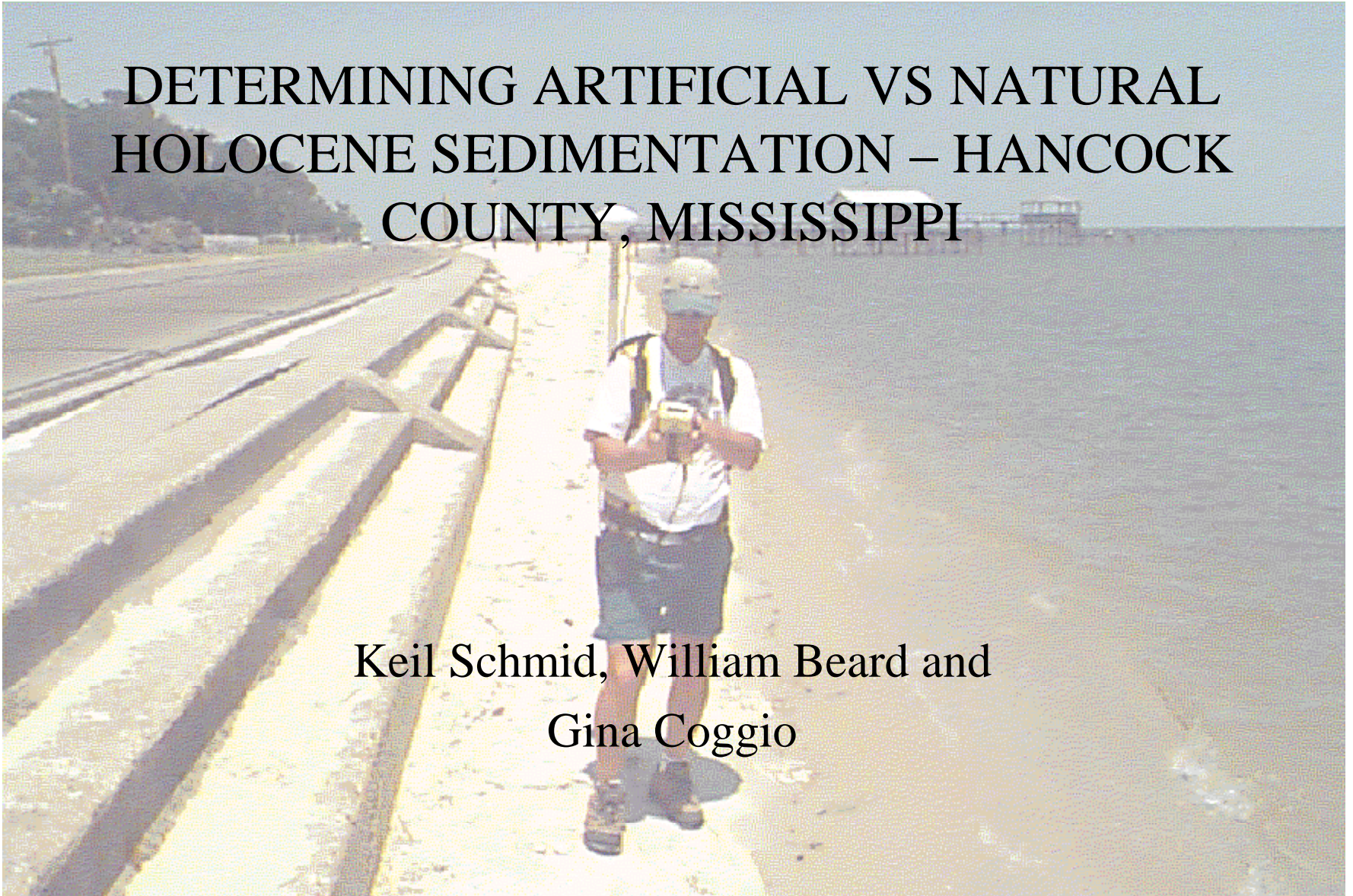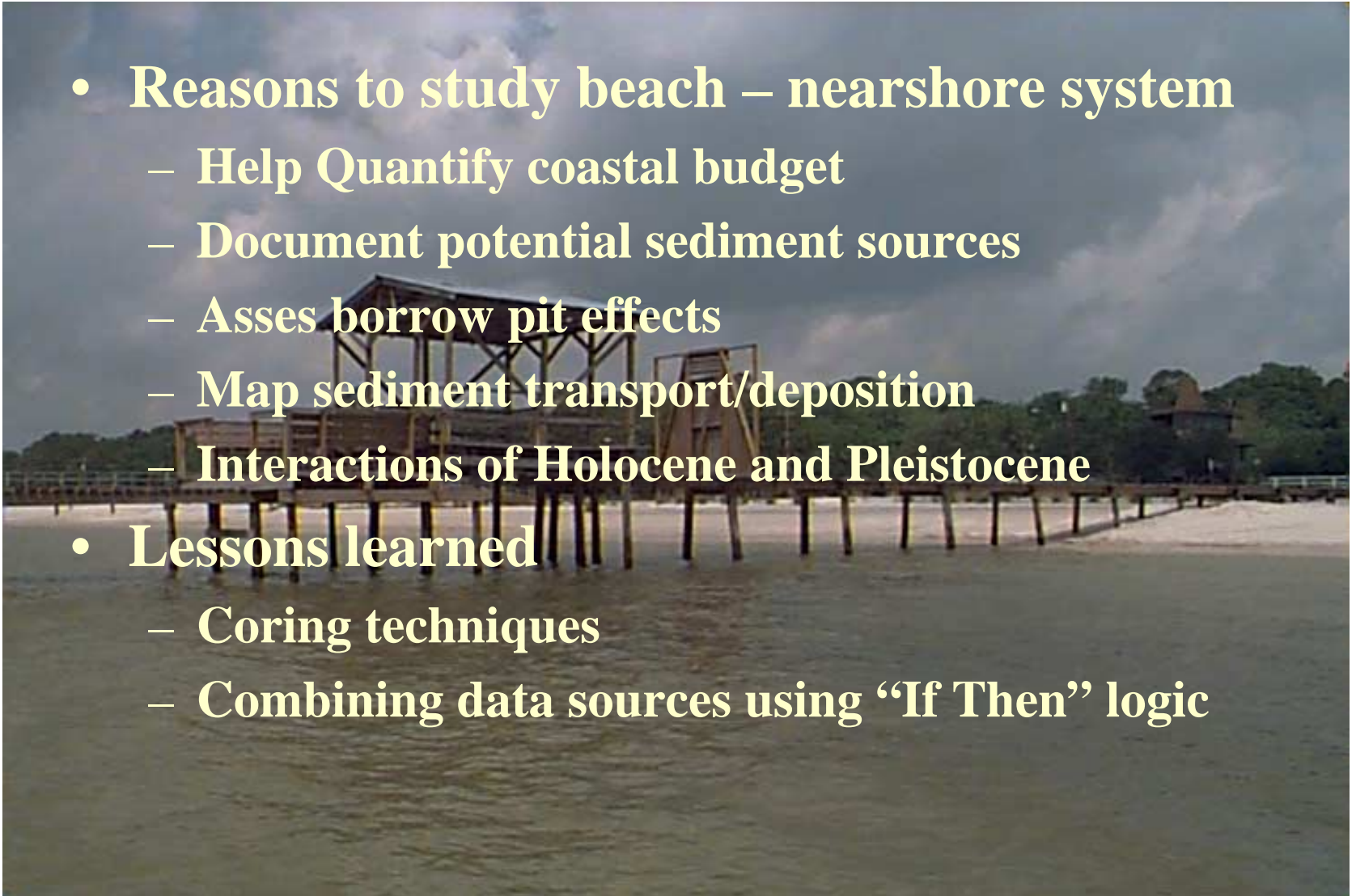# DETERMINING ARTIFICIAL VS NATURAL HOLOCENE SEDIMENTATION – HANCOCK COUNTY, MISSISSIPPI

