A Sedimentological and Granulometric Atlas of the Beach Sediments of Florida's East Coast

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The Florida Geological Survey

Coastal Research Program

under a cooperative agreement with

The National Oceanic and Atmospheric Administration

Florida's Beaches & Dunes

- Provide a buffer between the sea and urban coastal regions
- Important wildlife habitats
- Provide valuable recreation areas
- Integral part of Florida's economy

Sampling Summary

- 400 Beach Sampling Locations
- One Location on Cumberland Island, GA
- Samples Collected at One Mile Intervals
- 842 Samples were Collected and Described
- 609 were Granulometrically Analyzed

Catalogue of Beach Sediments

- Sample Descriptions
- Munsell Color Values
- Grain Size Statistics
- Carbonate Percentages
- Site and Sample Photographs
- Photomicrographs of Select Samples

The atlas provides a snap shot in time of the sediments of the beaches of the east coast of Florida.

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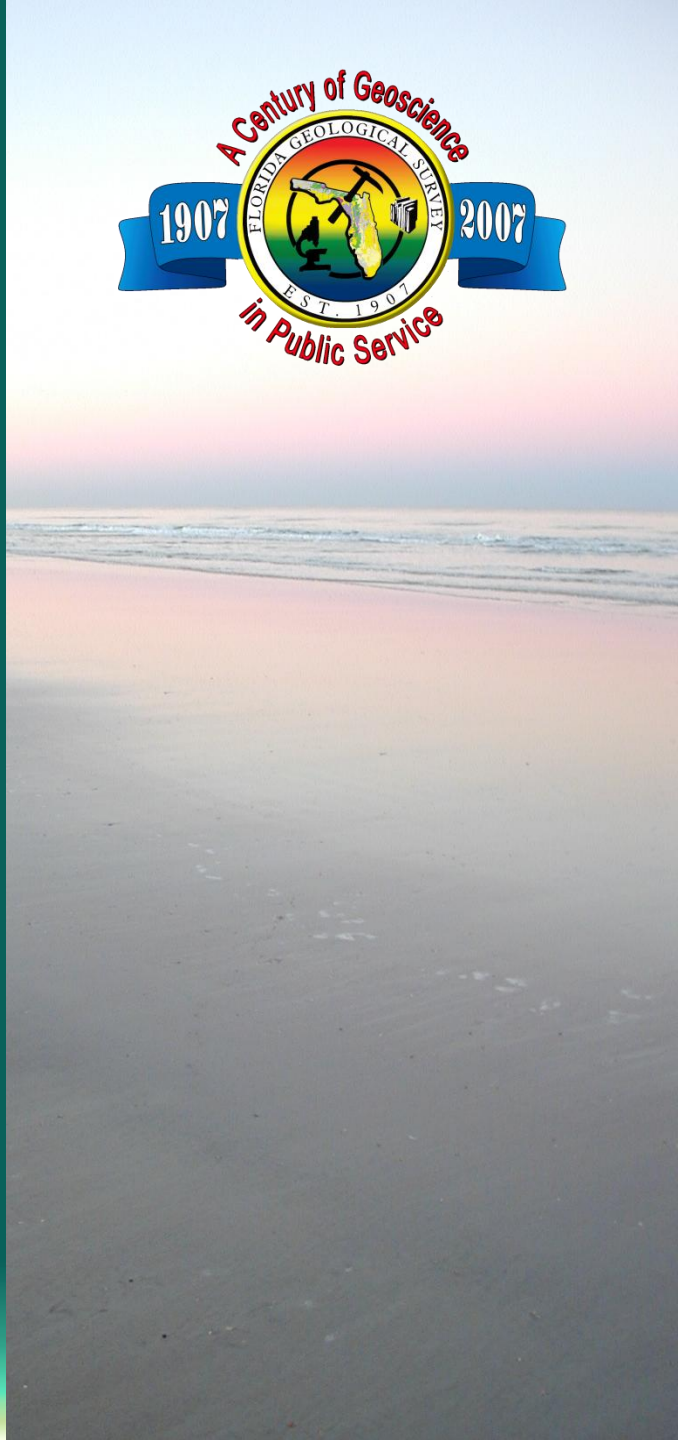
Florida's east coast has some beaches where the armored sections are quite long.

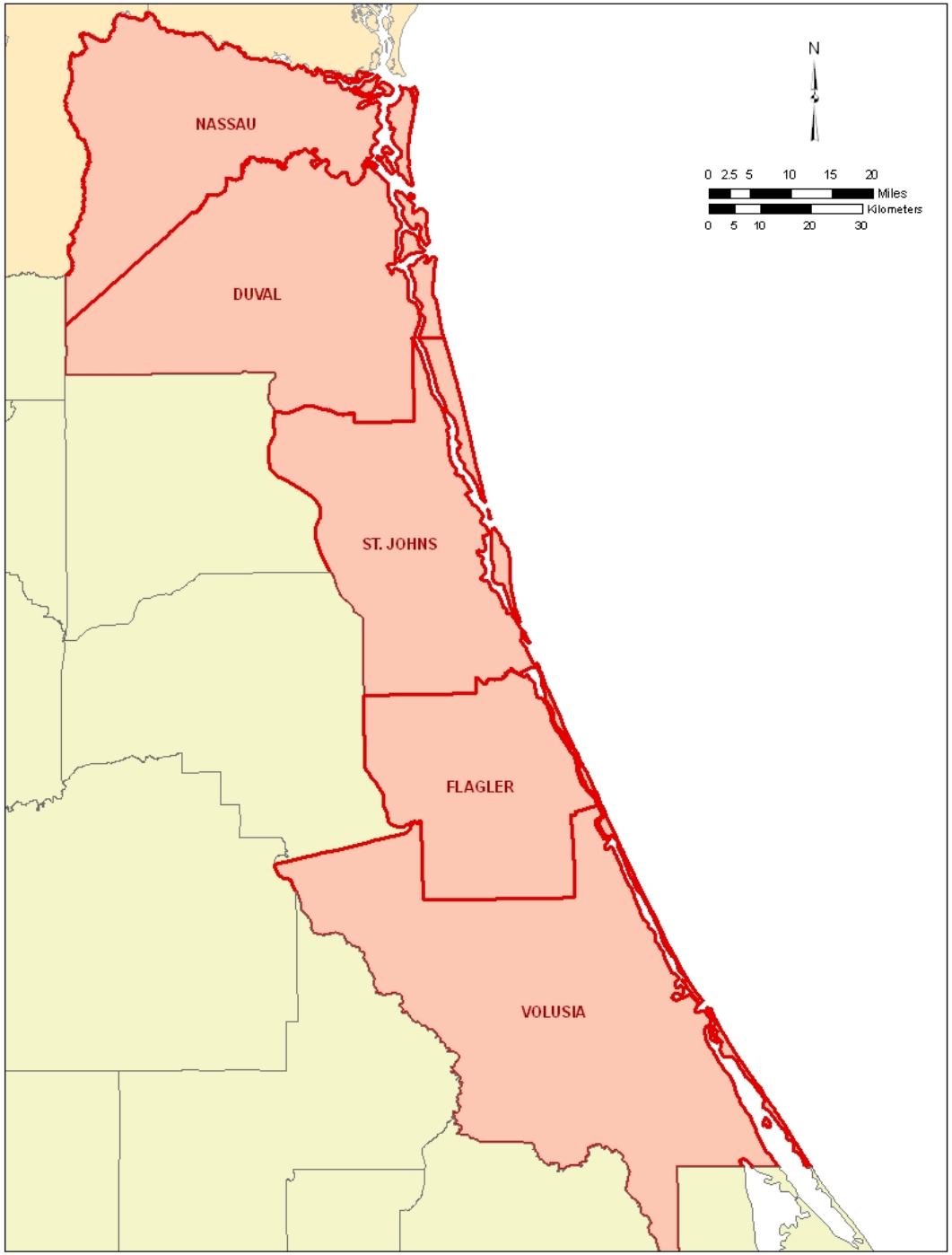
Erosion is evident and in some areas substantial

Some narrow barrier islands on Florida's east coast experience over wash during storm events.

