

Trends, Surprises and Pre-Dredge Status at Packery Channel

Presented to:
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Texas Coastal Bend Chapter

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US Army Corps of Engineers

Monitoring at Packery Channel

Highlights

- Brief History
- Changes Leading up to Dredge
- Nearshore Morphology
(North Packery)
- Discussion



17 May 2012 Photo: Courtesy of Dr. Richard Watson

Packery Channel: A Brief History



Emily
Opens
Channel

July 2005



Channel
Remains
Opens

July 2006



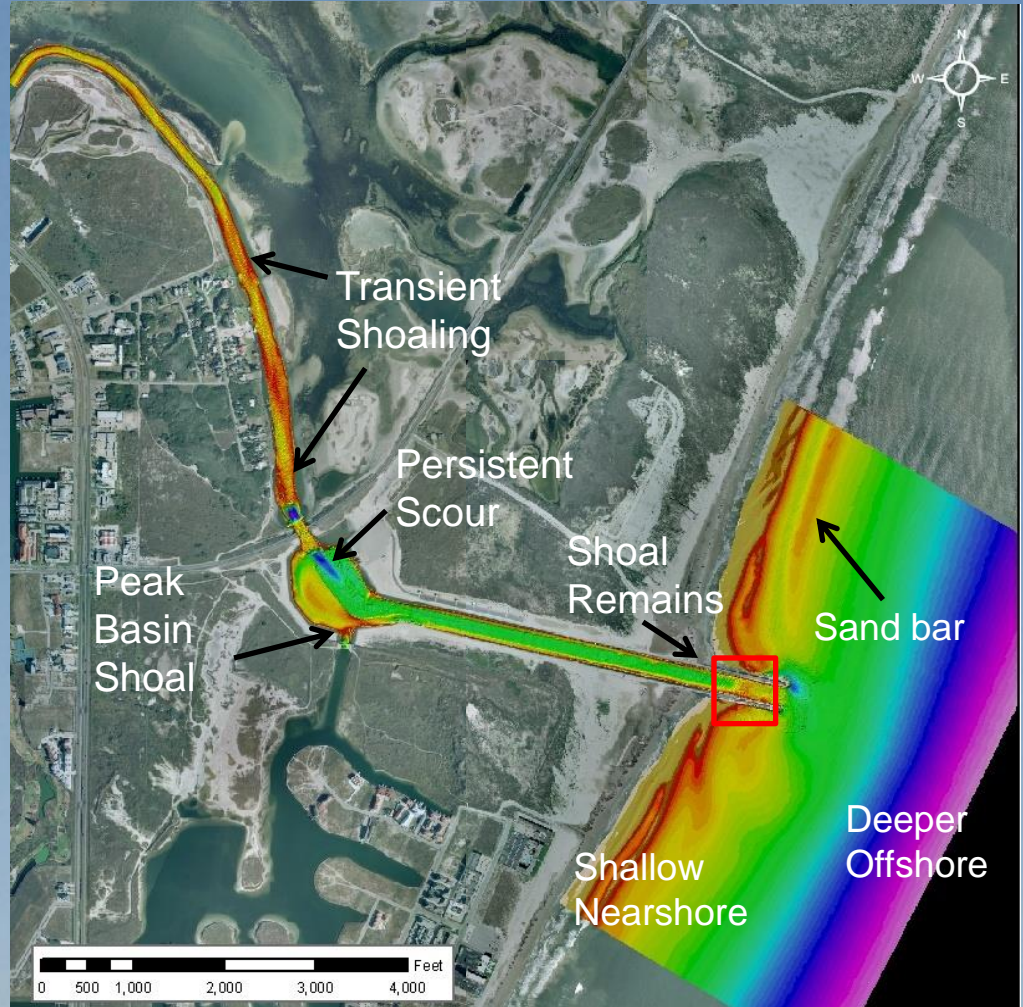
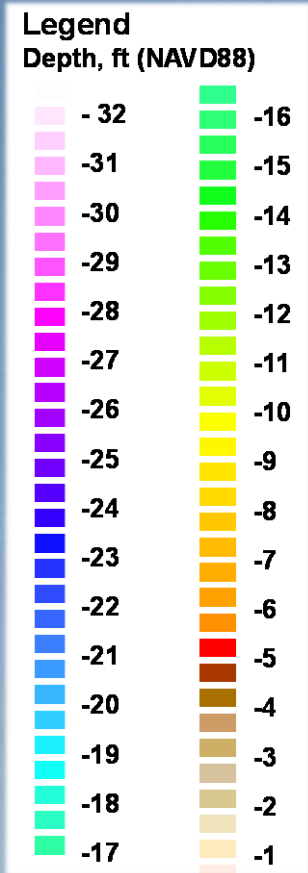
Dredging
Begins

Dec 2011

Bathymetry and Morphology 101

Bathymetry = Depth Measurements

Morphology = landforms (sand bars, scour, shoals)



Cool = Scour/Deeper Region

Warm = Shoal

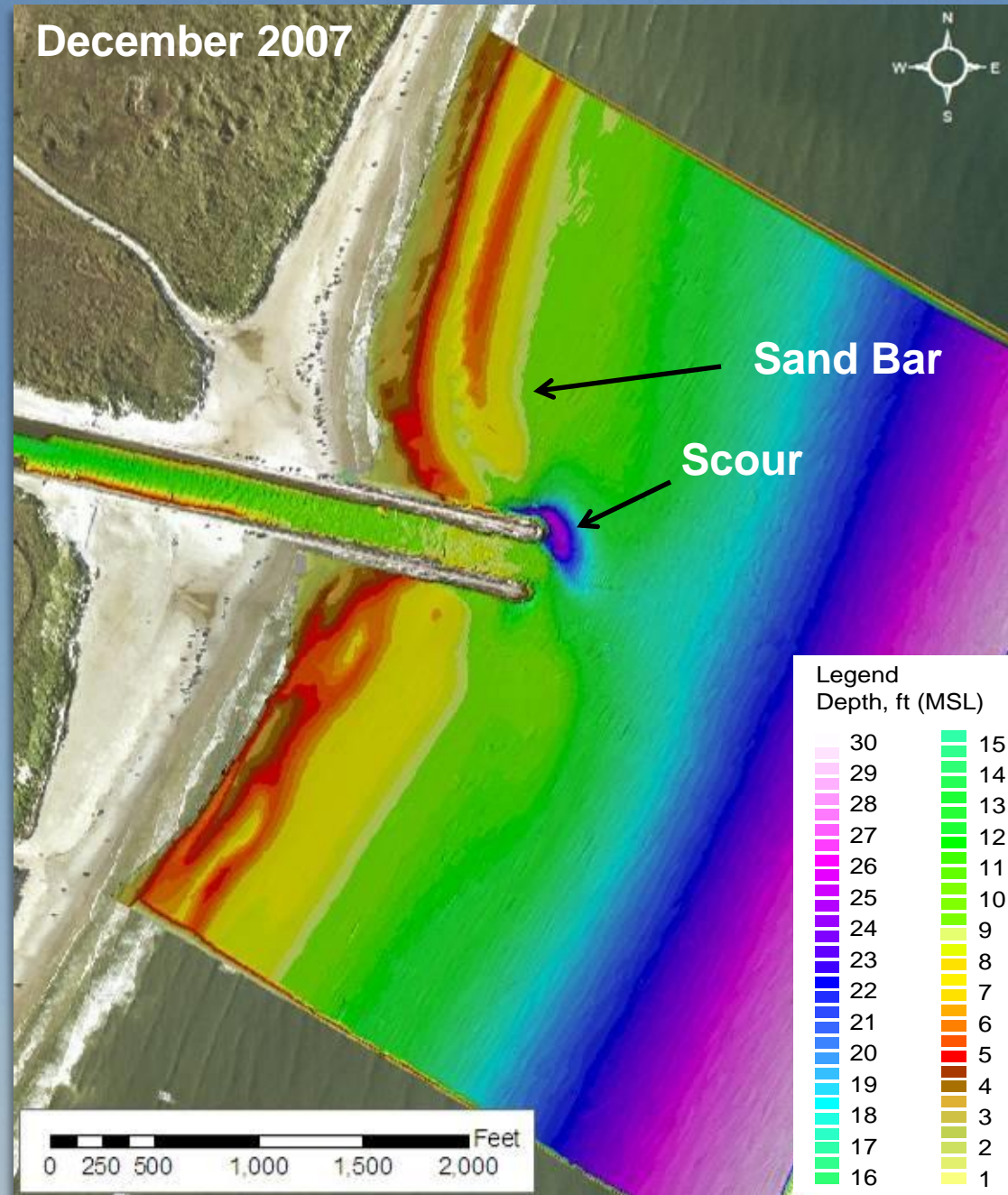
Well Established Seasonality

Aug 2006 to Sep 2008 (Pre-Ike)



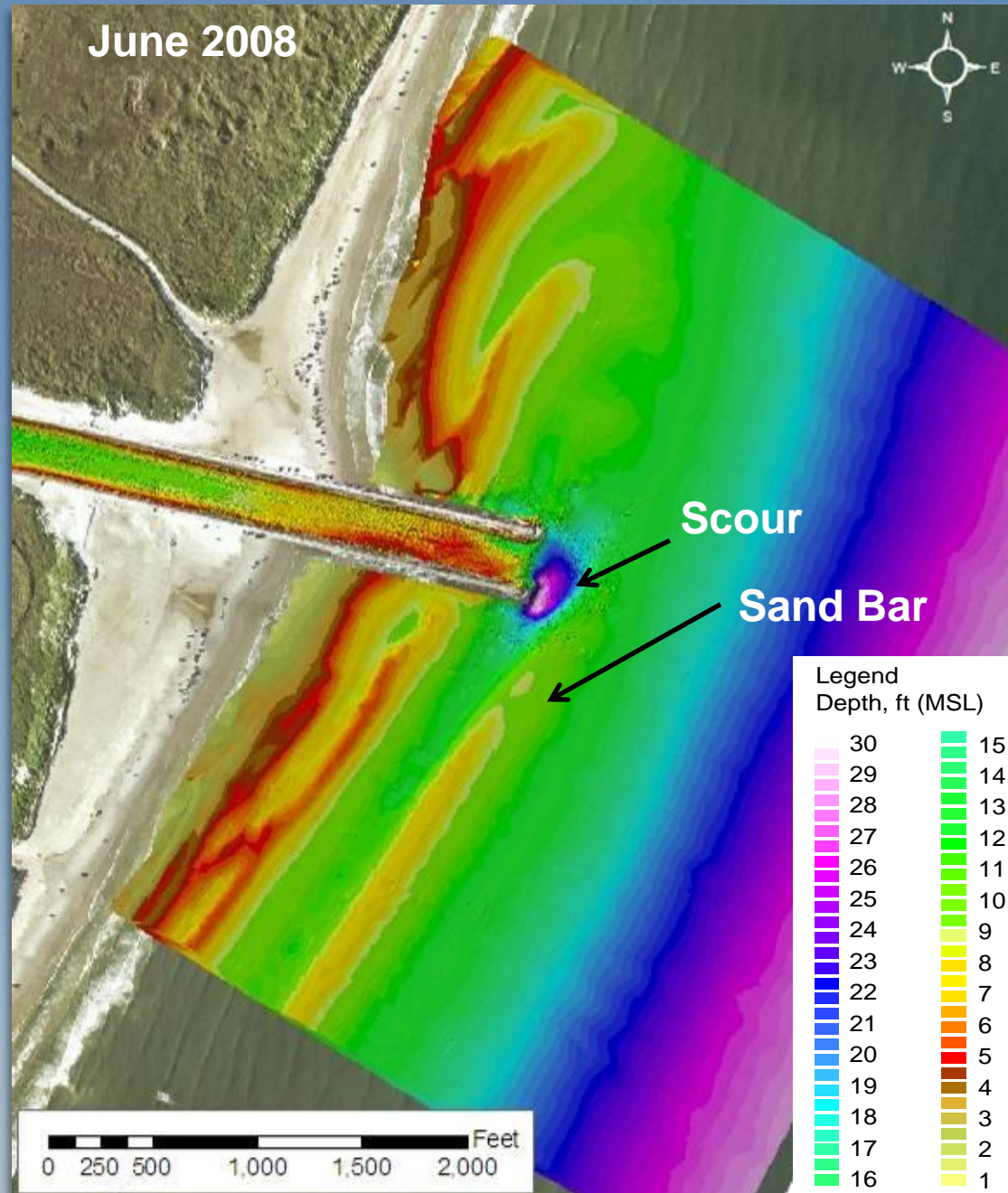
Winter Trend

- Channel Scour
- Bar builds North
- Scour increases at North Jetty



Summer Trend

- Channel Shoals
- Bar builds South
- Scour increases at South Jetty

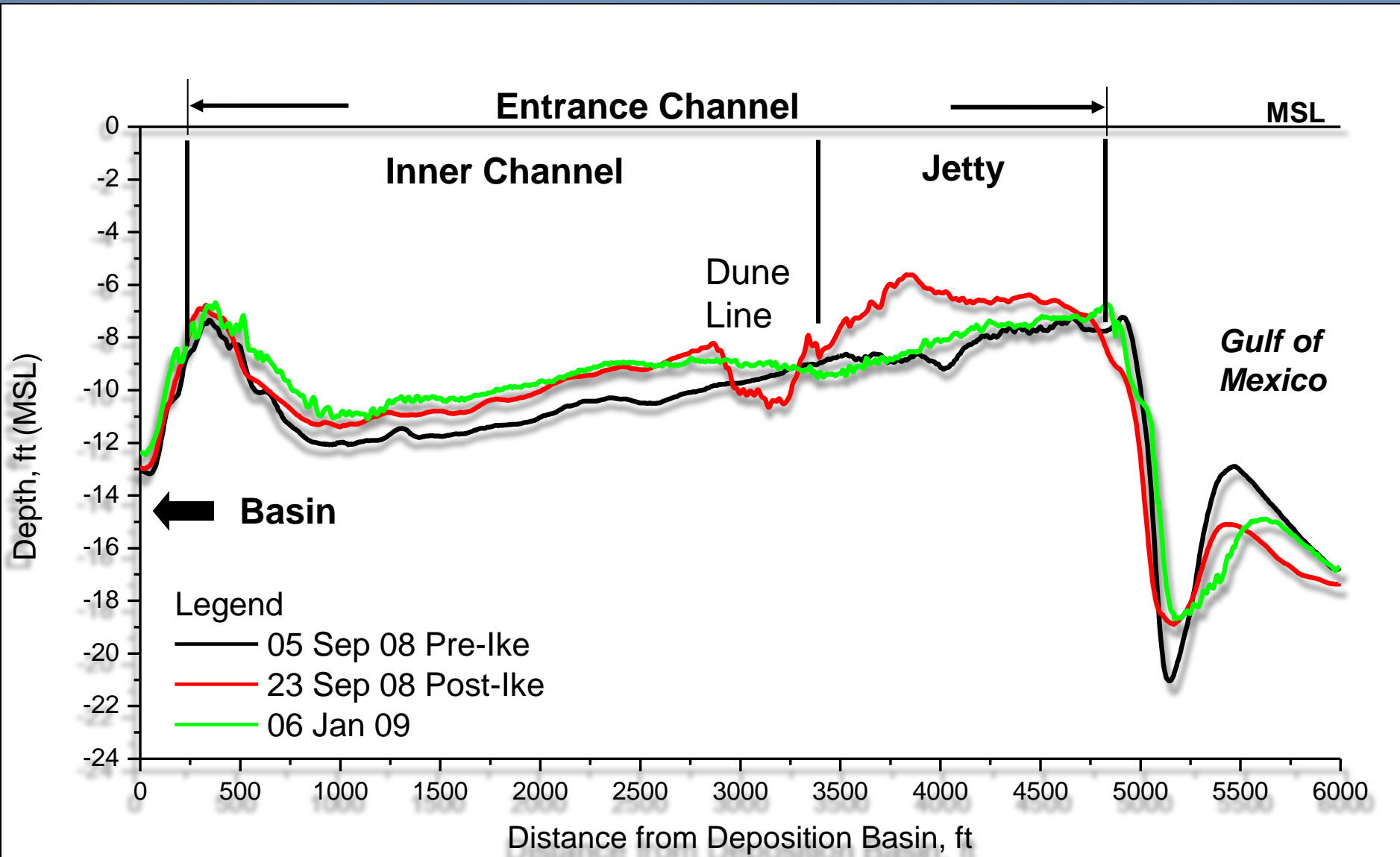


Post-Ike Change in System Dynamic Led to Dredge Event

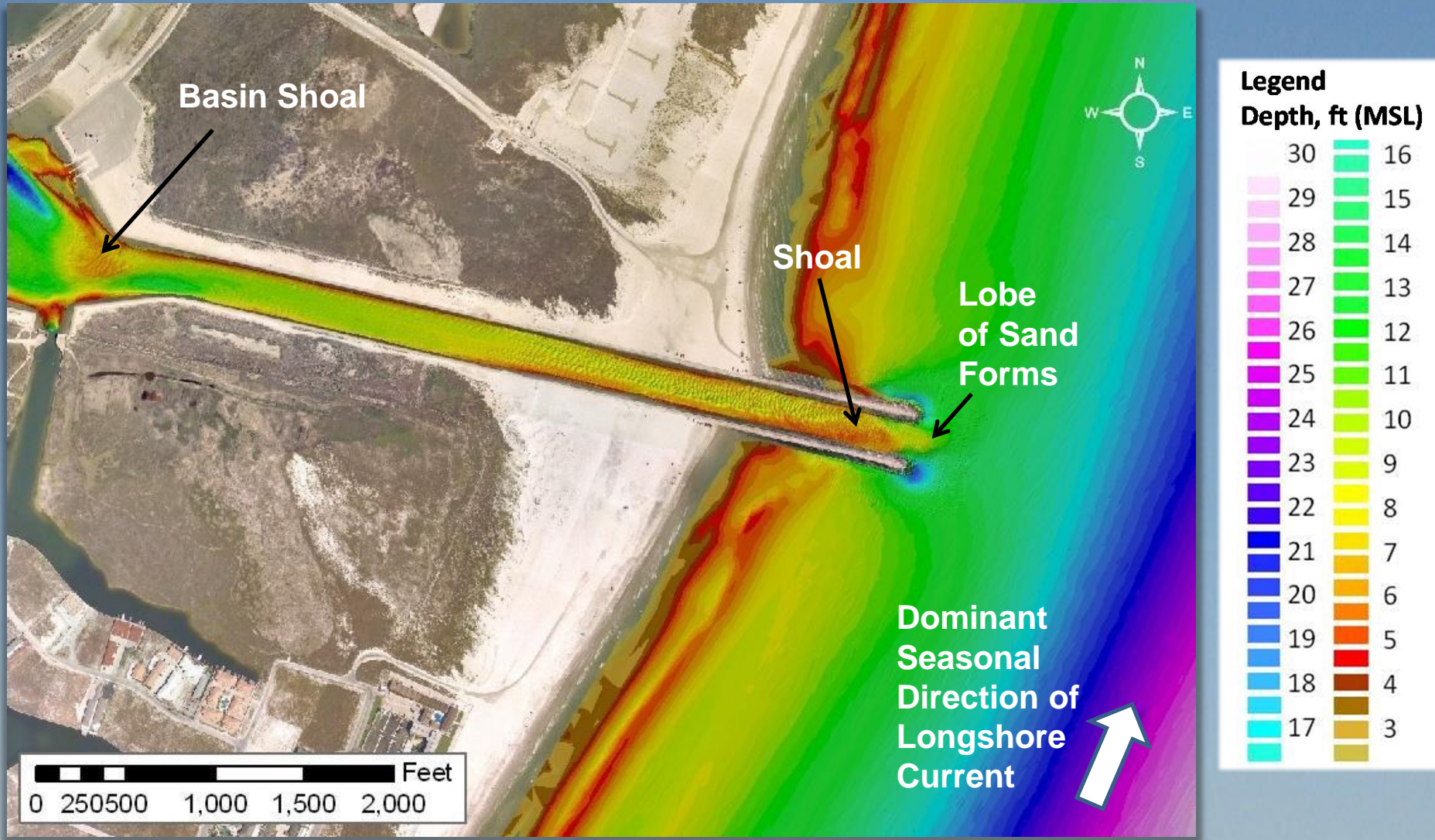
Post-Ike
June 2009 to Sep 2011



Packery Channel Centerline Pre-Ike, Post-Ike and Limited Recovery



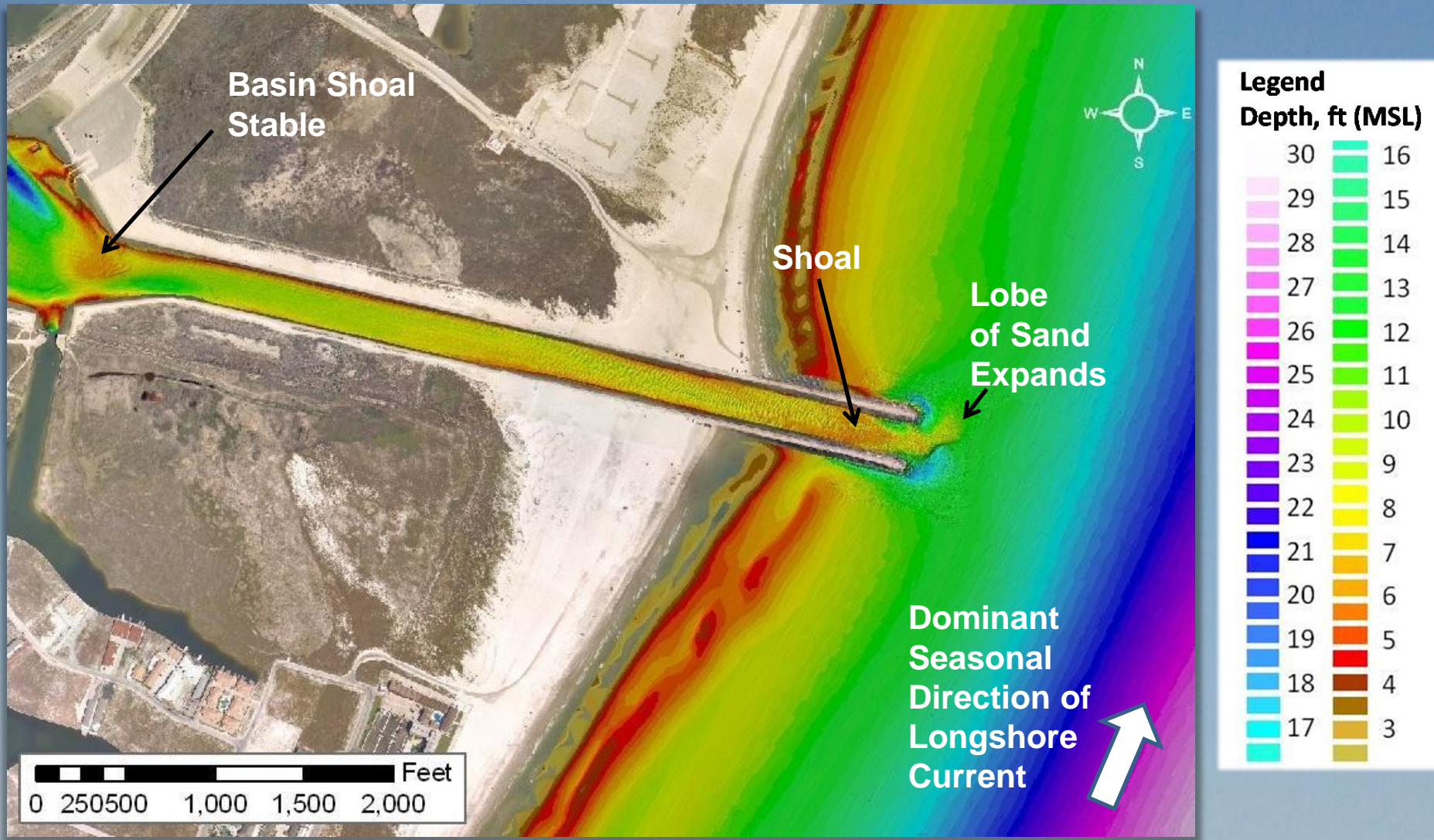
Lobe of Sand Forms at Channel Mouth June 2009



