Bar Morphology and Relationship to Shoreline Change on a Renourished Beach: Harrison County, Mississippi

By

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Introduction

- Nearshore bars are abundant on Mississippi Coast

- Multiple types

- Consistent through time; variable through space

- Bar patterns change at distinct locations

- Relationship to Erosion and Hot Spots ????

- Help map Sediment transport regime (future)

Multiple Longshore bars at Biloxi Lighthouse

Harrison County Beach

- Renourished Beach
  - 1953, 1964, 1973, 1988, 2001
- Shoreline Change
  - Average of 1 m/yr since 1993
- 'Hot Spots'
  - Smaller segments with double to triple the average shoreline retreat (2-3 m/yr)
  - Expensive to maintain and often causes for subsequent renourishment
  - Causes are still unresolved
- Gulfport to Henderson point – study area
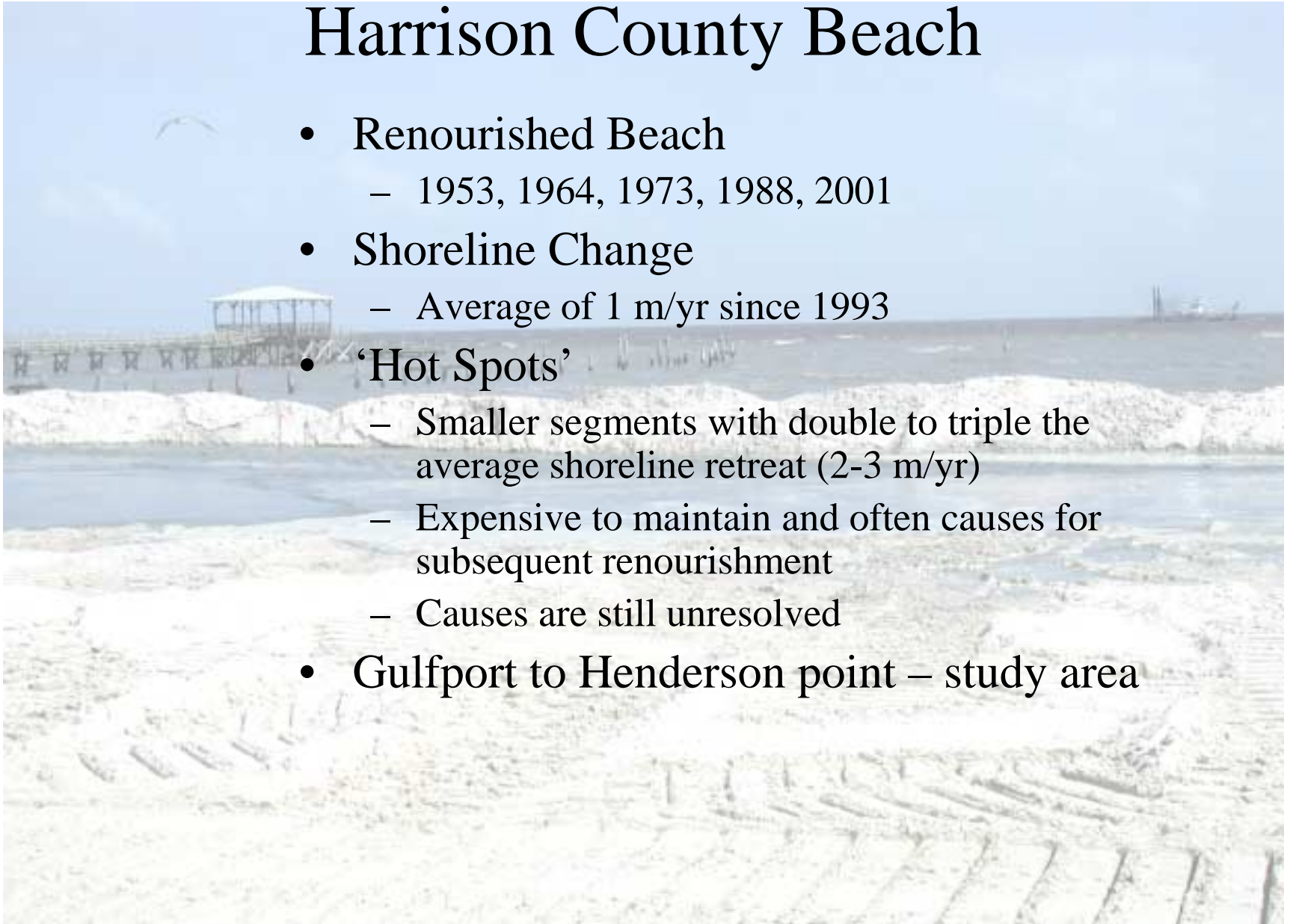
Previous Studies
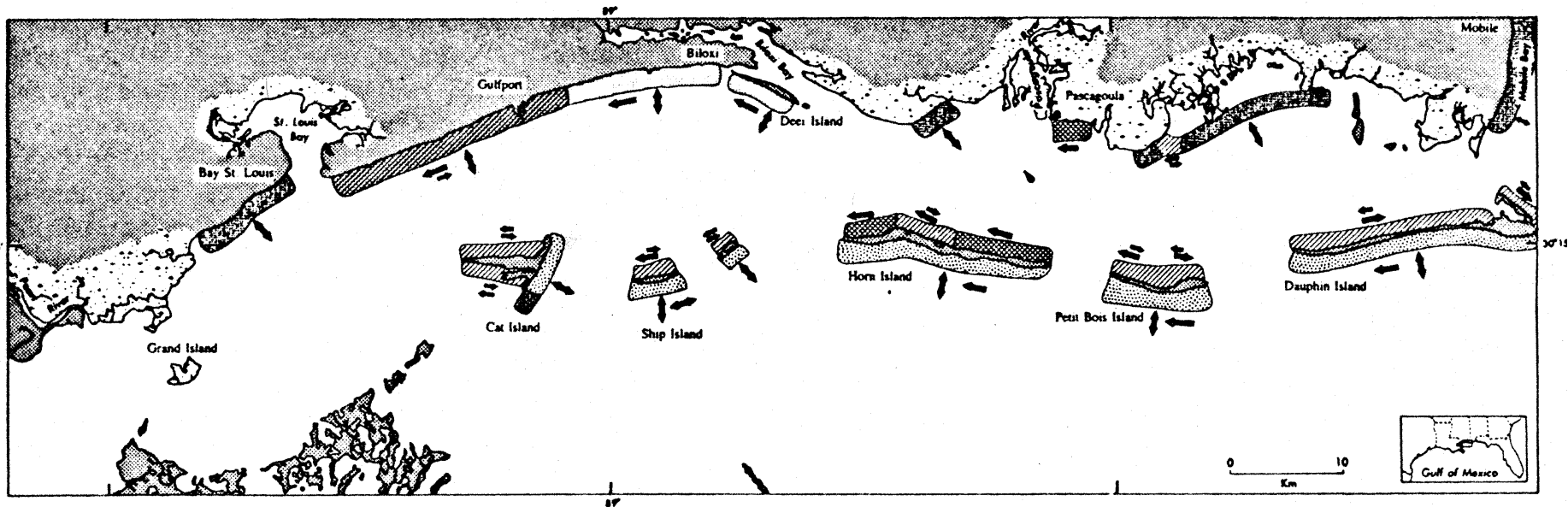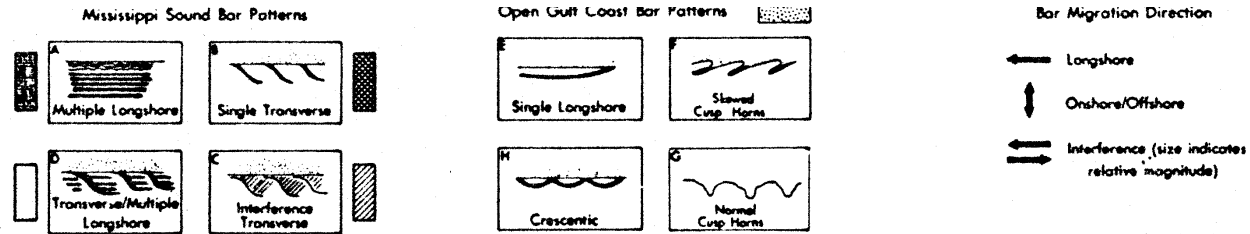
Taken from Nummedal et al., 1980 (GCAGS)