Keil Schmid, William Beard and

Gina Coggio
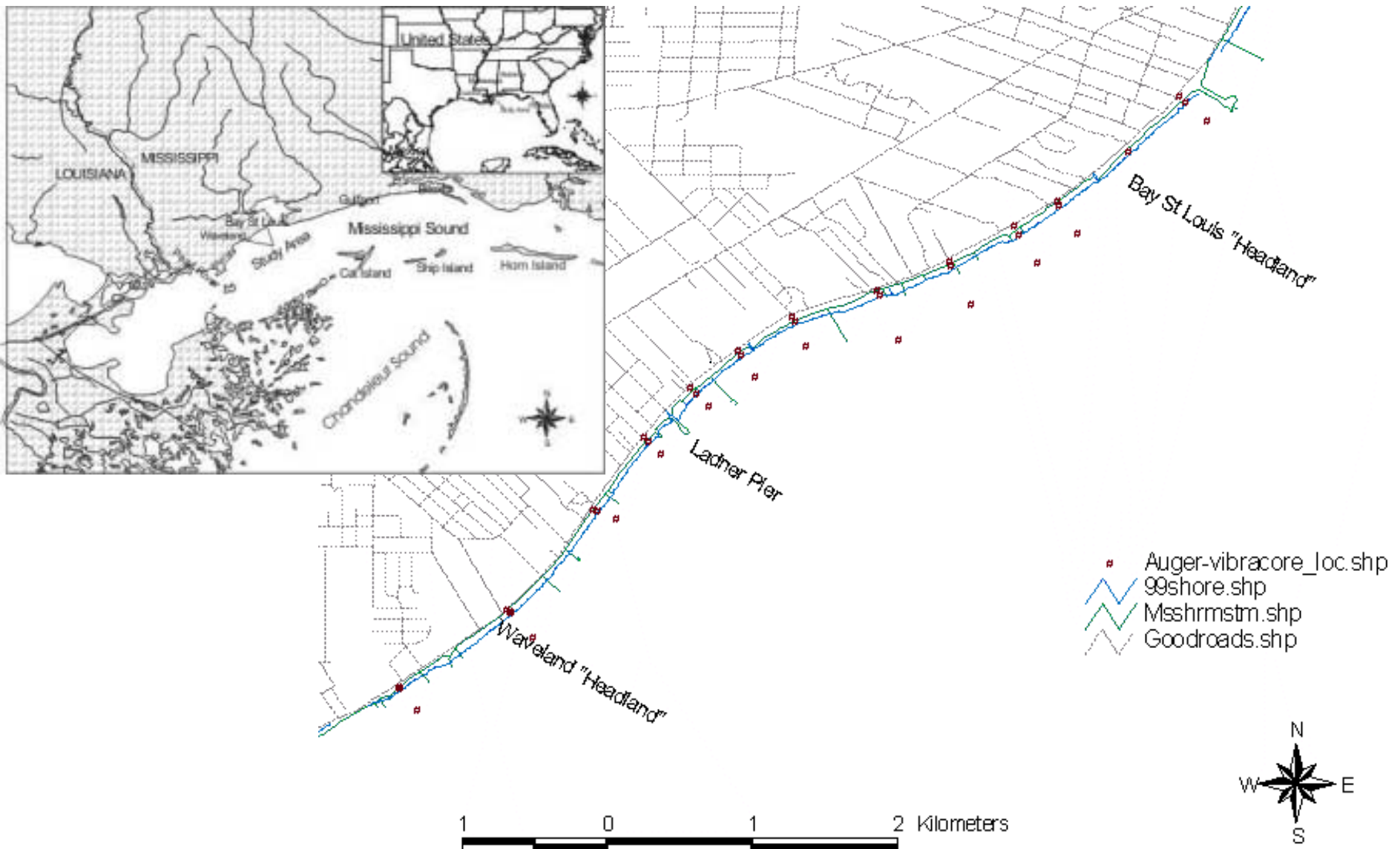
Introduction

- **Reasons to study beach – nearshore system**
  - **Help Quantify coastal budget**
  - **Document potential sediment sources**
  - **Asses borrow pit effects**
  - **Map sediment transport/deposition**
  - **Interactions of Holocene and Pleistocene**
- **Lessons learned**
  - **Coring techniques**
  - **Combining data sources using "If Then" logic**

Hancock County Study Site

Bay St Louis "Headland"

Ladner Pier

Waveland "Headland"

Legend:
- Auger-vibracore_loc.shp
- 99shore.shp
- Msshrmstrn.shp
- Goodroads.shp

Inset map labels: United States, MISSISSIPPI, LOUISIANA, Gulfport, Bay St Louis, Waveland, Study Area, Mississippi Sound, Cat Island, Ship Island, Horn Island, Chandeleur Sound

