

A Sedimentological and Granulometric Atlas of the Beach Sediments of Florida's Northwest Coast and Big Bend

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Eric P. Harrington



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Florida's Beaches

- Provide a buffer between the sea and urban coastal regions
- Are important wildlife habitats
- Provide valuable and unique recreation areas and opportunities
- Are an integral part of Florida's economy

Florida's beaches provide jobs

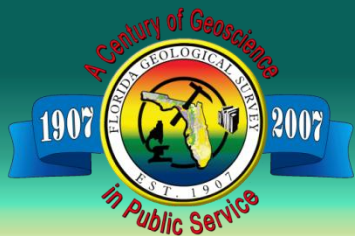


The atlas provides a snap shot in time of the sediments of the beaches of the northwest coast and Big Bend of Florida.



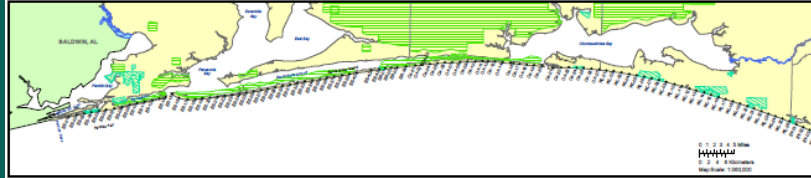
Catalog of Beach Sediments

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

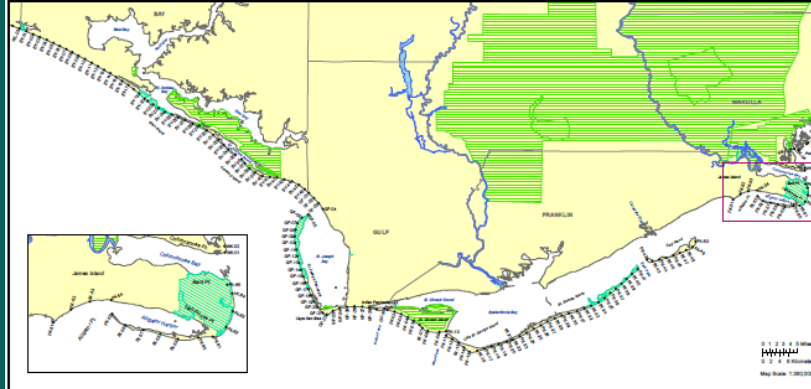


The Study Area

Western Panhandle

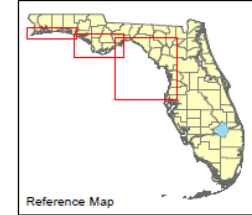


Central Panhandle



A SEDIMENTOLOGICAL AND GRANULOMETRIC ATLAS OF THE BEACH SEDIMENTS OF FLORIDA'S NORTHWEST COAST AND BIG BEND

Daniel C. Phelps (P.G. #1203), Michelle M. L. Ladle, Adel A. Dabous and Eric P. Harrington

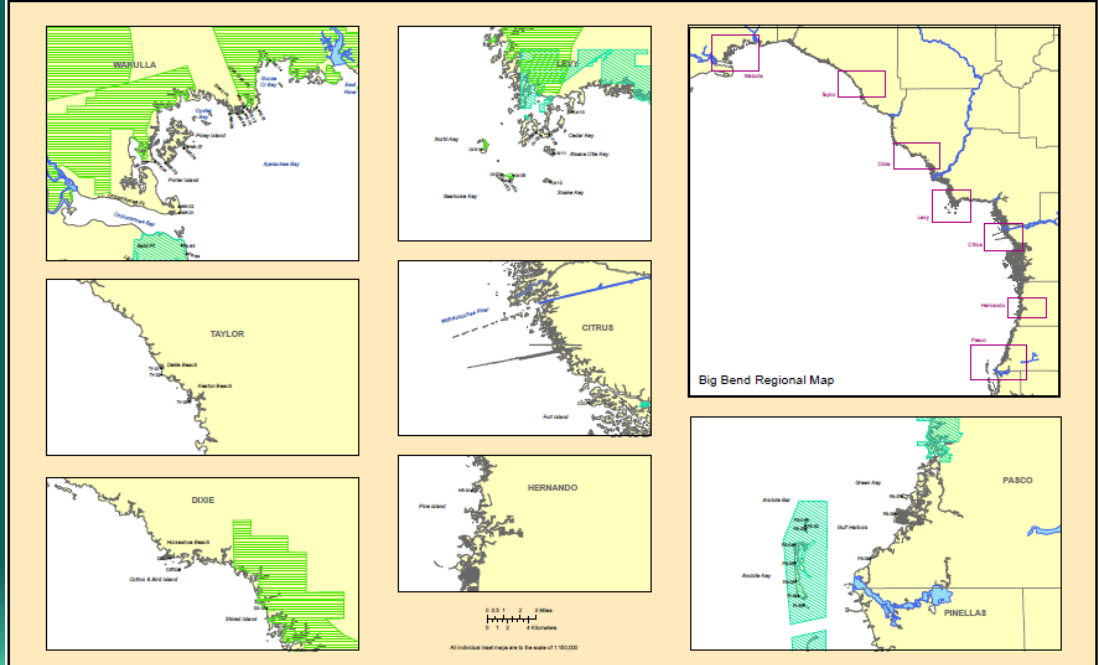


Explanation

- Beach Sample Sites - Year 3
- Major Rivers
- Federal Lands (FWG)
- Florida State Parks
- Florida Shoreline (FWC)
- Alabama Counties



Big Bend



Some beaches on the northwest coast are wide



Santa Rosa Island, Escambia County ES-26



More of the beaches on the northwest coast are narrower



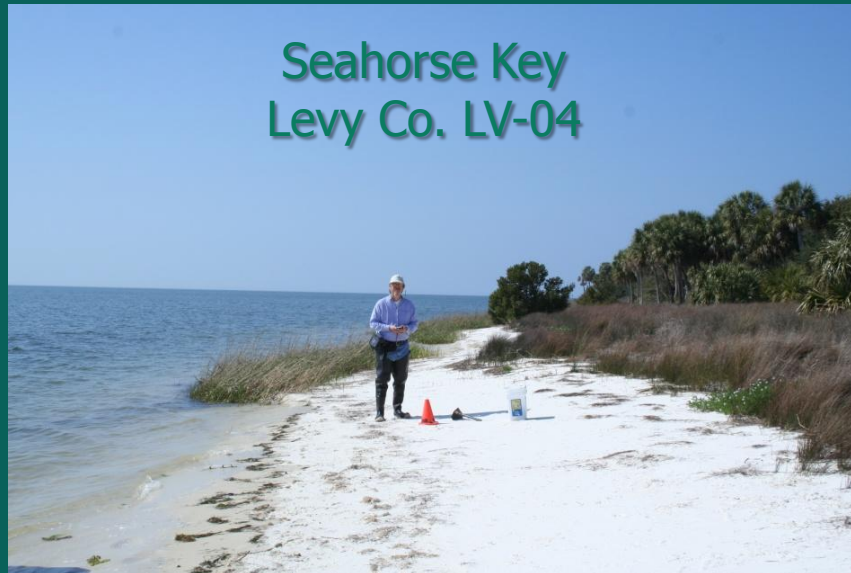
Near Topsail Hill State Park,
Walton County WL-09



Some beaches on
the northwest coast
are quite narrow

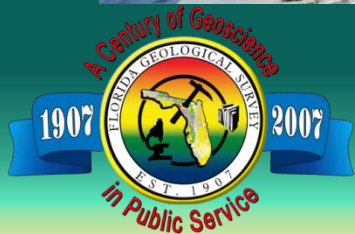


St. Joseph Peninsula State Park
Gulf Co. GF-07



Seahorse Key
Levy Co. LV-04

The few beaches
that exist in the Big
Bend are quite
narrow as well





St. Vincent Island, Franklin Co.
FK-08

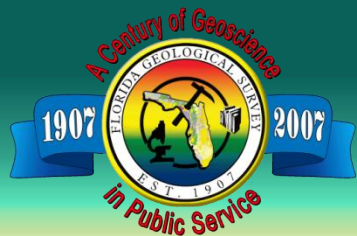


Cape San Blas, Gulf Co.
GF-21

Erosion and coastline retreat
is evident in some areas on
the northwest coast



Tindall AFB, Bay Co. BY-39



In some areas in the Big Bend coastal erosion and coastline retreat is also occurring.

Atsena Otie Key, Levy County LV-11

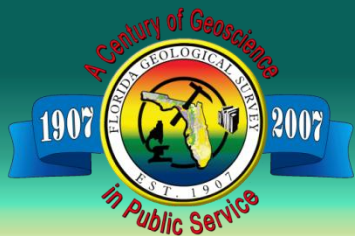




Beach Sediment Sample Collection

Sampling Summary

- 653 samples were collected and described from 240 sites on the northwest coast of Florida.
- 50 samples were collected and described from 39 sites in the Big Bend of Florida.
- 292 samples from the northwest coast and 39 from the Big Bend were granulometrically analyzed.
- Samples, where possible, were collected at an approximate one mile interval.



Sampling Summary

- In 2006, samples were collected from Escambia, Santa Rosa and Okaloosa Counties.
- In 2010 and 2011, samples were collected from western and central Escambia, Walton, Bay, Gulf, Franklin, Wakulla, Taylor, Dixie, Levy, Citrus, Hernando, Pasco and Pinellas Counties.
- No samples were collected from Jefferson County as it has no sandy beaches.



