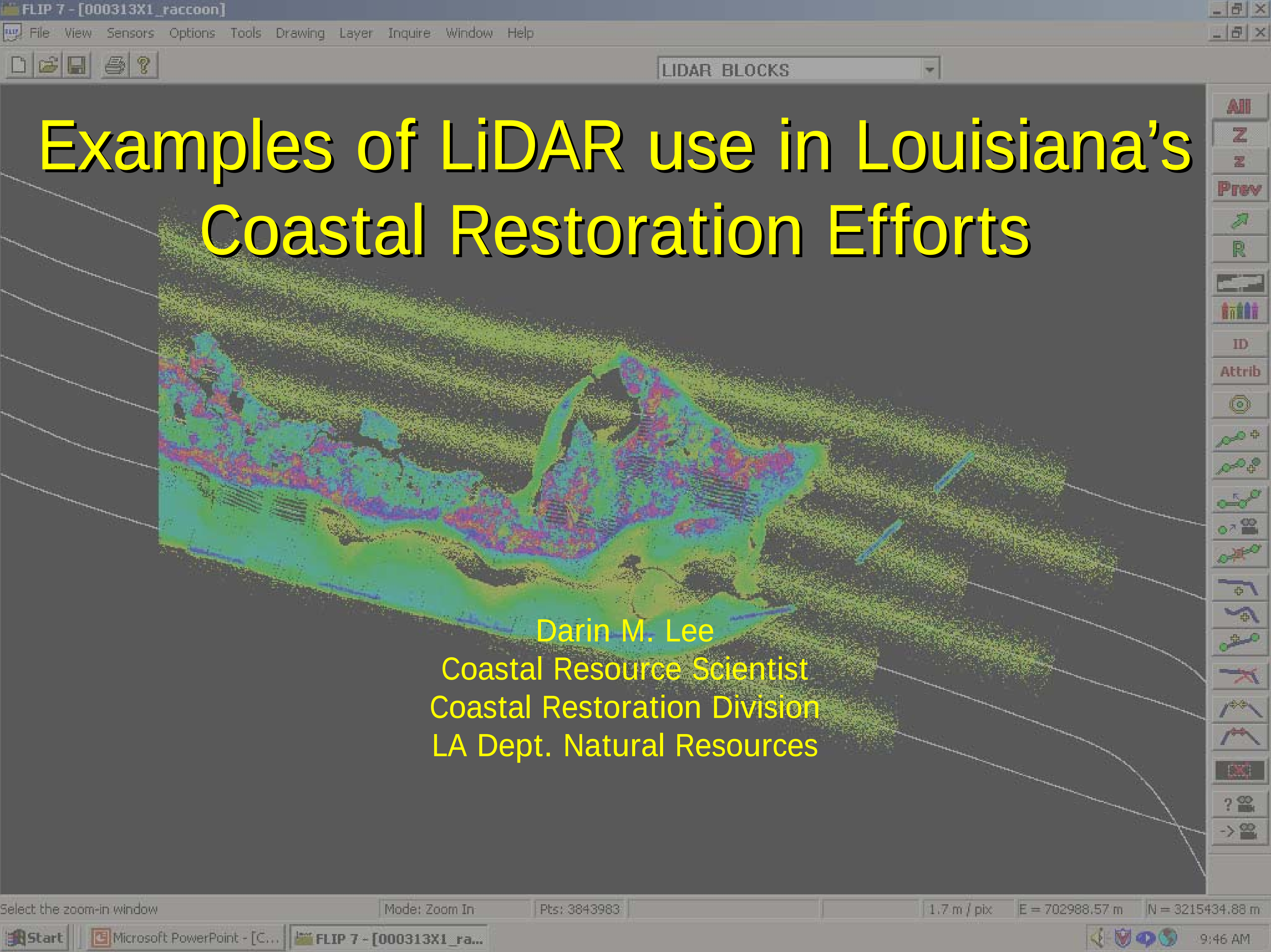
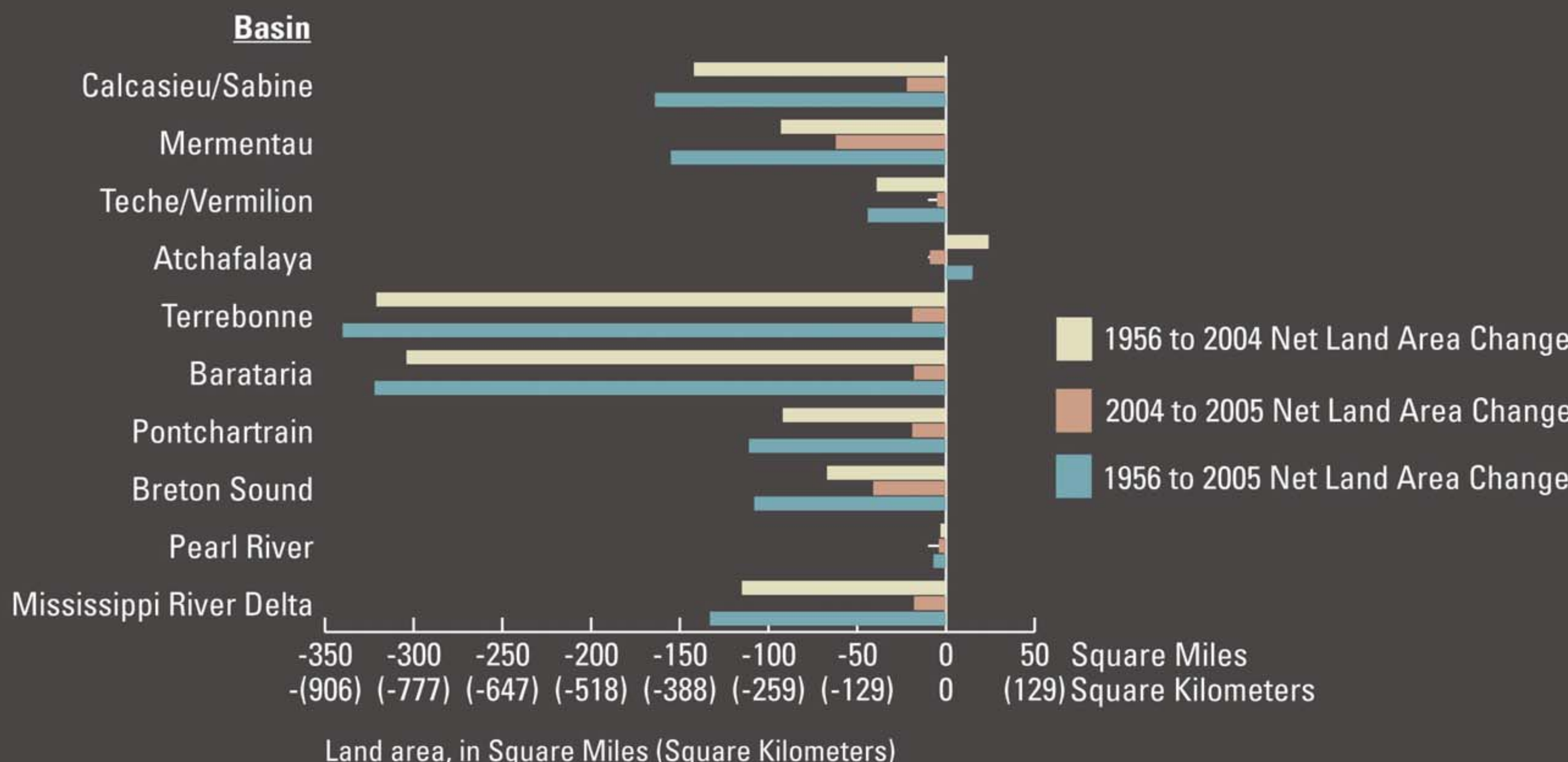
Examples of LiDAR use in Louisiana's Coastal Restoration Efforts



Darin M. Lee
Coastal Resource Scientist
Coastal Restoration Division
LA Dept. Natural Resources

