

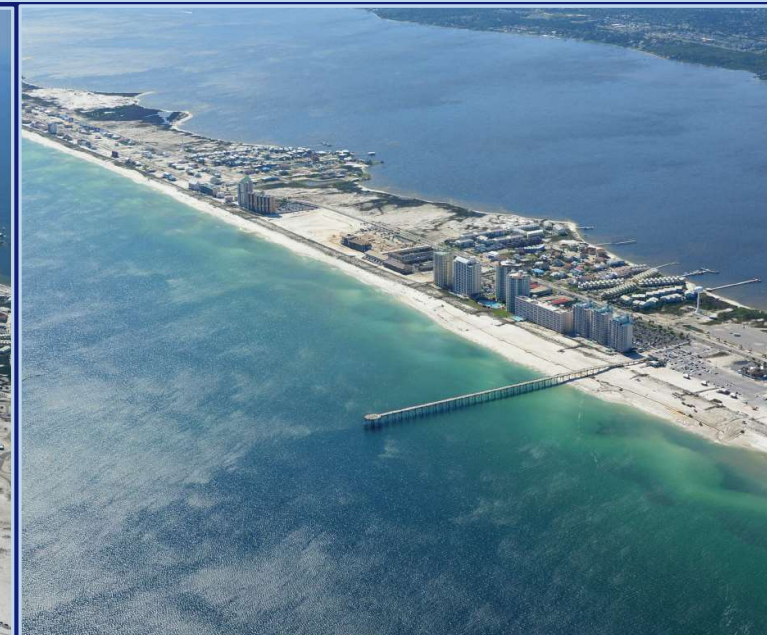
**Case Study:**  
**Navarre Beach – Performance**  
**during Hurricanes**

**Hannah Walsh, M.S., E.I.**  
**Tem Fontaine, P.E.**

**2021 FSBPA Technical Conference**  
**February 3, 2021**

This presentation will address:

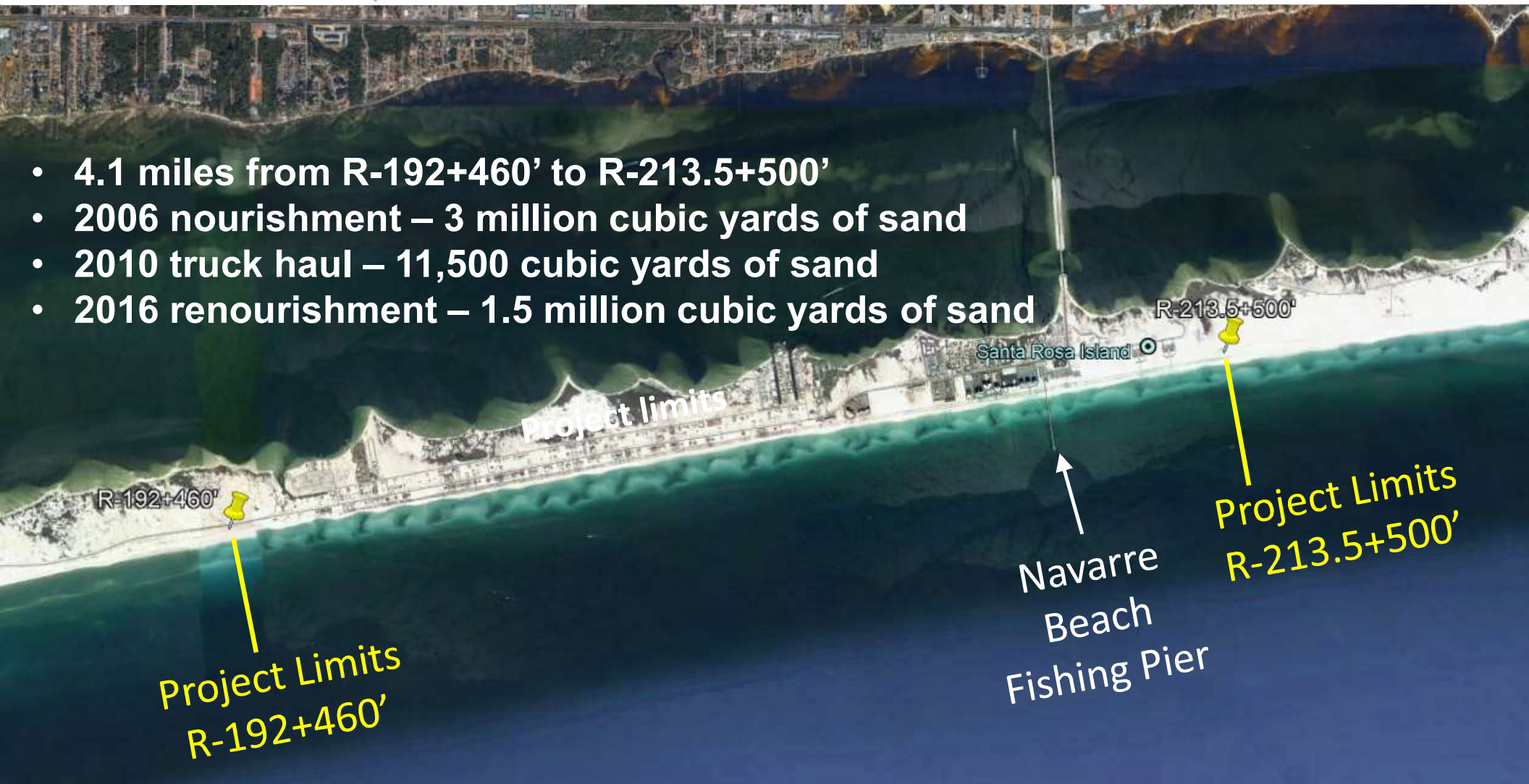
- ✓ Project location
- ✓ Project history
- ✓ Beach-dune system response prior to Project Construction
- ✓ Project Design
- ✓ Hurricane Impacts
- ✓ Lessons learned

