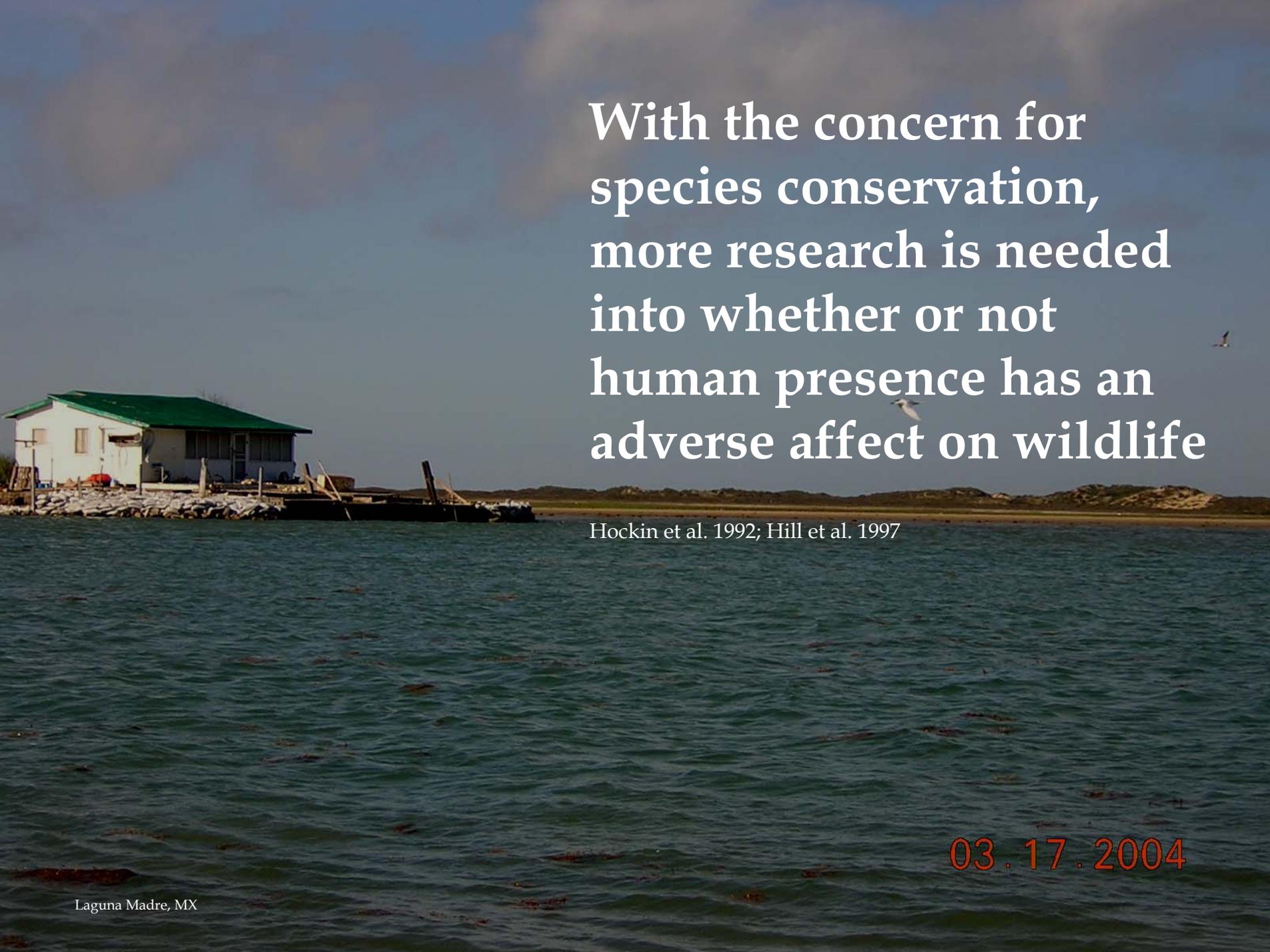


Using proxies of anthropogenic disturbance to estimate the distribution of wintering Piping Plovers