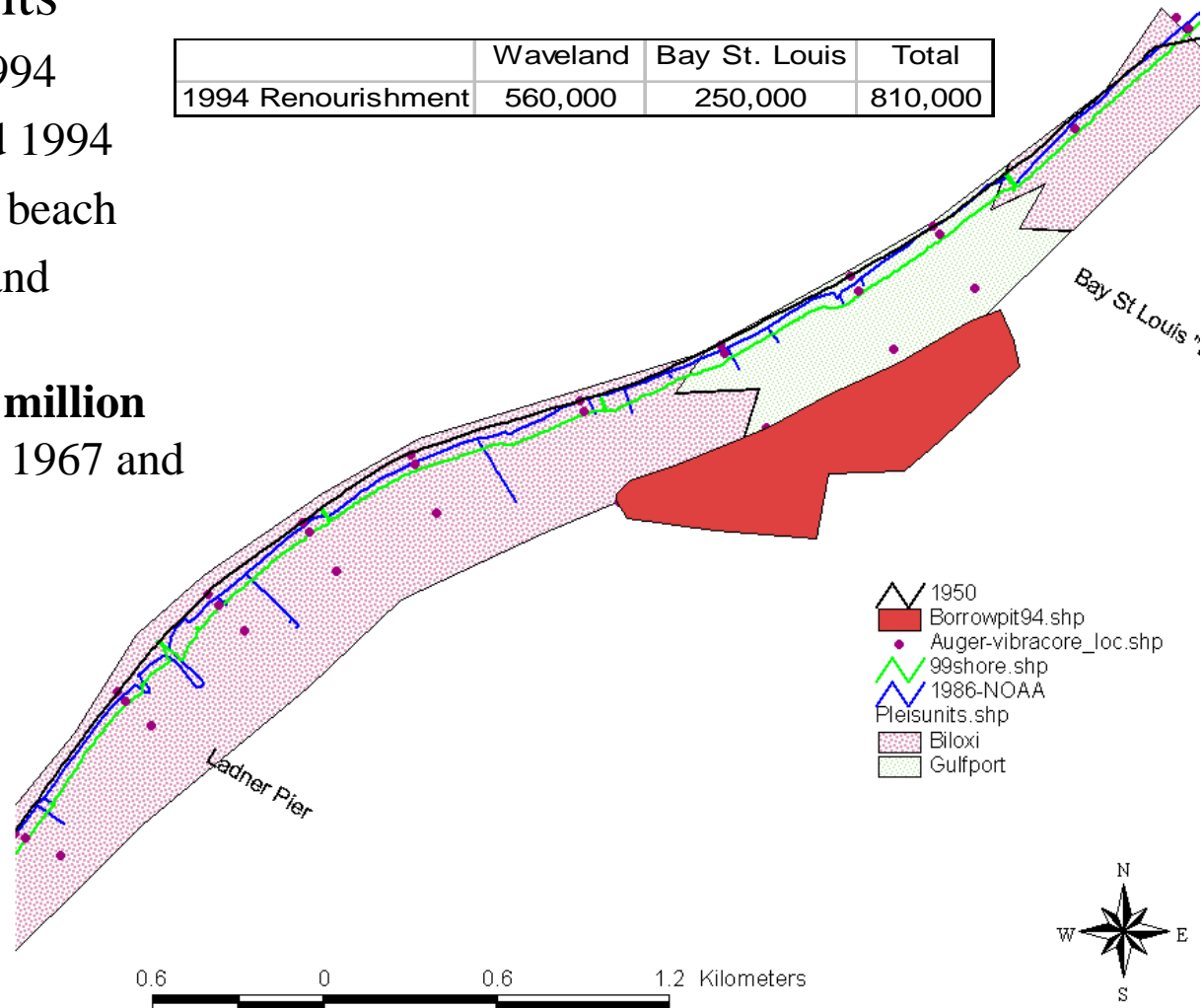1 0 1 2 Kilometers

N
W   E
S

Background/Goals

- ## Several Renourishments
  - 1941, 1967, 1972, and 1994
  - Most important 1967 and 1994
  - Both created 200 ft wide beach
  - 600,000 cyds for Waveland section of 1994 project
  - Potential for roughly **1.6 million** cyds of fill for combined 1967 and 1994 projects

- ## Two Pleistocene units
  - Biloxi
  - Gulfport

	Waveland	Bay St. Louis	Total
1994 Renourishment	560,000	250,000	810,000

Legend:
- 1950
- Borrowpit94.shp
- Auger-vibracore_loc.shp
- 99shore.shp
- 1986-NOAA
- Pleisunits.shp
  - Biloxi
  - Gulfport