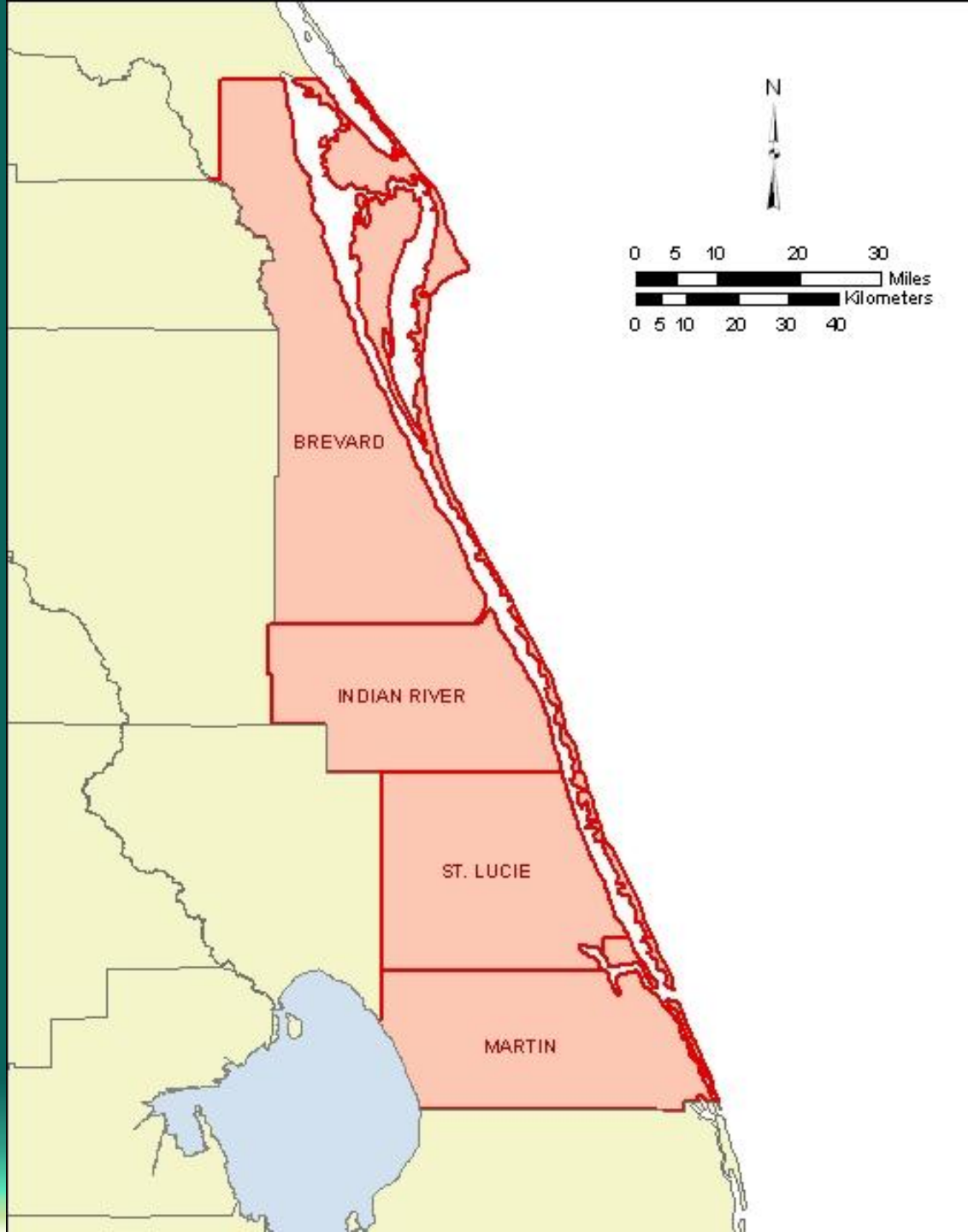
Beach Sediment Sample Collection



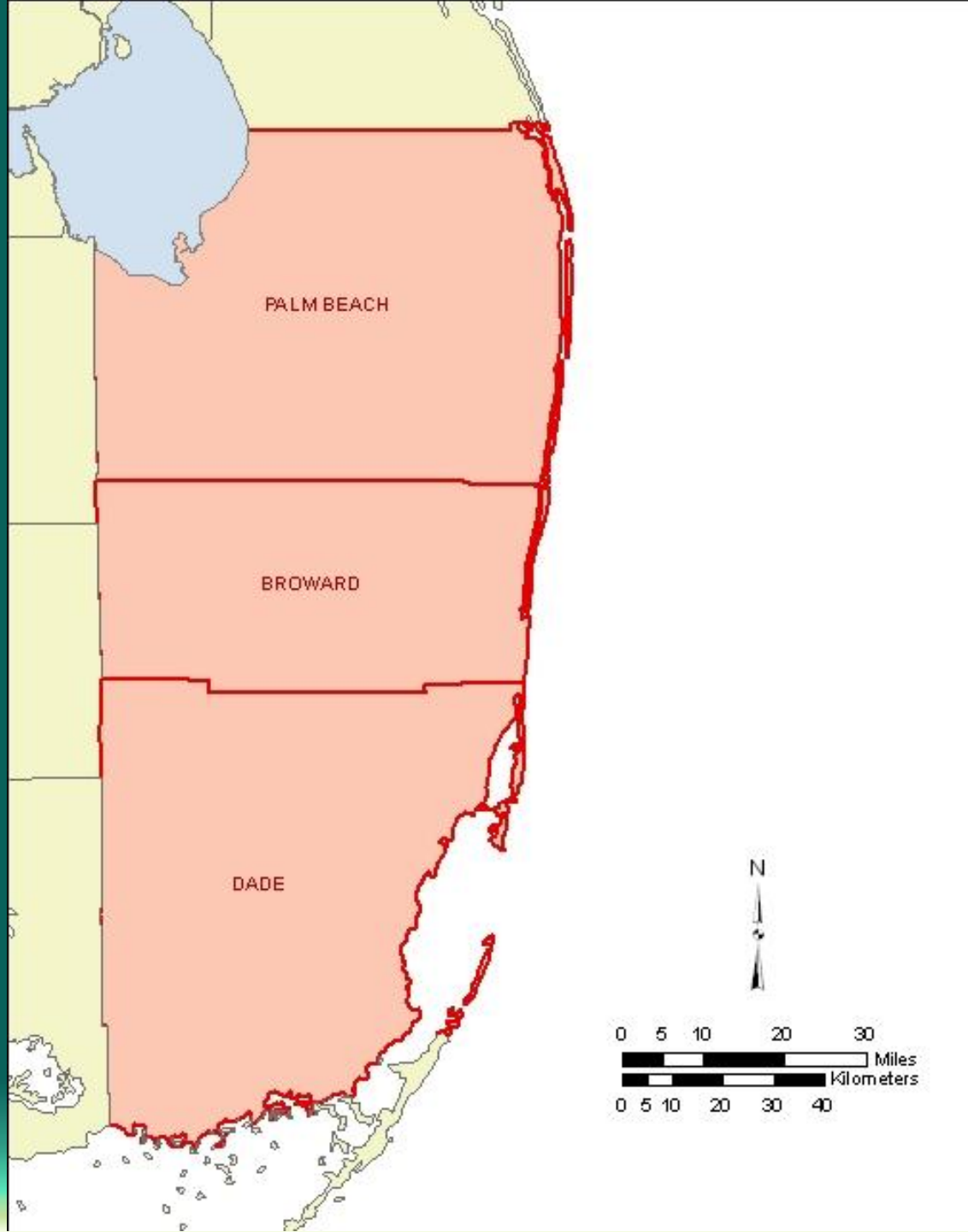
From 2002 – 2004, samples were collected from Nassau, Duval, St. Johns, Flagler, and Volusia Counties



In Fall 2008, samples were collected from Brevard, Indian River, St. Lucie, and Martin Counties

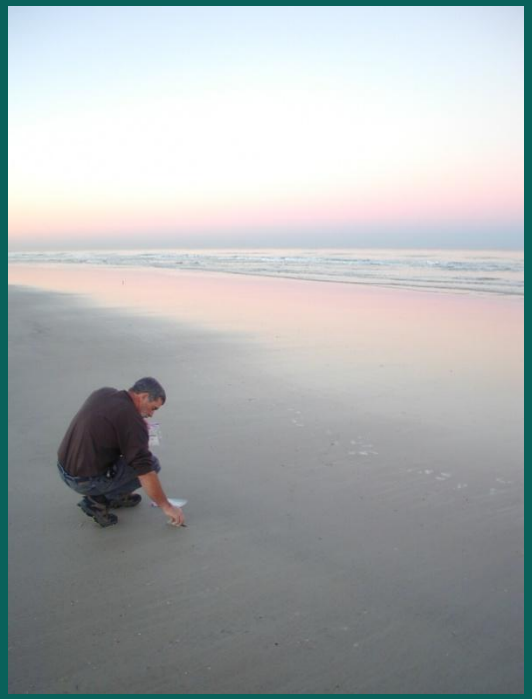


From December 2008 to February 2009, samples were collected from Palm Beach, Broward, and Dade Counties (through Key Biscayne)



Sample Collection

- GPS readings obtained for each sampling point.
- At each sampling point, either three or four individual duplicate samples were obtained.
- Samples from Nassau, Duval, St. Johns, Flagler and Volusia Counties were collected from the surface to an approximate depth of one inch (25.4 millimeters) below the beach surface .
- Samples from Brevard County south were collected from an approximate depth of 6 to 12 inches (15.2 centimeters to 30.4 centimeters) below the surface.



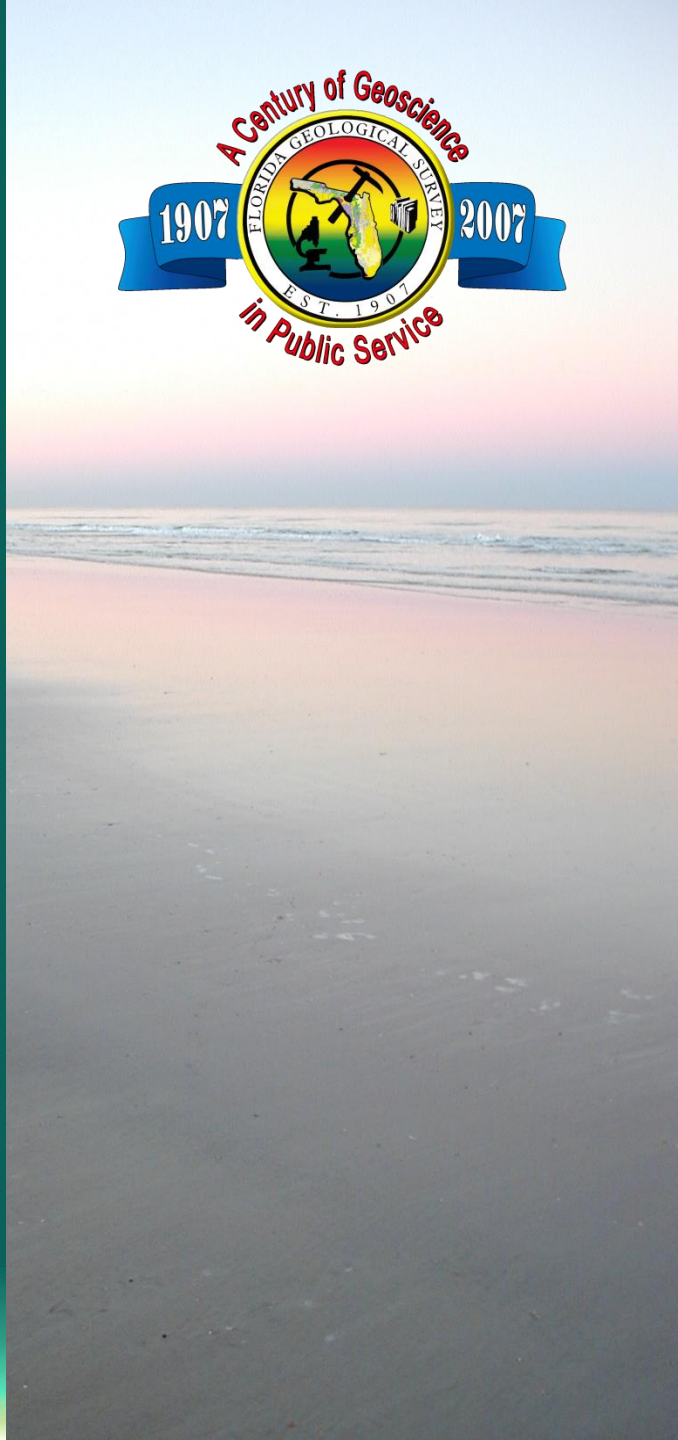
Sample Collection

- Optimally, samples would be collected from the swash zone, the beach berm, mid-beach and back beach.
- At some locations, where the beach was extremely narrow, only a back beach sample was collected.
- At three locations, typically where the sea beat against a seawall, no samples were taken.

Sample Processing

- Initially weighed after oven drying
- Wet sieved through a #230 (0.63 mm or 4 phi) sieve, oven dried and reweighed
- Dry sieved
- Digested with a 4 Molar hydrochloric acid solution, rinsed with deionized water, oven dried, reweighted and resieved.
- The weight of the fine fraction was assigned to the less than 4 phi fraction.

Granulometric Analysis



General Observations

- Where carbonate percentages increase so does mean grain size
- Significant separation between the pre- and post-carbonate curves is noted where the carbonate percentage curve rises above 50 percent.
- While the ratio of carbonate material to non-carbonate material varies substantially north of False Cape, the general trend from north to south shows a steady increase in the percentage of carbonate material within the samples until Government Cut is reached.
- After Government Cut, there is a substantial and abrupt decline in carbonate material.

