Feasibility Study for Modifications to Scott Creek

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Dept. of Natural Resources

DNR

Research Focus

- **Biology**
  - **Will the Marsh recover? How Fast?**
  - **How will the Fauna Change?**
- **Geology**
  - **What are Historical Sedimentation Rates?**
- **Hydrology**
  - **Which way will water flow?**
  - **What is the volume?**
  - **Will Channels Deepen?**
  - **Where should the bridge be?**

Cord grass

Spartina alterniflora

Juncus roemerianus

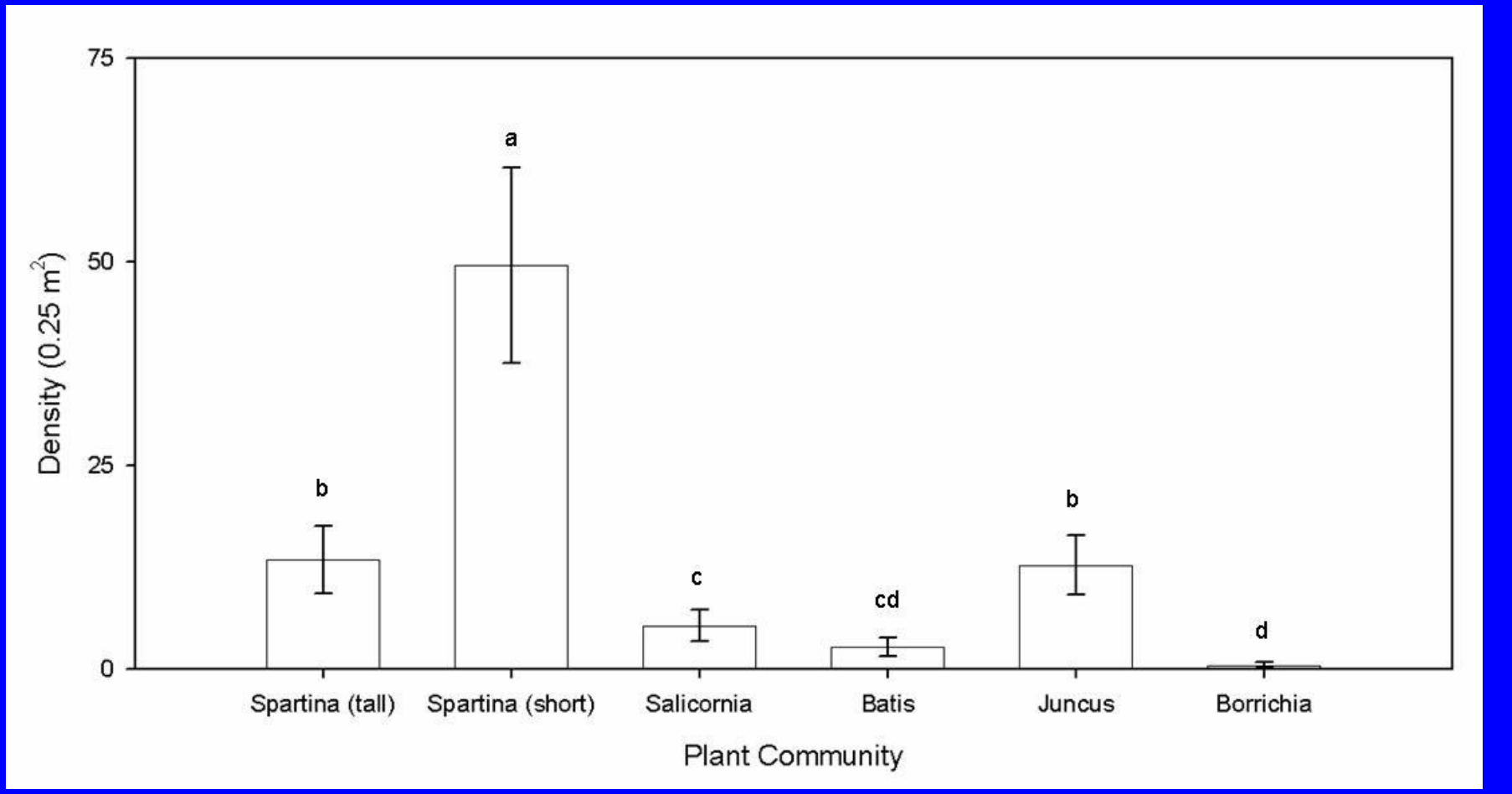
Borrichia frutescens

Upland

Water

Needle Rush

Bushy Sea Oxeye



Six Types of Plant Communities

Edisto Beach Causeway Plant Communities

N
W E
S

Polygon Color Code
White = Dead
Yellow = Sand
Blue = Open Water
Pink = Salicornia
Light Blue = Batis
Orange = Juncus
Red = Borrichia
Green Line or
Polygon = Spartina

By D.J. Gustafson & J. Kilheffer (June 2004)

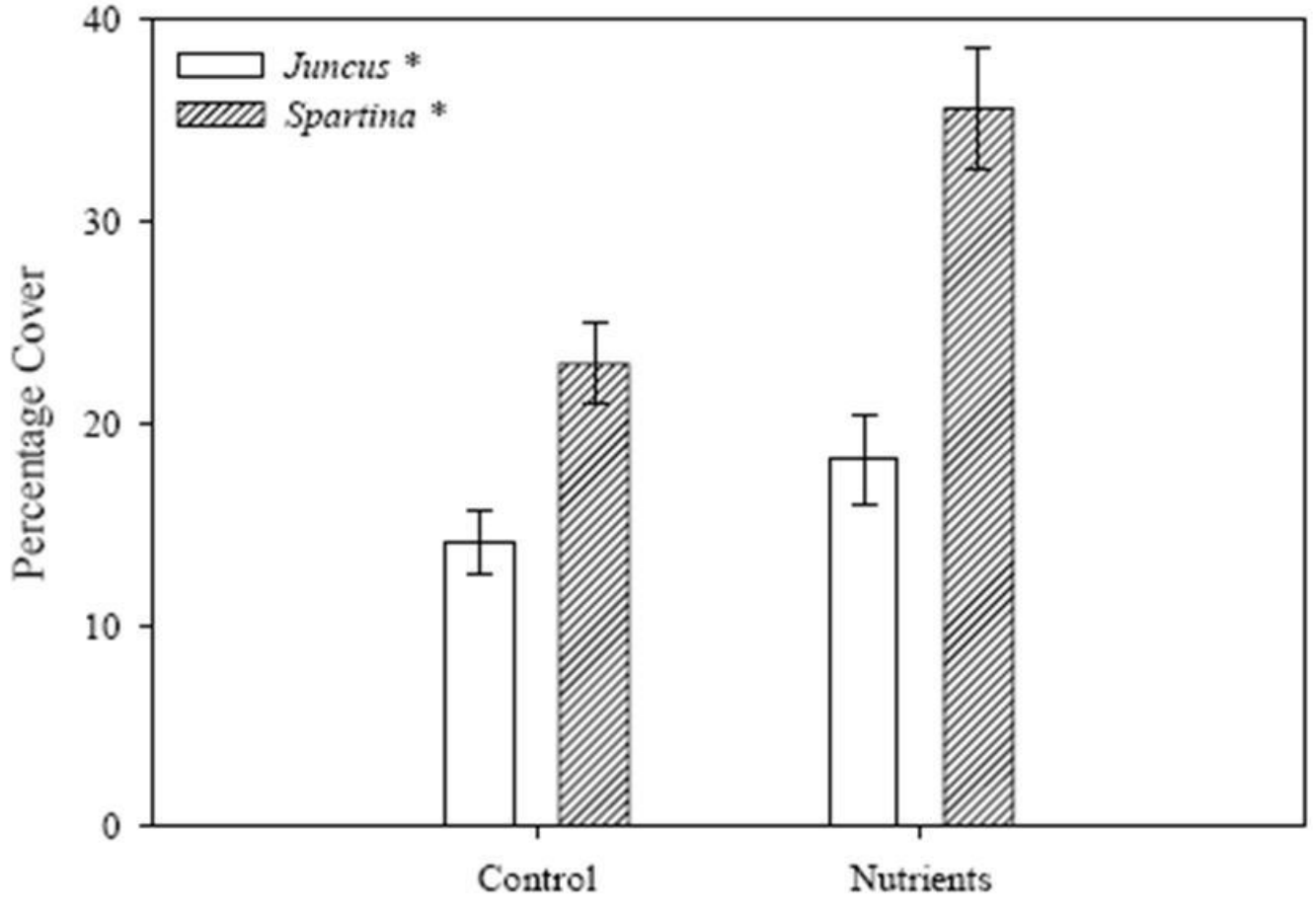
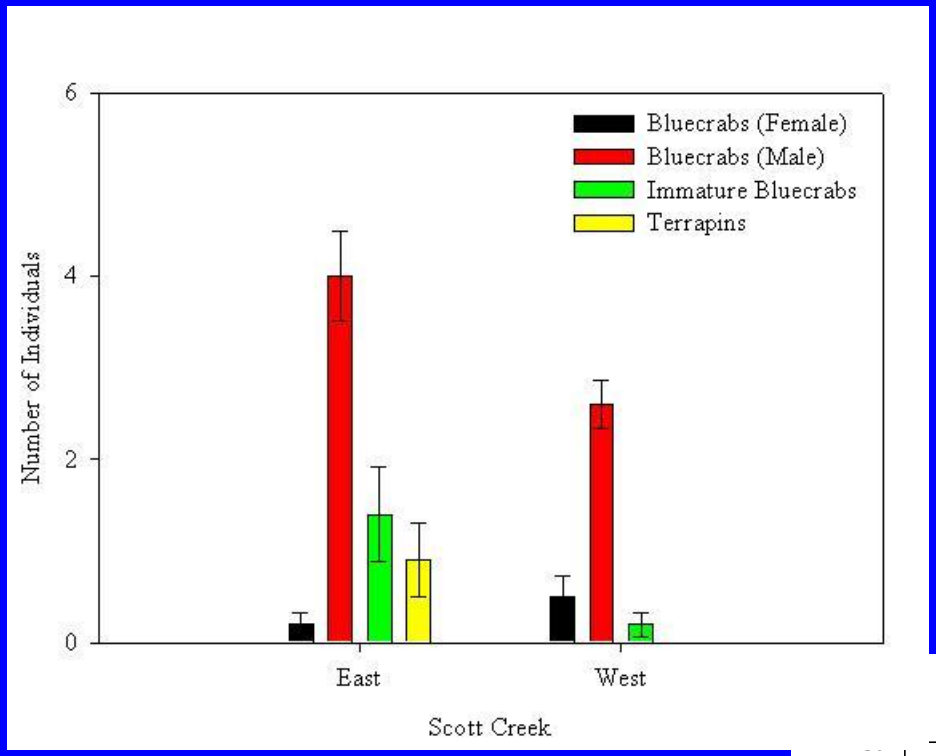


