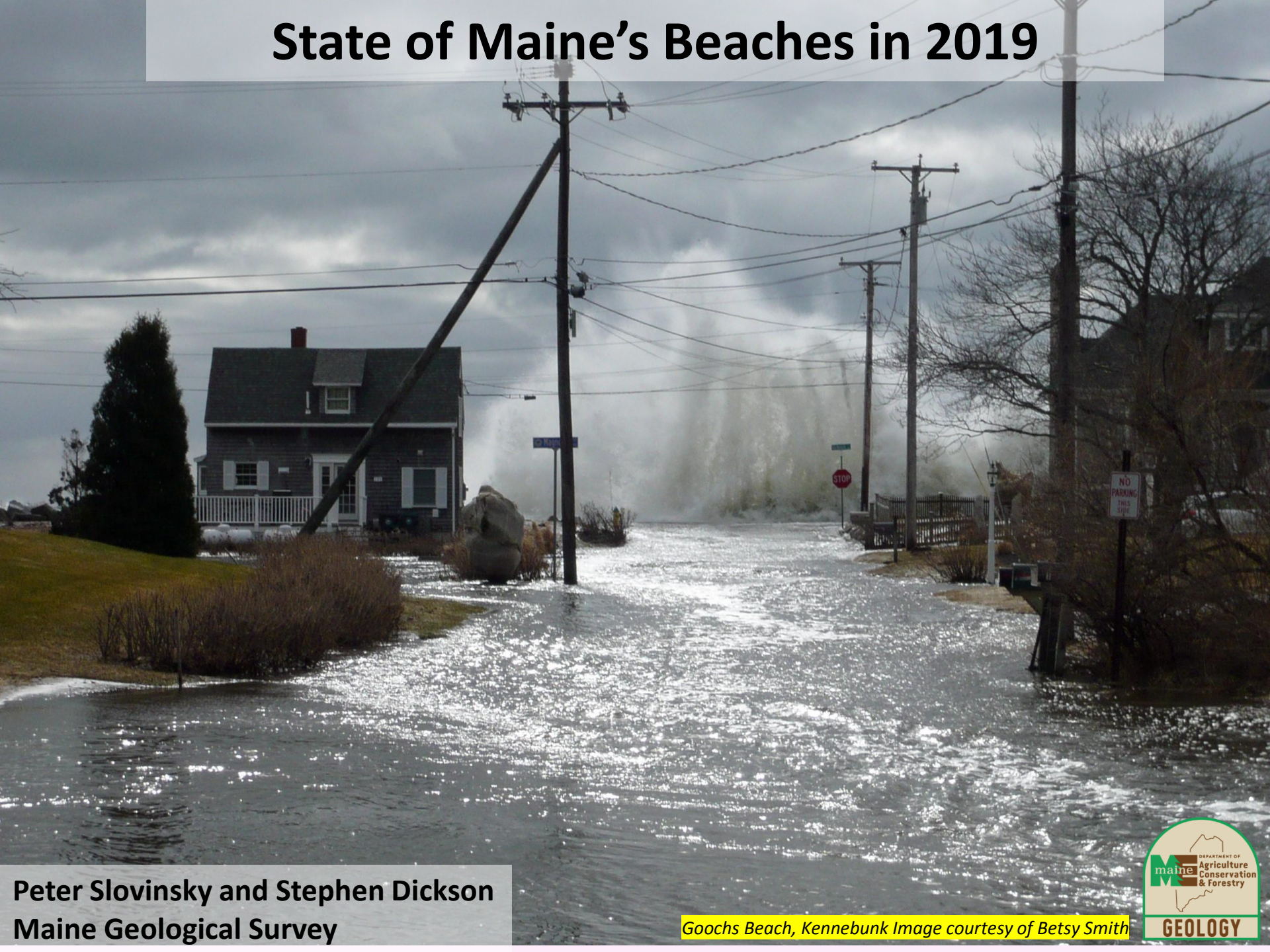


State of Maine's Beaches in 2019



Peter Slovinsky and Stephen Dickson
Maine Geological Survey

Goochs Beach, Kennebunk Image courtesy of Betsy Smith





ME's Monitoring Programs

State of Maine Beach Profiling:

14 beaches in 8 communities

Data from 2007-2019 (winter)

Maine Beach Mapping:

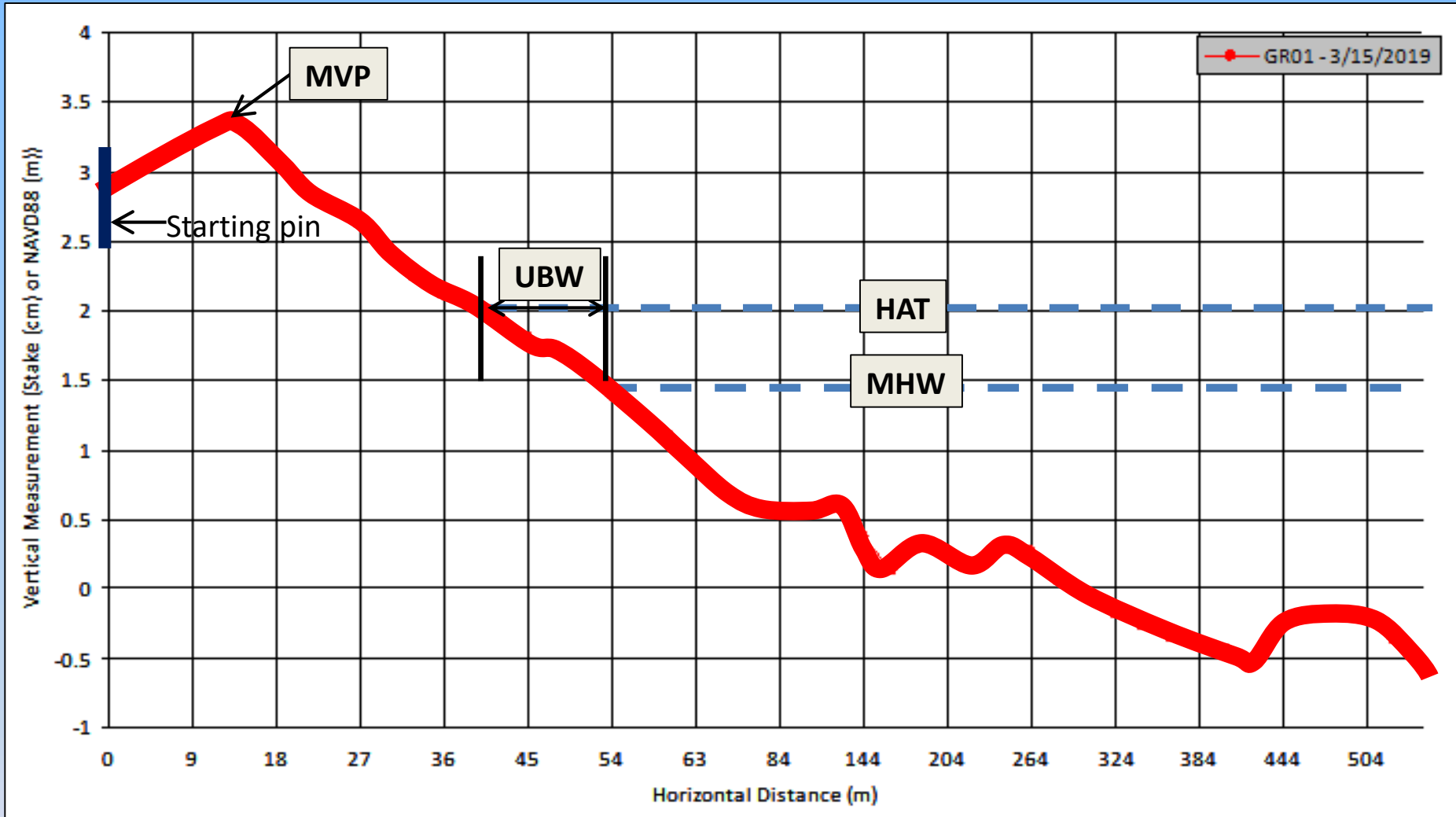
33 beaches in 15 communities

Data from 2007 – 2018 (summer)

State of Maine Beach Profiling Program (SMBPP)

- Started in 1999 (MGS, MCP, MSG, MCE)
- Trained volunteers from beach communities
- Uses Emery (1961) method of beach profiling to collect cross-shore data
- Collects monthly “qualitative” datasets, accuracy of typically 1-2 feet or less
- Data is uploaded to the Maine Shore Stewards website where it can be plotted or downloaded
- Used to track nourishment, impacts of storms, seasonal changes

SMBPP Key Metrics Determined and Analyzed in 2019



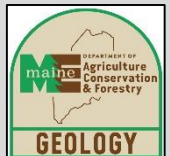
Key Metrics from Beach Profile Analyses:

Maximum Vertical Position (MVP) = maximum elevation along the beach profile from 2007-2019

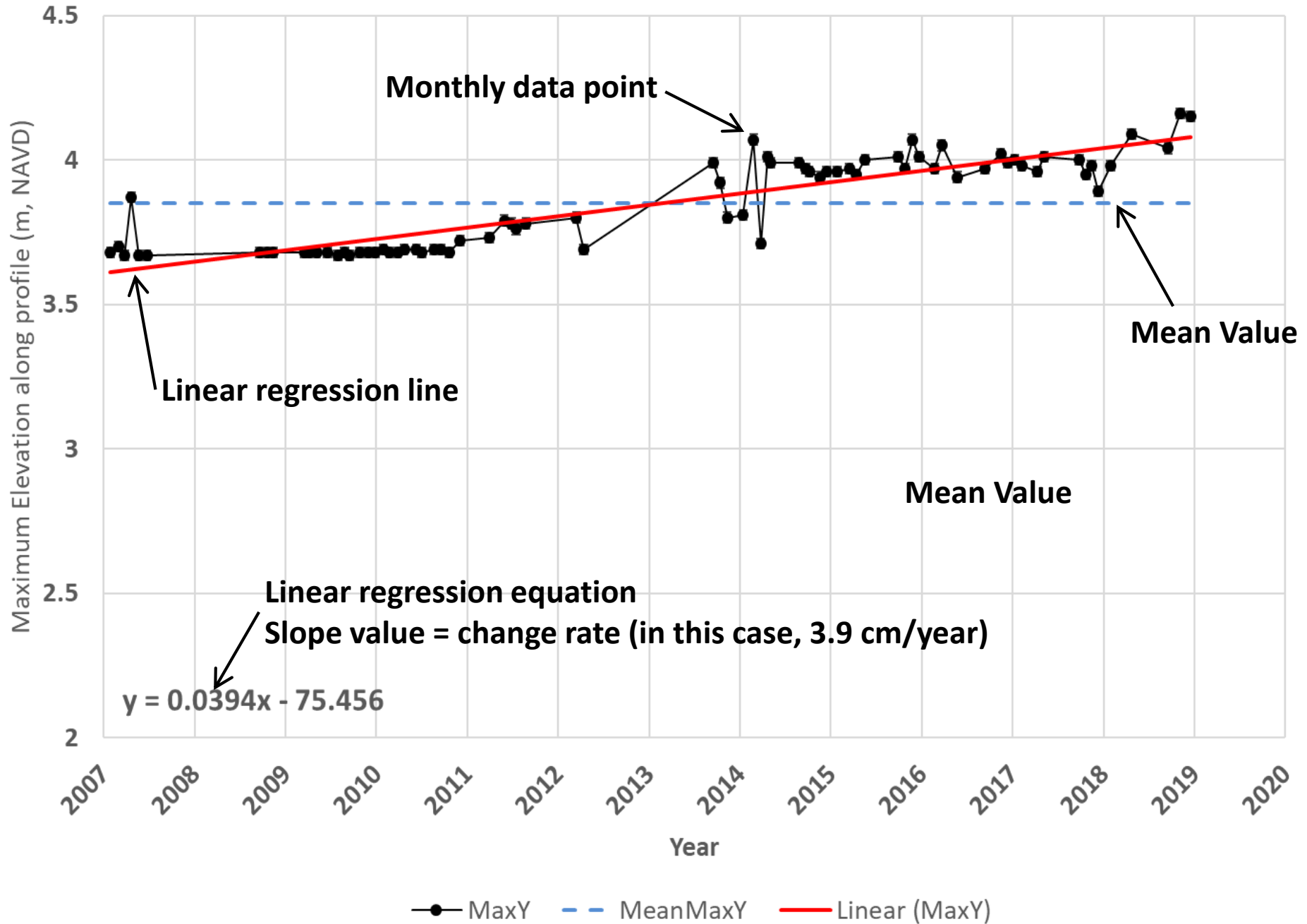
Upper Beach Width (UBW) = the width of the upper tidal portion of the beach, from the MHW to the HAT, from 2007-2019.