Methods

- GPS Shorelines
  - Performed yearly, provide shoreline change values and locations

- Profiles
  - Performed yearly, provide sediment transport directions, bar spacing and wave heights

- Aerial Photographs
  - Geo Rectified to identify patterns and locations
  - 1977, 1991, 1997
  - Classification + (Error Checking)[3]

- GIS
  - Compare and contrast spatial character of variables
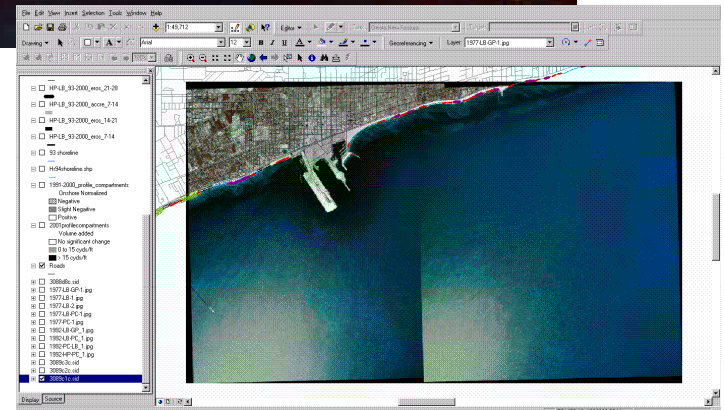
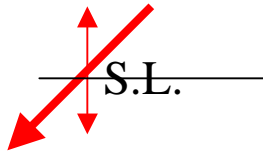# Bar Morphologies

Type ST – Single Transverse

S.L.

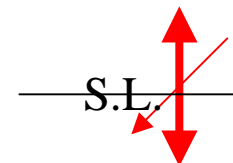Type ML – Multiple Longshore

S.L.

Bar Morphologies II

Type TML – Transverse Multiple Longshore
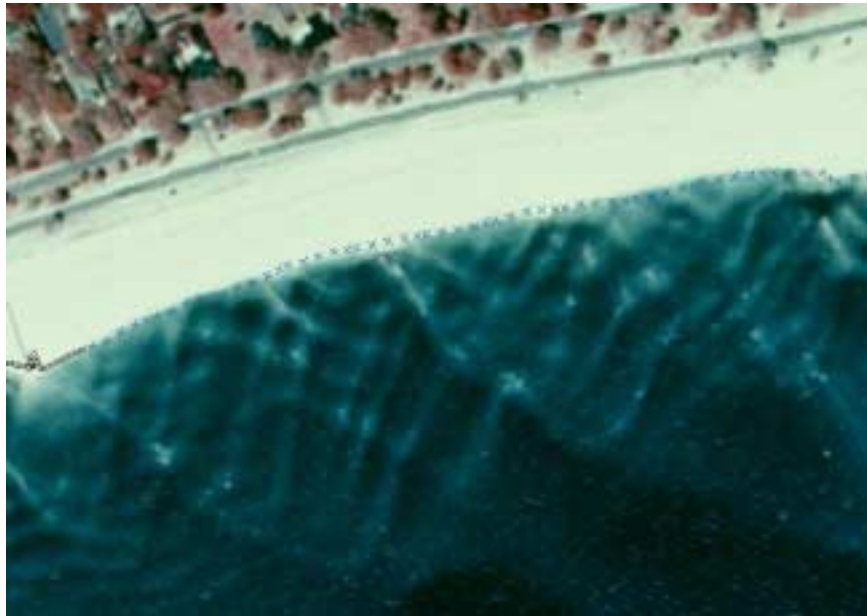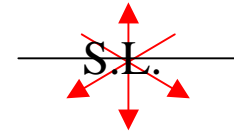

Type 1

Type 2

S.L.