Lobe of Sand Expands into Nearshore

Sep 2009

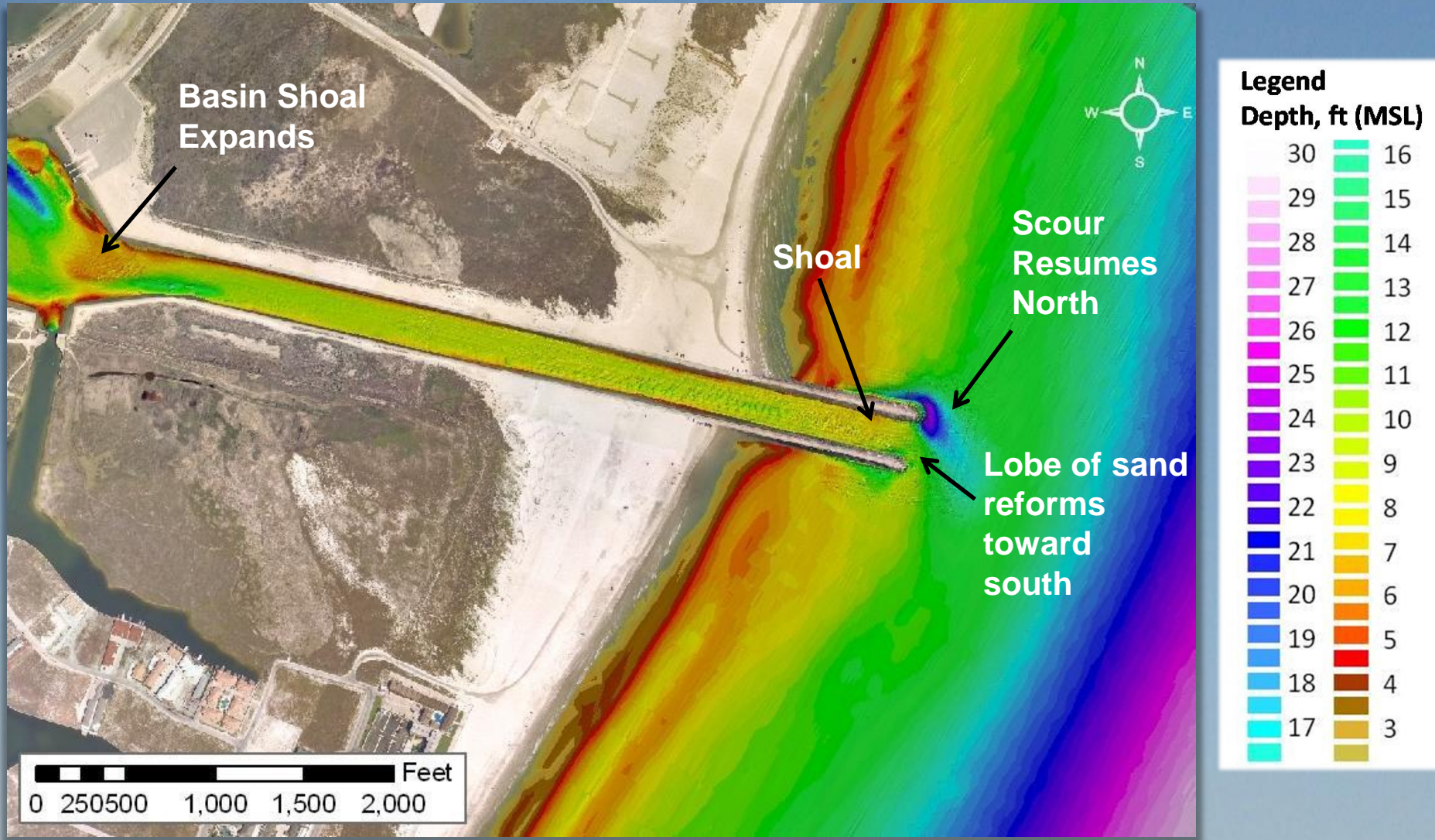
Nearly continuous flow of sand out of mouth



Shoals expand from Basin to Channel Mouth

January 2010

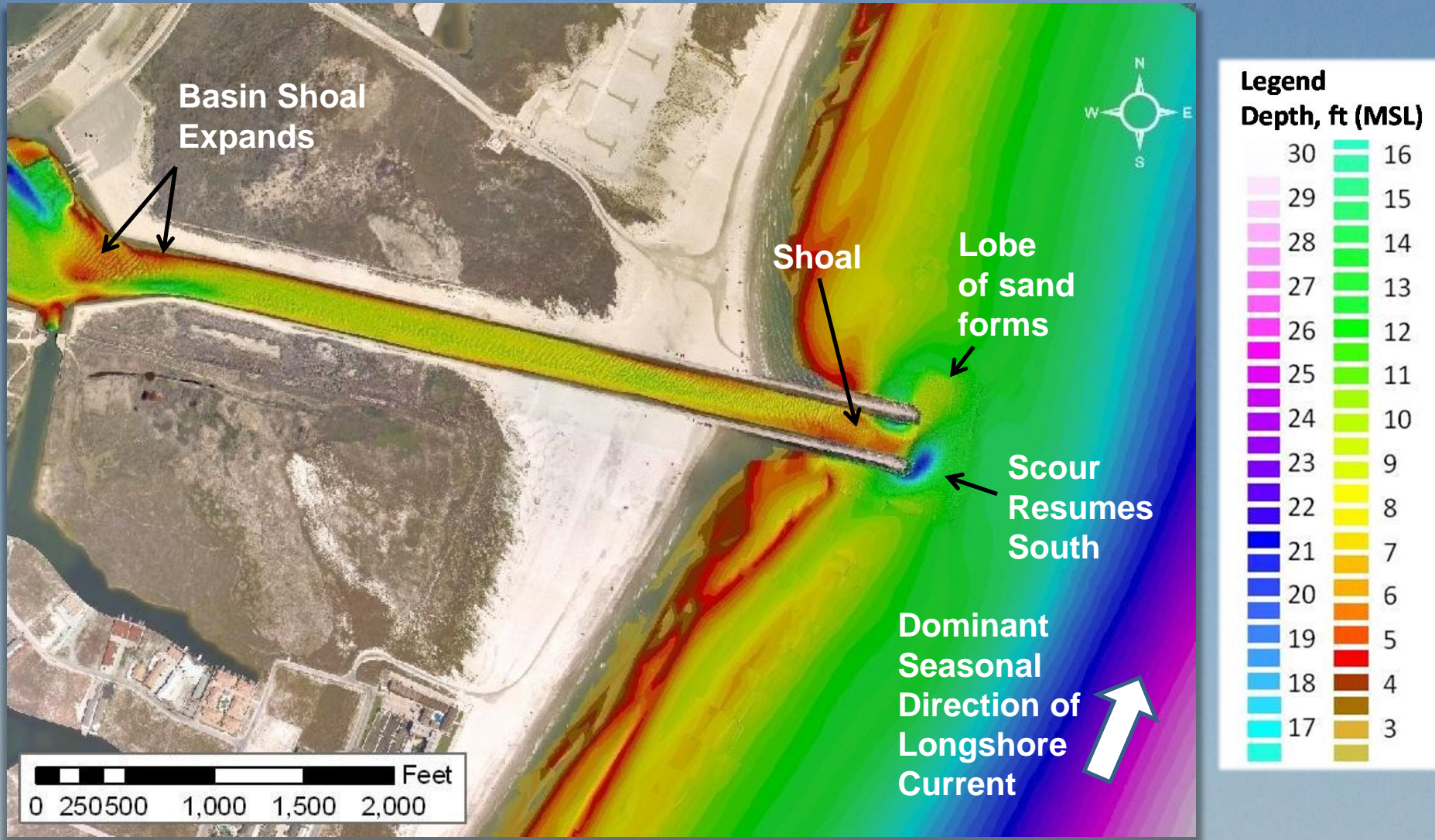
Winter fronts reinforce current and flush entrance channel



Shoals expand from Basin to Channel Mouth

June 2010

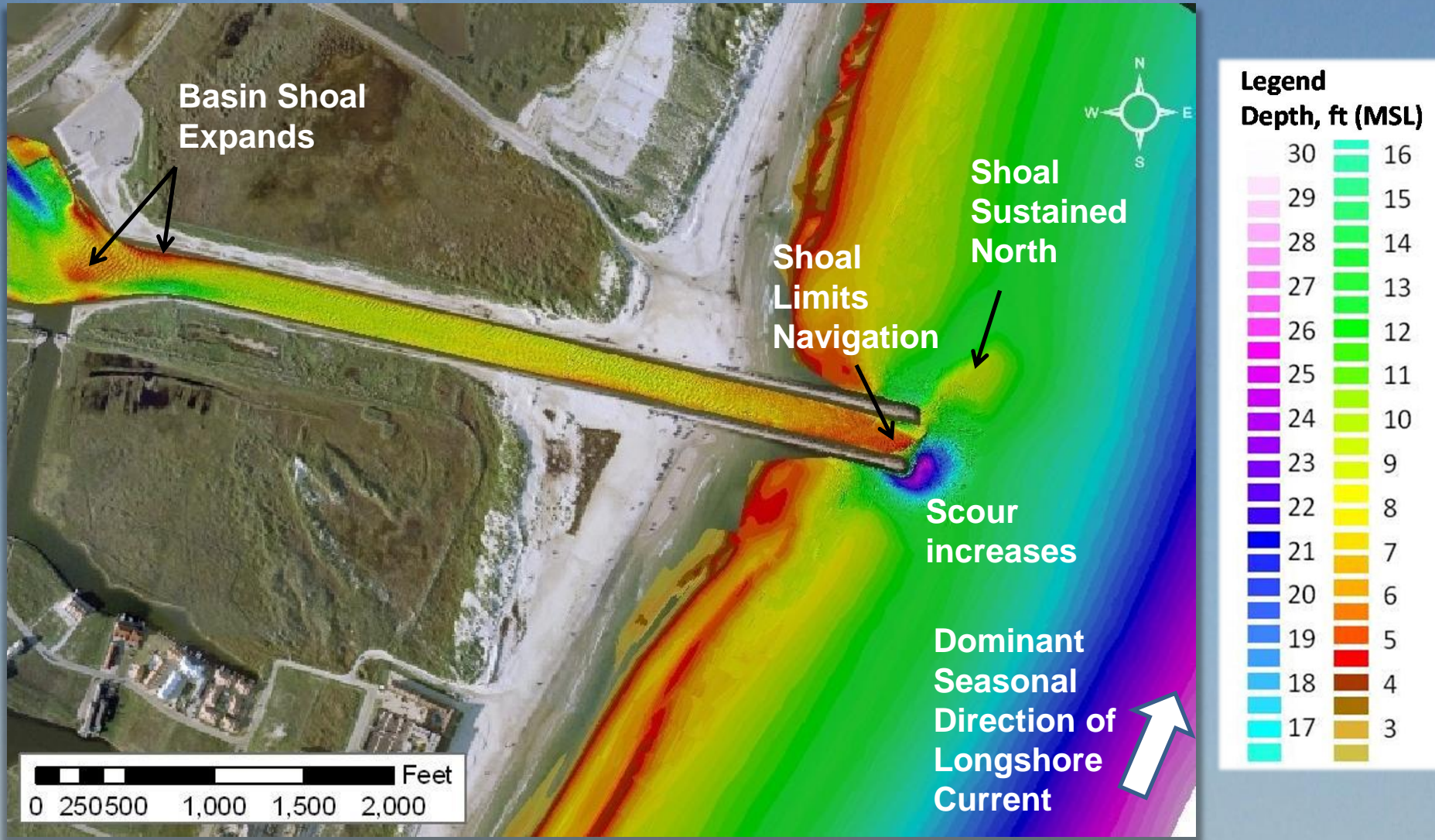
Lobe of sand forms north side of North Jetty



Shoals expand from Basin to Channel Mouth

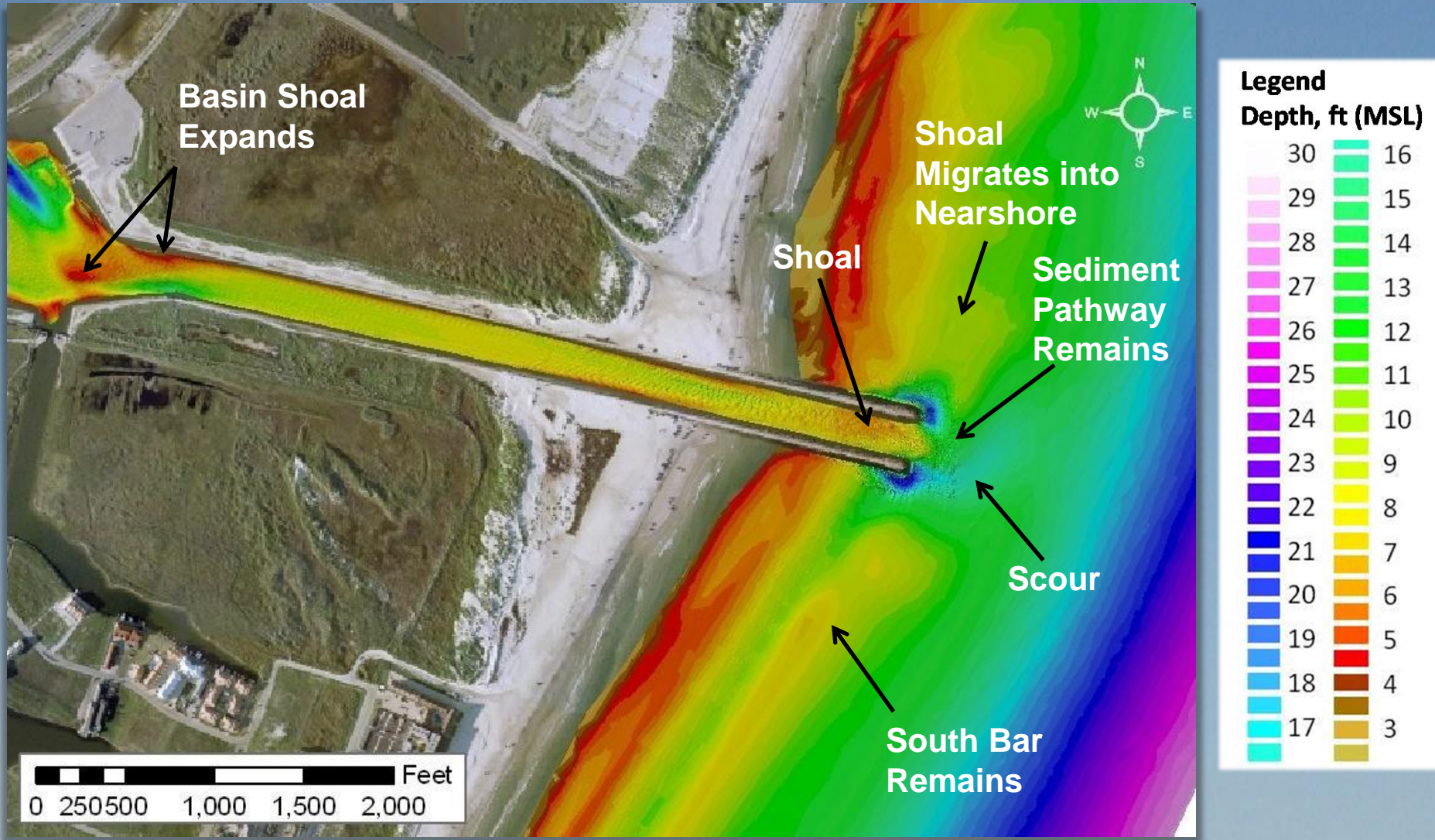
September 2010

Navigation depth-limited at channel mouth



Shoals expand from Basin to Channel Mouth February 2011

Potential for depth-limited navigation at Basin Shoal

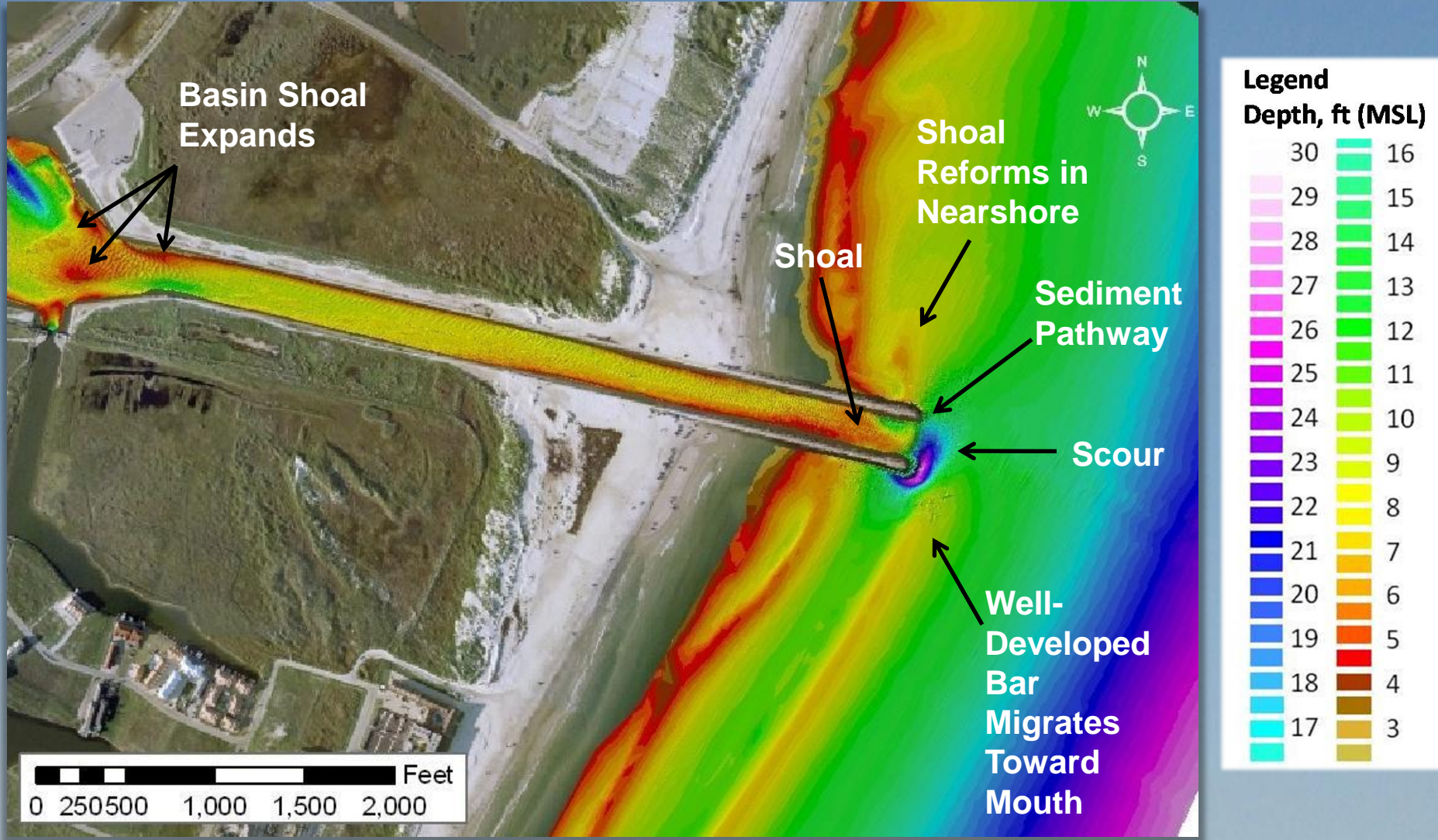


Surplus Available Sand in Basin and Immediate Nearshore

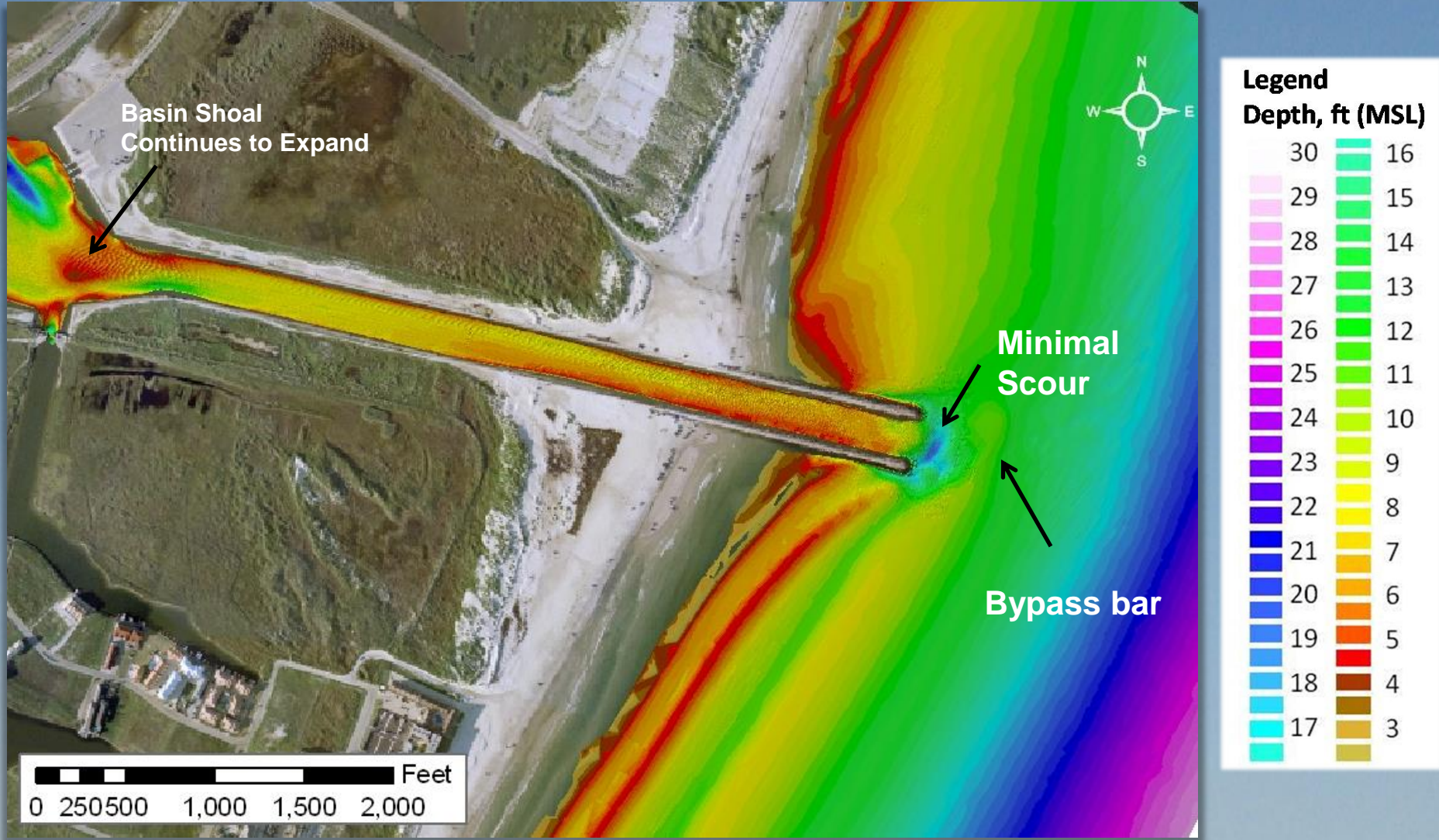
Shoals expand from Basin to Channel Mouth

