Something More Permanent: Upham Beach T-Groins 3-Year Monitoring

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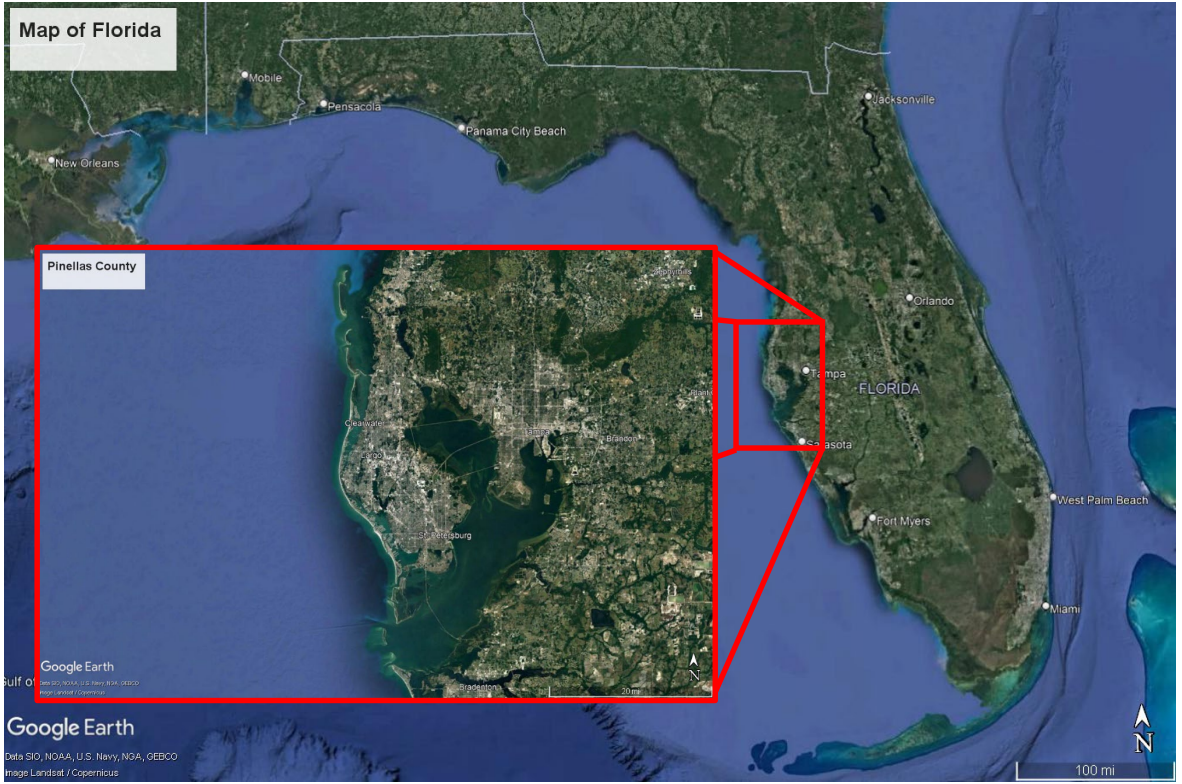
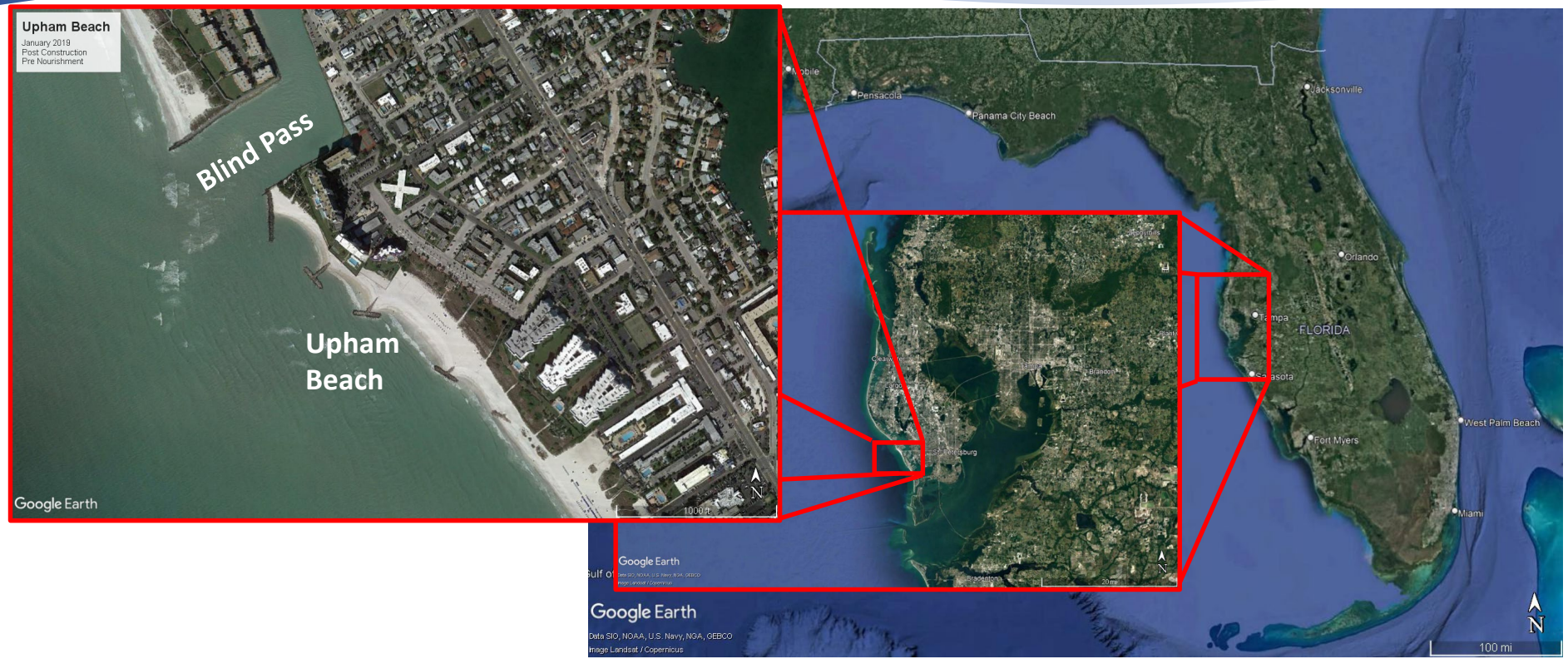
Pinellas County Beaches Overview

