Elevation Changes from Overwash at Ballston Beach, Truro MA: System Evolution and Management Implications

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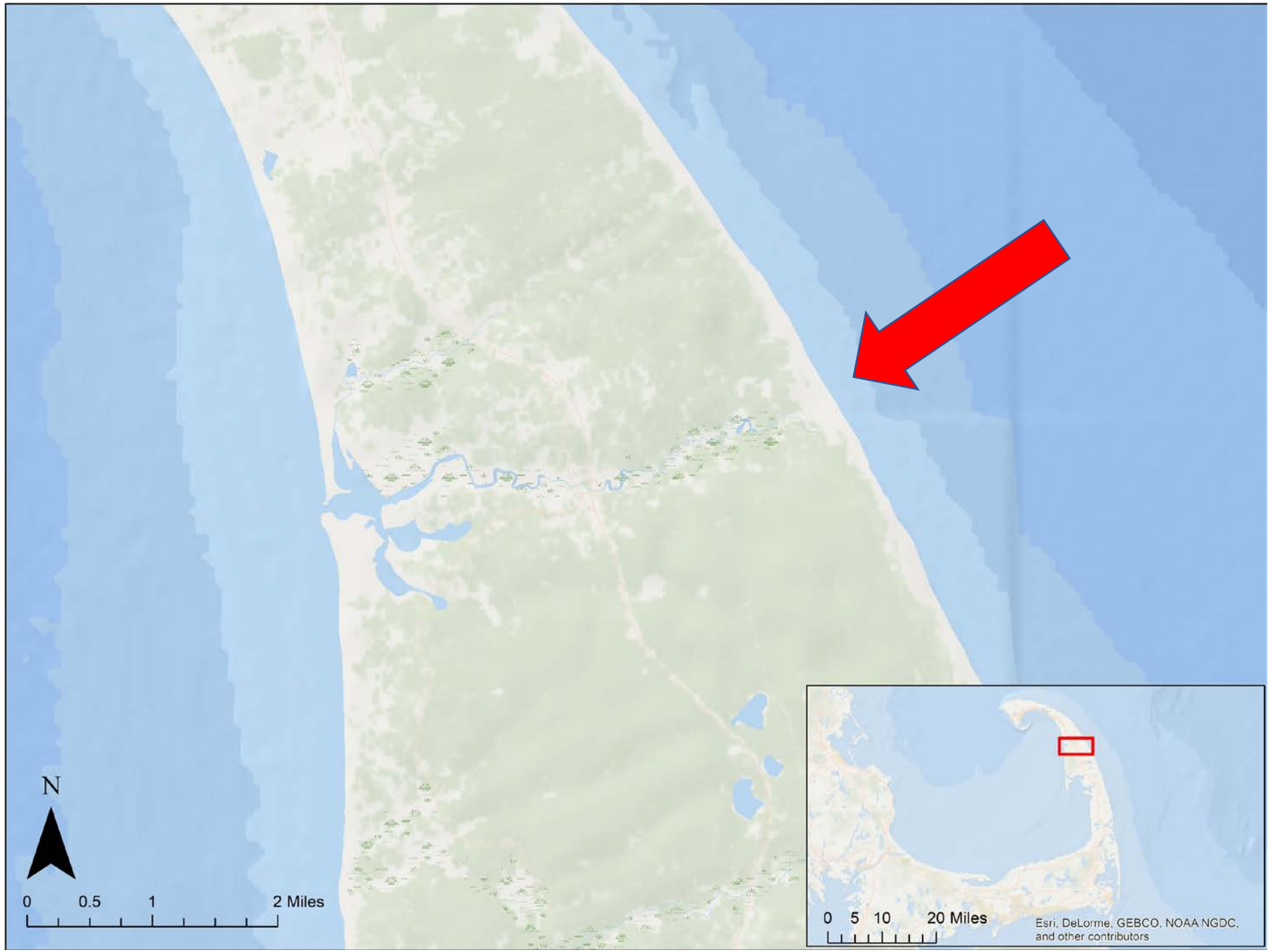
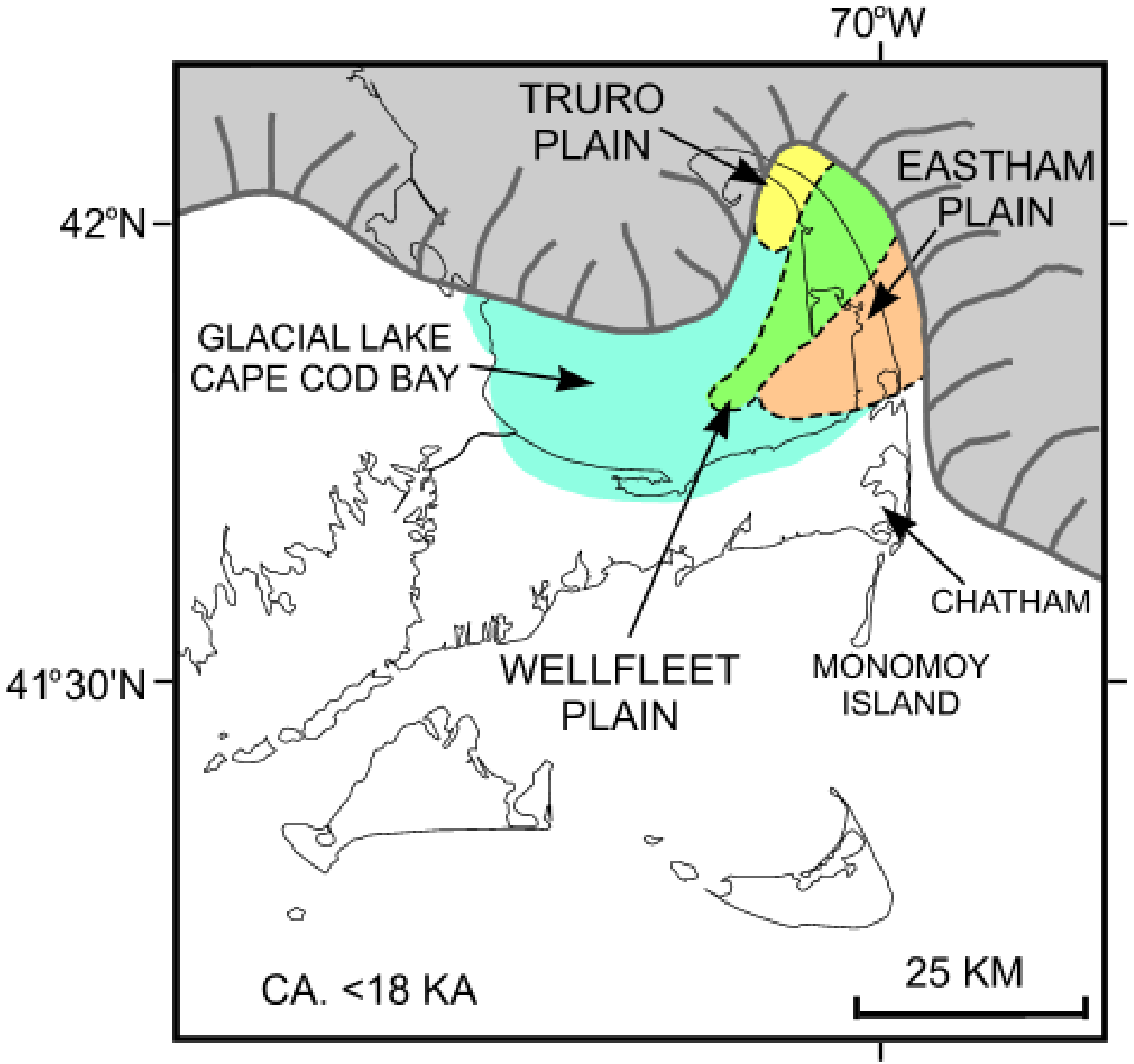