USGS
science for a changing world

1956 to 2004 and 2004 to 2005 Net Land Area Changes Graph*

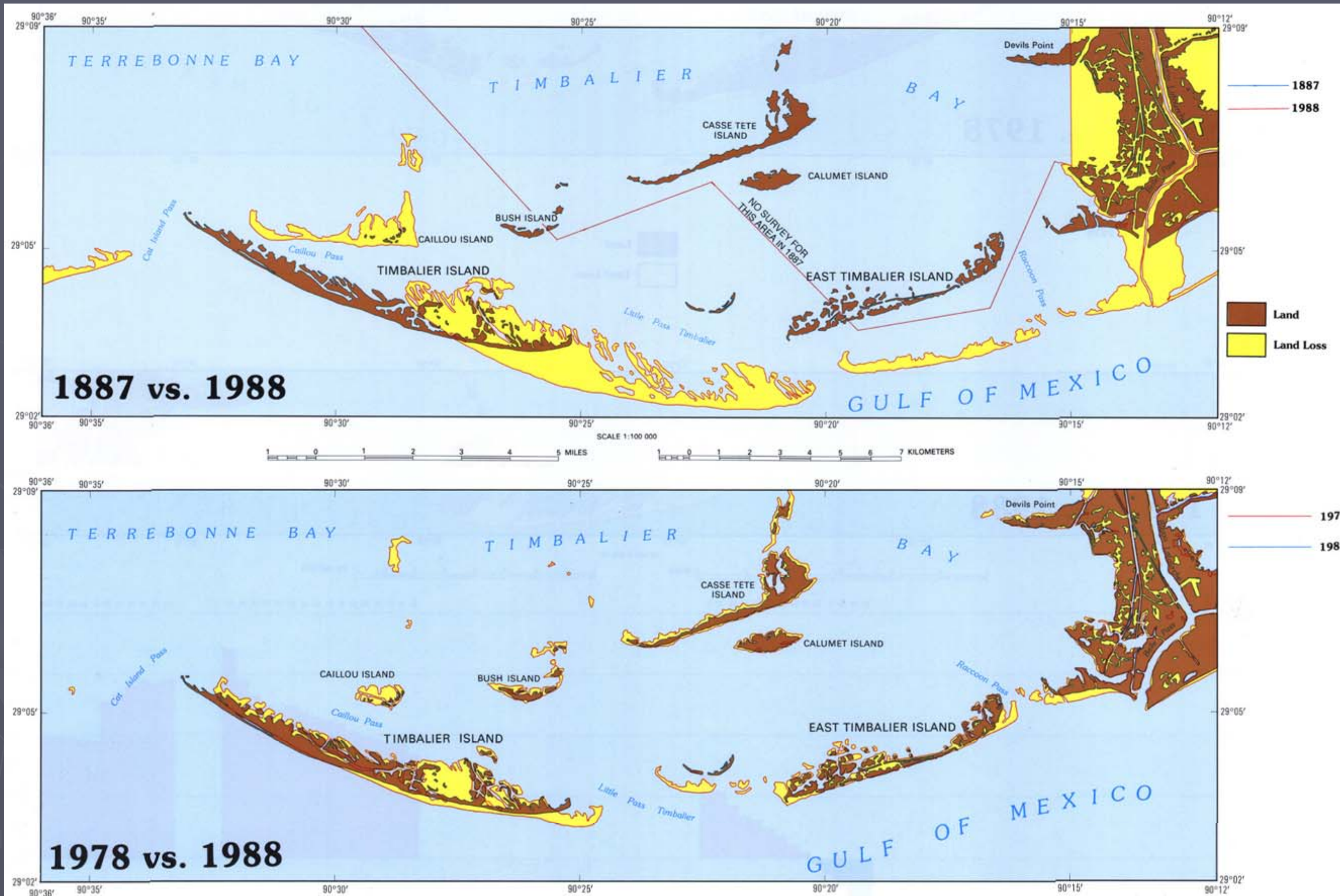


*The 1956 to 2004 net land decrease is 1,149 mi^2 (2,975.91 km^2). The 2004 to 2005 net land decrease is 218 mi^2 (564.62 km^2), which slightly varies from the 217 mi^2 given elsewhere in this report. The variation results from matching the CZB (1956) and LCA (2004 to 2005) data sets, as discussed in this methodology.

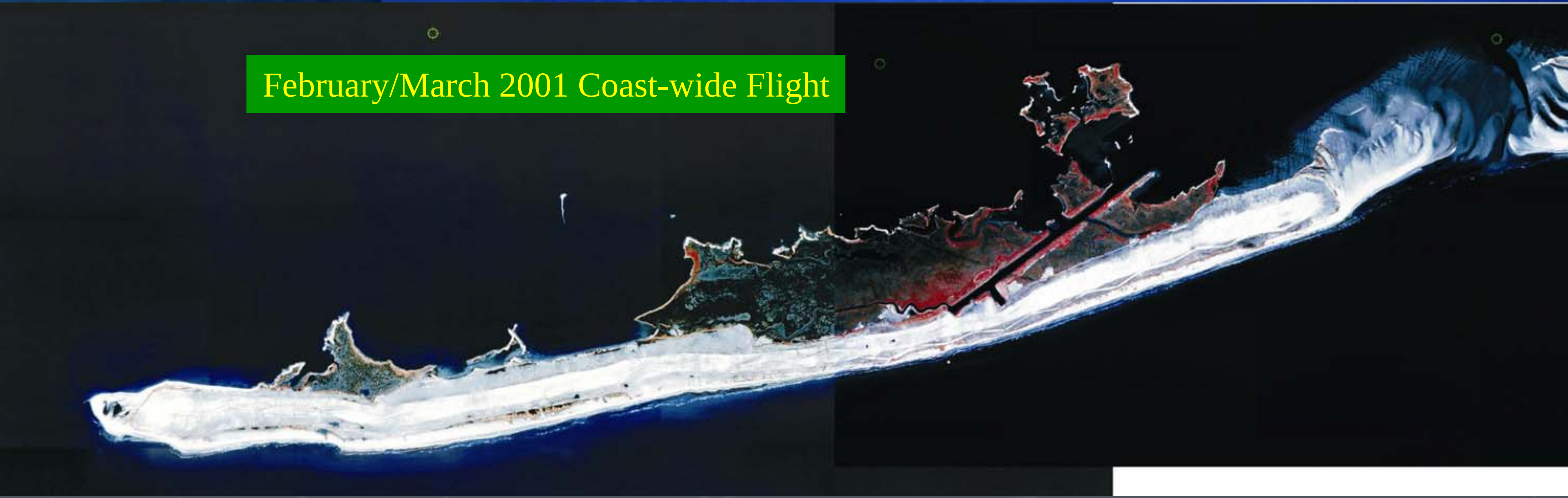
Source: Open-File Report 2006-1274, Land Area Change in Coastal Louisiana After the 2005 Hurricanes: A Series of Three Maps

Land Area Change in Coastal Louisiana After the 2005 Hurricanes: A Historical Perspective (from 1956)

Timbalier Islands Shoreline Change: 1887-1988



Trinity Island (TE-24)



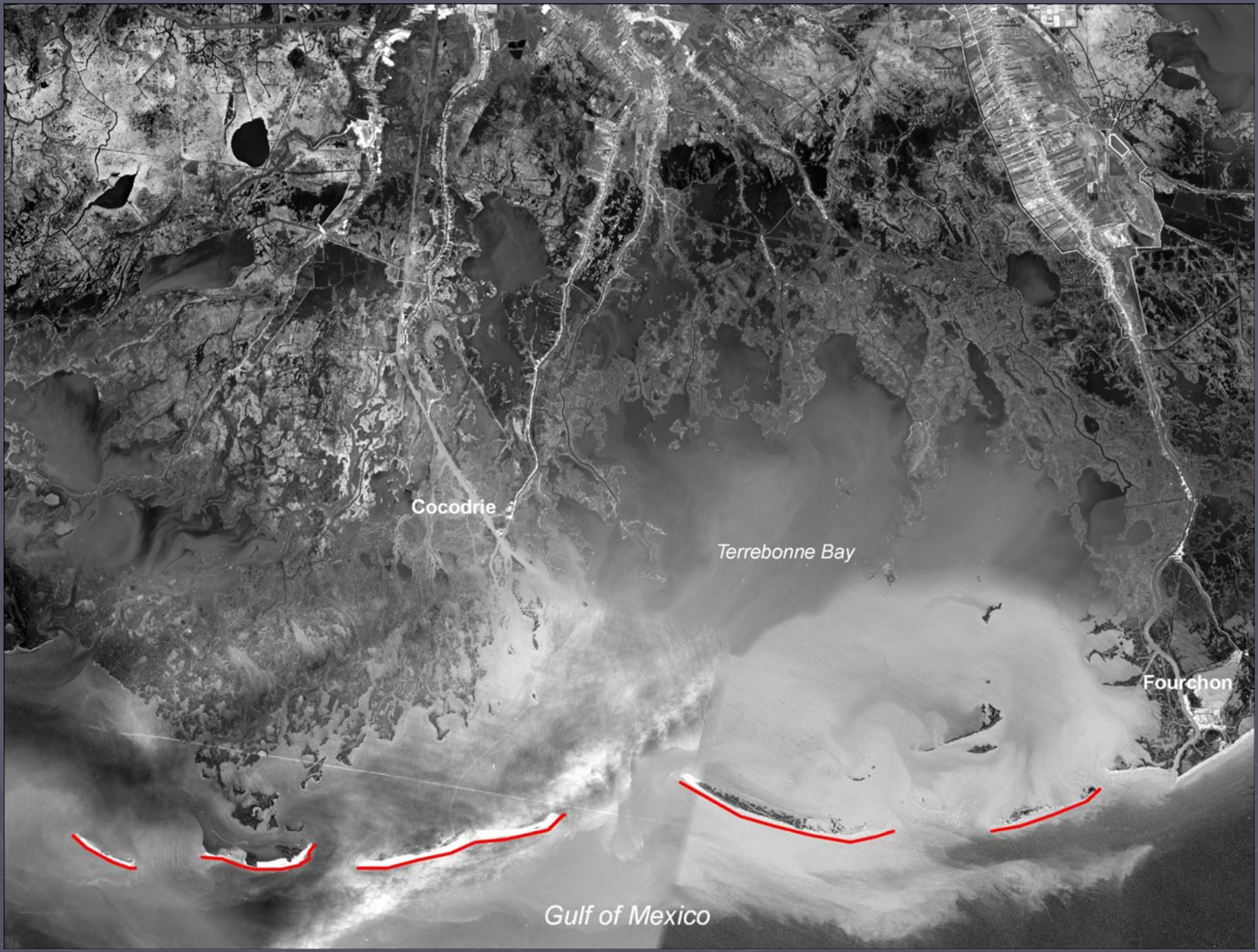
BASIC PROJECT GOALS

- increase the height and width of the islands using dredged sediments
- reduce the loss of dredged sediments through sand fencing and subsequent planting to establish a protective cover on the artificial fill surface
    - Elevation change ?
    - Volume change ?