June 2011

Basin Shoal expanding E/W and shoal at mouth > June 2010



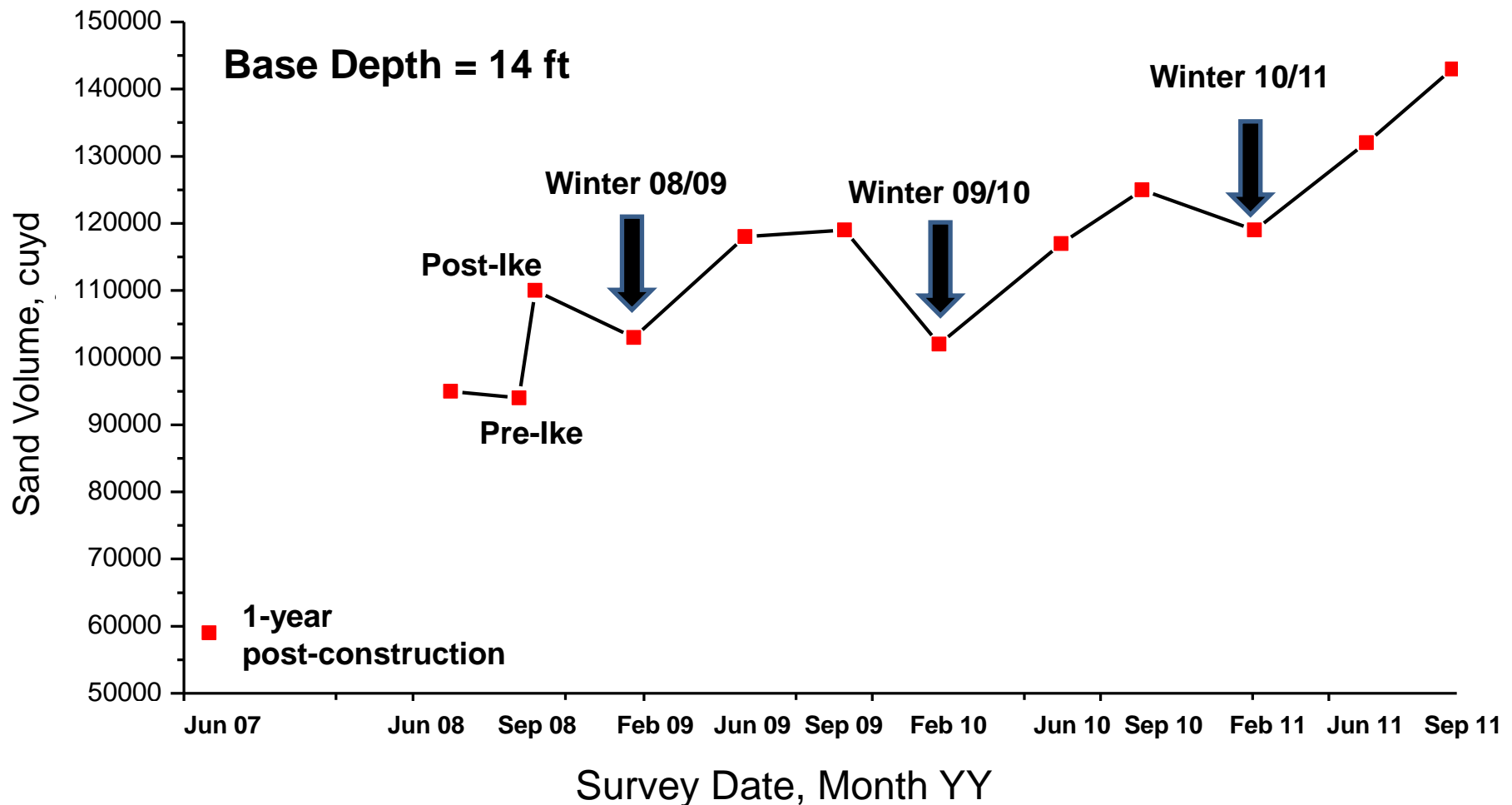
Shoaling Continues in Channel Bypass Bar Builds in Nearshore Sep 2011



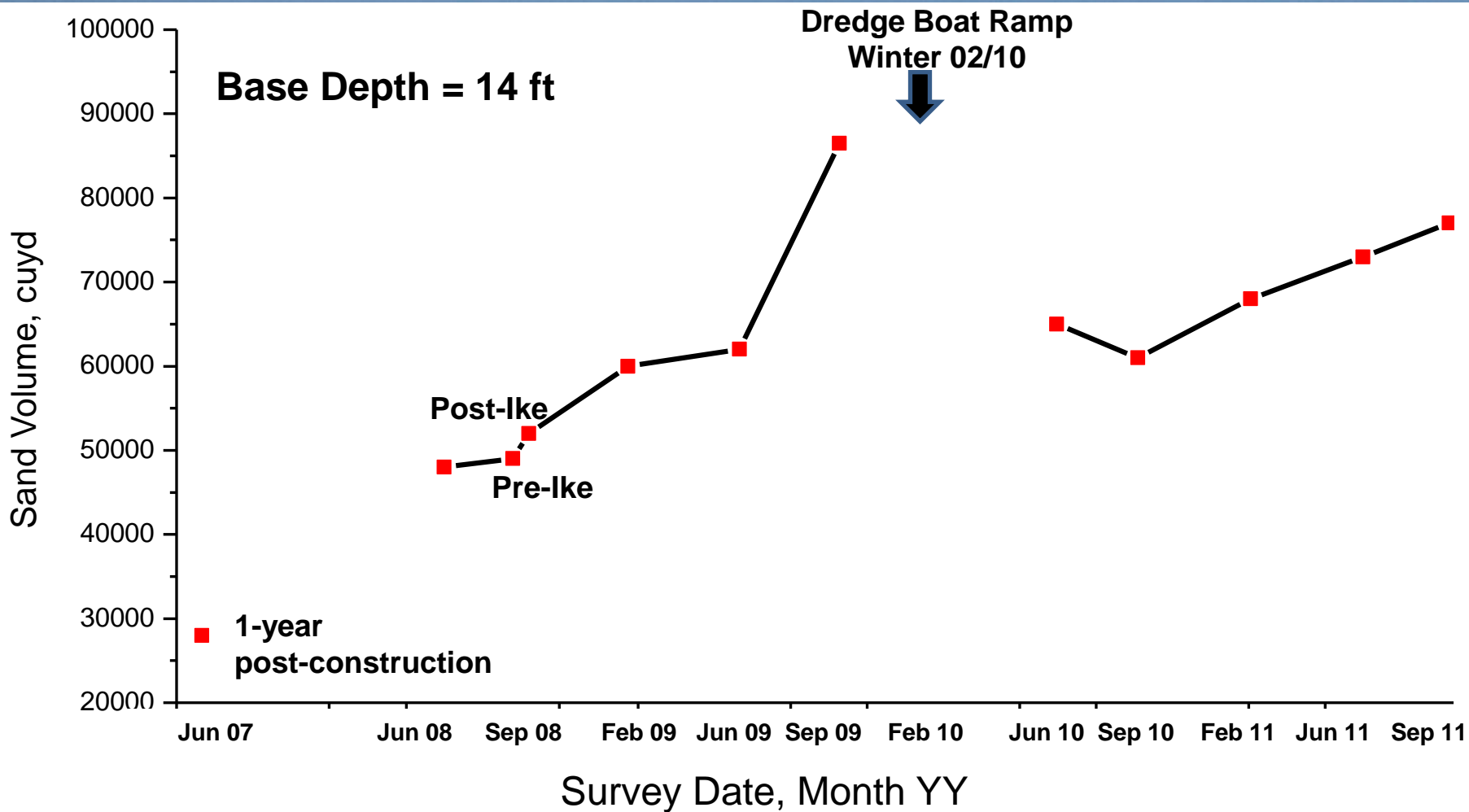
Estimated Dredge Volume (August 2007 to September 2011)



Increase in Sand Volume Inner Entrance and Entrance Channel Aug 2007 to Sep 2011



Increase in Sand Volume Basin (excluding SW quadrant) Aug 2007 to Sep 2011



Estimated Sand Volume

Basin to Mouth Total

≈ 220,000 to 293,000 cu yd of sand
(14 to 17 ft dredge depth)

Increase > 30,000 cuyd since February 2011

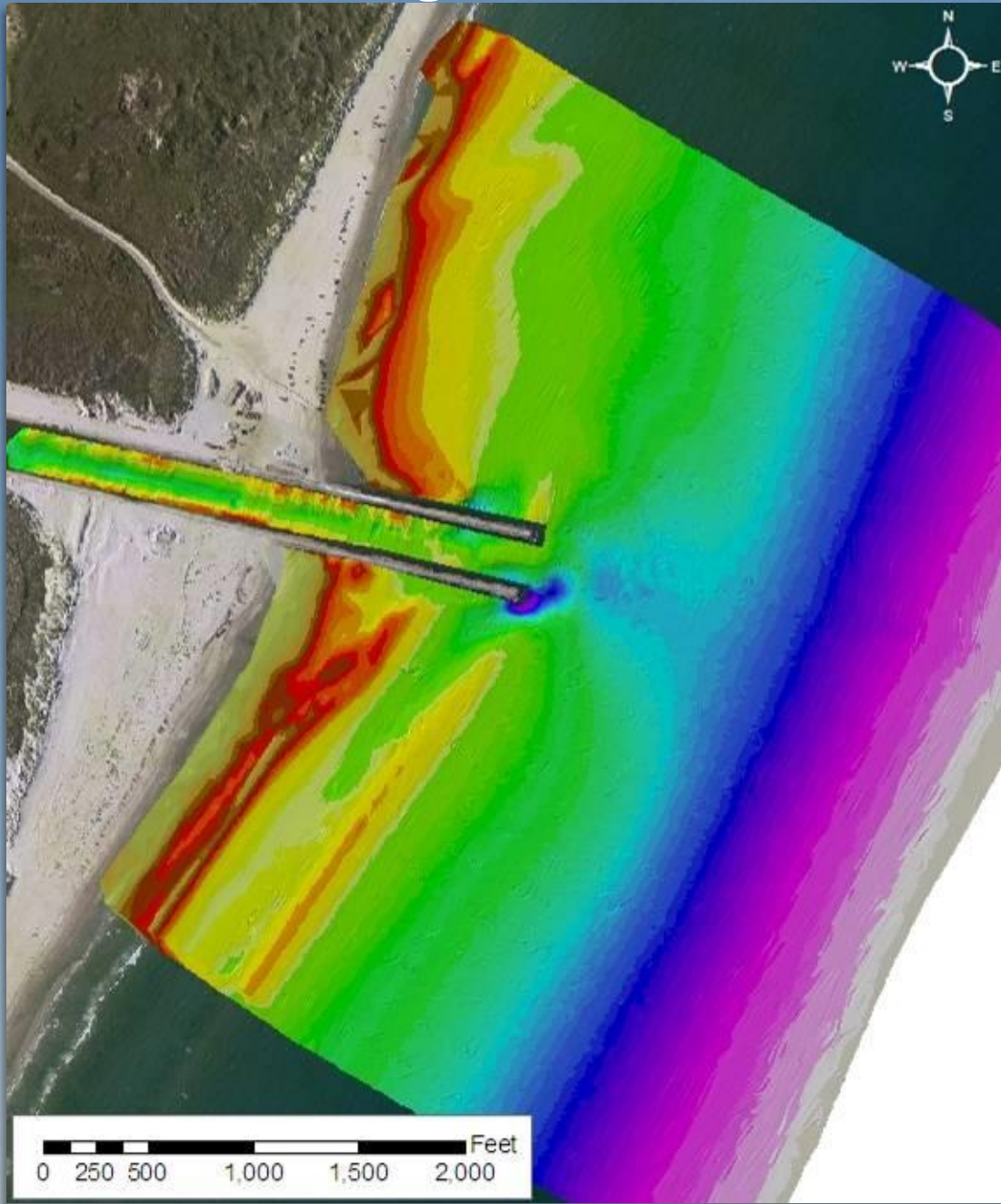


Changes in Nearshore Morphology

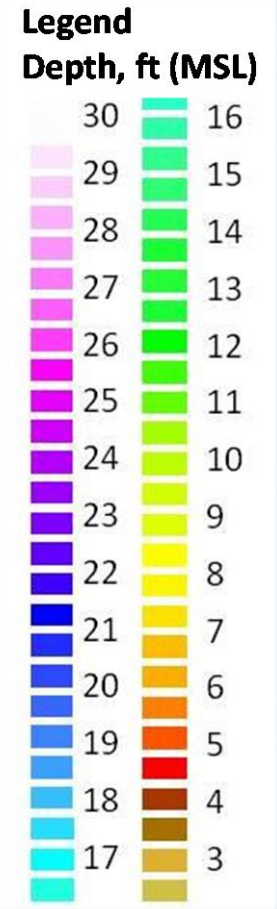
Focus: Bar Development
(or lack of!)