N
0 0.5 1 2 Miles
0 5 10 20 Miles
Esri, DeLorme, GEBCO, NOAA NGDC, and other contributors

Glacial History

(Poppe, 2007)
(modified from Uchupi, 1996)



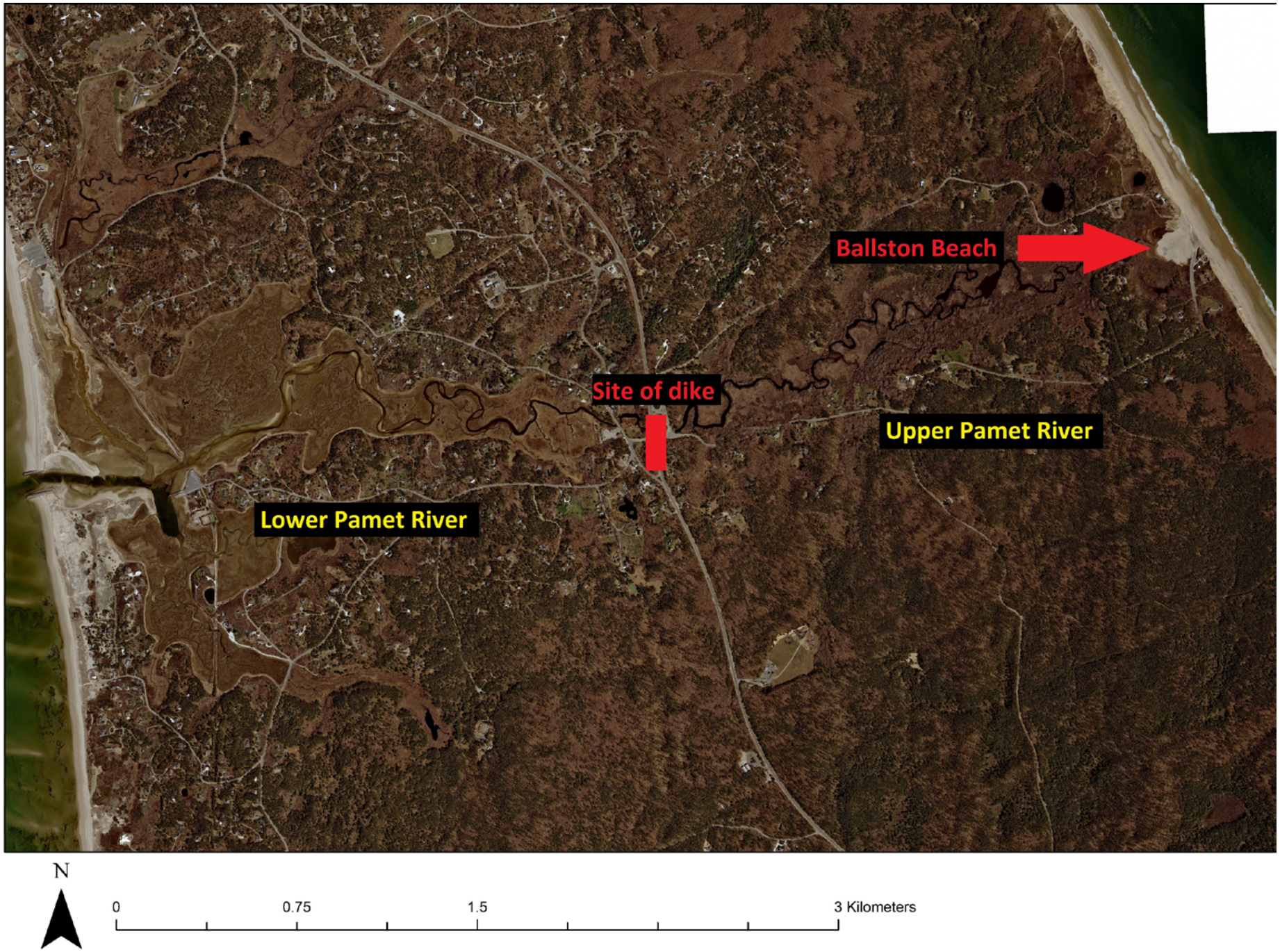
Pamet River

Dike introduced in 1869

Lower Pamet River is a salt marsh system

Upper Pamet River is a fresh marsh system

Photo Date:
April 2013/2014



Overwash

Washovers occur when wave energy combined with high water levels (storm surge) overtop or breach coastal barriers and transport nearshore and barrier sediments into the backbarrier environment (Schwartz, 1975)