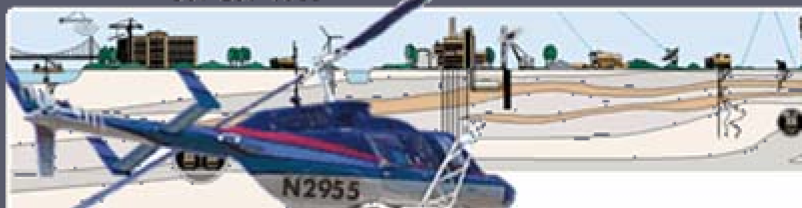
WHY LiDAR ?

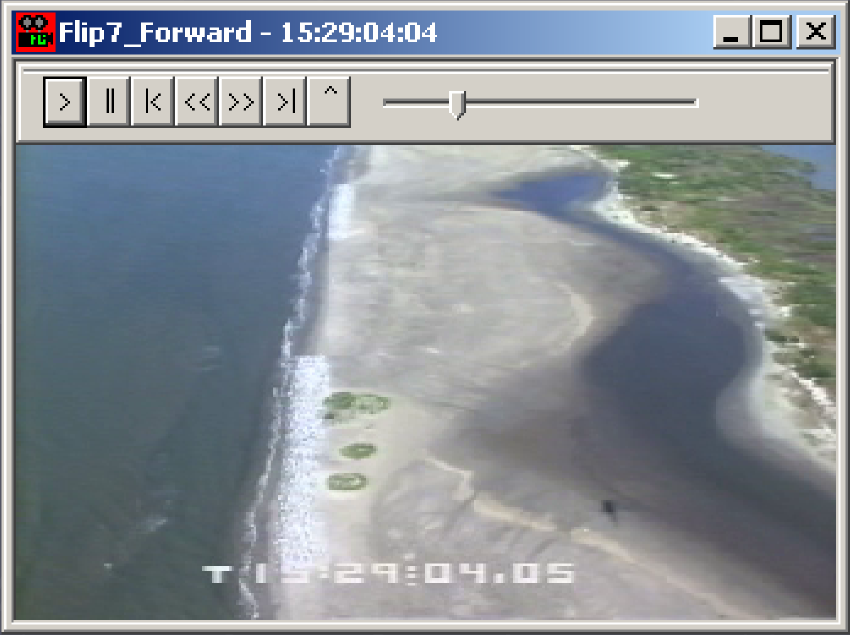
- Familiar Technology
  - SHOALS (Topography & Bathymetry ?)
  - Airborne LiDAR Assessment of Coastal Erosion (ALACE) (1998/99)
  - LA Oil Spill Coordinators Office
- Advantages
  - Rapid
  - Sufficient Accuracy for Monitoring & Planning
  - Dense coverage
  - Cost-effective
  - Comparable to traditional surveys
    - Develop x-sections
  - Comparable to future LiDAR