- West Central Gulf Coast
- Main sediment transport direction is from North to South
- Pre-dominantly siliciclastic sediments
- First barrier island chain coming down from the Big Bend of Florida
- Contain multiple inlets mainly used for recreation and as sand sources for beach projects
- Also heavily influenced by flows through the Tampa Bay Estuary
- Largely engineered shoreline (hard and soft)

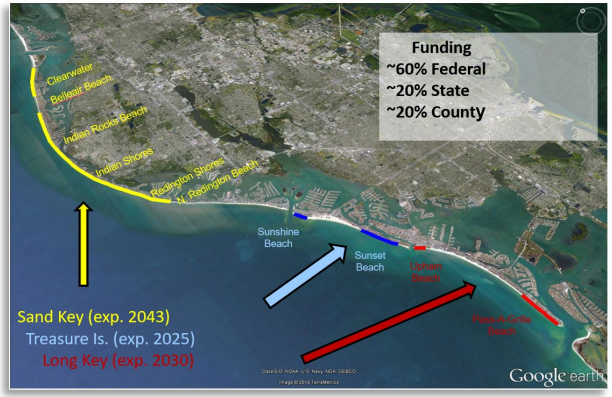


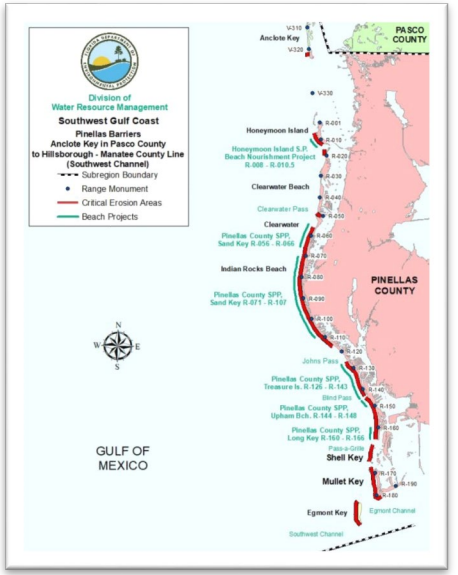
Upham Beach Park- St. Pete Beach



Pinellas County Beaches

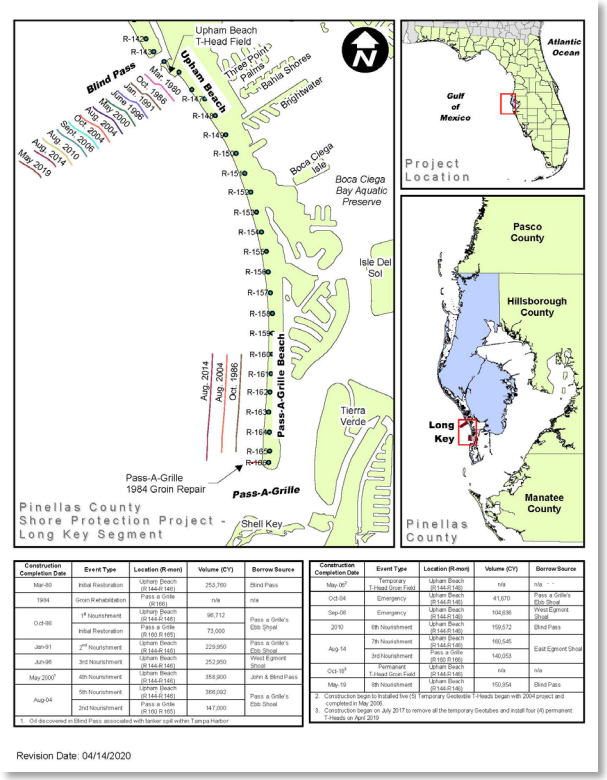
- Sand Key, Long Key, and Treasure Island are part of the USACE Federal Nourishment Projects.
- Nourishment has been occurring in Pinellas County since the late 1960s (Treasure Island) up until the most recent project in 2021 (Honeymoon Island)





Upham Beach T-Groins

- Nourished 11 times
- 1997-98 El Nino Winter
  - Erosion 1.4 ft/day*
- Upham is considered a feeder beach for Long Key.
- Explains why Pass-a-Grille beach to the south does not require as much sand to maintain



Construction Completion Date	Event Type	Location (R-mon)	Volume (CY)	Borrow Source
Mar-80	Initial Restoration	Upham Beach (R-144-R-146)	253,700	Blind Pass
1984	Groin Rehabilitation	Pass a Grille (R-166)	n/a	n/a
Oct-86	1st Nourishment	Upham Beach (R-144-R-146)	96,712	Pass a Grille's Ebb Shoal
	Initial Restoration	Pass a Grille (R-160 R-165)	73,000	
Jan-91	2nd Nourishment	Upham Beach (R-144-R-146)	229,950	Pass a Grille's Ebb Shoal
Jun-96	3rd Nourishment	Upham Beach (R-144-R-146)	252,950	West Egmont Shoal
May-2001	4th Nourishment	Upham Beach (R-144-R-146)	358,900	John & Blind Pass
Aug-04	5th Nourishment	Upham Beach (R-144-R-146)	366,092	Pass a Grille's Ebb Shoal
	2nd Nourishment	Pass a Grille (R-160 R-165)	147,000	