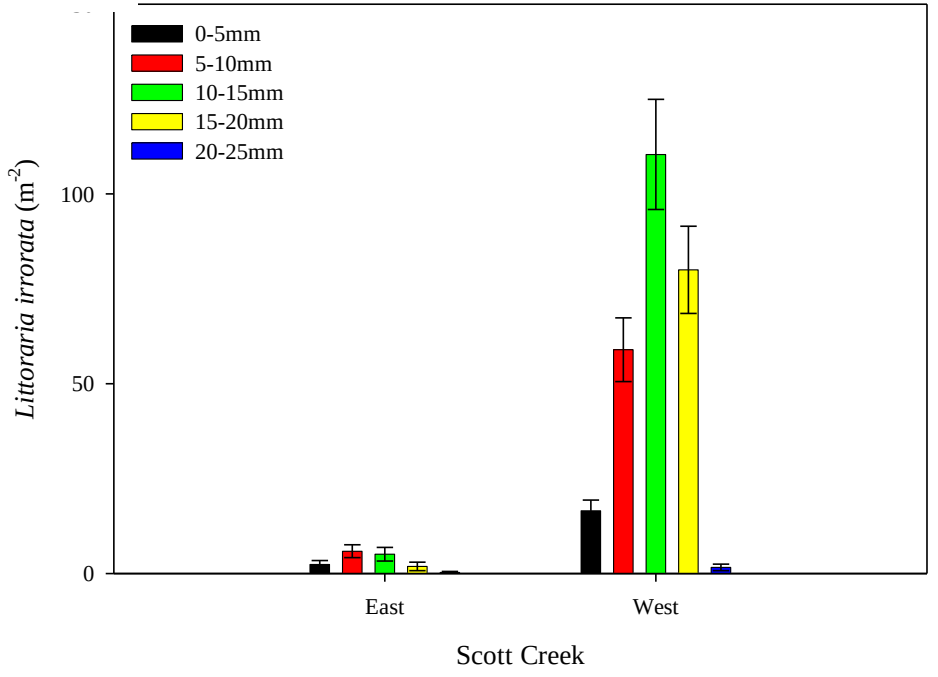
Figure 2. Response of *Juncus roemerianus* and *Spartina alterniflora* to a two year nutrient addition experiment in the Scott Creek marsh system, Edisto Beach, South Carolina. Both *Juncus* (t=3.67, d.f.=63, P=0.0005) and *Spartina*(t=5.30, d.f.=63, P<0.0001) responded positively to nutrient addition, however *Spartina* showed a much larger response.

Trapping Results



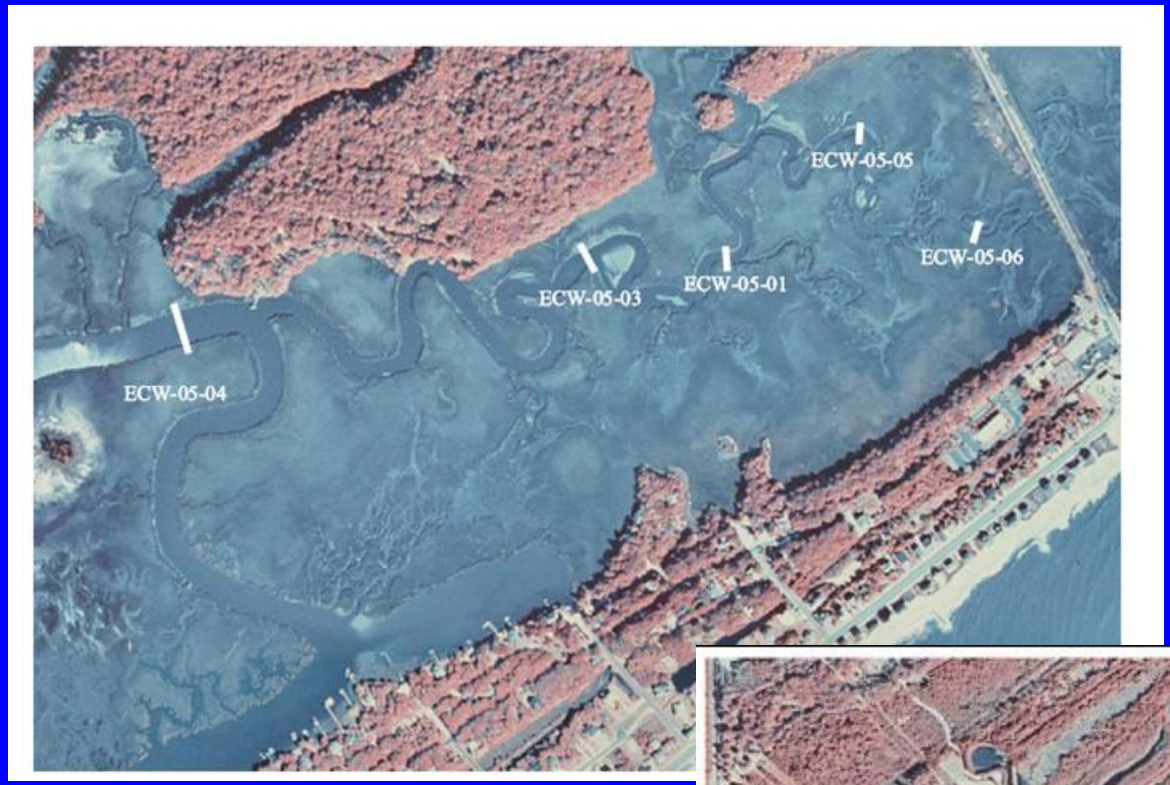
Blue Crab and Terrapin

Marsh Snails



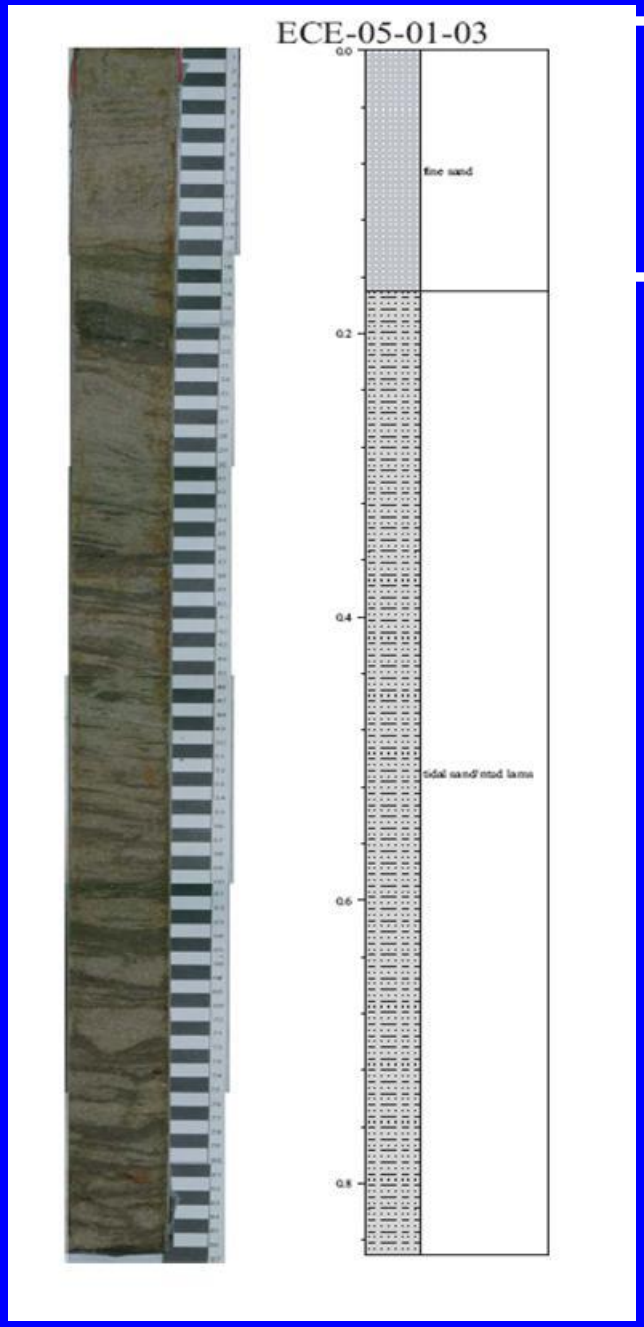
Biological Findings

- We predict a homogenizing of the animal communities once connectivity of Scott Creek is restored.
- Restoring the connectivity will result in expansion of the Spartina marsh as it outcompetes the other plant species.
- Overall primary productivity should increase -- providing a greater food base and more habitat for marine life.