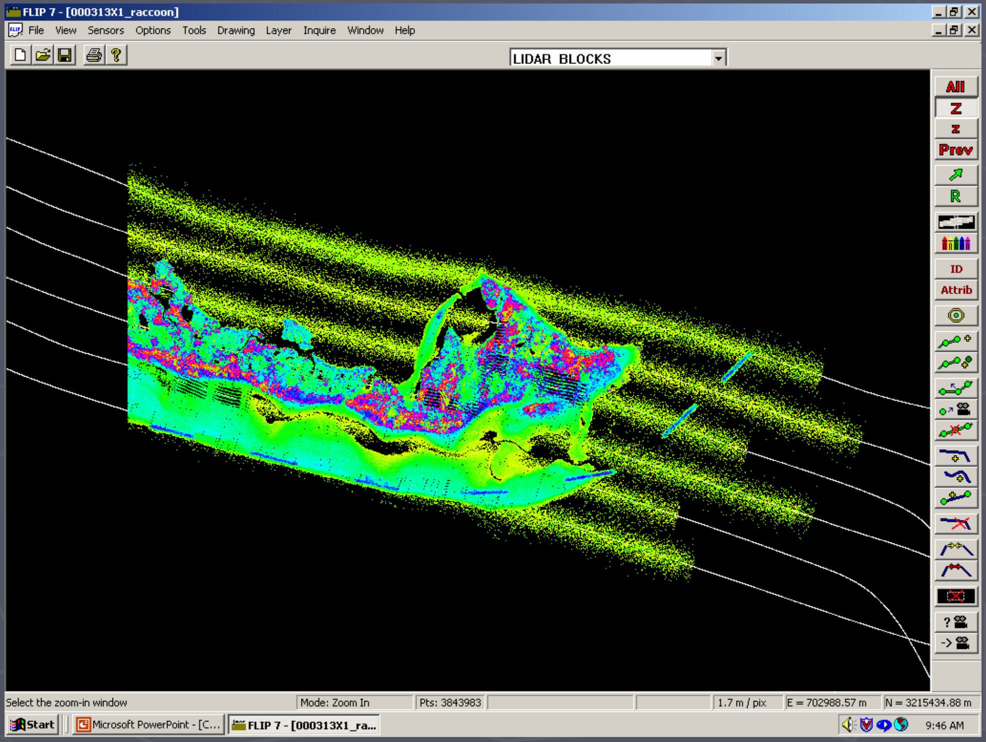
MARCH 2000

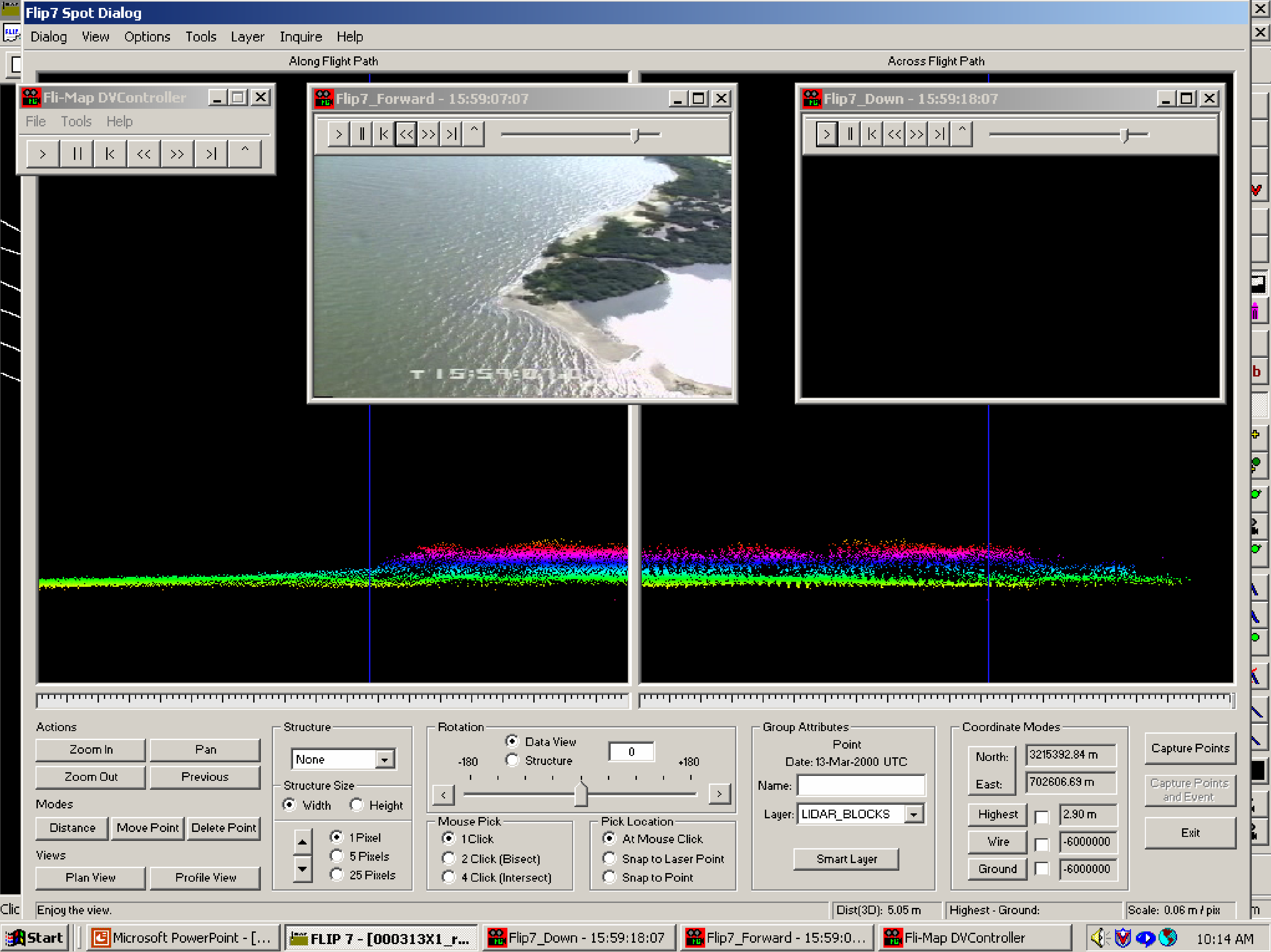


FLI-MAP
JOHN CHANCE LAND SURVEYS
337-237-1300



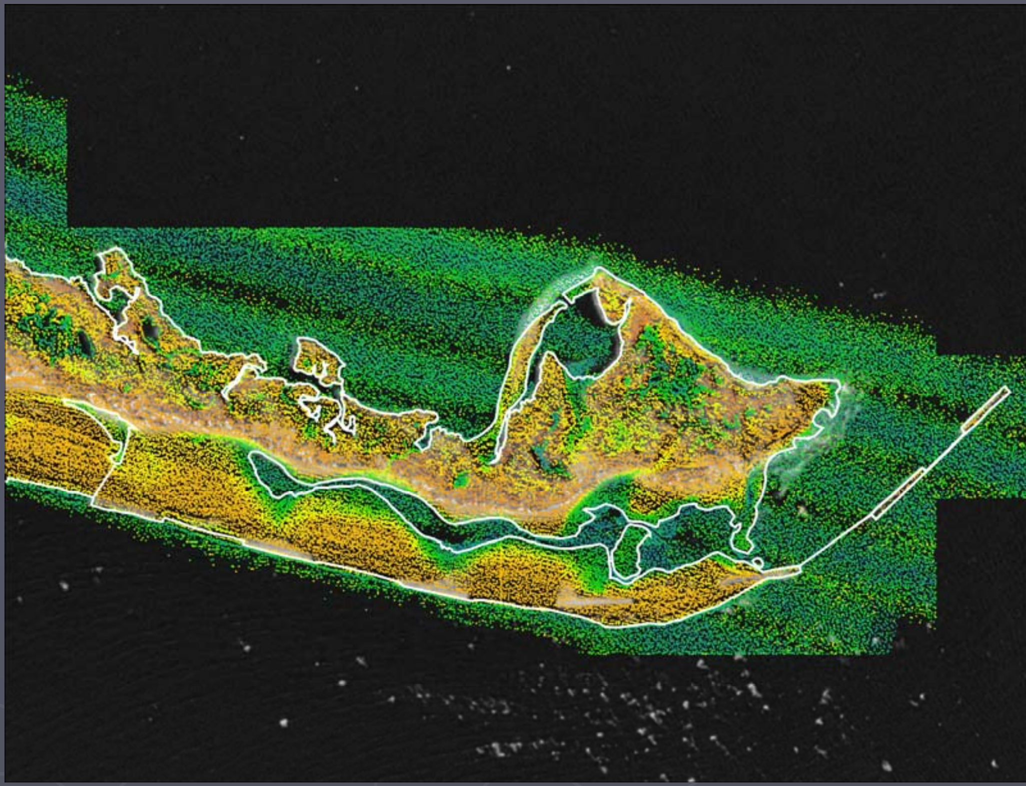




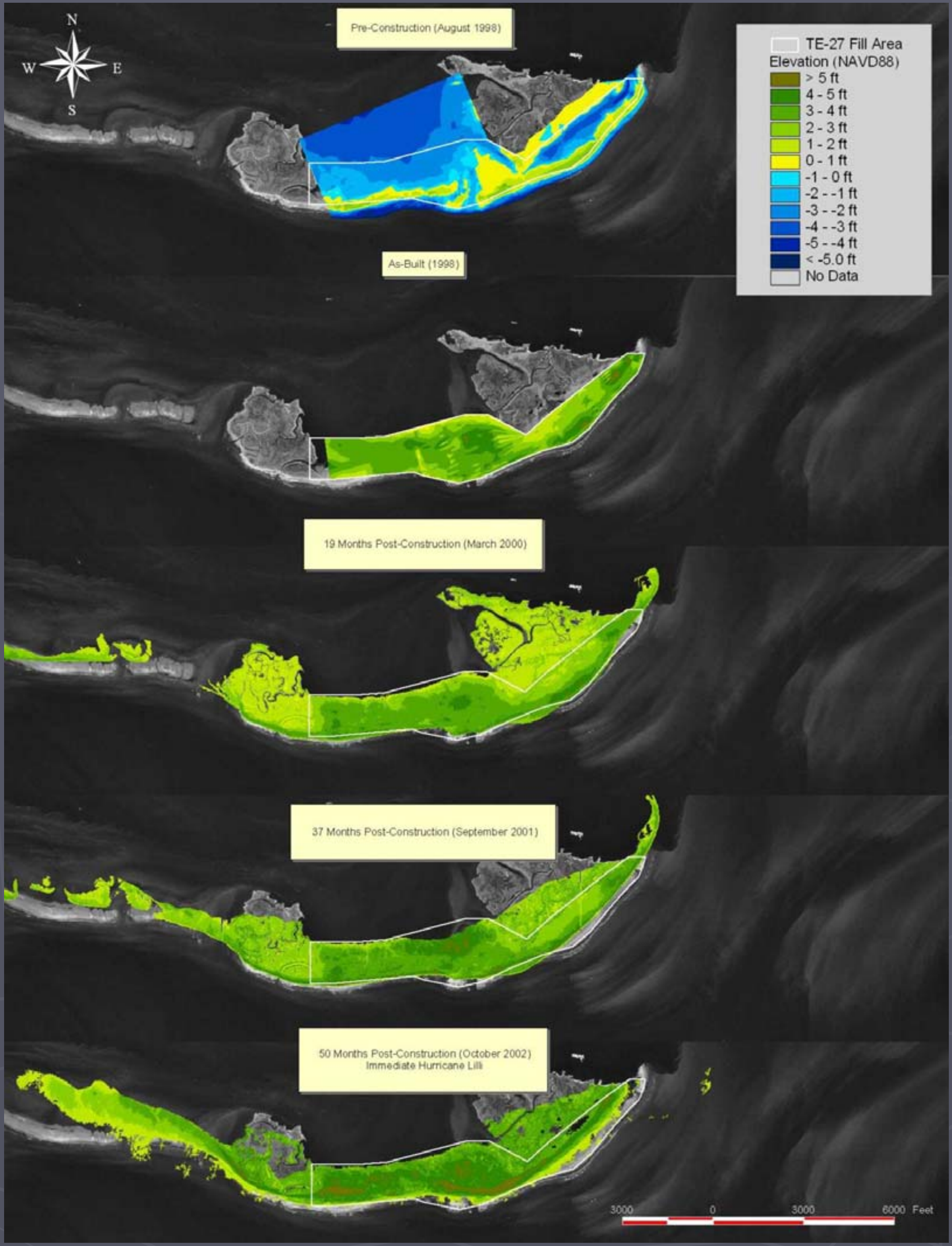

Flip7 Spot Dialog
Dialog View Options Tools Layer Inquire Help
Along Flight Path
Across Flight Path
Fli-Map DVController
File Tools Help
Flip7_Forward - 15:59:07:07
Flip7_Down - 15:59:18:07
Actions
Zoom In
Pan
Zoom Out
Previous
Modes
Distance
Move Point
Delete Point
Views
Plan View
Profile View
Structure
None
Structure Size
Width
Height
1 Pixel
5 Pixels
25 Pixels
Rotation
Data View
Structure
0
-180
+180
Mouse Pick
1 Click
2 Click (Bisect)
4 Click (Intersect)
Pick Location
At Mouse Click
Snap to Laser Point
Snap to Point
Group Attributes
Point
Date: 13-Mar-2000 UTC
Name:
Layer: LIDAR_BLOCKS
Smart Layer
Coordinate Modes
North: 3215392.84 m
East: 702606.69 m
Highest 2.90 m
Wire -6000000
Ground -6000000
Capture Points
Capture Points and Event
Exit
Enjoy the view.
Dist(3D): 5.05 m
Highest - Ground:
Scale: 0.06 m / pix
Start
Microsoft PowerPoint - [...
FLIP 7 - [000313X1_r...
Flip7_Down - 15:59:18:07
Flip7_Forward - 15:59:0...
Fli-Map DVController
10:14 AM