S.L.

Bar Morphologies III

Type IT –Interference Transverse

S.L.

Type MIT – Multiple Interference Transverse

S.L.

1997 Results – Bars

Baseline

Type	Meters	Percent
IT	2450	13%
MIT	3500	18%
ST	1950	10%
TML	8600	45%
WEAK	1200	6%
ML	1500	8%
Total	19200	100%

Raw Data

LENGTH	ANGLE	ID	B97_D	B97_M	B97TY	B91_D	B91_M	B91TY	B77_D	B77_M	B77TY	CHNG_1
50	180	18	2	1	TML	1	0	ST	1	0	ST	Dif
50	181	19	2	1	TML	1	0	ST	1	0	ST	Dif
50	178	20	2	1	TML	1	0	ST	1	0	ST	Dif

Results – GPS Shorelines
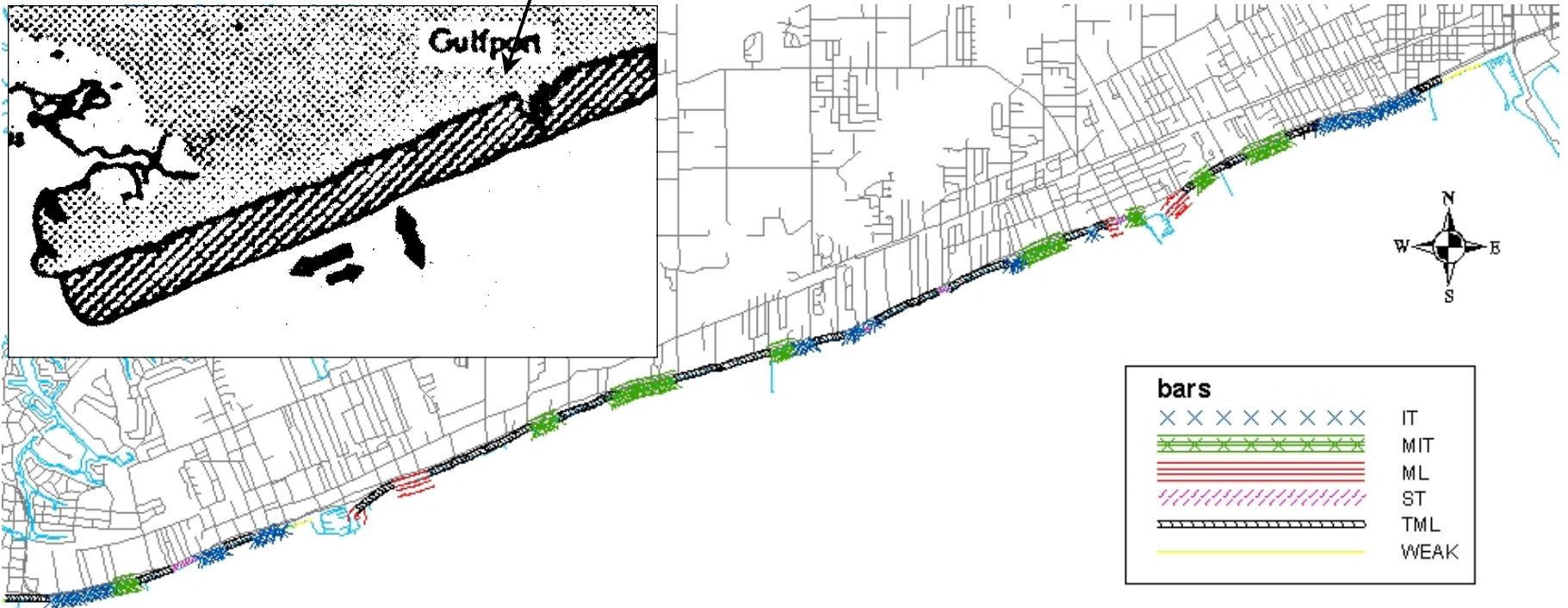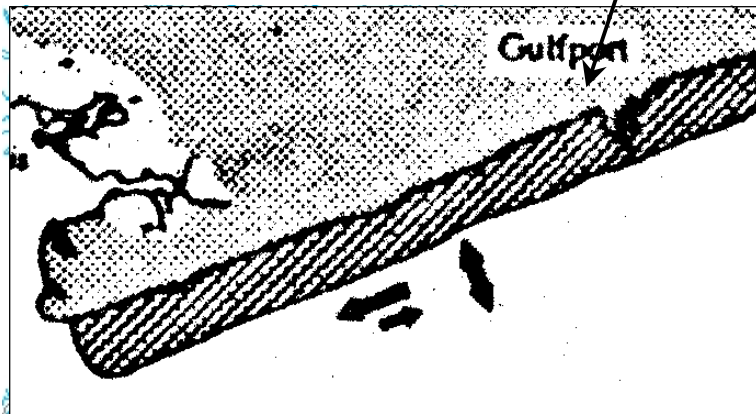
1986_NOAA	
Roads	
Bars_7-14_eros	
Bars_14-28_eros	
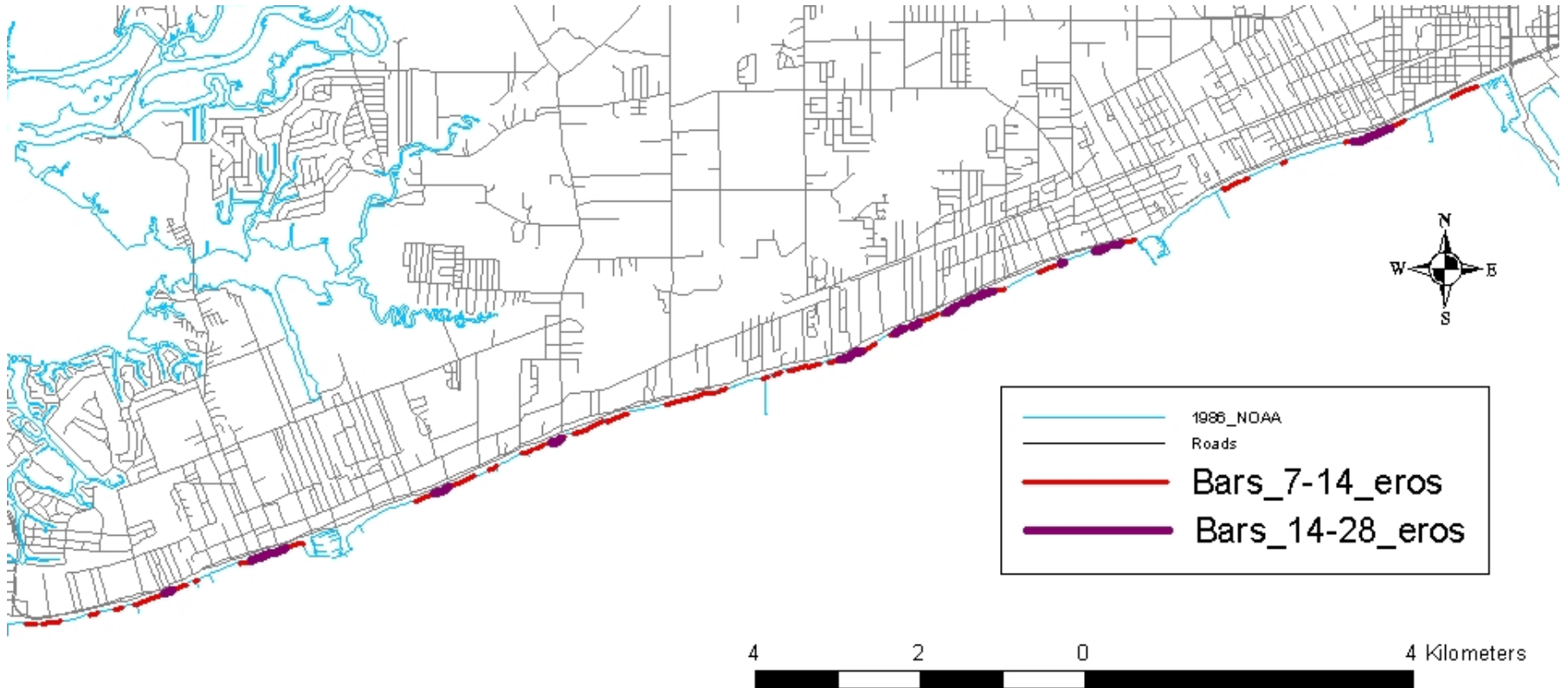
Measured Erosion Segments		
Level	Meters	% of total
1-2 m/yr	4560	23.1%
> 2 m/yr	1354	6.9%
Total	5914	30.0%