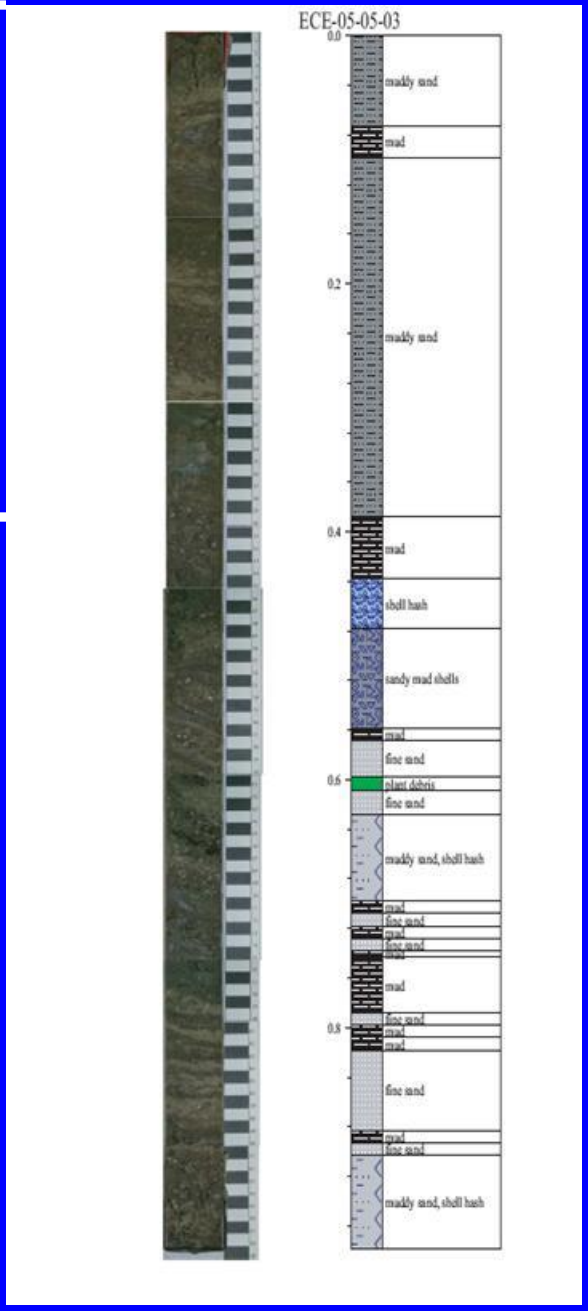
West Scott Creek

East Scott Creek



New Fine Sediments

East Side Cores



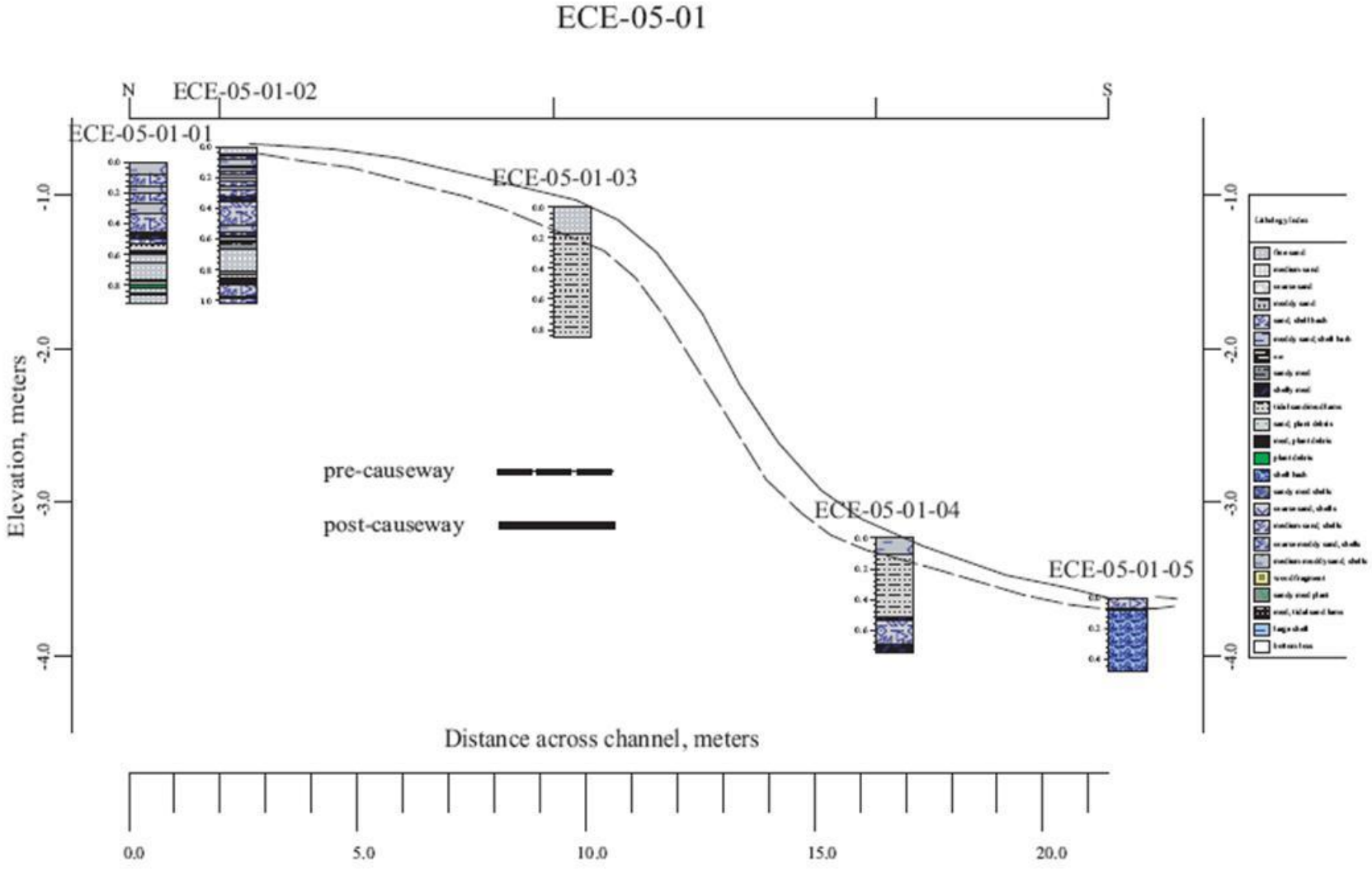


Figure 7. Interpreted pre and post causeway channel cross-section, transect ECE-05-01