Data Processing

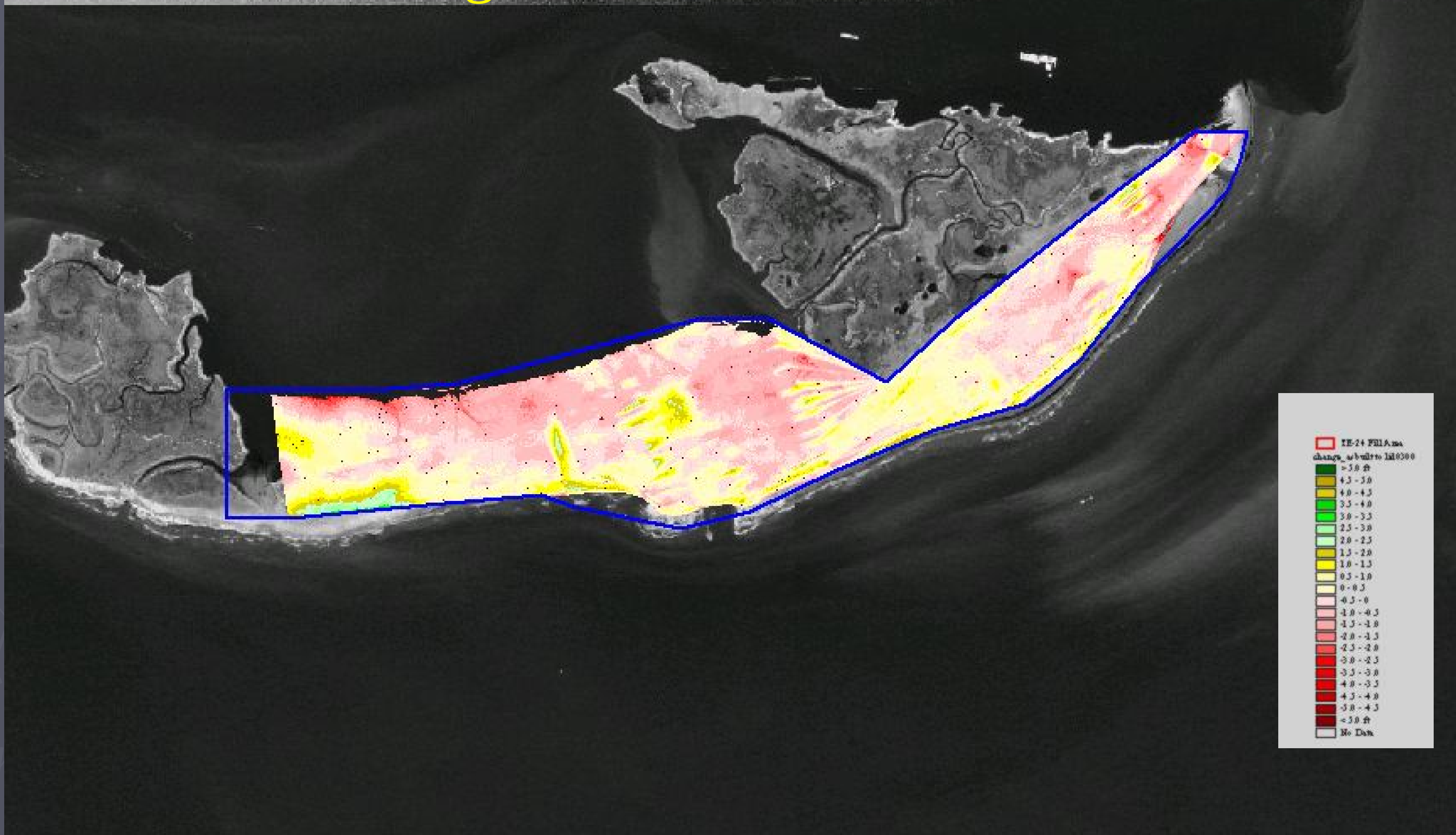
- Filter Data
  - Nearest neighbor analysis
- Digitize waterline polygons
  - Utilize geo-referenced video
- Remove outliers (SAS)
- Develop TIN & GRID models