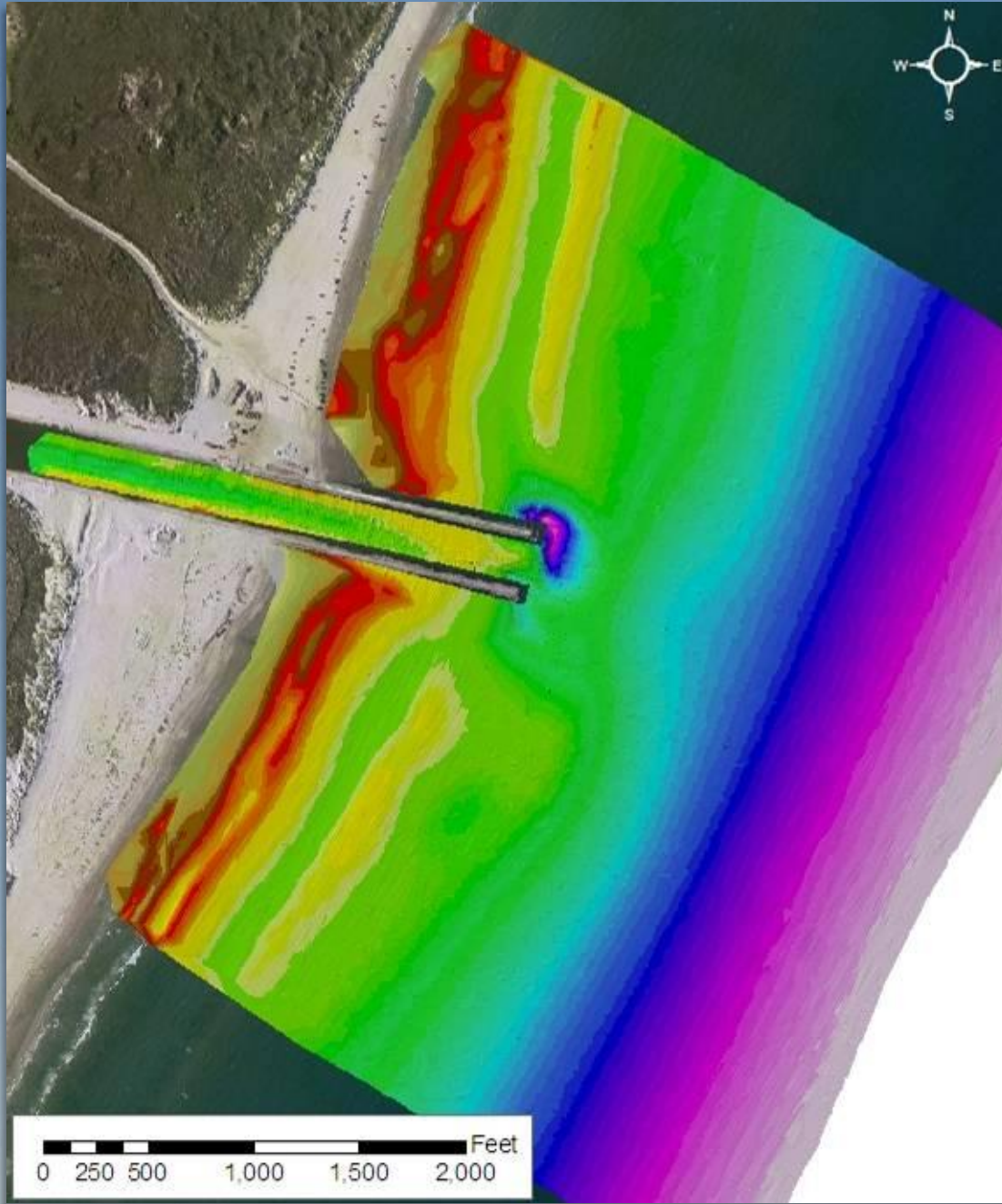
August 2006



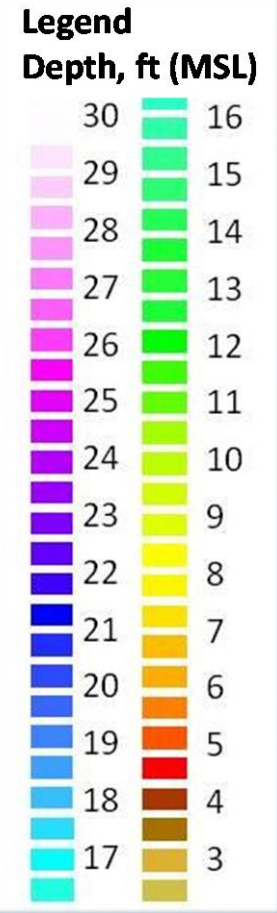
Channel Completed



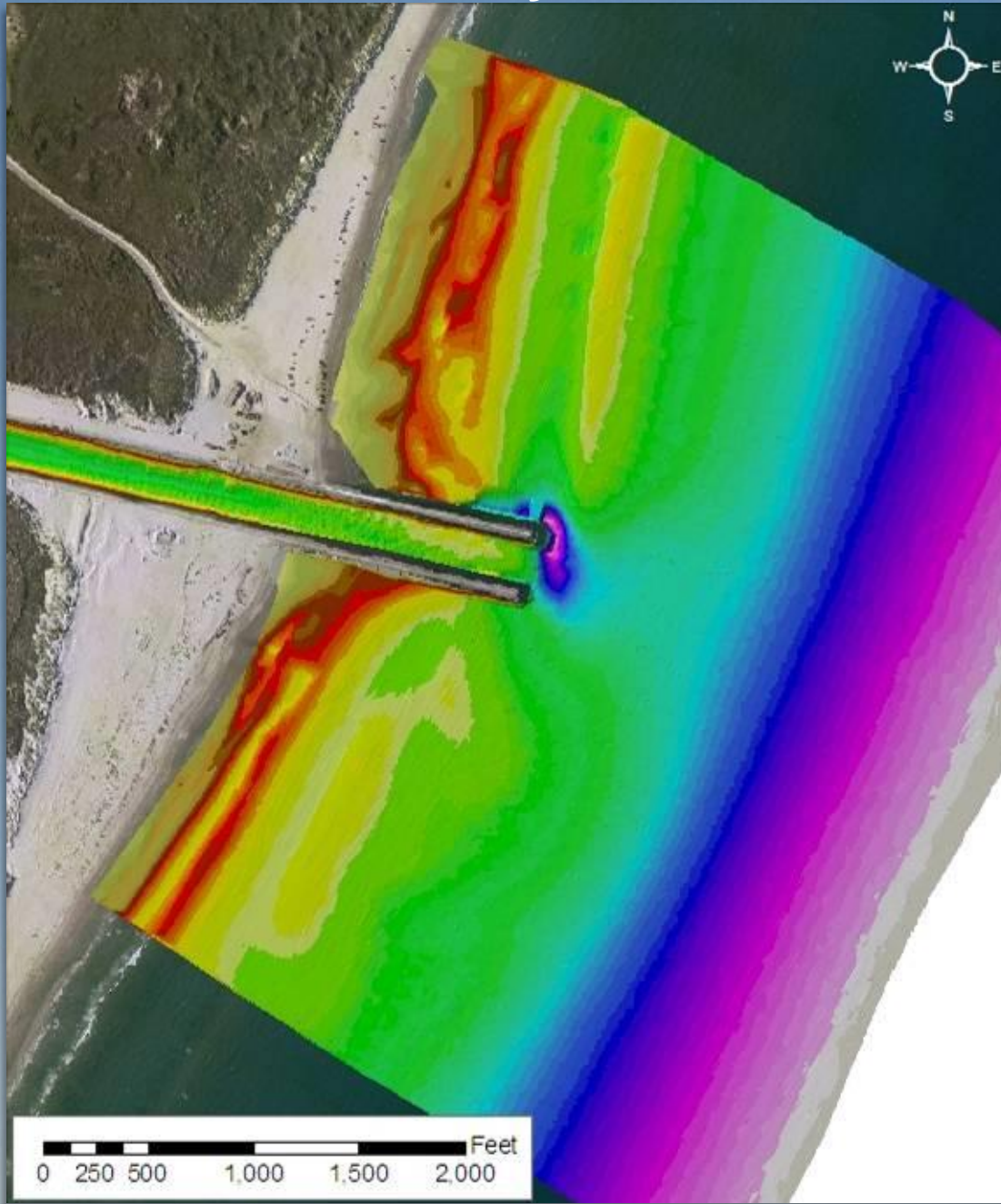
December 2006



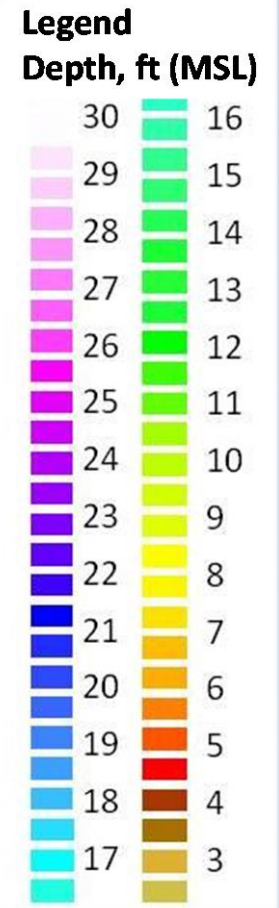
Mid-winter



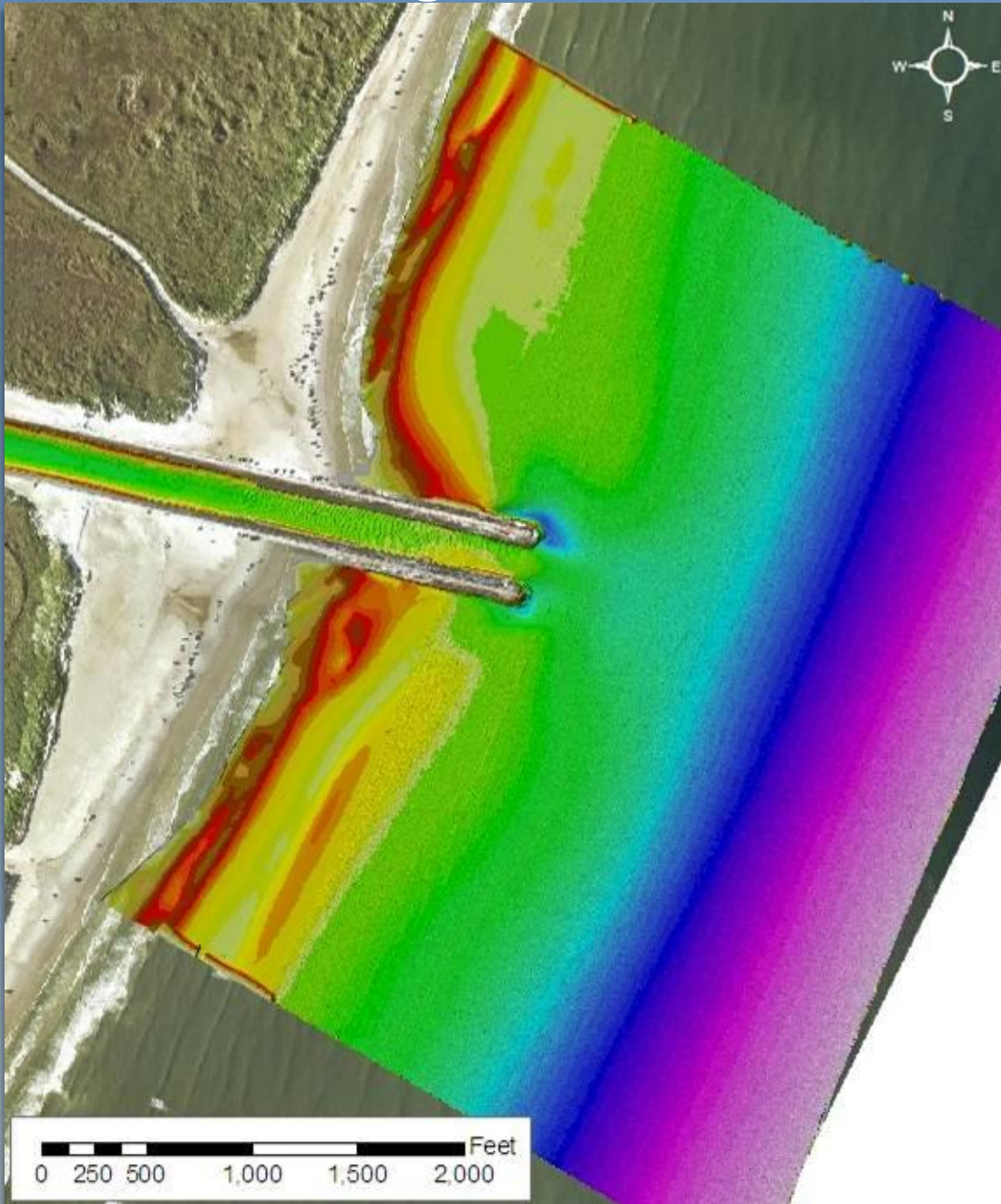
February 2007



Peak
Winter



August 2007

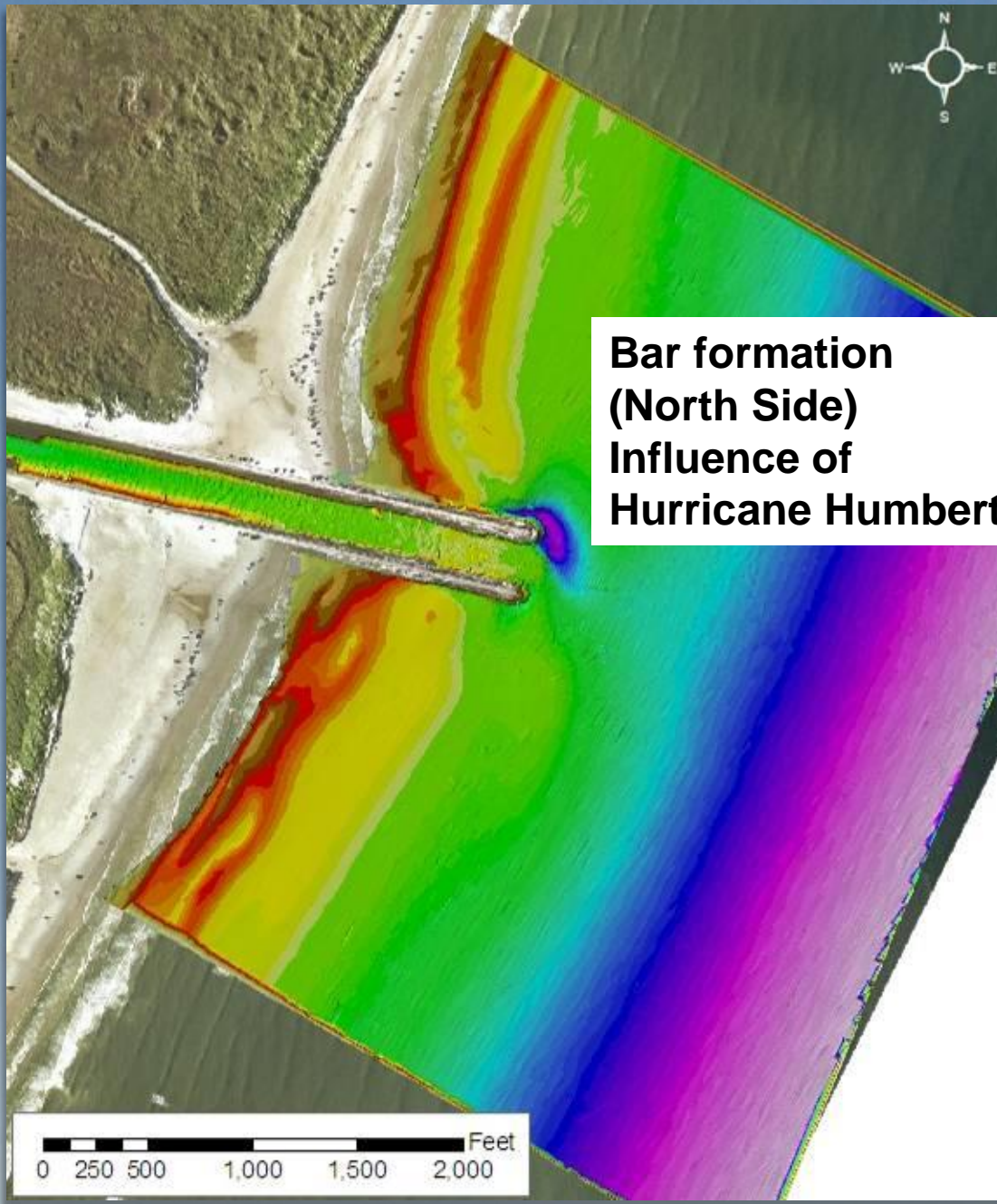


Peak
Summer

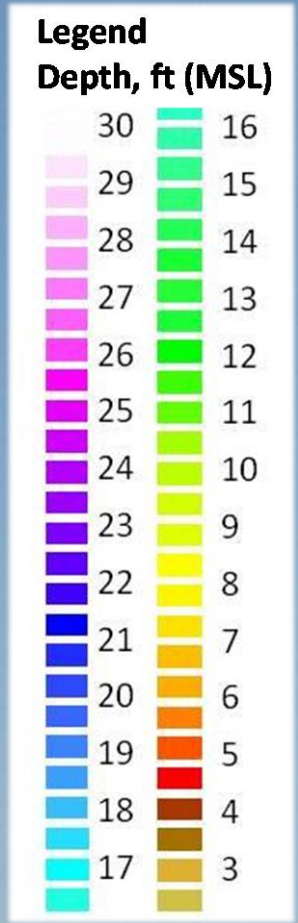
Legend Depth, ft (MSL)

30	16
29	15
28	14
27	13
26	12
25	11
24	10
23	9
22	8
21	7
20	6
19	5
18	4
17	3

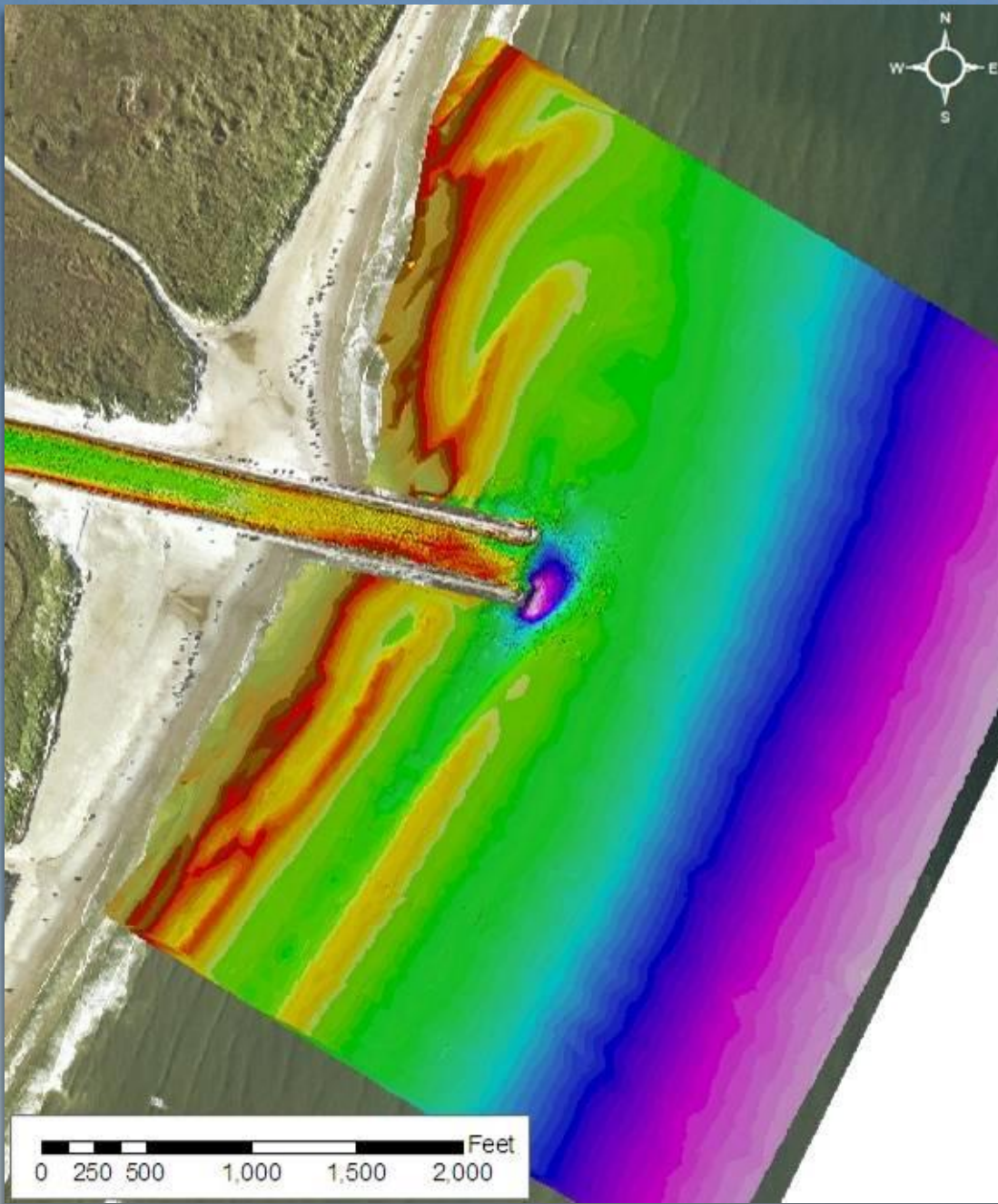
December 2007



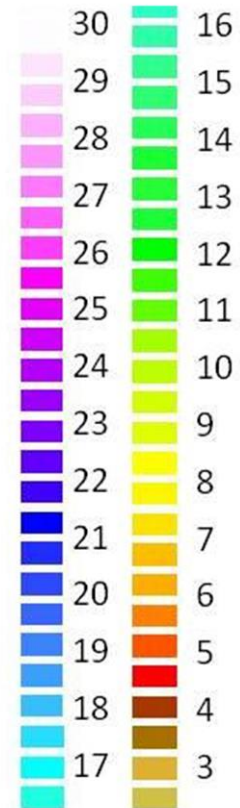
Mid-winter



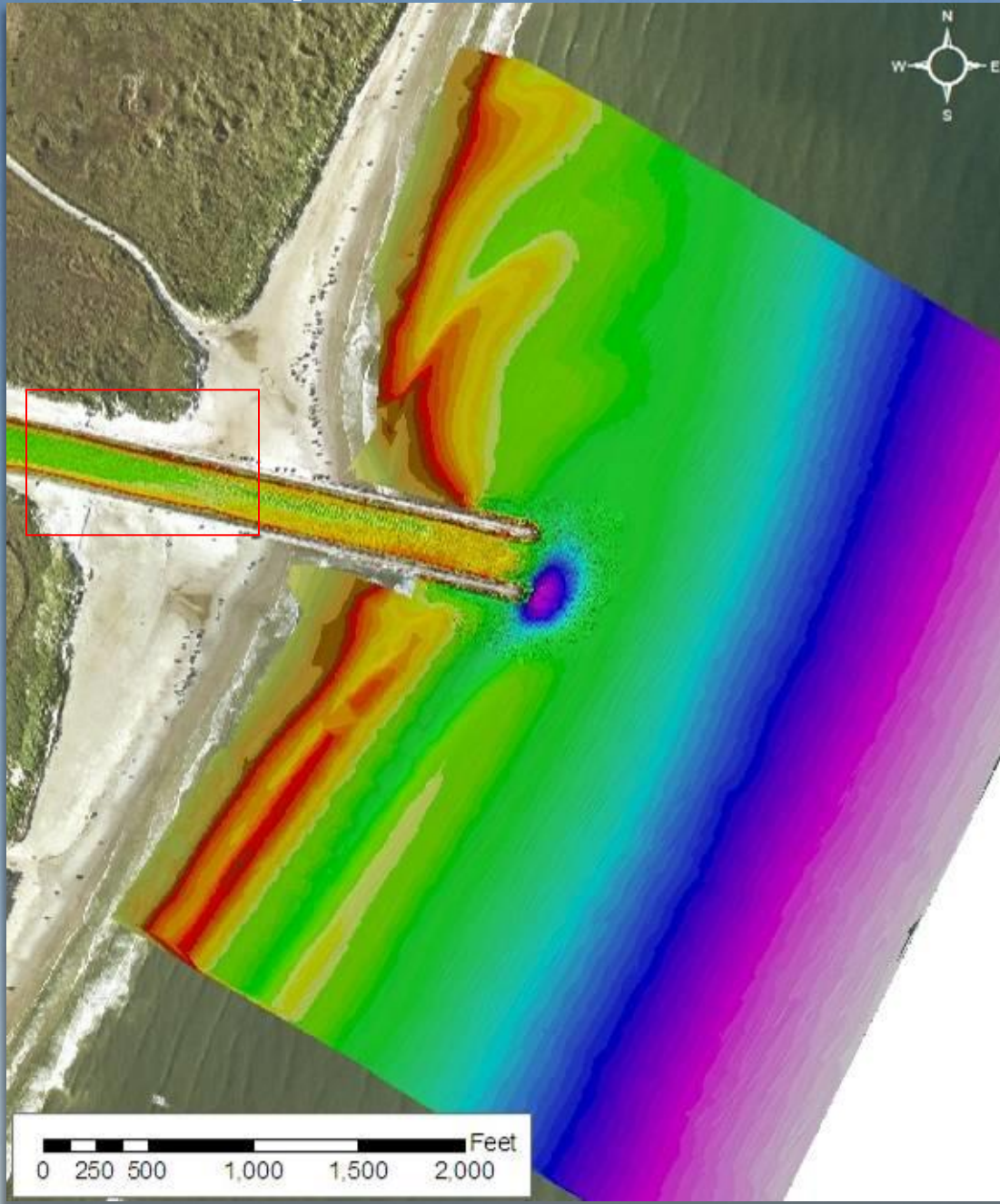
June 2008



Legend
Depth, ft (MSL)

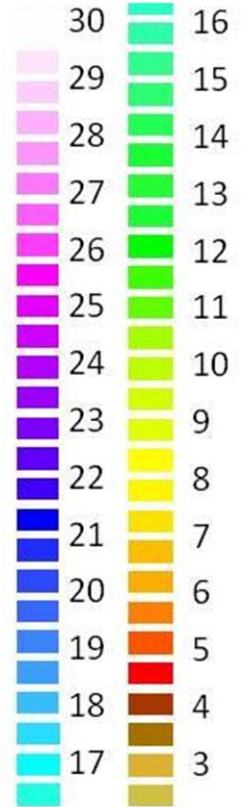


05 September 2008 Pre-Ike



Legend

Depth, ft (MSL)

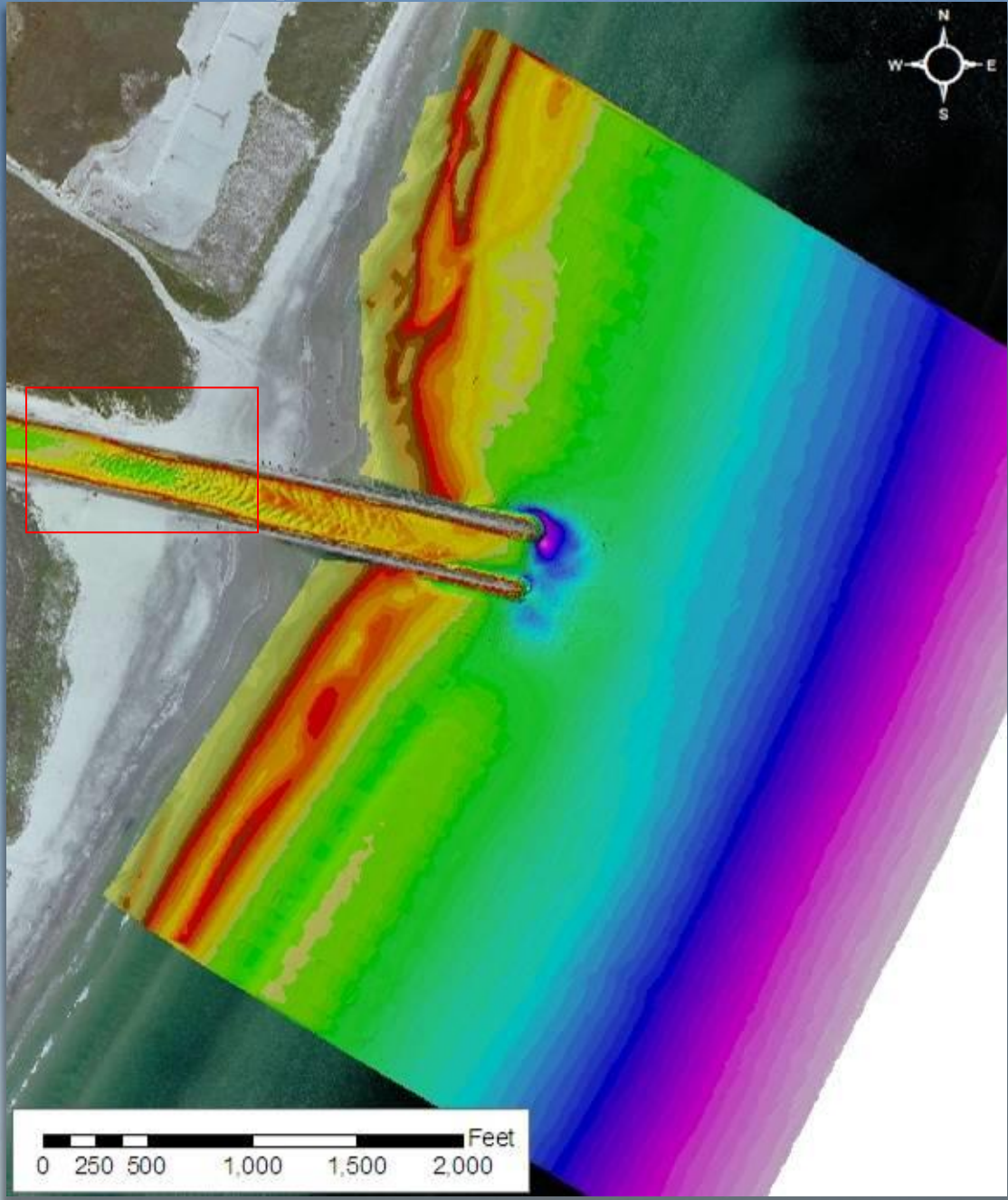


Peak
Summer

PLUS

Influence of
Dolly

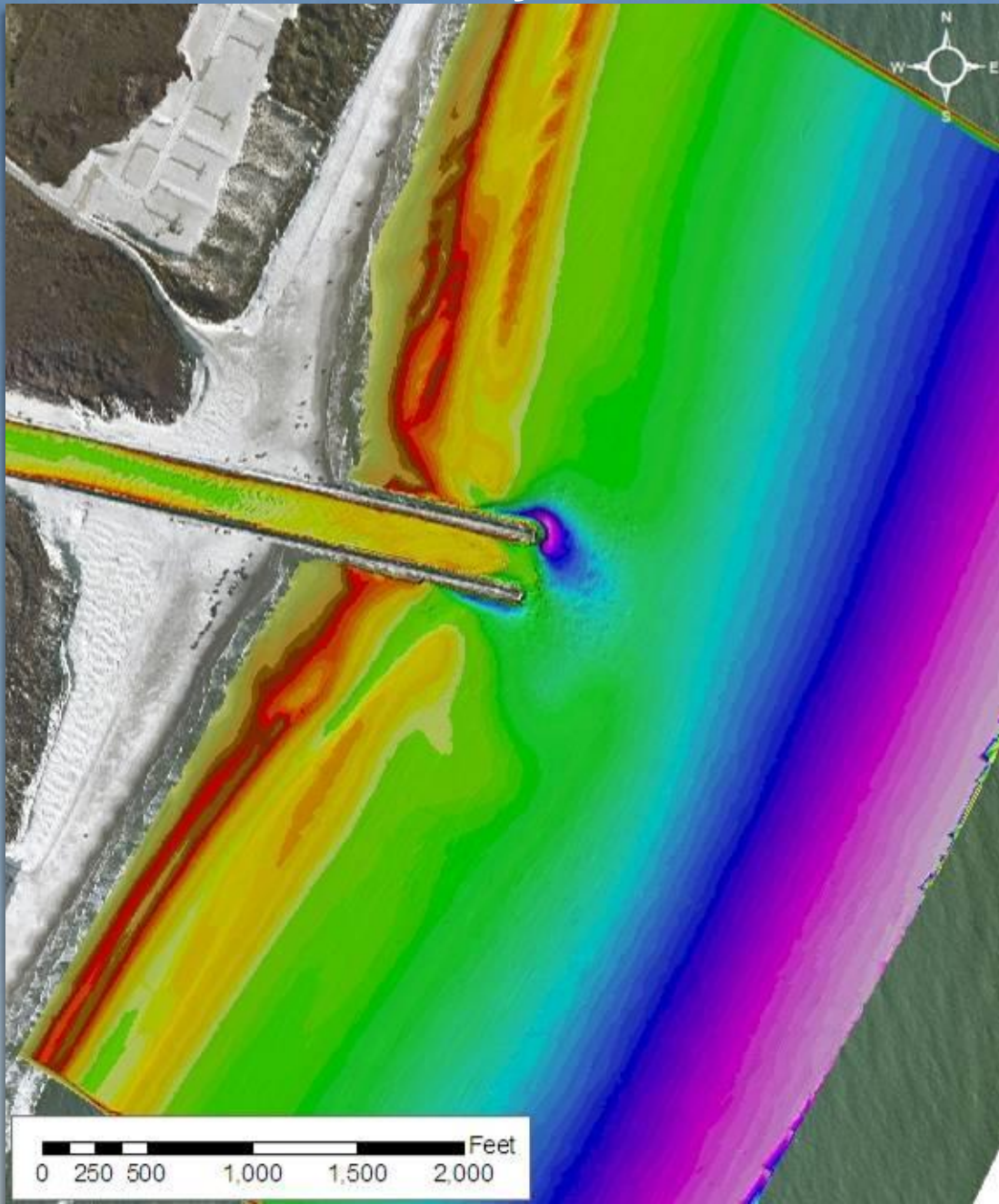
23 September 2008 Post-Ike



≈ 20K cu yd
Of sand
enters
channel

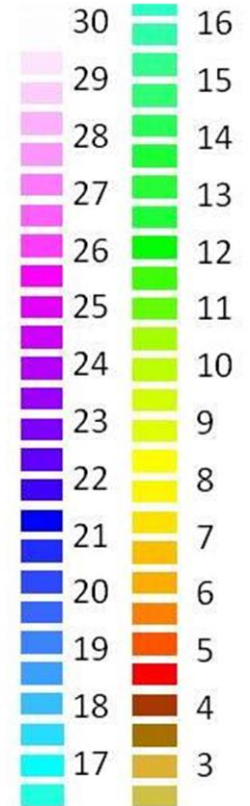
Legend	
Depth, ft (MSL)	
30	16
29	15
28	14
27	13
26	12
25	11
24	10
23	9
22	8
21	7
20	6
19	5
18	4
17	3

January 2009



Legend

Depth, ft (MSL)

