Deer Island Evolution and Morphology

Steve Sloan, Keil Schmid
Coastal Section
Mississippi Office of Geology
August 2002

Introduction

- Recently acquired by the State of Mississippi
- Incorporated into the Mississippi Coastal Preserves Program
- Located just offshore of the entrance to Biloxi Bay
- Remnant portion of the mainland
- Shoreline erosion dominant on eastern end, slight accretion on western end, overall loss of about 2.4 acres per year

Methods

- Field survey of shoreline morphology
- Shoreline change monitored by GPS surveys
- Buffers used to determine advance and retreat of the shoreline
- Long and short term erosion rates used to extrapolate possible future shoreline changes

Morphology Determining Factors

- Shoreline and adjacent morphology divided into 6 types based on 8 existing morphological components
- 1. Beach: sub-classified as wide or narrow
- 2. Remnant geology
- 3. Relict features: trees, stumps, etc.
- 4. Wooded: sub-classified as mixed or pine
- 5. Grass: dune and marsh types
- 6. Scarps: sub-classified as large or small
- 7. Marsh platform: sub-classified as large or small and further distinguished as angled, terraced, or steep
- 8. Spit

Type 1: Spit

- Narrow land formation that is tied to the coast at one end. It is formed by the longshore movement of sediments.

Type 2: Marsh, Marsh Platform

- Feature characterized by fine grained organic-rich soils and dominated by marsh grass. It is subdivided into angled, terraced, and steep.

Type 3: Marsh or Marsh Platform with Beach

- Same as previous, but is fronted by a small or narrow sandy beach.

Type 4: Beach

- Sandy sediments that accumulate along the shore, typically associated with dune grasses. Sub-classified as wide or narrow.