0.6   0   0.6   1.2 Kilometers

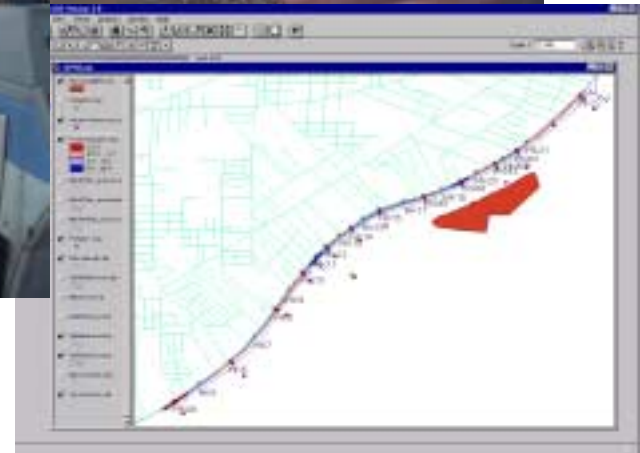# Methods

- Data
  - Profiles
    - total station
  - GPS
    - easily acquired
  - Augers
    - no sedimentary structures
  - Vibracores
    - Costly, most complete
- Analysis
  - Sediments
    - Texture, composition, structures, trace fossils
    - "If then"
  - GIS
    - Interpolation
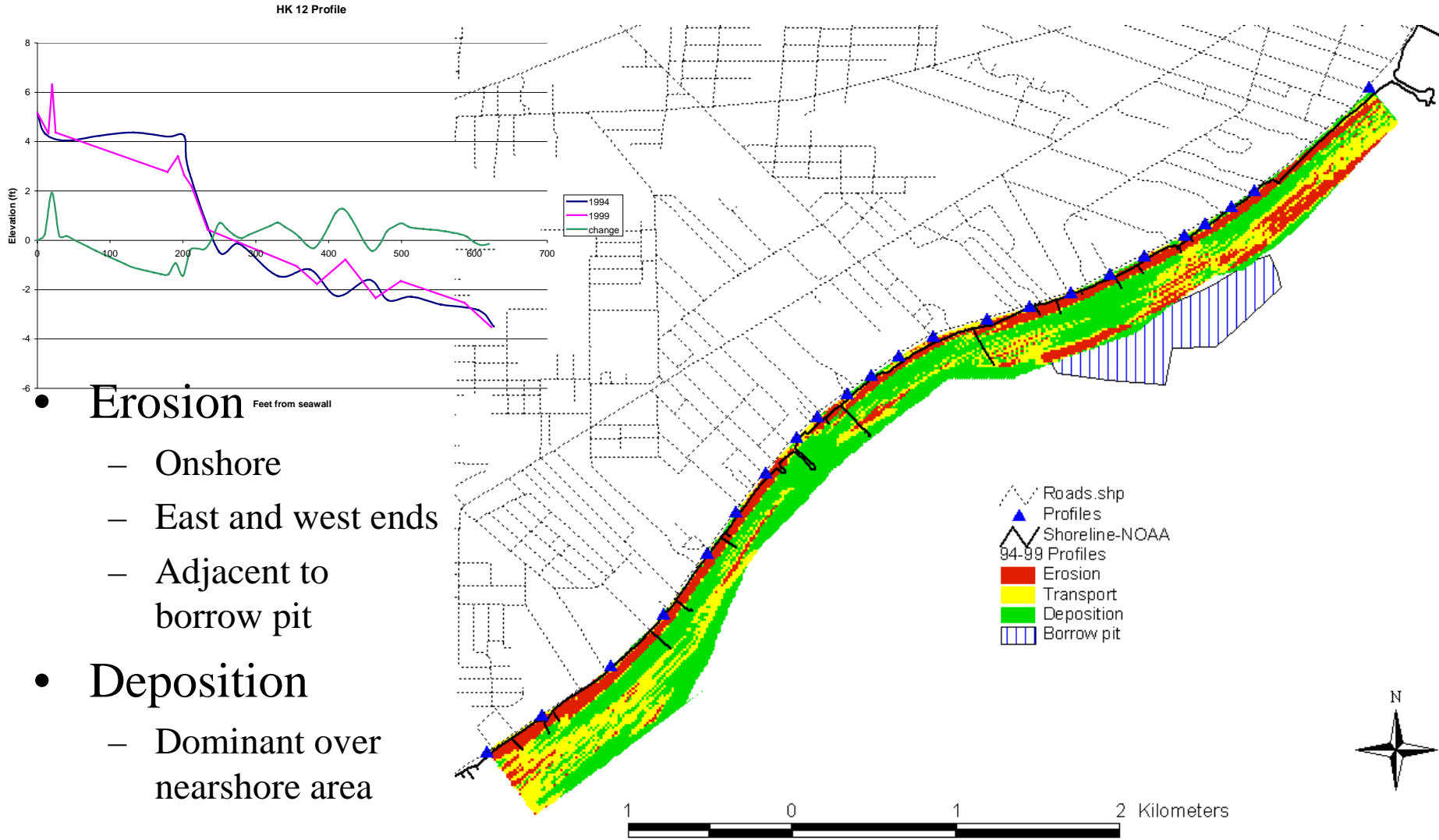   - Trends

Data

- Profile Comparison
  - Total Station
    - 1993
    - 1994
    - 1999
- Onshore Stratigraphy
  - Augers
  - Facies Change
- Nearshore Stratigraphy
  - Vibracores
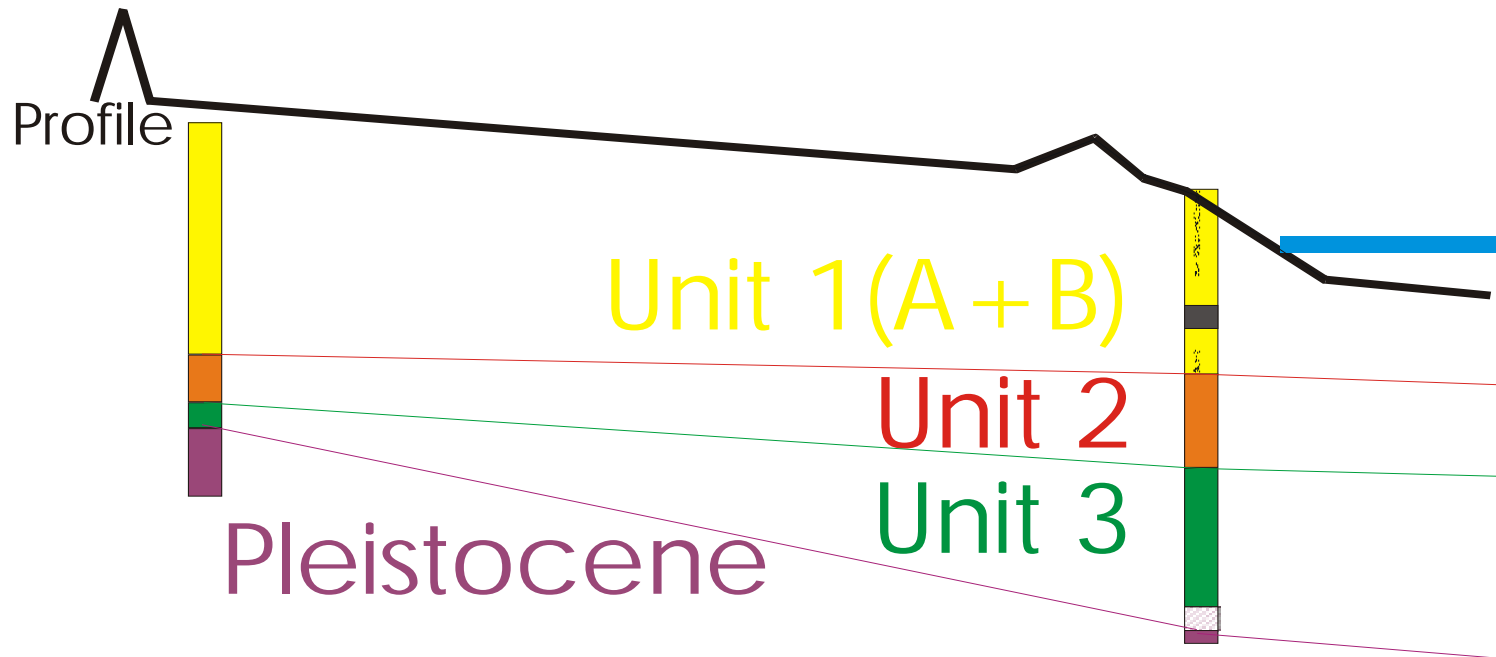 - Same Facies
  - Sedimentation Rates