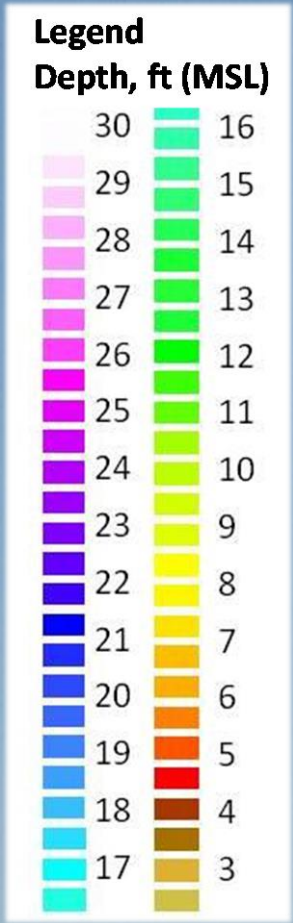
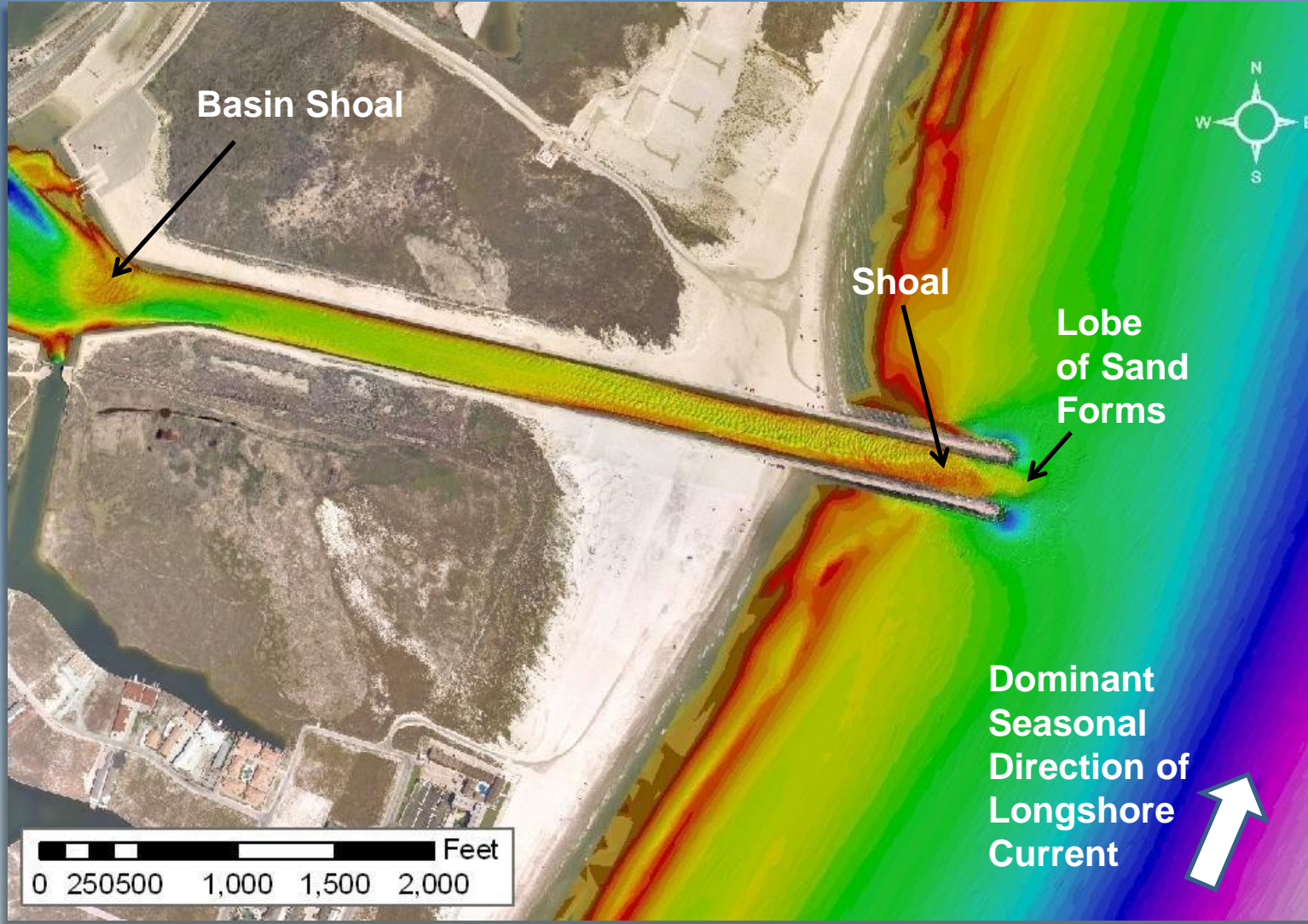


Surplus of Sand....

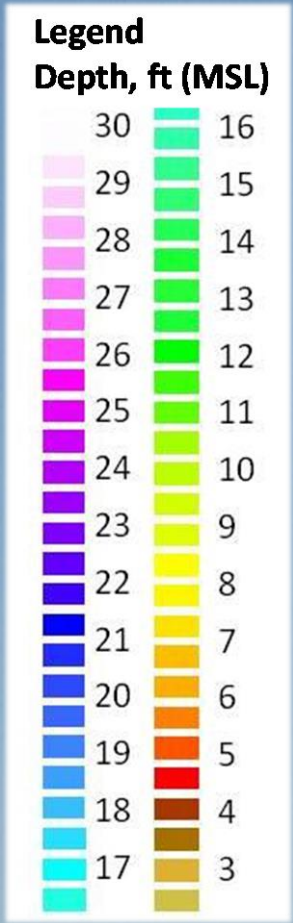
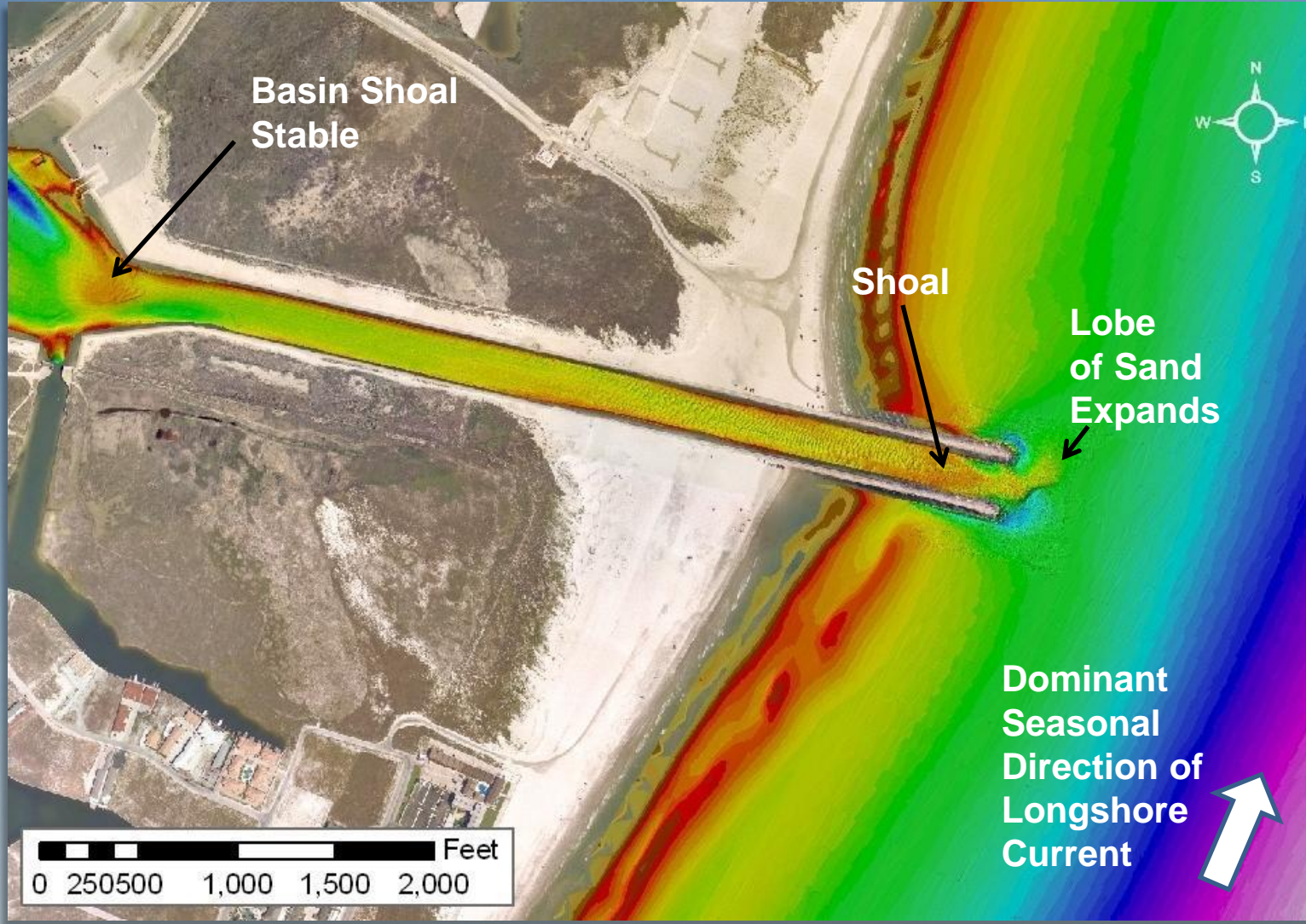
Contributes to Changes in the Nearshore



June 2009



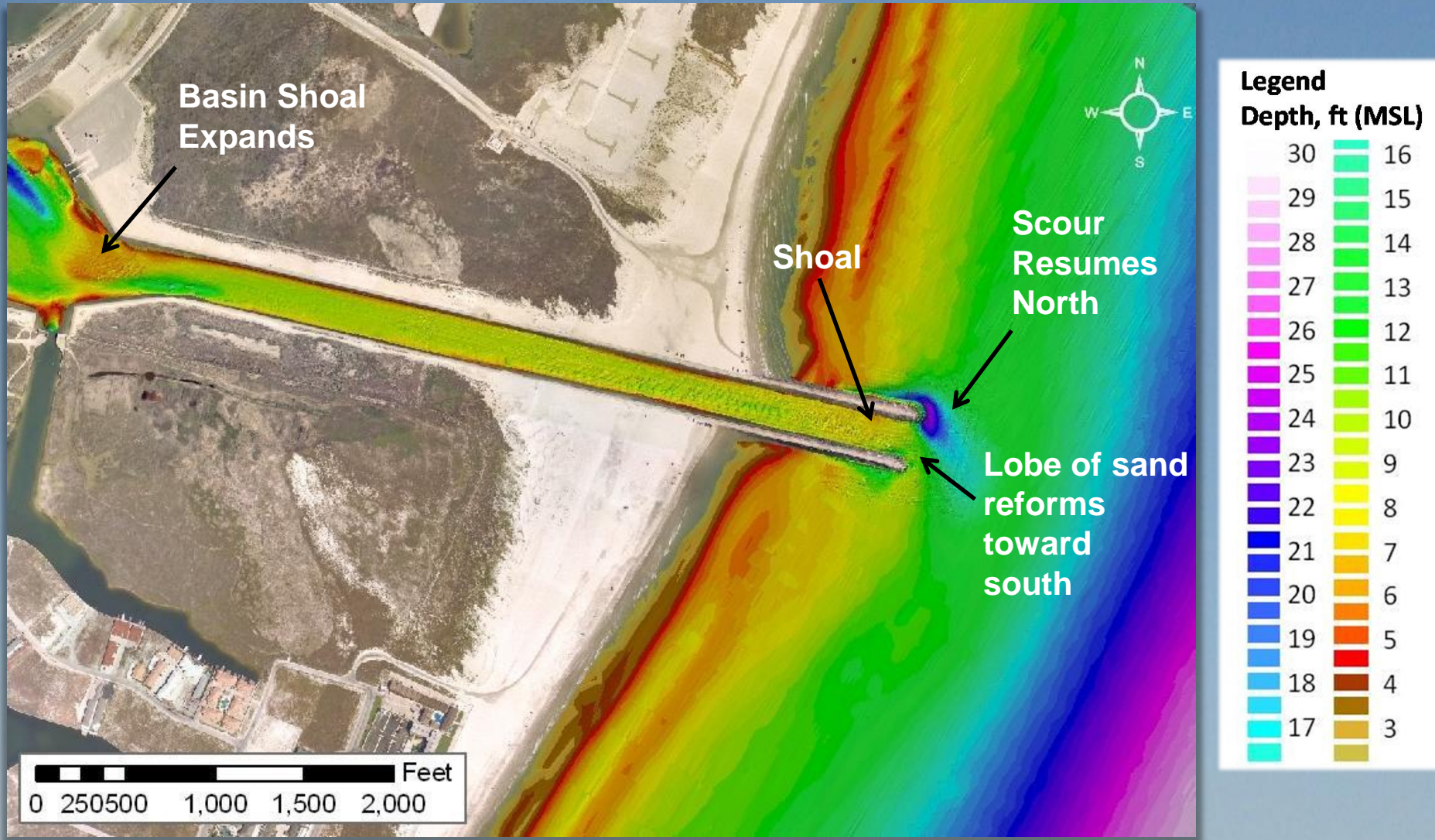
Sep 2009



Shoals expand from Basin to Channel Mouth

January 2010

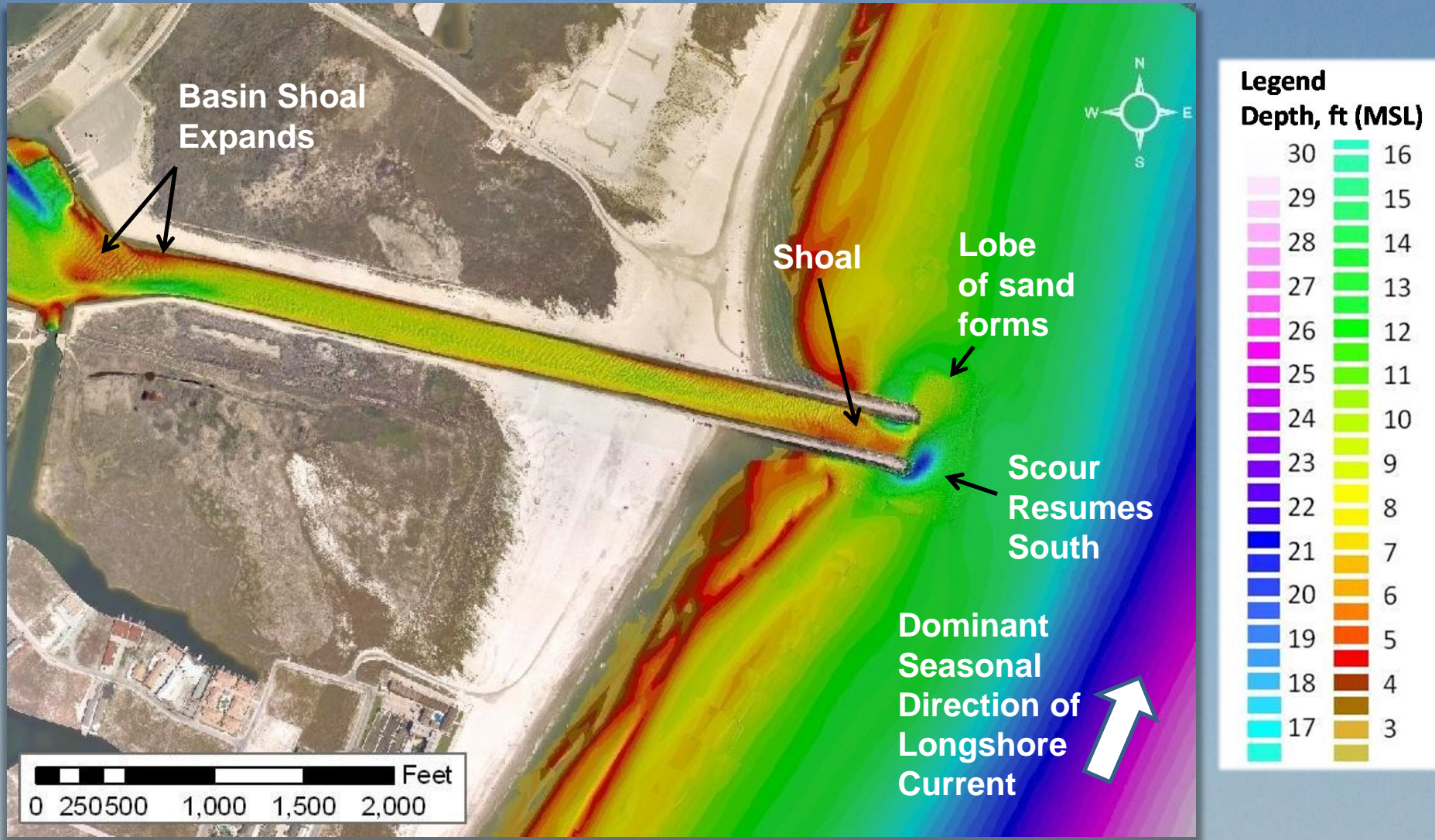
Winter fronts reinforce current and flush entrance channel



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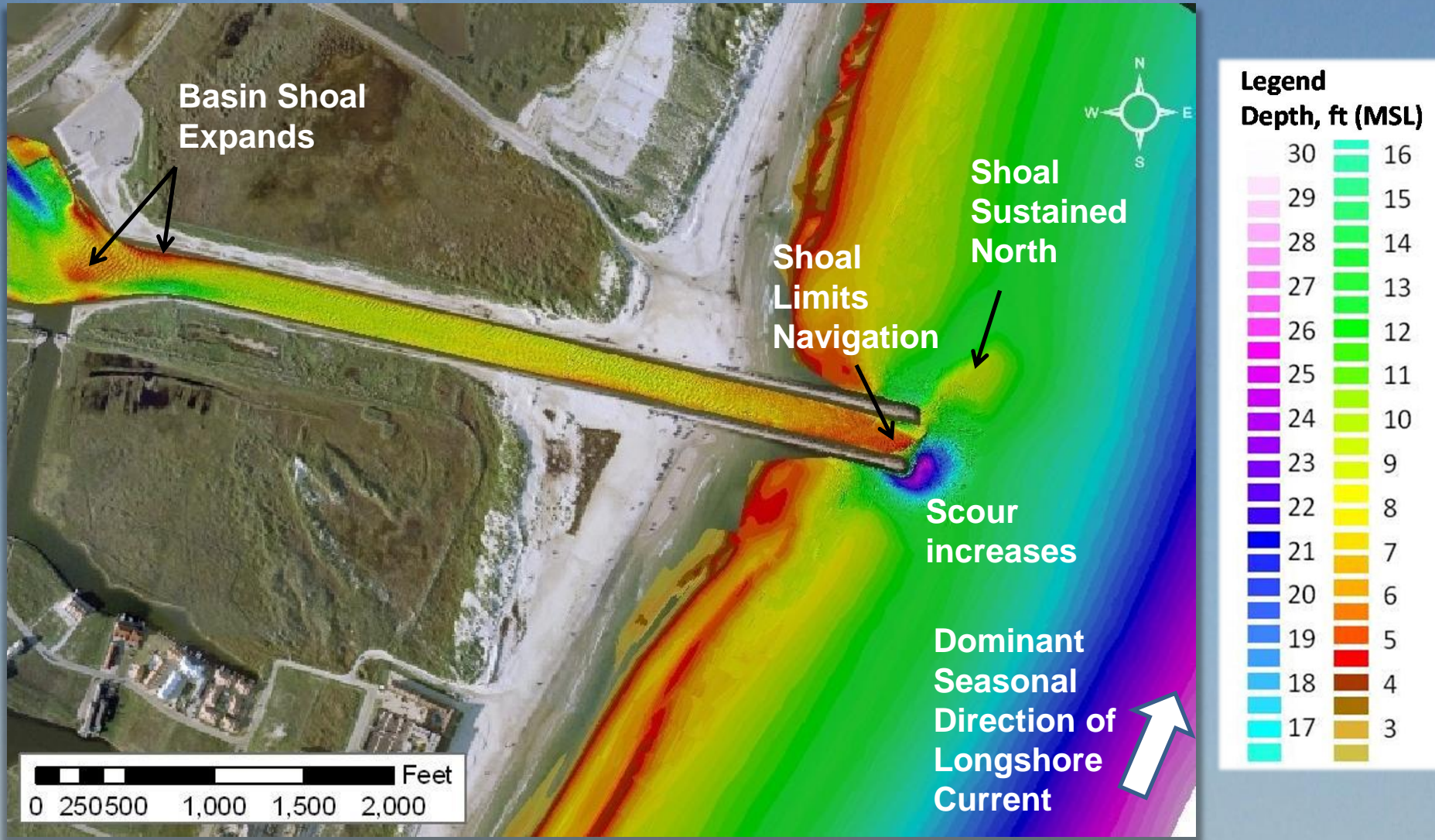
Lobe of sand forms north side of North Jetty