West end of St. George Island, Franklin Co. FK-22



Sample Collection

- Optimally, samples were to be collected from the swash zone, the beach berm, mid-beach and back beach. These few optimal locations were found on the northwest coast.
- Where there was no beach berm, samples were collected from the swash zone, the mid-beach and back beach.
- Where there was a beach berm but the beach was narrow, samples were collected from the swash zone, the berm and back beach.
- Where the beach was narrower, only swash zone and back beach samples were collected.
- At a few locations, primarily in the Big Bend where the beaches were extremely narrow, only a single sample point was utilized.
- At very few locations, typically where no beach was present, no samples were collected.

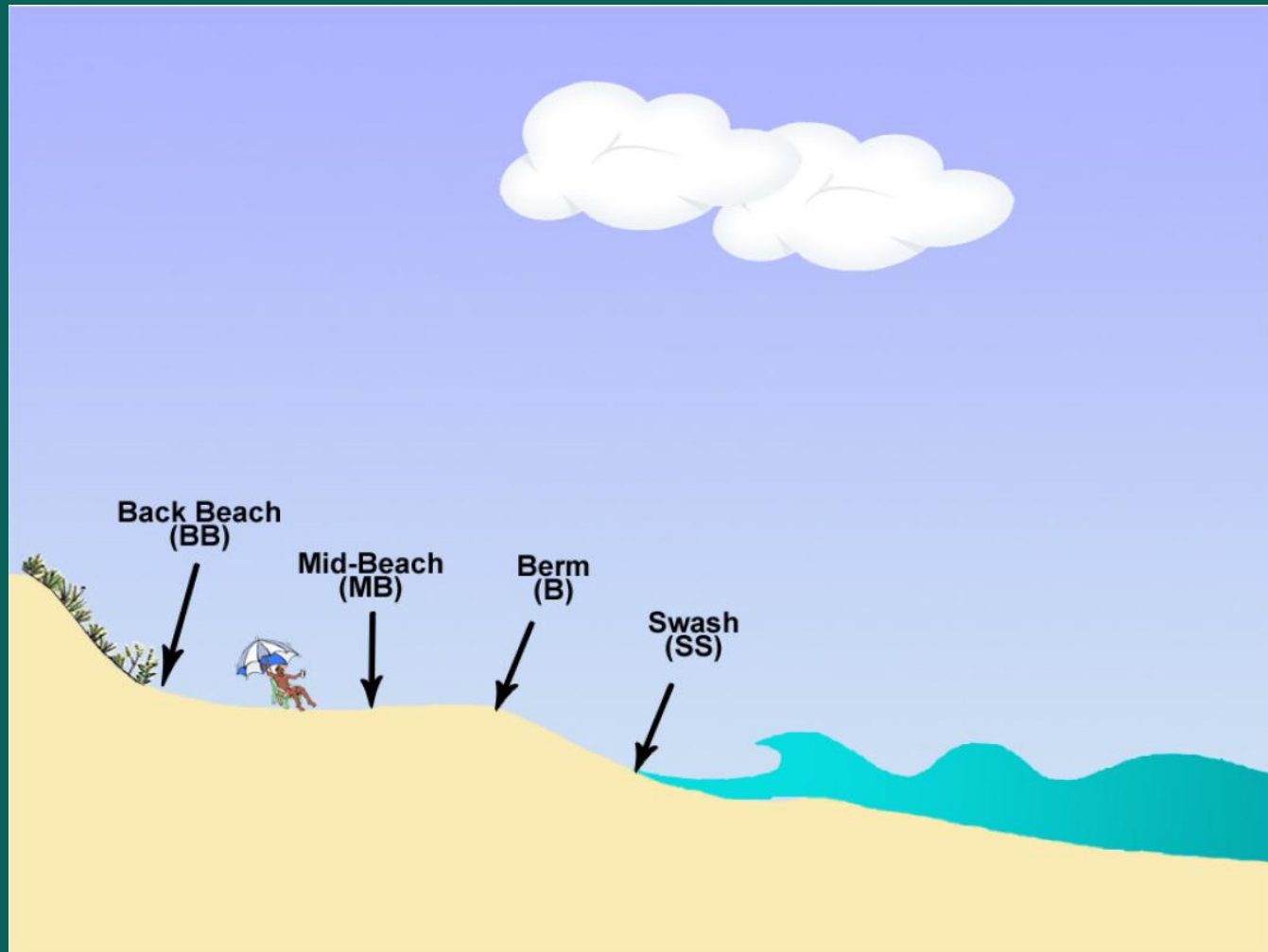


Sample Collection

- Sample points were marked using survey flags and/or “traffic cones”.
- Photographs were taken to show the sample points as marked.
- GPS coordinates of all sampling points were recorded.
- In all but Santa Rosa and Okaloosa counties and two locations in Escambia County, sampling holes were dug at each sampling point and four bags of two oz (56.7 gm) sample collected at a depth of 6 to 12 inches (15.2 cm to 30.4 cm) below land surface.
- The beaches of Santa Rosa and Okaloosa counties and two locations on Escambia County beaches were surface sampled with three individual bags of approximately 7-10 ounces (200-300 grams) of sediment collected from each sampling point.



Sample Collection



Sample points along the beach profile



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.

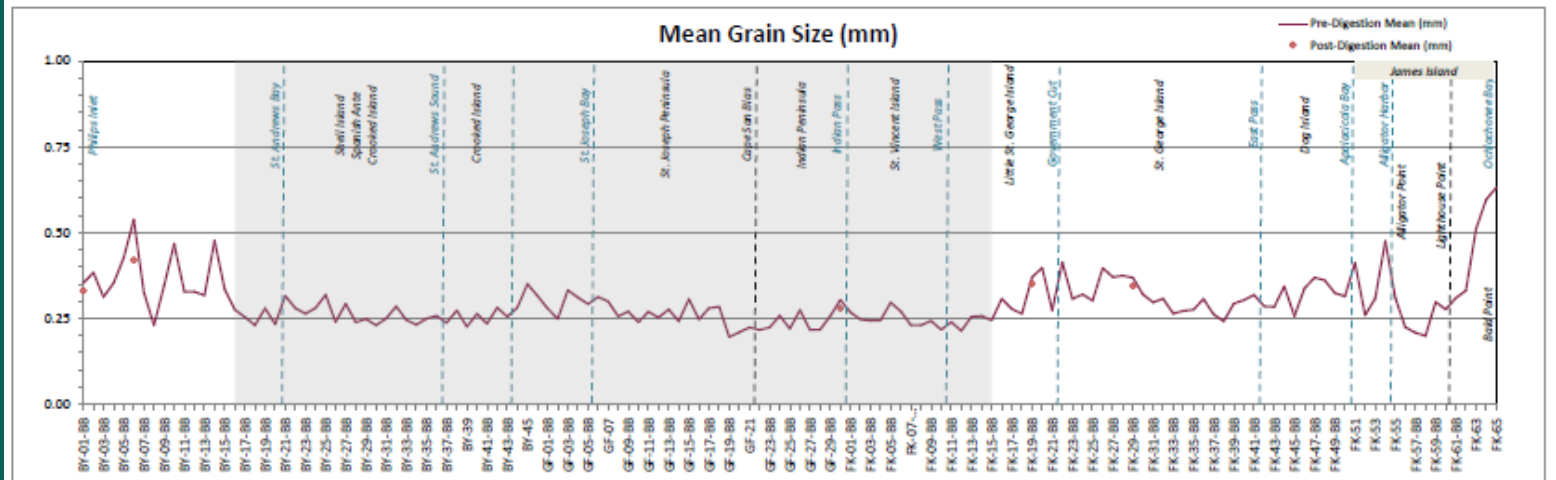
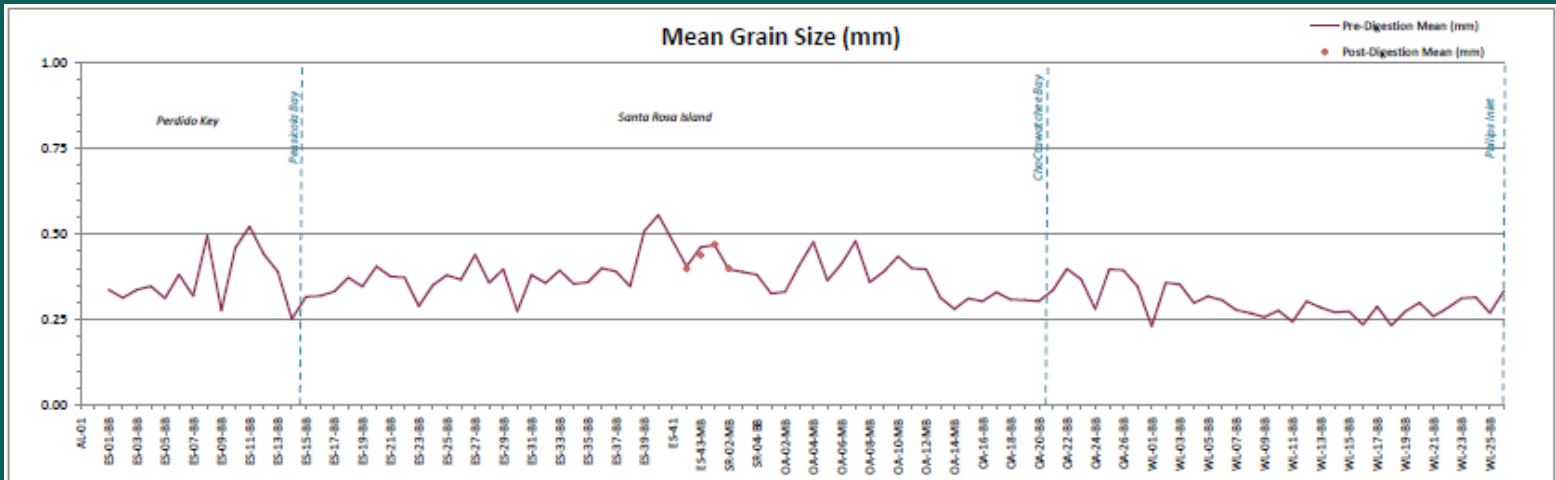




