

# POST-STORM ASSESSMENT METRICS FROM ANNA MARIA ISLAND

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FLORIDA SHORE & BEACH  
PRESERVATION ASSOCIATION  
A League of Cities and Counties on Beach and Coastal Issues

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# ANNA MARIA ISLAND

- Manatee County, Florida
- 7-mile-long barrier island
- Passage Key Inlet to north
- Longboat Pass to the south
- 6.8 million cubic yards placed since 1992
- Coquina Beach:
  - Southern mile of island (erosional hotspot)
  - Public beach and recreation facility
  - Roadway and critical evacuation route
  - County managed coastal program



# COQUINA BEACH HISTORY

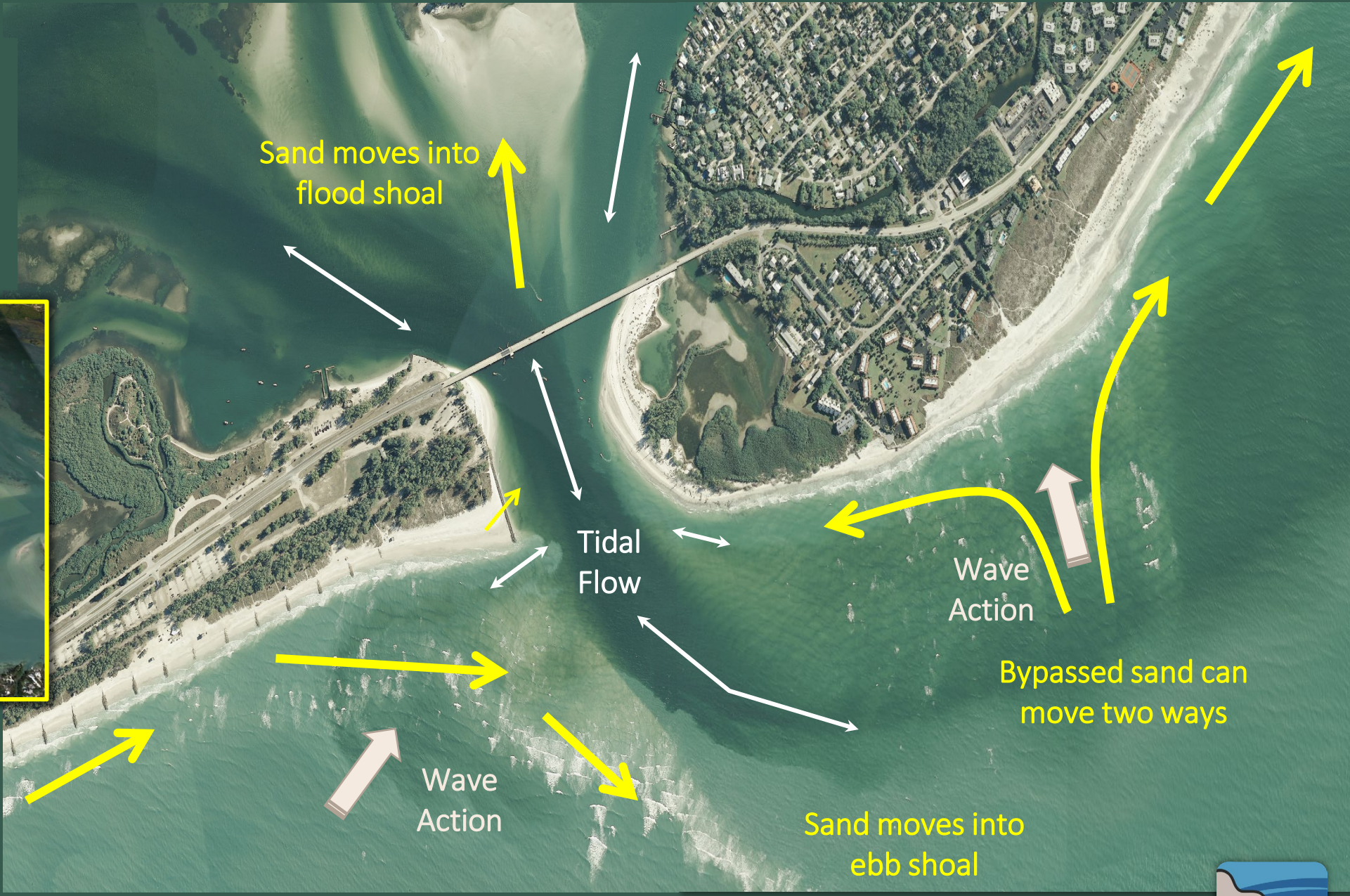


- Island only accessible by boat until 1921
- Man-made extension of Anna Maria Island
- Stabilized by groins to protect road in 1959
- Recreational area and wildlife habitat

Image Source: <https://www.worthpoint.com/worthopedia/1959-aerial-anna-maria-island-manatee-401907321>