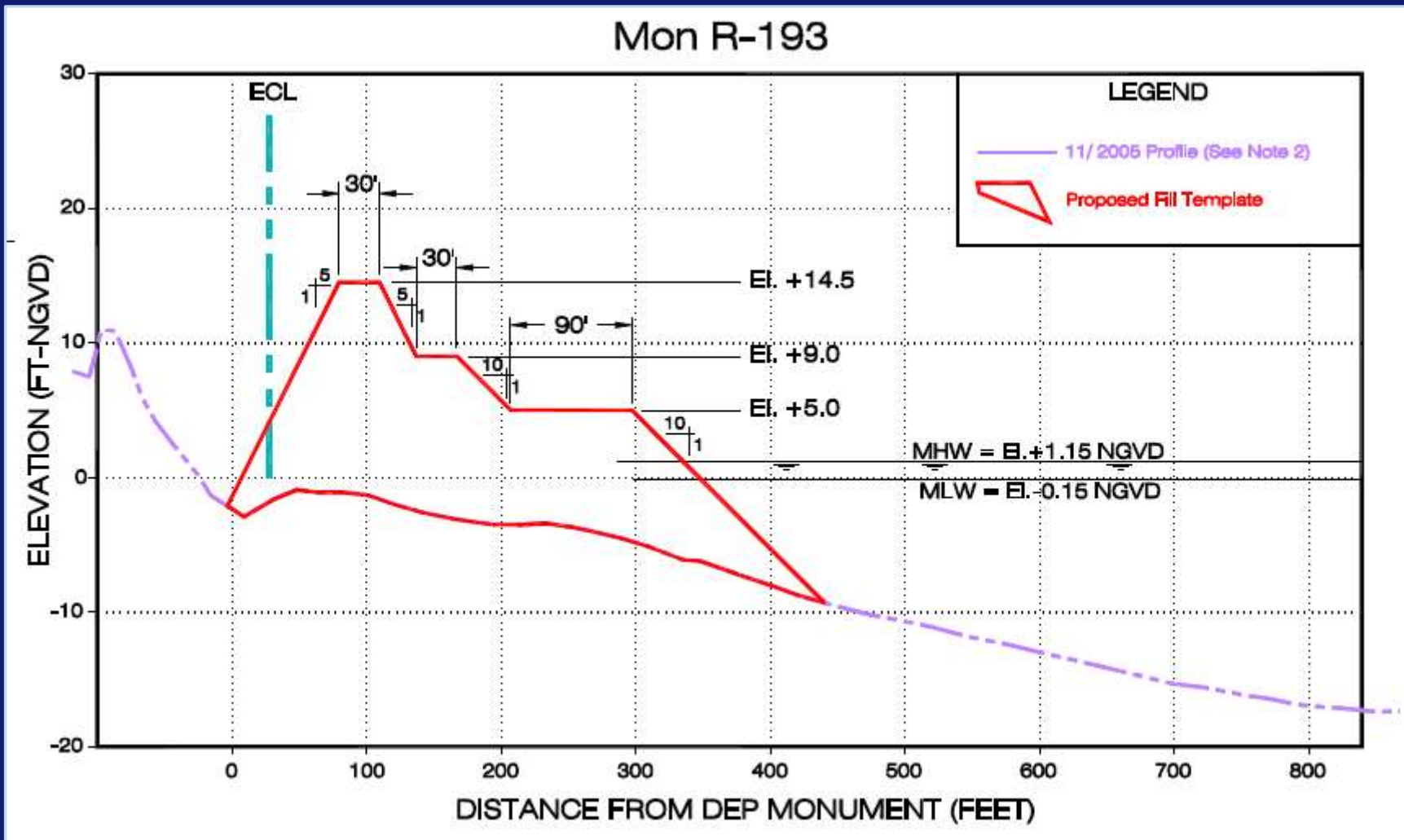


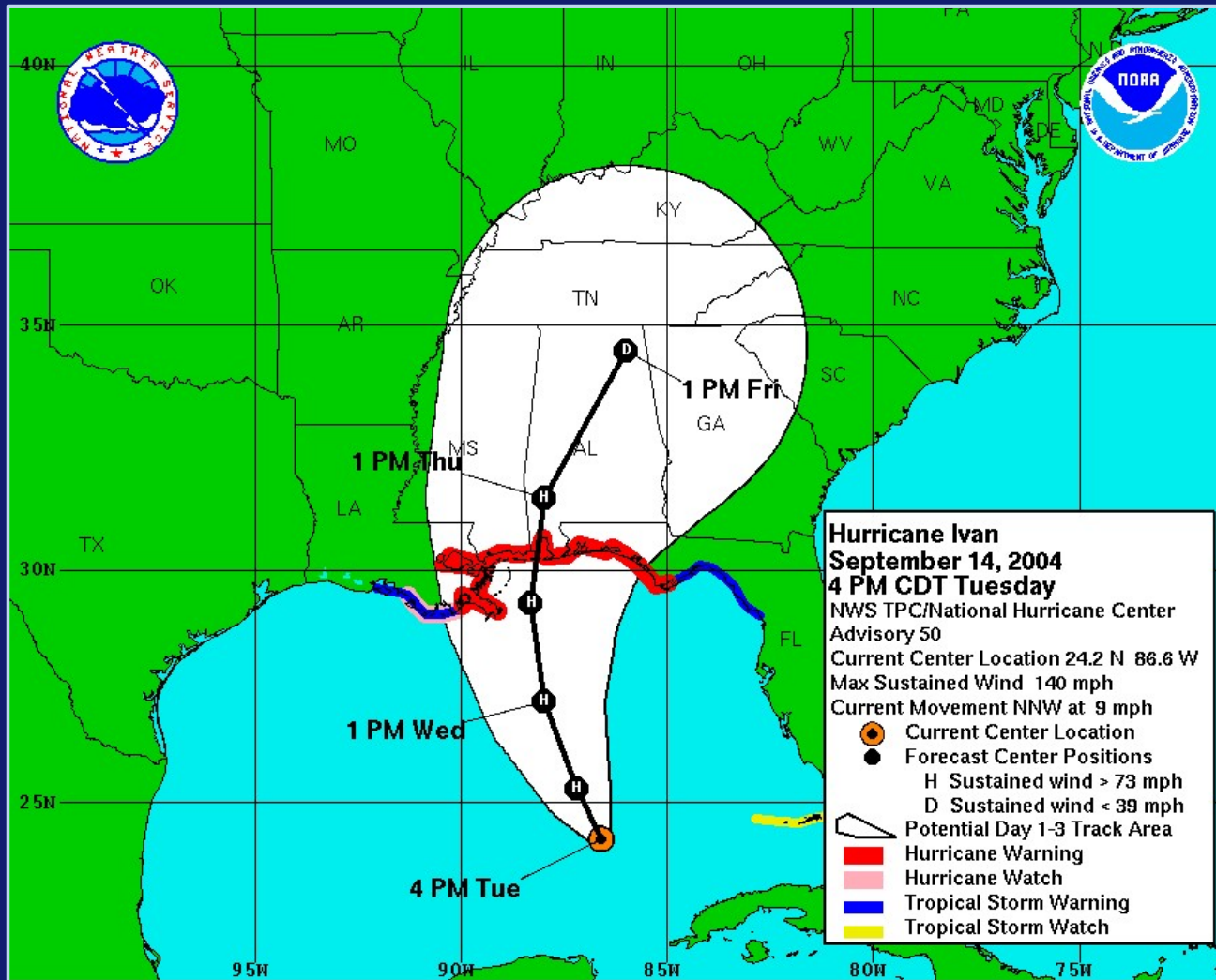
# Location Map – Navarre Beach



- 4.1 miles from R-192+460' to R-213.5+500'
- 2006 nourishment – 3 million cubic yards of sand
- 2010 truck haul – 11,500 cubic yards of sand
- 2016 renourishment – 1.5 million cubic yards of sand