East Coast Statistics

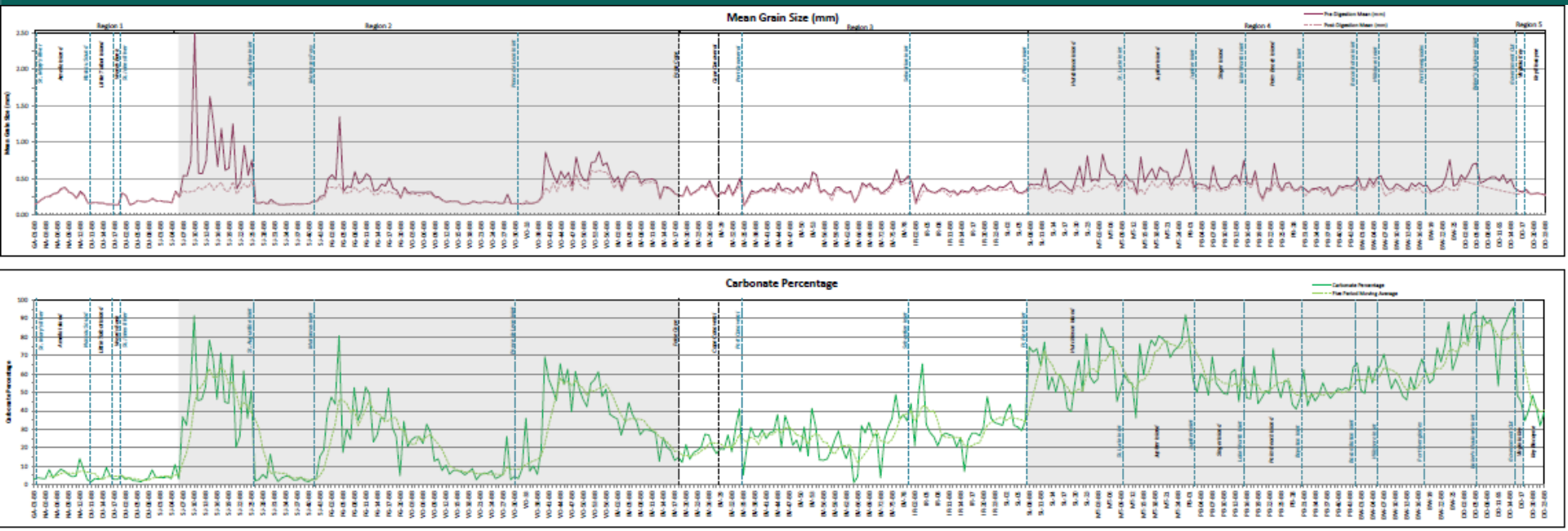


Figure 18 - Mean Grain Size and Carbonate Percentage over the East Coast Beaches of Florida

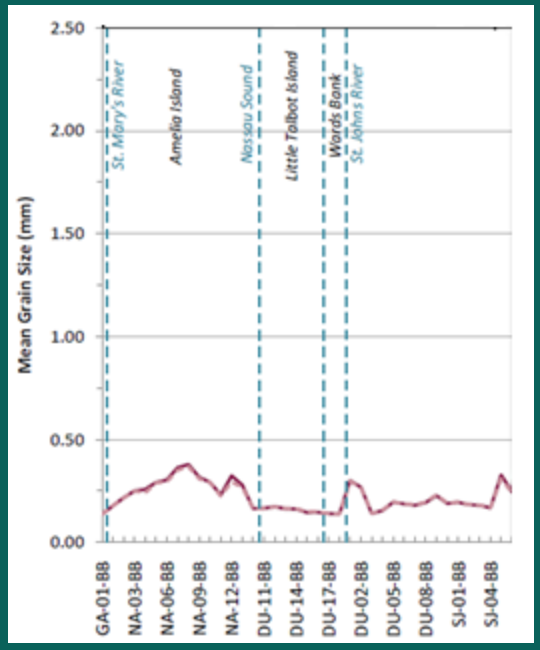
By graphing mean grain size and carbonate percentage along the length of the East Coast, five distinct regions were observed.

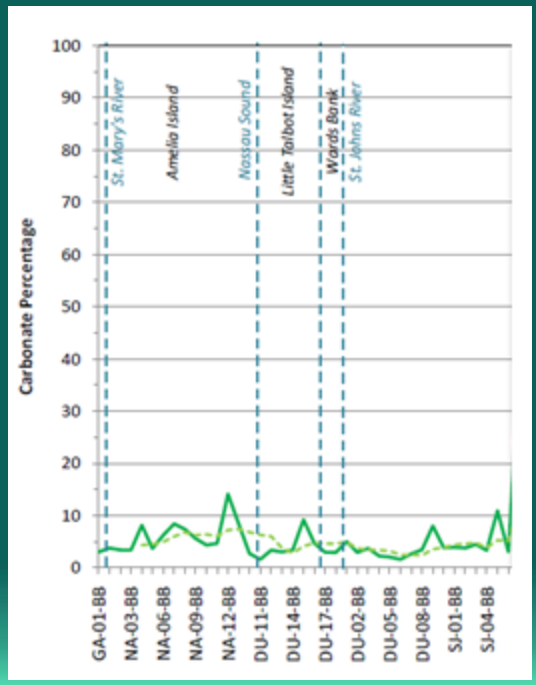
Region 1

St. Mary's River to Northern St. Johns County

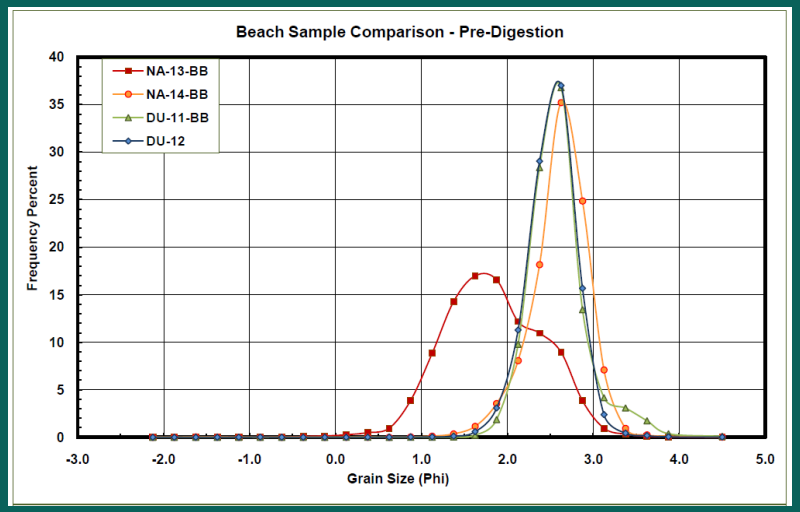
On Amelia Island, mean grain size varies from fine grained sands at the northern and southern most points to medium grain sands in the middle of the island.

Talbot Island proved to be lesser in both grain size and carbonate percentage. Internal to the reach, there was seen a slight rise to a peak in carbonate material in the middle of Talbot Island. Mean grain size remains relatively constant across the reach.

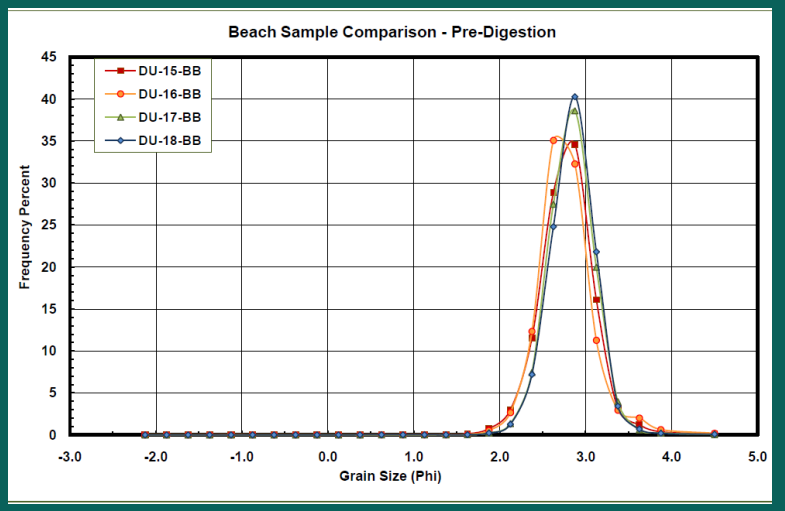




Entrance to Nassau Sound

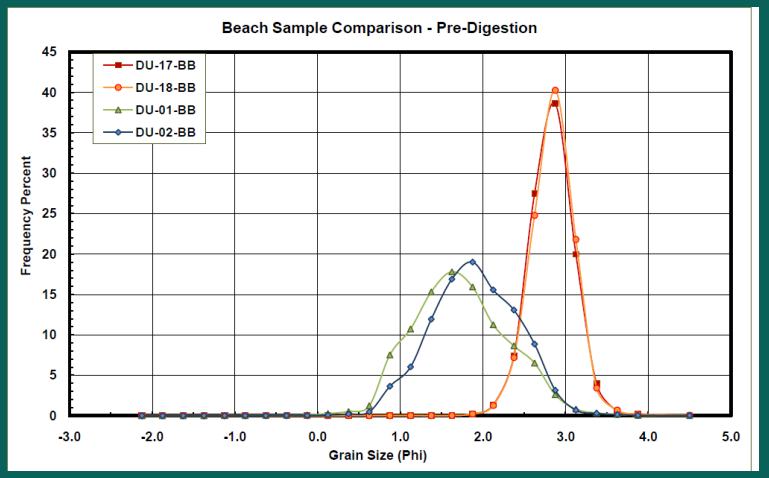


Ft. George Inlet



Southward from the end of Amelia Island there is both a fining and a narrowing of the spectrum of grain sizes present. The fining and narrowing of the grain size spectrum continues southward across Talbot Island and Wards Bank and ends at the mouth of the St. Johns River.