# COASTAL PROCESSES



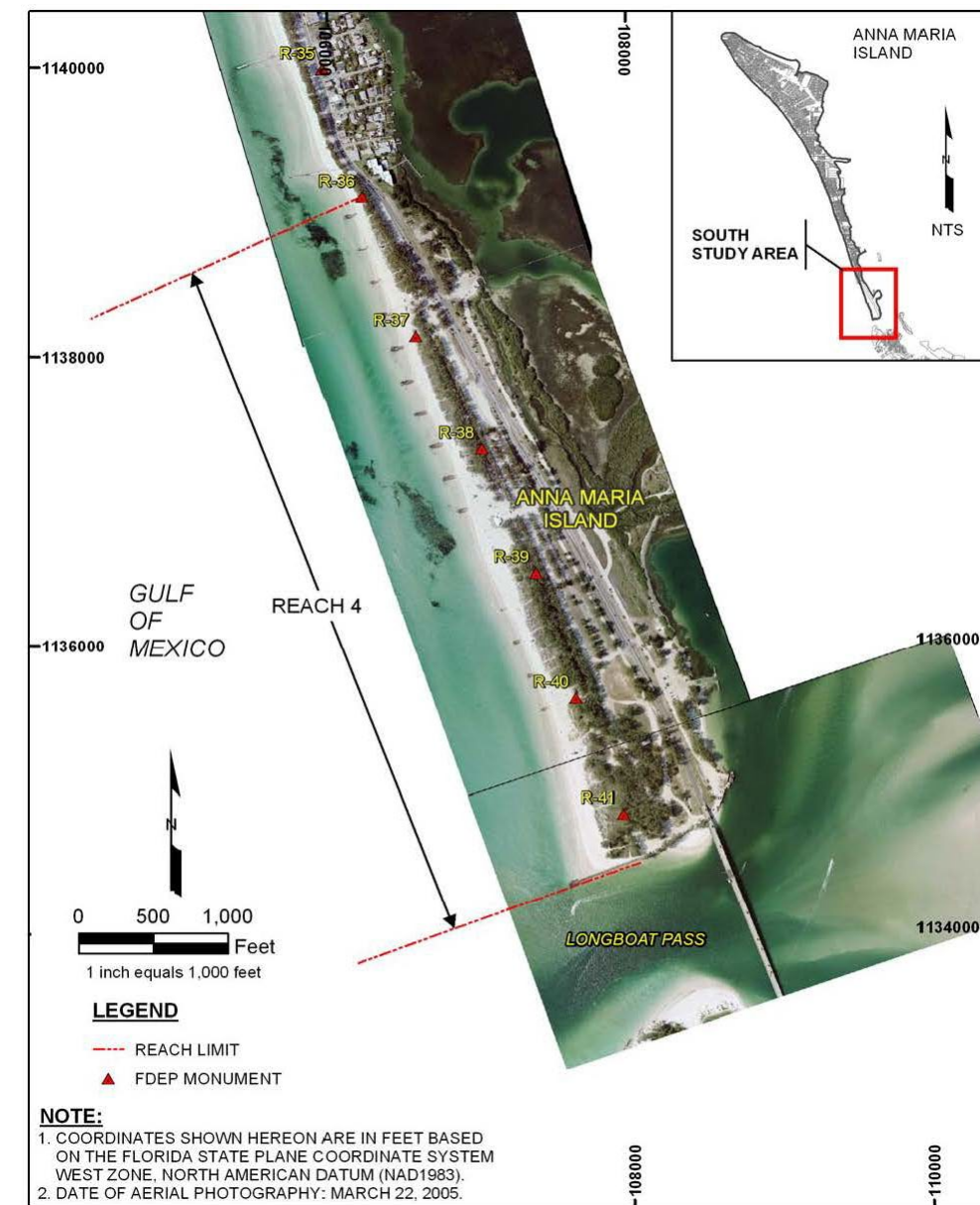
Longshore Transport



# MANATEE COUNTY ANNA MARIA ISLAND SHORE PROTECTION FEASIBILITY STUDY

Coastal Planning & Engineering, Inc. (n/k/a APTIM), January 2007

- Evaluate the feasibility of coastal protection measures at north and south ends of island
- Reach 4 (R-36 to R-41+300 feet)
- Project Alternatives:
  - No Action
  - Hard Structure Solution
  - **Beach Nourishment**
  - Beach Nourishment with Structures
  - Shoreline Retreat
- SBEACH analysis for beach design



# STORM STAGES, WAVES, AND WINDS

## ANNA MARIA ISLAND, FL

Return Period (years)	Storm Stage* (feet NGVD)	Significant Wave Height** (feet)		Peak Wave Period** (seconds)		Wind Speed*** (mph)
		Mean	$\sigma$	Mean	$\sigma$	
1	1.2	10.8	0.2	9.4	0.1	30
2	1.9	13.2	0.9	10.3	0.4	43
5	3.6	16.5	2.1	11.4	0.8	60
10	4.9	19.2	3.1	12.4	1.0	73
20	6.2	22.0	4.7	13.3	1.4	86
30	7.0	23.9	6.3	13.9	1.8	93
50	7.9	26.2	9.2	14.6	2.6	100
100	9.3	29.4	13.9	15.6	3.7	108
500	11.9	36.7	24.6	17.9	6.4	127

Design Basis

Source: 2007 MANATEE COUNTY ANNA MARIA ISLAND SHORE PROTECTION FEASIBILITY, APPENDIX B STORM RECESSON ANALYSIS, Table A-1.

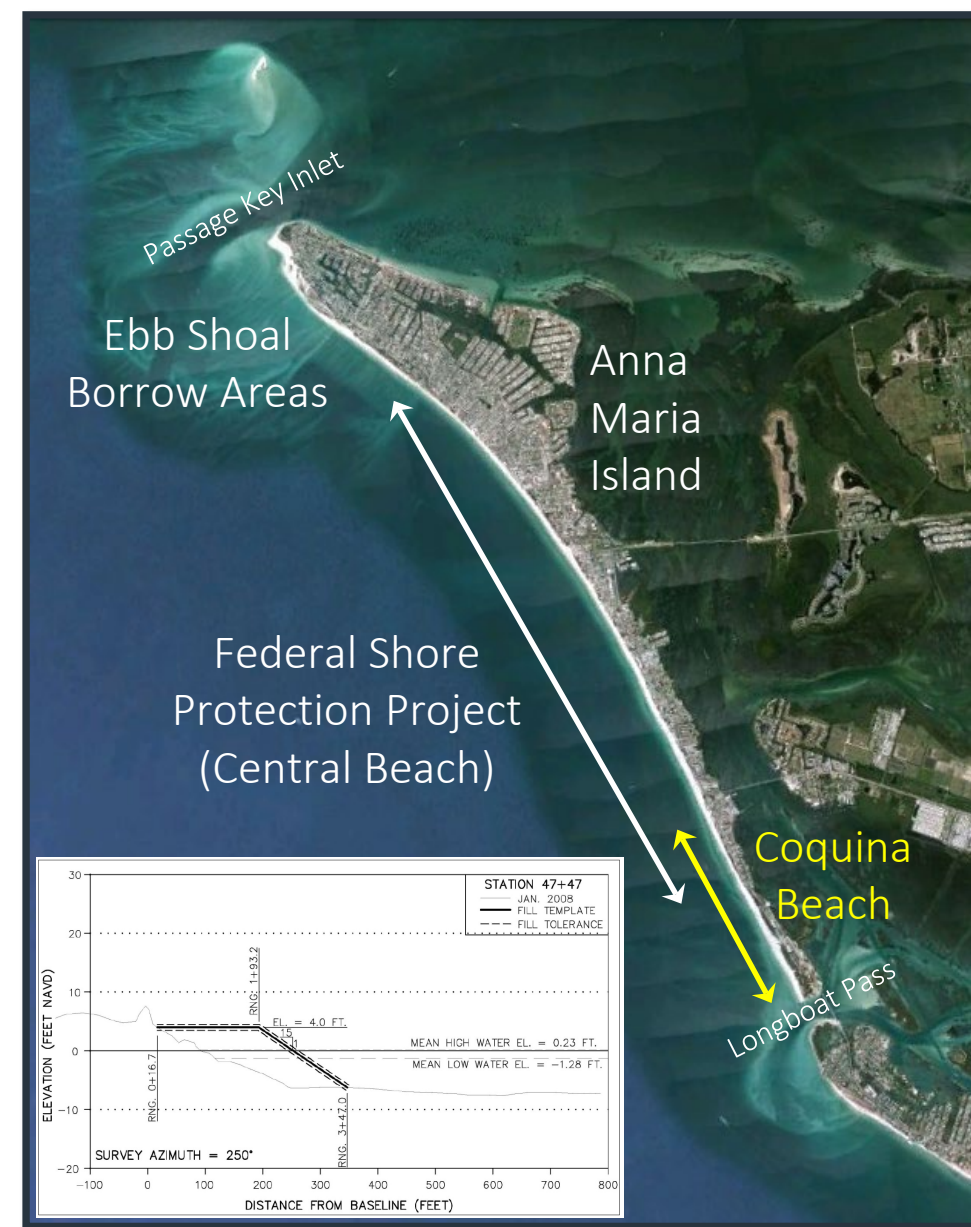
\* FEMA (1983). Storm stage values are open-Gulf water levels ref. NGVD and do not include onshore wave setup.

\*\* CHL (2000). The nominal depth for these wave heights is 59 feet.

\*\*\* USACE (1985).