1. Oil discovered in Blind Pass associated with tanker spill within Tampa Harbor

Construction Completion Date	Event Type	Location (R-mon)	Volume (CY)	Borrow Source
May-06[2]	Temporary T-Head Groin Field	Upham Beach (R-144-R-146)	n/a	n/a - -
Oct-06	Emergency	Upham Beach (R-144-R-146)	41,670	Pass a Grille's Ebb Shoal
Sep-06	Emergency	Upham Beach (R-144-R-146)	104,636	West Egmont Shoal
2010	6th Nourishment	Upham Beach (R-144-R-146)	159,572	Blind Pass
Aug-14	7th Nourishment	Upham Beach (R-144-R-146)	160,545	East Egmont Shoal
	3rd Nourishment	Pass a Grille (R-160 R-166)	140,053	
Oct-19[3]	Permanent T-Head Groin Field	Upham Beach (R-144-R-146)	n/a	n/a
May-19	8th Nourishment	Upham Beach (R-144-R-146)	150,954	Blind Pass

2. Construction began to installed five (5) Temporary Geotextile T-Heads began with 2004 project and completed in May 2006.
3. Construction began on July 2017 to remove all the temporary Geotubes and install four (4) permanent T-Heads on April 2019

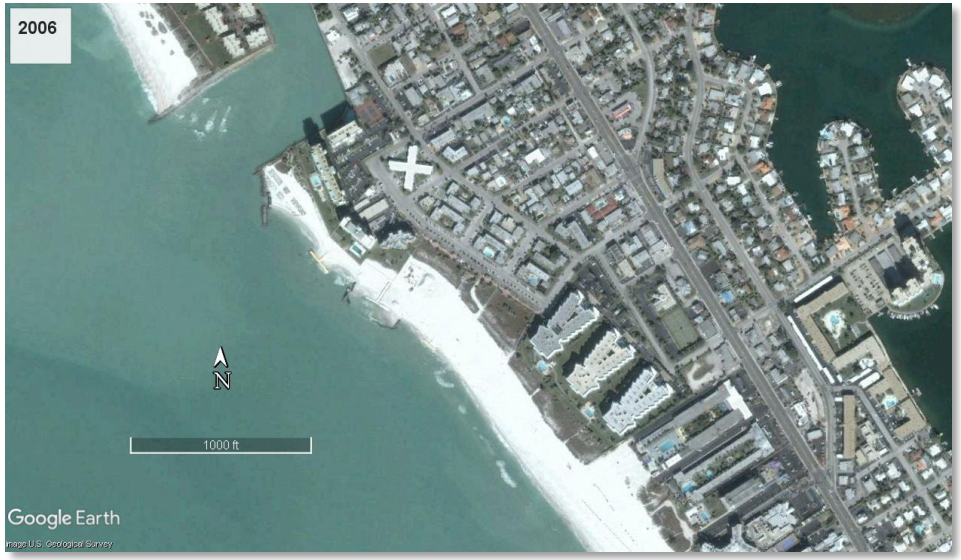
* Elko, N. & Mann, D. (Spring 2007) Implementation of Geotextile T-Groins in Pinellas County, Florida. *Shore & Beach,* Vol. 75, No.2: pp 2

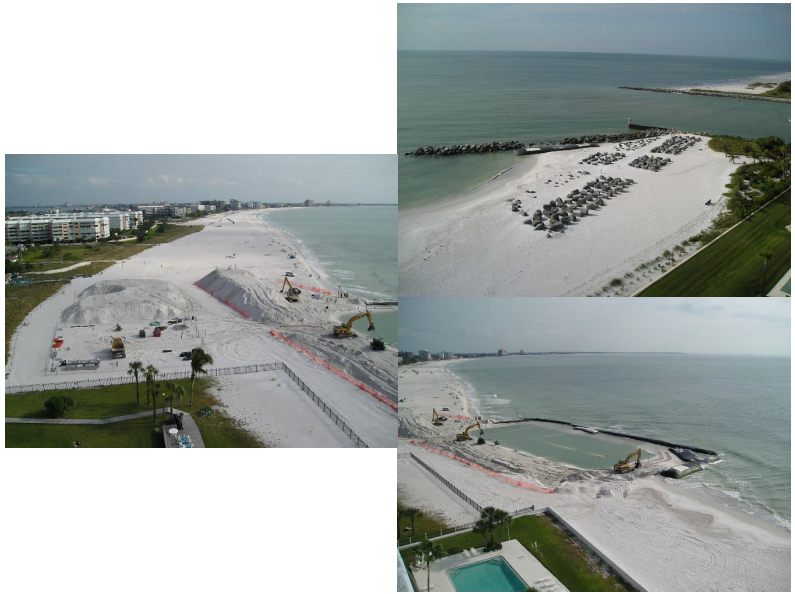
History of Structures at Upham

Heavily eroded beach. Aerial from 1995. Close up from 1989.

History of Structures at Upham

Construction of Geotube T-Groins and filling in of detached breakwater.