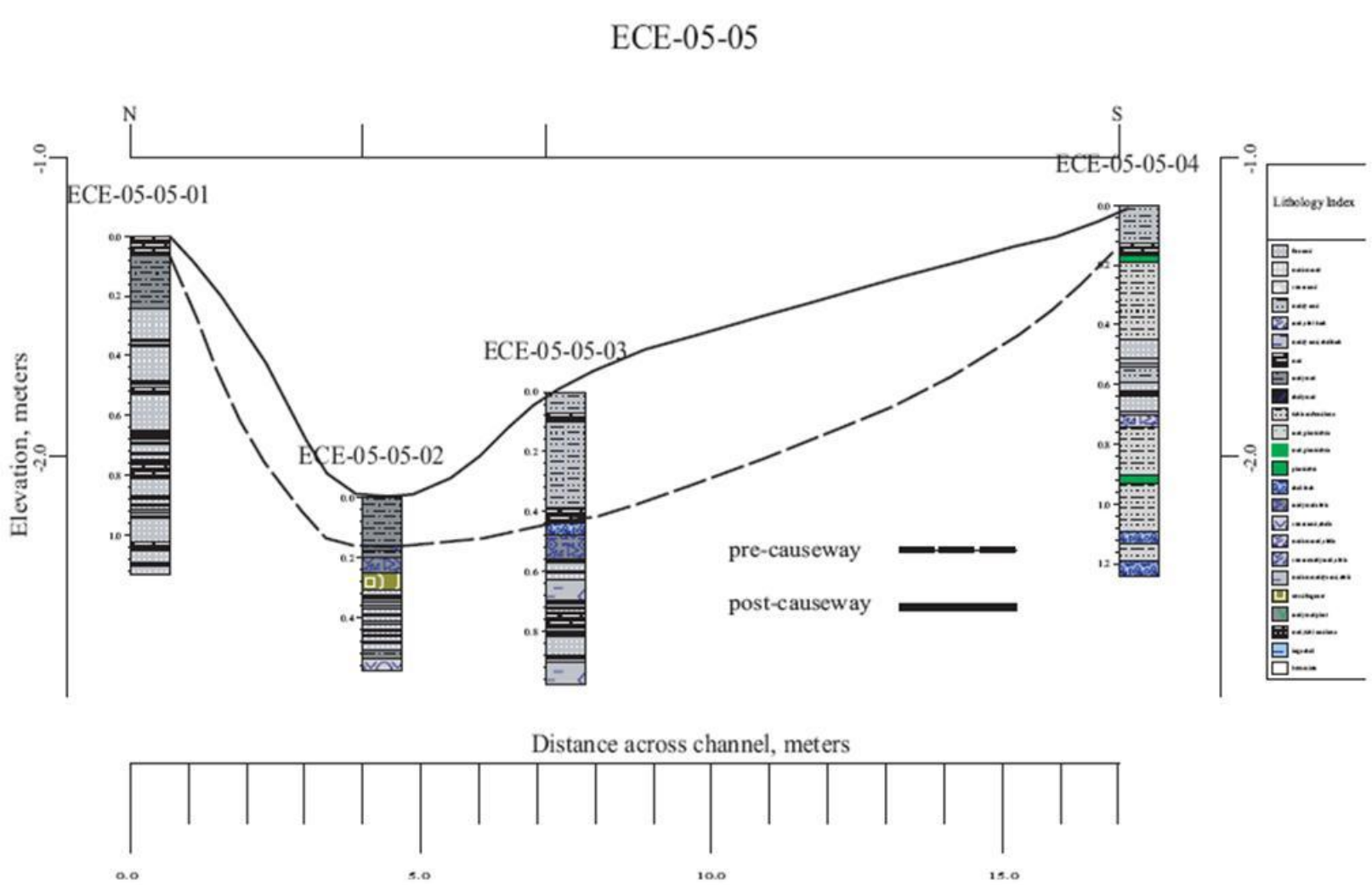
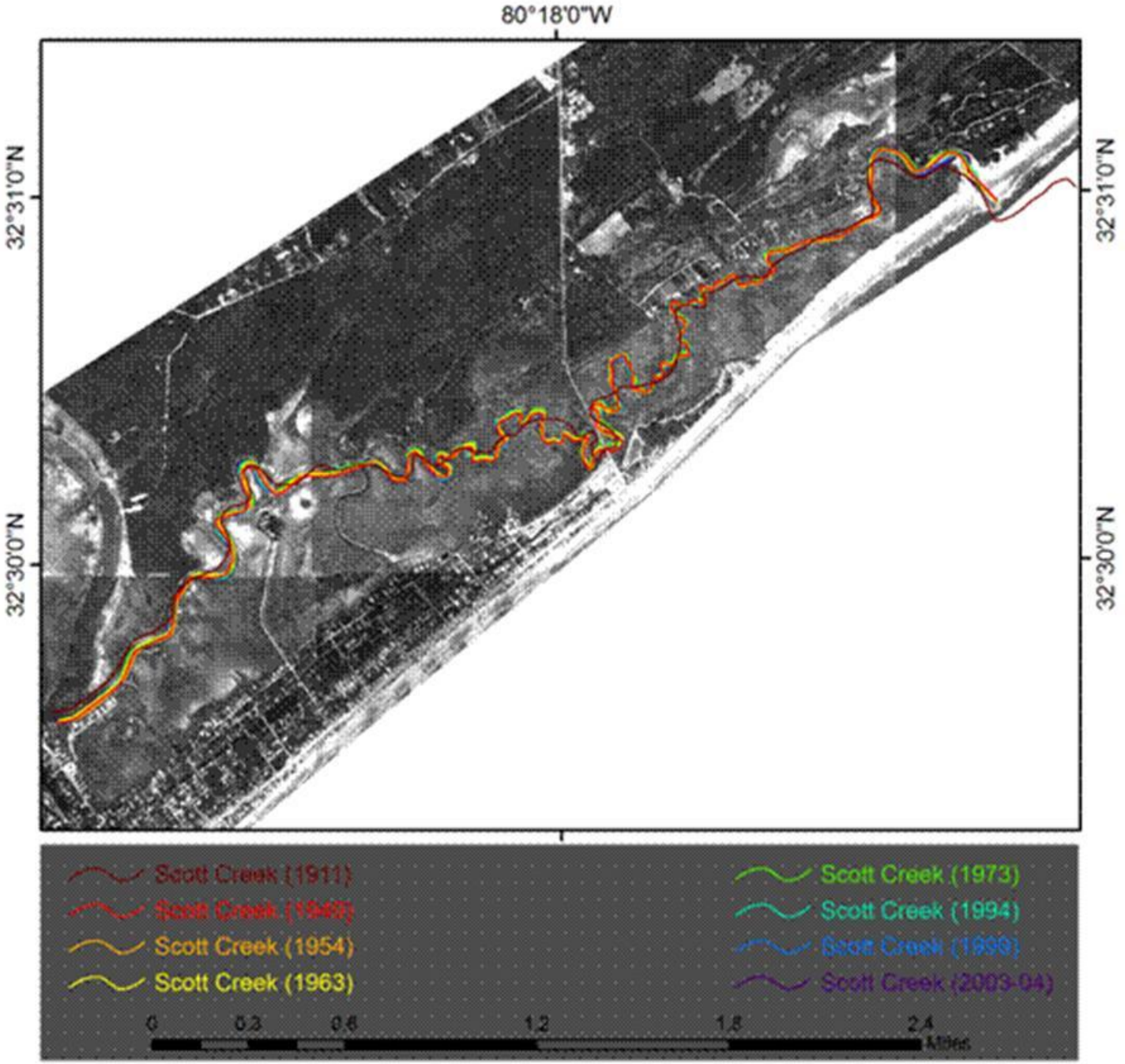


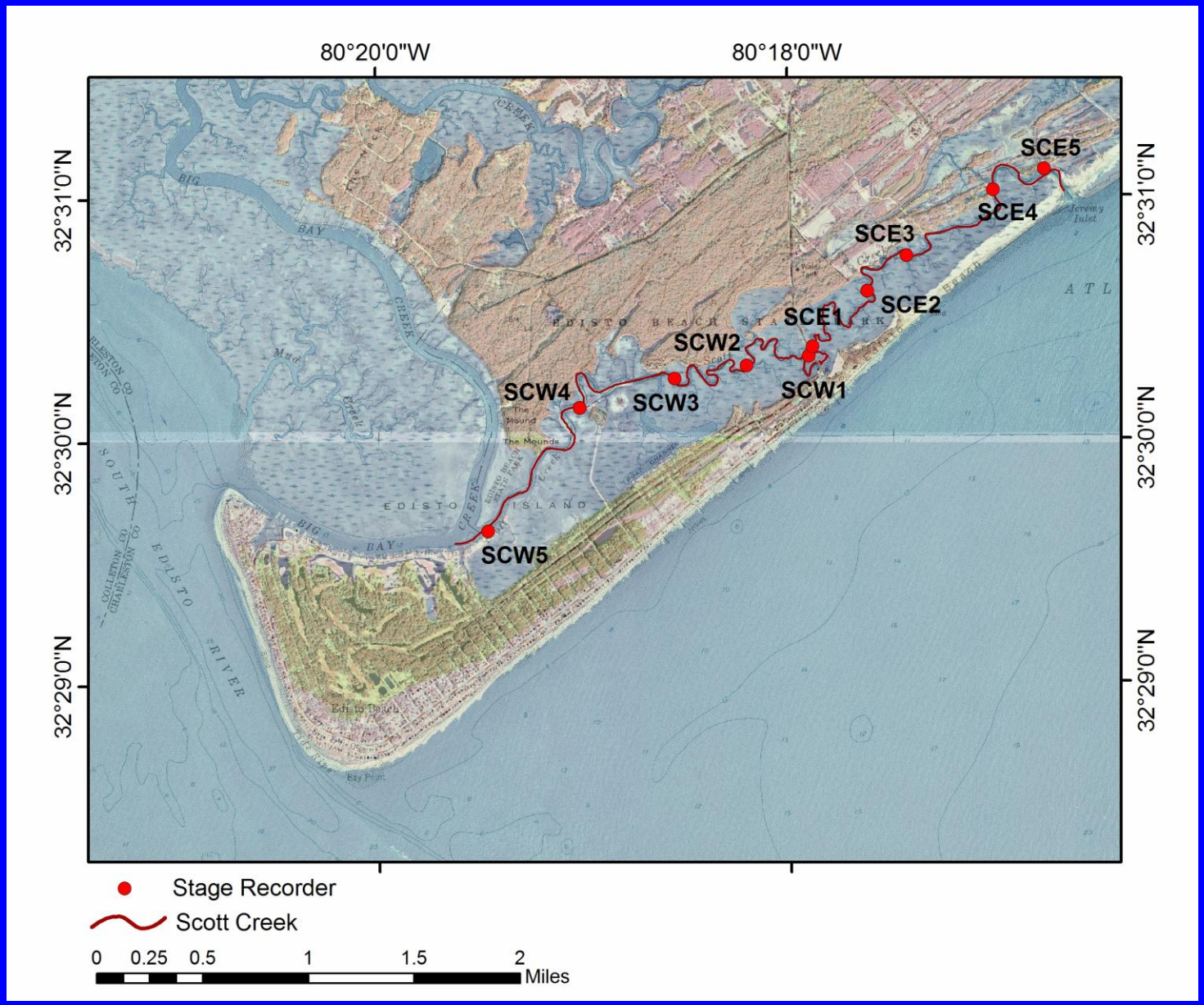
Figure 8. Interpreted pre and post causeway channel cross-section, transect ECE-05-05

Geological Findings

- Sediment size data indicate water flow velocity was reduced when the causeway was built.
- Cores indicate an abrupt change in side grain size, particularly on the East side, and the creek became shallower
- Opening the causeway would result in greater flow rates and cross sectional area of the creek.