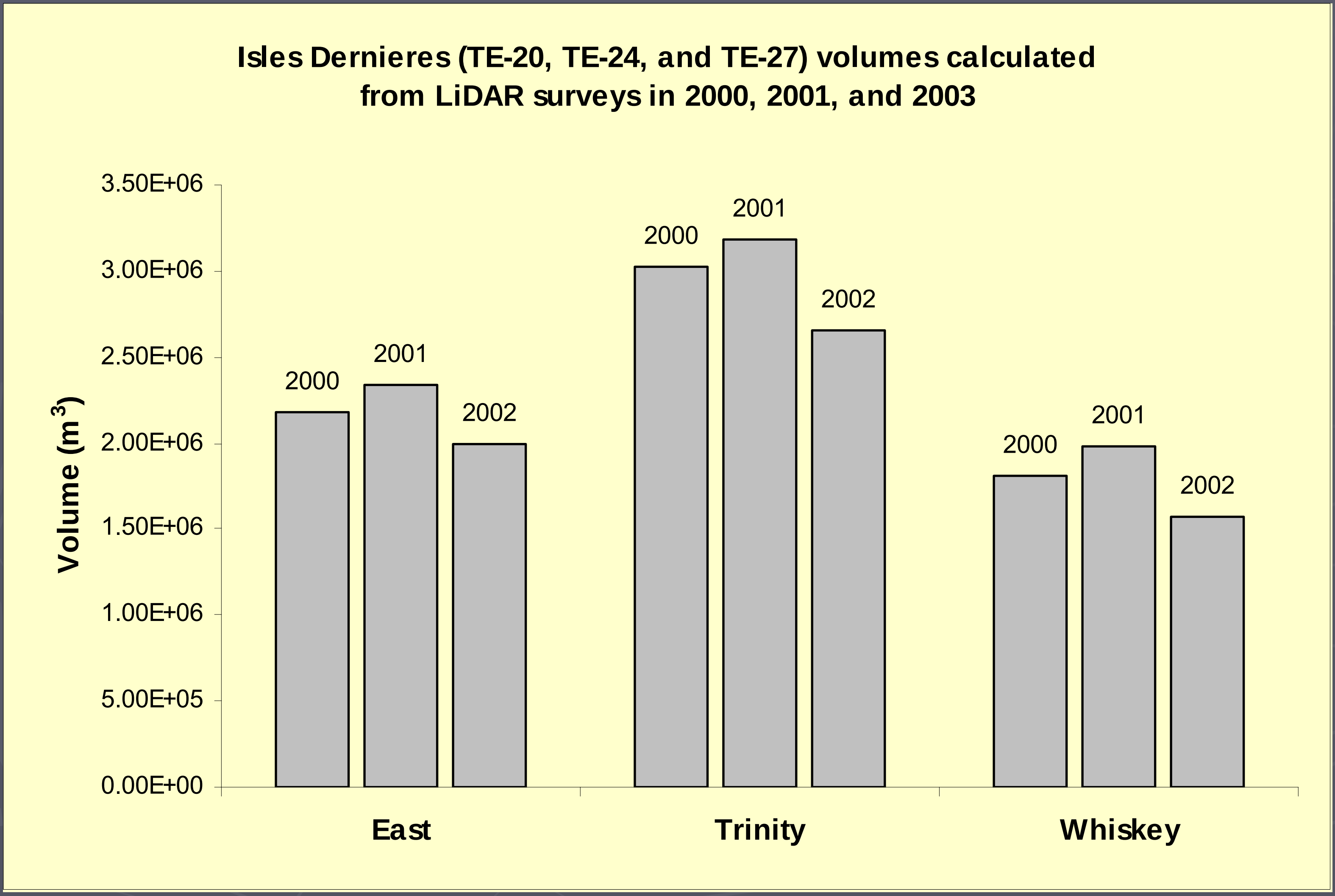
Modeling data



Change As-built to LiDAR 2000



Volume & Elevation Changes

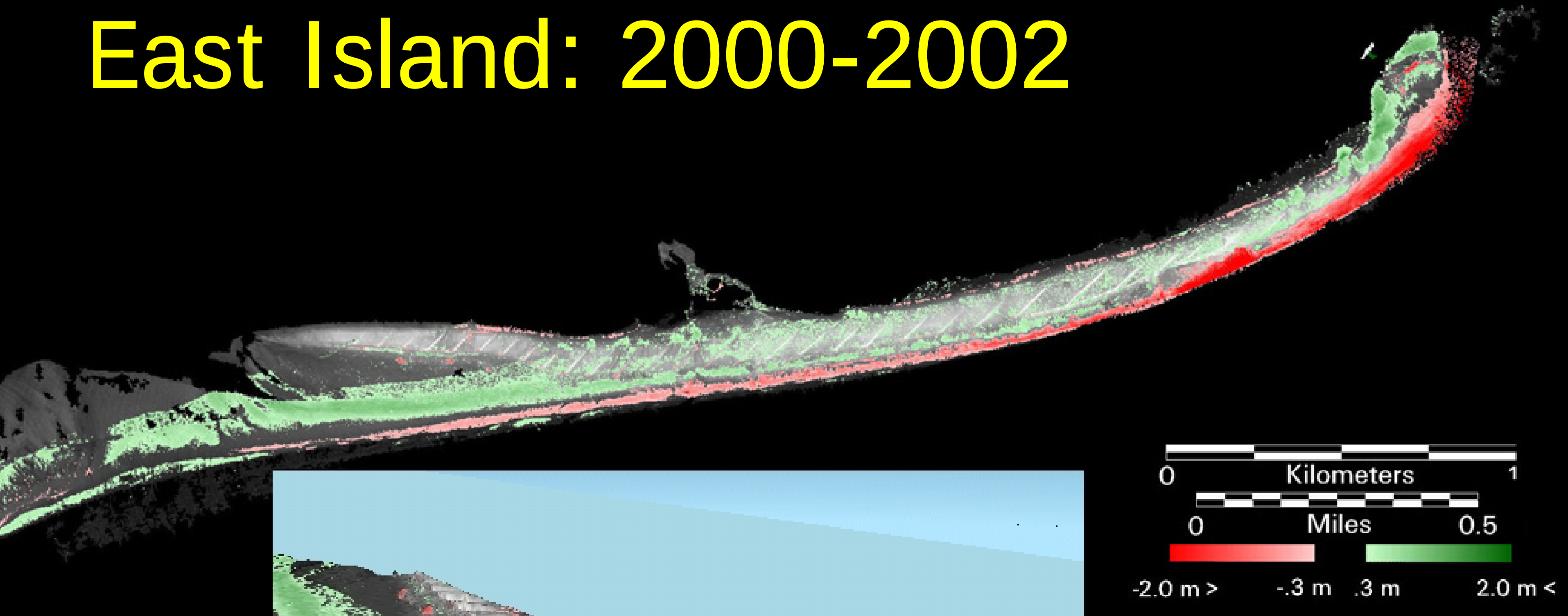


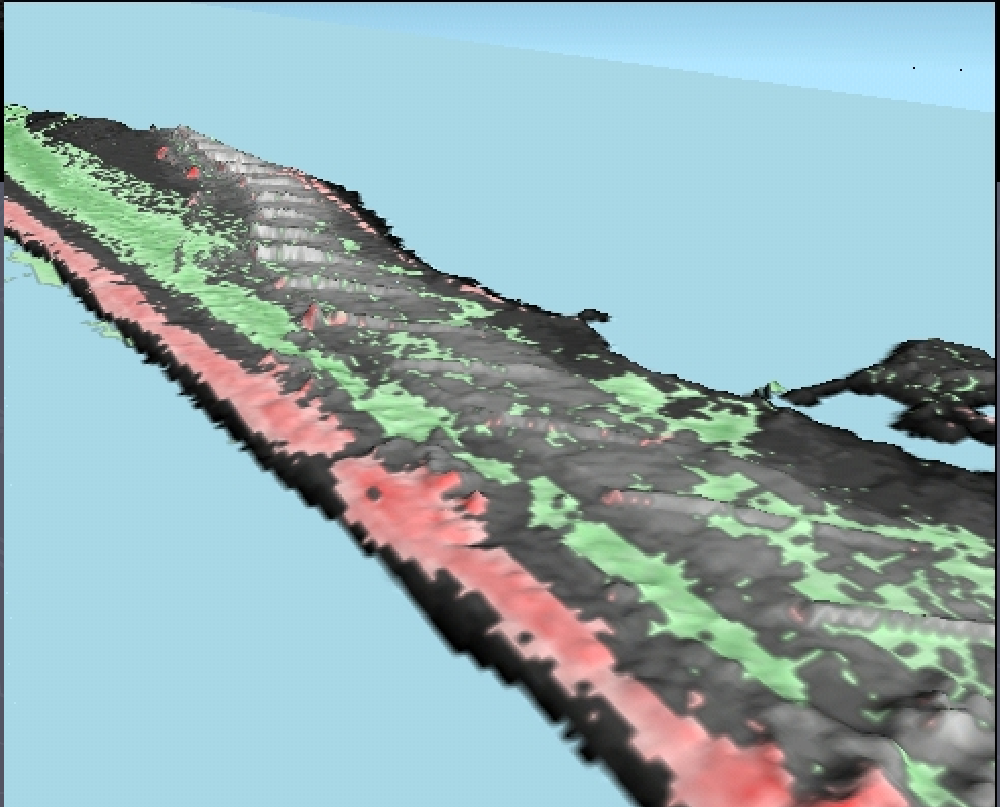
LiDAR Partnerships

- USGS Center for Coastal Geology
  - September 2001 (pre-storm baseline)
    - Repeat of ALACE datasets
    - Sandy Shorelines of the Deltaic Plain only
    - Interest in storm impacts to shoreline/beaches
  - October 2002 (post-Lili and Isidore)