Granulometric Analysis

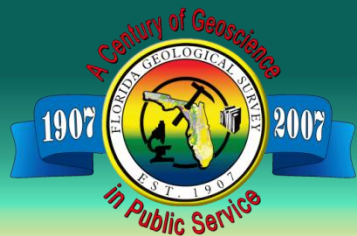
The Northwest Coast of Florida

Northwest Coast Statistics

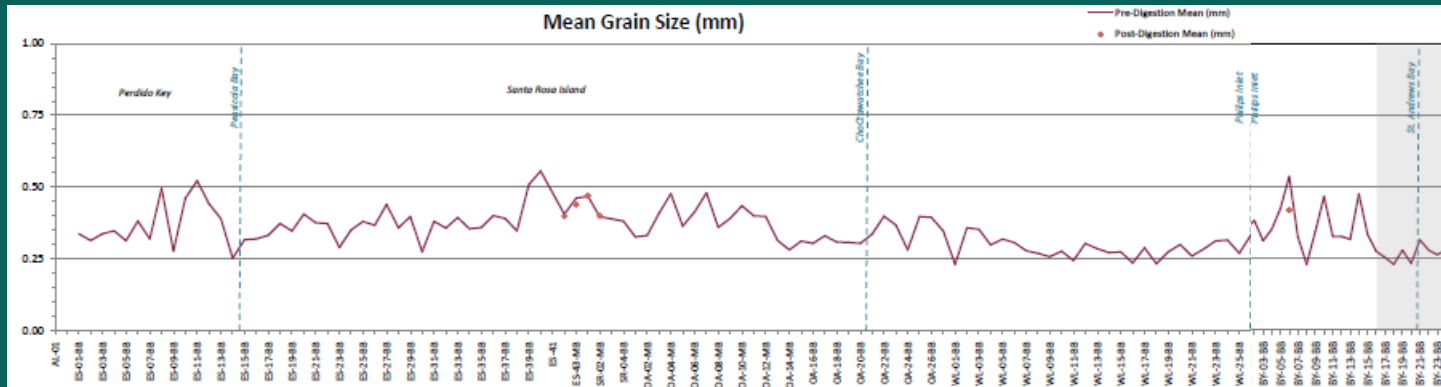


Note: Only E5-42-MB through SR-02-MB, BY-01-88, BY-06-BB, GF-30-BB, FK-19-BB, & FK-29-BB were processed after digestion. E5-41 was not collected.

By graphing mean grain size along the length of the Northwest Coast, three distinct regions were observed.

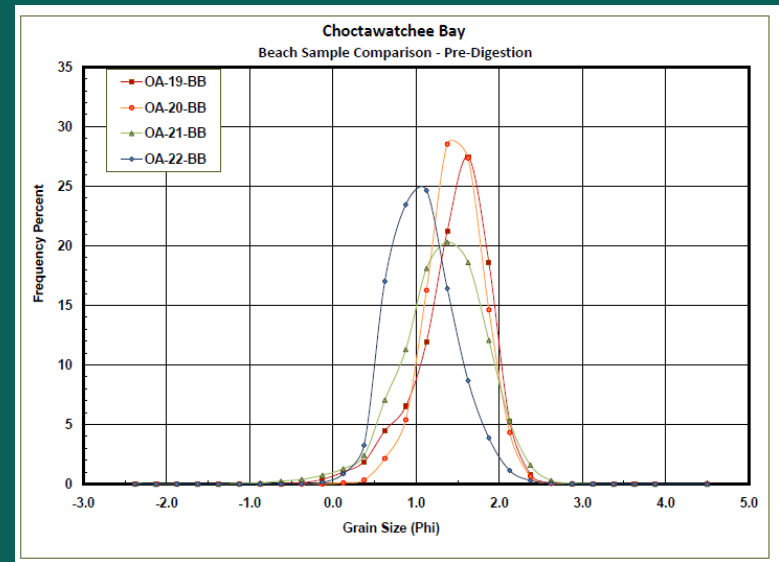
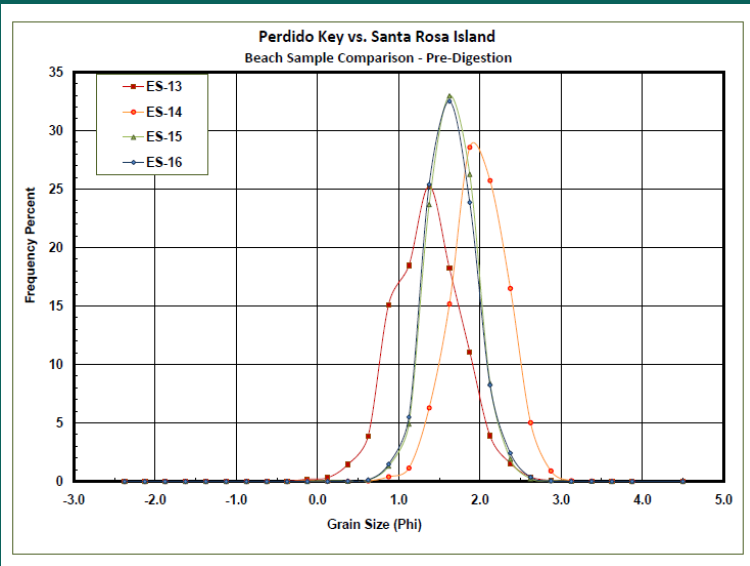


Region 1

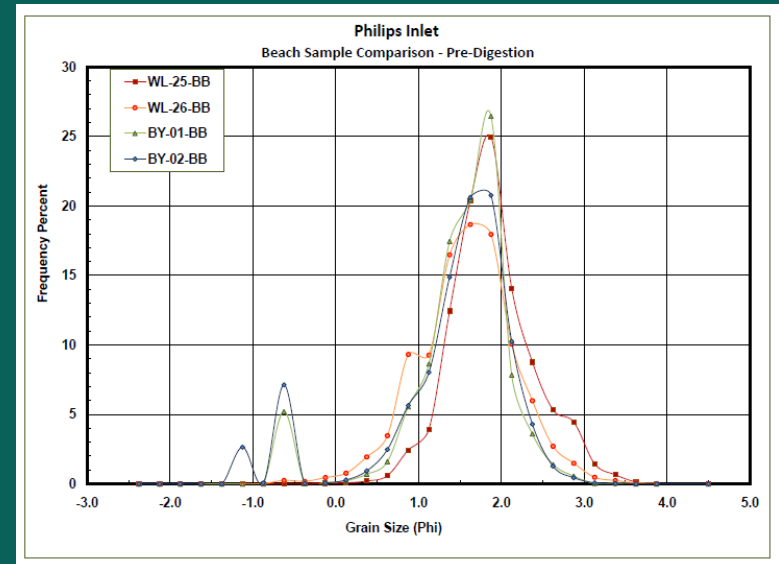


- Extends from Perdido Key to just west of the mouth of St. Andrews Bay.
- Its mean grain size curve generally declines eastward.
- The curve peaks on Perdido Key (in western Escambia Co), on Santa Rosa Island (in eastern Escambia Co), and on the mainland beaches of western Bay County.