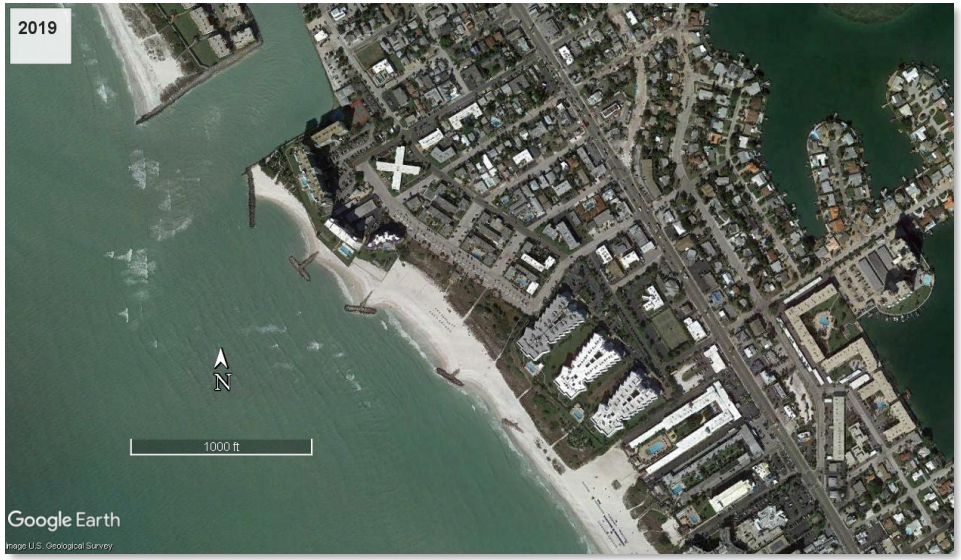


History of Structures at Upham

Aerial and close up image from 2013 showing extent of sand loss due to background erosion rates and Tropical Storm Debbie (2012)

History of Structures at Upham

Installation of Rock T-Groins which finished 10/2018

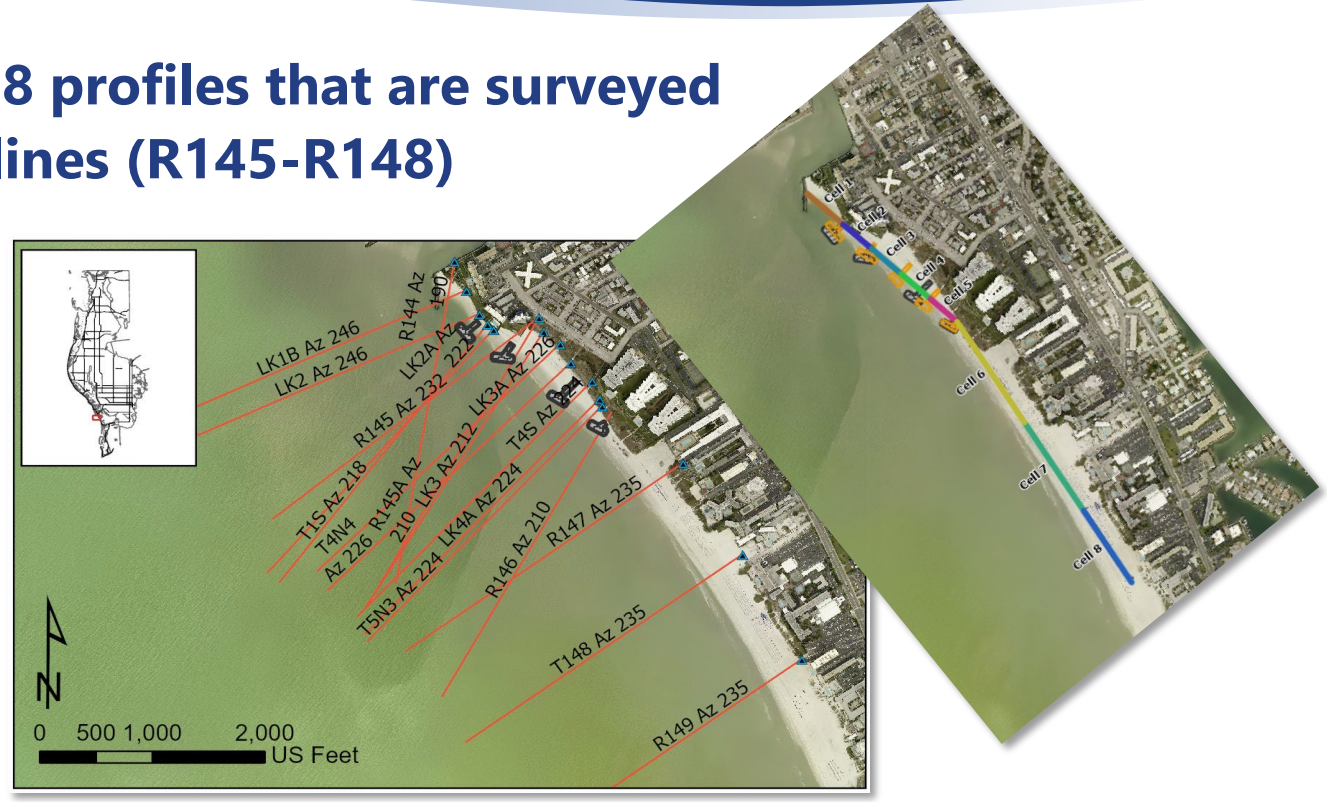


How the Structures are Monitored

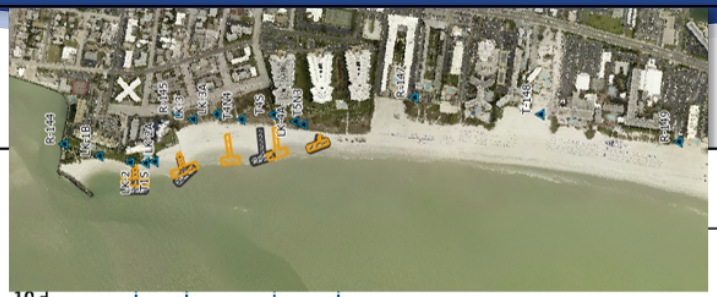
There are roughly 18 profiles that are surveyed including 5 RMON lines (R145-R148)