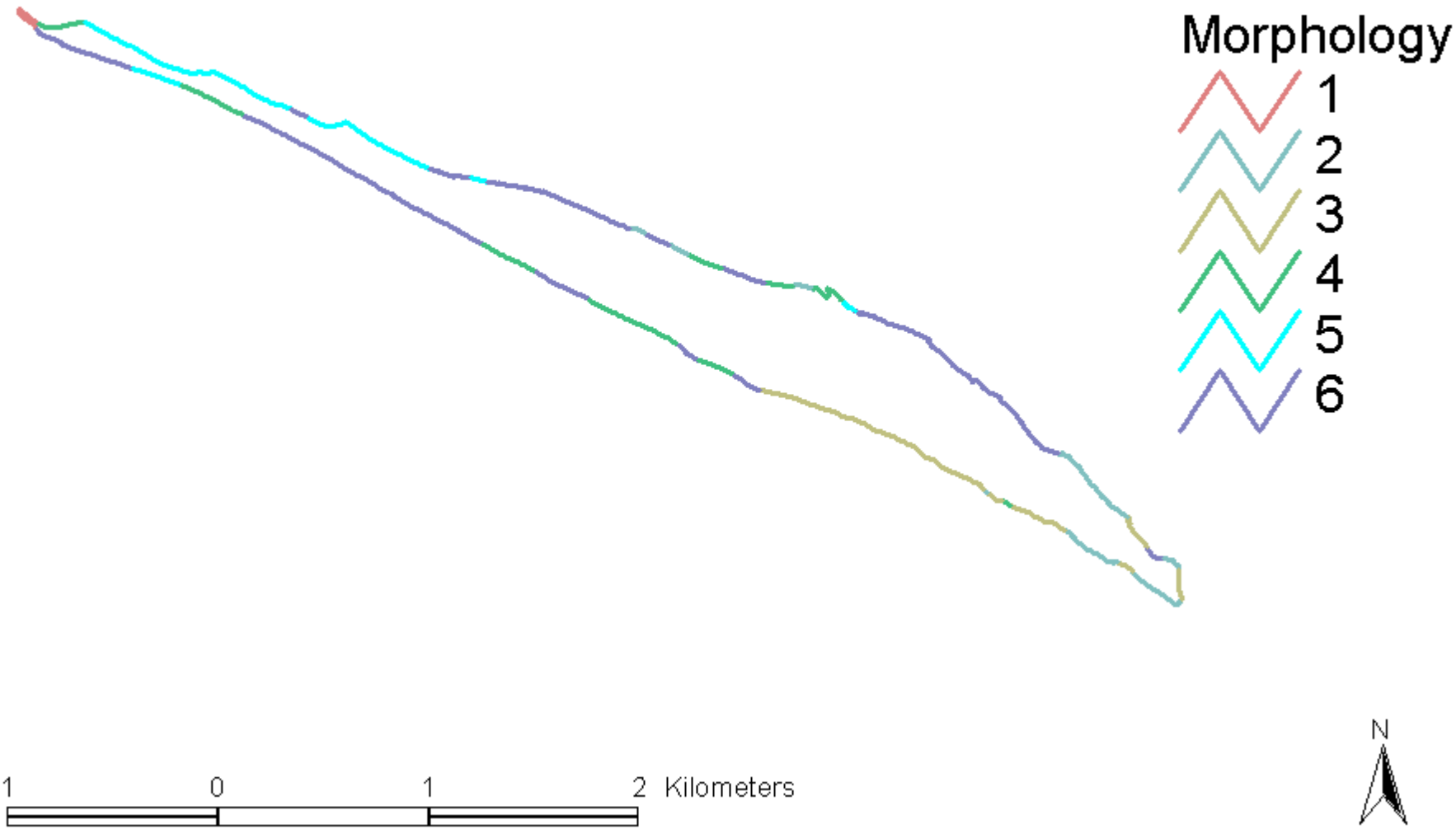
Type 5: Wooded Beach

- Sandy beach that is backed by a maritime forest composed of either mixed trees or pine trees.

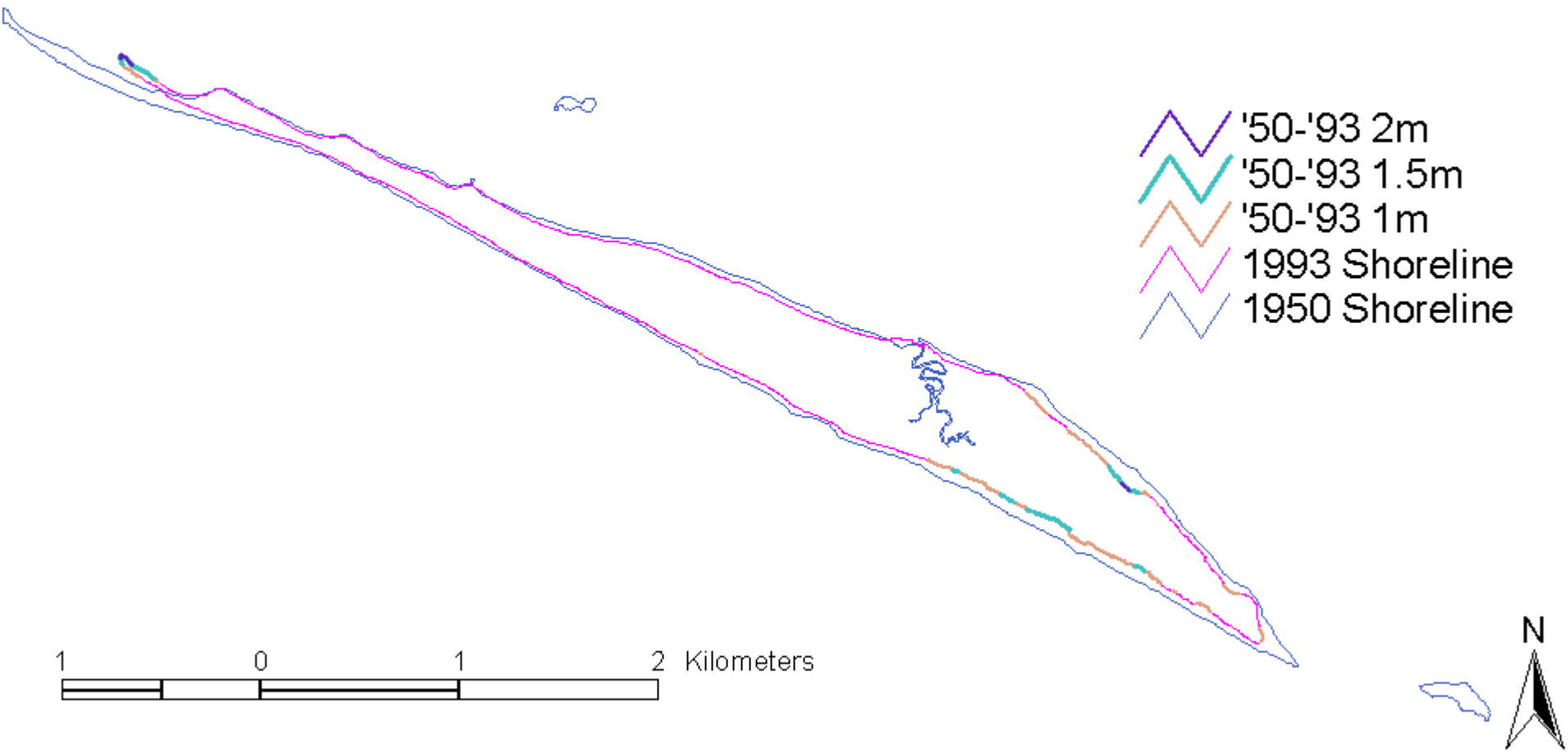
Type 6: Relict Beach

- Sandy beach that contains relict stumps, trees, or other vegetation that have remained after the original shoreline receded.