# Hurricane Ivan

September 2004



# Hurricane Ivan

September 2004



# Hurricane Ivan

September 2004





**Image Date:**  
**11/30/2004**  
**Source:**  
**Google Earth**



# Hurricane Ivan

September 2004

Image Date:  
11/30/2004  
Source:  
Google Earth



Image Date:  
3/31/2007  
Source:  
Google Earth





# Hurricane Dennis

July 2005



# Hurricane Dennis

July 2005



# Hurricane Dennis

July 2005



## Hurricane Dennis

July 2005





During  
Construction

July 2006

## Post- Construction

September 2007

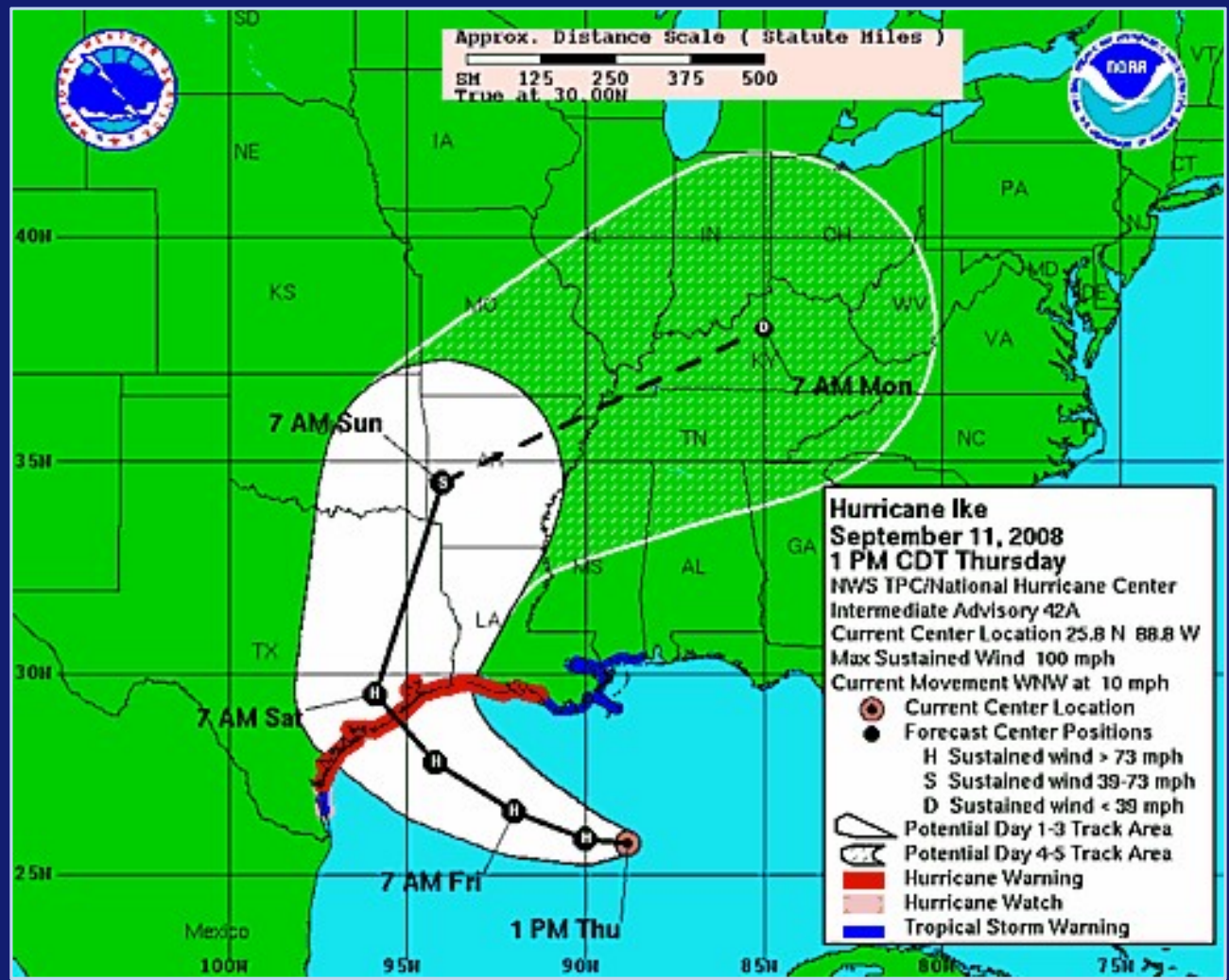