Highest Astronomical Tide (HAT) = the approximate highest tide elevation on the profile

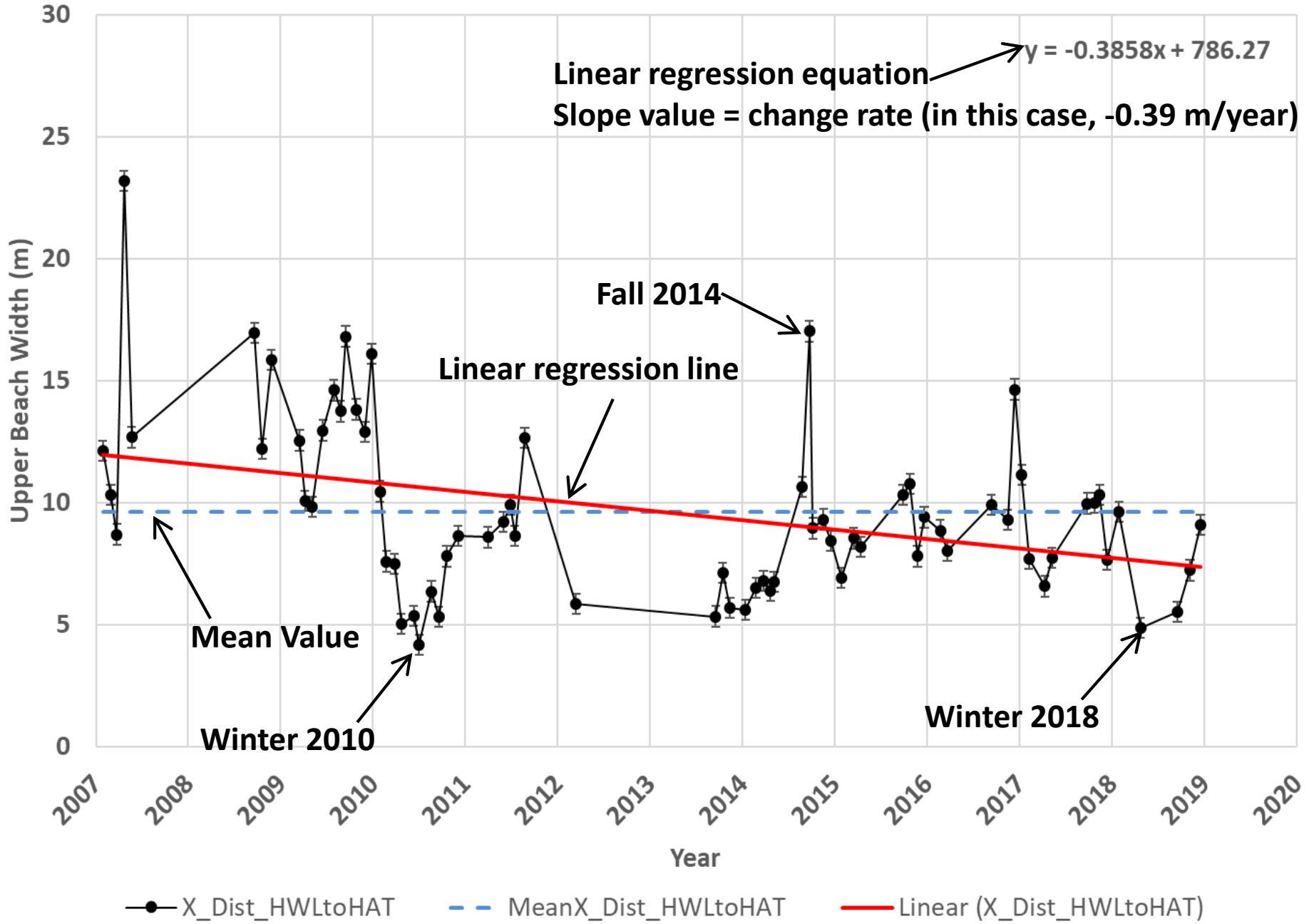
Mean High Water (MHW) = the approximate mean high water elevation on the profile



Maximum Vertical Position (NAVD88 M) for EG01



Upper Beach Width (M) for EG04



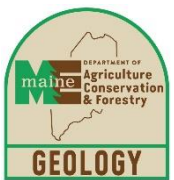
Maine Beach Mapping Program (MBMAP)

- Real Time Kinematic Global Positioning System (RTK-GPS)
- Accuracy of 1-2 inches
- Annual measurements of *alongshore features*, such as the seaward extent of dominant sand dune vegetation, the mean high water line, and seawalls
- Used to track nourishment and dune restoration, monitor erosion, impacts of storms