Profiles

HK 12 Profile

- Erosion
  - Onshore
  - East and west ends
  - Adjacent to borrow pit

- Deposition
  - Dominant over nearshore area

Onshore Units

- Unit 1 = Fill
- Unit 2 = Holo/Fill
- Unit 3 = Holo

Unit	n	Mean	Sorting (std dev)	Mud%
1A	3	2.01	0.58	0.08
1B	3	2.11	0.60	0.30
2	4	2.48	1.05	5.76
3	3	3.20	1.79	21.36

Profile

Unit 1(A+B)

Unit 2

Unit 3

Pleistocene

Nearshore

- A1 = Fill
- A2 = ?? – Big Question
- A3 = Holocene

Type	n	Mean	Sorting	Mud%
A1	4	2.88	0.90	10.79
A1(TYP)*	3	2.60	0.65	1.66
A2	3	2.72	0.96	5.76
A3	3	3.11	1.25	14.37

Unit A1

Unit A2

Unit A3

A1

A2

A3

Pleistocene

Pleistocene
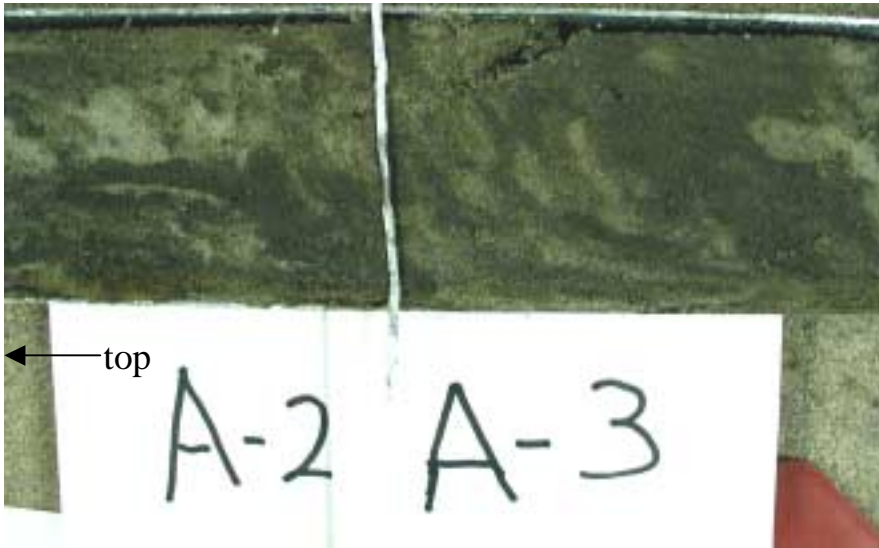
Nearshore Contacts

top→

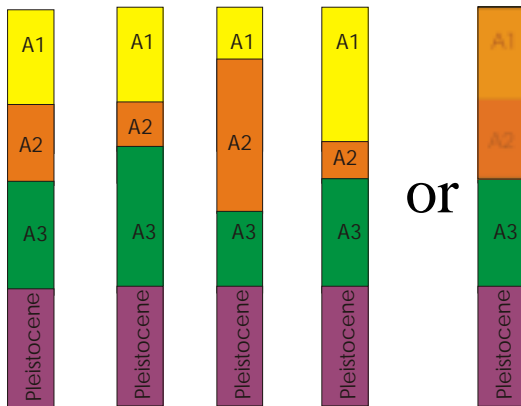←top

Pleis   Holo (A-3)

←top
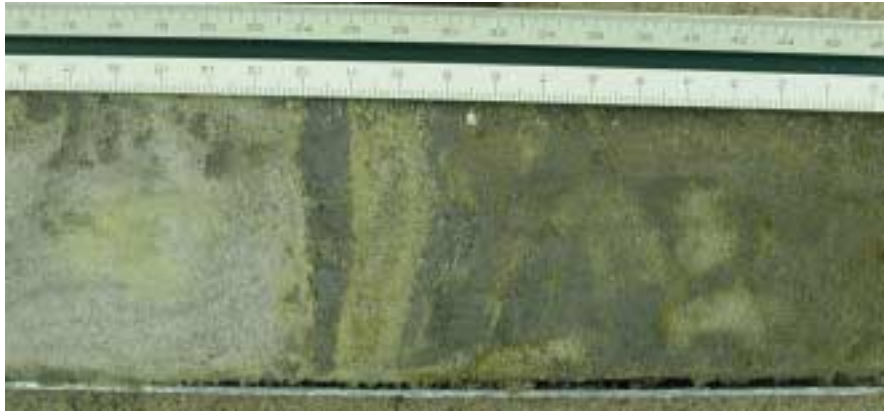
A-2 A-3

A-1 A-2

Combined Data

- Profiles – Measured variable (low error)

- Onshore – Facies change (done)