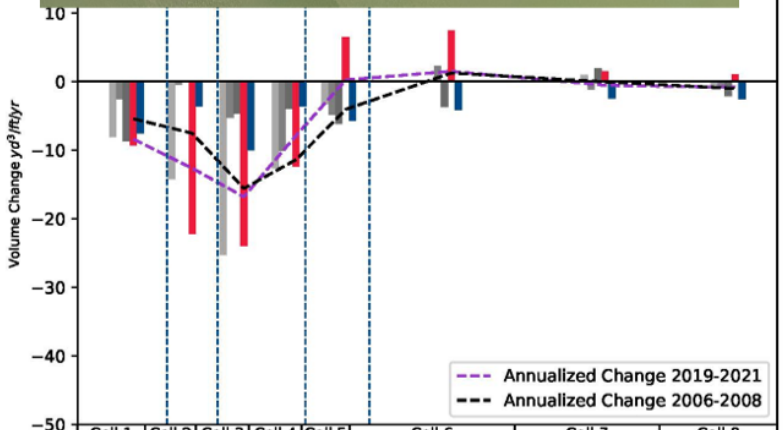
The monitoring report focuses on whether the rock T-Groins function as well as the geotube T-Groins without downdrift impacts

Cell size coincides with the original location of geotubes



Blue lines coincide with location of the structures within the individual cells

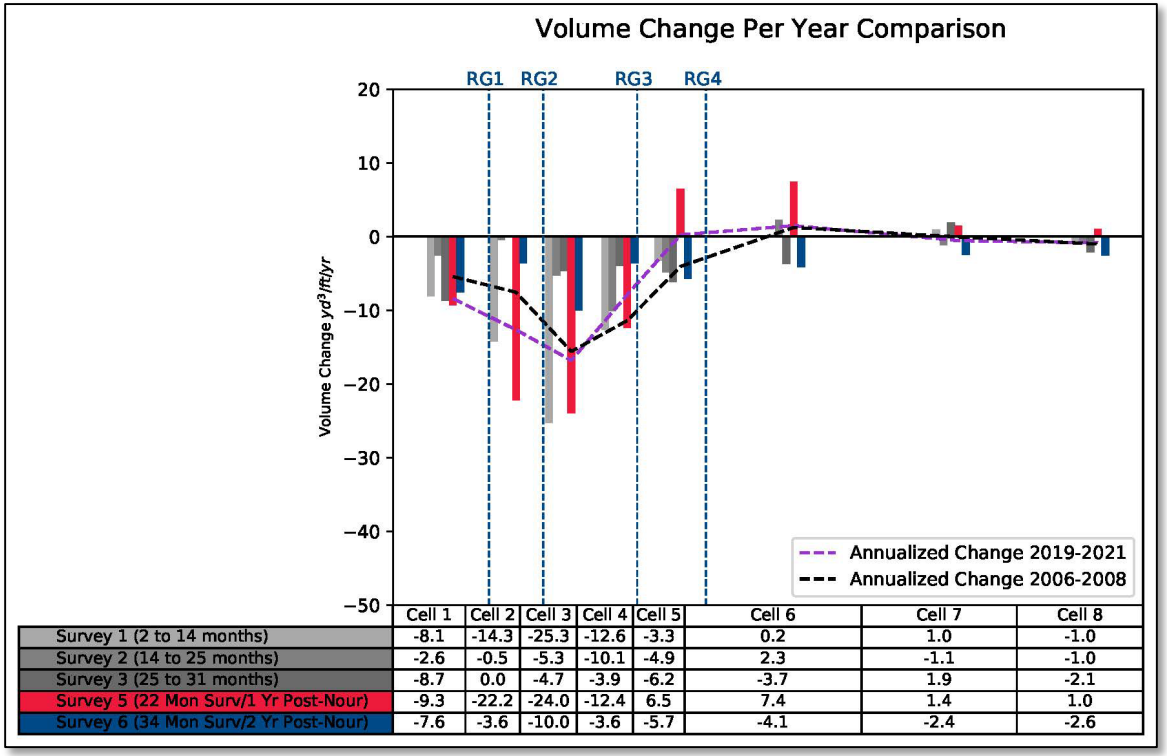




	Cell 1	Cell 2	Cell 3	Cell 4	Cell 5	Cell 6	Cell 7	Cell 8
Survey 1 (2 to 14 months)	-8.1	-14.3	-25.3	-12.6	-3.3	0.2	1.0	-1.0
Survey 2 (14 to 25 months)	-2.6	-0.5	-5.3	-10.1	-4.9	2.3	-1.1	-1.0
Survey 3 (25 to 31 months)	-8.7	0.0	-4.7	-3.9	-6.2	-3.7	1.9	-2.1
Survey 5 (22 Mon Surv/1 Yr Post-Nour)	-9.3	-22.2	-24.0	-12.4	6.5	7.4	1.4	1.0
Survey 6 (34 Mon Surv/2 Yr Post-Nour)	-7.6	-3.6	-10.0	-3.6	-5.7	-4.1	-2.4	-2.6

Volumetric Change

Sand being retained at a constant rate along the project area. No major peaks or valleys in volumetric changes



	Cell 1	Cell 2	Cell 3	Cell 4	Cell 5	Cell 6	Cell 7	Cell 8
Survey 1 (2 to 14 months)	-8.1	-14.3	-25.3	-12.6	-3.3	0.2	1.0	-1.0
Survey 2 (14 to 25 months)	-2.6	-0.5	-5.3	-10.1	-4.9	2.3	-1.1	-1.0
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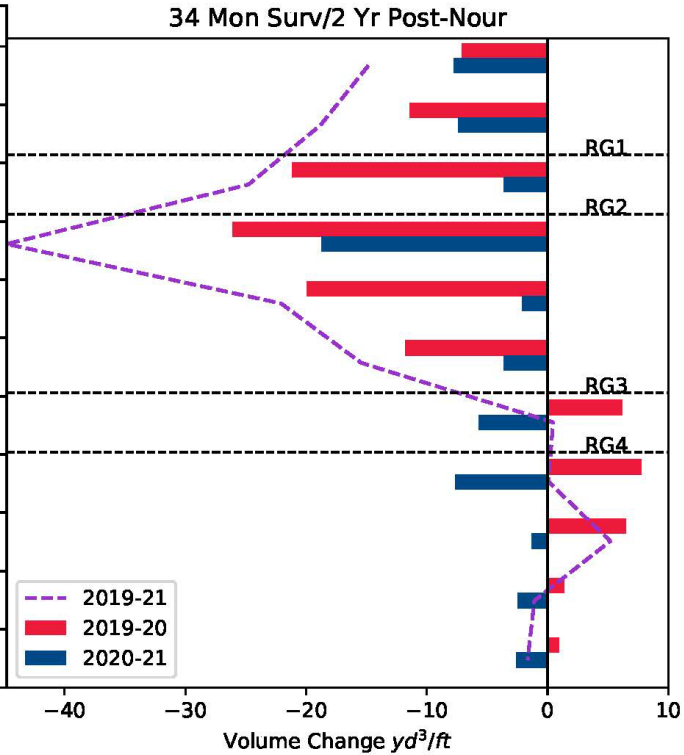
Survey 6 (34 Mon Surv/2 Yr Post-Nour)	-7.6	-3.6	-10.0	-3.6	-5.7	-4.1	-2.4	-2.6