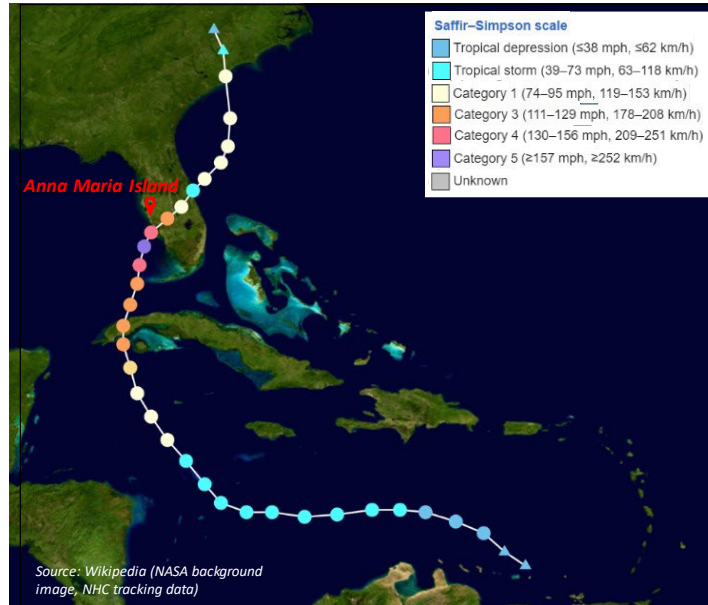
# COQUINA BEACH PROJECT

- 1.5 miles from 4<sup>th</sup> St. S to Longboat Pass
- Initial restoration in 2011
- Meets FEMA “Engineered Beach” standard
- Renourished in 2013-2014 and 2020
- FEMA repair project completed 2021
- Hurricanes Ian & Nicole in 2022
- Hurricane Idalia in 2023



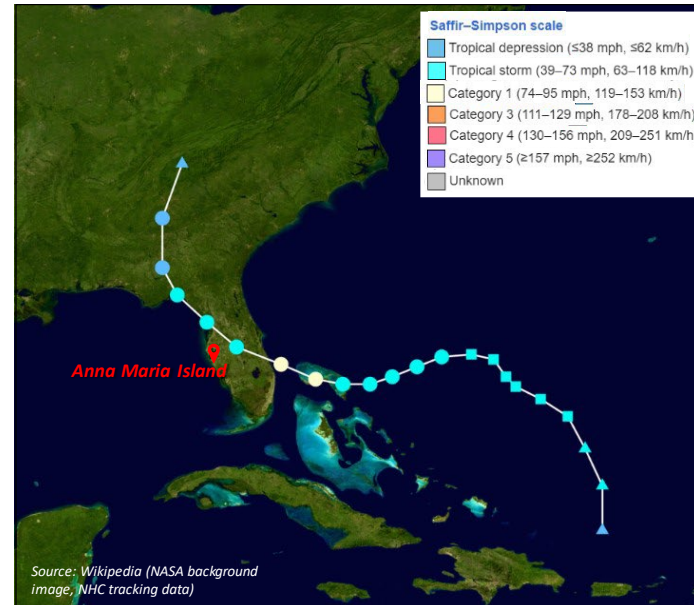


# DIFFERENT TRACKS, VERY DIFFERENT EFFECTS ...



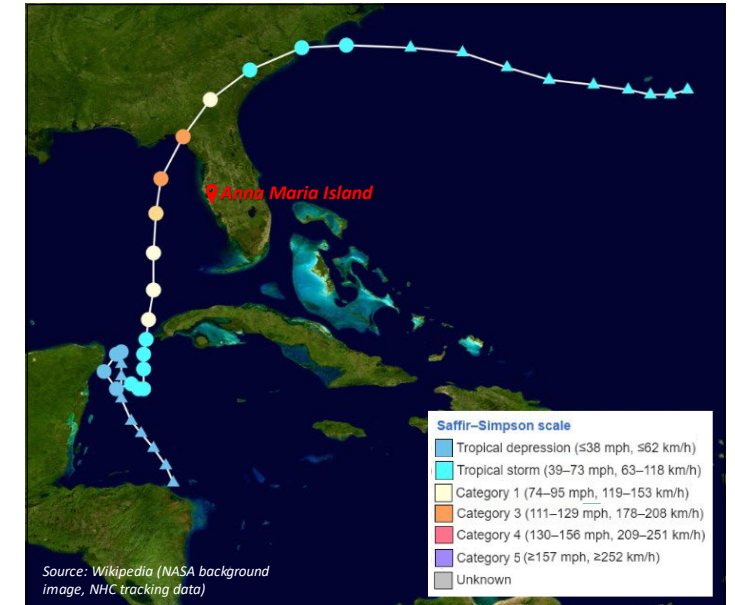
## Hurricane Ian

- September/November 2022
- Federal disaster, DR-4673-FL
- Landfall in the Cayo Costa as Cat 4
- Major reverse surge (drawdown)
- Minor impacts from surge and waves
- FEMA approved Categories A-G



## Hurricane Nicole

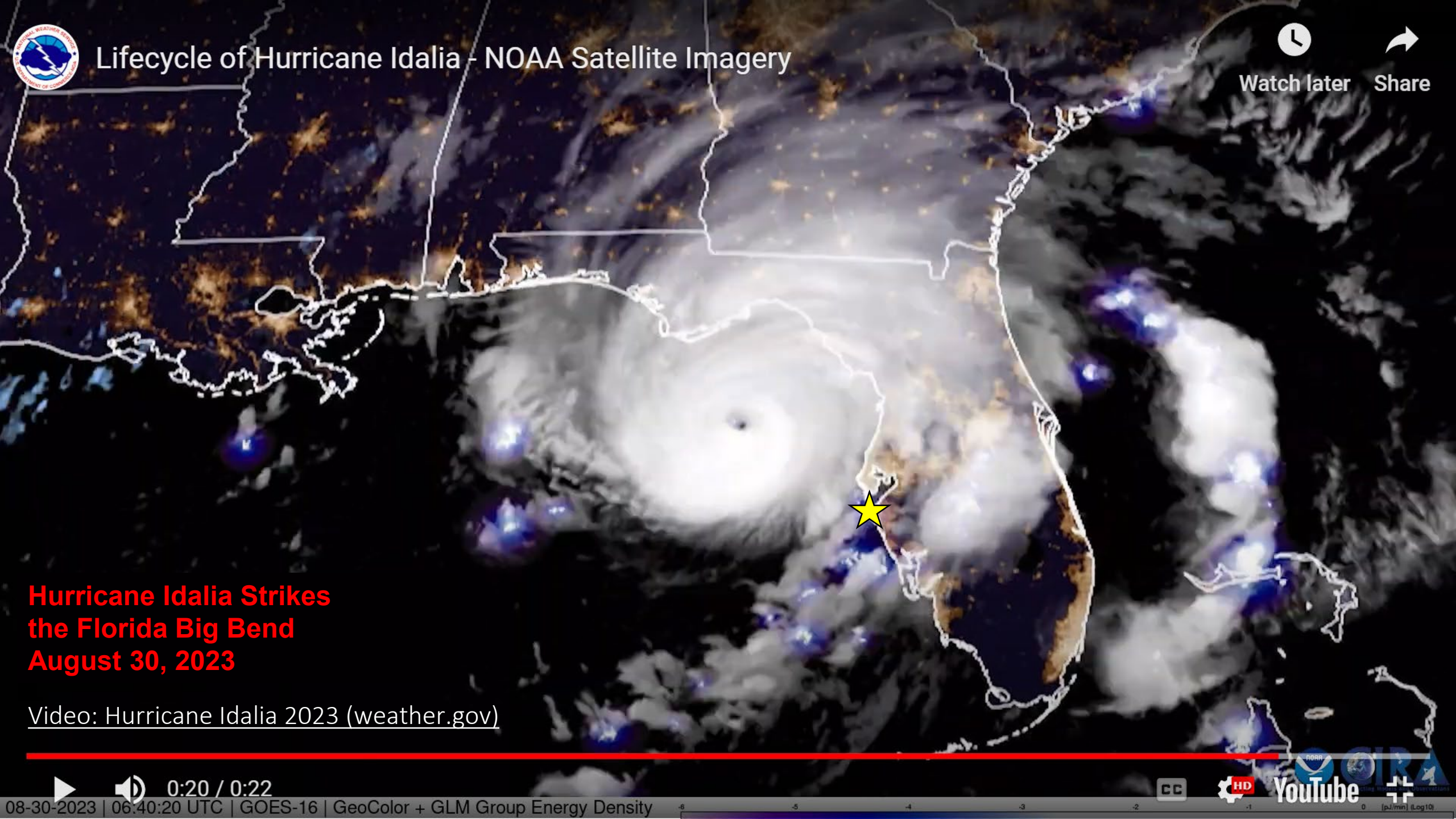
- November 2022
- Federal disaster, DR-4680-FL
- Two landfalls as Cat 1 and T.S.
- Minor surge event
- Indirect impacts from surge and waves
- FEMA approved Category B only