East Scott Creek

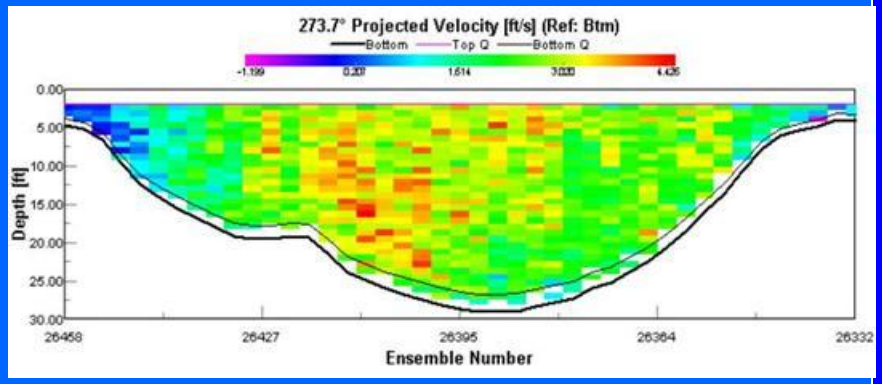


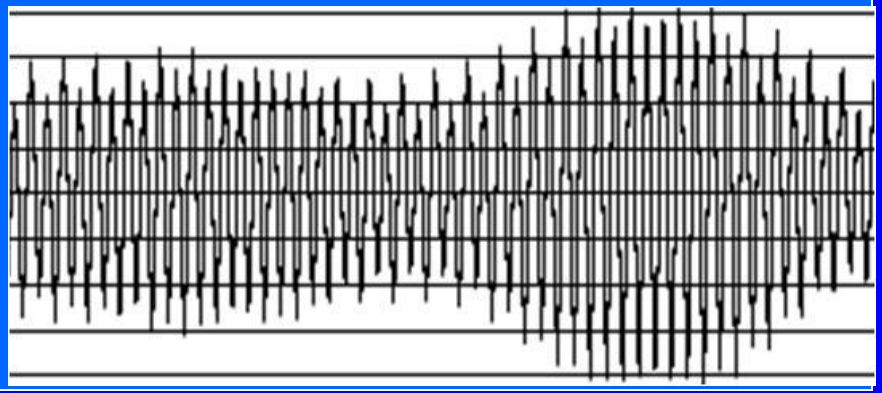


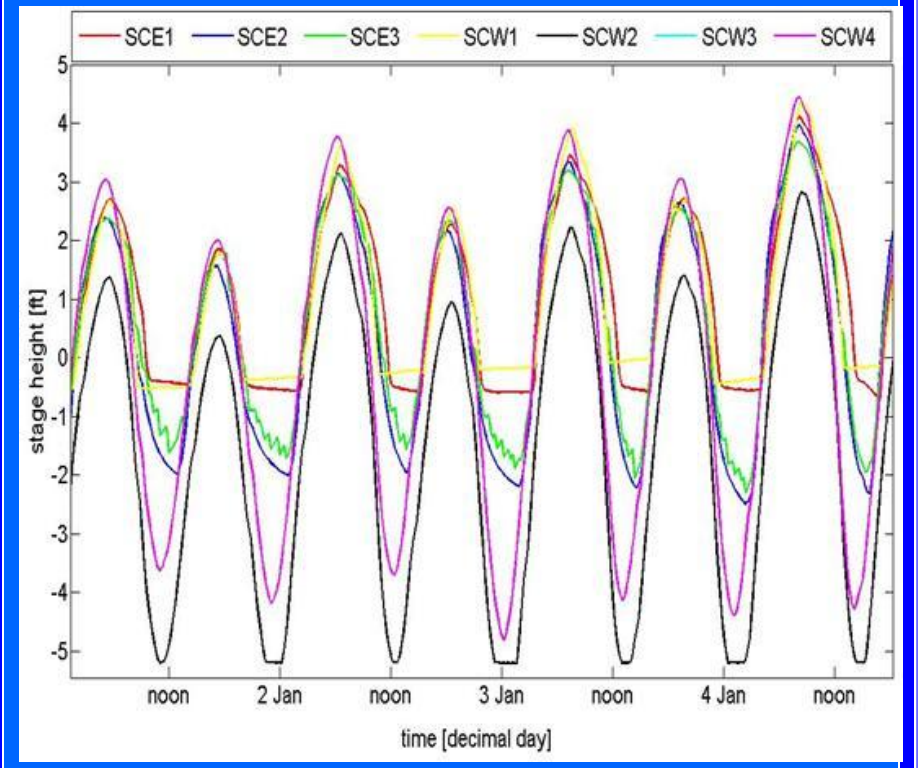
DNR Water Level Monitoring Stations

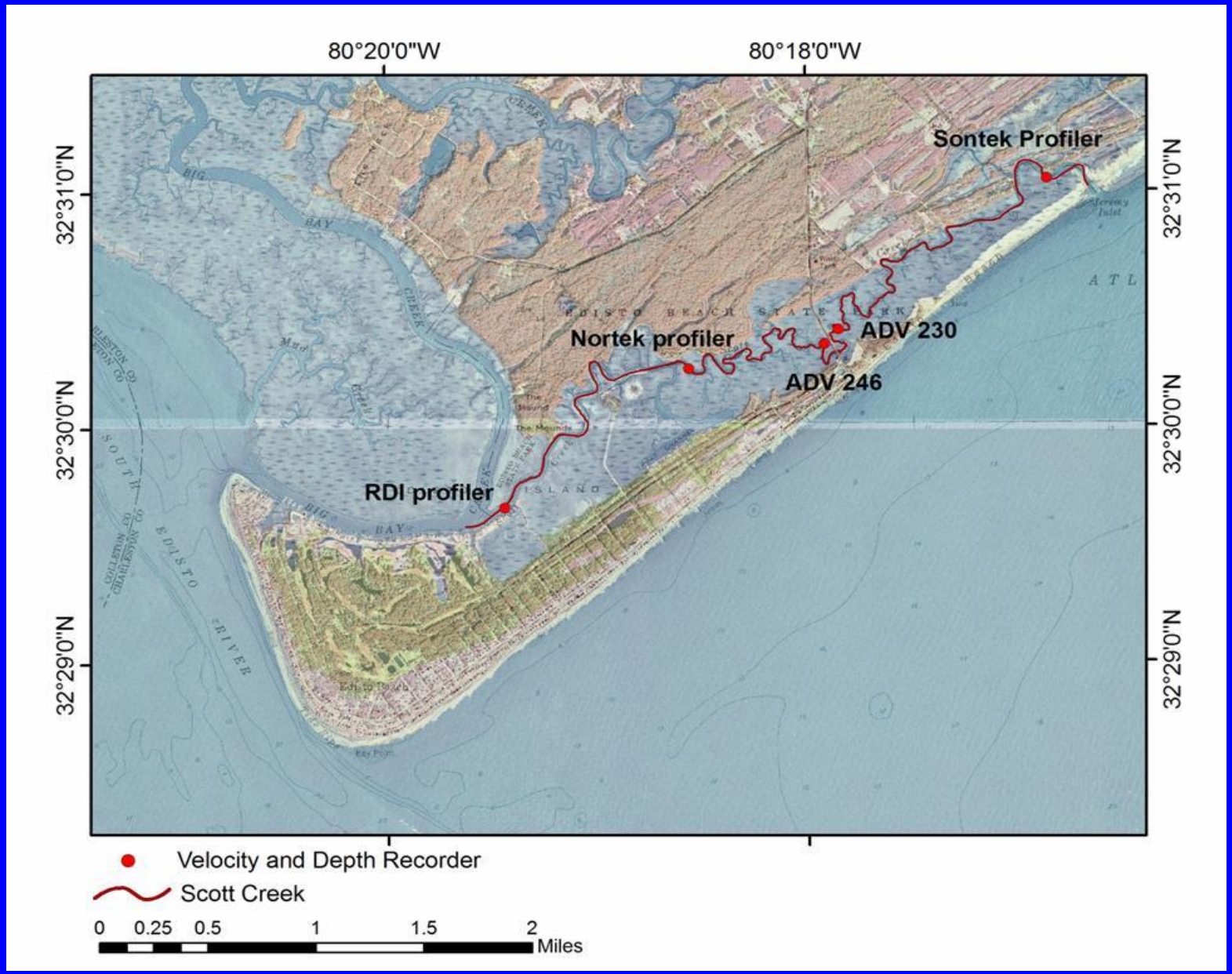
Acoustic Doppler Current Profiler (ADCP)