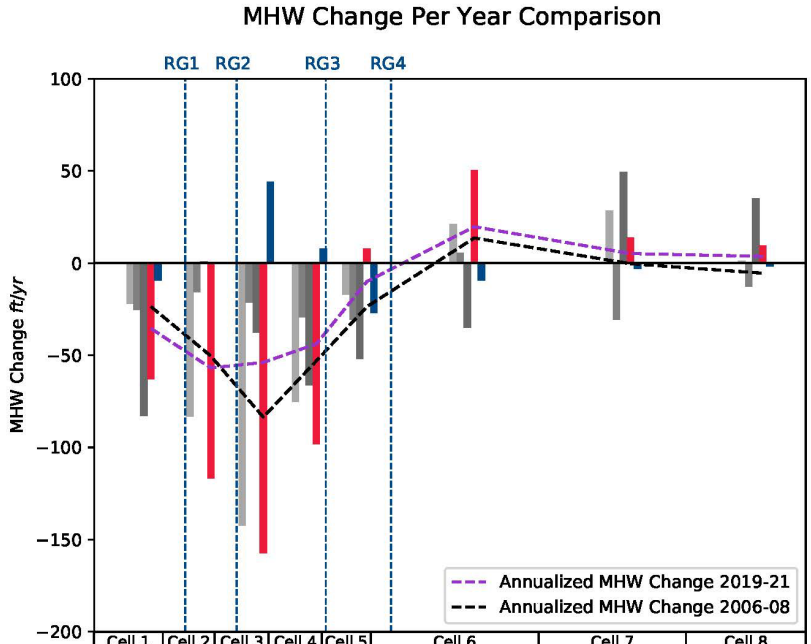
Volumetric Change

2019-20 $\Delta yd^3/ft$	2020-21 $\Delta yd^3/ft$	Rmon
-7.1	-7.8	LK1A
-11.4	-7.4	LK2
-21.1	-3.6	LK2A
-26.1	-18.7	R145
-19.9	-2.1	LK3A
-11.8	-3.6	LK3B
6.2	-5.7	LK4A
7.7	-7.7	LK5A
6.5	-1.3	R147
1.4	-2.5	R148
1.0	-2.6	R149



Sand being retained at a higher rate post-equilibration within the rock groin areas

Shoreline Change

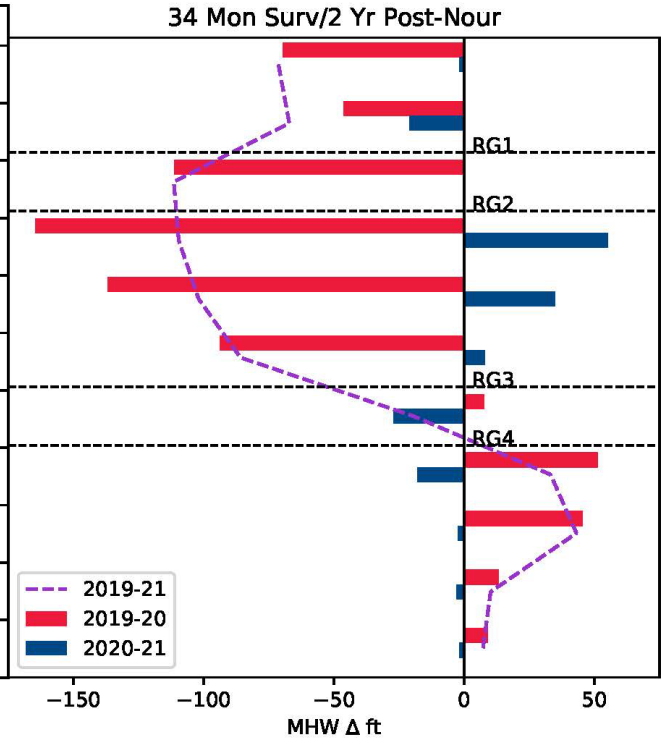


	Cell 1	Cell 2	Cell 3	Cell 4	Cell 5	Cell 6	Cell 7	Cell 8
Survey 1 (2 to 14 months)	-22.0	-83.3	-142.4	-75.3	-17.0	21.2	28.4	1.3
Survey 2 (14 to 25 months)	-25.4	-15.7	-21.4	-29.5	-30.6	5.6	-30.8	-12.7
Survey 3 (25 to 31 months)	-82.9	1.0	-37.7	-66.2	-52.0	-34.9	49.6	35.0
Survey 5 (22 Mon Surv/1 Yr Post-Nour)	-62.9	-116.7	-157.4	-98.3	7.9	50.4	13.8	9.5
Survey 6 (34 Mon Surv/2 Yr Post-Nour)	-9.6	-0.2	44.2	7.8	-27.0	-9.3	-3.0	-1.9

When comparing the geotubes and rock groins, the shoreline change has been minimized in the project area with shoreline accretion occurring downdrift

Shoreline Change

2019-20 Δ ft	2020-21 Δ ft	Rmon
-69.6	-1.7	LK1A
-46.2	-20.9	LK2
-111.3	-0.2	LK2A
-164.6	55.1	R145
-136.7	34.8	LK3A
-93.7	7.8	LK3B
7.6	-27.1	LK4A
51.1	-17.9	LK5A
45.5	-2.4	R147
13.2	-3.0	R148
9.0	-1.9	R149



MHW line accreted landward between RG2 and RG3 where there is a gap in the structures. Minimal changes to the shoreline downdrift.