Mouth of the St. Johns River



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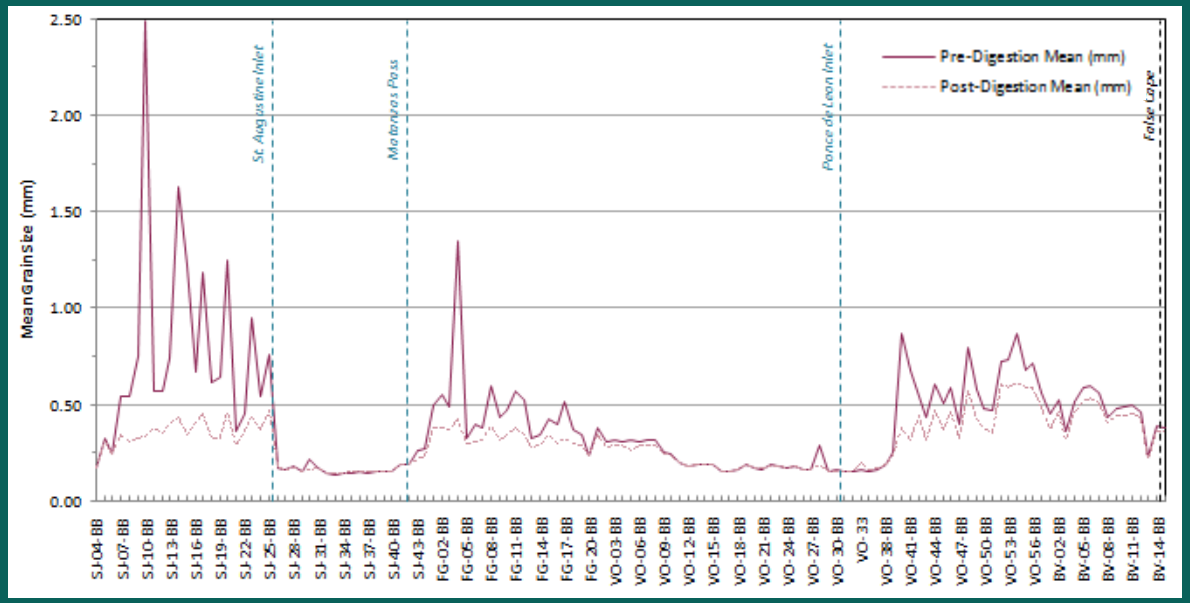
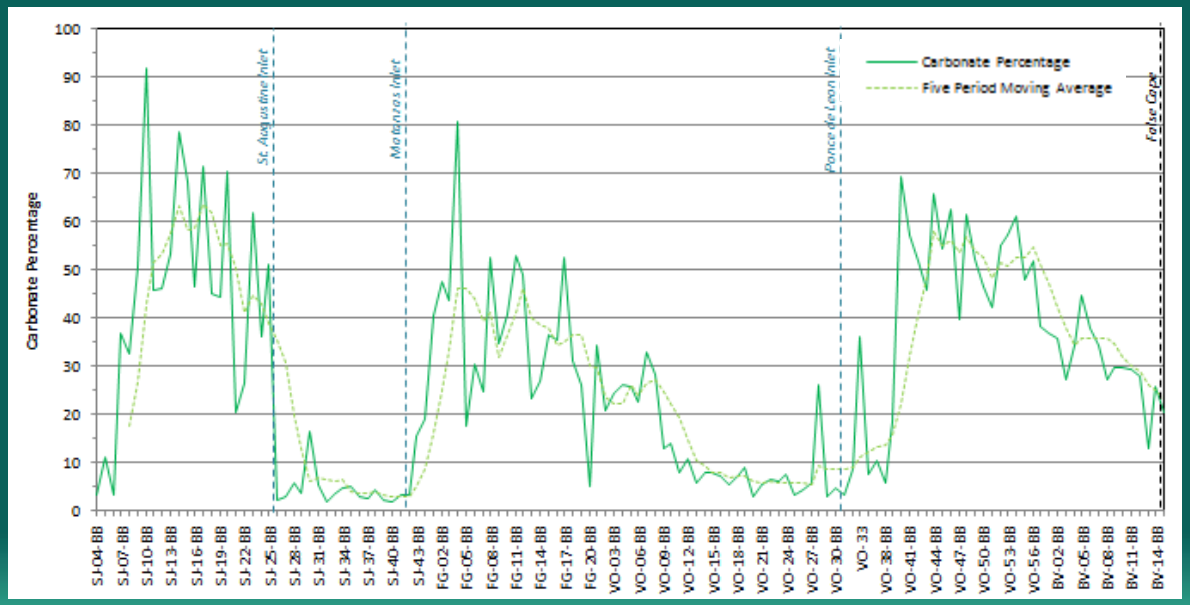
Region 2

Northern St. Johns County to False Cape

Mean grain size and carbonate percentages both periodically spike in tandem and then decline southward.

Where grain size and carbonate percentages spike, there is a strong separation between the pre- and post-carbonate curves.





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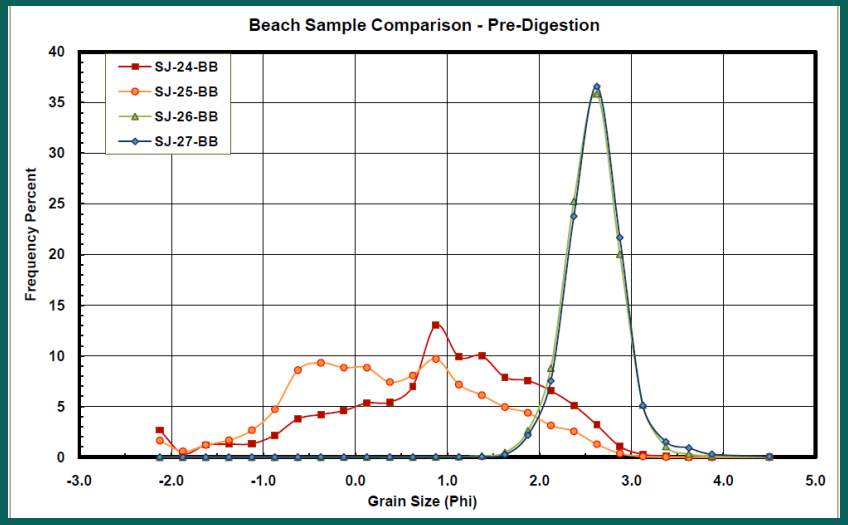
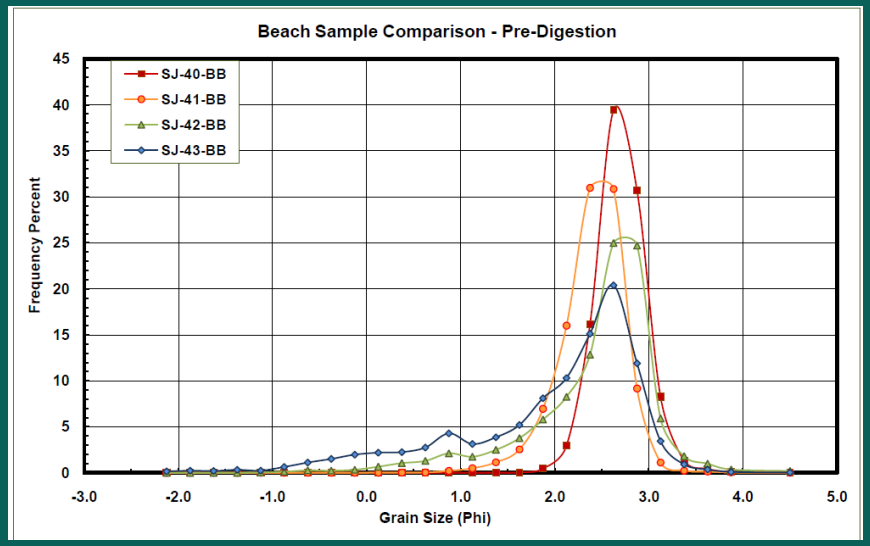
St. Augustine Inlet



Matanzas Pass

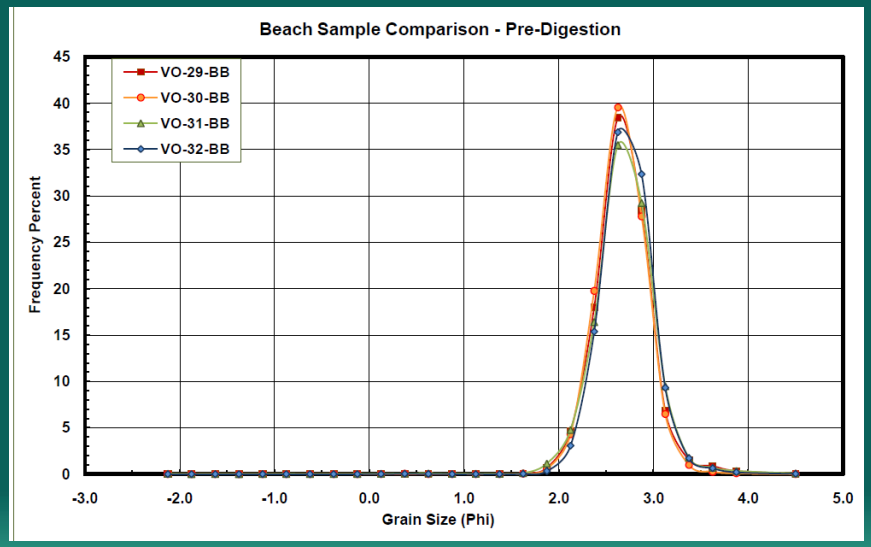


North of St. Augustine Inlet, grain size is coarser and broader than to the south.

There is a fining and narrowing of grain sizes that continues to the south with a slight coarsening and broadening of grain sizes at Matanzas Inlet.

At Ponce Inlet, there is little variation.