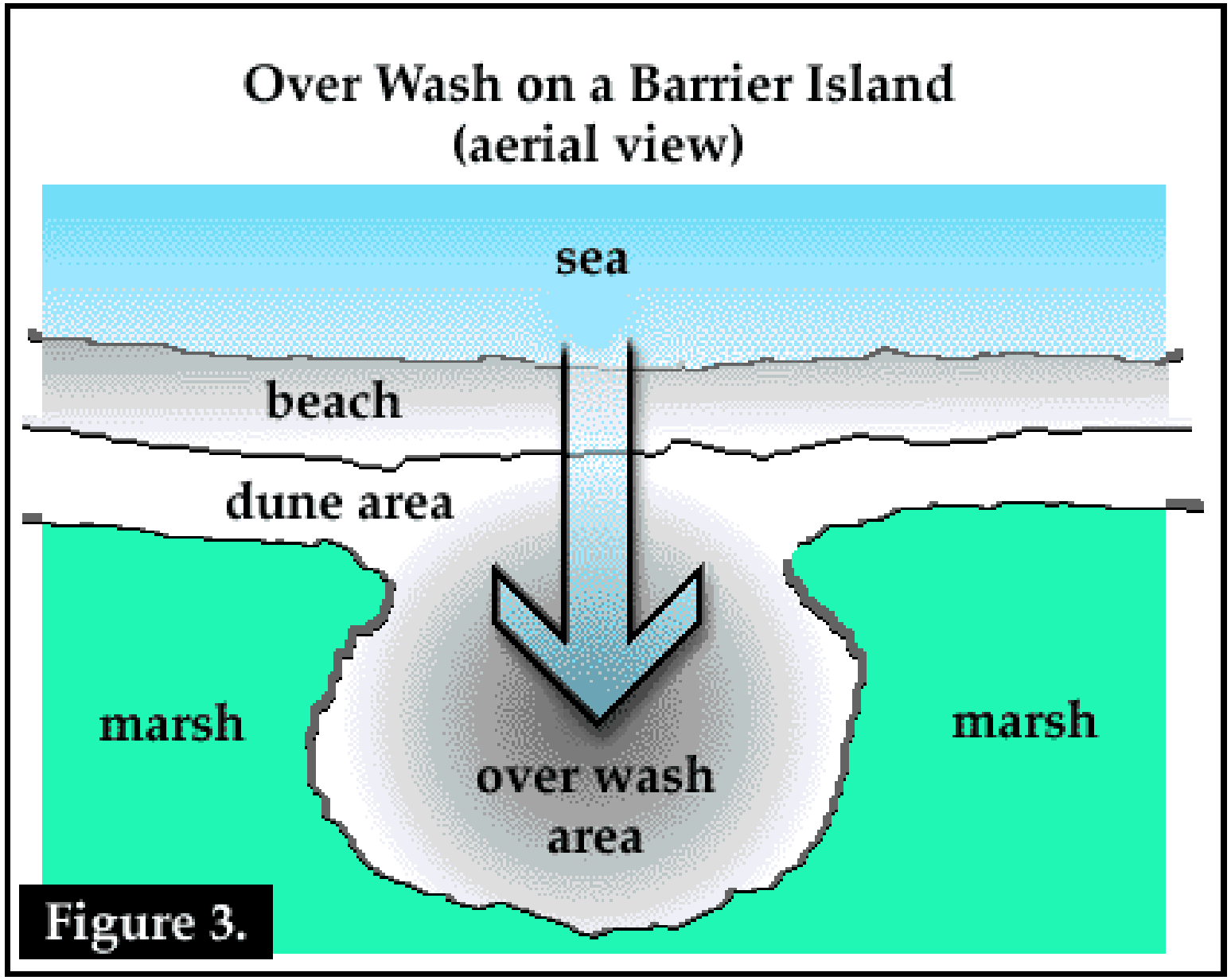


Photo Source:
USGS National Wetlands Research Center. The Fragile Gringe. https://www.nwrc.usgs.gov/fringe/figure3.html

Methods

- Aerial photographs and historical maps
- Contemporary data from Cape Cod National Seashore and Center for Coastal Studies was collected using a Trimble R8 RTK-GPS
- Tide data from NOAA tide gauge 8443970 in Boston, MA is used to find storm surge for know overwash events
- Analysis through ArcGIS