Example Profiles

LK2A

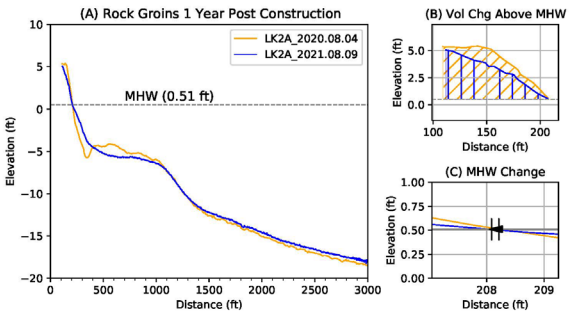


Table 1. MHW Shoreline and Volume Changes

	Rock T Groins (370 Days)
Vol Chg Above MHW	-3.64 yd^3/ft , -3.59 $yd^3/ft/yr$
MHW Change	-0.2 *ft* , -0.2 *ft/yr*

LK3

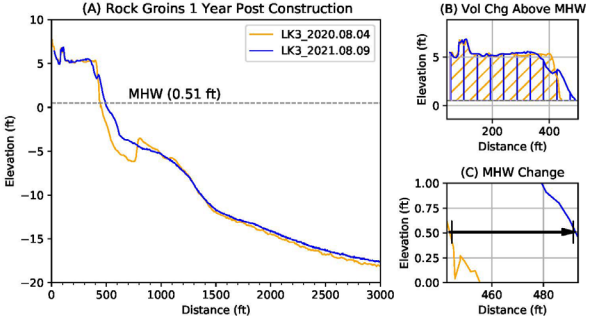


Table 1. MHW Shoreline and Volume Changes

	Rock T Groins (370 Days)
Vol Chg Above MHW	2.09 yd^3/ft , 2.06 $yd^3/ft/yr$
MHW Change	48.76 *ft* , 48.1 *ft/yr*

R149

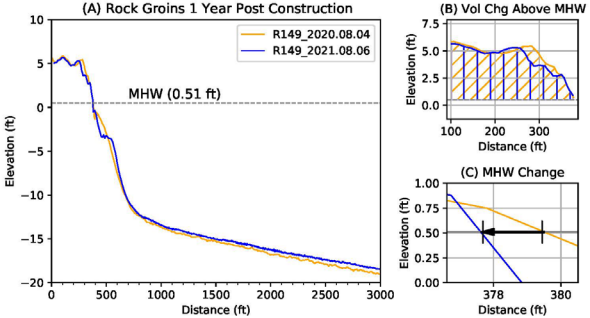
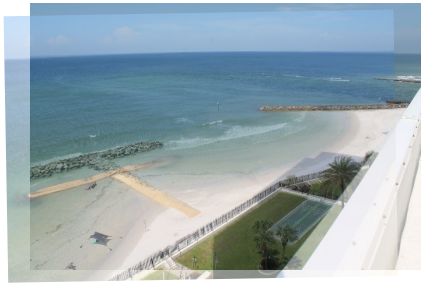


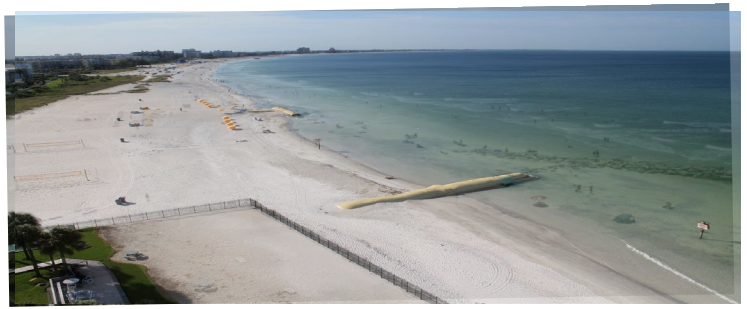
Table 1. MHW Shoreline and Volume Changes

	Rock T Groins (367 Days)
Vol Chg Above MHW	-2.61 yd^3/ft , -2.59 $yd^3/ft/yr$
MHW Change	-1.88 *ft* , -1.87 *ft/yr*