Ponce de Leon Inlet

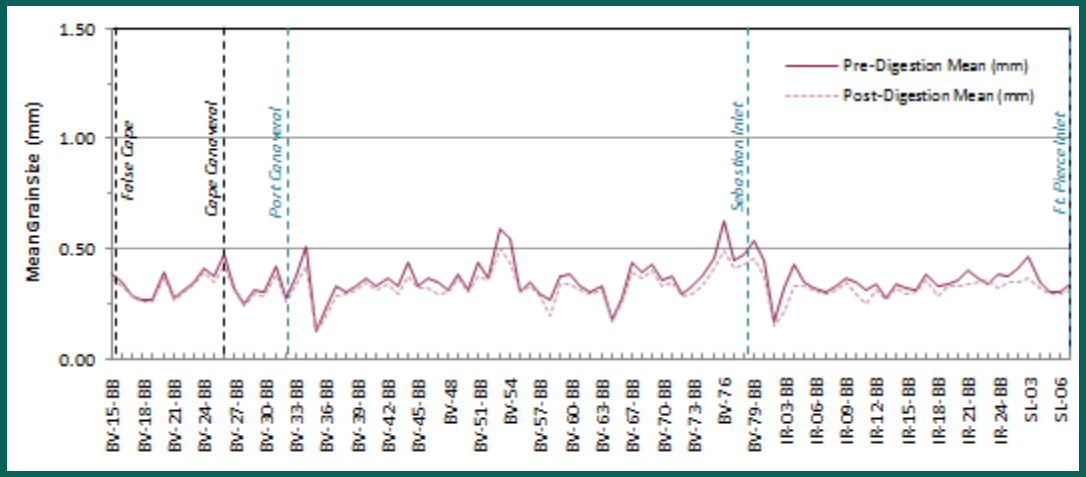


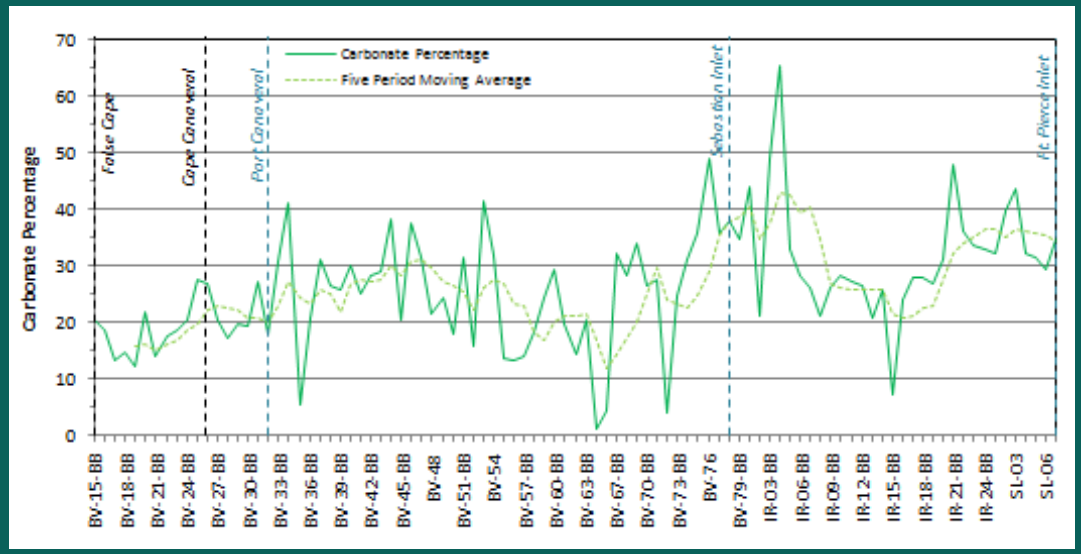
Region 3

False Cape to Ft. Pierce Inlet

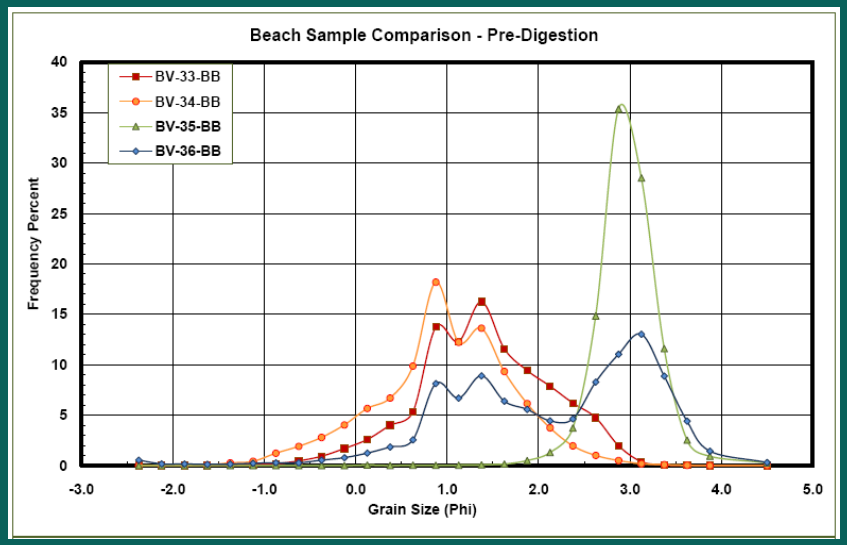
In this region, the mean grain size curves are relatively constant.

With the exception of occasional dips and spikes, the carbonate curve generally remains between 20 and 40 percent.

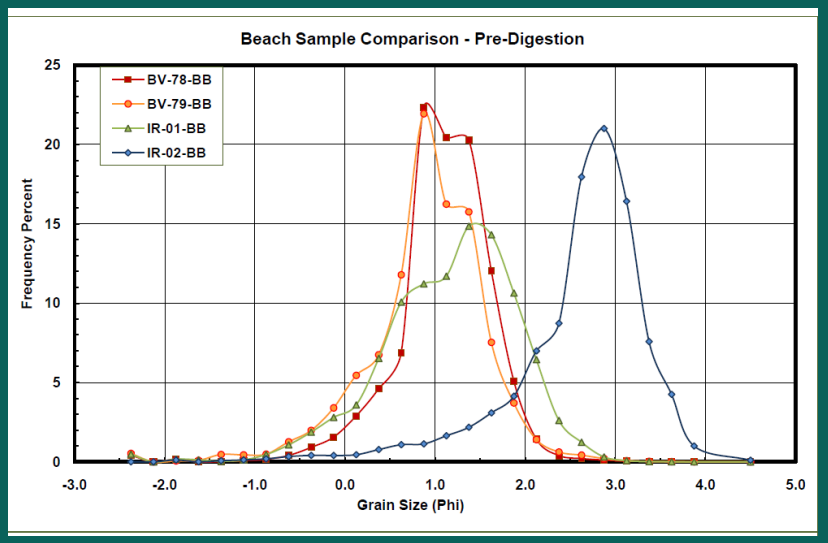




Port Canaveral

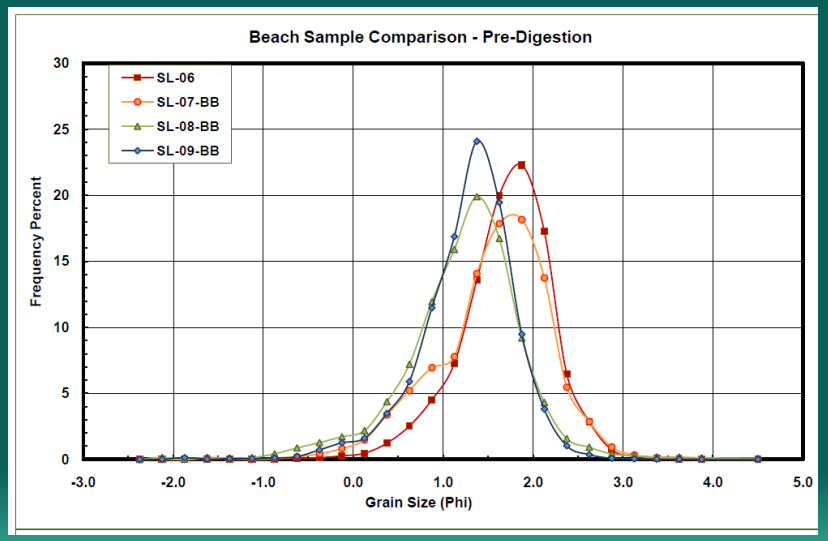


Sebastian Inlet



Between Sebastian Inlet and Ft. Pierce Inlet, there is a fining and narrowing of the spectrum of grain sizes present within the reach compared to the reaches to the north and south.

Ft. Pierce Inlet

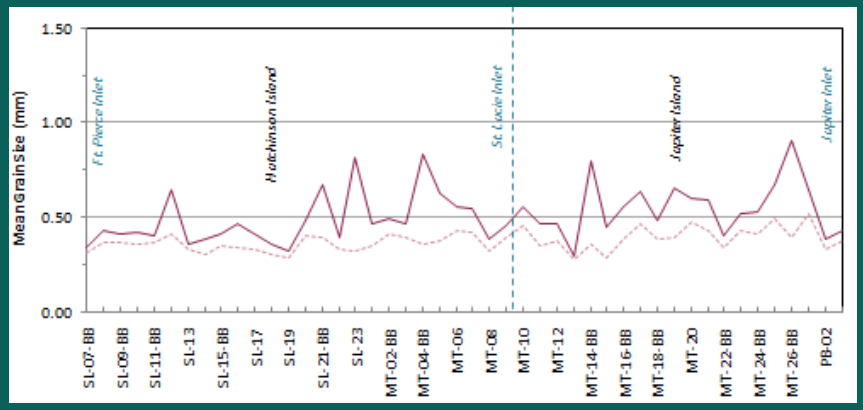


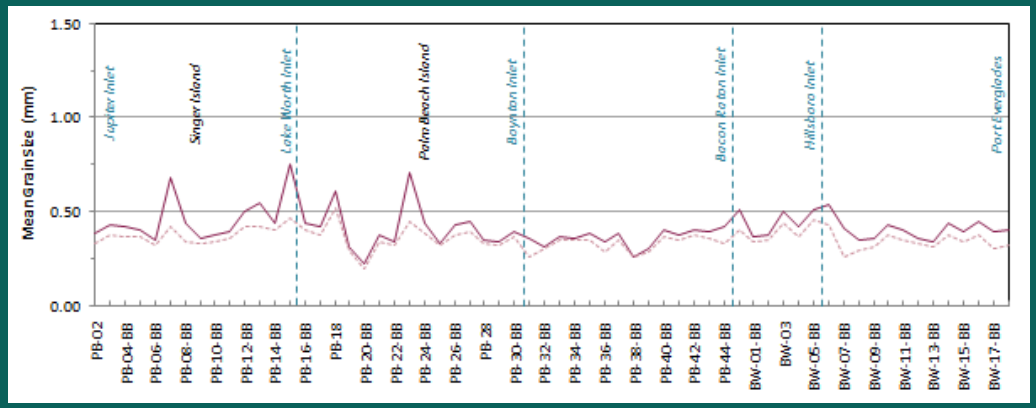
Region 4

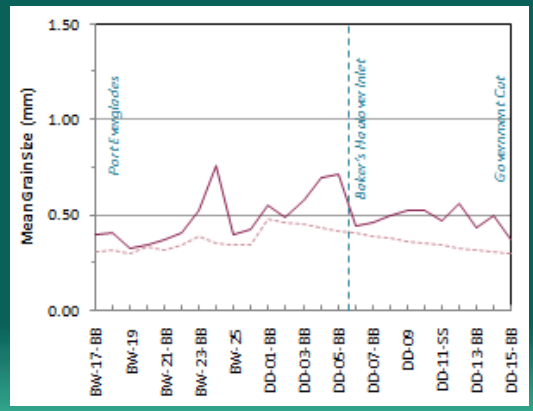
Ft. Pierce Inlet to Government Cut

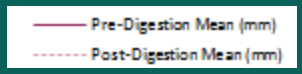
In this region, the Mean Grain Size is relatively constant.

Carbonate Percentage ranges between 40 and 95 percent, with a tendency of being higher around the inlets.