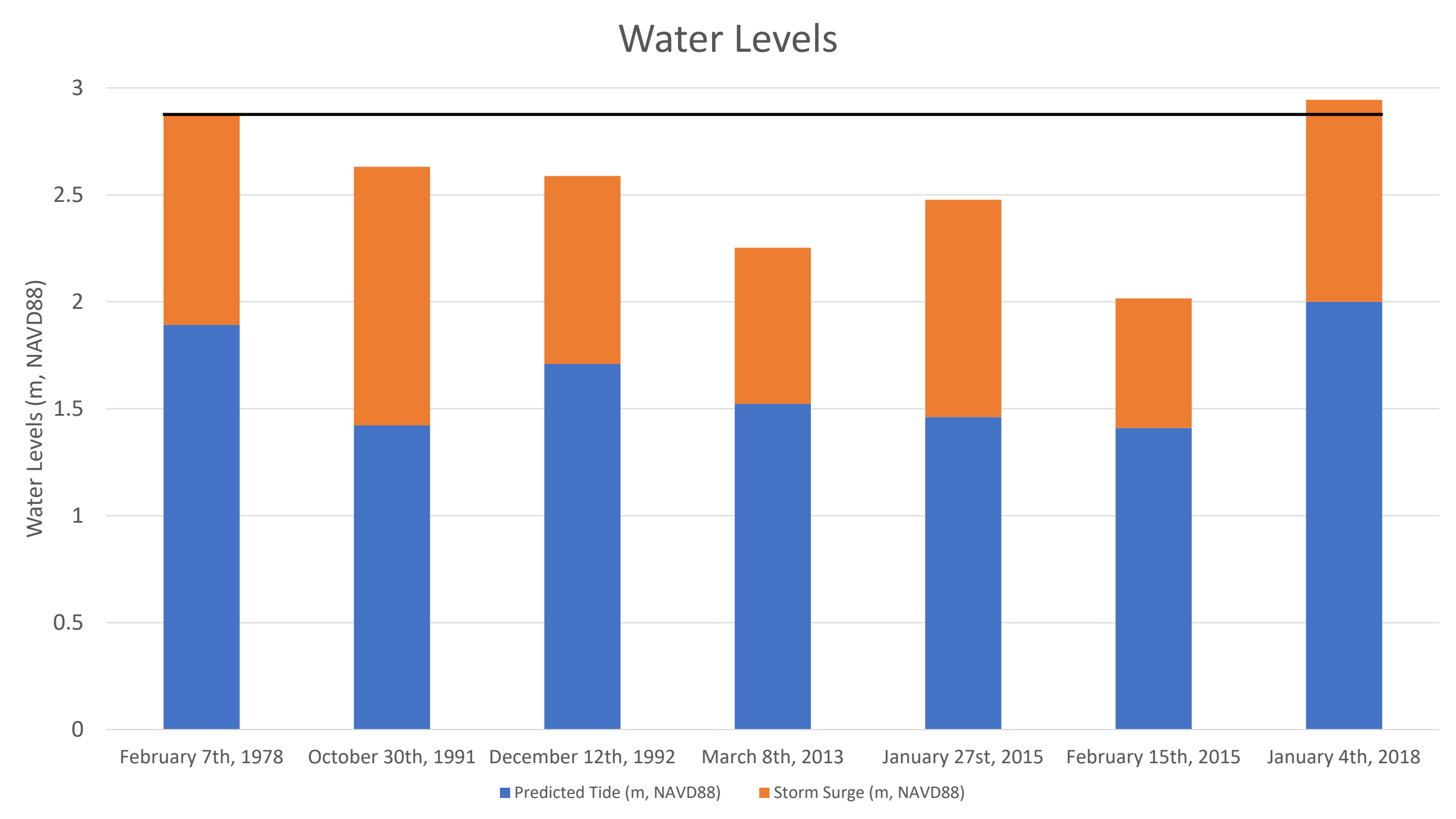
Typical Survey

Survey Date:
January 14th, 2018

Photo Date:
April 2013/2014

Date of Known Overwash Event	Predicted Tide Height (m, NAVD88)	High Tide Time (local)	Peak Storm Surge (m, NAVD88)	Peak Storm Surge Time (local)	Observed High Tide (m, tide + storm surge)
February 7th, 1978	1.892	11:00	1.34	3:00	2.902
October 30th, 1991	1.422	17:00	1.49	21:00	2.631
December 12th, 1992	1.709	13:00	0.96	16:00	2.588
March 8th, 2013	1.523	8:00	0.94	15:48	2.253
January 27th, 2015	1.461	05:00	1.44	11:06	2.477
February 15th, 2015	1.410	07:24	0.66	5:42	2.016
January 4th, 2018	2.000	12:42	0.94	12:42	2.944

NOAA Tide Data, Gauge 8443970 (Boston MA)


Water Levels
3
2.5
2
1.5
1
0.5
0
Water Levels (m, NAVD88)
February 7th, 1978
October 30th, 1991
December 12th, 1992
March 8th, 2013
January 27st, 2015
February 15th, 2015
January 4th, 2018
Predicted Tide (m, NAVD88)
Storm Surge (m, NAVD88)

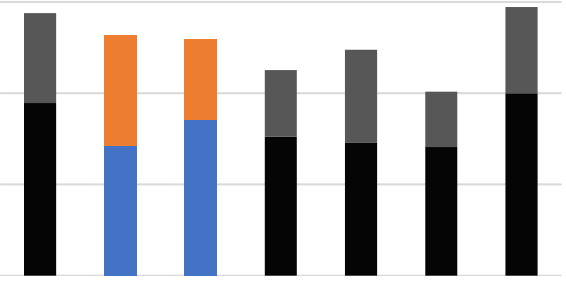
1994 Washover Fan Extent

Overwash events:
October 30th, 1991

December 12th, 1992

Tide Height (m, NAVD88): 2.631, 2.588 respectively

Photo Date:
1994



Cape Cod Times (2013, March 8) *Day 2 of the Pamet breach in Truro* [Video File] Retreived from https://www.youtube.com/watch?v=j0t3Pdc3MPw