## Hurricane Idalia

- August/September 2023
- Federal disaster, DR-4734-FL
- Landfall in the Big Bend as Cat 3
- Direct impacts from surge and waves
- Documented storm induced erosion
- FEMA approved Categories A-G





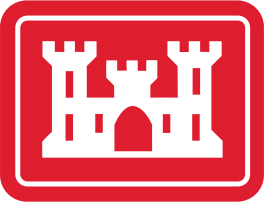
# Lifecycle of Hurricane Idalia - NOAA Satellite Imagery

Watch later Share

**Hurricane Idalia Strikes  
the Florida Big Bend  
August 30, 2023**

Video: Hurricane Idalia 2023 (weather.gov)

# HURRICANE IDALIA POST-STORM ASSESSMENT





# POST IDALIA – PROFILE ADJUSTMENT





# POST IDALIA – DUNE SCARPING





# POST IDALIA – OVERWASH





# POST IDALIA – WAVE SCOUR





# POST IDALIA – UPLAND PROTECTION





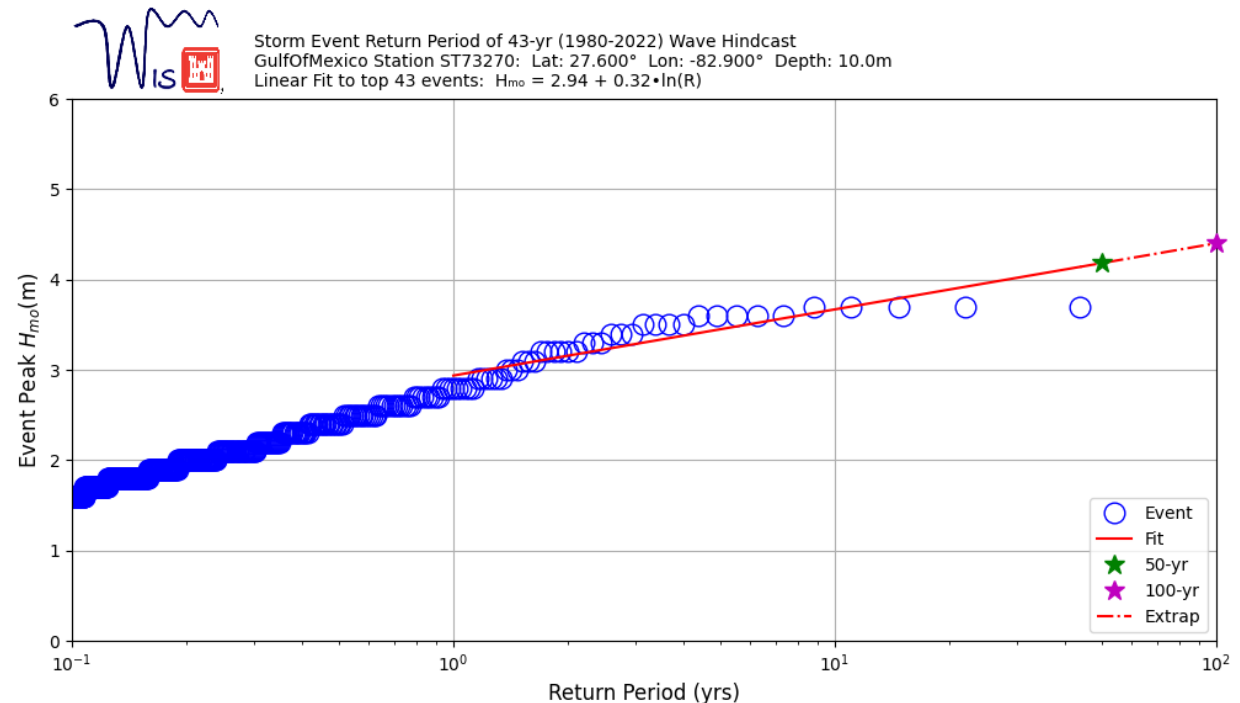
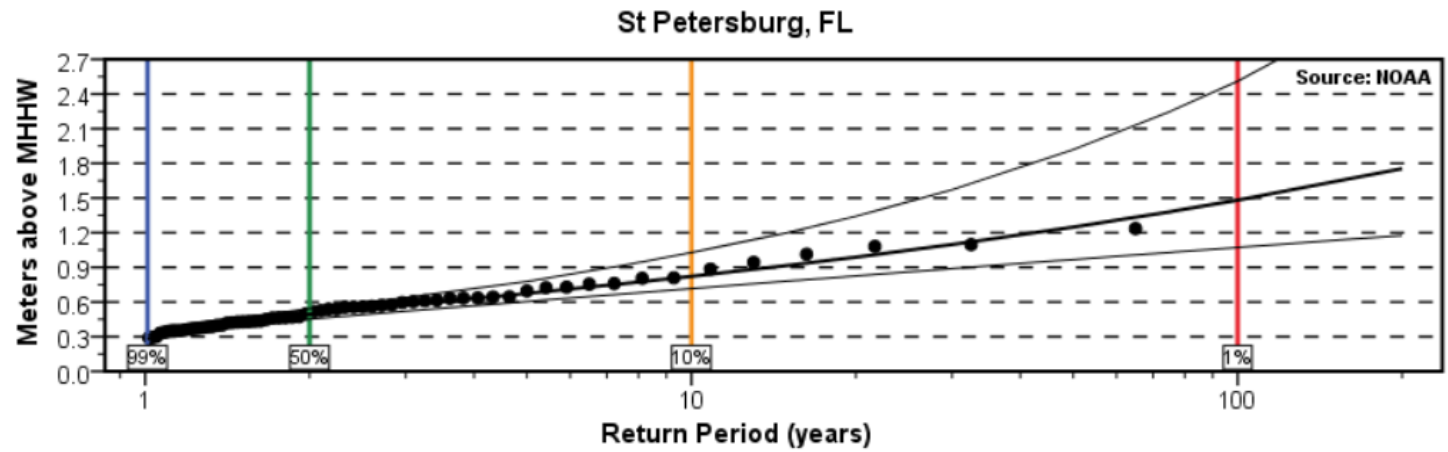
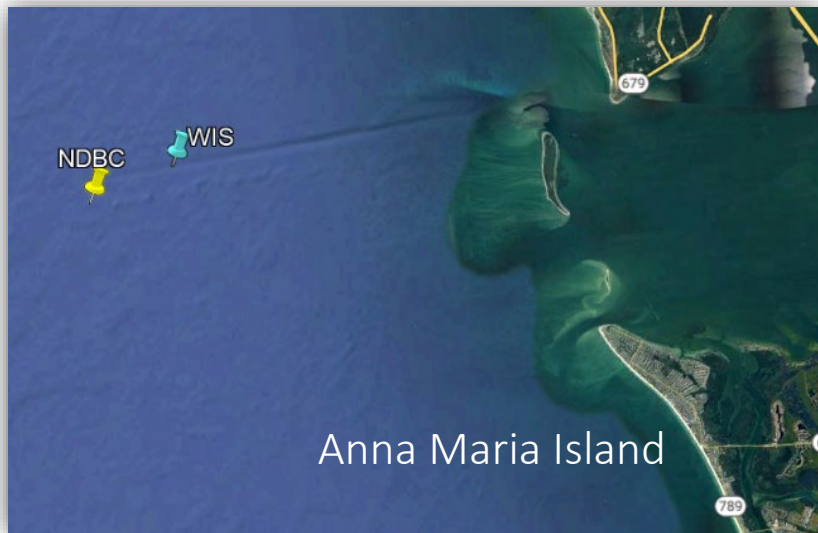
# HOW DOES THIS ALL MEASURE UP?