Deer Island Morphology



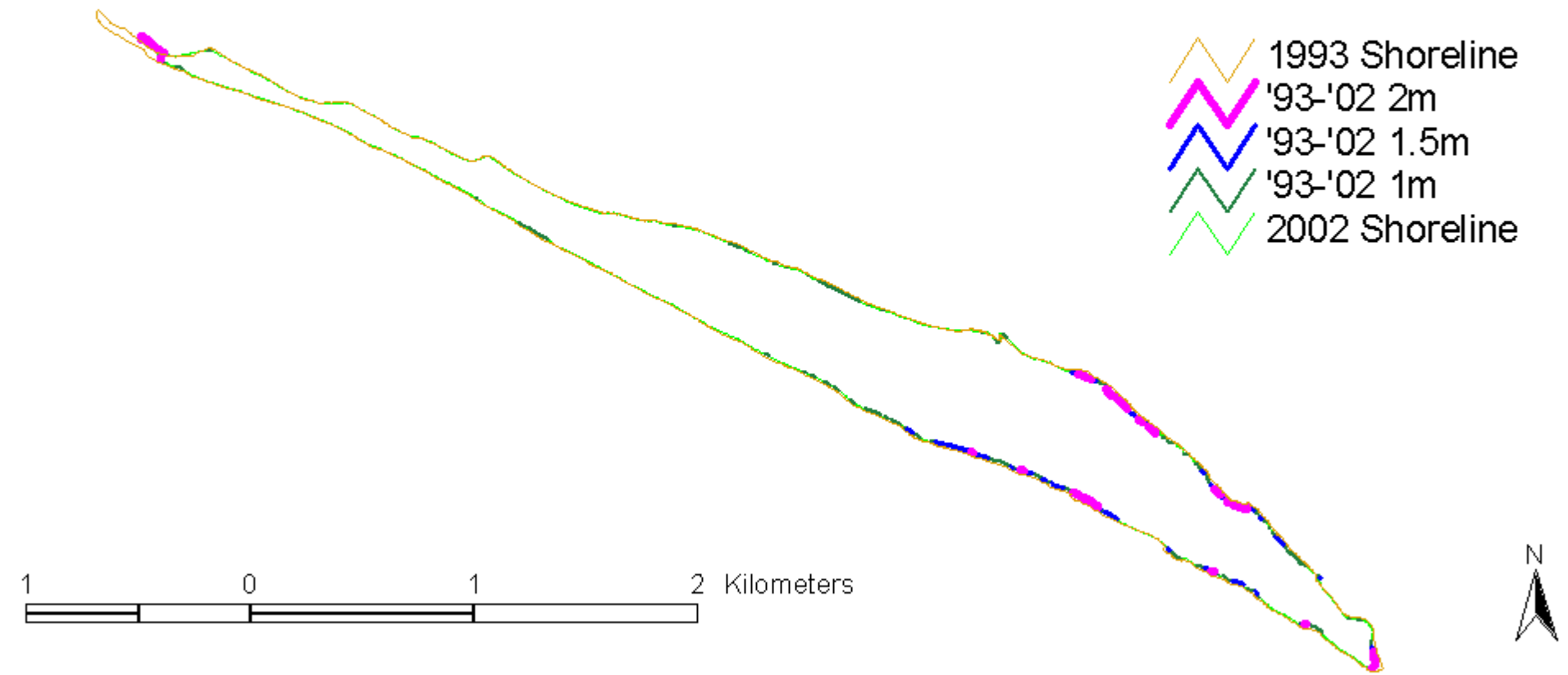
Areas of Erosion and Accretion 1950-1993