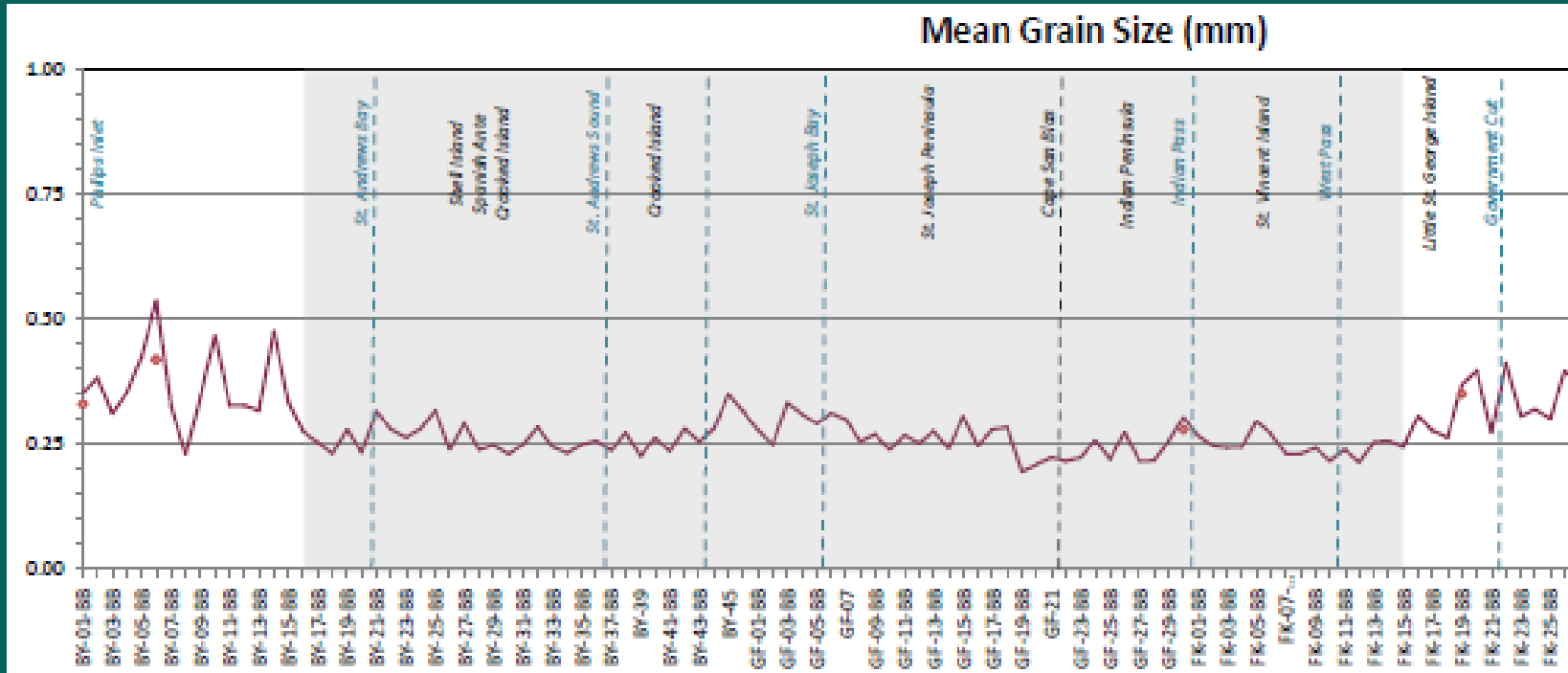




The grain size curves for samples collected on either side of the inlets and bay mouths that define the reaches in Region 1 are general uni-modal until Phillips Inlet is reached.

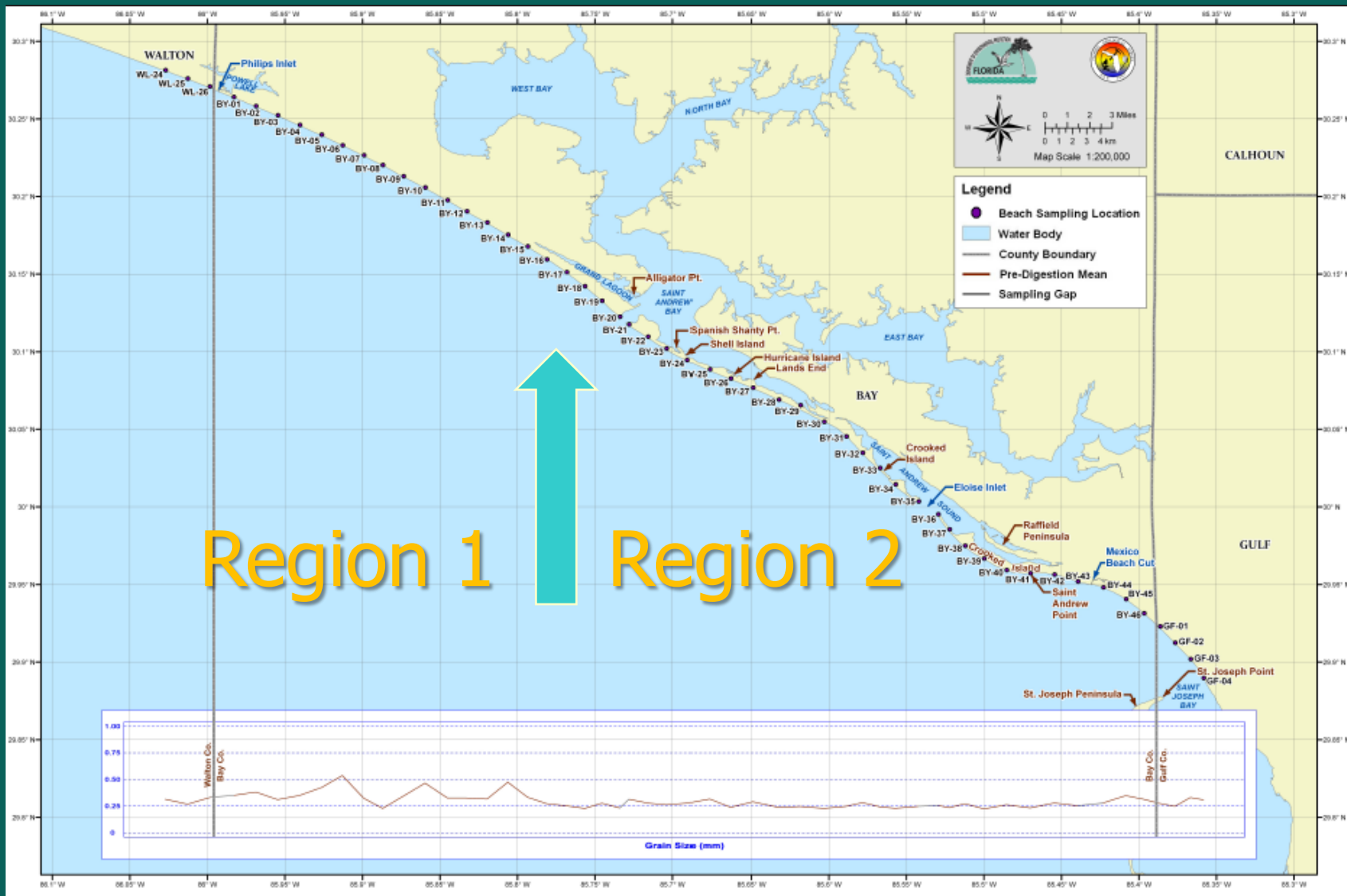


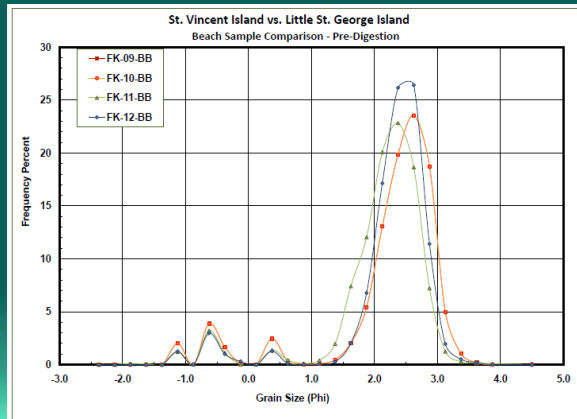
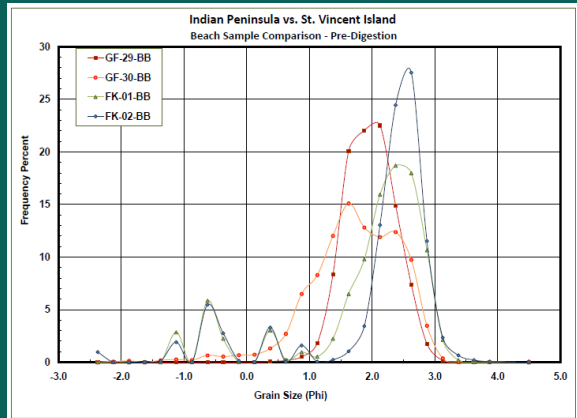
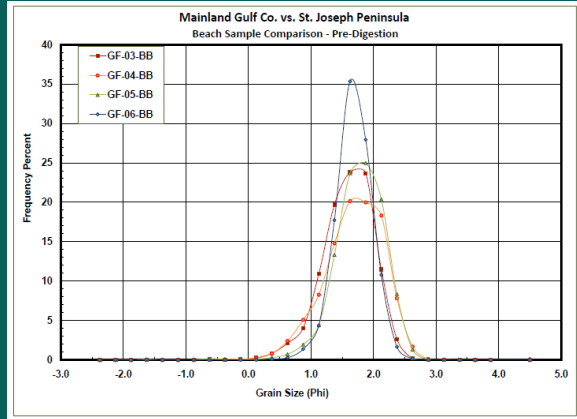
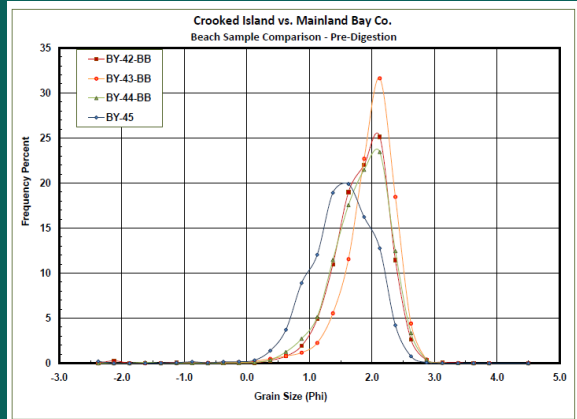
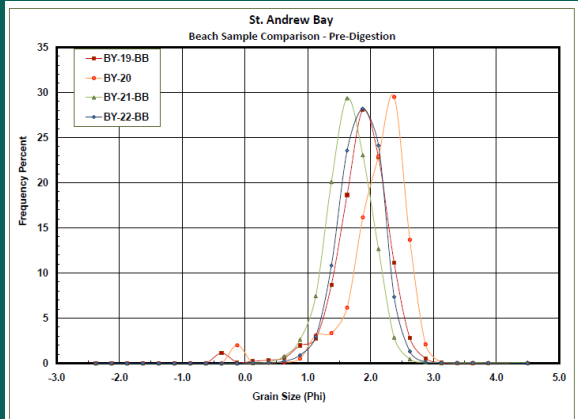
Region 2



- Extends from just west of the mouth of St. Andrews Bay to the portion of Little St. George Island west of Cape St. George.
- Its mean grain size averages finer than those in the regions to either side and generally declines eastward.