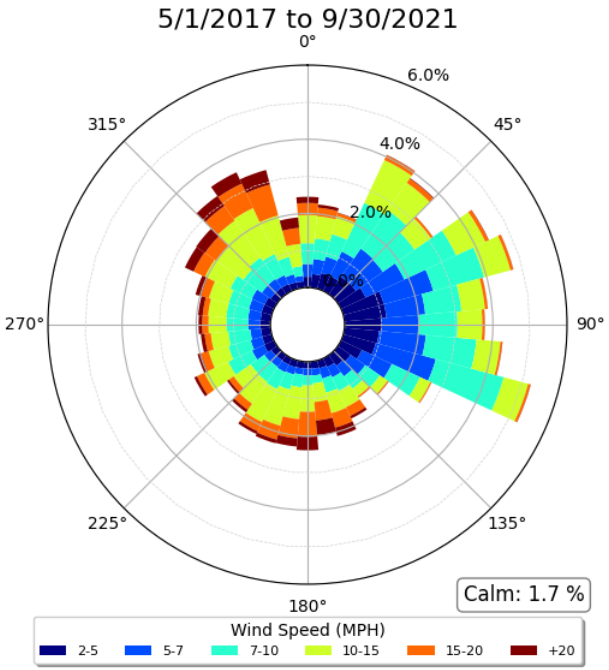
Overview

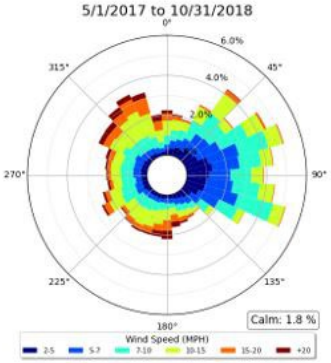
Survey	Shoreline Change (ft/yr)	Volume Change above MHW (yd^3/yr)
Survey 1	-14.7	-24,190.1
Survey 2	-16.7	-8,282.7
Survey 3	-11.4	-13,890
Survey 4	-18.9	-3,457.13
Survey 5	-17.0	-13,086
Survey 6	-1.7	-21,720
Survey 7	TBD	TBD

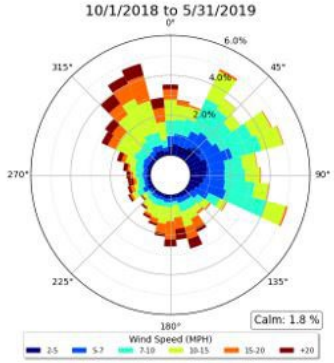


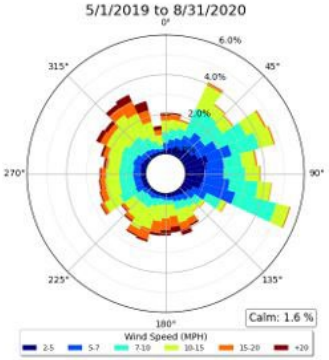


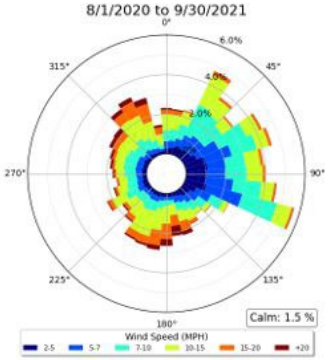
Wind Conditions During The Monitoring Period 3-Year Period





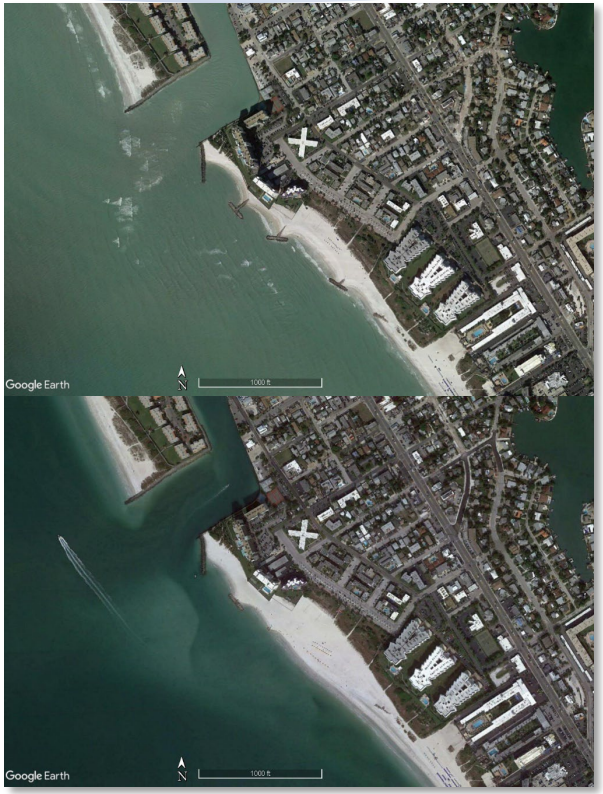




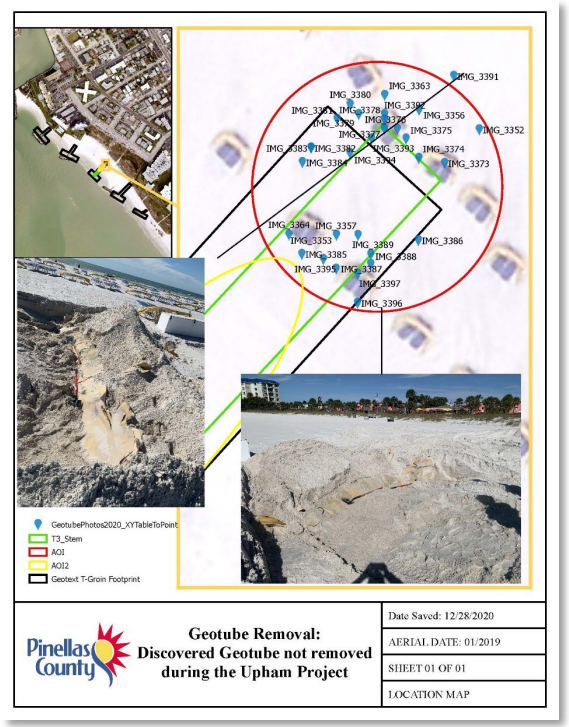


Update On Current Project

- Rock T-Groins have been in place for 3 years
- Last Nourishment was 2019 after the T-Groins were constructed and geotextile tubes were removed
- Construction Funds for a combined Treasure Island-Long Key project have been approved.
- Construction should start in Summer 2023
- Next monitoring period will be a reset since there will be a new nourishment project



There's Always Surprises



Discussion

- The different medium (rock vs geotextile tube) allows for better wave deflection evidenced by the absence of scour holes around the structures

- Different configuration and orientation allow for a better shoreline equilibration that doesn’t sacrifice equilibration for sediment transport

Questions?

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Pinellas County Beach Performance Index→