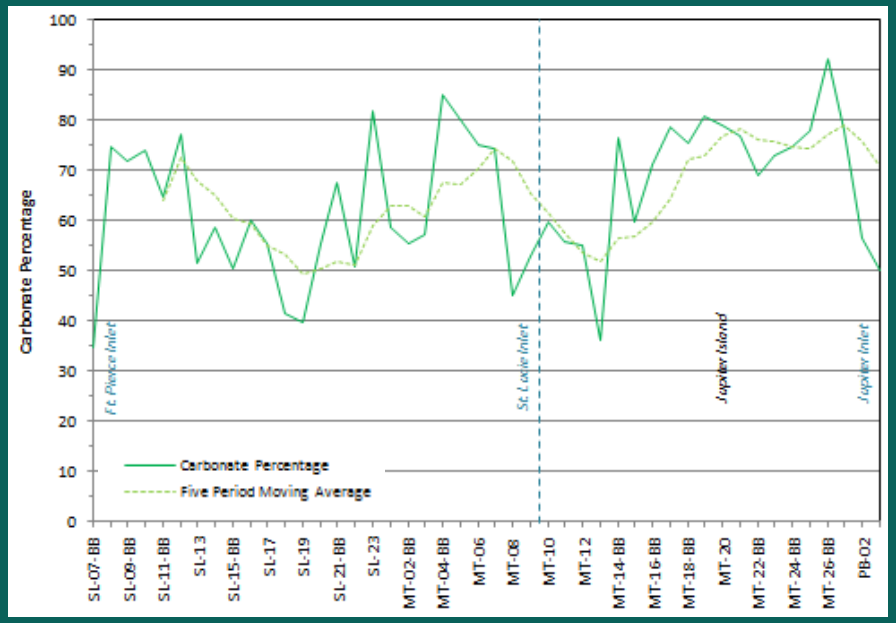




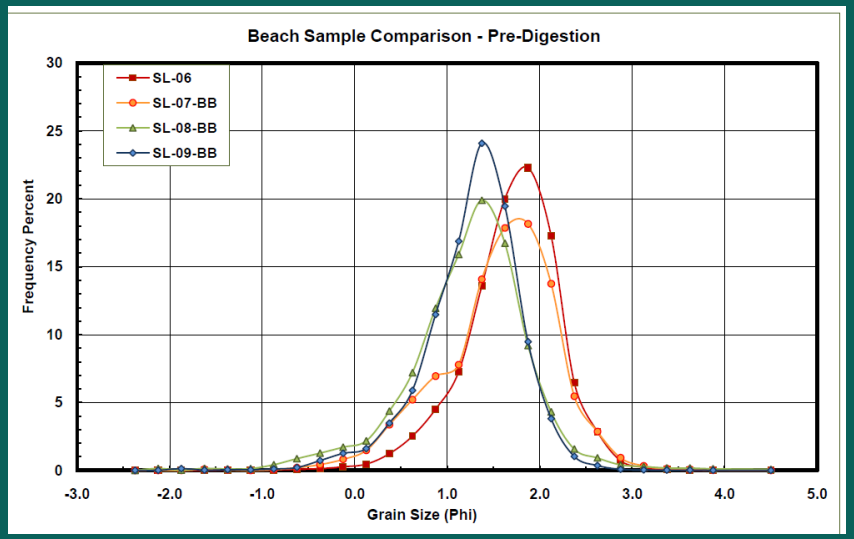


Ft. Pierce Inlet to Jupiter Inlet

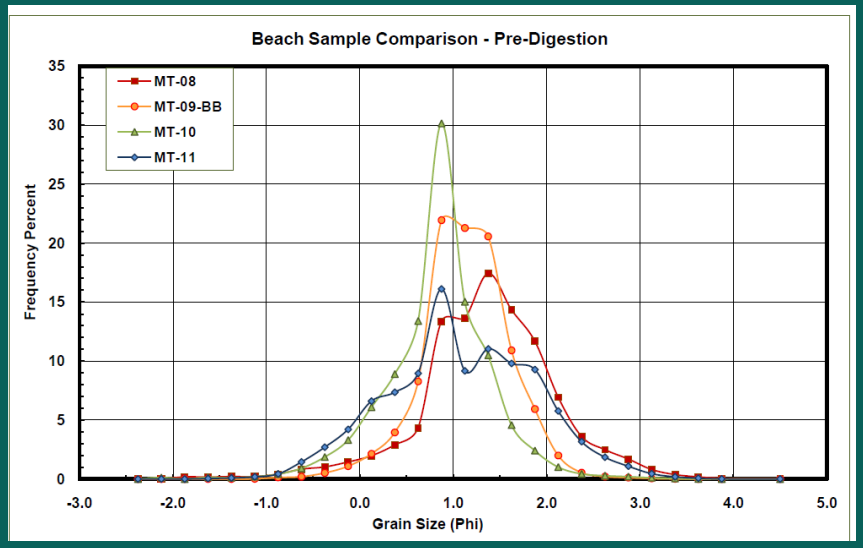
While there is a slight trend upward in Mean Grain Size, there a dramatic increase in Carbonate Percentage compared to the region to the north.



Ft. Pierce Inlet

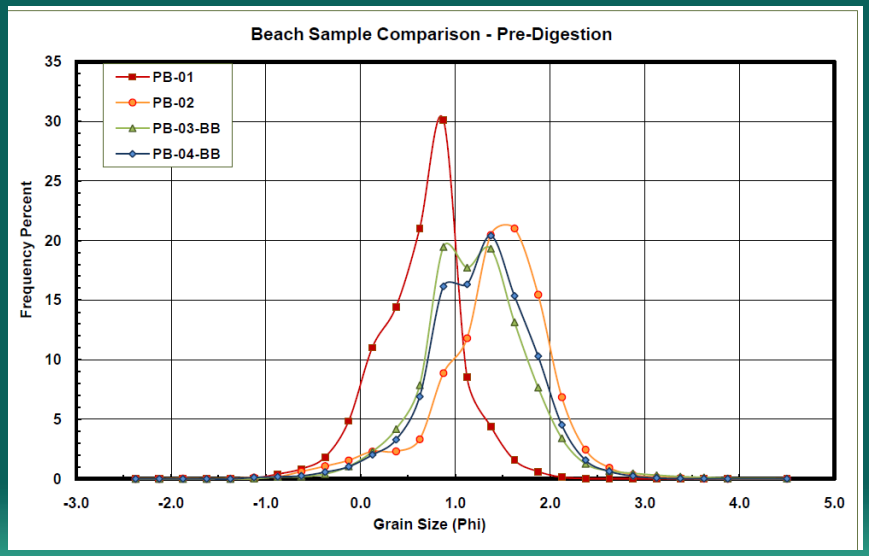


St. Lucie Inlet



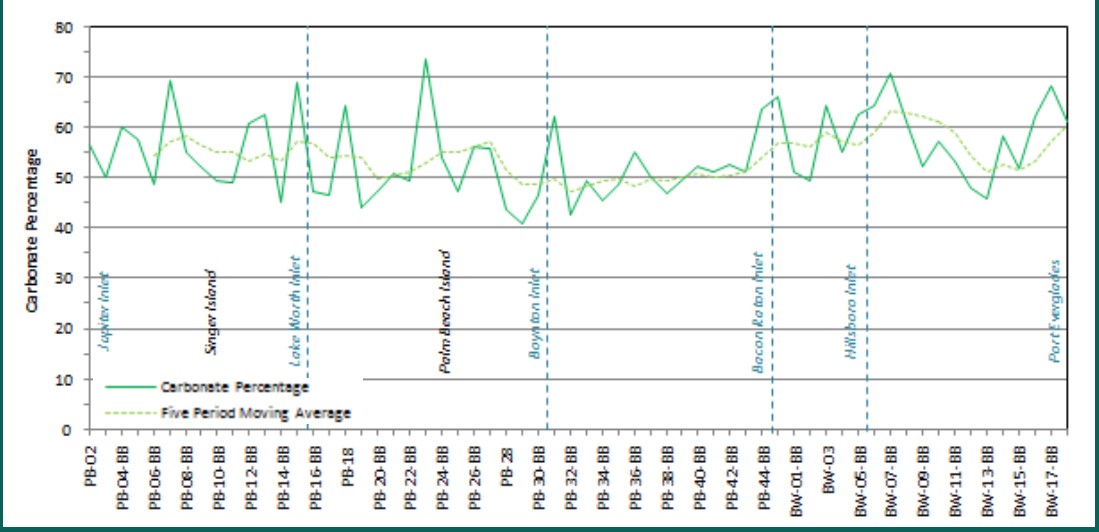
There is a fining and broadening of the spectrum of grain sizes southward from Ft. Pierce Inlet to Jupiter Inlet.

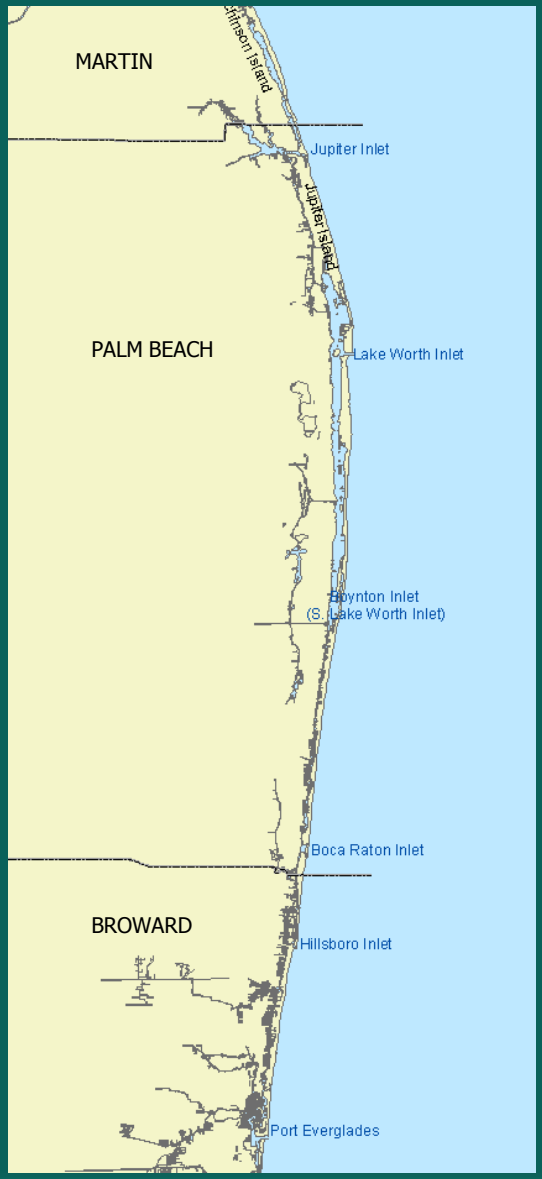
Jupiter Inlet



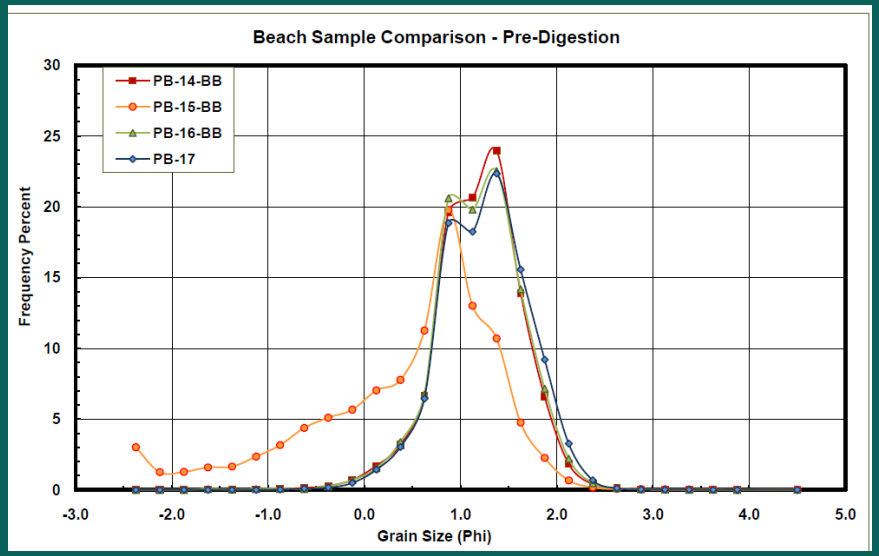
Jupiter Inlet to Port Everglades

Carbonate Percentage decreases at Jupiter Inlet and ranges between 40 to 70 percent until Port Everglades.