Area
1950: 563 acres
1993: 456 acres

Land loss of 107 acres

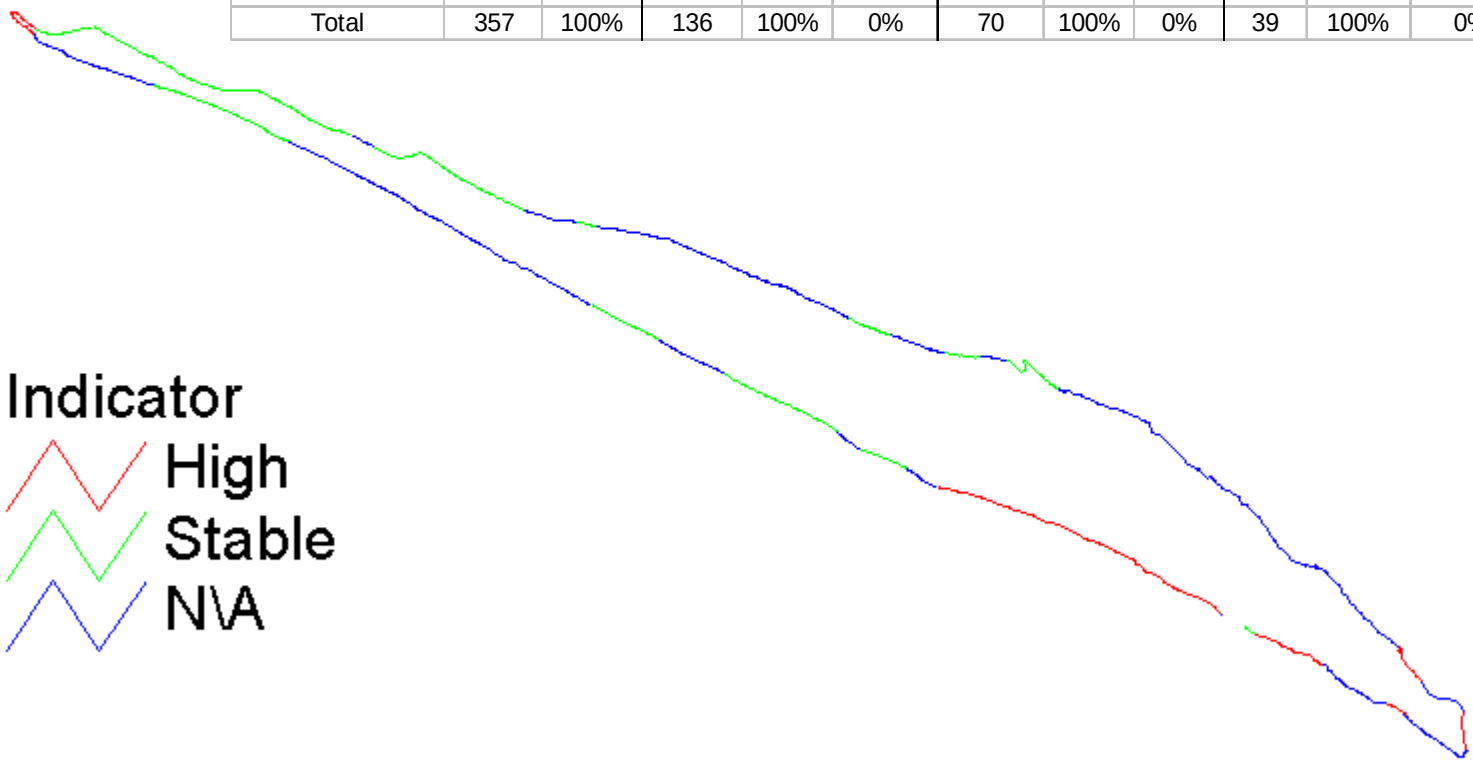
Areas of Erosion & Accretion: 1993-2002



Area
1993: 456 acres
2002: 433 acres Land loss of 23 acres

Erosion Indicators

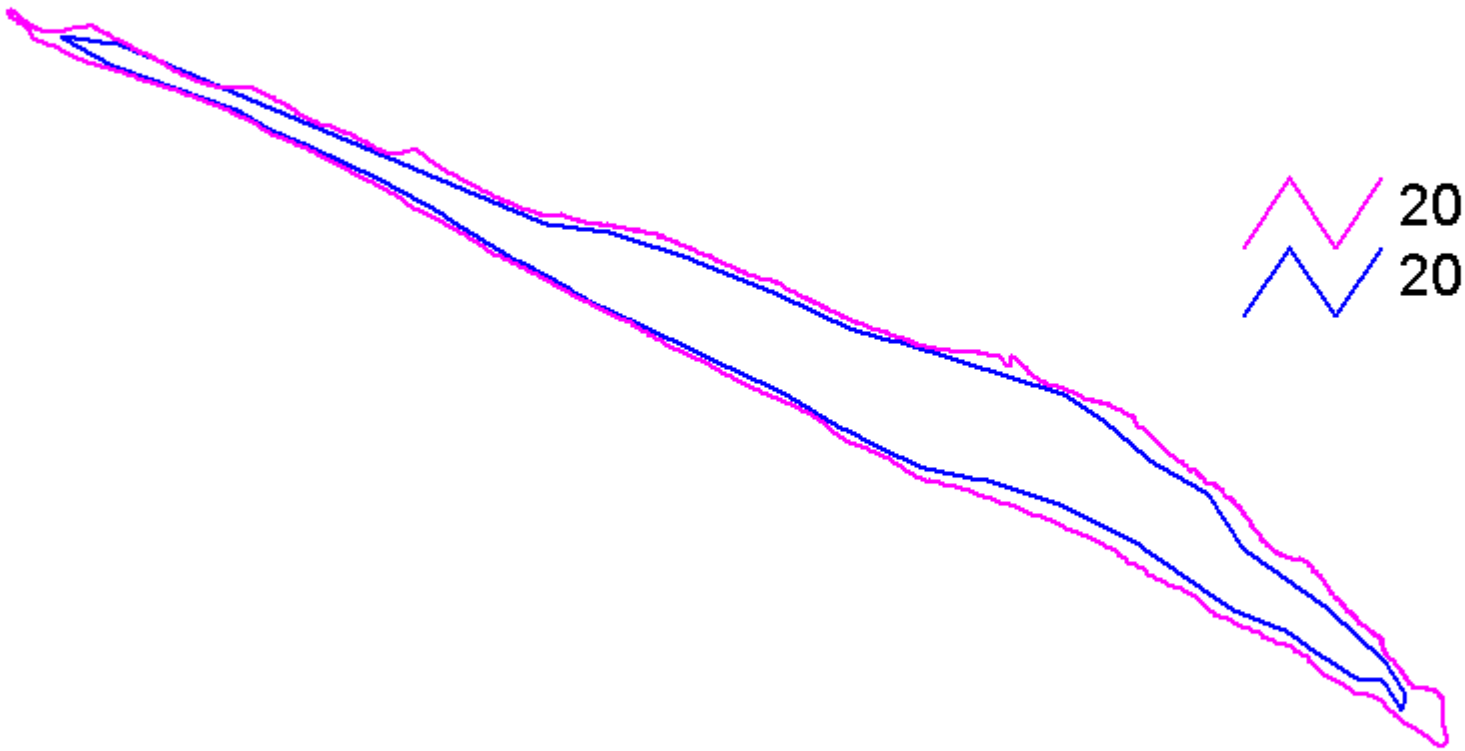
	Population		>1m			>1.5 m			>2m			Indicator
Morphology	N	%	N	%	Diff	N	%	Diff	N	%	Diff	
1	8	2%	1	1%	-2%	5	7%	5%	5	13%	**11%**	High Erosion
2	44	12%	23	17%	5%	11	16%	3%	3	8%	-5%	Not Indicator
3	47	13%	35	26%	**13%**	30	43%	**30%**	15	38%	**25%**	Erosion Dominant
4	61	17%	23	17%	0%	1	1%	**-16%**	1	3%	**-15%**	Stable
5	56	16%	1	1%	**-15%**	0	0%	**-16%**	0	0%	**-16%**	Stable
6	141	39%	53	39%	-1%	23	33%	-7%	15	38%	-1%	Not Indicator
Total	357	100%	136	100%	0%	70	100%	0%	39	100%	0%	



Extrapolated Shorelines

- Shoreline data collected in the past can be used to predict future shoreline changes
- Cross-shore profiles are used to determine erosion rates over two different time frames, one long and one short
- In this case the periods used extended from 1950-1993 (43 yrs.) and 1993-2002 (9 yrs.)
- Both long and short-term erosion rates are averaged and used to extrapolate a predicted shoreline for a specified year in the future

2050 Extrapolated Shoreline



2002 Shoreline
2050 Shoreline

1 0 1 2 Kilometers

N

Conclusions

- Average land loss due to erosion is 2.4 acres per year
- Marsh platform areas with beach and spit morphologies are associated with medium to high erosion
- Beach and wooded beach morphologies are associated with stable shorelines
- The average acreage loss of the 2050 shoreline is very close to the average over the last 52 yrs.
- Future investigations might include determining specific factors that cause certain morphology types to erode faster and correlating sand bar morphologies to island morphology types