# Hurricane Gustav

September 2008



# Hurricane Ike

September 2008



# Hurricane Ike

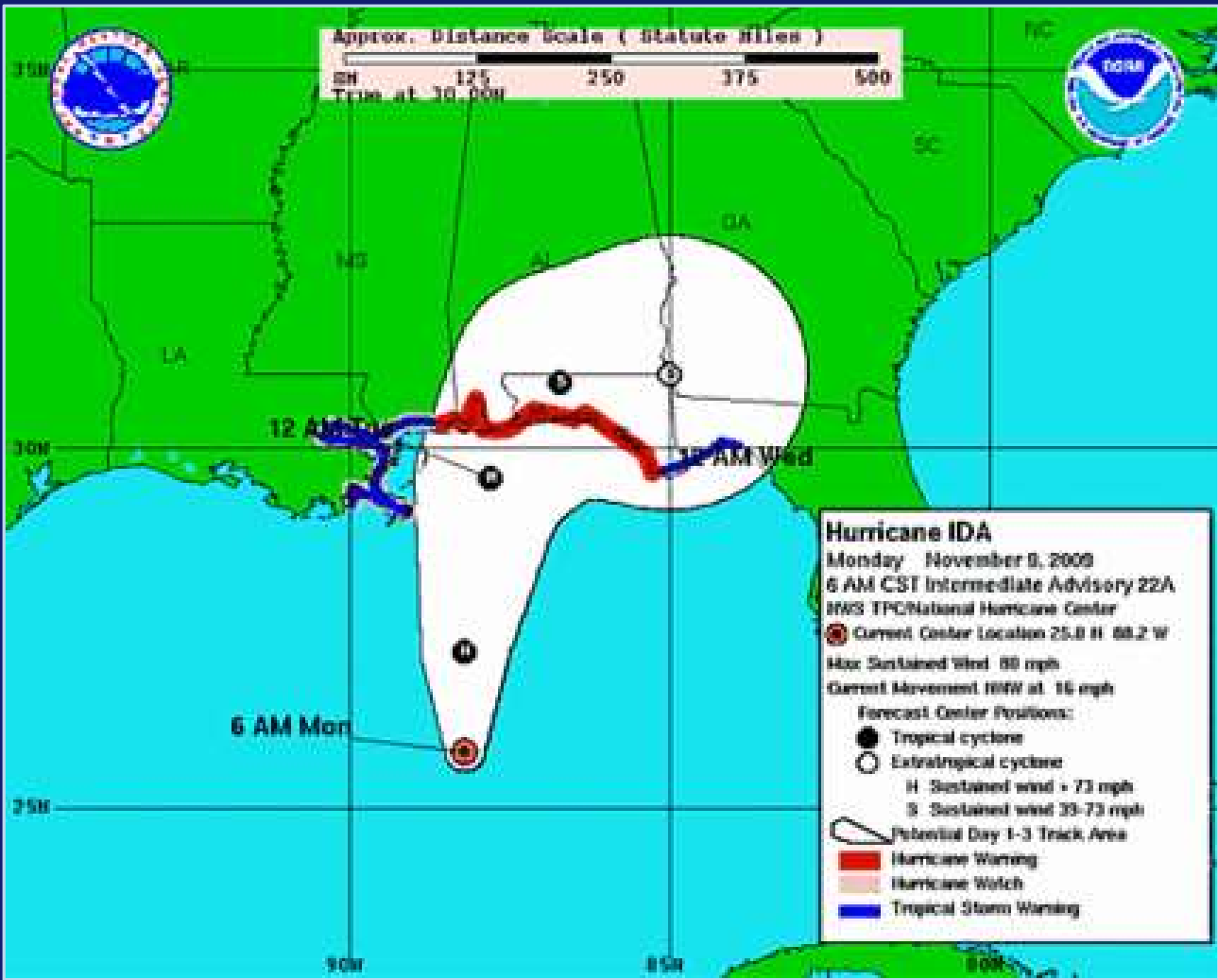
**September 2008**

# Hurricane Ike

September 2008



Photo courtesy of Kenny Wilder



# Hurricane Ida

November 2009





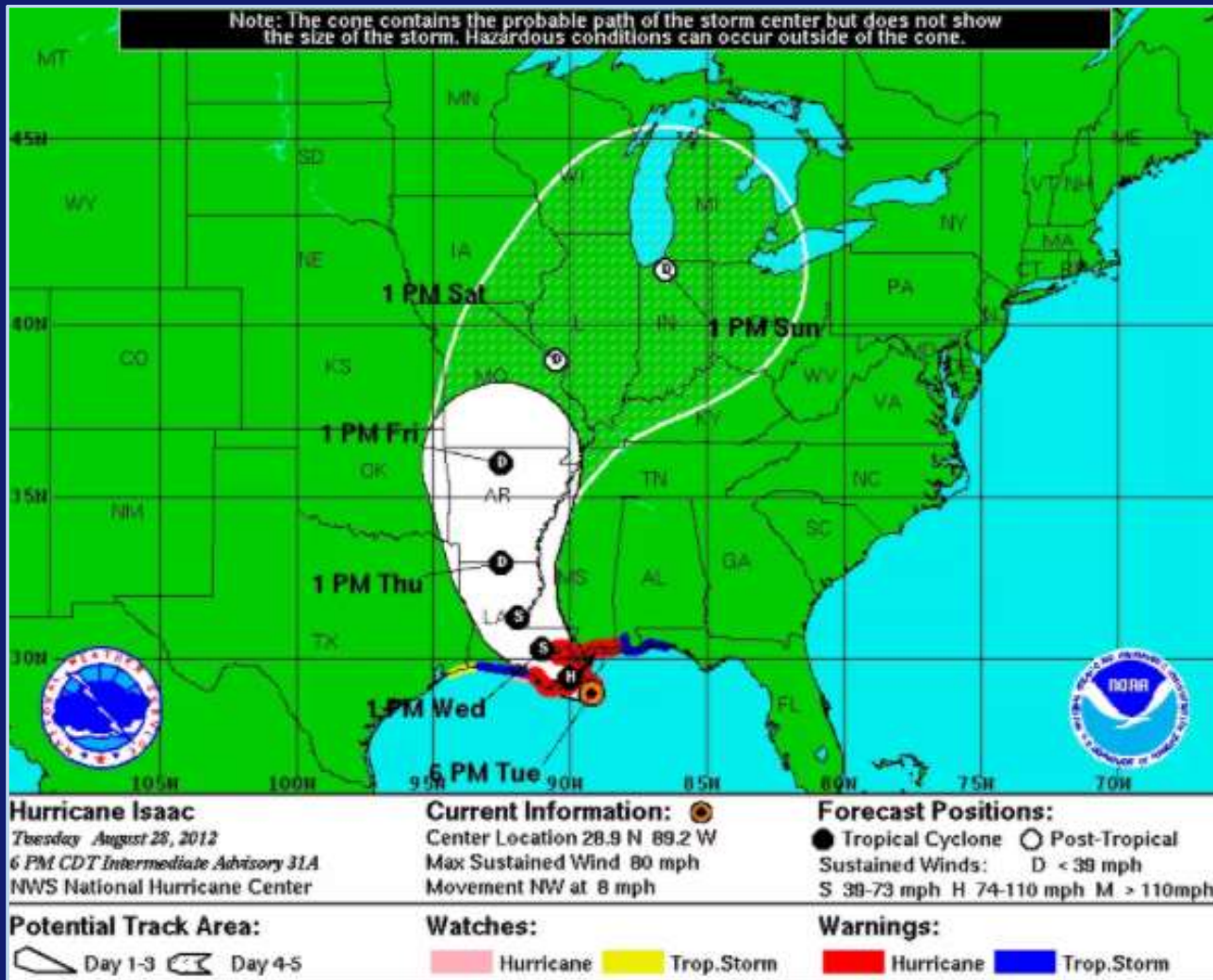
# Hurricane Ida

November 2009

Photo courtesy of Navarre Beach Life

# Hurricane Isaac

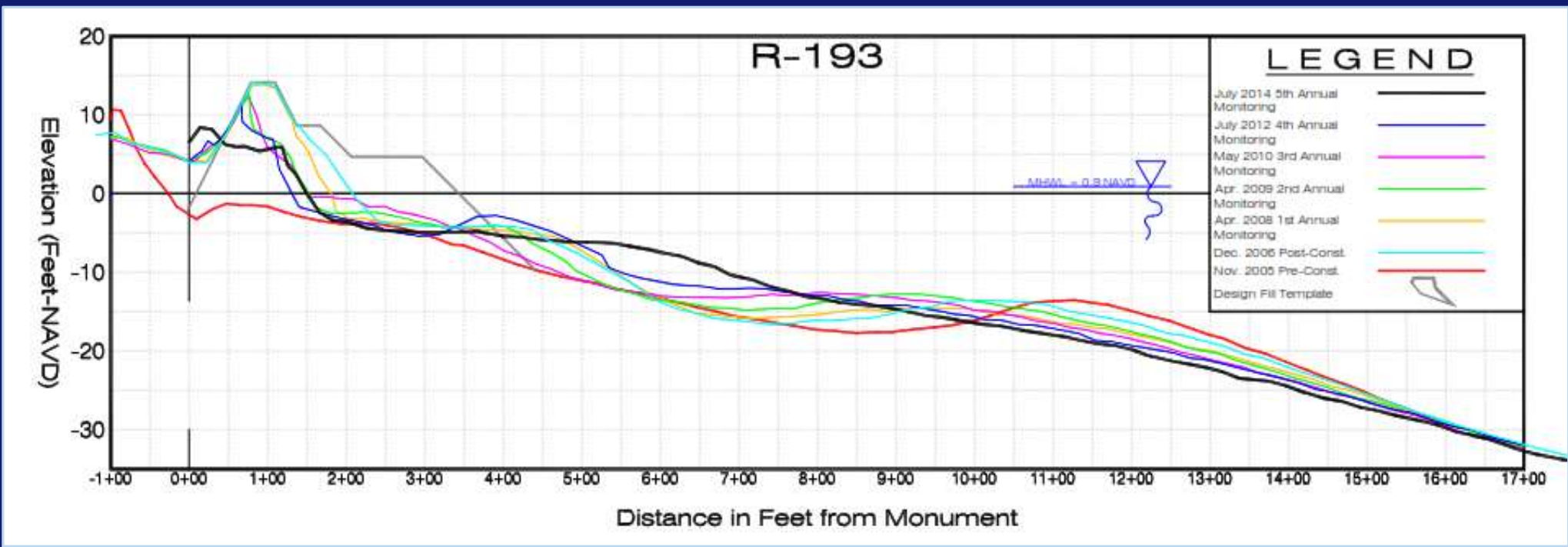
August 2012

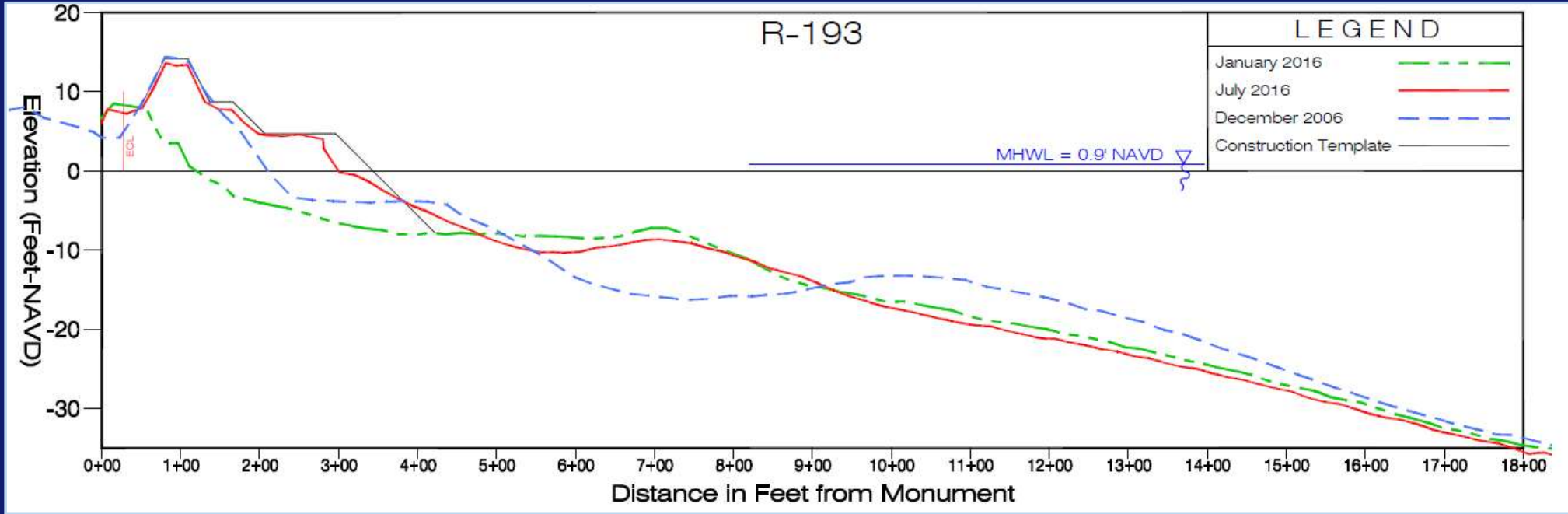




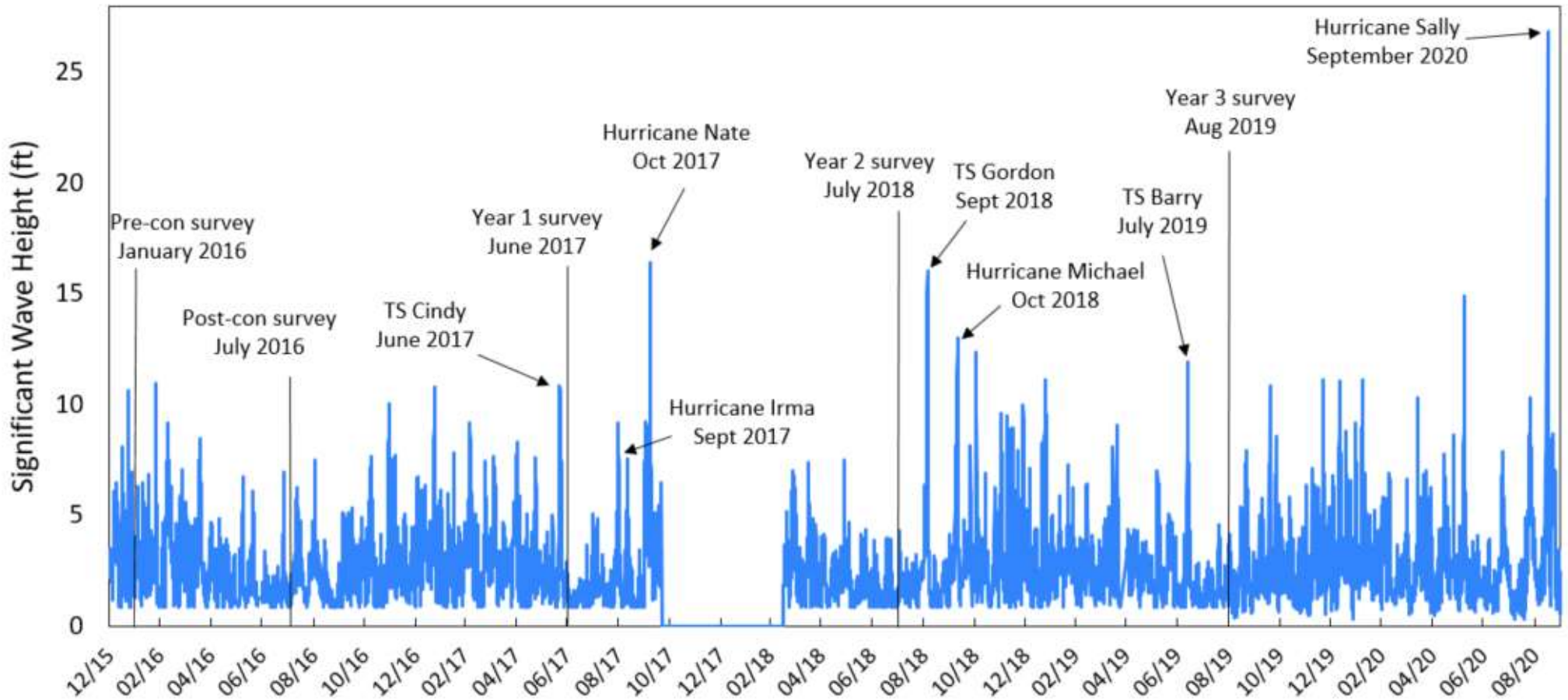