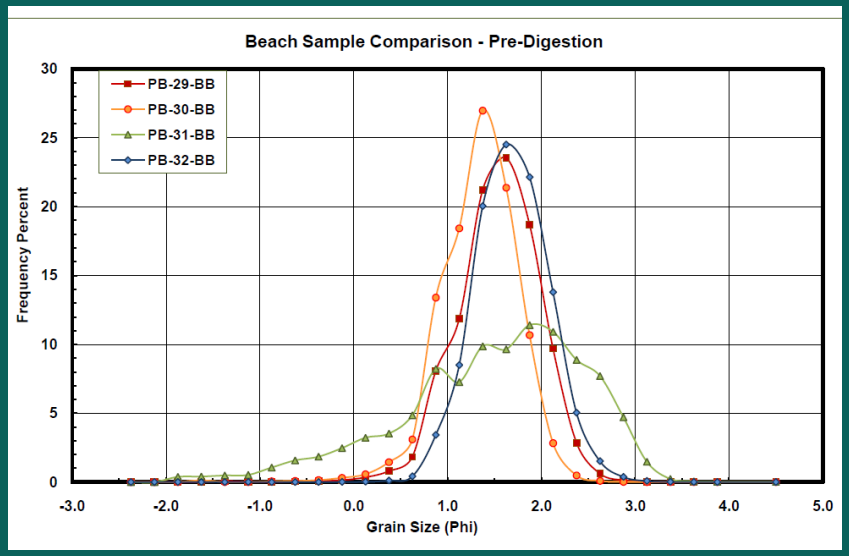




Lake Worth Inlet



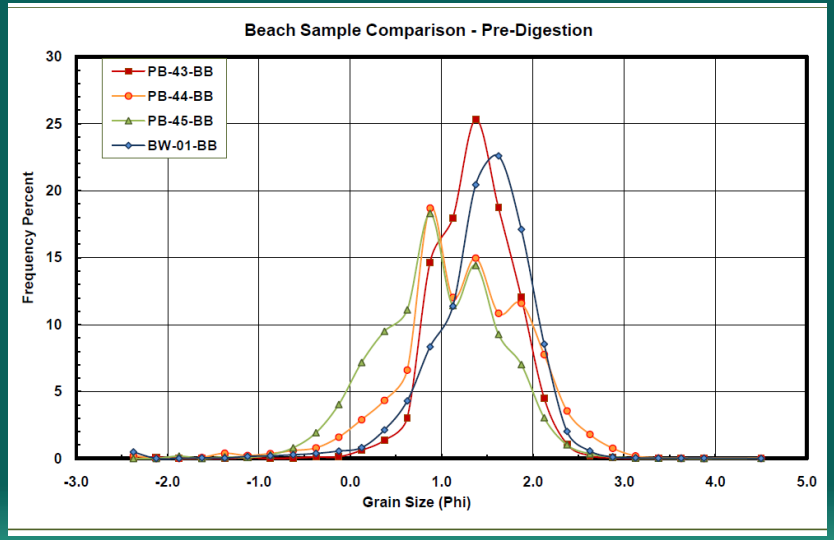
Boynton Inlet



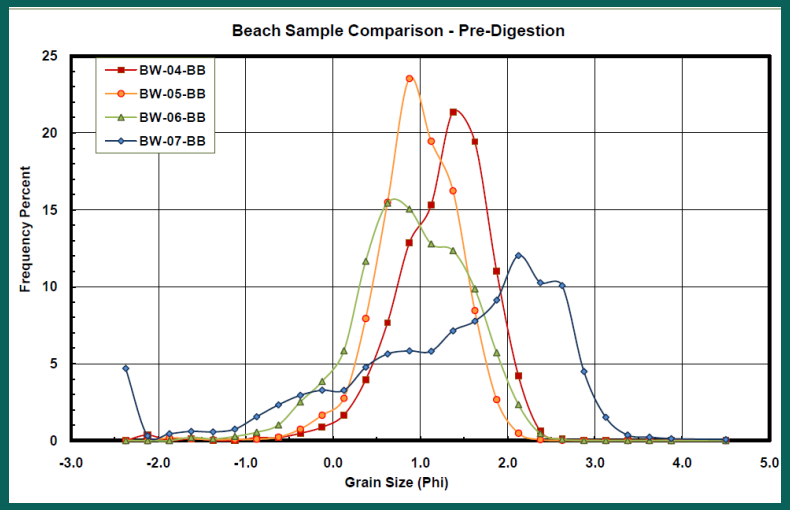
Little change is seen across Lake Worth Inlet and Boynton Inlet; however, the sediments immediately south of Boynton Inlet are broader in spectrum.

Little change is seen across Boca Raton Inlet; however, the sediments immediately proximal to the inlet are marginally coarser and broader in spectrum.

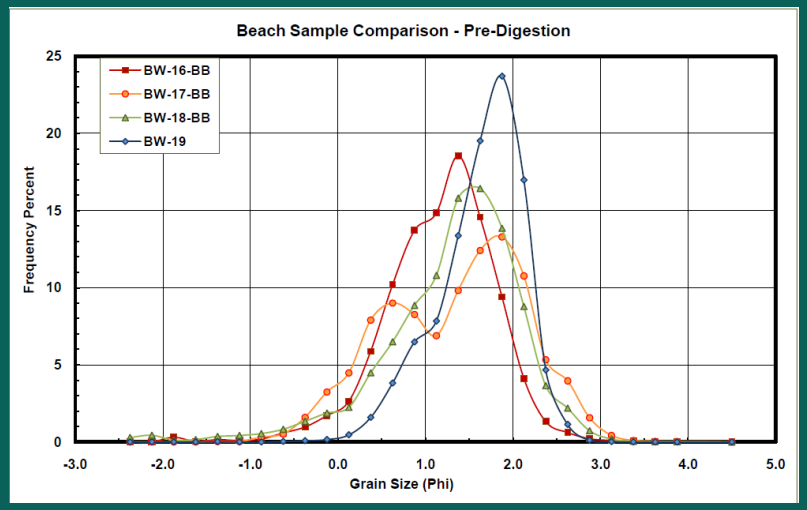
Boca Raton Inlet



Hillsboro Inlet



Port Everglades

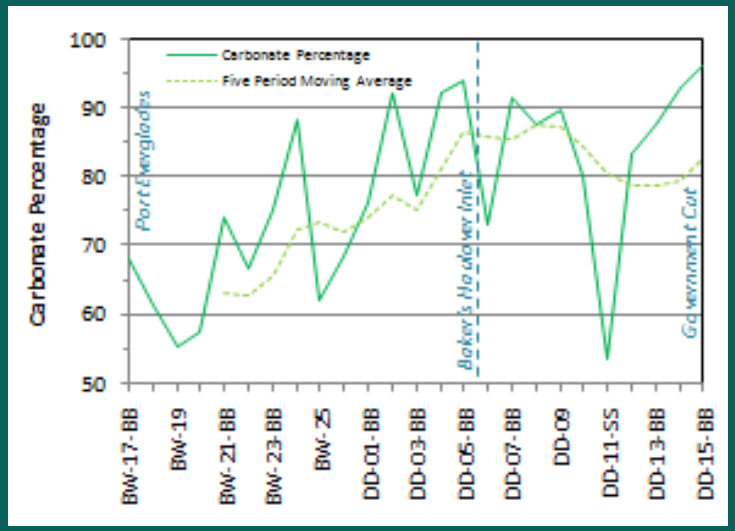


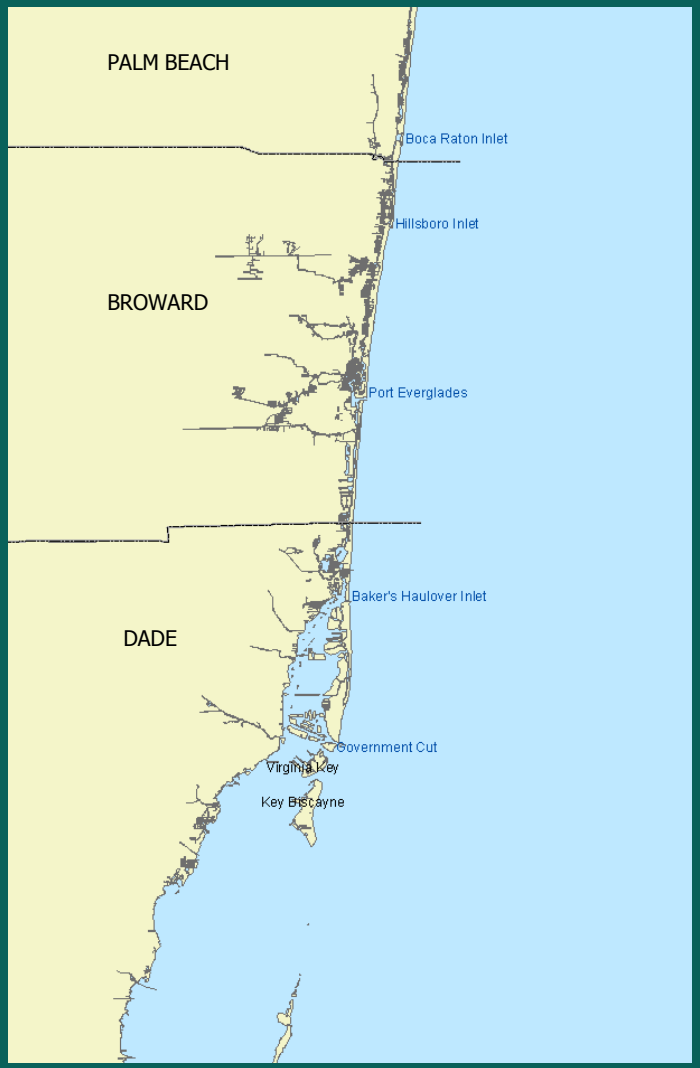
There was little change across Hillsboro Inlet however, the sediments immediately proximal to the inlet are marginally coarser while those sediments to the south are broader in spectrum.