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With the concern for
species conservation,
more research is needed
into whether or not
human presence has an
adverse affect on wildlife

Hockin et al. 1992; Hill et al. 1997

03.17.2004

Threats to wintering plovers

- 55-60% of Americans in 722 counties adjacent to the U.S. coasts; some 100 million beach tourists Hinrichsen 1998
- By 2025, nearly 75% of Americans are expected to live in coastal counties Hinrichsen 1998



How disturbance affects PIPL



Marco Island, FL

- Recreational activity higher at non-plover sites than plover sites
Nicholls, J.L. and G.A. Baldassarre. 1990
- Human disturbance appears to limit local piping plover abundance; vehicle use displaces PIPL from preferential habitat
Zonick and Ryan 1995
- Beach length and beach vehicular density strongly influence PIPL abundance
Zonick and Ryan 1995; Zonick 2000
- PIPL seldom use tidal flats adjacent to developed areas (5/1371)
Drake et al. 2001

Disturbance
reduces time spent
foraging and
increases energy
expenditure

Burger 1991; Zonick and Ryan 1995



Objectives

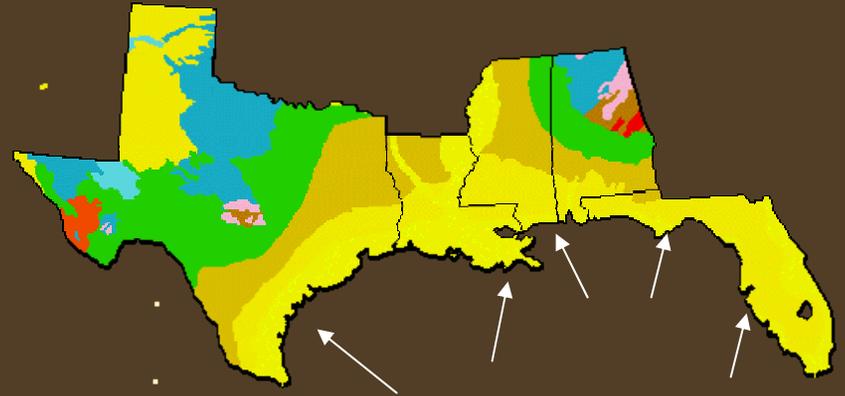
- Investigate relationship between plover abundance and 4 selected anthropogenic variables
- Create linear model of plover macro-habitat to predict plover distribution along the Gulf Coast

Questions

- Is there a relationship between plover abundance and selected human-related 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



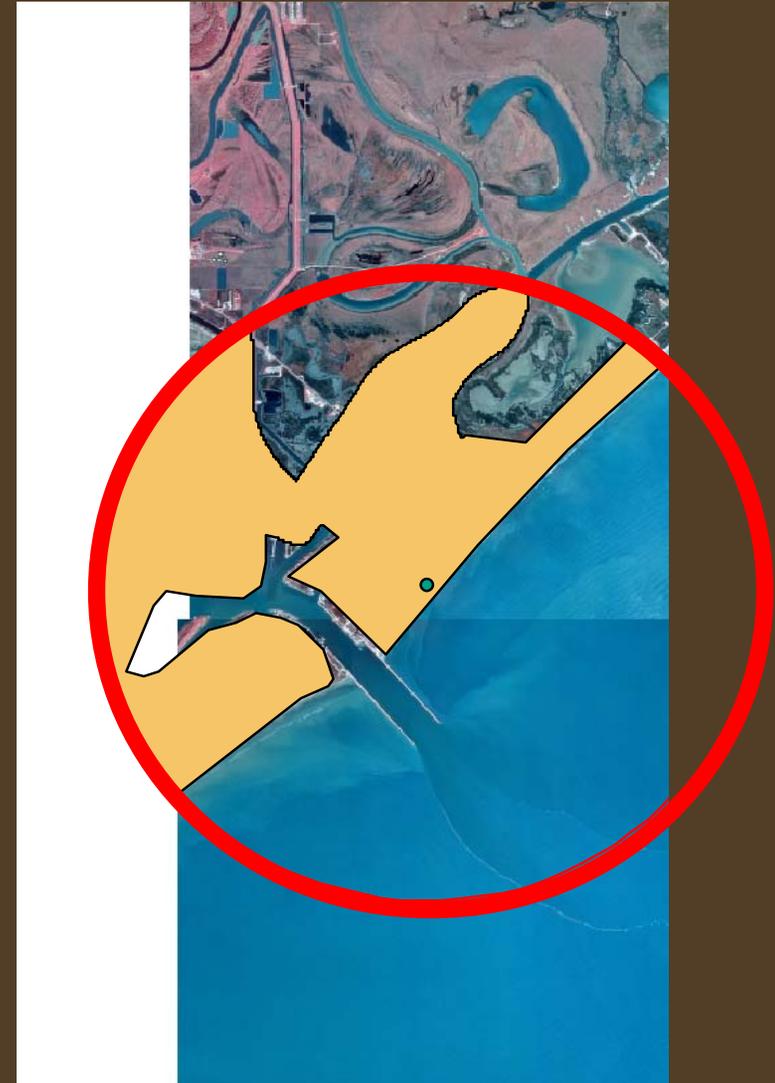
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GIS Sources