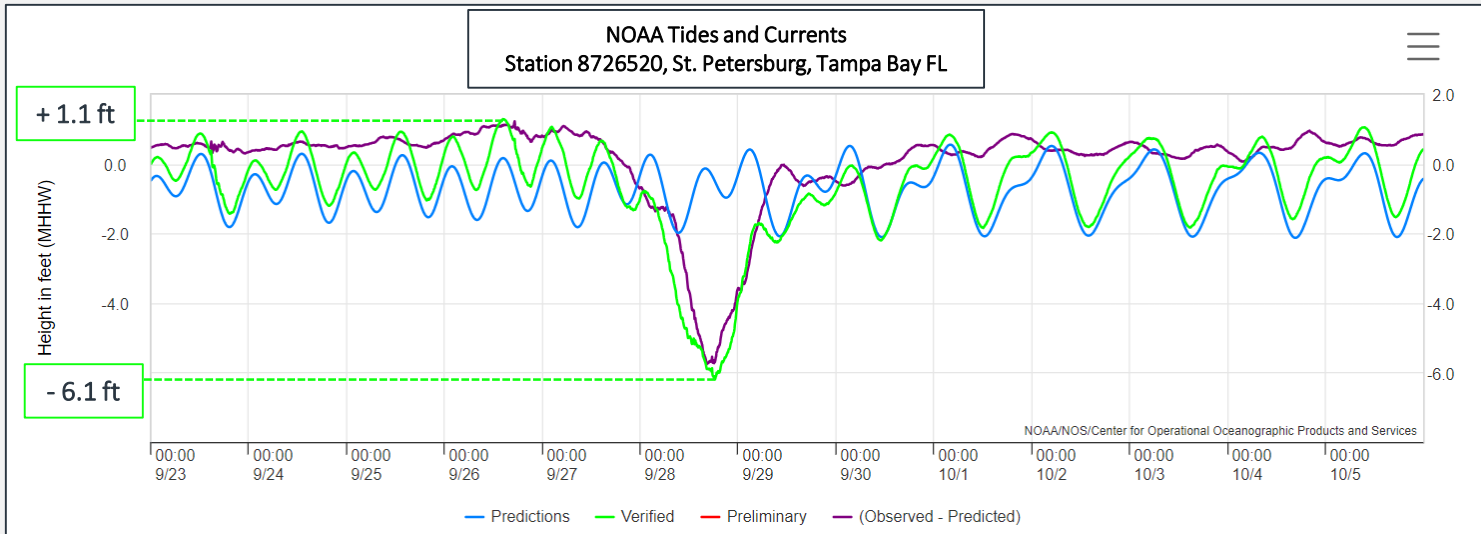


# RETURN INTERVAL

- Water levels and return period from NOAA station at St. Petersburg, FL
- Wave return period analysis based on WIS hindcast (1980-2022)
- Wave data measured during the storms from NDBC buoy