Stage height gauge on West Scott Creek,
near Big Bay Creek

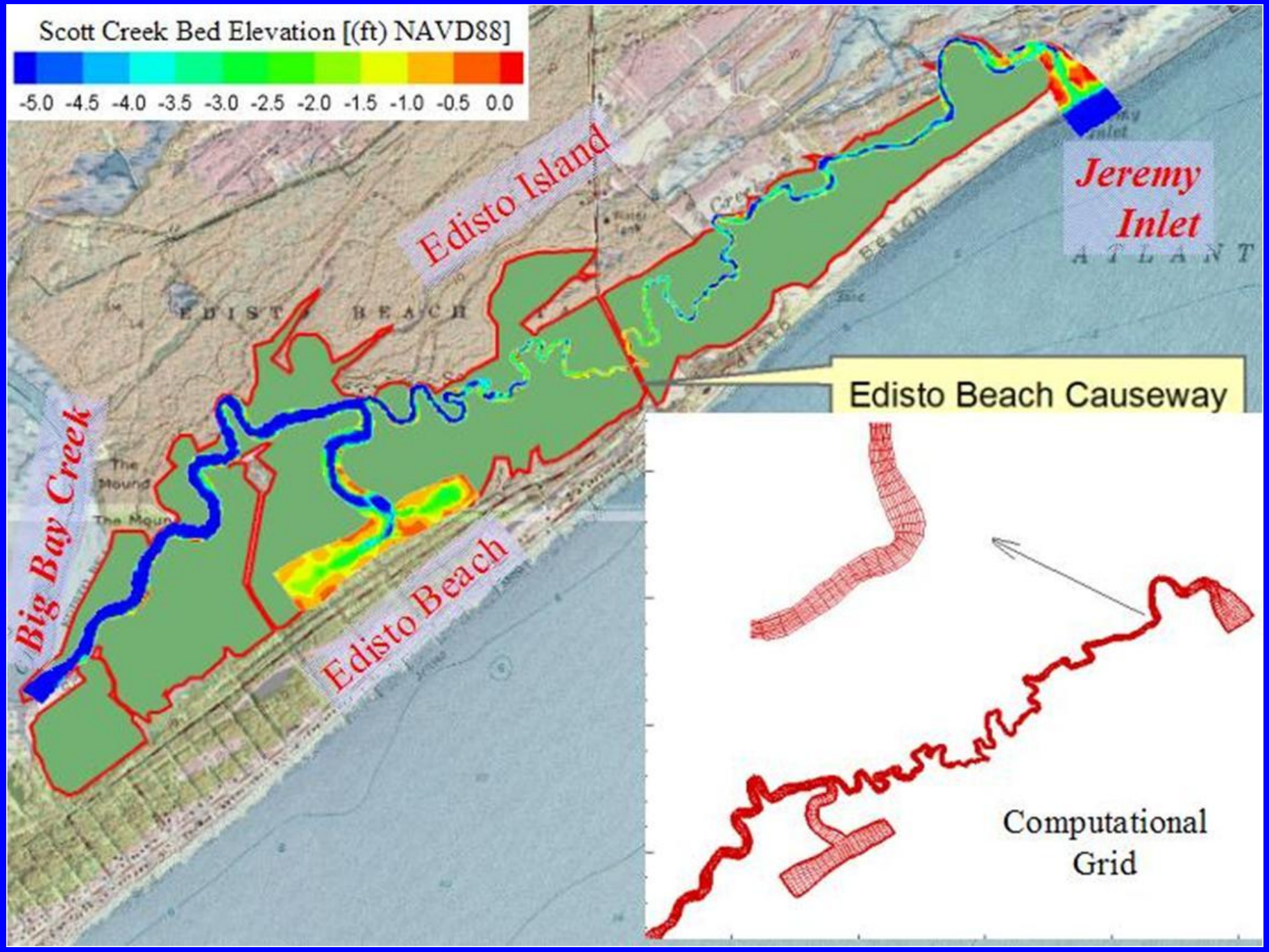

273.7° Projected Velocity [ft/s] (Ref: Btm)
Bottom
Top Q
Bottom Q
Depth [ft]
Ensemble Number

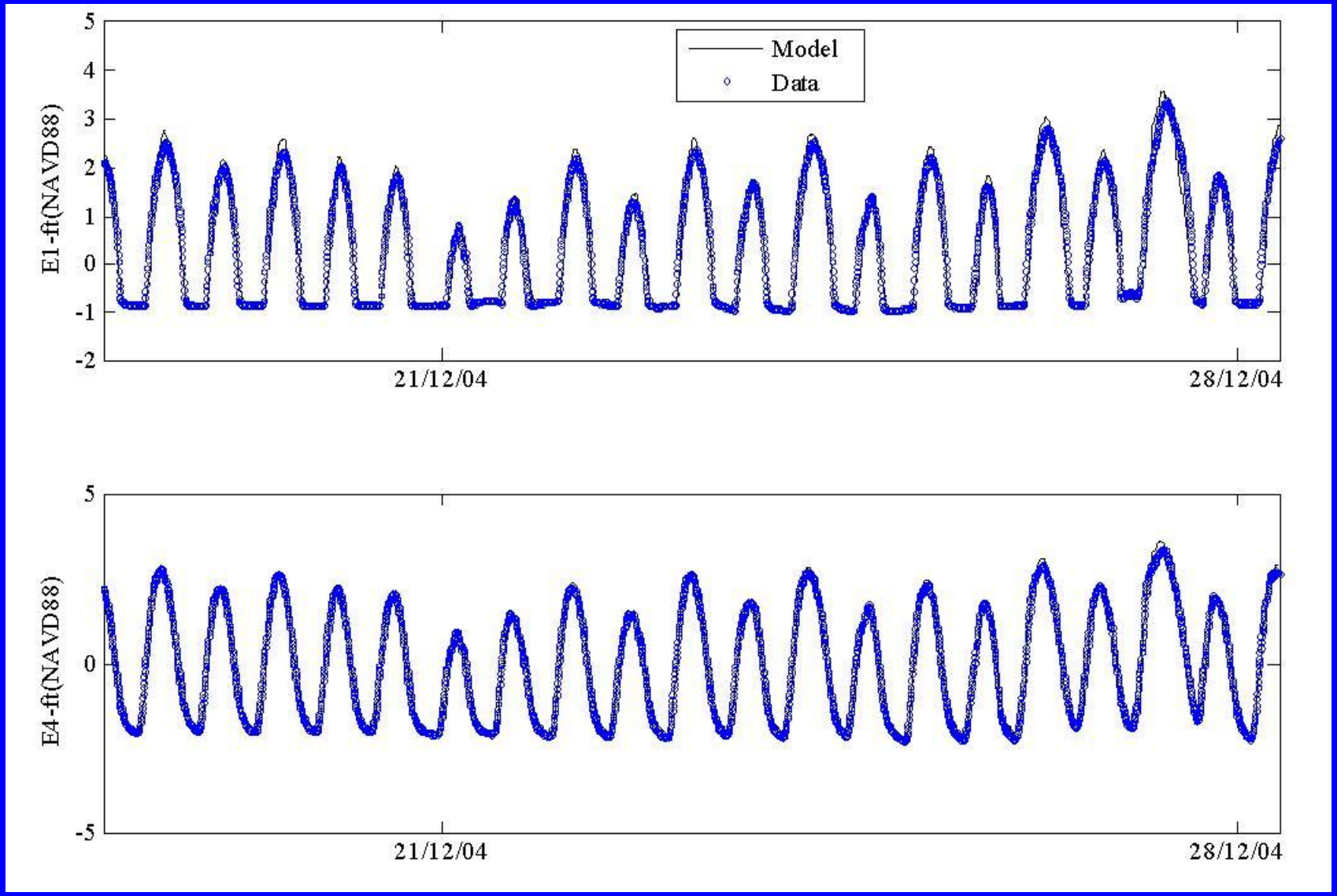



SCE1
SCE2
SCE3
SCW1
SCW2
SCW3
SCW4
stage height [ft]
noon
2 Jan
noon
3 Jan
noon
4 Jan
noon
time [decimal day]