Different interests
Survey Datum
Time frame for deliverables
Coast-wide scale

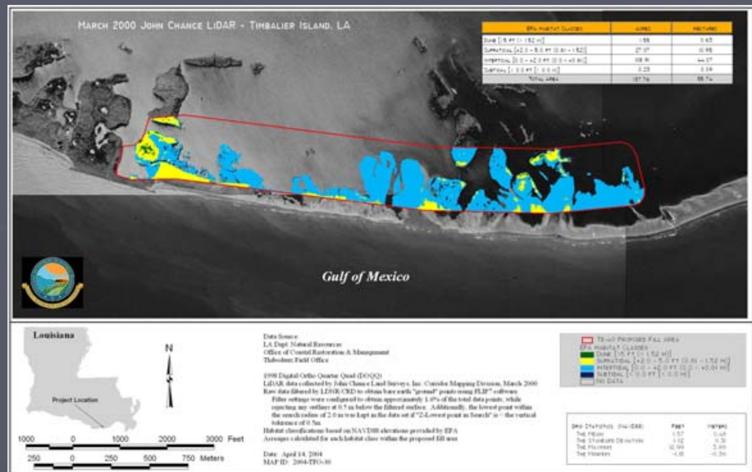
East Island: 2000-2002

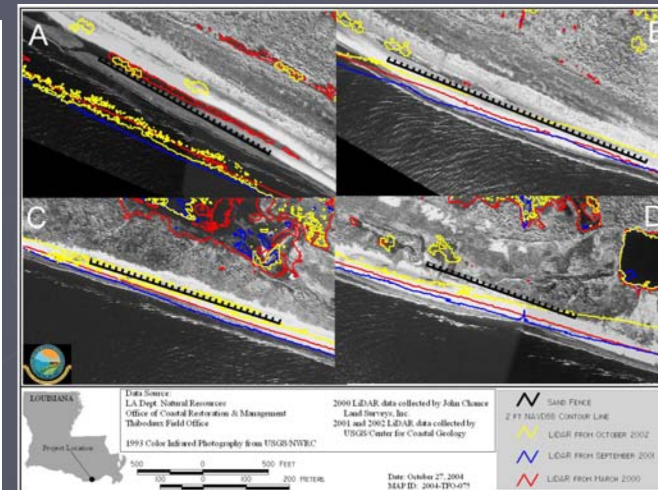


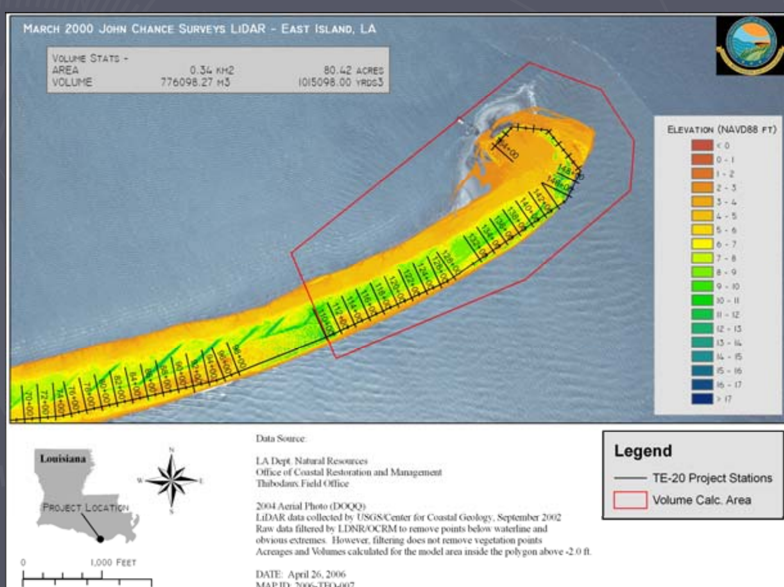


ADDITIONAL DATA USE

- PLANNING
- MAINTENANCE
- MONITORING
- MODELING
- FEMA Claims

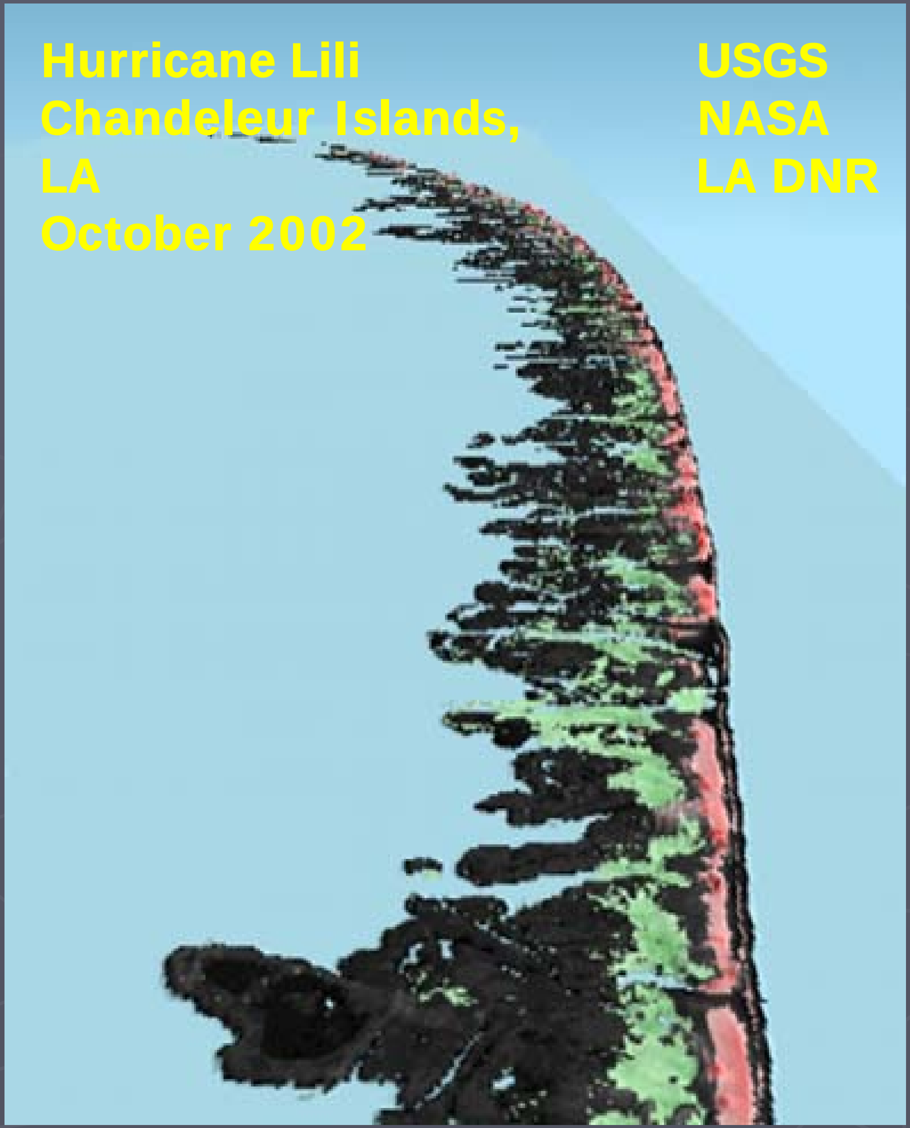






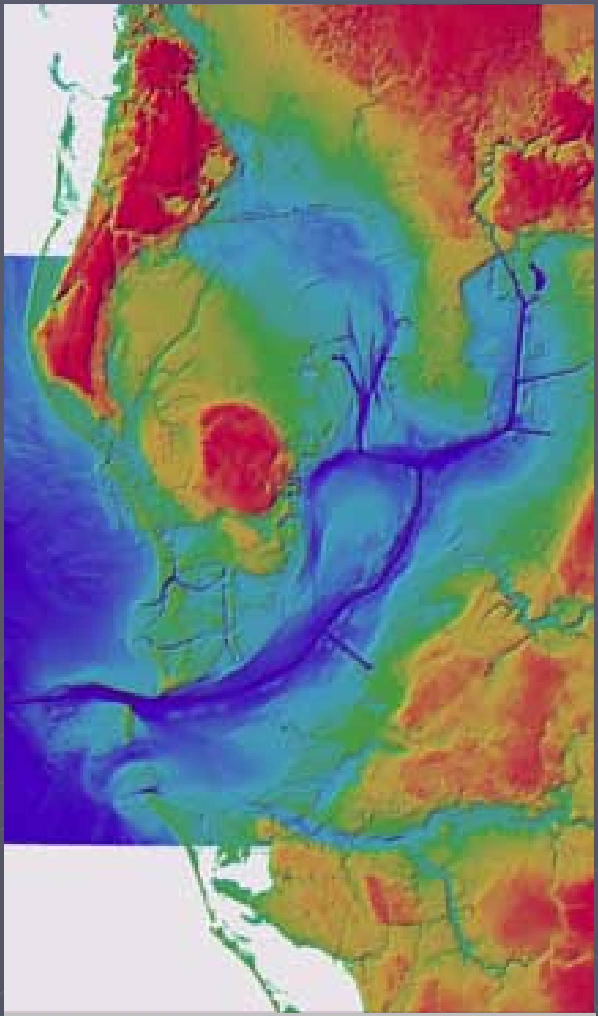
LiDAR ISSUES

- Data accuracy
- Data coverage
  - Little chance for bathymetry in LA
  - Does not cover whole Island or Project
- Standard Formats
- Standard Analysis
  - How to filter
  - DEM's vs DTM
- Data Availability
  - Large Datasets
  - RAW vs FILTERED
- Confidence Intervals
  - Develop statistical CI for change detection
  - Type I vs Type II errors



LiDAR's Future in LA

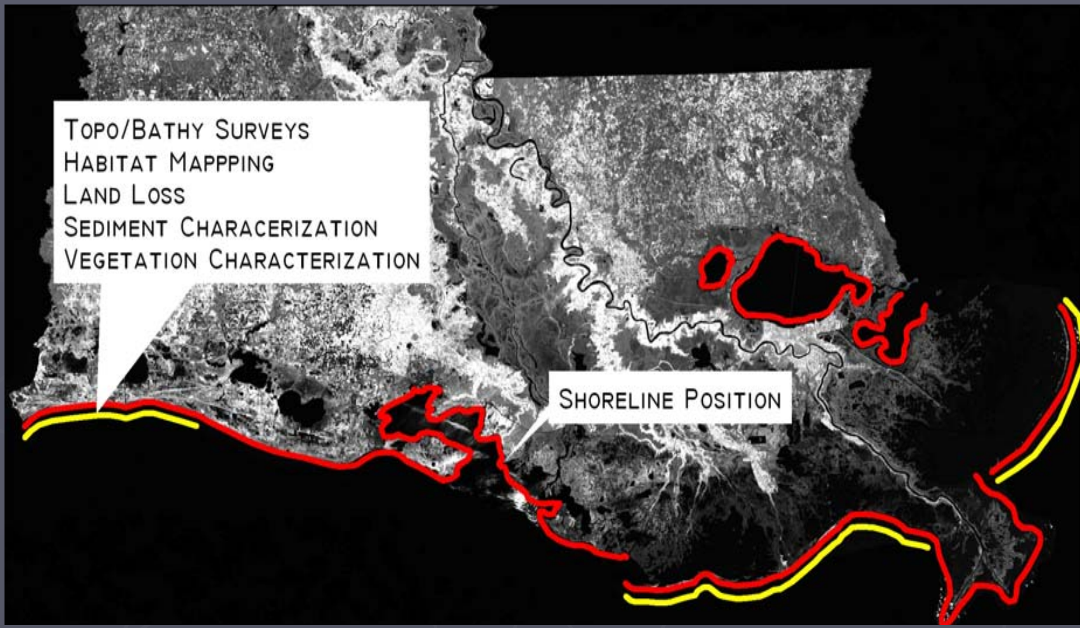
- Barrier Island Comprehensive Monitoring (BICM)
  - Coast-wide data collection every 5 years
  - Process and response variables
  - Data Delivery
- Morphodynamic Classification
  - after Brock et al. 2004
- Topo/Bathy Model for LA coast
- FEMA/Damage Assessment



USGS/NOAA
Tampa Bay, FL
Topo/Bathy data

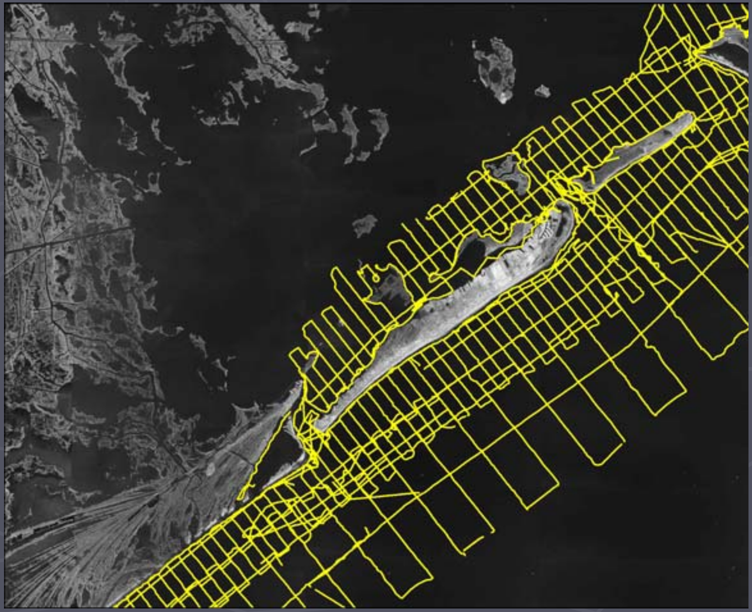
BICM – data collection every 5 years

Aerial Photos –
Shoreline position – 1880's, 1920-30's, 1998, 2004, 2005
Habitat Mapping (7 habitats – beach, marsh, bare land, barrier vegetation, inter-tidal, structure, water)
Land Loss