Ogunquit Beach, Ogunquit

Shore_Type

- HWL
- VEG
- WALL



25 12.5 0 25 Meters



In this example:
DBW 2017 = 20 m
DBW 2018 = 15 m
 Δ DBW = -5 m

MBMAP Key Metrics analyzed in 2019:

Dune Change (Δ Dune) = calculated rate of change from data 2007-2018

Beach Change (Δ beach) = calculated change from data 2017-2018

Dry Beach Width (DBW) = distance from MHW line to vegetation line or wall in 2018
walled vs. natural areas

Dry Beach Width Change (Δ DBW)= the difference in DBW from 2017-2018
walled vs. natural areas



Beaches Highlighted in 2019 Presentation (for brevity's sake)

From South to North

Wells Beach
Goose Rocks Beach
Saco Beaches

State Average MBMAP Metrics (for all beaches)

Dune Change (Δ Dune)

Average (A) = -0.1 feet/year

Beach Change (Δ Beach)

Average (A) = -2.3 feet/year

Dry Beach Width (DBW)

Average (A) = 76 feet

Natural (N) = 85 feet

Walls (W) = 52 feet

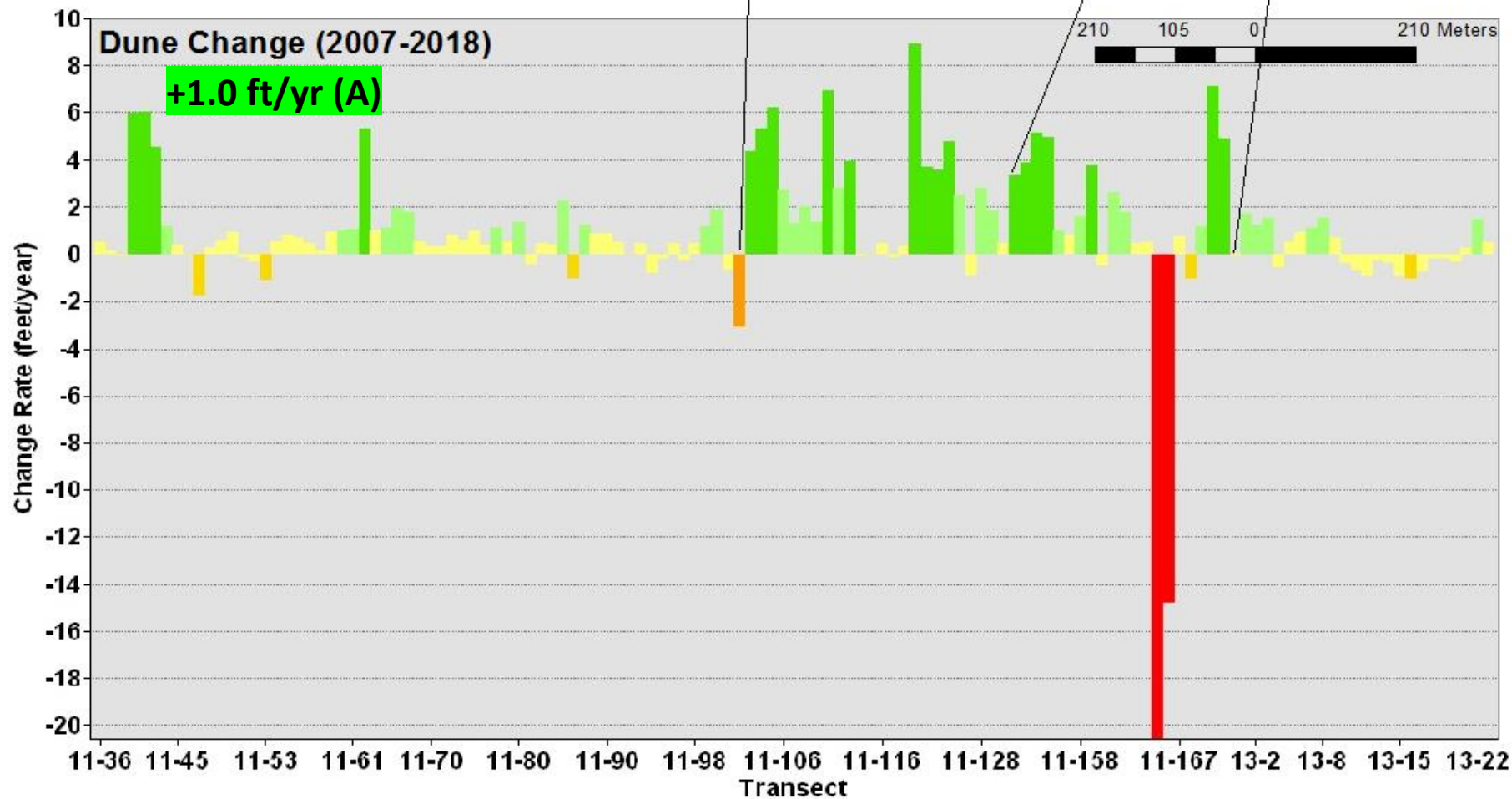
Dry Beach Width Change (Δ DBW)