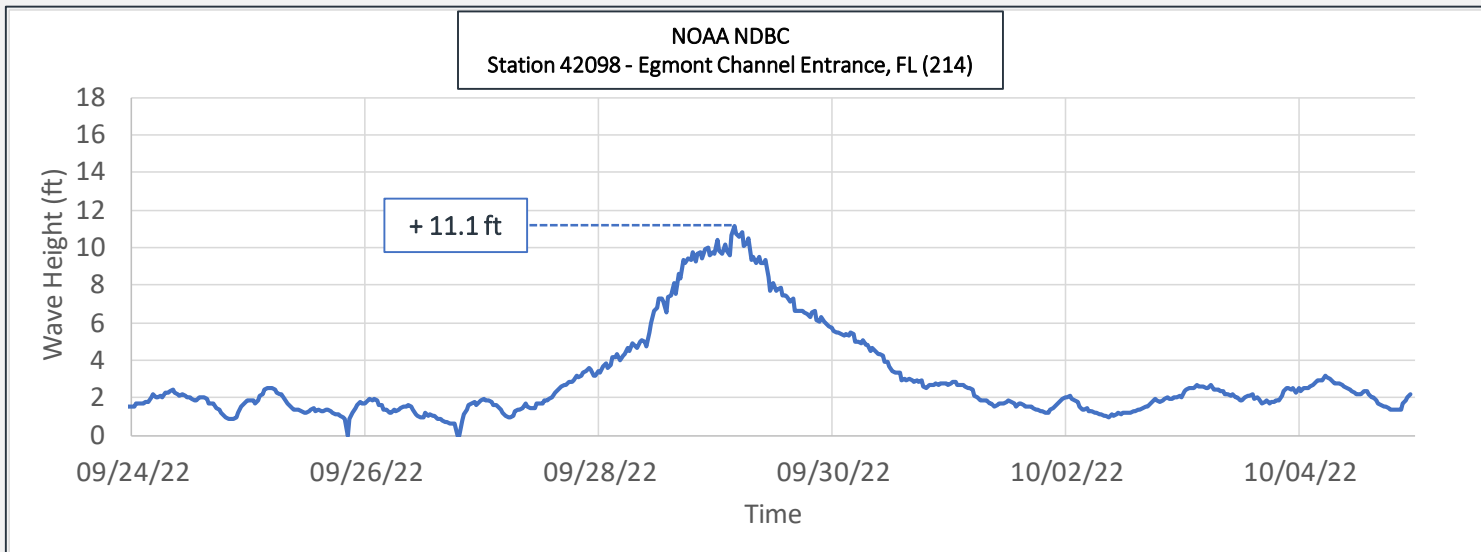


# HURRICANE IAN (2022)



## ■ Water Levels:

- -5.8 ft surge (drawdown)
- +1.1 ft MHHW (+0.3 m)
- 1-year return interval

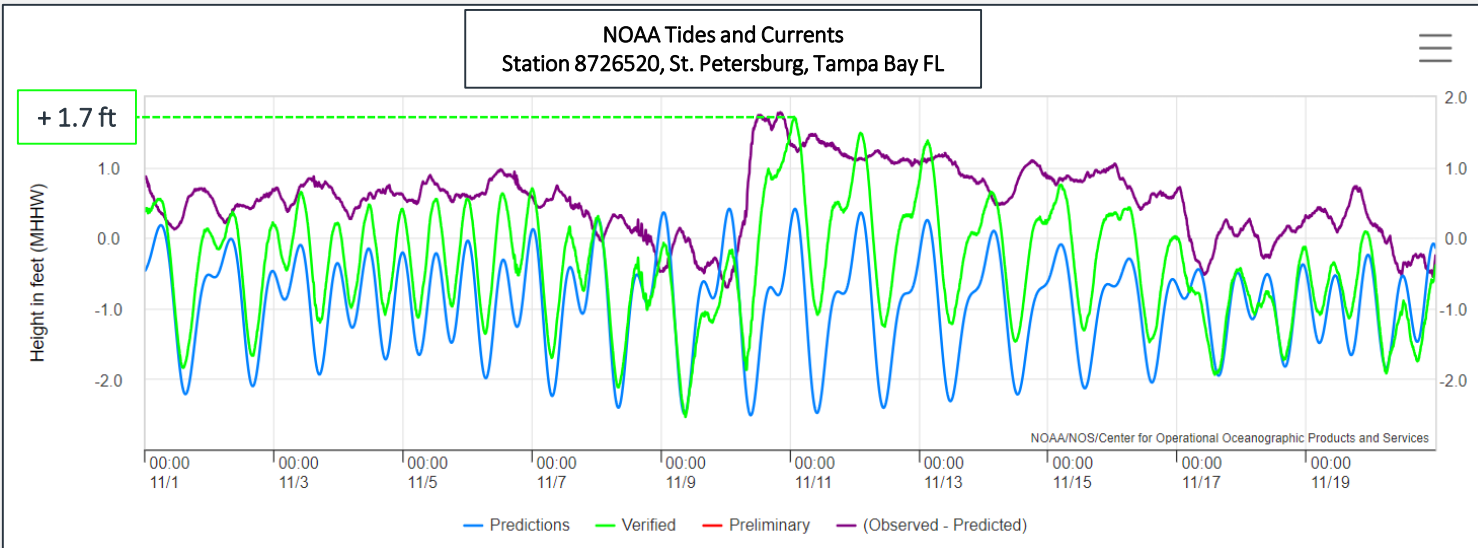


## ■ Waves:

- 11.1 ft peak (3.4 m)
- 5-year return interval