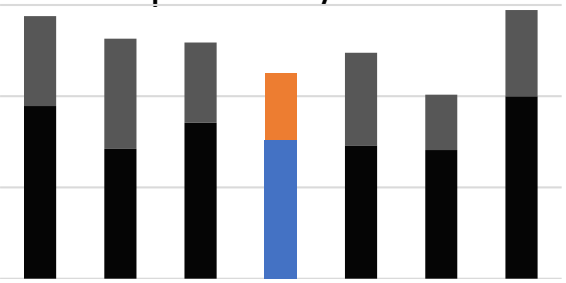
2013 Washover Fan Extent

Overwash Event:
March 8th, 2013

Tide Height (m, NAVD88): 2.253

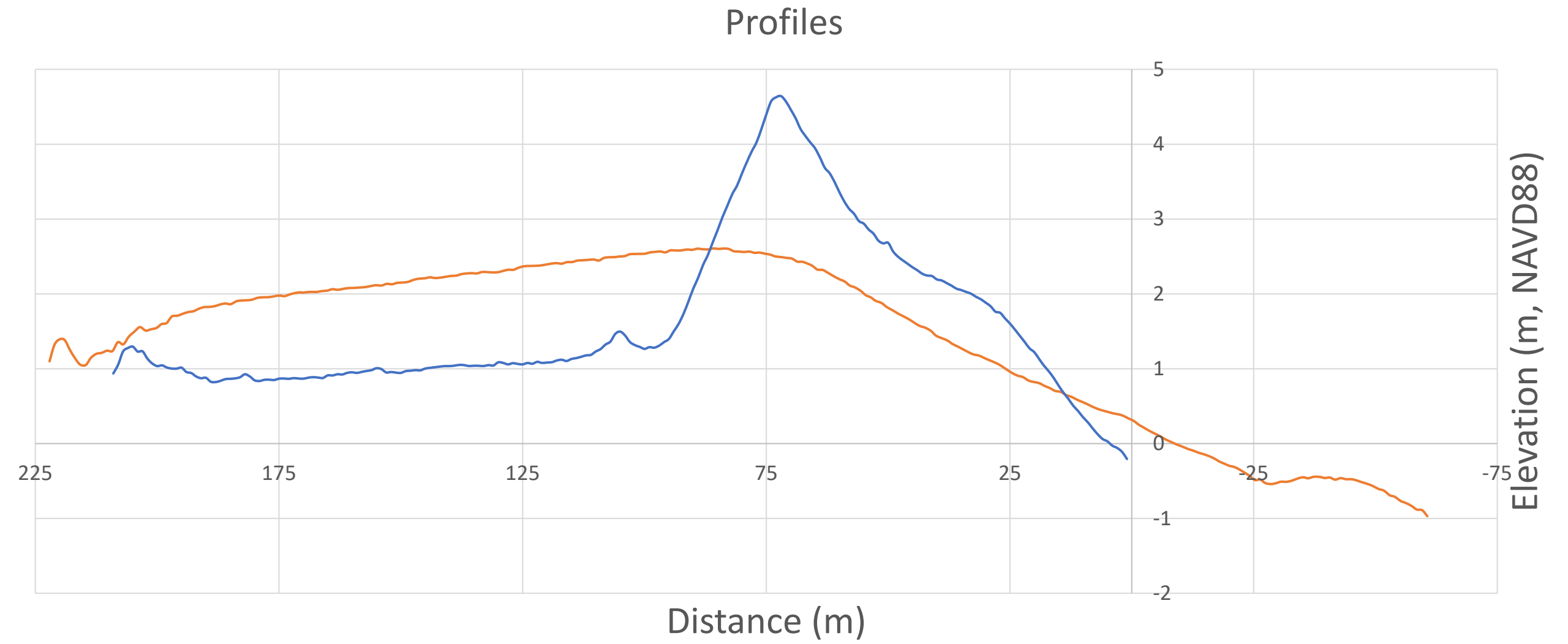
Survey Date:
July 25th, 2013

Photo Date:
April 2013/2014



Profile Transect Location

January 2015

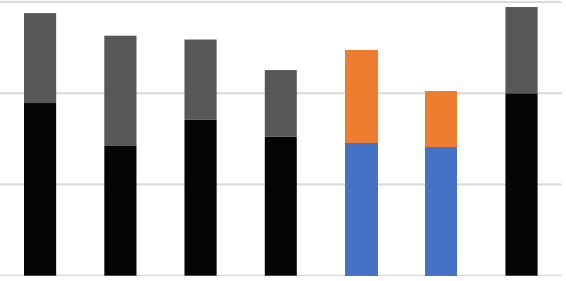


2015 Washover Fan Extent

Overwash Events:
January 27th, 2015
February 15th, 2015

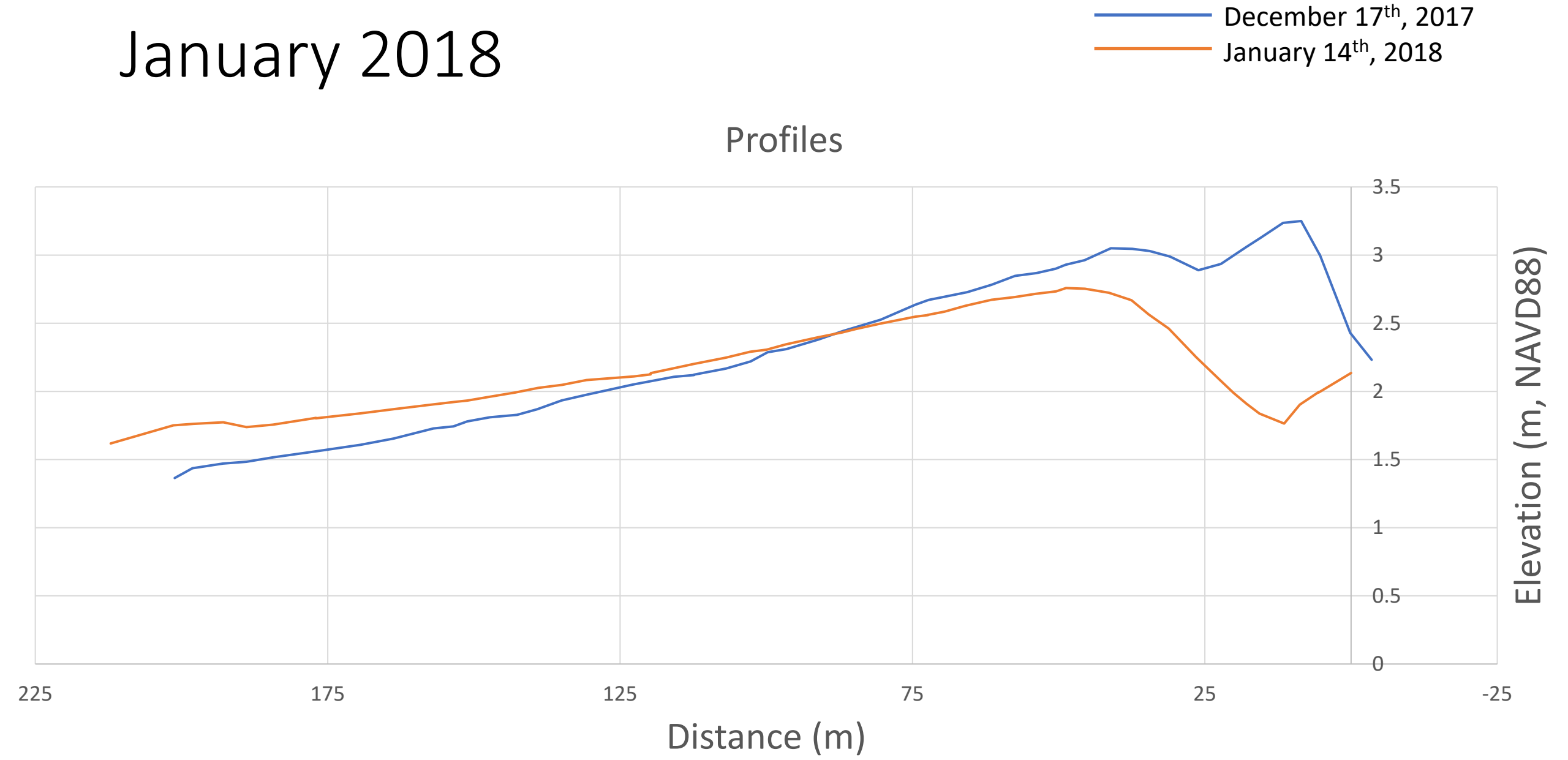
Tide Height (m, NAVD88): 2.477, 2.016 respectively

Survey Date:
February 15th, 2015



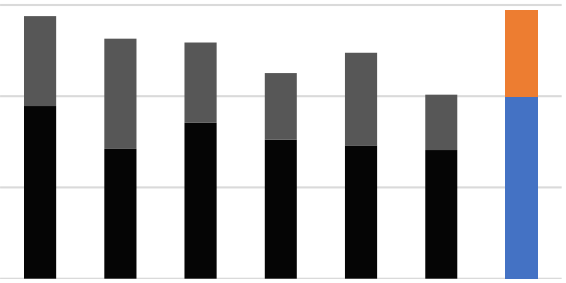
Nancy Bloom (2018, January 5th) *Ballston Beach Breach 2018* [Video File] Retrieved from: https://www.youtube.com/watch?v=mP5pCvFUL5I

January 2018



2018 Washover Fan Extent

Pre- vs. post-January 4th, 2018 storm



Salt Marsh vs. Fresh Marsh

- Fresh water vegetation has little resistance to the salt water from overwash events
- Major issues have been avoided because overwash events occur mostly from extratropical storms in the winter, therefore vegetation and biological activity in this area is at a minimum
- Subsidence from ecological changes in the marsh have lowered elevation in Upper Pamet relative to Lower Pamet

Prospect of Sea Level Rise (SLR)

- Overwash events have the potential to become more destructive with sea level rise
- Possibility of compounding effects with continued marsh subsidence
- Destruction of marsh grasses could greatly increase rates of erosion throughout the Pamet River Valley

Why does this matter?

- One of the major concerns for the area is that salt water intrusion could reach drinking wells for local residents.

- Increased erosion could damage property in the surrounding area.

- Understanding impacts from overwash could help to implements the best management practices for the Town of Truro.

Questions?

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