- Digital Orthographic Quarter Quads (DOQQs)
- TIGER, Texas Natural Resources Information System, ATLAS, LABINS, TX Parks and Wildlife Division, LA Oil Spill Coordinator's Office, TX General Land Office, TX Department of Transportation

Methods I

- 4 anthropogenic variables (**urban area**, **primary roads**, **beach access points**, **marinas/ boat launches**) were incorporated into the analysis
- **Area** (urban), **Length** (roads), and **Number** (beach access points, marinas, and boat launches) were calculated for each location.



Results I: Is there a relationship between plover abundance and selected human-related variables?

REGION	URBAN AREA	ACCESS POINTS	ROADS	BOAT LAUNCHES
GULF COAST (GC) (31/32)	0.01113* (29)	0.1109 (20)	0.04854* (29)	0.1015 (20)
WESTERN GC (23/24)	0.04131* (20)	0.1109 (20)	0.06269 (20) .	0.1015 (20)
FLORIDA GC (8/8)	0.2657 (7)	NA	0.01976* (7)	NA

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

Why are plover numbers correlated with these variables?

- Urban: human activity; fewer alternative food sources; increased predation
- Roads: human activity; access to sites



Does a combination
of selected variables
explain plover
presence at wintering
sites?



What we learned from Part I...

- PIPL abundance significantly correlated with intertidal area, total area, peninsula/island

Methods II: Development of model to predict habitat use

- Used significant variables from Part I
- Tested interactions among and between variables
- Constructed models using multi-factor linear regression

Results II: Does a combination of selected variables explain plover presence at wintering sites?

Model:

$\{\text{sqrt}(\text{pipl}) \sim \text{intertidal_flat} + \text{urban} + \text{peninsula}\}$

- **Gulf Coast:**

Adjusted R-squared: 0.4621; 3 and 27 DF; p-value: 0.0001763***

- **Western Gulf Coast:**

Adjusted R-squared: 0.4694; 3 and 18 DF, p-value: 0.002253 **

- **Florida:**

Adjusted R-squared: 0.6594; 3 and 5 DF, p-value: 0.0392*

Conclusions

- 2/4 anthropogenic variables (e.g. urban, roads) significantly correlated with plover abundance
- Combination of 3 variables (intertidal area, urban area, and peninsula/island) explain almost 50% of variability in plover abundance

Plover abundance is strongly associated with physical shoreline features + human infrastructure

Conservation Implications



- Mixed-models needed to understand habitat use
- Spatial or temporal management may be advised for urban areas
- Protect roosting/feeding habitat at sites with moderate-high human activity

Future research

- How much isolation/distance required to influence presence/absence of plovers ?
- What landscape scale is relevant for studying plover habitat use?

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