Shoals expand from Basin to Channel Mouth

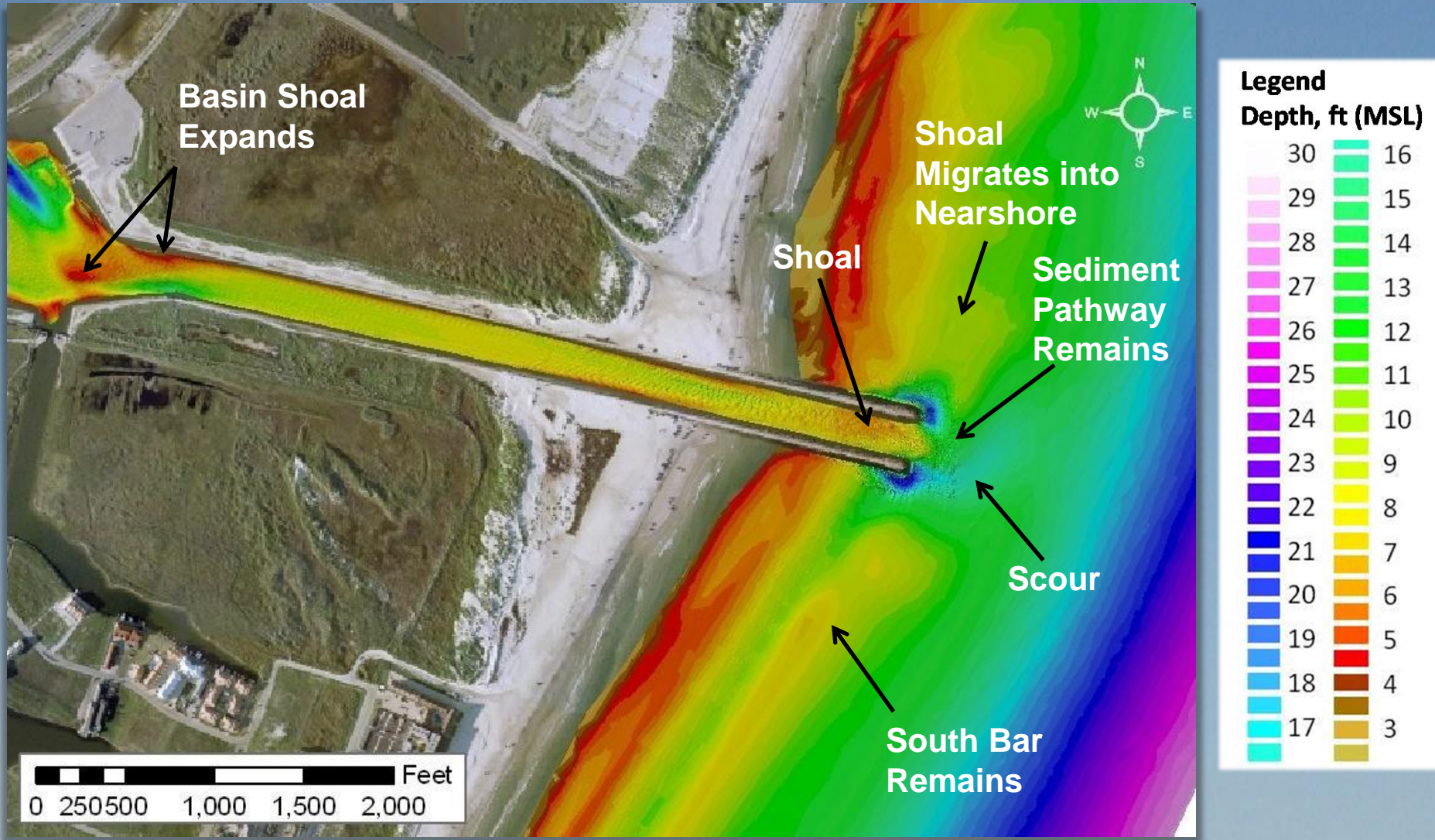
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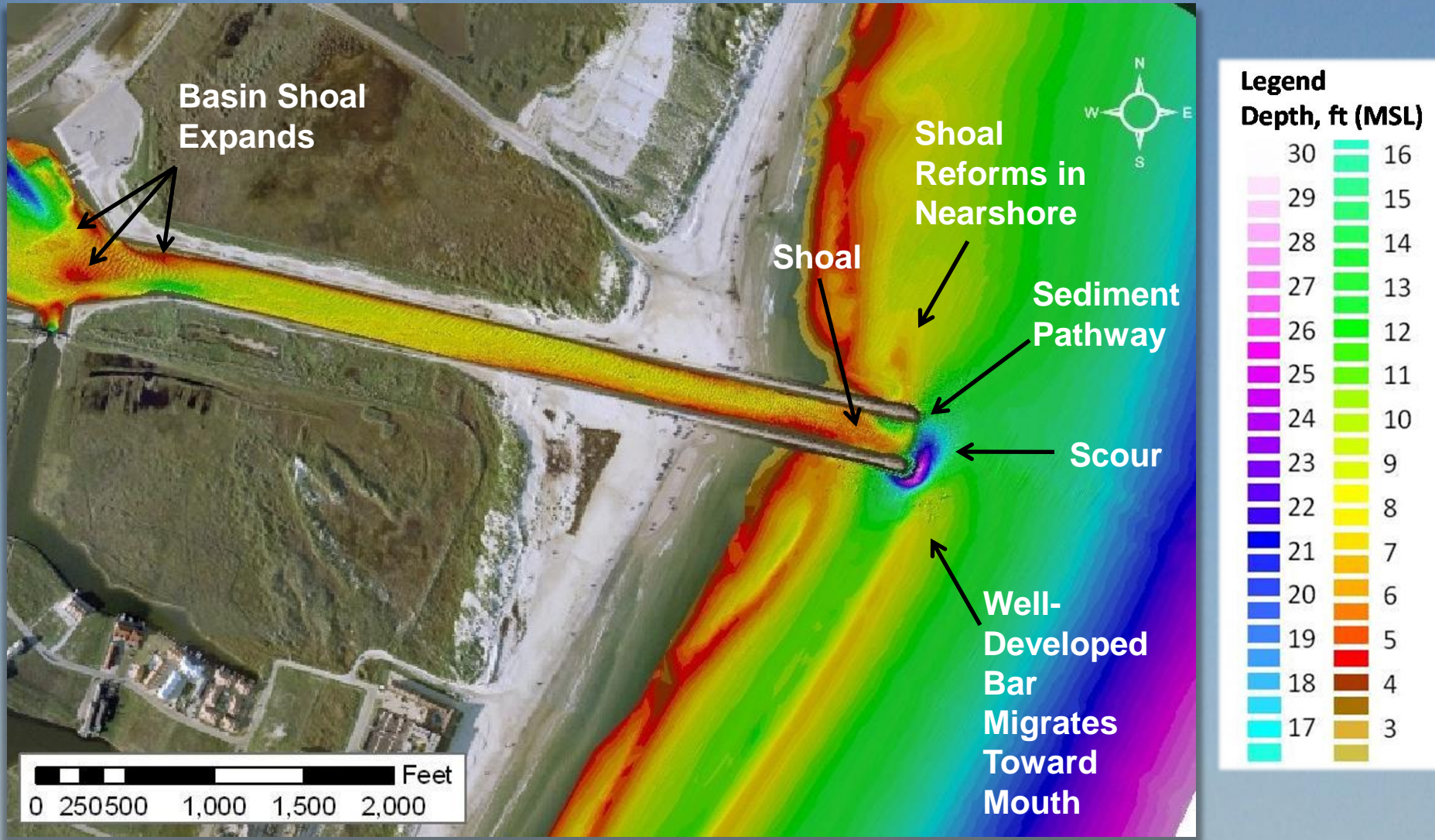


Surplus Available Sand in Basin and Immediate Nearshore

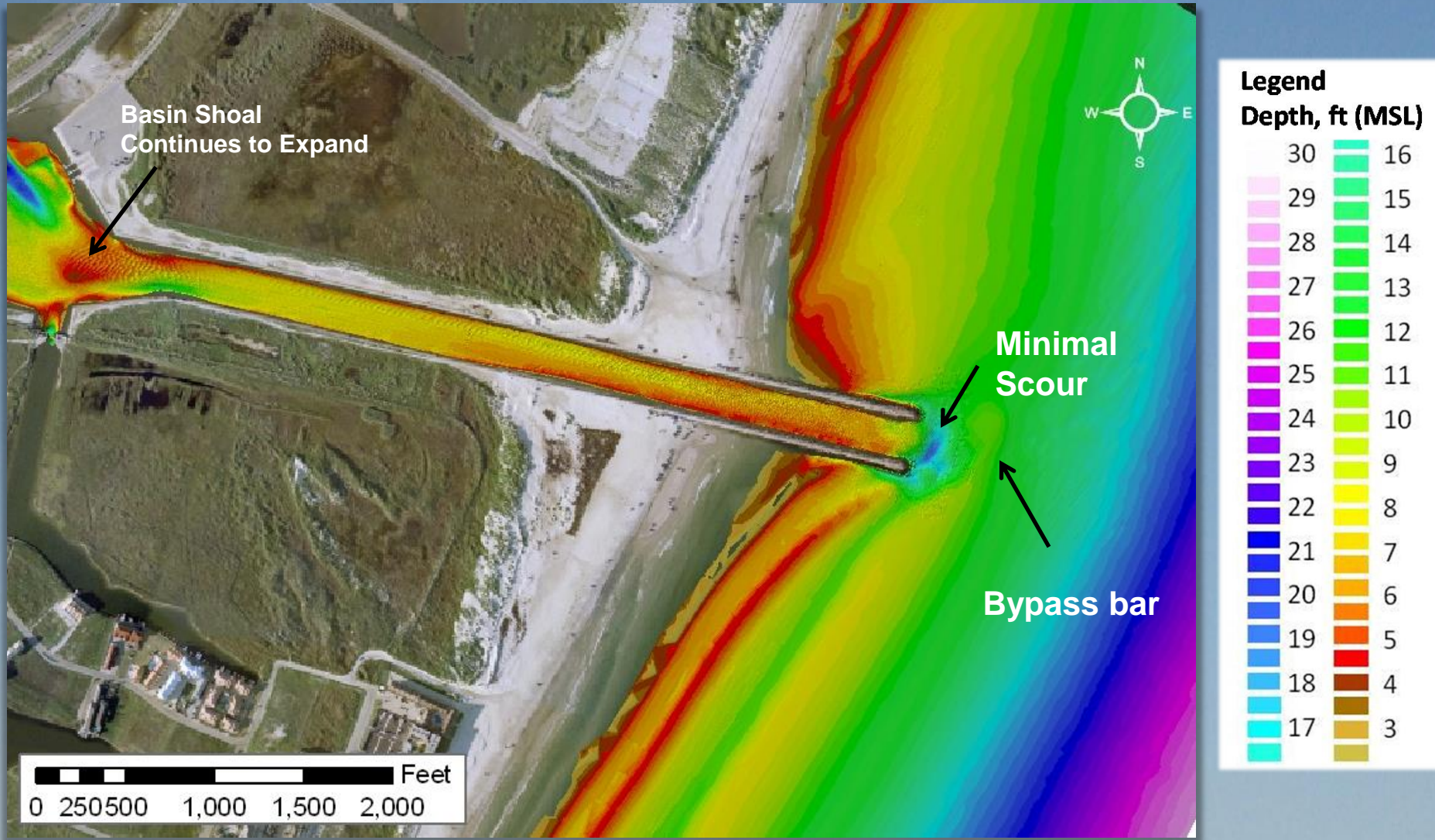
Shoals expand from Basin to Channel Mouth

June 2011

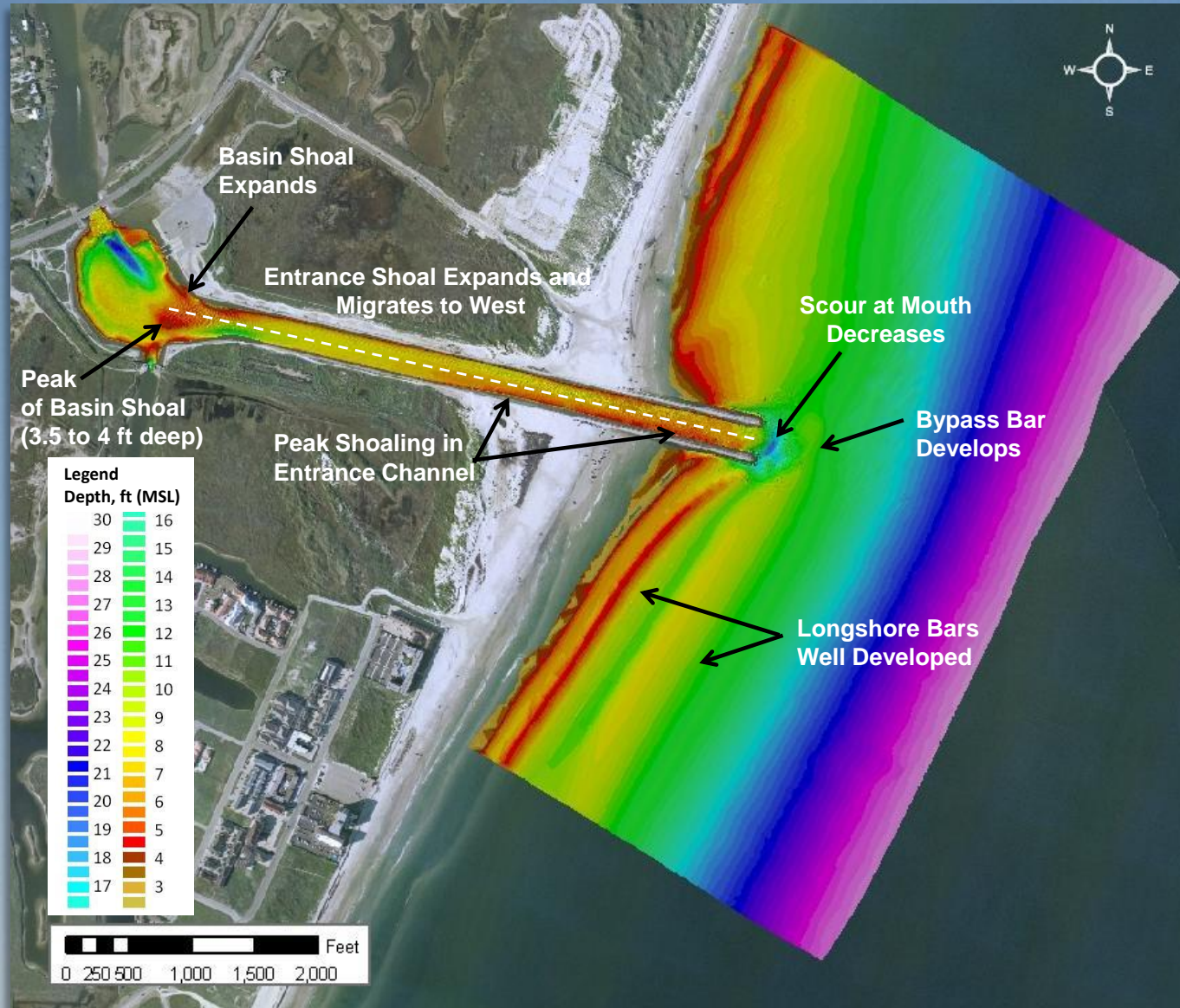
Basin Shoal expanding E/W and shoal at mouth > June 2010



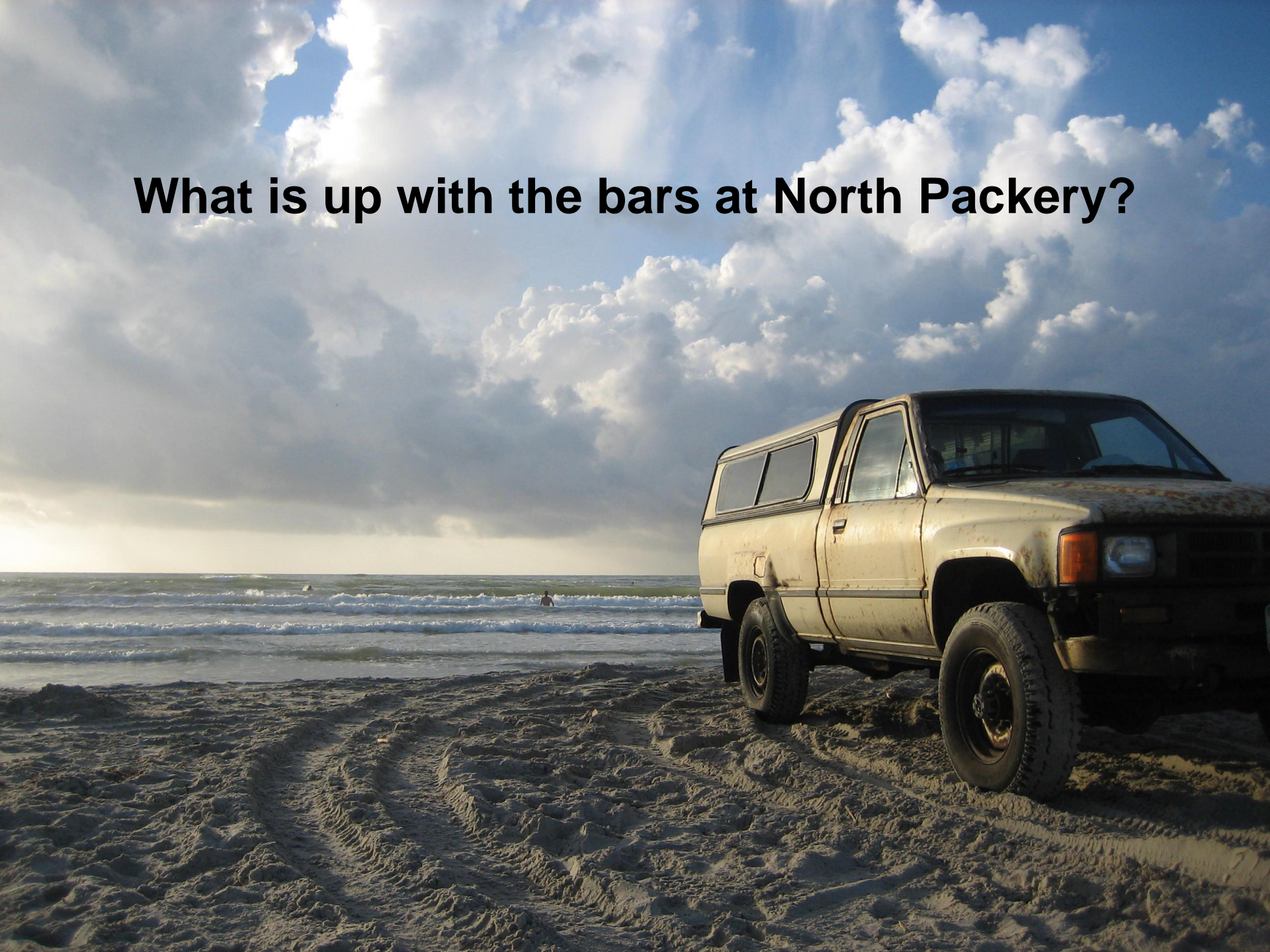
Shoaling Continues to Increase in Basin and Entrance Channel Sep 2011



Pre-Dredge Survey Sep 2011



What is up with the bars at North Packery?



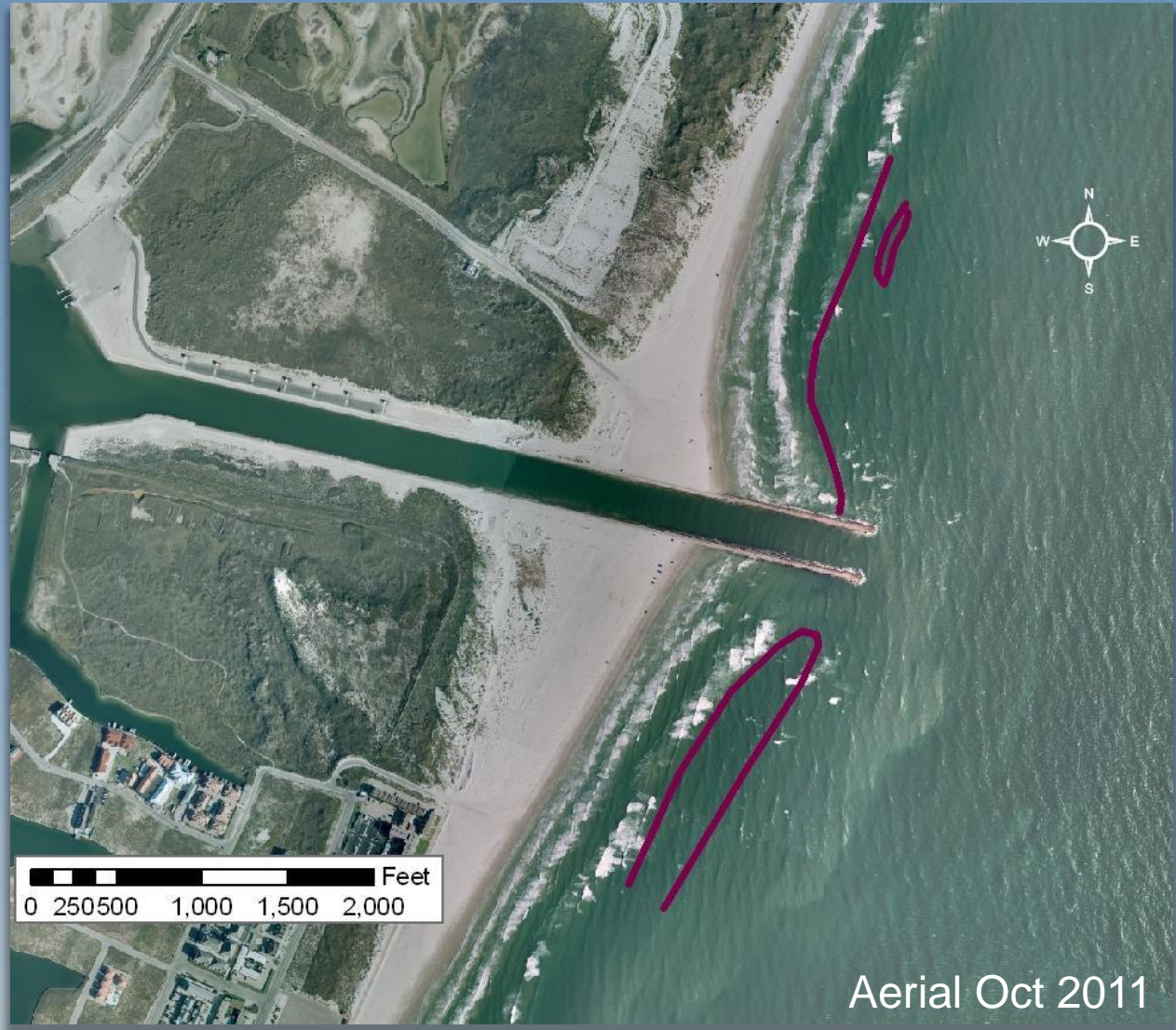
Development of Nearshore “Shelf”

Aug 2007

Location of 8-9 ft (MSL)

Legend

— Aug 2007



Aerial Oct 2011

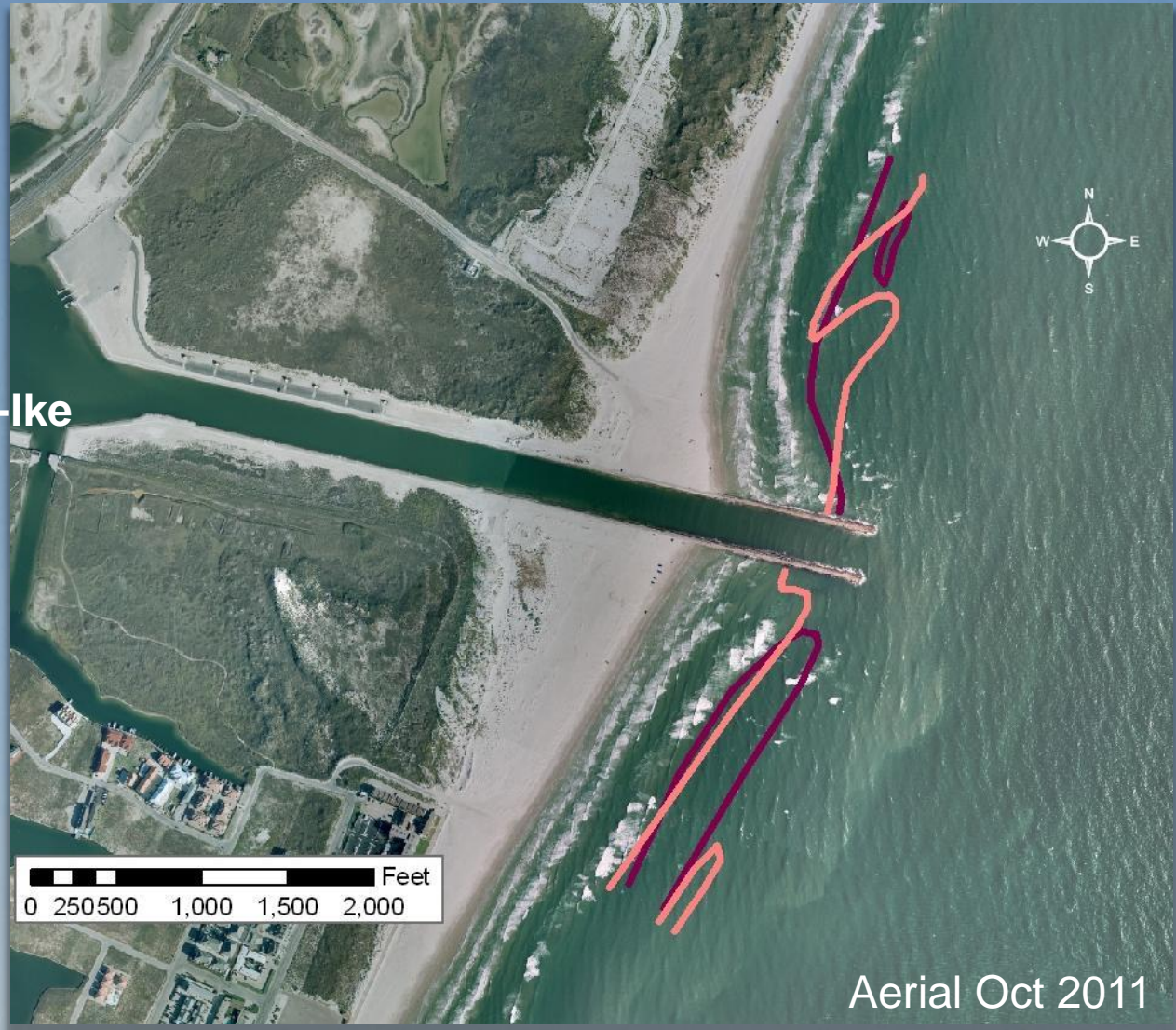
Development of Nearshore "Shelf"

Sep 2008 (Pre-Ike)

Location of 8-9 ft (MSL)