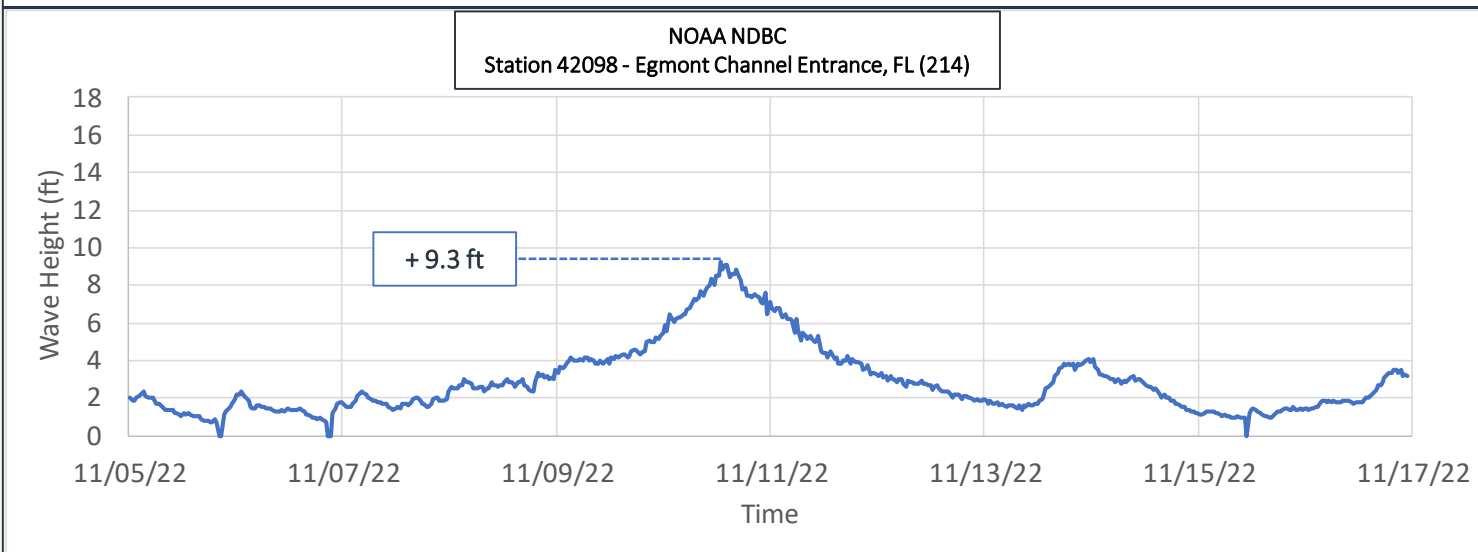


# HURRICANE NICOLE (2022)



## ■ Water Levels:

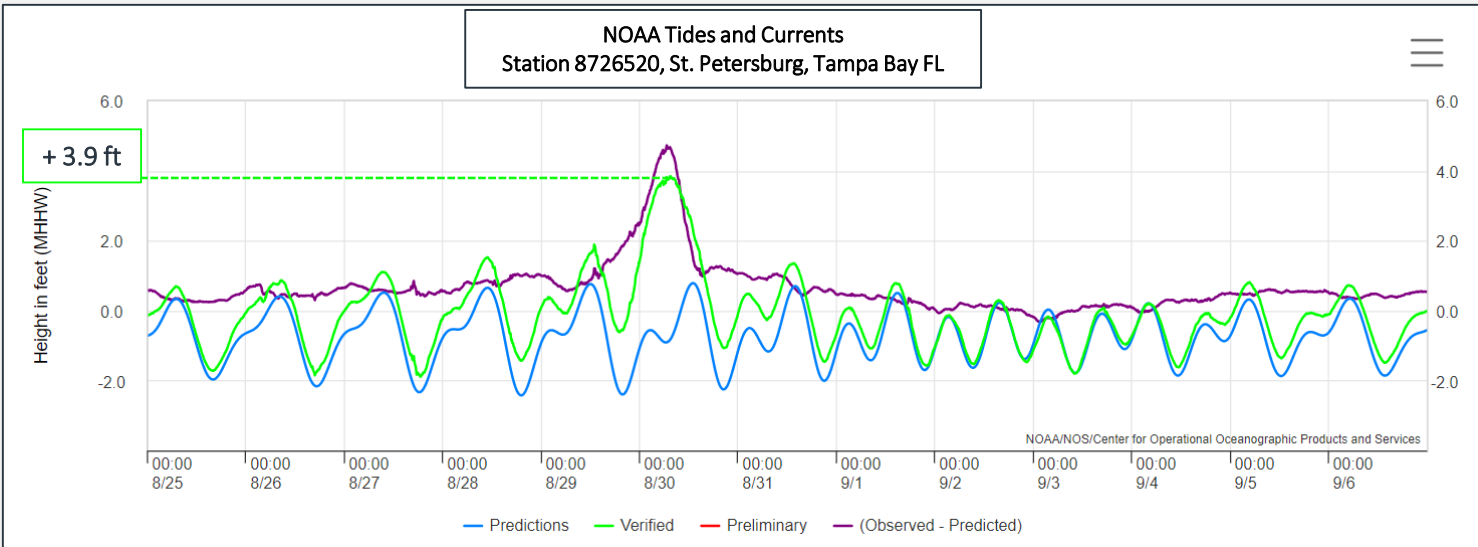
- +1.8 ft surge (peak)
- +1.7 ft MHHW (+0.5 m)
- 2-year return interval



## ■ Waves:

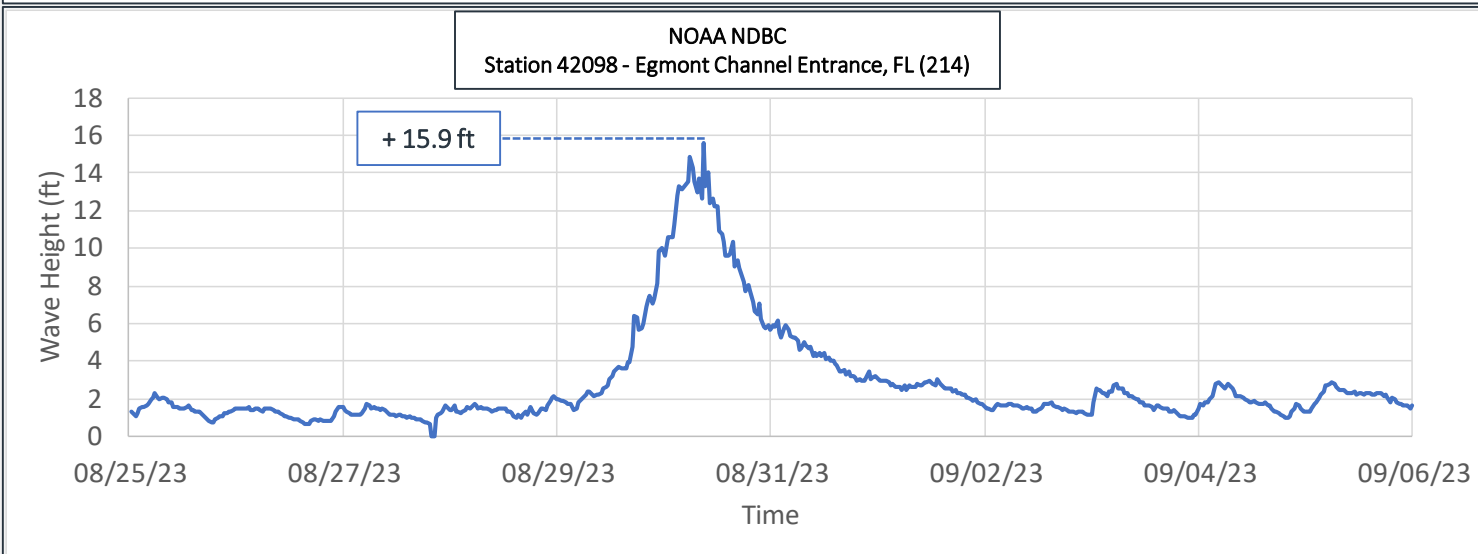
- 9.3 ft peak (2.8 m)
- < 1-year return interval