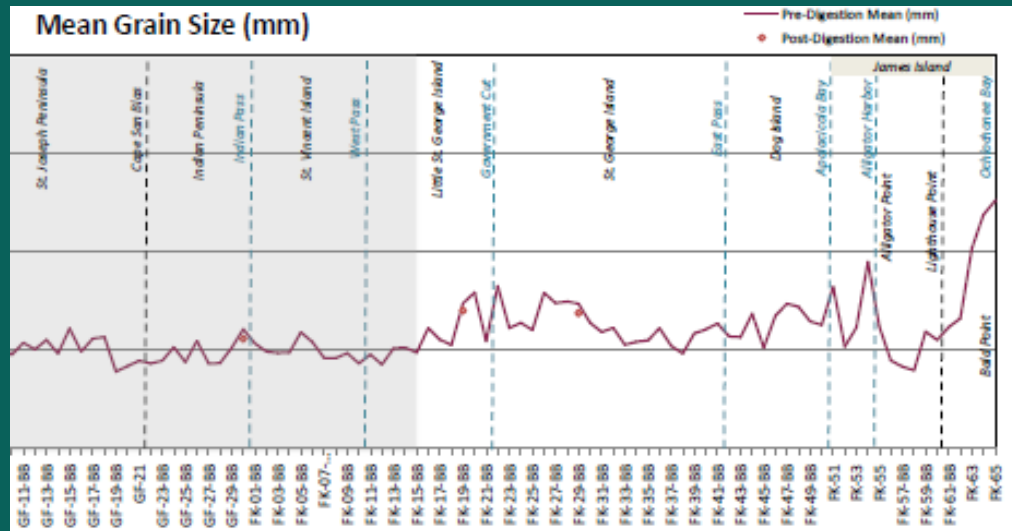




The grain size curves for samples collected on either side of the inlets and bay mouths that define the reaches in Region 2 are at first bimodal with a minor coarse fraction and then uni-modal until St. Vincent Island is reached.



Region 3



- Extends from Little St. George Island east of Cape St. George to St. James Island/Alligator Point.
- Mean grain size generally increases eastward across this region and peaks both at the end of the Alligator Point spit and Bald Point. Between those points, the curve shows a significant trough.
- This region shows the largest variances of mean grain size evidenced in any of the three regions.

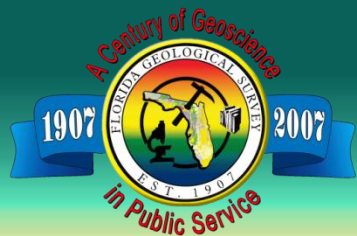


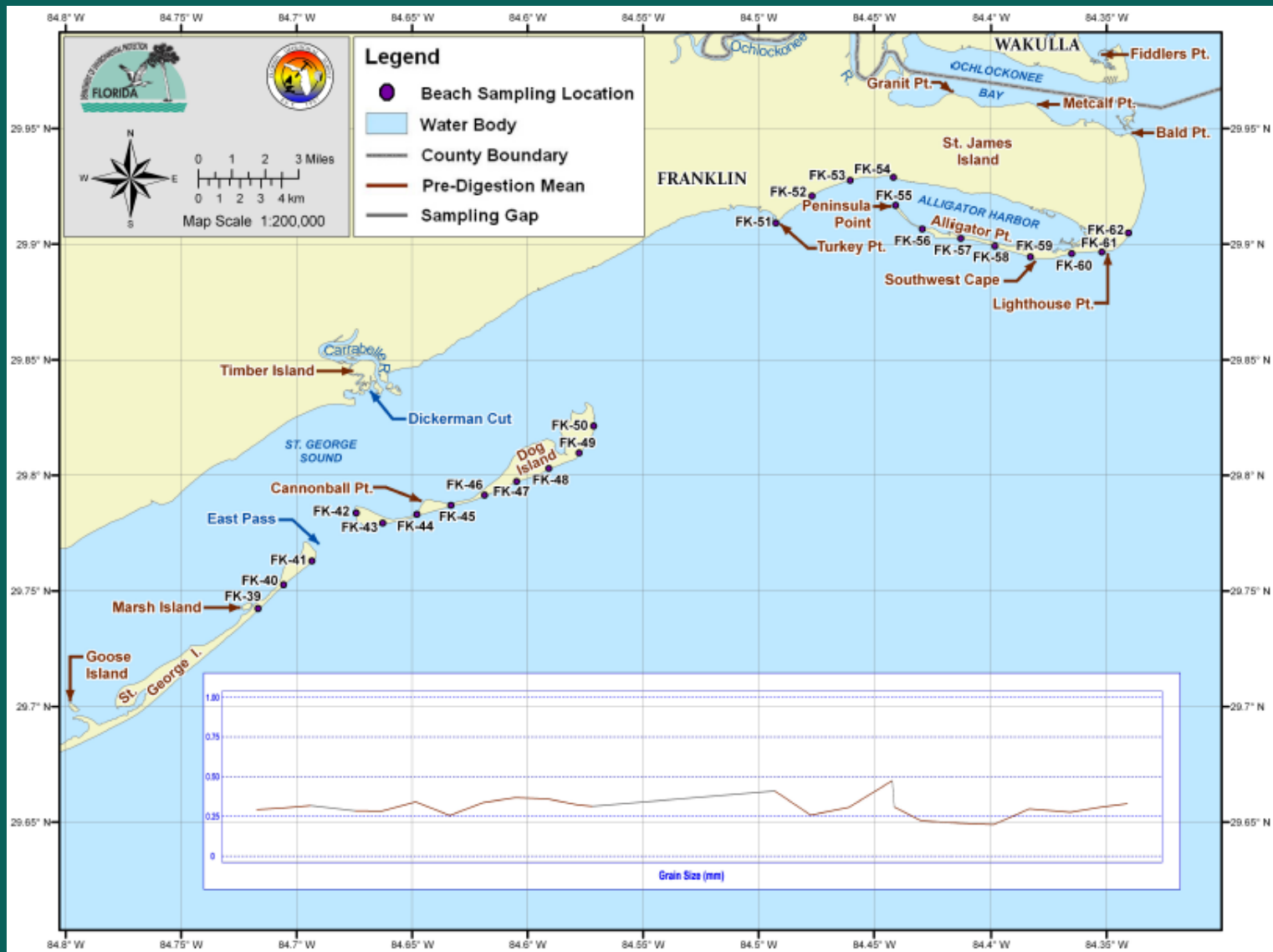


Region 2



Region 3



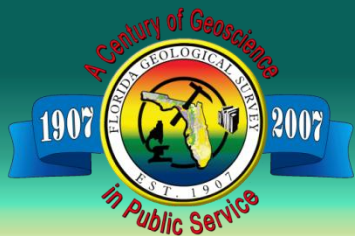


There are no sandy beaches between the east end of Dog island and Turkey Point.



Conclusions

- Less than four percent of the sediments present in the samples analyzed are carbonate.
- Changes in mean grain size define three regions on the northwest coast of Florida.
- The general trend from west to along the northwest coast of Florida shows an decrease in the mean grain size across Region 1 to Region 2 then an increase in mean grain size from Region 2 across Region 3.