Legend

- Aug 2007
- Sep 2008 Pre-Ike



Aerial Oct 2011

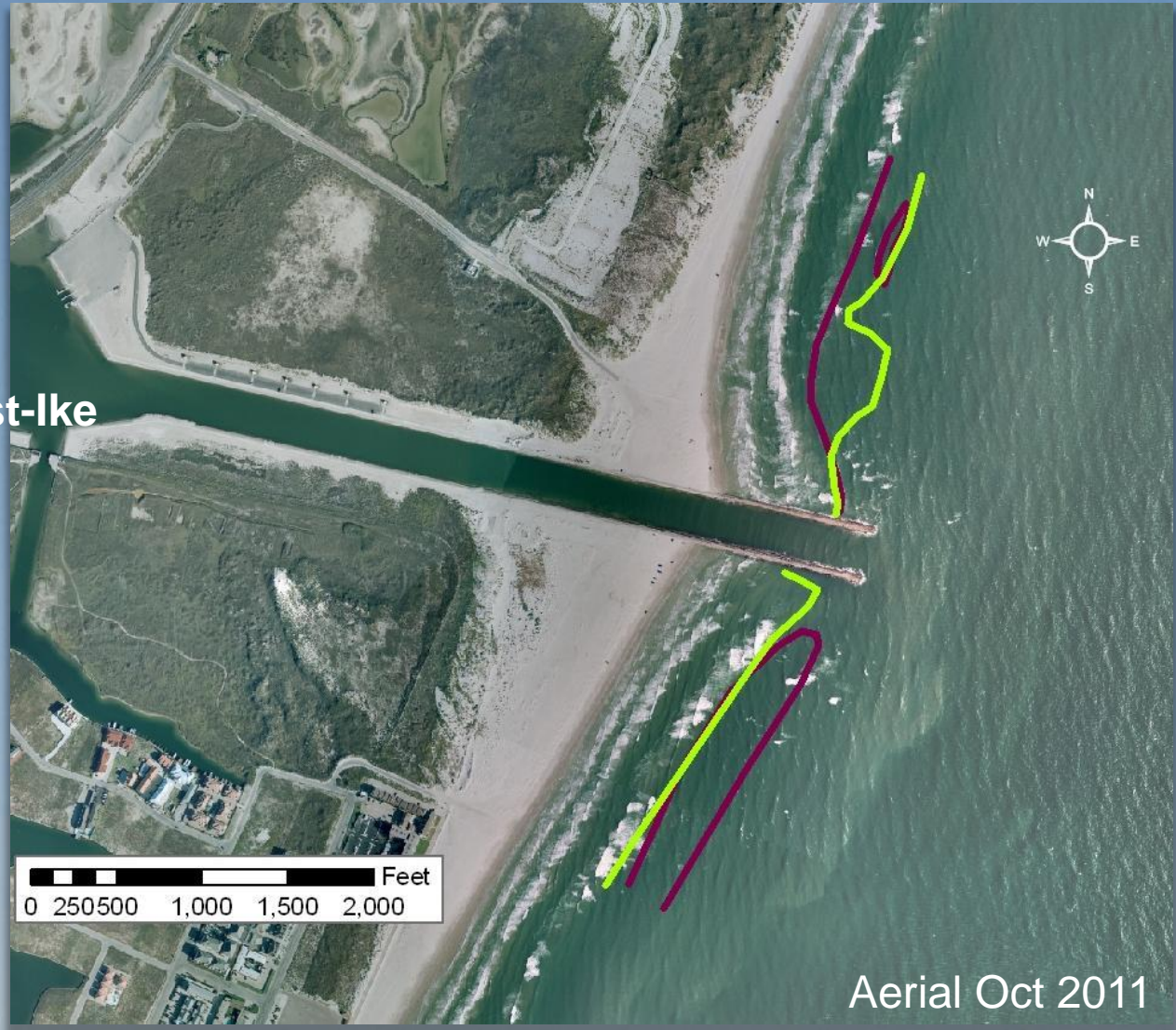
Development of Nearshore "Shelf"

Sep 2008 (Post-Ike)

Location of 8-9 ft (MSL)

Legend

- Aug 2007
- Sep 2008 Post-Ike



Aerial Oct 2011

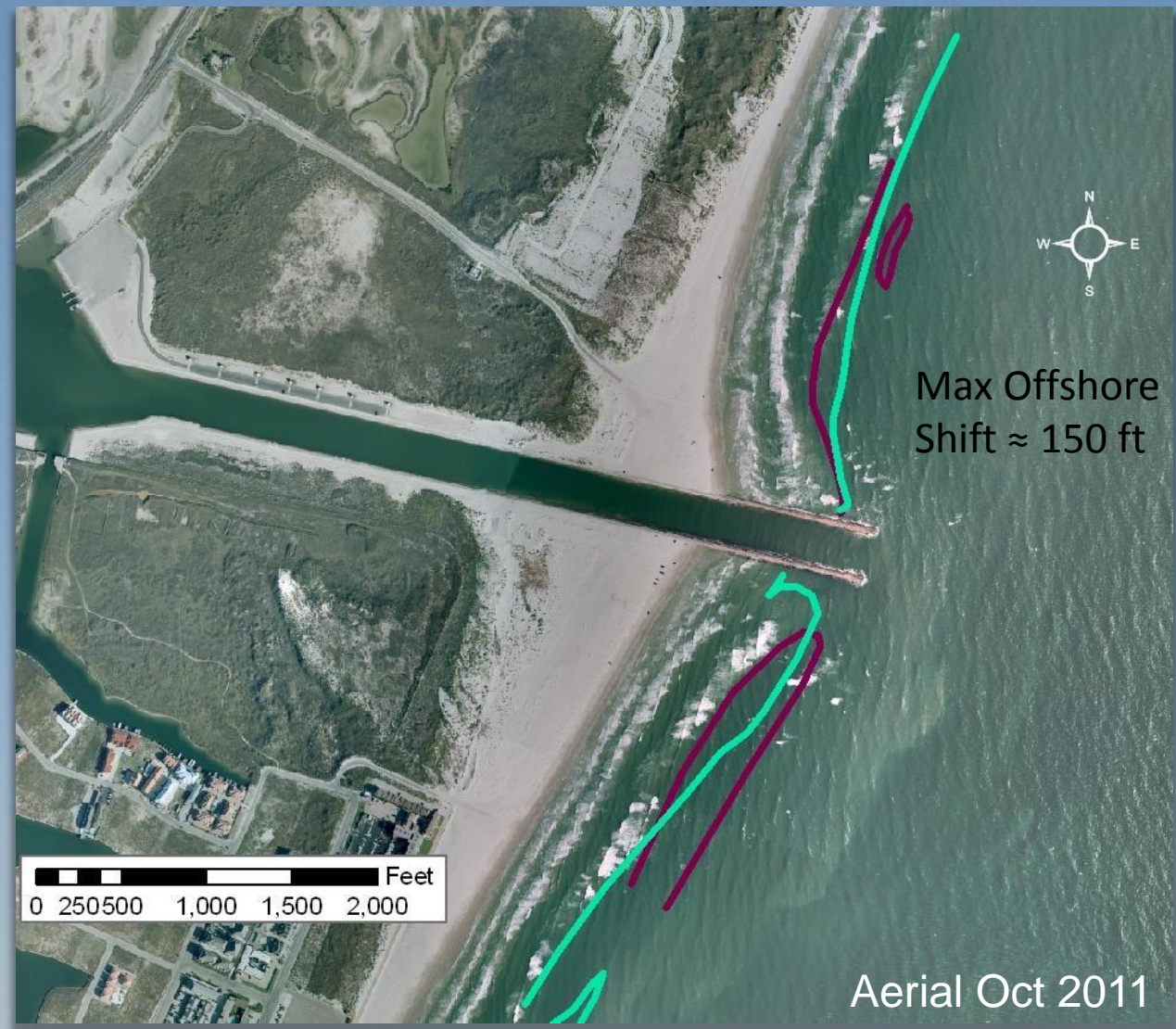
Development of Nearshore "Shelf"

Sep 2009

Location of 8-9 ft (MSL)

Legend

- Aug 2007
- Sep 2009



Max Offshore Shift ≈ 150 ft

Aerial Oct 2011

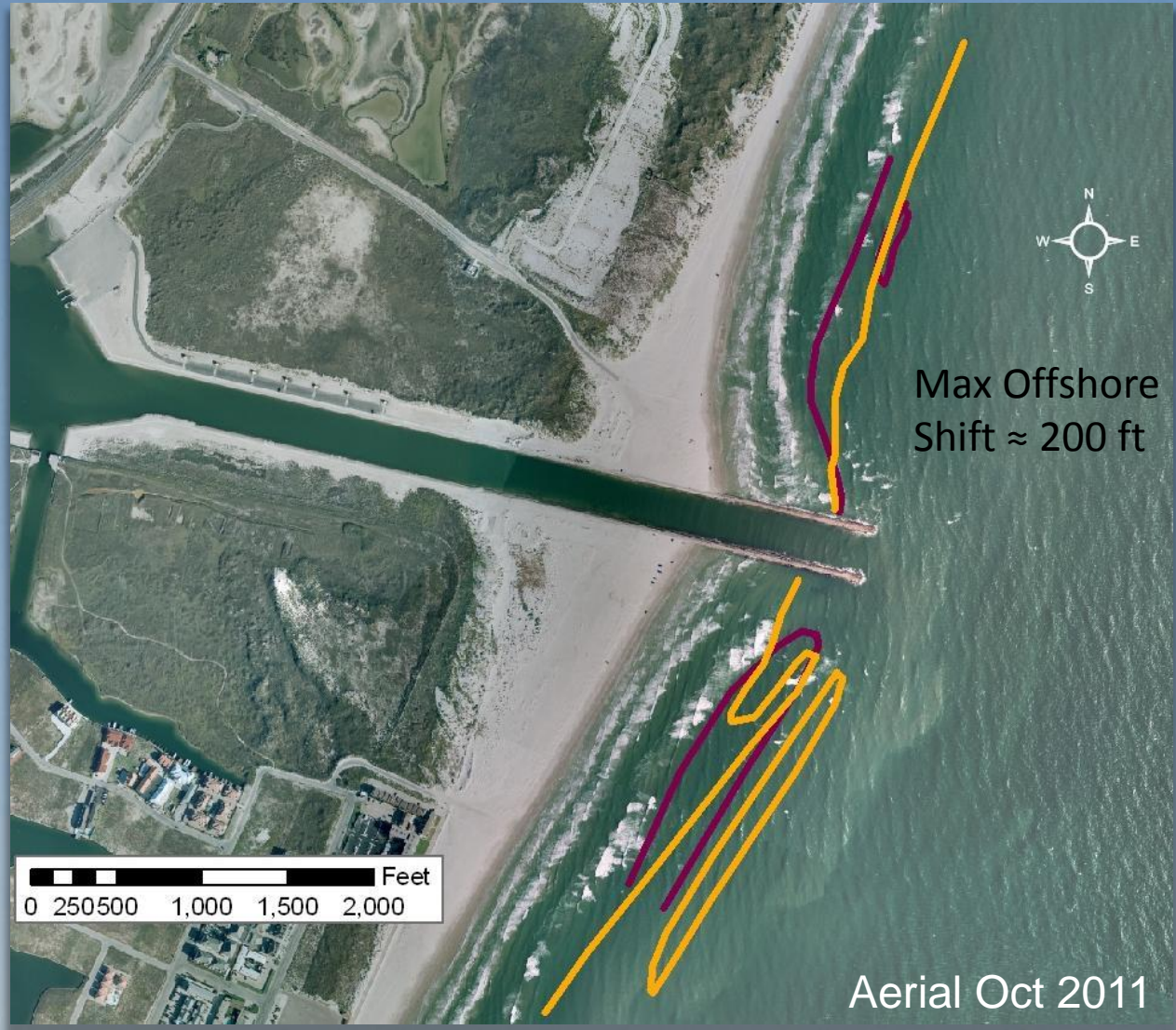
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Sep 2010

Location of 8-9 ft (MSL)

Legend

- Aug 2007
- Sep 2010

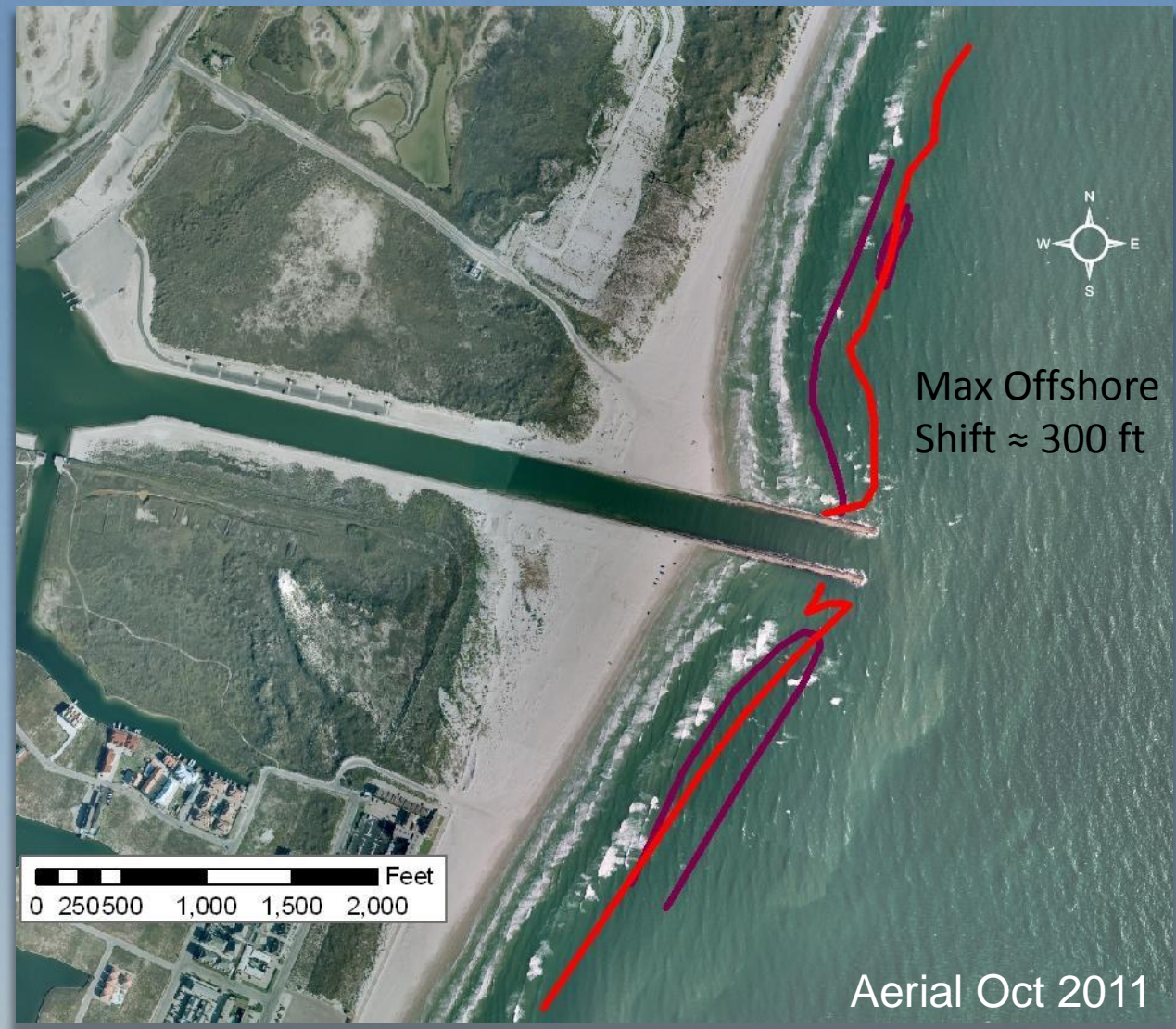


Development of Nearshore "Shelf"

Sep 2011

Location of 8-9 ft (MSL)

- Legend**
- Aug 2007
 - Sep 2011



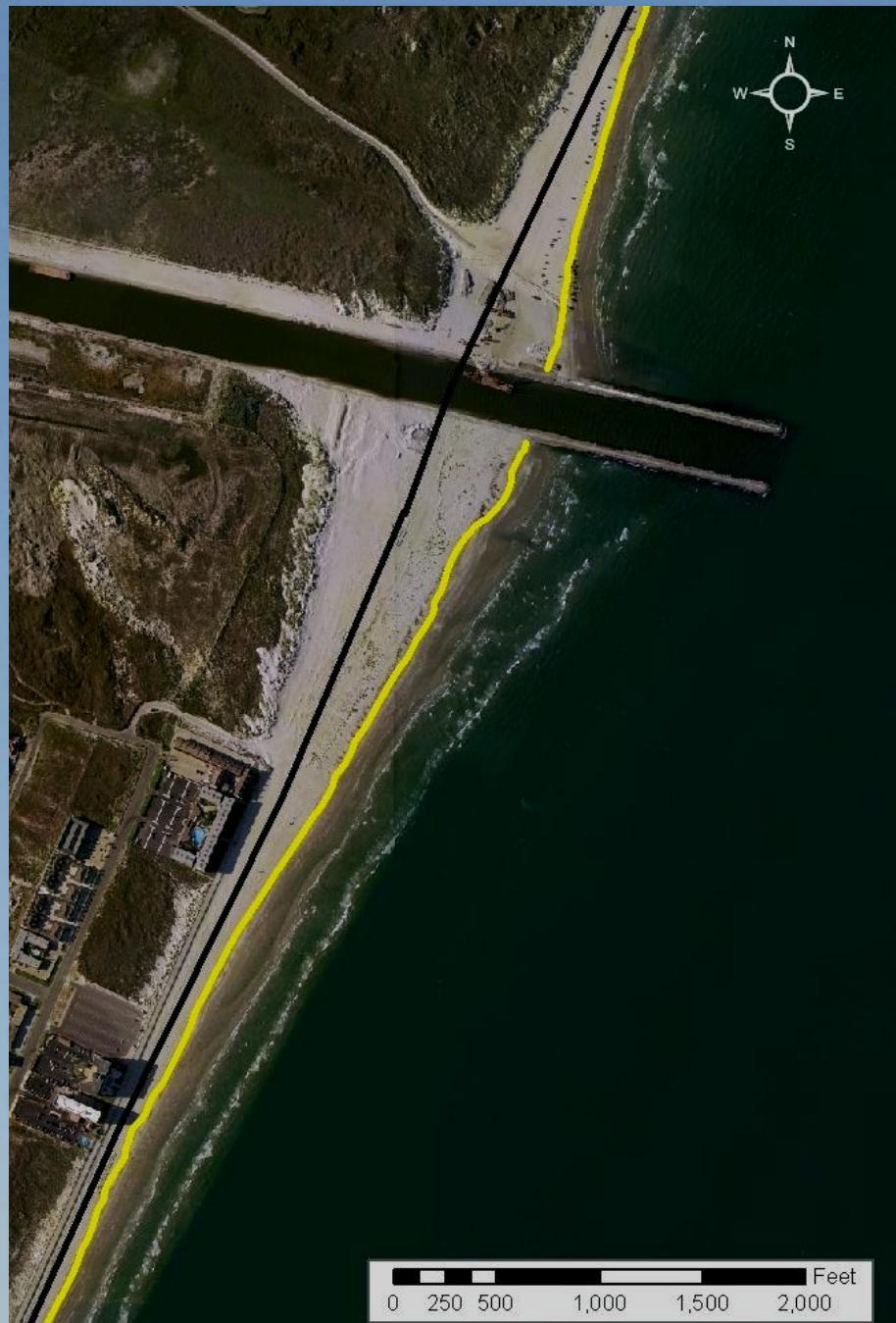
Is Erratic Bar Development Related to Shoreline Advance?



Shoreline Position Change

Legend

- Aug 2003 (Baseline)
- Jul 2006 Post-Const.)



Shoreline Position Change

Legend

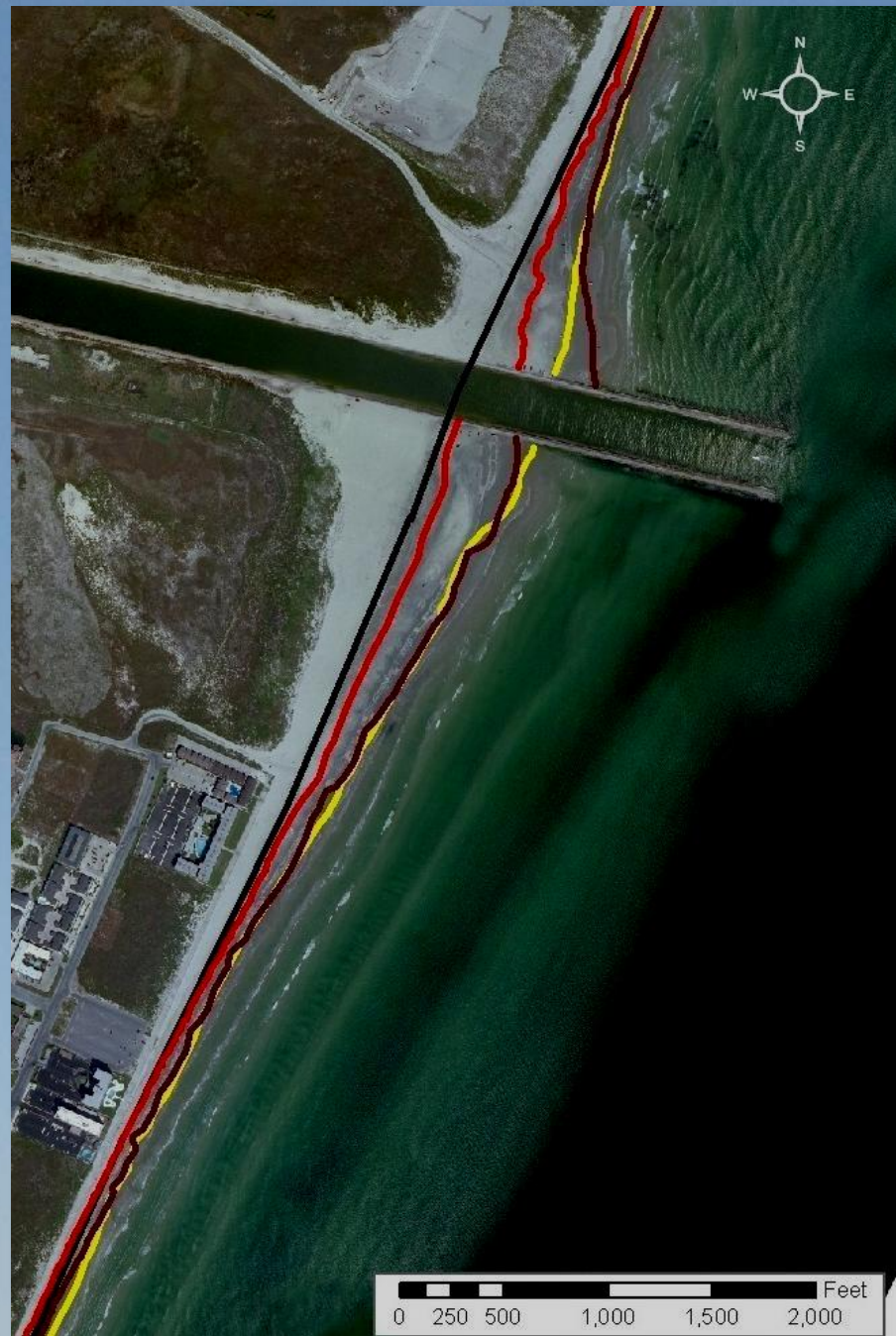
- Aug 2003 (Baseline)
- Jul 2006
- Sep 2007