Topographic Surveys - LiDAR (entire sandy beach or entire island if not attached to headland)

Bathymetric Surveys - 1500' perpendicular line spacing bayside to 6600' offshore, 3000' and 6000' shore parallel lines, 2500' grid outside of 2 mi



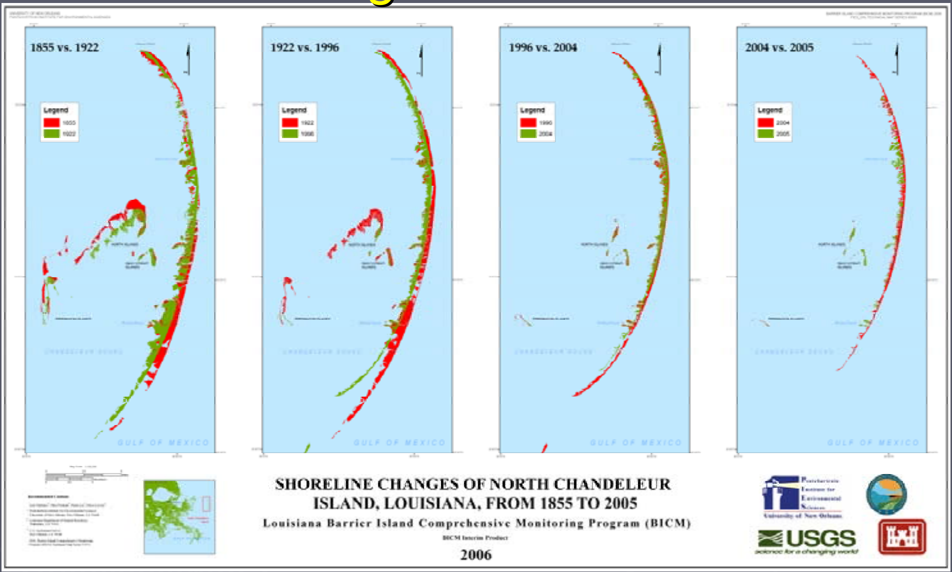
Sediment Sampling - 7 grab samples from offshore DoC, cross-shore to bays

Vegetation Sampling – to be determined

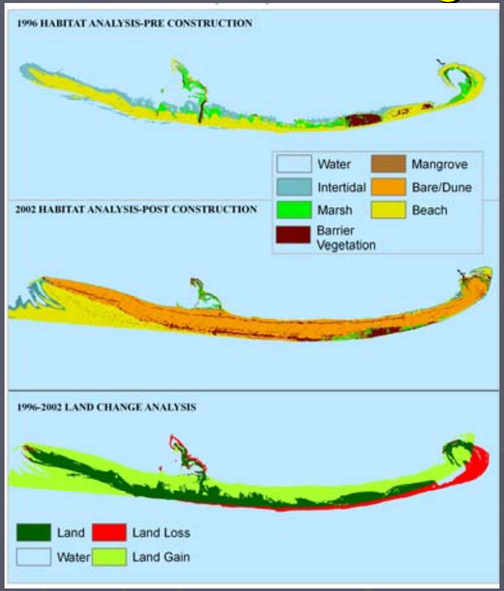
Proccess Data Sampling – to be determined (winds, waves, currents, precipitation, etc...)

BICM Products

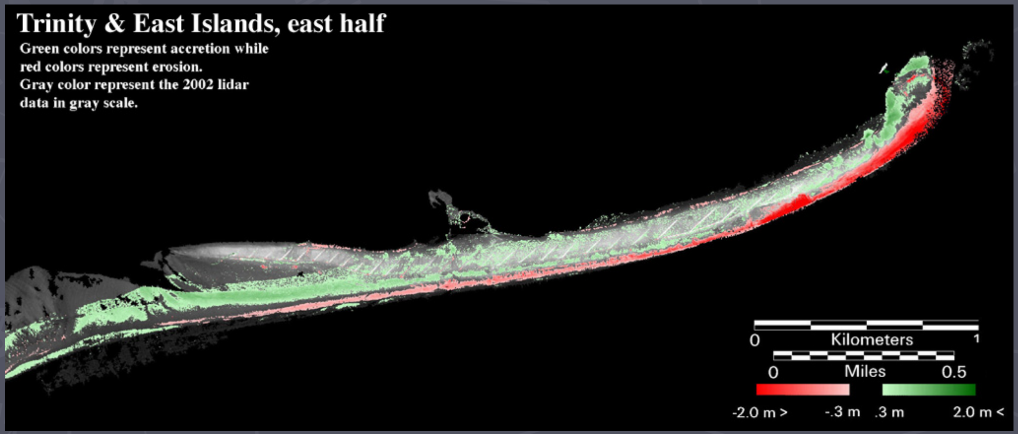
Shoreline Change/Land Loss



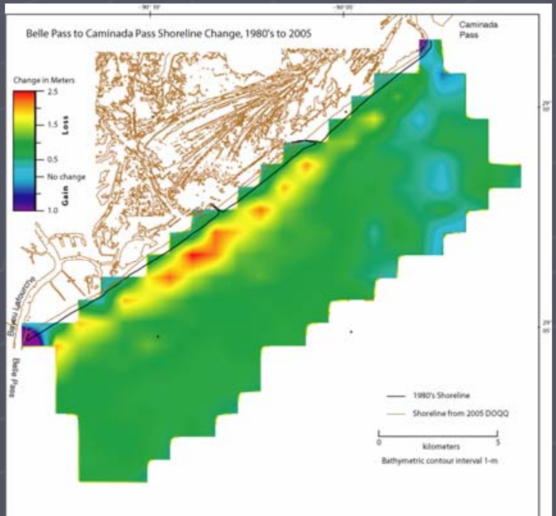
Habitat Change



Topographic Change

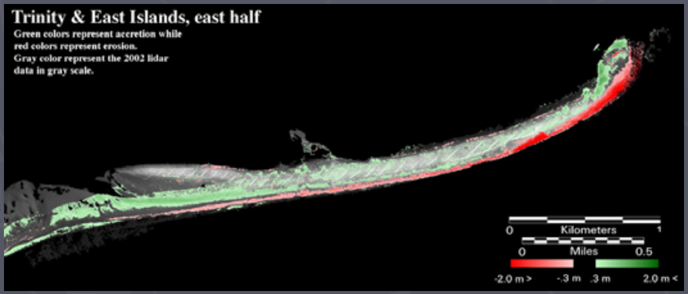


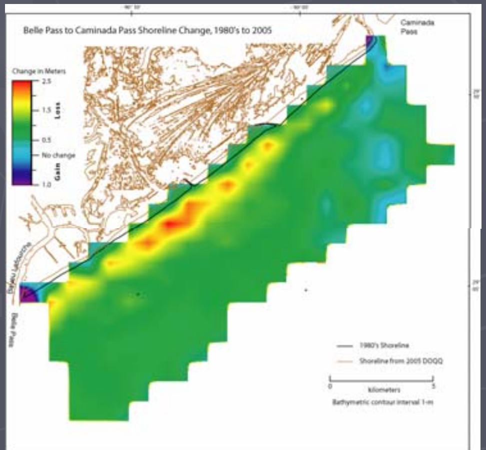
Bathymetric Change

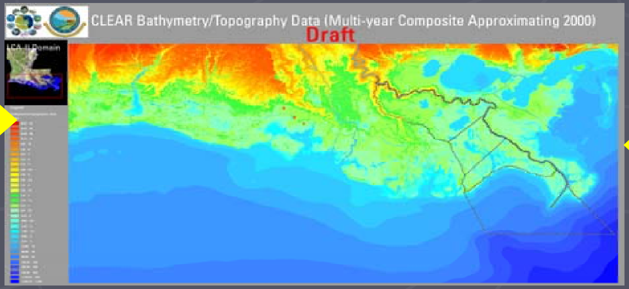


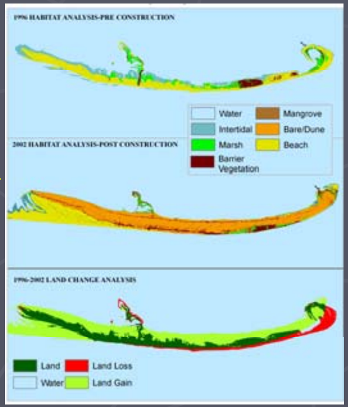
BICM Integration into SWAMP

- Improved Modeling grids
- Improved characterization of long shore sediment transports and sediment budgets
- Better understanding of processes on geomorphologic changes
- Ability to link hydrologic and storm surge models with biotic and physical landscape configuration










Questions ?