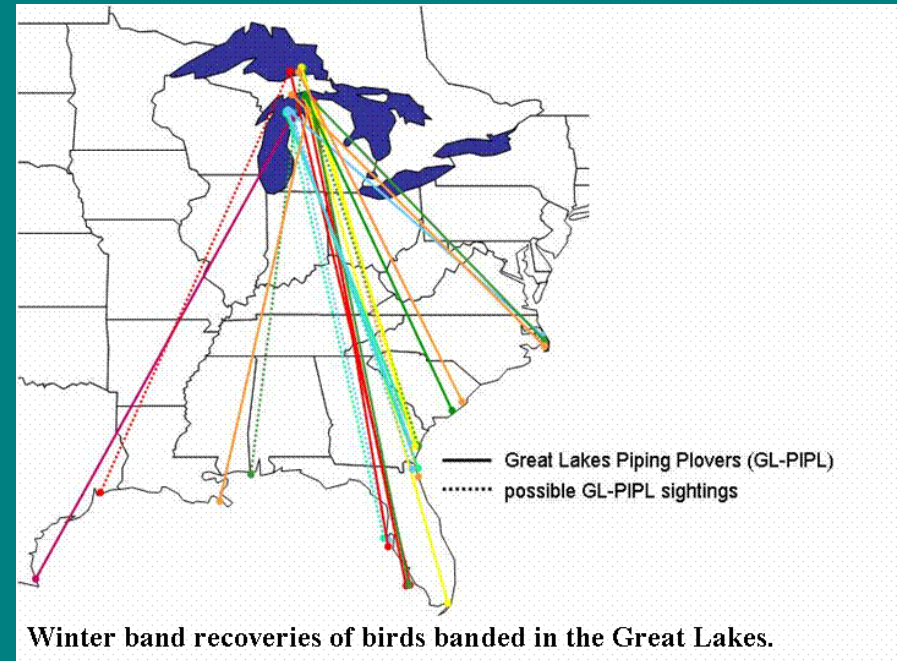


Dauphin Island, AL

# Plover Winter Life History

- They arrive at wintering sites between late July and September
- Wintering ground site fidelity  
Wemmer 2000
- Three populations winter in the same area: coastal U.S. from Texas to North Carolina, eastern Mexico, and the Caribbean islands Haig 1992
- International PIPL winter censuses located ~ 40-60% of the estimated number of continental breeding birds

Haig and Plissner 1993; Plissner and Haig 2000, Ferland and Haig 2002



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# Winter Studies

- Sandflats adjacent to beaches or coastal inlets Haig and Oring 1985
- Protected mudflats or sandflats exposed at low tides Johnson and Baldassare 1988



# Winter Studies: cont.

- Associated with beach width, percent beach, percent mudflat, small inlets Nicholls and Baldassarre 1990
- Frequency of use: algal flats, lower sand flats, washover passes, upper sand flats, mudflats, beach, dredge placement area, roadside ditches Drake et al. 2001
- Potential importance of micro-roosting sites Kiel Drake
- Mean core area: 2.9km<sup>2</sup>; 79% of movements were <5km Drake et al. 2001

# Objectives

- Use historical literature and surveys to identify areas of high piping plover abundance
- Investigate relationship between plover abundance and 7 selected habitat variables
- Create linear model of plover macro-habitat to predict plover distribution along the Gulf Coast

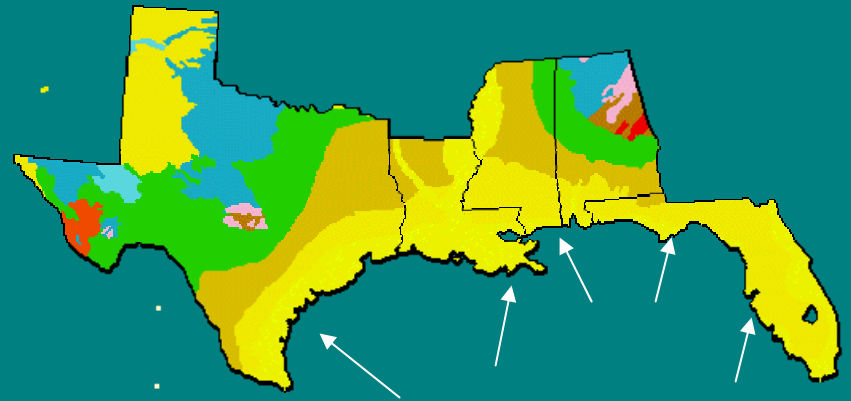
# Questions

- Is there a set of sites that is consistently used by wintering plovers?
- Is there a relationship between plover abundance and selected habitat variables?
- Does a combination of selected variables explain plover presence at wintering sites?