Shoreline Position Change

Legend

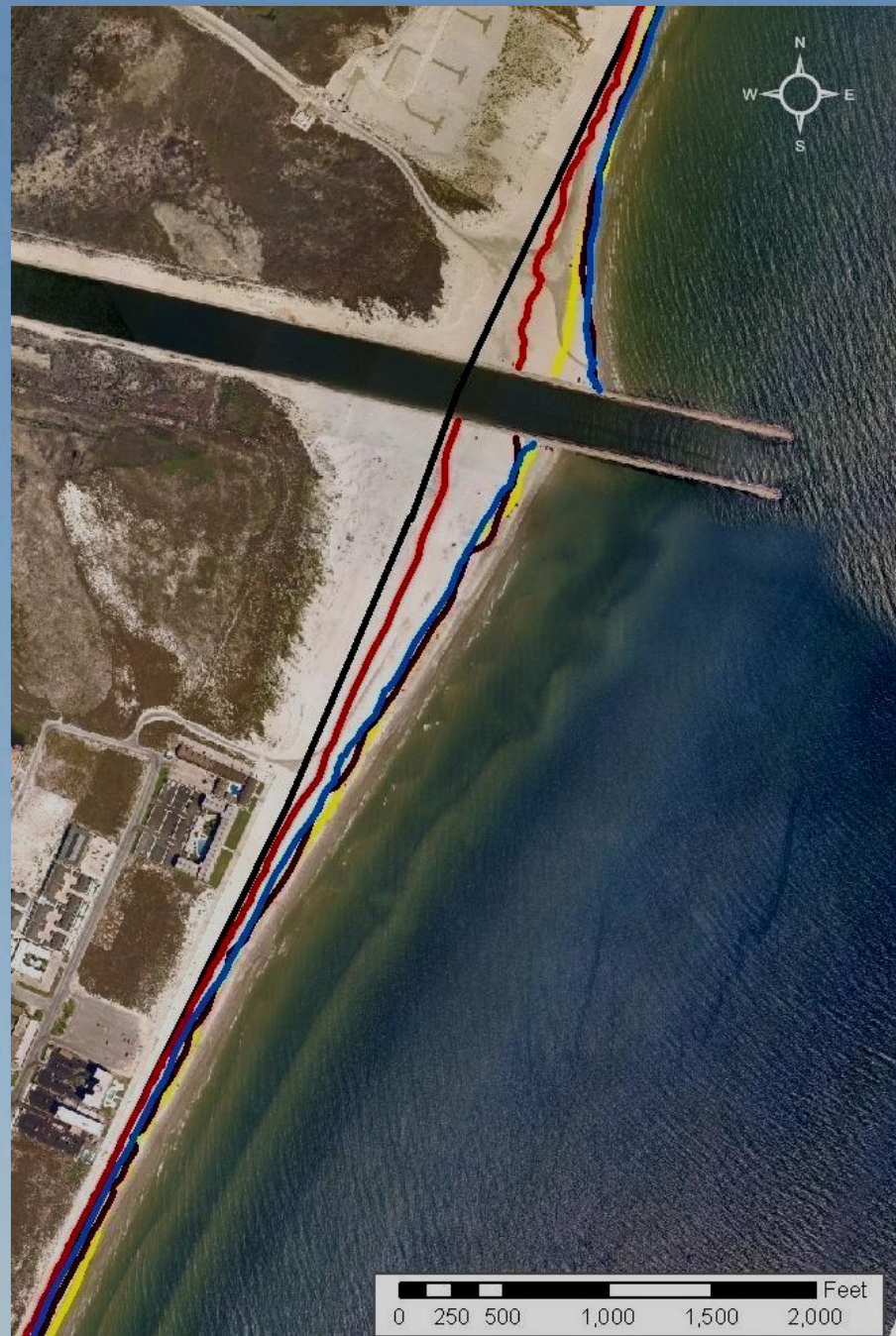
- Aug 2003 (Baseline)
- Jul 2006
- Sep 2007
- Sep 2008 (Post-Ike)



Shoreline Position Change

Legend

- Aug 2003 (Baseline)
- Jul 2006
- Sep 2007
- Sep 2008 (Post-Ike)
- Jul 2009



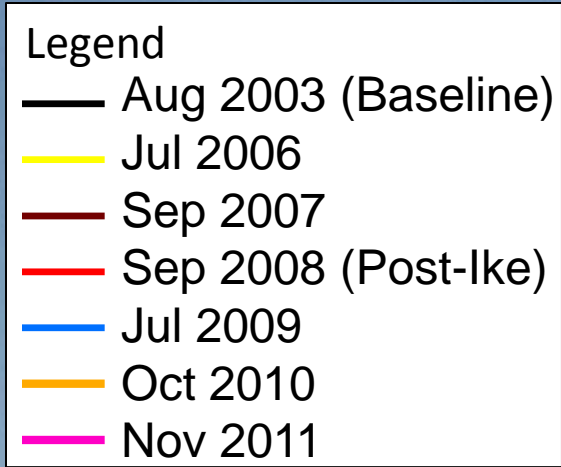
Shoreline Position Change

Legend

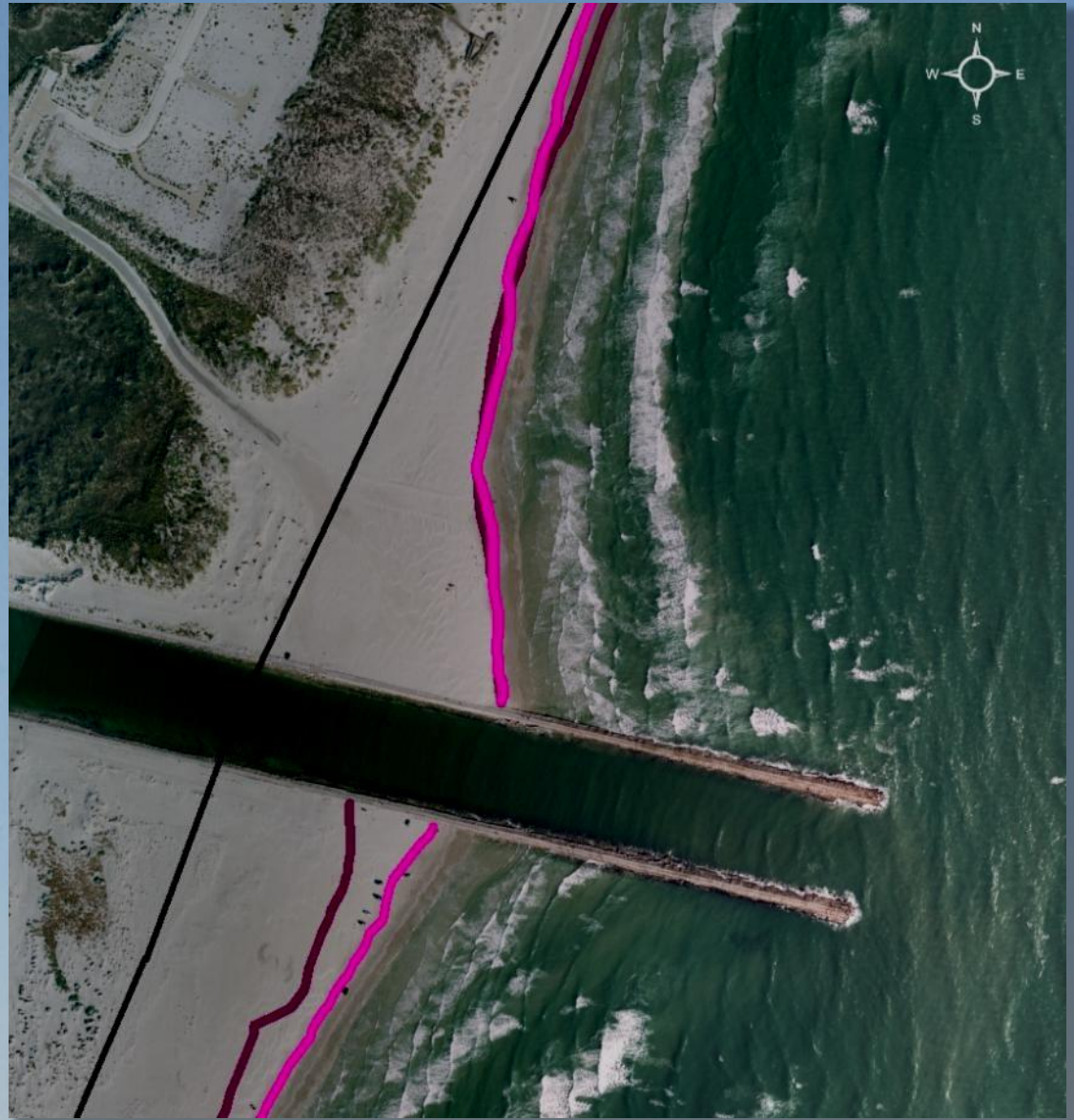
- Aug 2003 (Baseline)
- Jul 2006
- Sep 2007
- Sep 2008 (Post-Ike)
- Jul 2009
- Oct 2010



Shoreline Position Change



North Packery Shoreline Position Limited Net Change Since Sep 2007



Beach Profile



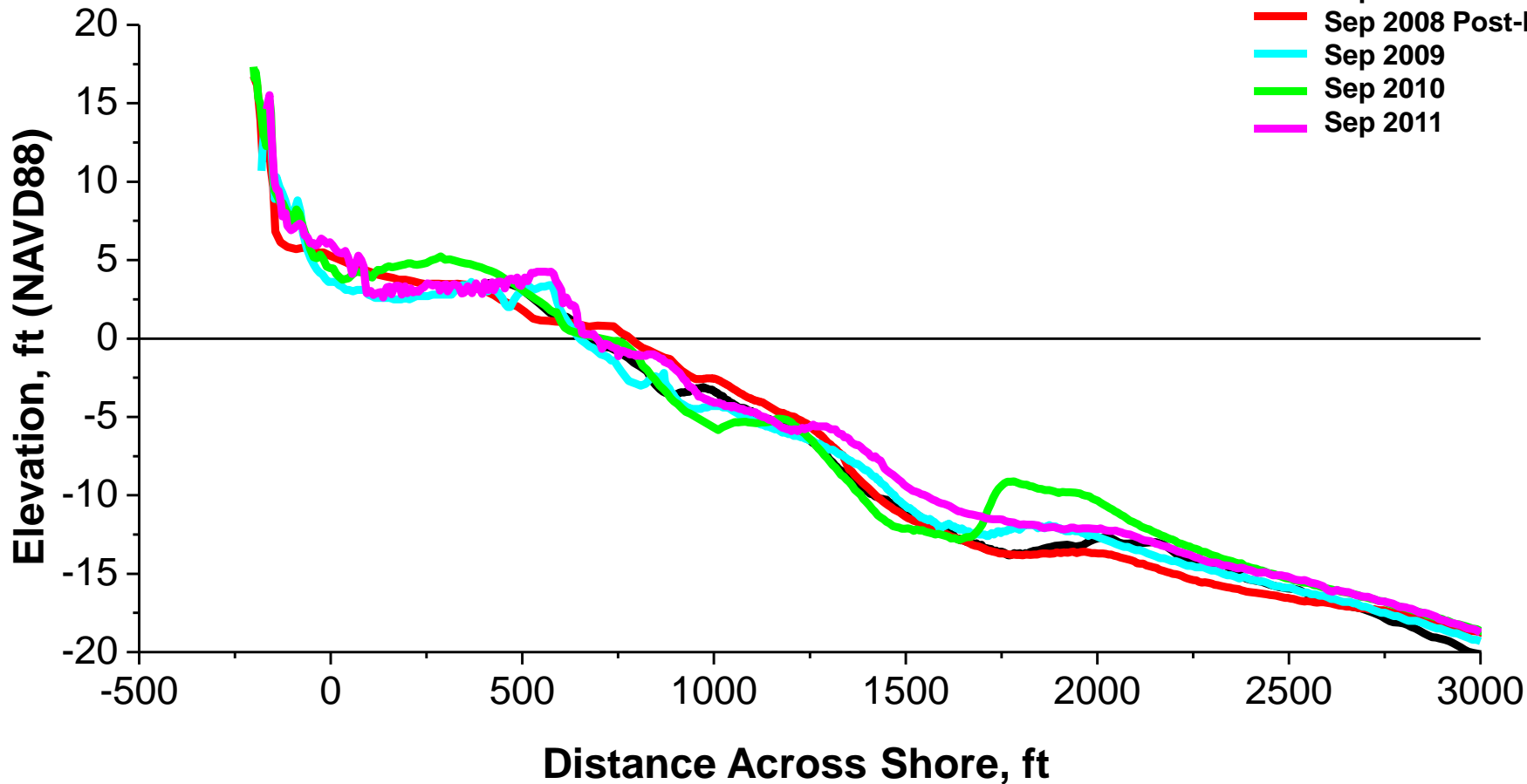
Profile at North Packery Jetty

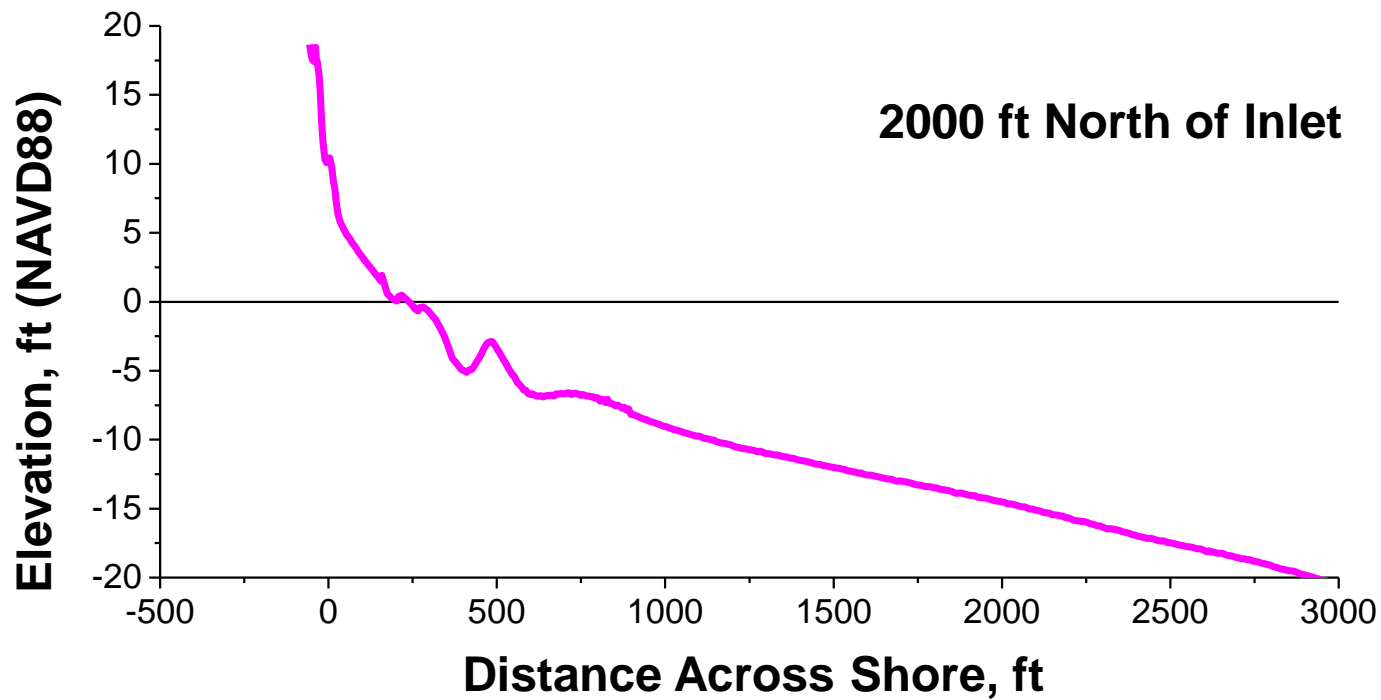
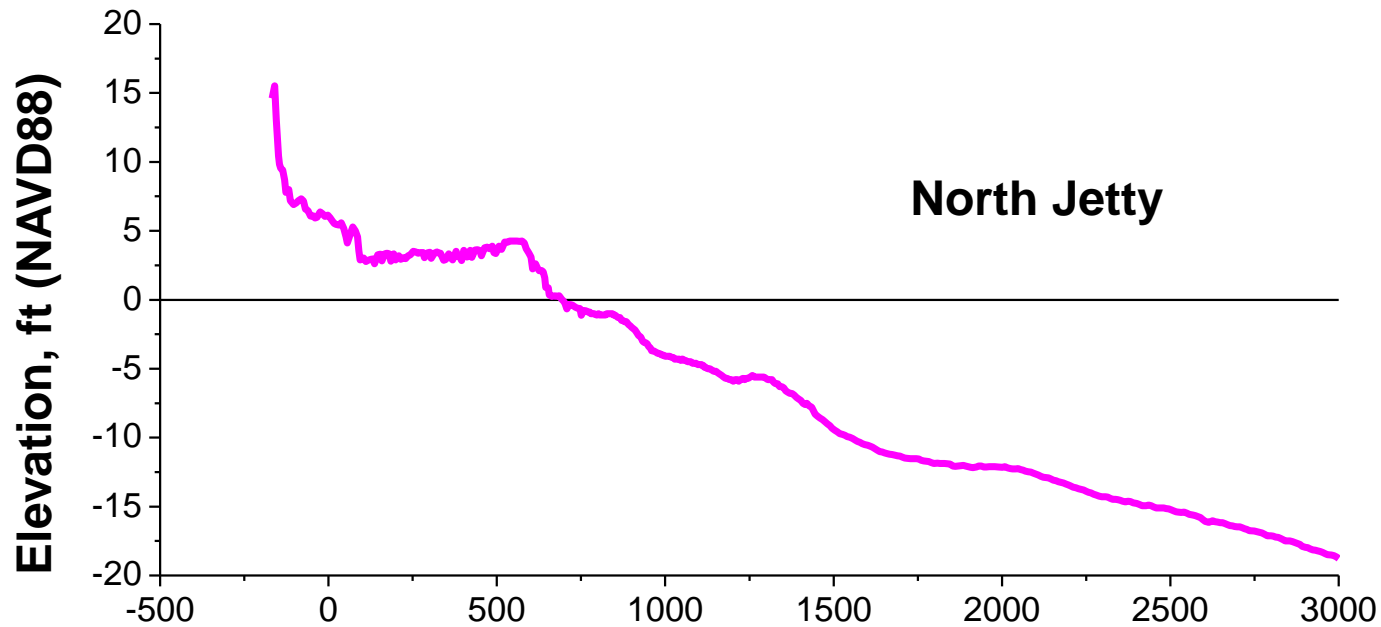
Sep 2007 to Sep 2011

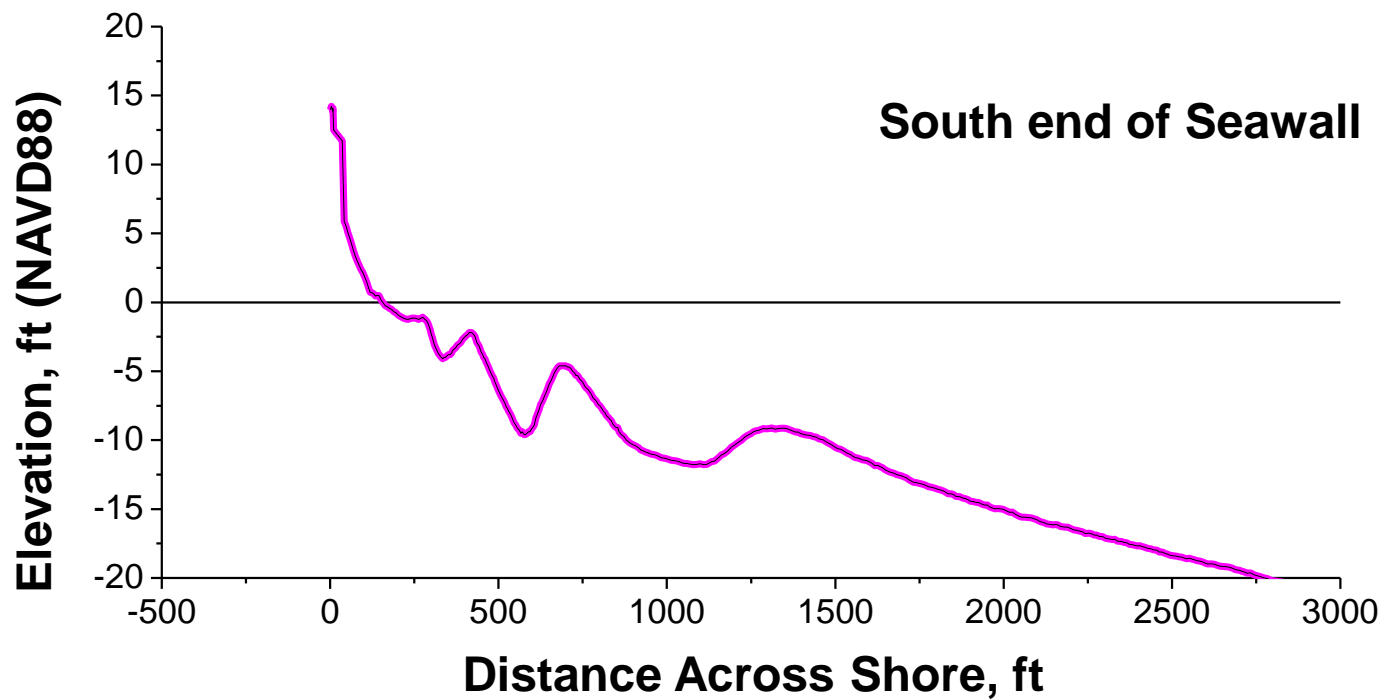
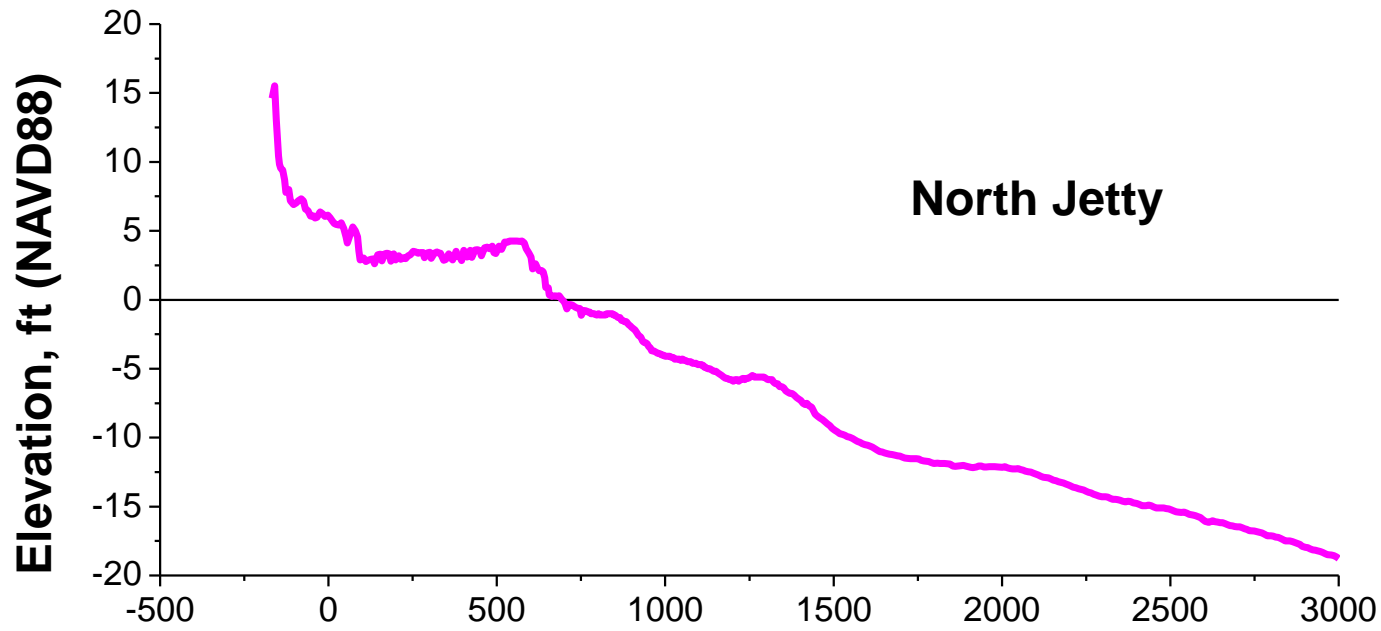
Legend

Legend

- Sep 2008 Pre-Ike
- Sep 2008 Post-Ike
- Sep 2009
- Sep 2010
- Sep 2011







Summary

- **Channel Shoaling occurred gradually over 6 years:**
Contributing Factors- wind, drought, Ike
- **Shoal in nearshore**
Contributing Factors- surplus sand in Entrance Channel
- **Lack of permanent bars at North Packery**
 - Short winter season
 - Strong/persistent longshore current directed from South
 - Expanding nearshore shelf fed by inlet