- **Nearshore** – "If Then" condition

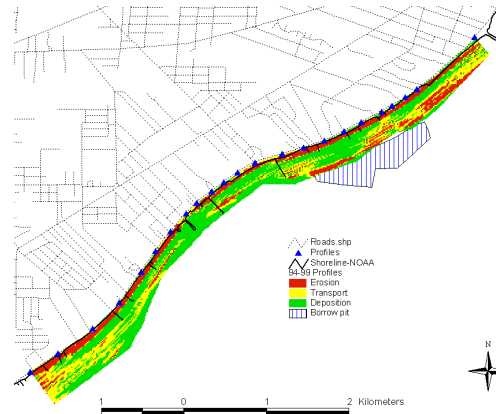

Variable 1   Variable 2
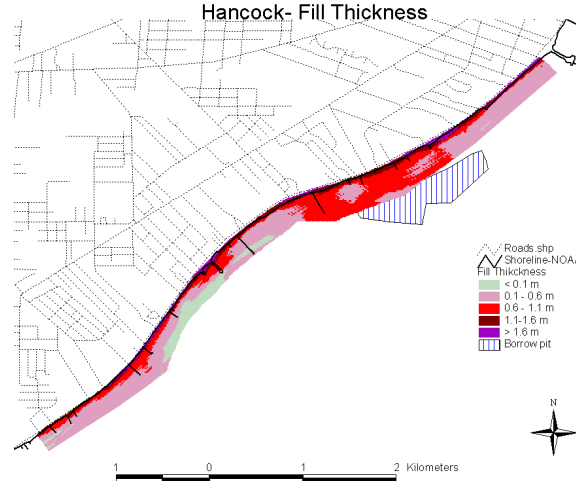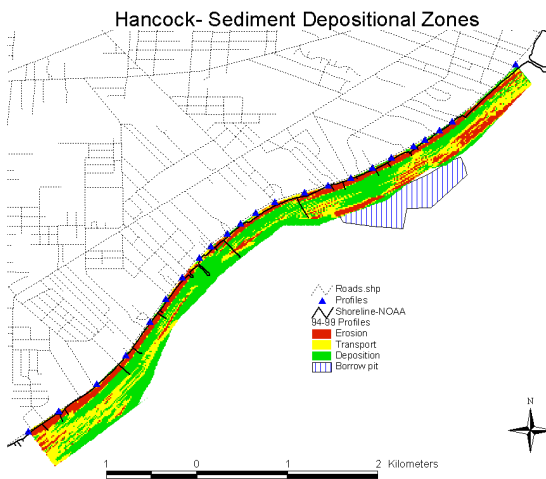
Combined Data (cont)

- "If Then" logic
  - Depositional areas have more accommodation space (deep Holocene)
  - Transport areas have higher energy and less accommodation space (if you cant tell the difference it must all be part of the fill unit)
  - Erosional areas have low accommodation space

- More Assumptions must be made
  - Sedimentation patterns during past 5 years are consistent in long term
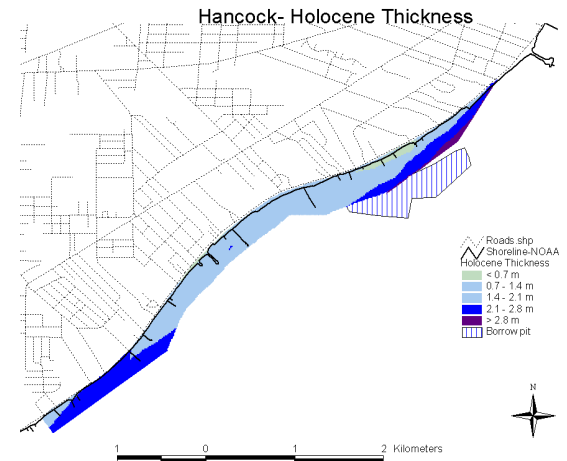 - Bedforms are relatively stable
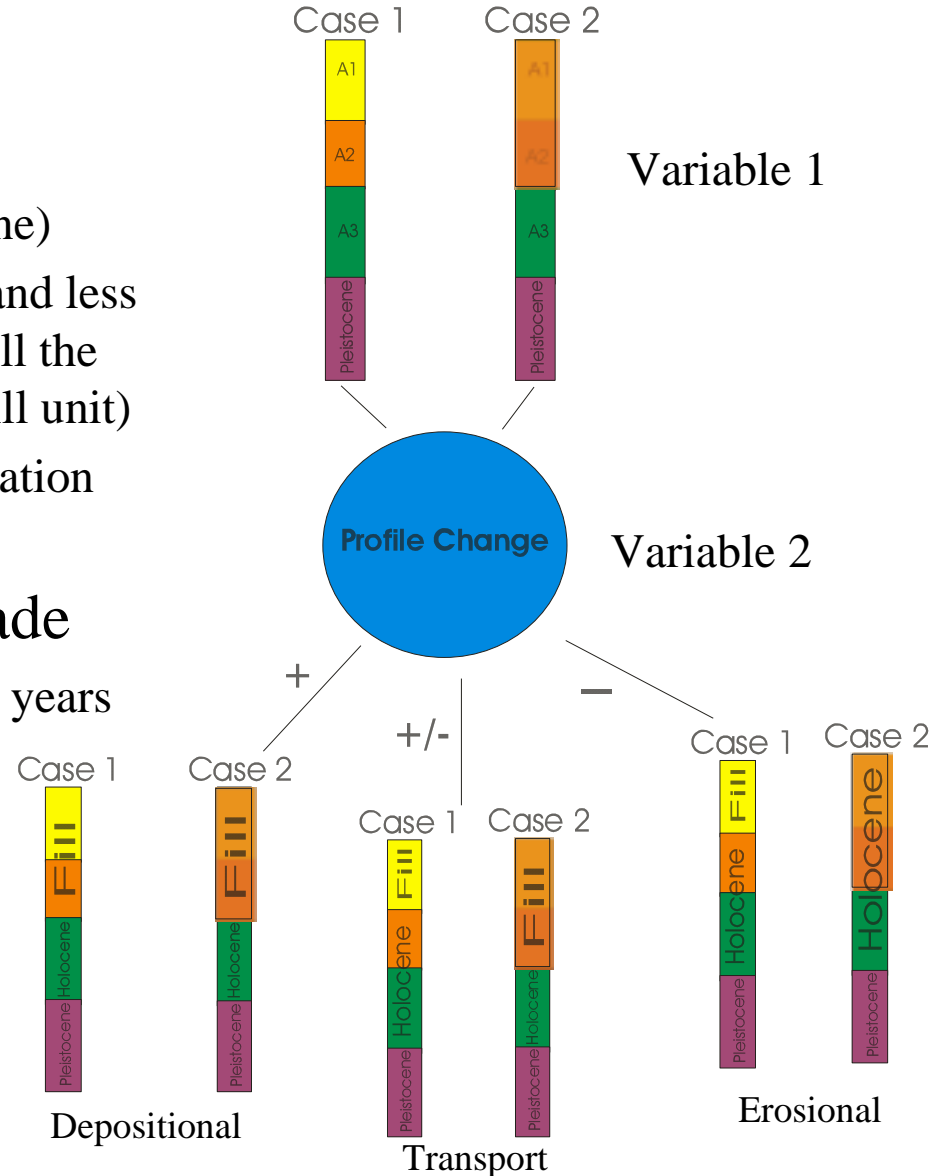
Results

		Onshore	Nearshore	Total
1994 to 1999 change		-76,000	156,000	80,000
Total Fill (1945-1999)		700,000	980,000	1,680,000
Total Holocene*		640,000	3,250,000	3,890,000
*total actual volume higher on the nearshore due to smaller calculation area				