# Hurricane Isaac

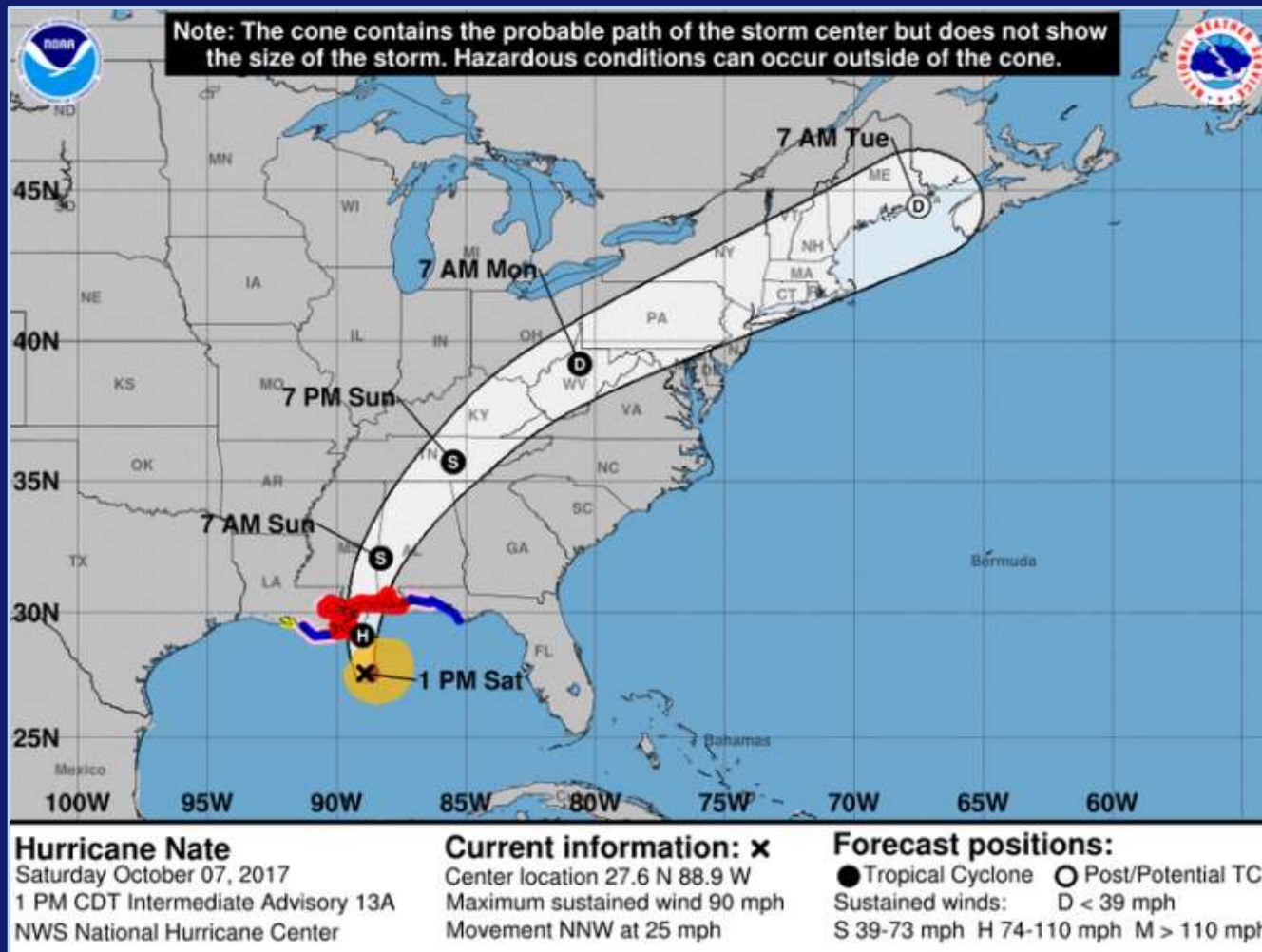
August 2012





Wave Observations at Buoy 42012 - Orange Beach - 44 NM SE of Mobile, AL





# Hurricane Nate

October 2017



# Hurricane Nate

October 2017





Note: The cone contains the probable path of the storm center but does not show the size of the storm. Hazardous conditions can occur outside of the cone.

<p><b>Hurricane Michael</b>                  Tuesday October 09, 2018                  7 PM CDT Intermediate Advisory 13A                  NWS National Hurricane Center</p>	<p><b>Current information:</b> ●                  Center location 26.6 N 86.5 W                  Maximum sustained wind 120 mph                  Movement N at 12 mph</p>	<p><b>Forecast positions:</b>                  ● Tropical Cyclone ○ Post/Potential TC                  Sustained winds: D &lt; 39 mph                  S 39-73 mph H 74-110 mph M &gt; 110 mph</p>
<p><b>Potential track area:</b>                  ☐ Day 1-3 ☐ Day 4-5</p>	<p><b>Watches:</b>                  ■ Hurricane ■ Trop Storm</p>	<p><b>Warnings:</b>                  ■ Hurricane ■ Trop Storm</p>