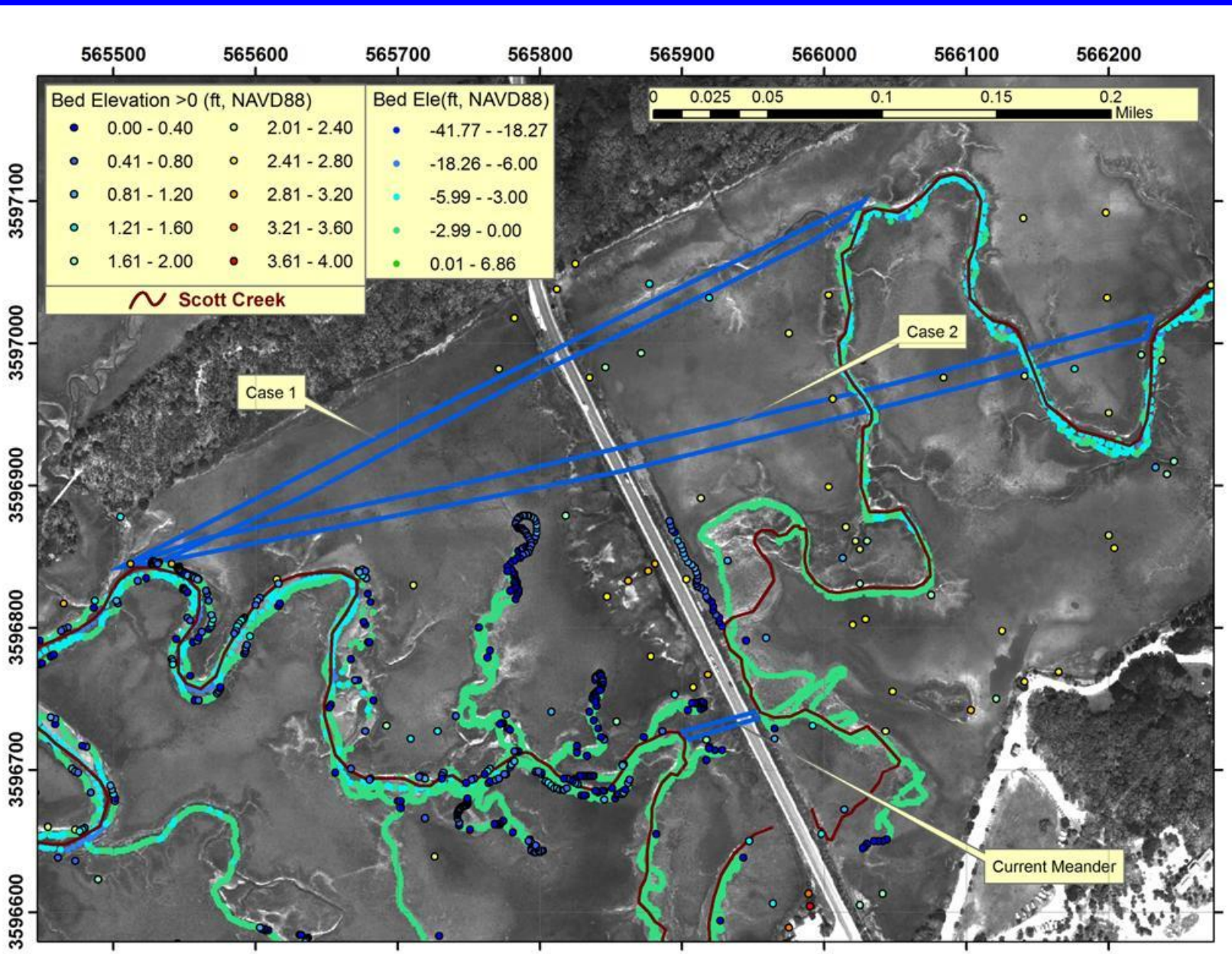


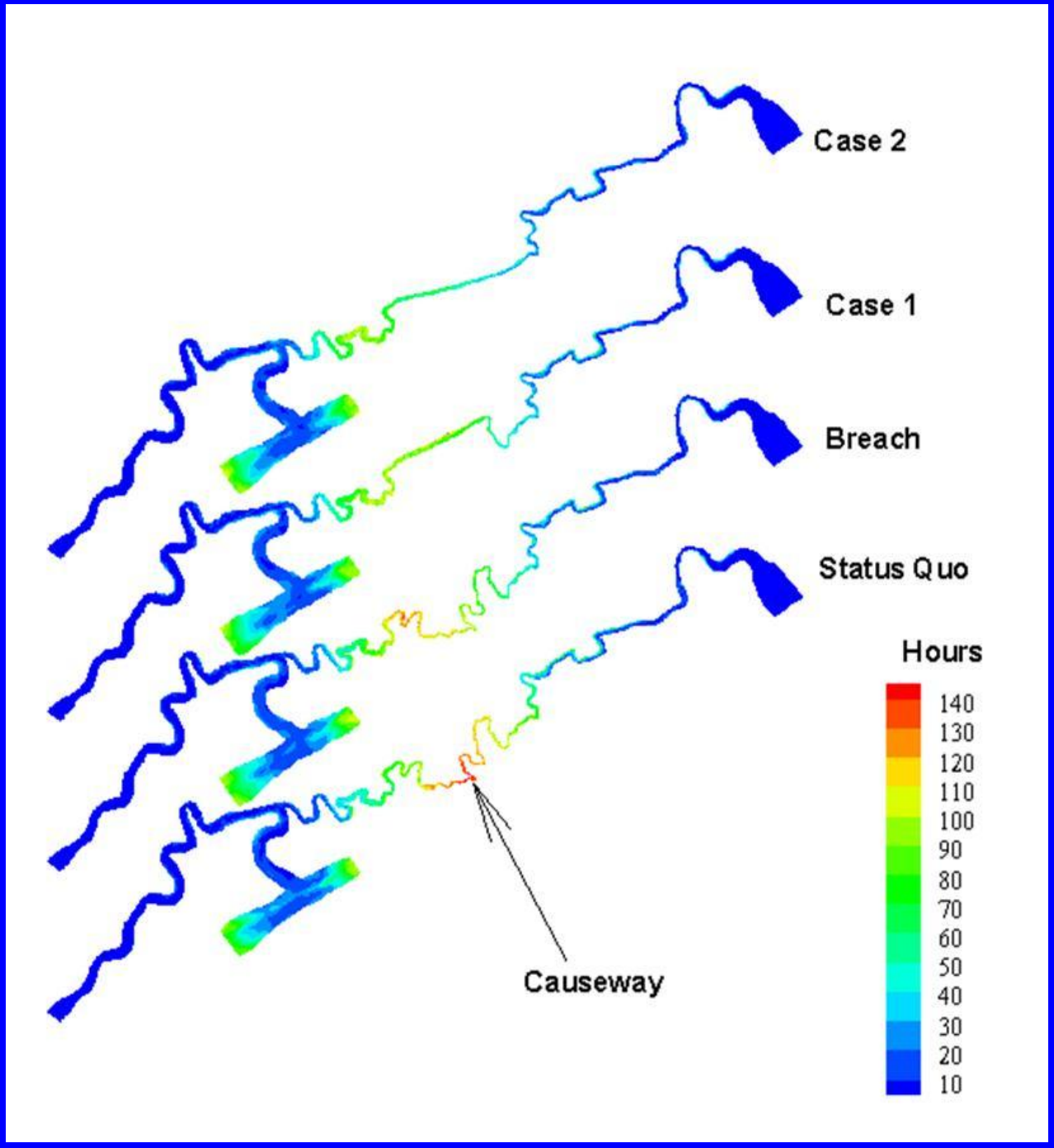
USC Velocity Monitoring Equipment


Scott Creek Bed Elevation [(ft) NAVD88]
-5.0 -4.5 -4.0 -3.5 -3.0 -2.5 -2.0 -1.5 -1.0 -0.5 0.0
Edisto Island
Jeremy Inlet
Big Bay Creek
Edisto Beach
Edisto Beach Causeway
Computational Grid



Comparison of Observed and Predicted Tidal Height At Two Locations

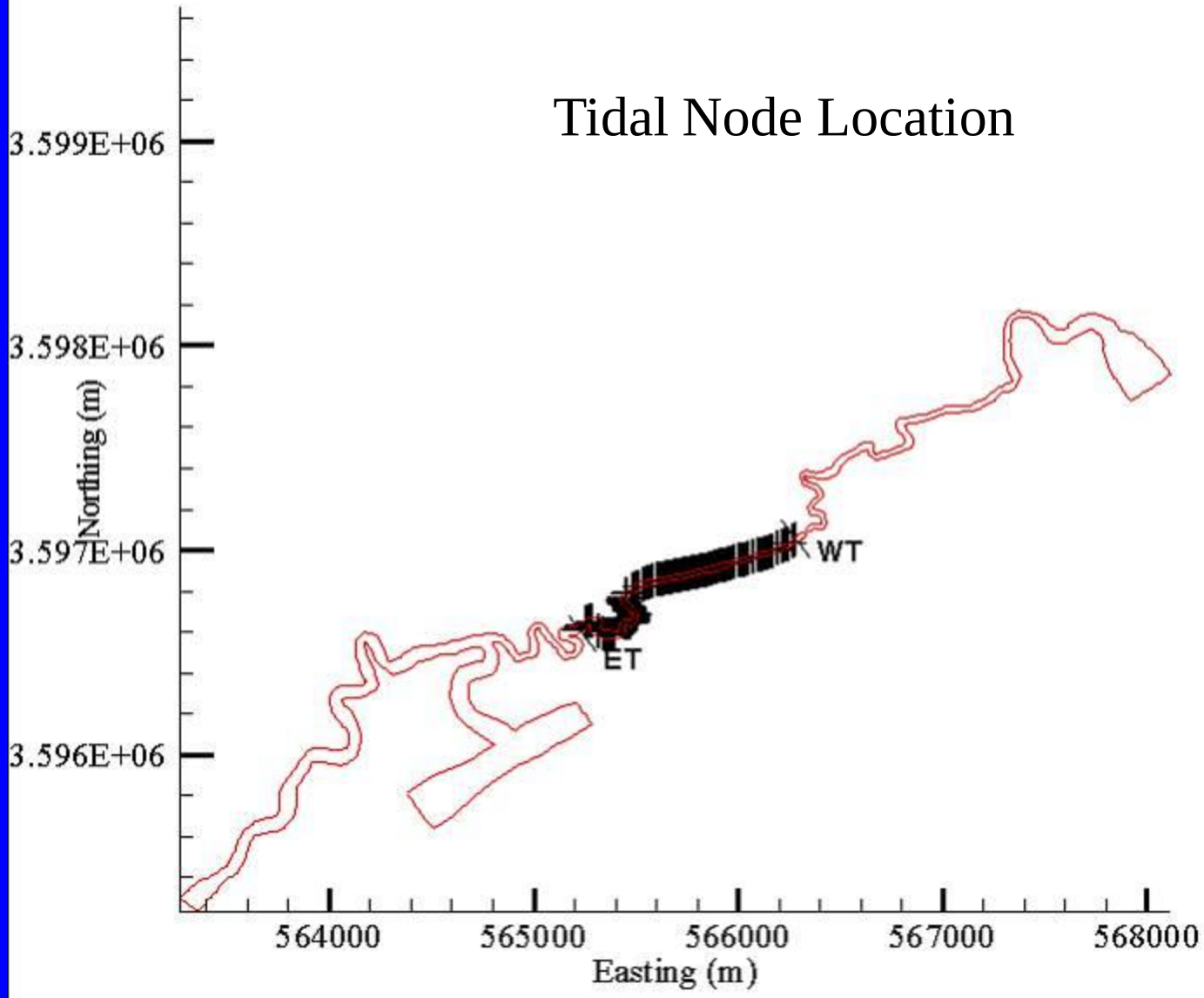

565500
565600
565700
565800
565900
566000
566100
566200
3597100
3597000
3596900
3596800
3596700
3596600
Bed Elevation >0 (ft, NAVD88)
0.00 - 0.40
0.41 - 0.80
0.81 - 1.20
1.21 - 1.60
1.61 - 2.00
2.01 - 2.40
2.41 - 2.80
2.81 - 3.20
3.21 - 3.60
3.61 - 4.00
Scott Creek
Bed Ele(ft, NAVD88)
-41.77 - -18.27
-18.26 - -6.00
-5.99 - -3.00
-2.99 - 0.00
0.01 - 6.86
0 0.025 0.05 0.1 0.15 0.2
Miles
Case 1
Case 2
Current Meander