Hancock- Sediment Depositional Zones

Hancock- Fill Thickness

1.6 million

Hancock- Holocene Thickness
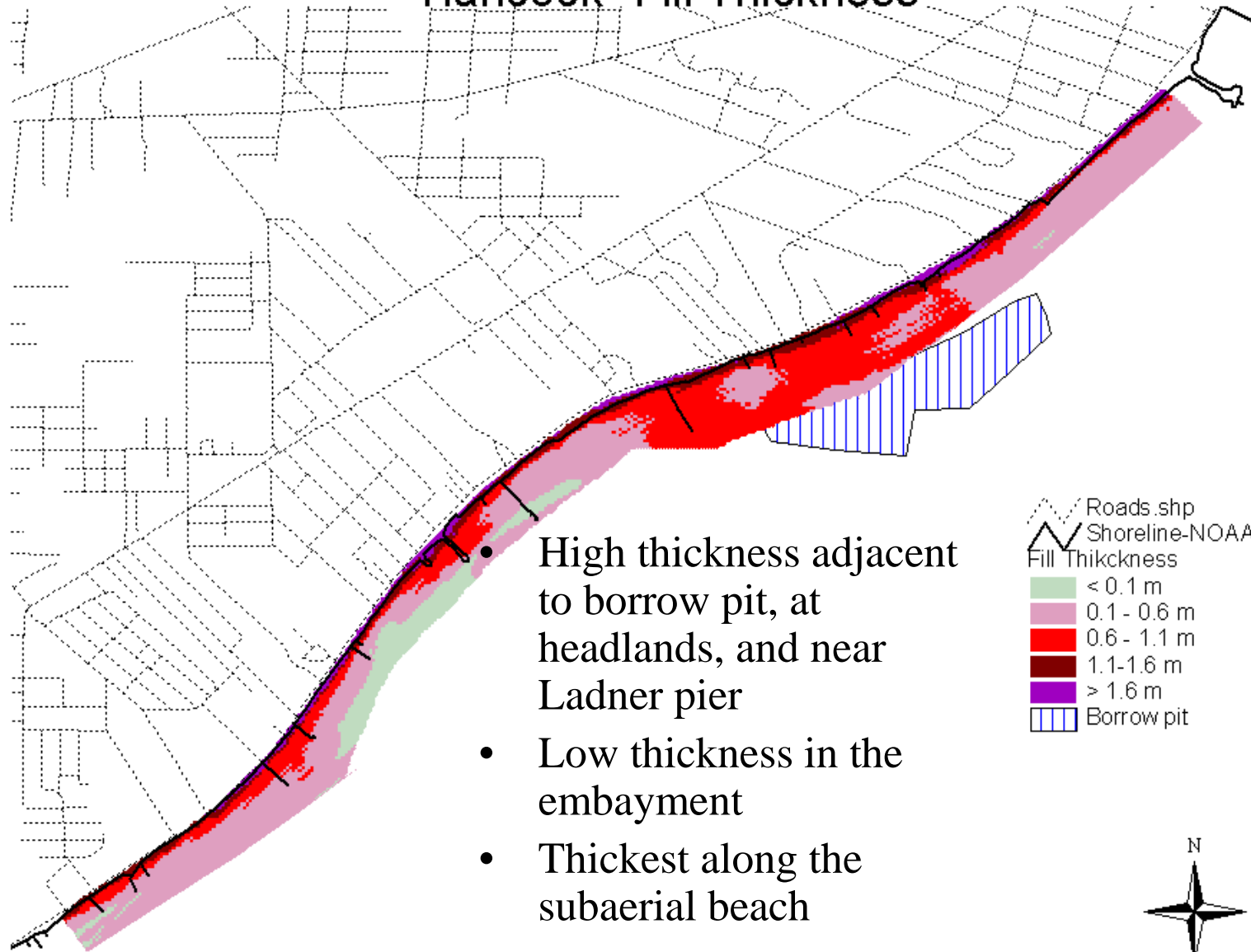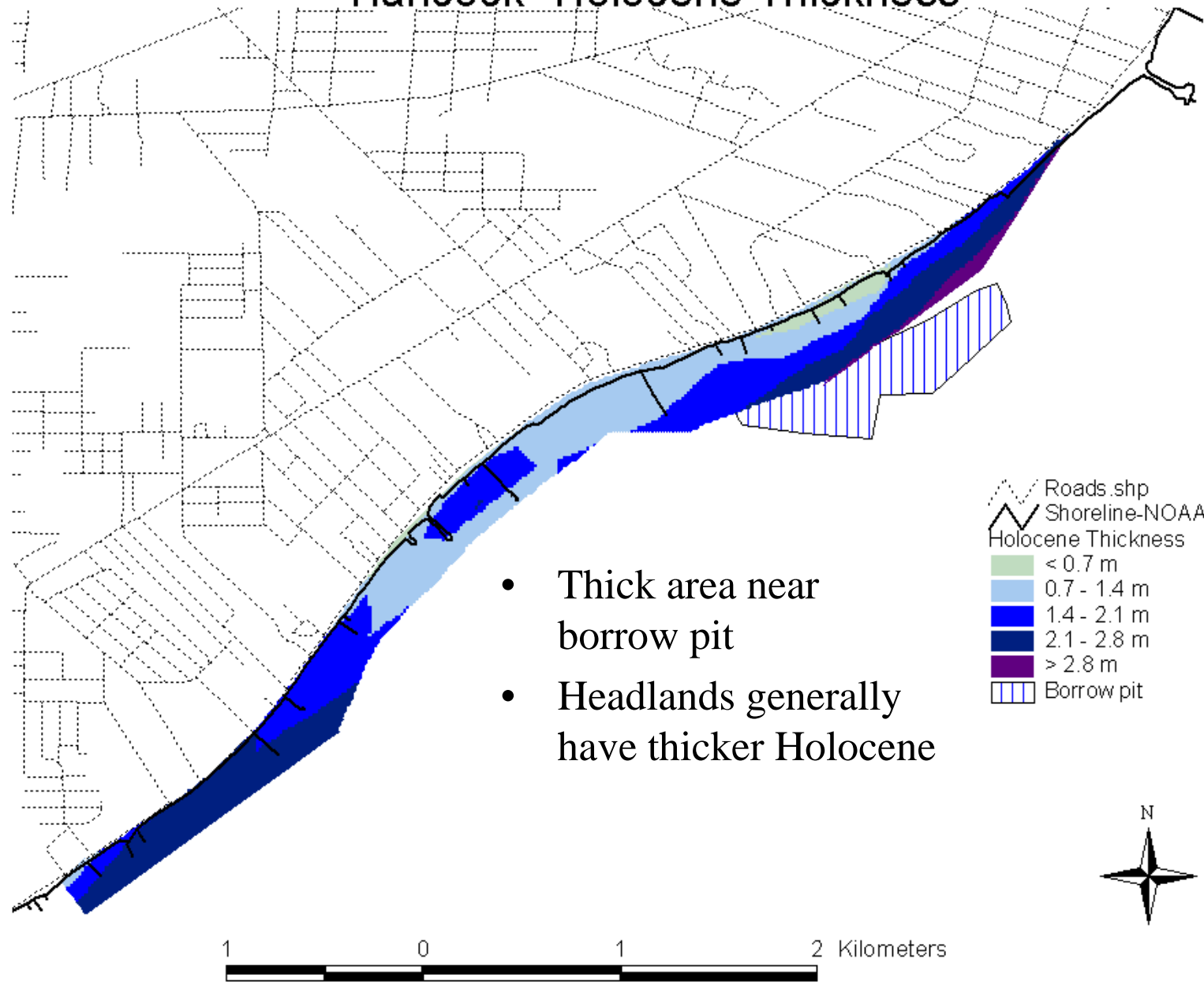
4.2 million