Values used in analysis

50 m Segments		
Level	Meters	% of total
1-2 m/yr	8700	44.2%
> 2 m/yr	3400	17.3%

Results - Profiles

Out of phase with volume change trend

Terminal groin

Bars and Profiles

- ## HR-14
  - TML
  - Longshore dominant
  - No nearshore enhancement

- ## HR-13
  - TML
  - Cross-shore dominant
  - Measurable nearshore enhancement
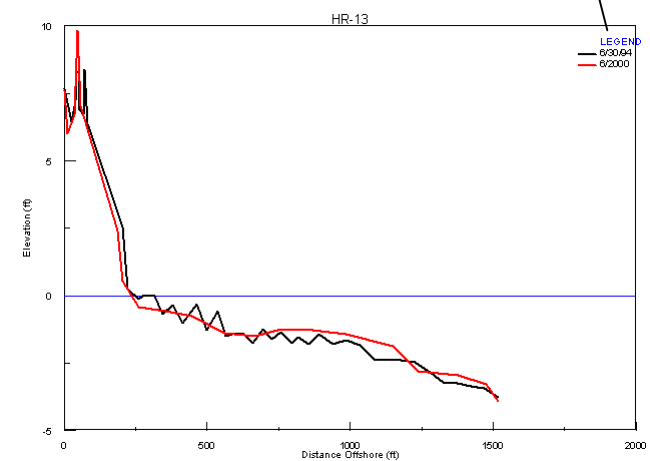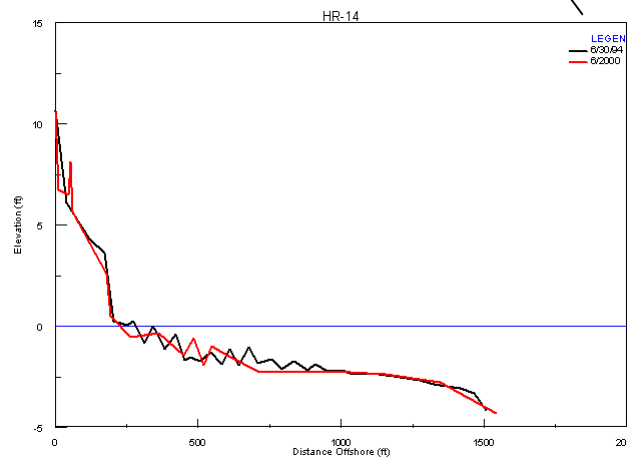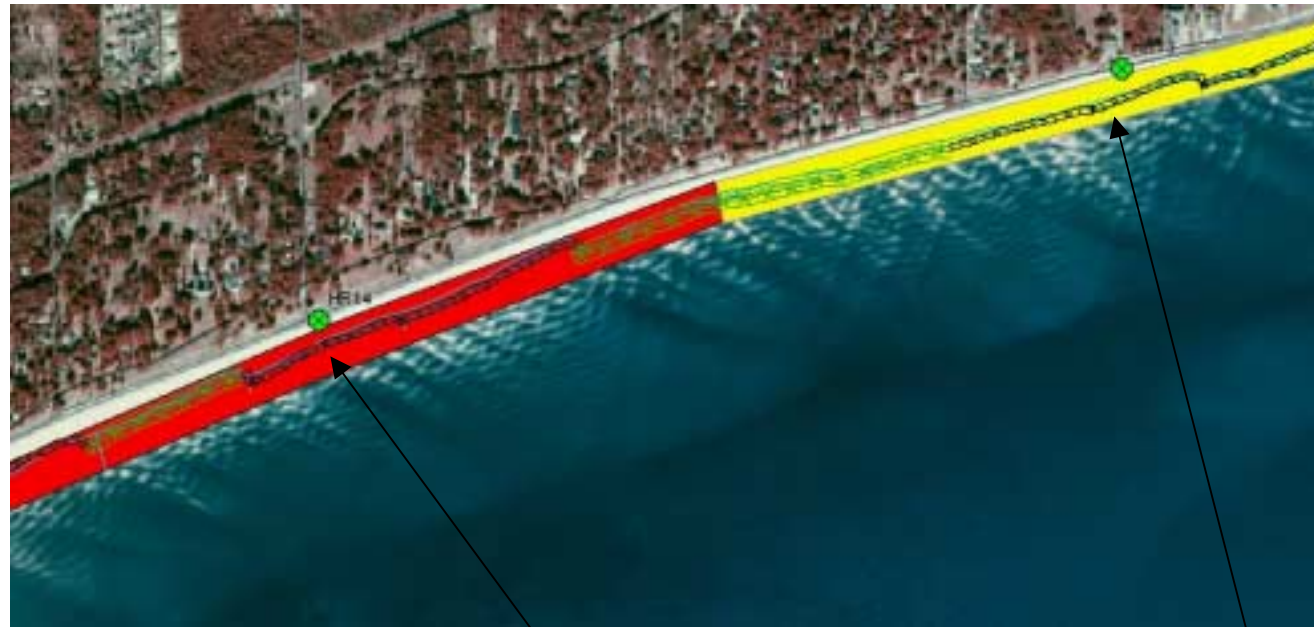
Bars and Shoreline Change