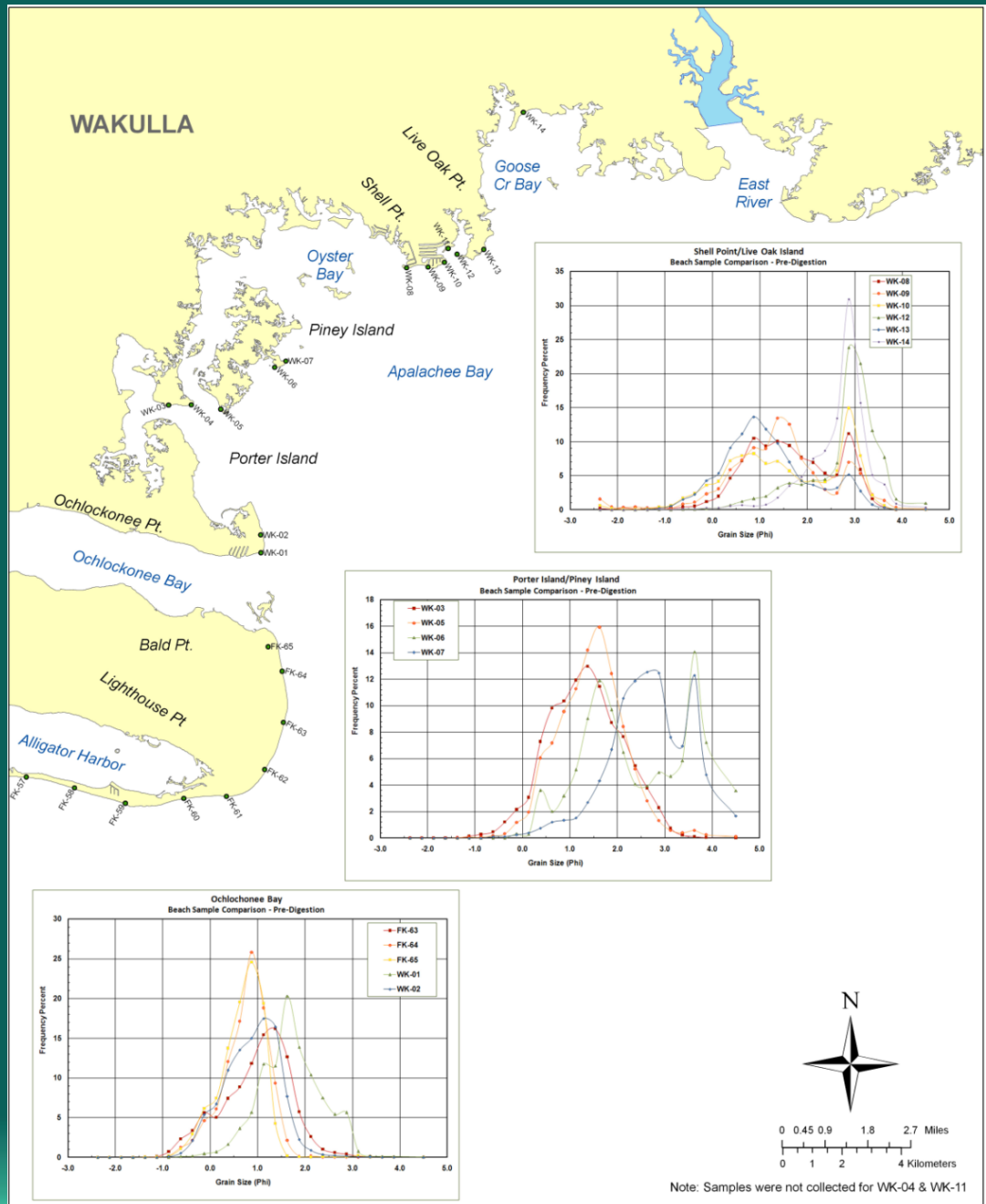
Granulometric Analysis

The Big Bend Coast of Florida

The Beaches of Bald Point (Franklin Co) and Wakulla County

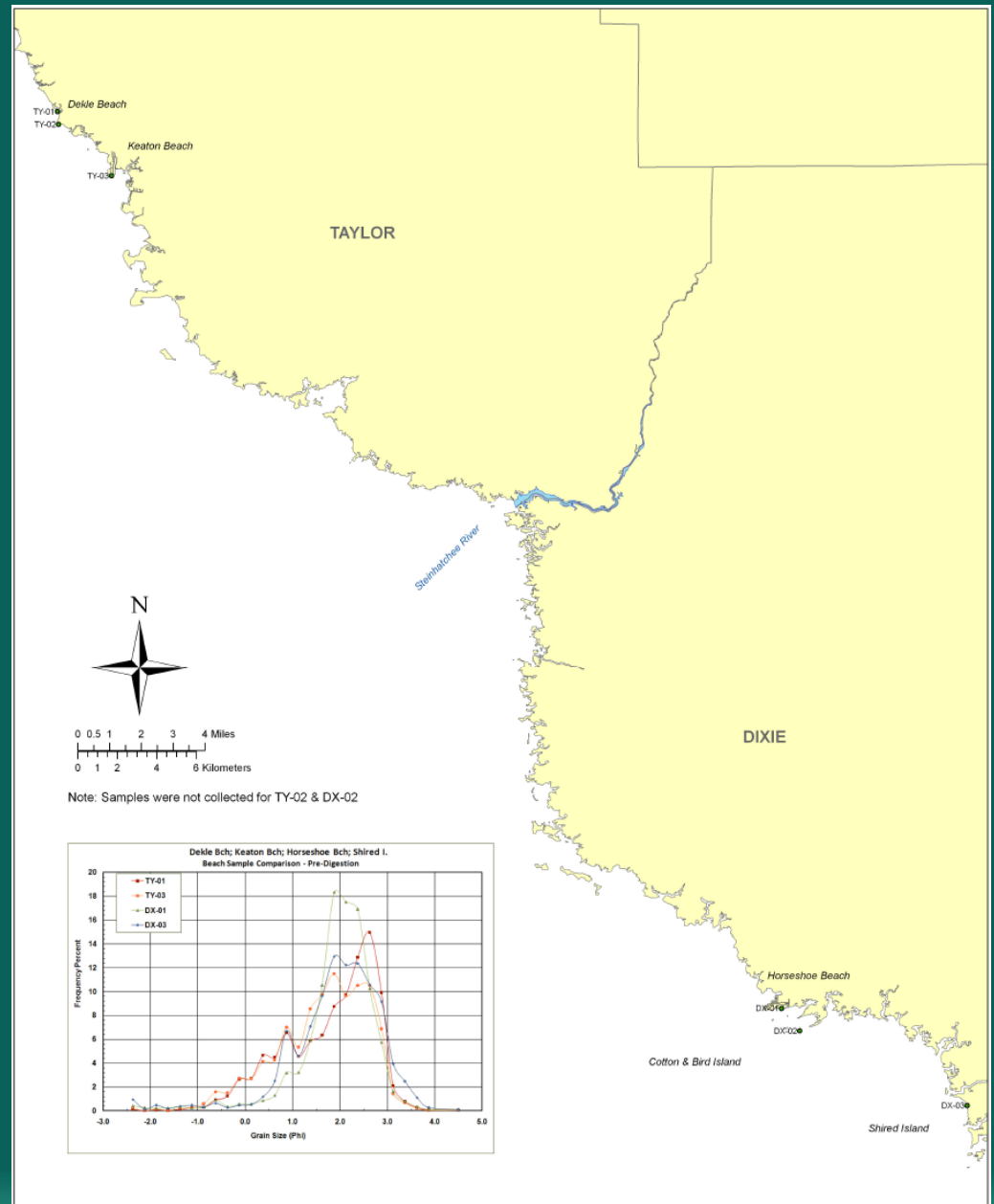
Progressing northward and eastward into Wakulla County:

- Mean grain size becomes variable from location to location
- Grain size distribution goes from uni-modal coarser grained sands to bimodal sands and then to uni-modal finer grained sands.



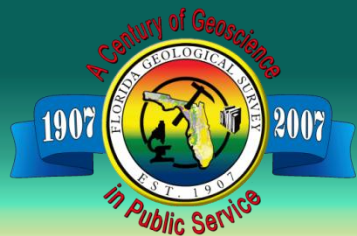
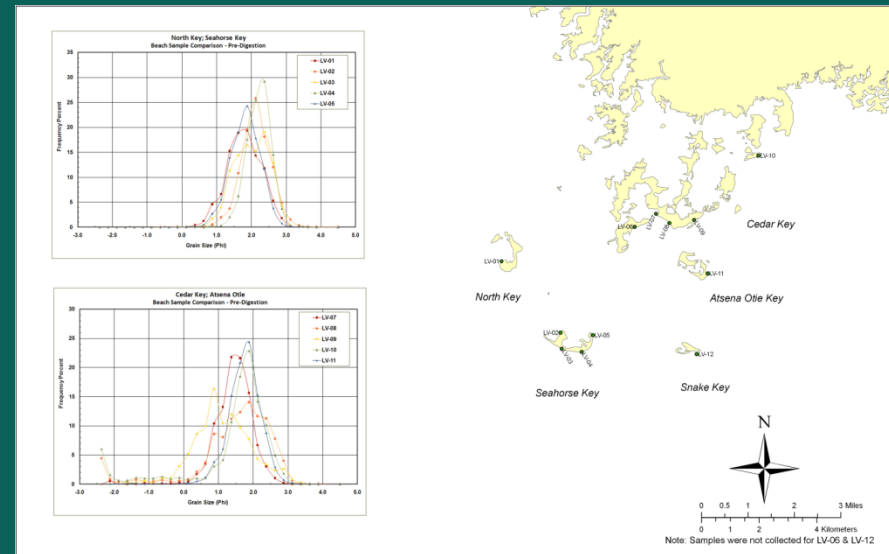
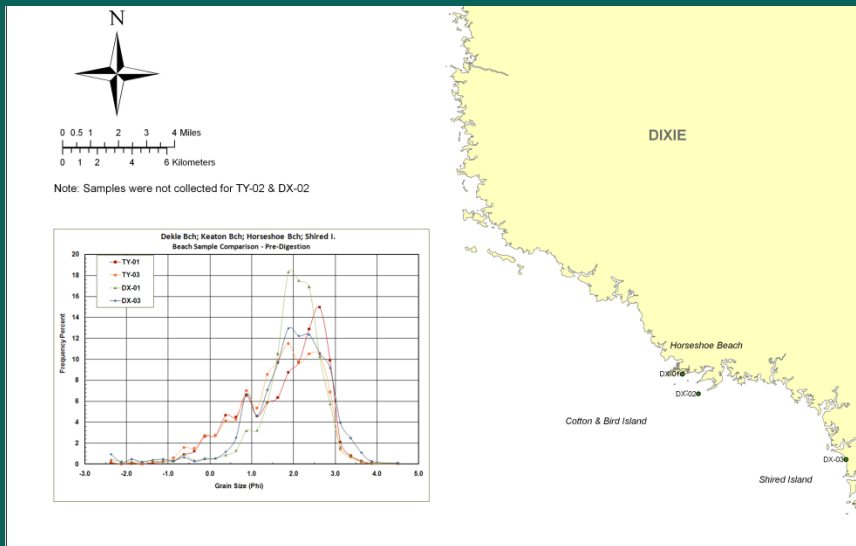
Taylor County