Hancock- Fill Thickness

- High thickness adjacent to borrow pit, at headlands, and near Ladner pier
- Low thickness in the embayment
- Thickest along the subaerial beach

Roads.shp
Shoreline-NOAA
Fill Thikckness
- < 0.1 m
- 0.1 - 0.6 m
- 0.6 - 1.1 m
- 1.1-1.6 m
- > 1.6 m
- Borrow pit

1   0   1   2 Kilometers

N

Hancock- Holocene Thickness

- Thick area near borrow pit
- Headlands generally have thicker Holocene

Roads.shp
Shoreline-NOAA
Holocene Thickness
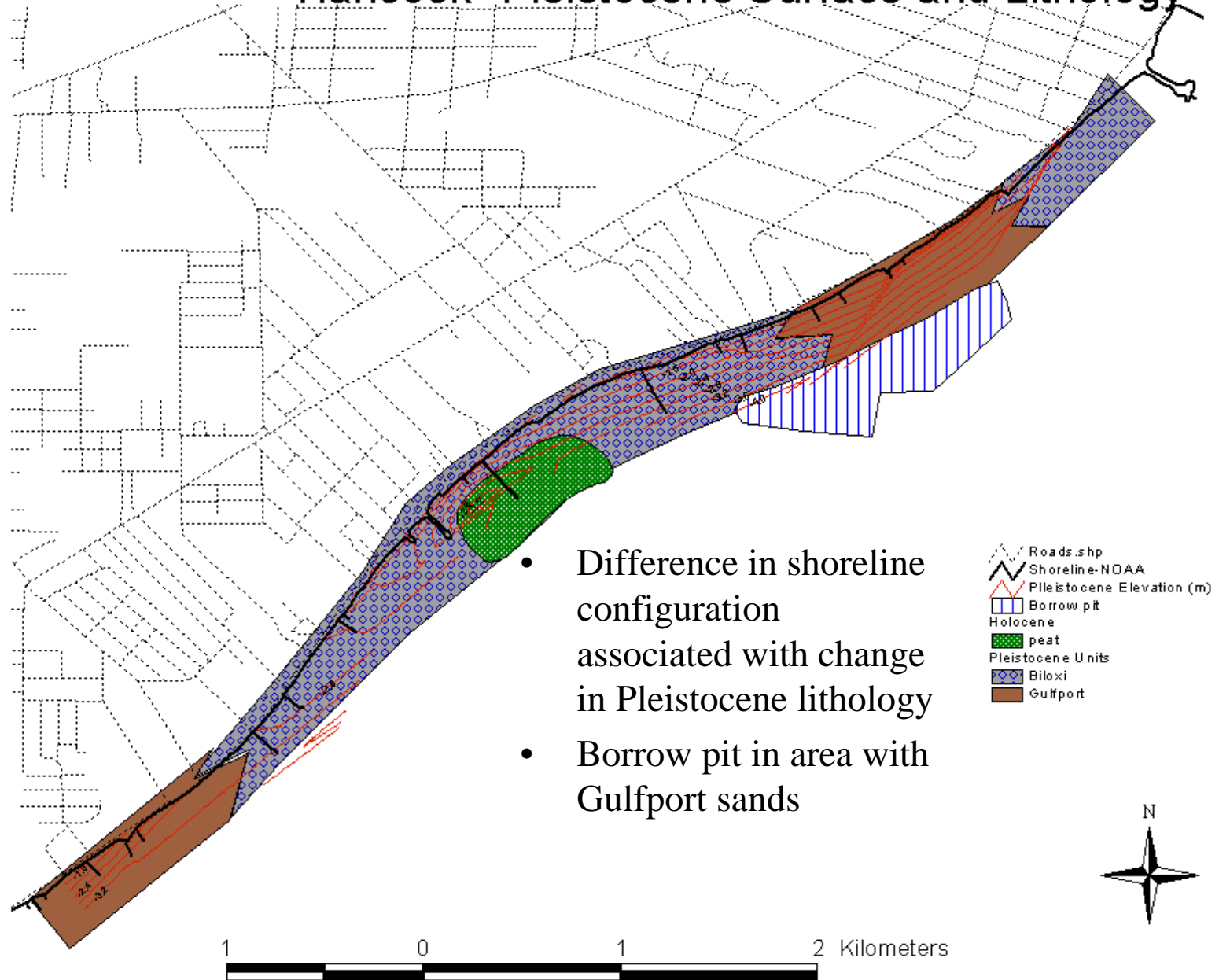- < 0.7 m
- 0.7 - 1.4 m
- 1.4 - 2.1 m
- 2.1 - 2.8 m
- > 2.8 m
- Borrow pit

N

1   0   1   2 Kilometers

Hancock- Pleistocene Surface and Lithology

- Difference in shoreline configuration associated with change in Pleistocene lithology

- Borrow pit in area with Gulfport sands

Roads.shp
Shoreline-NOAA
Pleistocene Elevation (m)
Borrow pit
Holocene
peat
Pleistocene Units
Biloxi
Gulfport

1   0   1   2 Kilometers

Conclusions

- Volume of calculated fill thickness is in general agreement with theoretical fill volumes

- Thick Holocene sequences are associated with thick fill

- Gulfport units are typically overlain by thicker Holocene sequences than Biloxi units

- Erosion is higher on ends of beach and also near borrow pit

- Borrow pit may have increased erosion behind it