# HURRICANE IDALIA (2023)



## ■ Water Levels:

- +4.7 ft surge (peak)
- +3.9 ft MHHW (+1.2 m)
- 40-year return interval

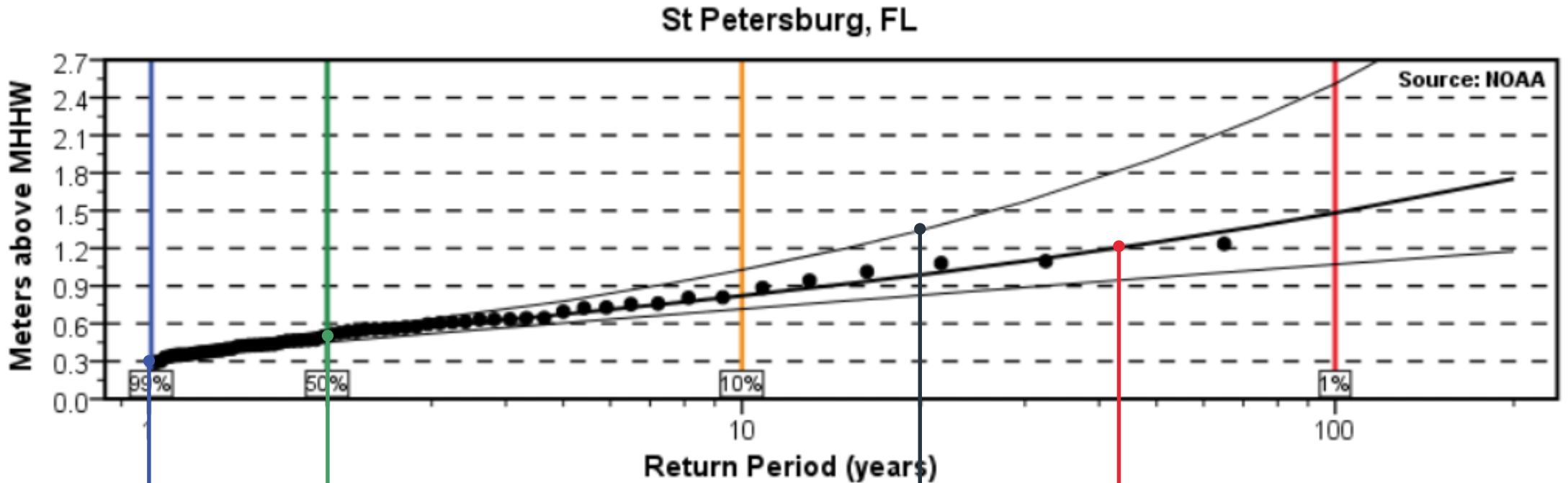


## ■ Waves:

- 15.9 ft peak (4.8 m)
- >100-year return interval



# WATER LEVEL COMPARISON



Ian

0.3 m

1-year

Nicole

0.5 m

2-year

Design

1.4 m

20-year

Idalia

1.2 m

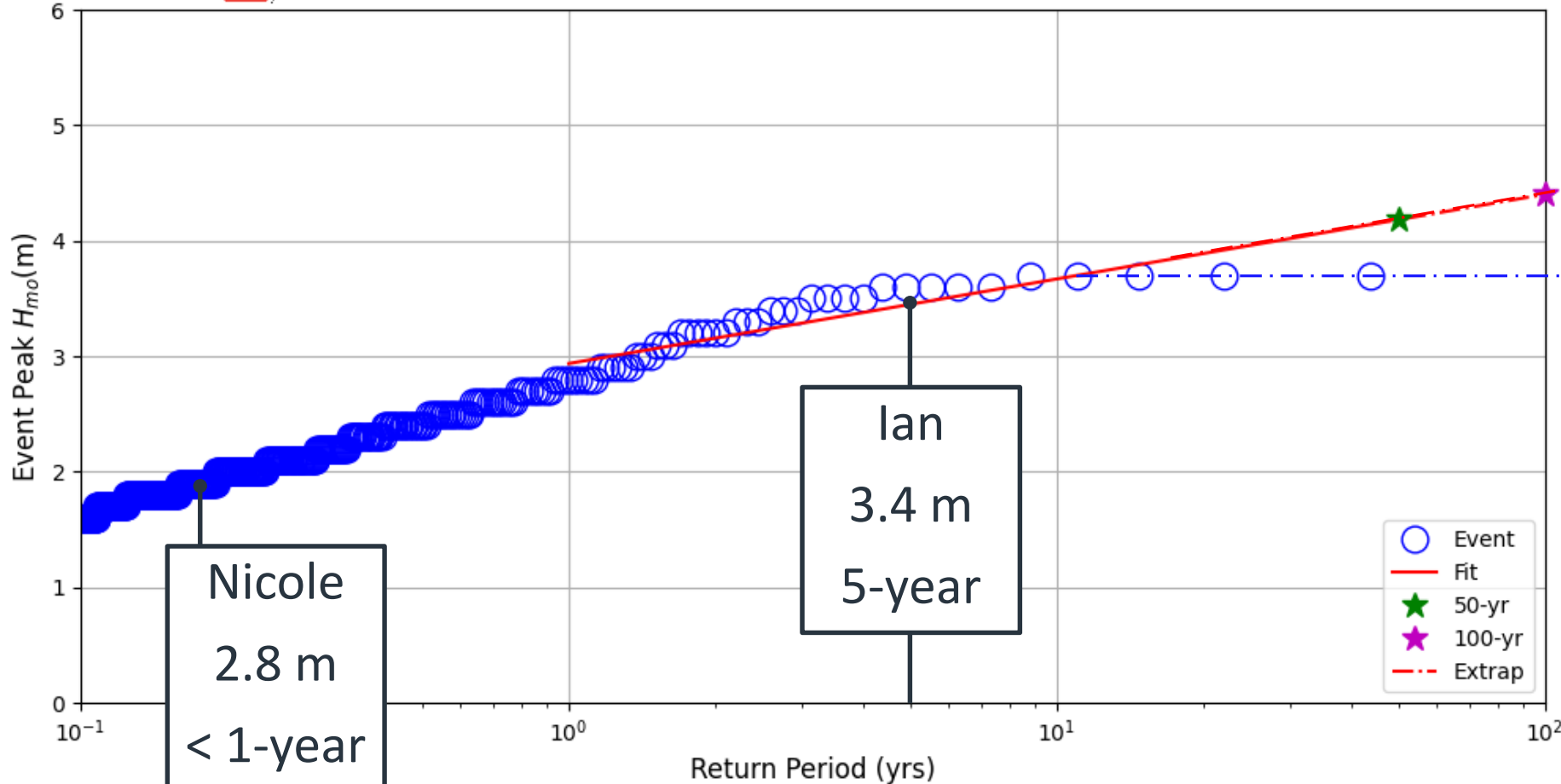
40-year



# WAVE HEIGHT COMPARISON



Storm Event Return Period of 43-yr (1980-2022) Wave Hindcast  
 GulfOfMexico Station ST73270: Lat: 27.600° Lon: -82.900° Depth: 10.0m  
 Linear Fit to top 43 events:  $H_{mo} = 2.94 + 0.32 \cdot \ln(R)$



Design = 5.3 m  
 Idalia = 4.8 m  
 > 100-year





# POST STORM ASSESSMENT

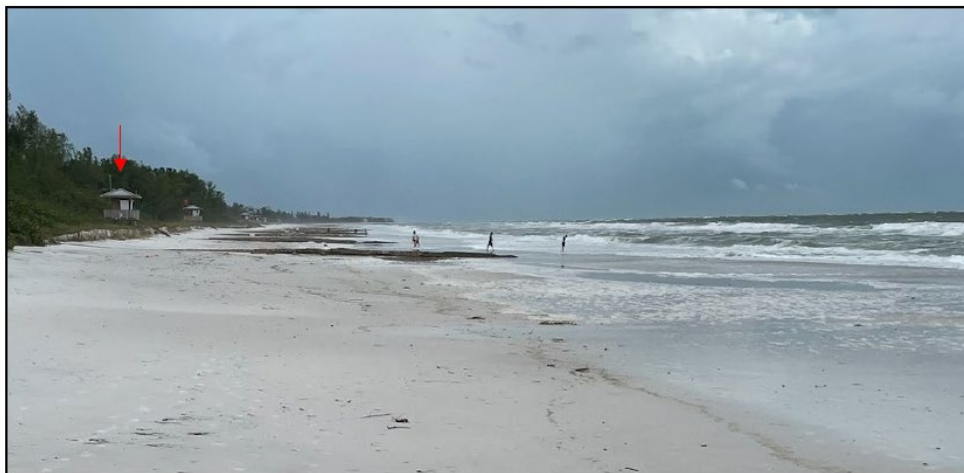


# FEMA

R-35.6 (Southernmost Cortez Groin)



March 25, 2021 (Post-Construction)



August 31, 2023 (Post-Idalia)

- FEMA Public Assistance Program
  - Category G – Parks, Recreational Facilities, ...
  - Publicly owned facilities, i.e. “Engineered Beach”
  - Storm Damage Report submitted January 2024
- Volume Estimates
  - -91,200 cy Pre (Dec 2022) to Post (Oct 2023)
  - +16,400 cy background erosion
  - -74,800 cy storm-induced change (to DOC)
- Cost Estimate \$4.5M (pending FEMA review)

# FINDINGS



**Manatee County and the USACE working together on post Hurricane Idalia surveys**

- Return intervals are location and storm specific
- Storm track/landfall makes all the difference
- 20-yr project design estimate was conservative
- Beach absorbed impact of 40-year storm
- Long-term maintenance increased protection
- Uncertainty in wave return period (larger events)
- FEMA “sand box” may not capture full impact
- Storm response coordination greatly improved



# THANK YOU!



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## Special Thanks:

Manatee County Natural Resources Department  
Storm Damage Assessment Teams - USACE-SAJ, FDEP, and FEMA  
APTIM-CPE Project Team