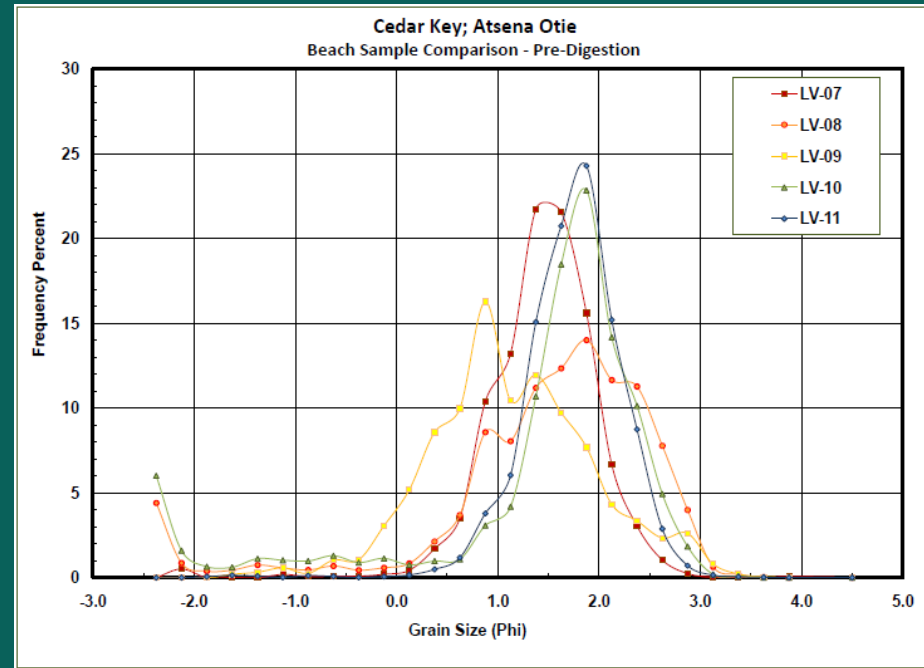
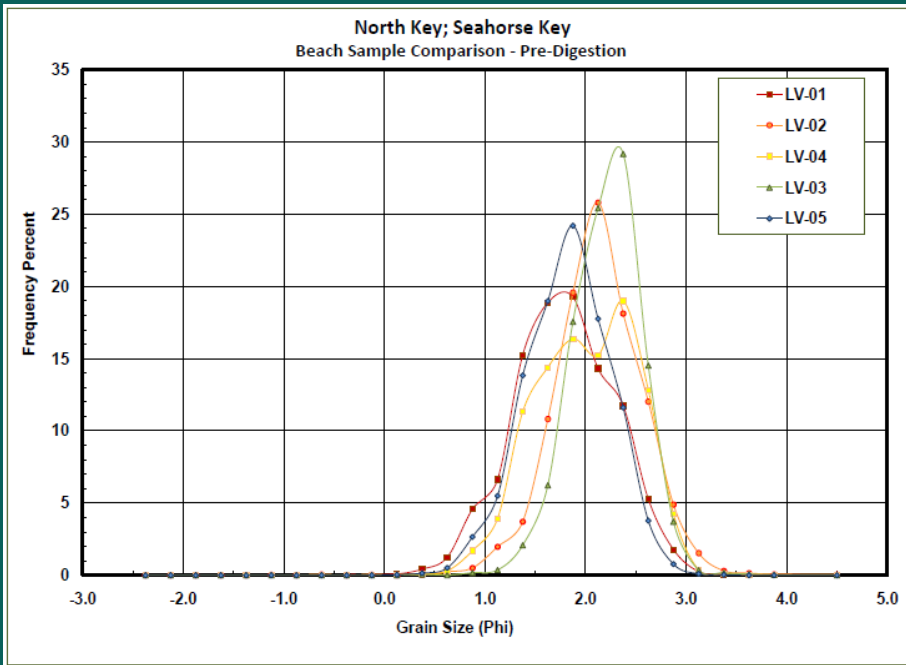
The beach, at Keaton Beach in Taylor County seems to have been man-made. Both Dekle Beach and Keaton Beach have been augmented and protected with engineered structures.



Dixie and Levy Counties

The natural beaches lying in Dixie and Levy Counties owe their existence to sediments supplied by the ancestral Suwannee River, relic dunes and possibly the reworking of the Ocala Limestone. While their mean grain size is variable, they are finer grained than the beaches to the north at Bald Point, in Franklin County, and in Wakulla County. They are coarser grained and their grain size curves broader than the beaches of Anclote Bar and Anclote Key further south.



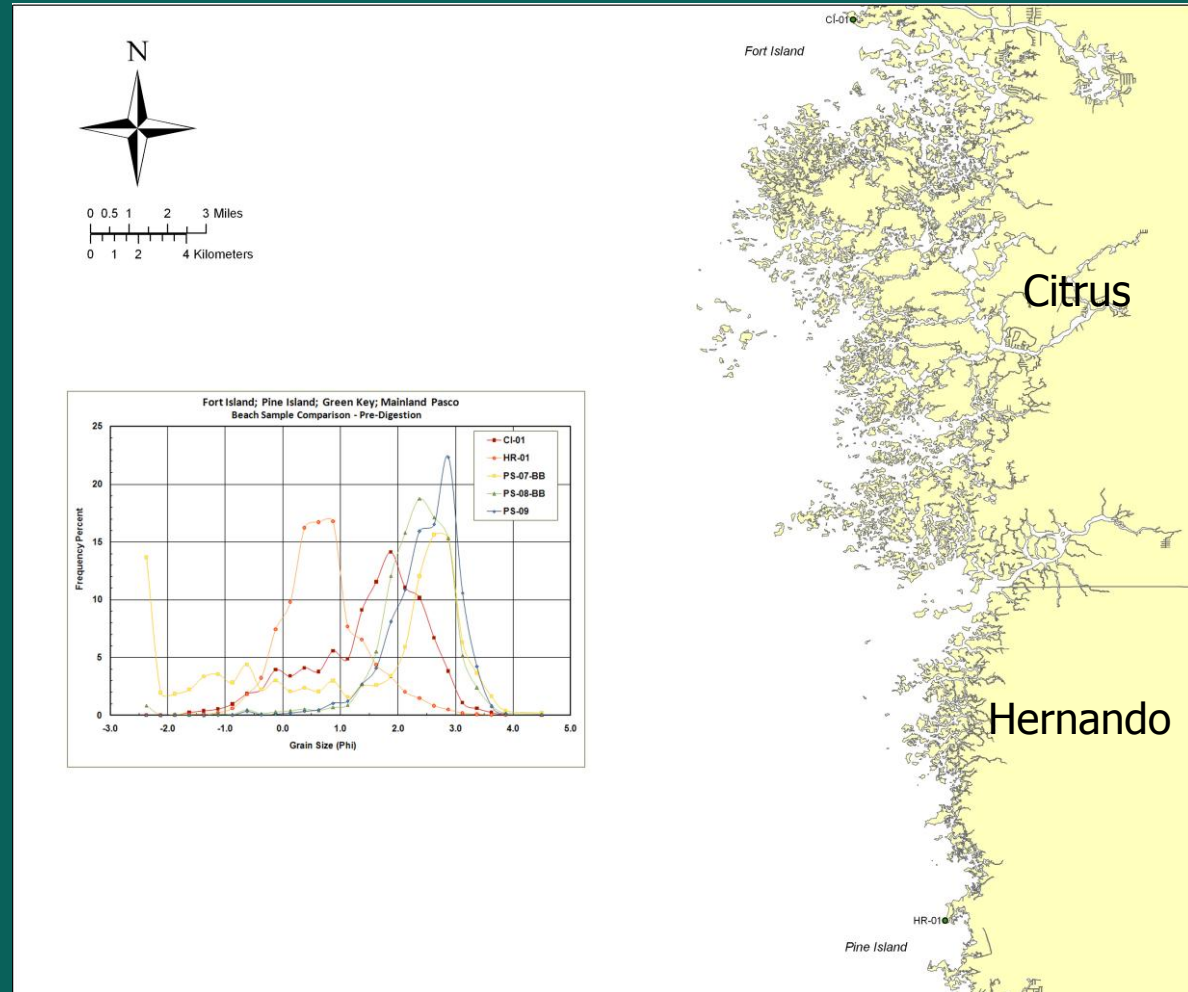


The characteristics of the curve for the sample collected at LV-09, shown in yellow on the graph to the right, are markedly different from those other samples collected in Levy County. The curve's peak is broader and shows the sediments to be, on average, coarser grained. That location is known to have been replenished.