There was little change across Port Everglades except a narrowing of grain sizes. The sediments are also marginally finer in grain size compared to those closer to Hillsboro Inlet.

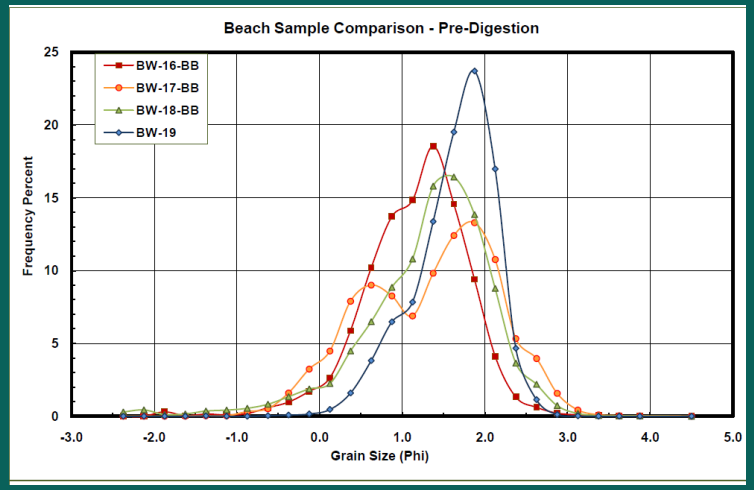
Port Everglades to Government Cut

Both grain size and carbonate percentage decrease at Port Everglades and directly south before trending upward. Mean grain size is coarser and carbonate percentages significantly higher than to the south.

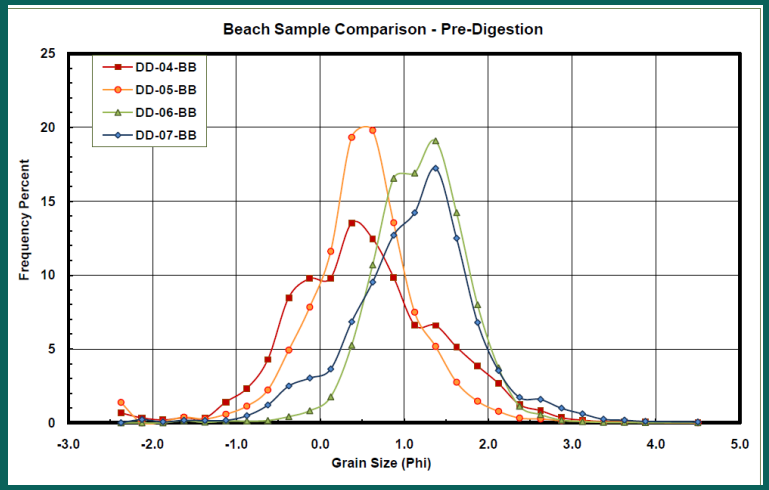




Port Everglades



Baker's Haulover Inlet



There appears to be little change across Port Everglades save that the samples closer to the inlet are broader in spectrum.

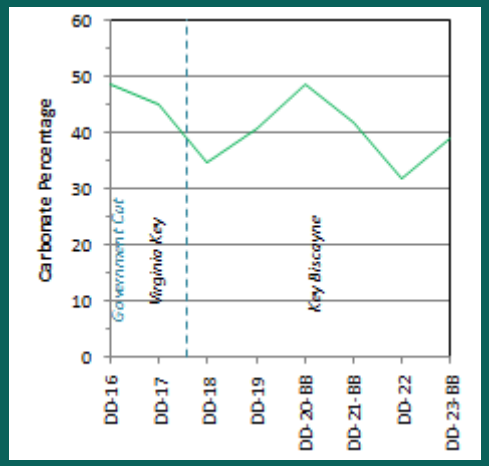
The sediments north of Baker's Haulover Inlet appear to be coarser that those to the south.

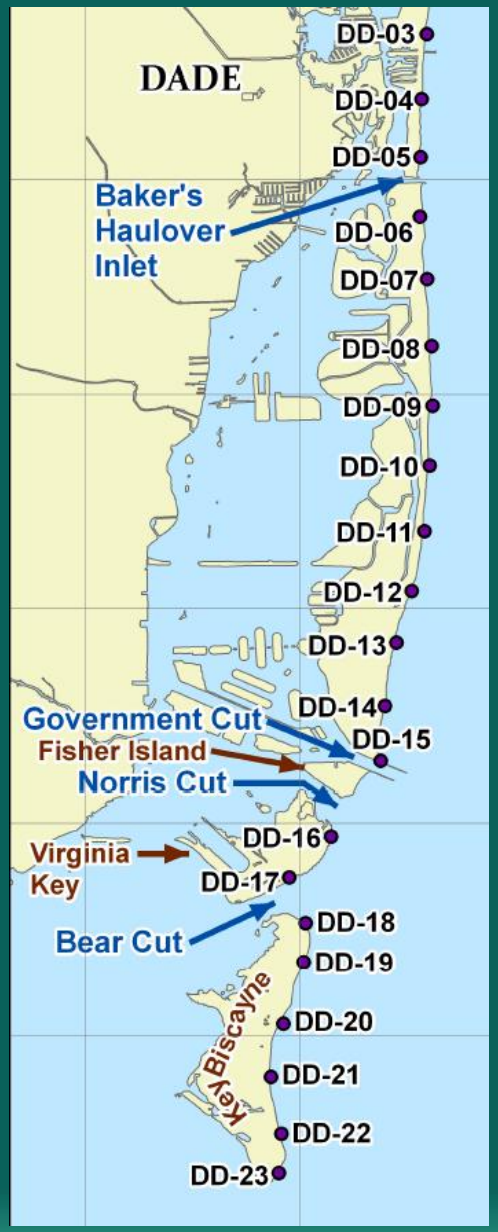
Region 5

Virginia Key & Key Biscayne

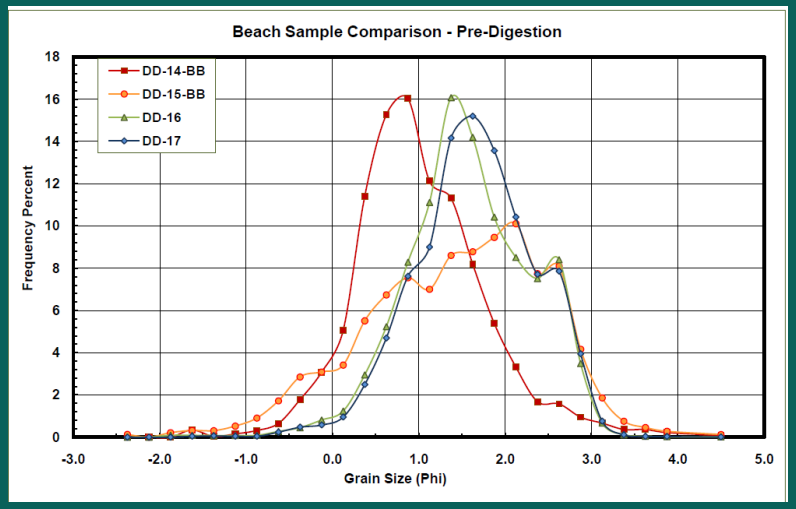
From Region 4, both Mean Grain Size and Carbonate Percentage abruptly decline.

Carbonate percentage falls to between 20 percent and 40 percent.

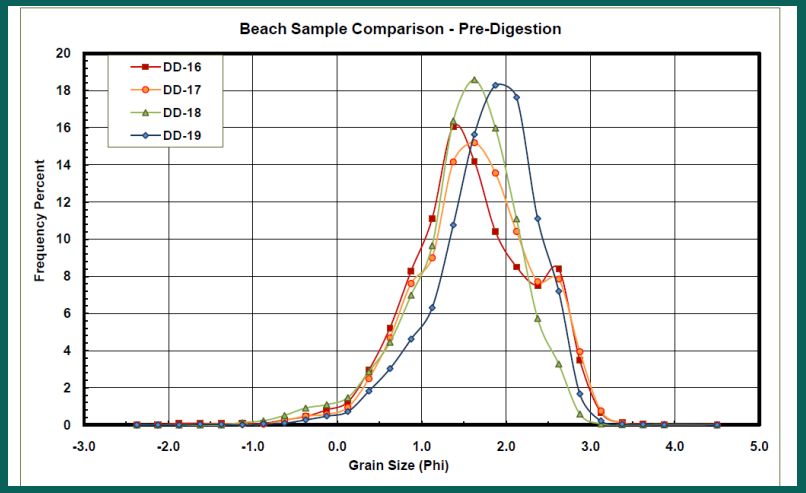




Government Cut and Norris Cut

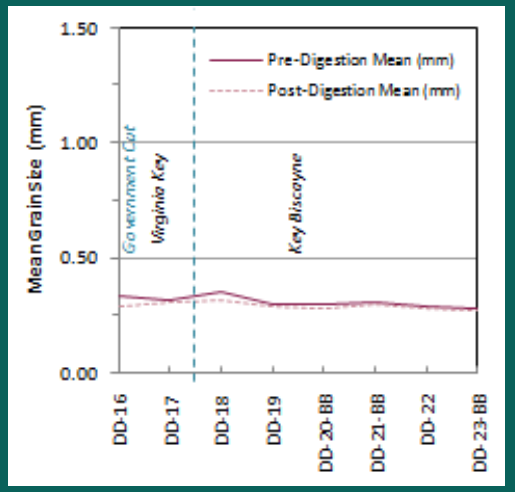


Bear Cut



Sediments on Virginia Key appear to be finer than the sediments to the north.

In addition, sediments appear to be trending finer across Key Biscayne.



Conclusions

- Frequent correlation exists between inlets and changes in Mean Grain Size and Carbonate Percentage .
- Changes in Mean Grain Size and Carbonate Percentage define five regions.
- A moderate positive correlation exists between Mean Grain Size and Carbonate Percentage.
- The carbonate sediments present in the samples appear to be coarser than the non-carbonate fraction. This difference appears to be most significant where the carbonate percentage rises above 50 percent.
- While the ratio of carbonate material to non-carbonate material varies substantially north of False Cape in Brevard County, the general trend from north to south shows a steady increase in the percentage of carbonate material within the samples until Government Cut in Miami-Dade County is reached. After Government Cut, there is a substantial and abrupt decline in carbonate material.