# Study Area: Gulf of Mexico Coast

- Central Barrier Coast
- Apalachicola Cuspate
- The North Central Gulf
- Mississippi Delta
- Texas Barrier Islands



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# Methods I: Site Selection

4 criteria characterize the sample units

- Data from a published source
- Surveys were in a well-defined location
- Surveys occurred within a defined time period
- Three categories were defined to describe historical piping plover abundance: 1-14; 15-29, and 30+

# Results: Objective I

Where are plovers wintering consistently and in what numbers?

- 46 sites identified:
- 25 high abundance (30+); 8 medium (15-29); and 19 low (1-14)

# Results I: Locations w/ 30+ PIPL

State	Site
TX	Corpus Christi (Flour Bluff)
TX	Laguna Atascosa
TX	Mustang Island
TX	Aransas NWR (Matagorda Island)
TX	Aransas Pass (causeway, Harbor Island area)/Port Aransas
TX	Bolivar Flats
TX	Matagorda Peninsula (layers in 14)
TX	N. Padre Island
TX	S. Padre Island
TX	San Bernard NWR (Cedar Lakes)
TX	San Jose Island
TX	Mad Island Marsh (no location)
LA	Breton Island
LA	Chandeleur Islands (Chadeleur Light)
LA	Last Island (excluded- W Timbalier)
LA	Trinity Island (Central Isles Dernieres)
LA	Timbalier Island
LA	Barataria Pass
FL	Big Marco Pass Shoal
FL	Lanark Reef
FL	Port St. Joe
FL	Honeymoon Island
FL	Shell Key
FL	Three Rooker Bar
AL	Dauphin Complex

# Results I: Locations w/ 15-29 PIPL

State	Site
TX	Freeport
TX	Sea Rim S.P.
LA	Sabine NWR
LA	Point Au Fer NE
LA	Caminada Pass
LA	Belle Pass
FL	Caladesi Island
FL	Ft DeSoto/Pass-a-Grille

# Results I: Locations w/ 1-14 PIPL

State	Site
TX	Rockport
TX	Follets Island
TX	Tule Lake
LA	Cameron
LA	Holly Beach
FL	Perdido Bay
FL	Bay Point Marriot
FL	Crooked Island
FL	Ward's Bank
FL	Big Sabine Point
FL	Apalachicola Bay/ St. Vincent NWR
FL	Cape San Blas
FL	Cedar Key
FL	Jonathan Dickinson S.P.
FL	Coot Bay-Everglades
FL	Arikepa/Bayport
FL	Navarre Beach/ Navarre Beach St. Pk
FL	Ft Morgan
FL	Gulf Shores

# Methods II:

- Piping plover points, either georeferenced or descriptive, were buffered at 3.5km







# Results: Are selected habitat variables correlated with PIPL abundance?

REGION (numbers of sites)	INTERTIDAL AREA	BEACH	AREA	PENINSULA
GULF COAST (GC) (31/32)	0.01318* (29)	0.4724 (29)	0.01282* (29)	0.001109** (29)
WESTERN GC (23/24)	0.02639* (20)	0.8758 (20)	0.02268* (20)	0.007525** (20)
FLORIDA GC (8/8)	0.2783 (7)	0.01305* (7)	0.1073 (7)	0.04171* (7)

Significance value: .05\*, .01\*\*, .001\*\*\*

# Why are plover numbers correlated with these variables?

- Intertidal: food availability
- Peninsula/Island: reduced access → reduced disturbance
- Beach: secondary habitat less important; human activity



## Results: Objective III

Does a combination of selected variables explain plover presence ?

We partially know about the habitat, but we do not know enough about other factors that affect its use...

# Conclusions

- Consistent, historical sites: 25 high abundance (30+); 8 medium (15-29); and 19 low (1-14)
- PIPL abundance significantly correlated with intertidal area, total area, peninsula/island
- FL: Beach area negatively correlated with PIPL abundance

# Management Implications: Census

- Stratified sampling important for census efforts
- Planned census efforts in inaccessible areas important
- Accuracy of International PIPL census



# Management Implications: Habitat Alteration

- At some locations, spatial and/or temporal protection of known wintering sites may be warranted.



# Research Needs

- Why are certain sites abandoned?
- Are overwinter survival and return rates different at different sites?
- Is survival and return influenced by winter ecology?
- How much have current site records been influenced by timing (e.g. tides) of counts?

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