Citrus and Hernando Counties

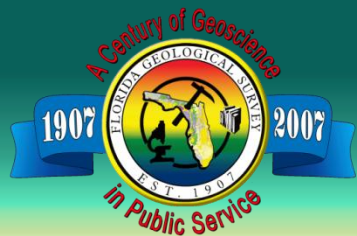
- The beaches sampled in Citrus and Hernando Counties have been modified with engineered structures.
- The beach at Fort Gulf Island Park in Citrus County is known to be man-made. The curve for its sample is shown in yellow on the graph.



Fort Gulf Island Park
Citrus County
← CI-01

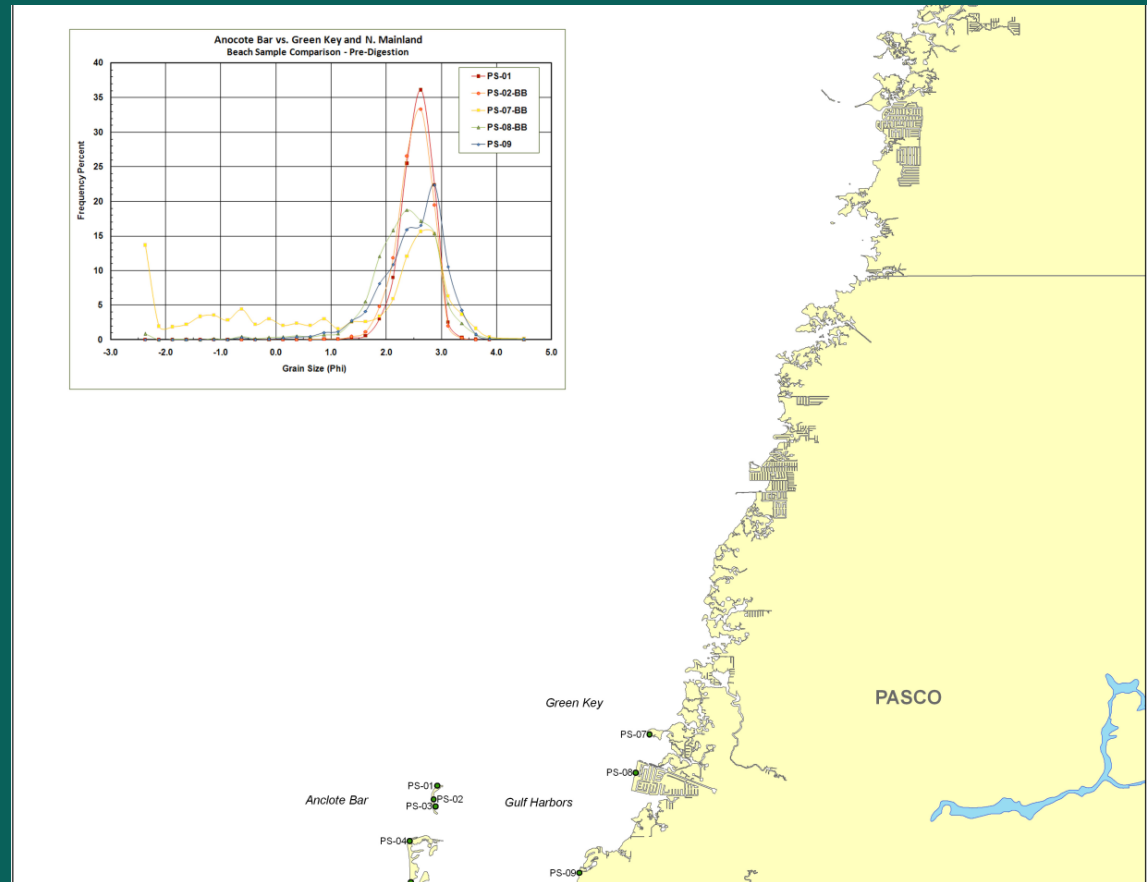
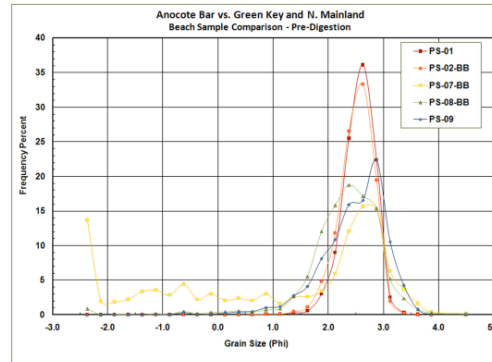


Hernando County
HR-01 →

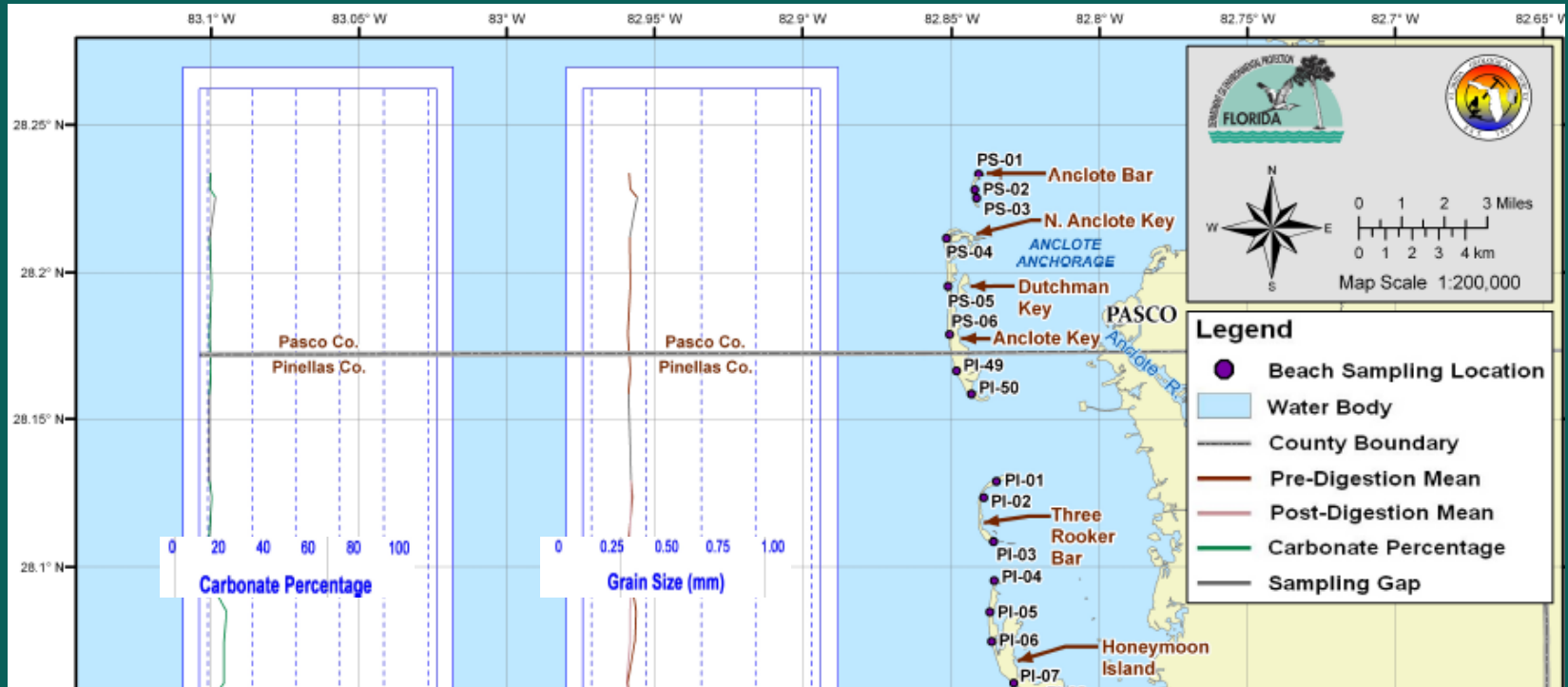


Onshore Pasco County beaches

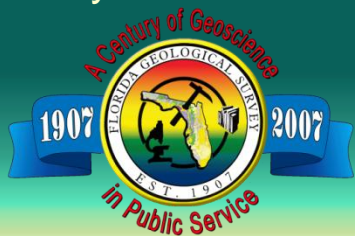
- The beach at Key Vista Nature Park appears to be natural.
- The beach at Robert K. Rees Memorial Park on Green Key is man-made. The curve for its sample is shown in yellow on the graph.
- The beach at Gulf Harbors is substantially augmented and protected with engineered structures.



Anclote Bar and Anclote Key



Anclote Bar and Anclote Key, are part of the southwest Florida barrier island system. They are the northern extension of the northern most of the regions described in Phelps *et al.* (2010). Their beach sediments are typified by low carbonate percentages and mean grain sizes that are finer than those of the reach to its south and the natural beaches of the Cedar Keys to the north.



Conclusions

- Geographic isolation and restricted sediment sources define the beaches on the Big Bend coast of Florida.
- Beaches in Wakulla County, while highly variable in mean grain size, fine northeastward.
- The natural beaches found in Dixie and Levy Counties owe their existence to sediments supplied by the ancestral Suwannee River, relic dunes and likely some reworking of the Ocala Limestone.
- The beaches of Anclote Bar and Anclote Key, offshore of southern Pasco County and extreme northern Pinellas County, complete the northward trend of increasingly finer grain size and lower carbonate percentages previously reported for Pinellas County beaches.