Eroding

Type	Meters	Percent	Difference from Baseline
IT	2250	23%	+ 10%
MIT	1350	14%	- 4%
ST	650	7%	- 3%
TML	4750	48%	+ 3%
WEAK	700	7%	+1 %
ML	250	3%	- 5%
Total	9950	100%	

No Change

Type	meters	Percent	Difference from Baseline
IT	1250	19%	+ 6%
MIT	1600	25%	+ 7%
ST	50	1%	- 9%
TML	3050	47%	+ 2%
WEAK	300	5%	- 1%
ML	200	3%	- 5%
Total	6450	100%	

Accretion

Type	Meters	Percent	Difference from Baseline
IT	400	13%	0%
MIT	300	10%	**- 8%**
ST	150	5%	- 5%
TML	1550	49%	+ 4%
WEAK	100	3%	- 3%
ML	650	21%	**+ 13%**
Total	3150	100%	

- IT favors erosion
- ML favors accretion
- MIT favors no change
- ST occurs at transitions

Bars and Hot Spots

- Hot Spots – Greater than 2 m/yr retreat
  - 17% of the shoreline
  - Interference Transverse (IT) bar pattern is dominant
  - Interaction with shoreline structures (culverts)

Type	Percent Difference higher than baseline
IT	30%
ST	-3%
ML	-5%
TML	-2%
WEAK	-2%
MIT	-18%

Conclusions

- **Bar Morphology**
  - **Changes spatially**
  - **No significant temporal changes**
- **Transverse Multiple Longshore (TML) Dominant**
  - **45% of shoreline**
  - **50% of eroding shoreline**
- **Interference Transverse (IT)**
  - **Dominant on eroding shoreline**
  - **43% of highly eroding shoreline**
- **Multiple Longshore (ML)**
  - **Dominant on accreting shoreline**

Future Work

- Focus on bar change locations
- Sediment transport cells
- Relationship with shoreline angle
- Role of shoreline structures
- Bar evolution where occuring