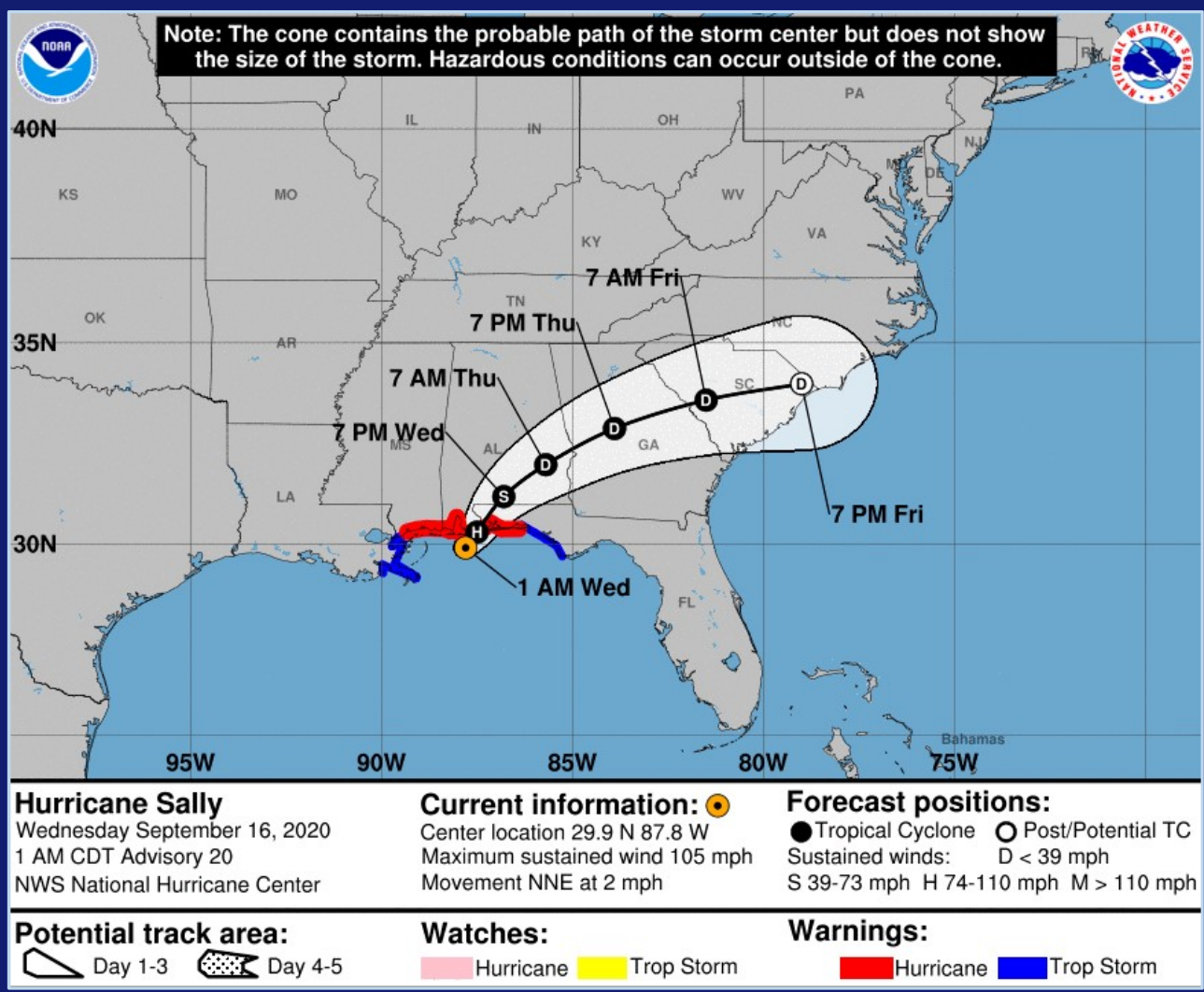
# Hurricane Michael

October 2018



# Hurricane Michael

October 2018



# Hurricane Sally

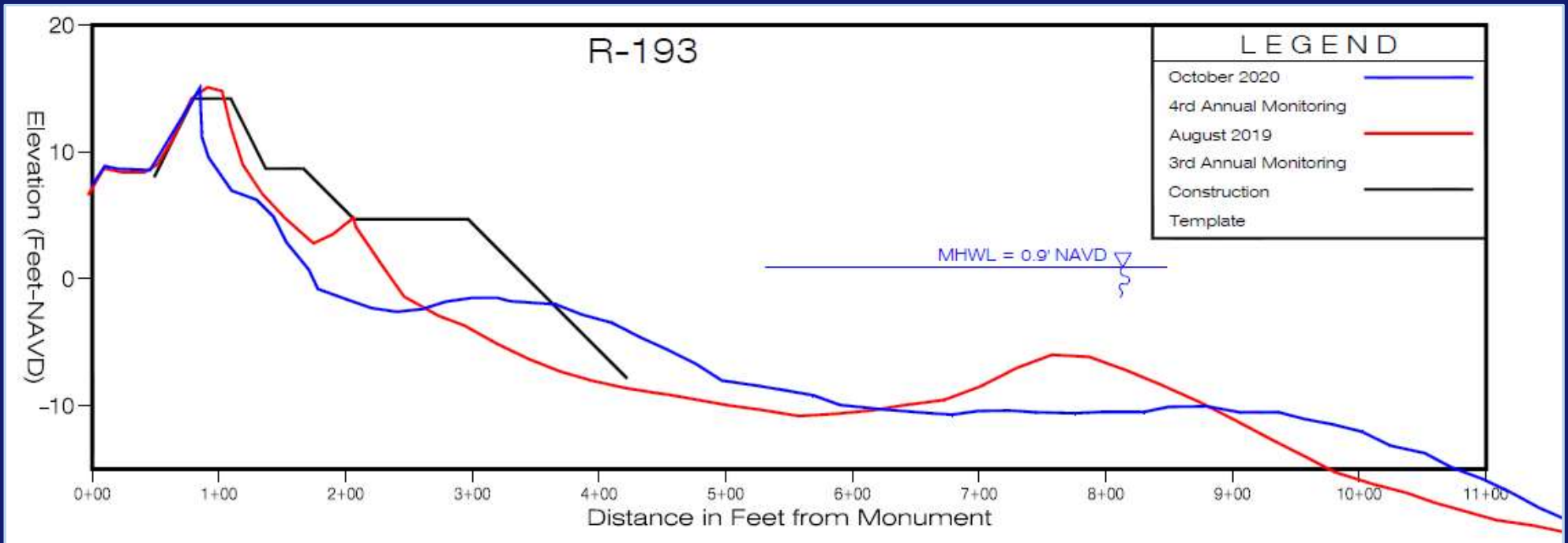
## September 2020

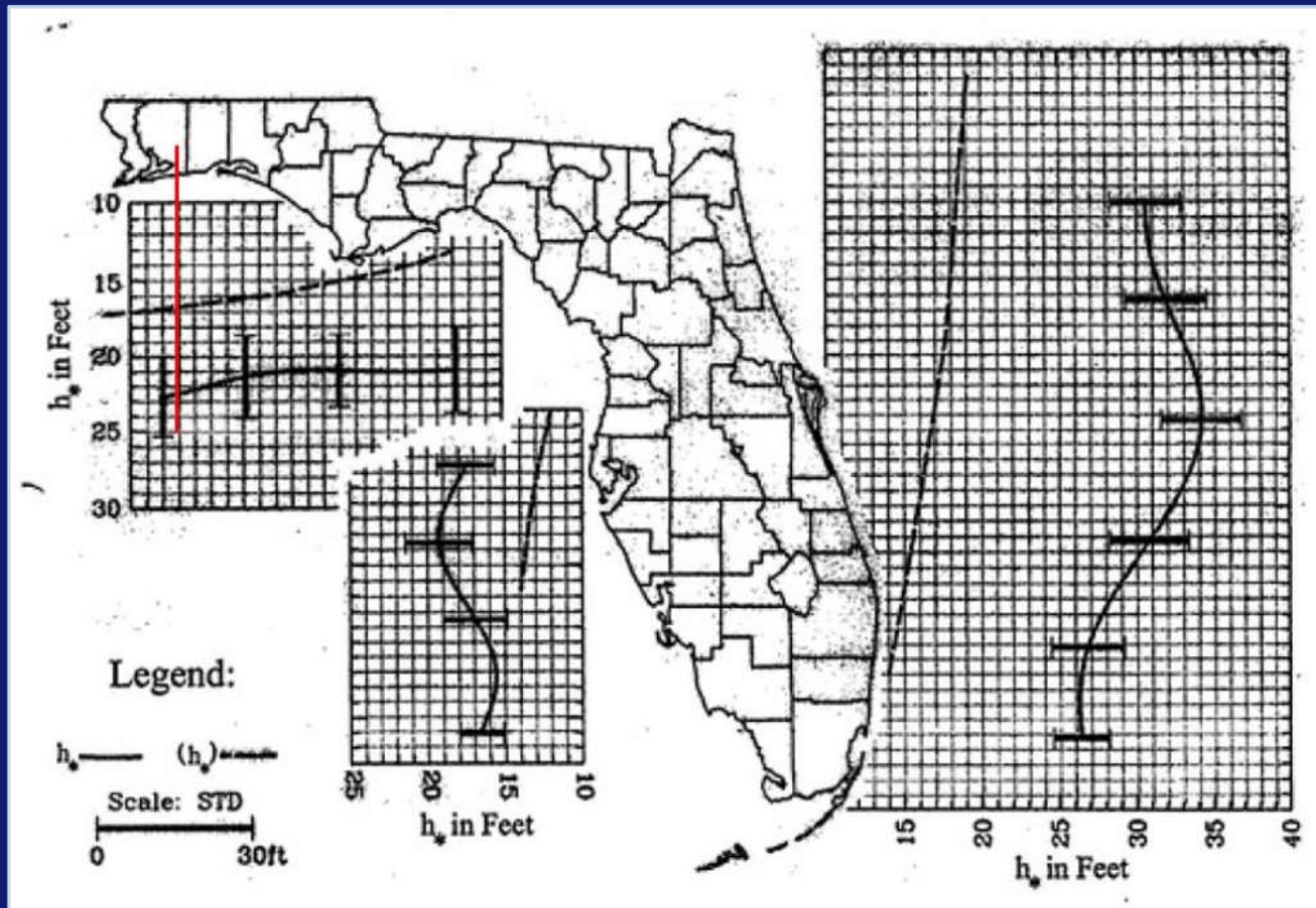
## Hurricane Sally

September 2020

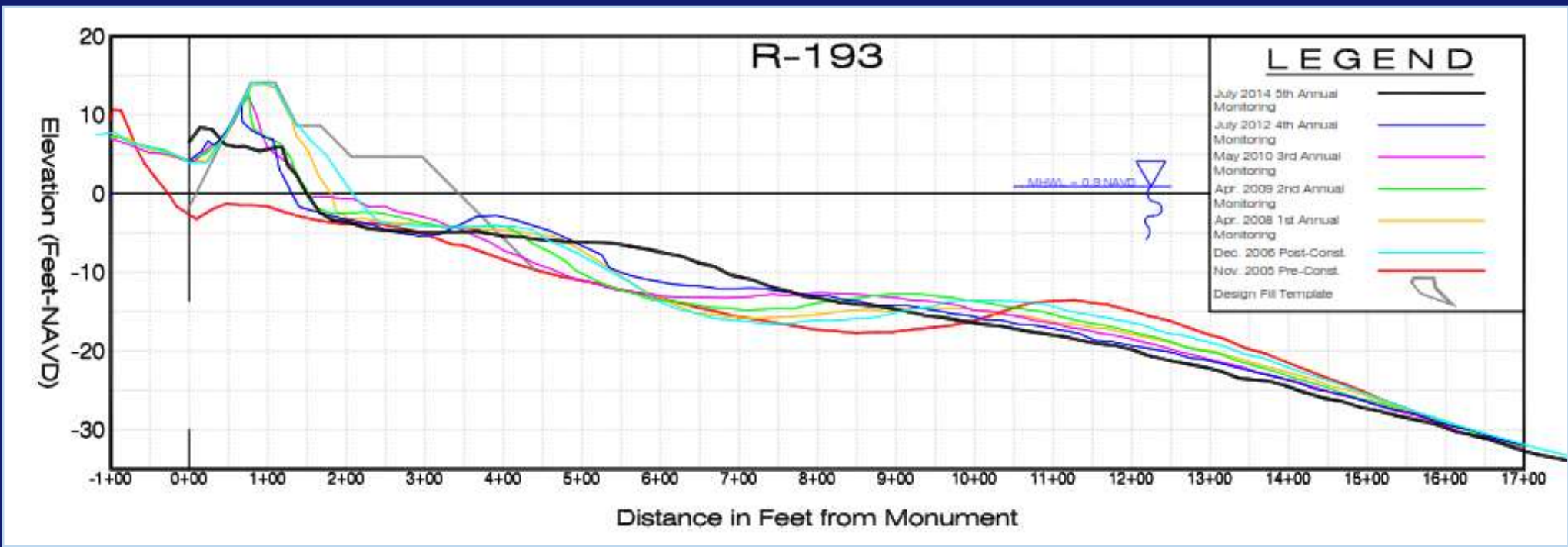








Source: "Closure Depth Considerations Along the Florida Shoreline" by Robert G. Dean and Subarna B. Malakar





## Summary of Hurricanes

Storm	Date	Storm Surge (ft)	Return Interval
Gustav	September 2008	3.4	9-year
Ike	September 2008	3.35	9-year
Ida	November 2009	2.65	7-year
Isaac	August 2012	2-4	10-year
Nate	October 2017	2-4	10-year
Michael	October 2018	2-4	10-year
Sally	September 2020	3-4	10-year



# Questions?

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