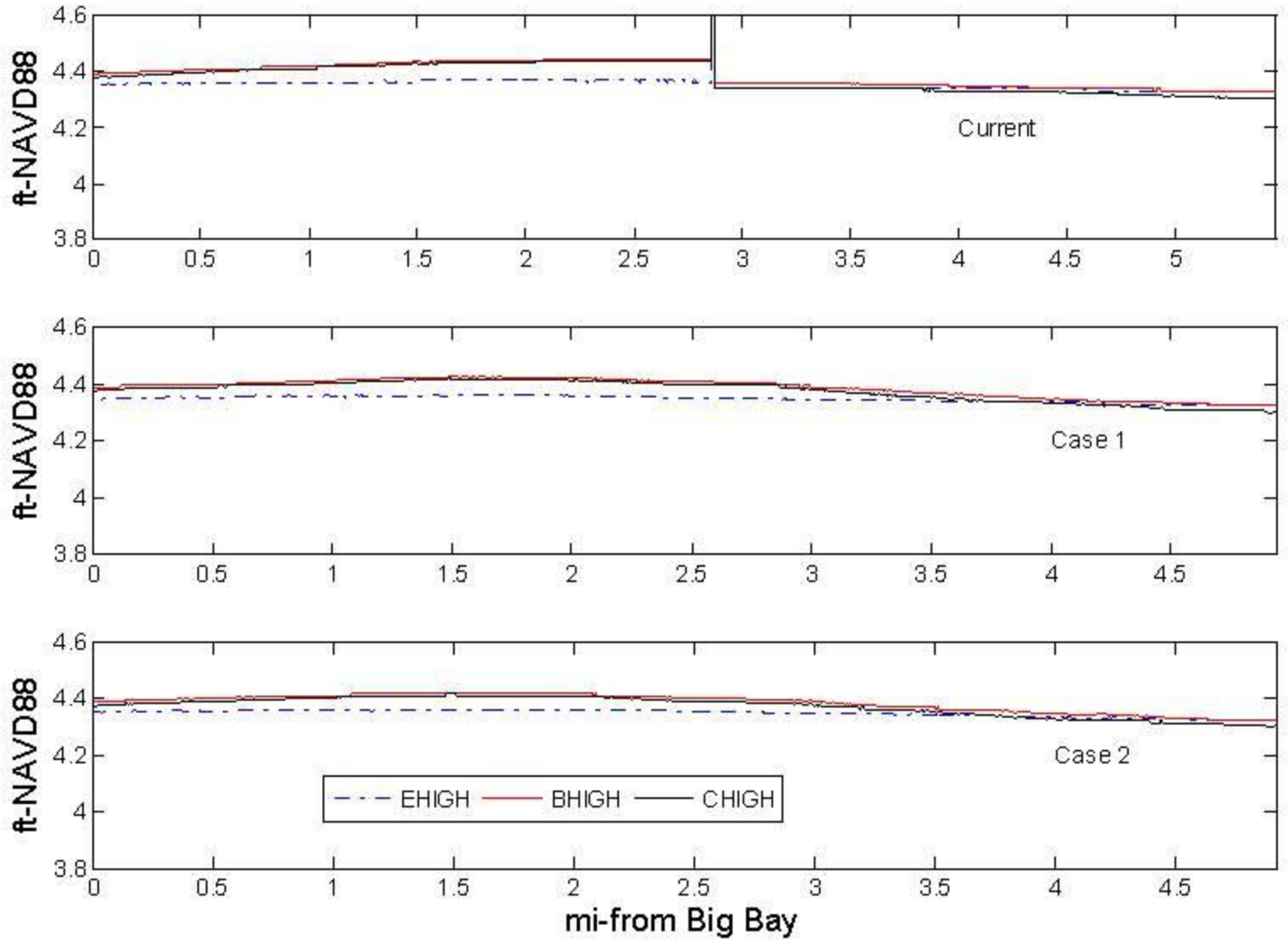
Residence Time Of Water in Hours

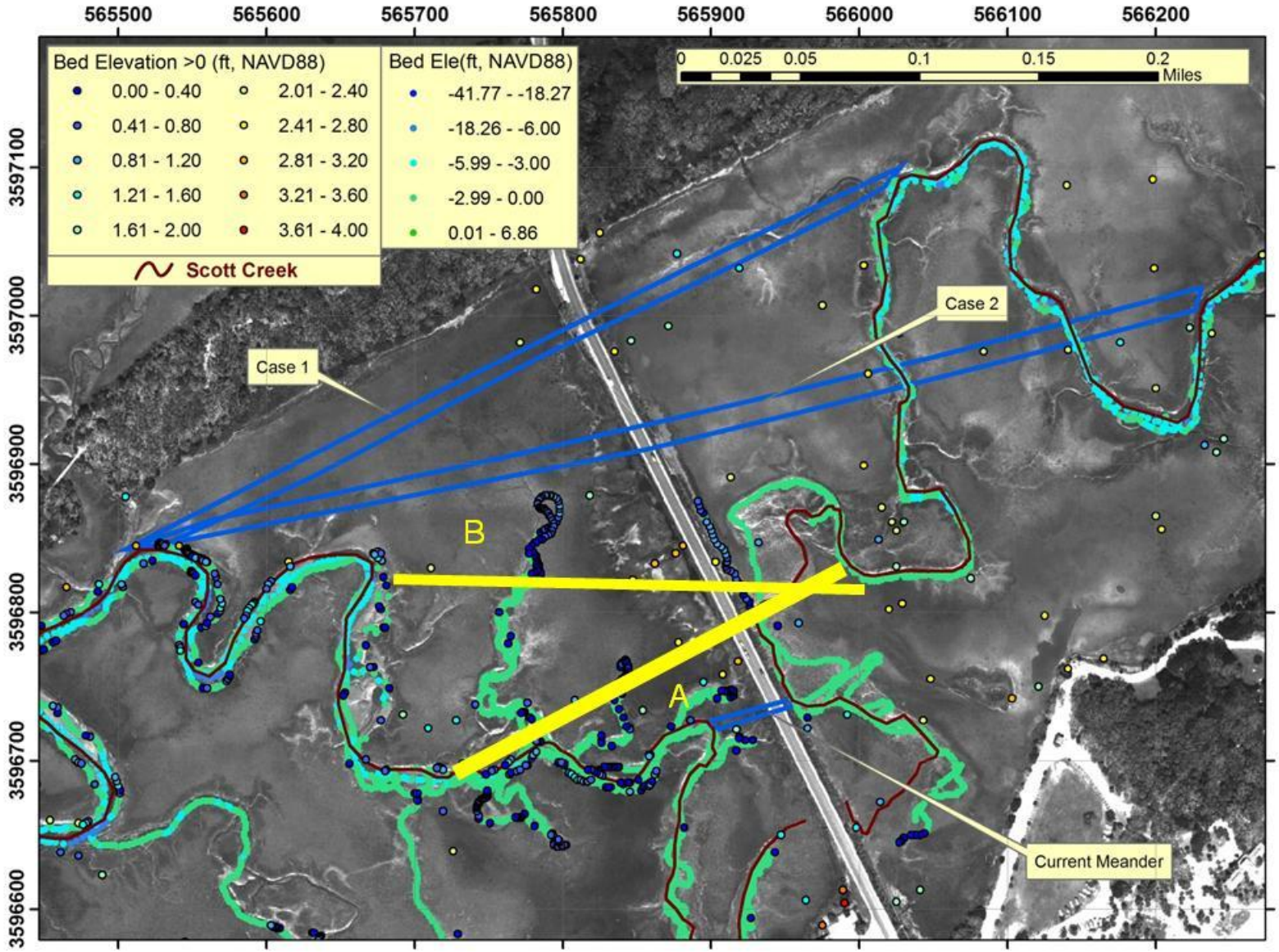
Red = Longer Flushing Times

Tidal Node Location



Current and Predicted Water Height Levels




565500
565600
565700
565800
565900
566000
566100
566200
3597100
3597000
3596900
3596800
3596700
3596600
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0.81 - 1.20
1.21 - 1.60
1.61 - 2.00
2.01 - 2.40
2.41 - 2.80
2.81 - 3.20
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3.61 - 4.00
Scott Creek
Bed Ele(ft, NAVD88)
-41.77 - -18.27
-18.26 - -6.00
-5.99 - -3.00
-2.99 - 0.00
0.01 - 6.86
0 0.025 0.05 0.1 0.15 0.2
Miles
Case 1
Case 2
B
A
Current Meander

Hydrological Conclusions

- Breaching the Causeway will improve flushing times which will improve water quality
- Flood tide water would flow past the causeway to the west and then to the east
- Water surface levels would be essentially unchanged if the causeway were breached

Hydrological Conclusions

- Breaching would result in about a 15-17% more water moving through Jeremy Inlet with an increase in velocity of 1-3.5%
- To support navigation, 3.5 feet of sediment must be dredged for a distance of 0.4 to 0.6 miles, although shorter routes should be explored

Overall Conclusion

- Breaching the causeway would have a positive biological impact – improving water quality, providing more marine habitat, and improving system productivity
- Breaching the causeway is viable from a hydrodynamic perspective – the water will flow past the causeway