Average (A) = +4 feet

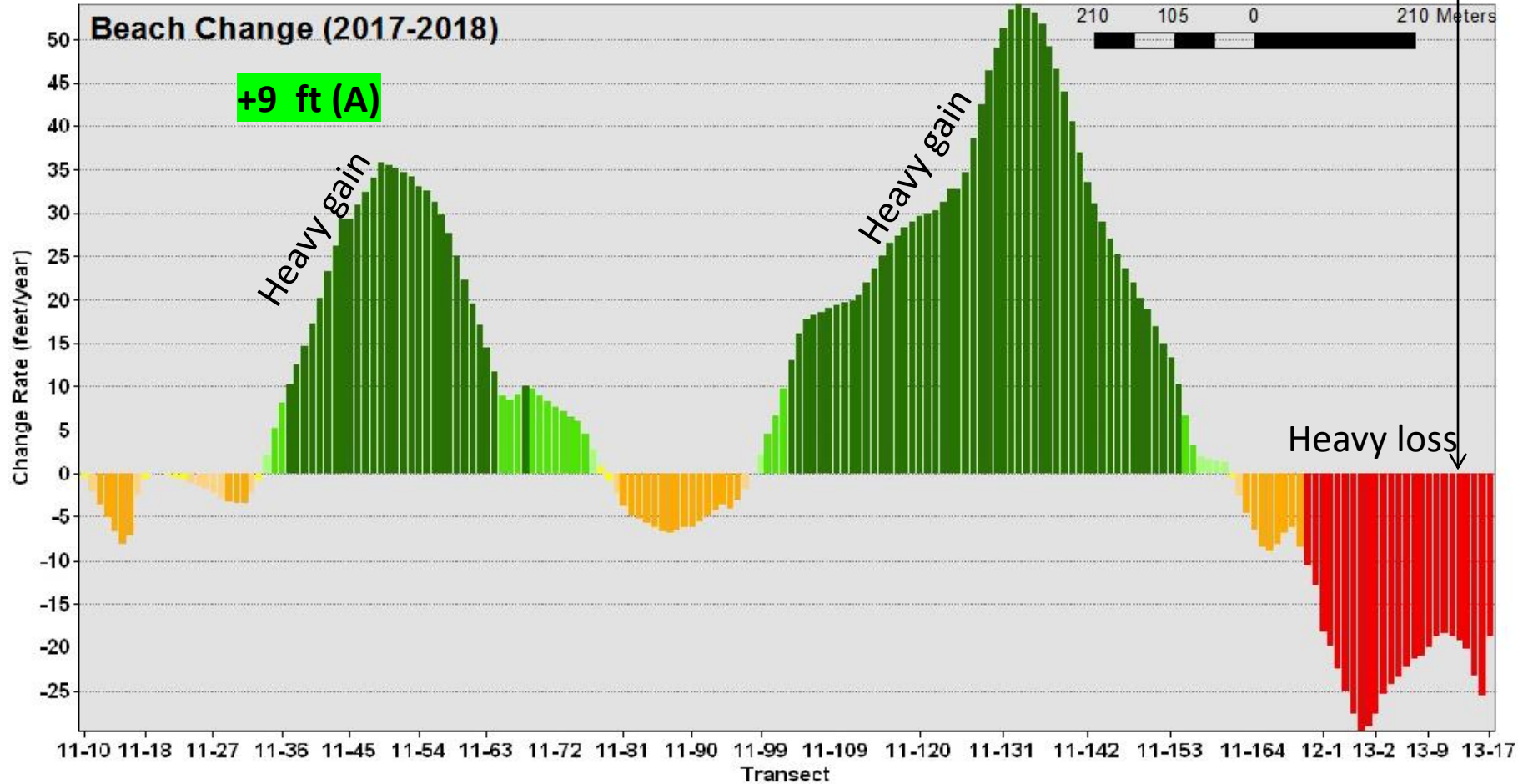
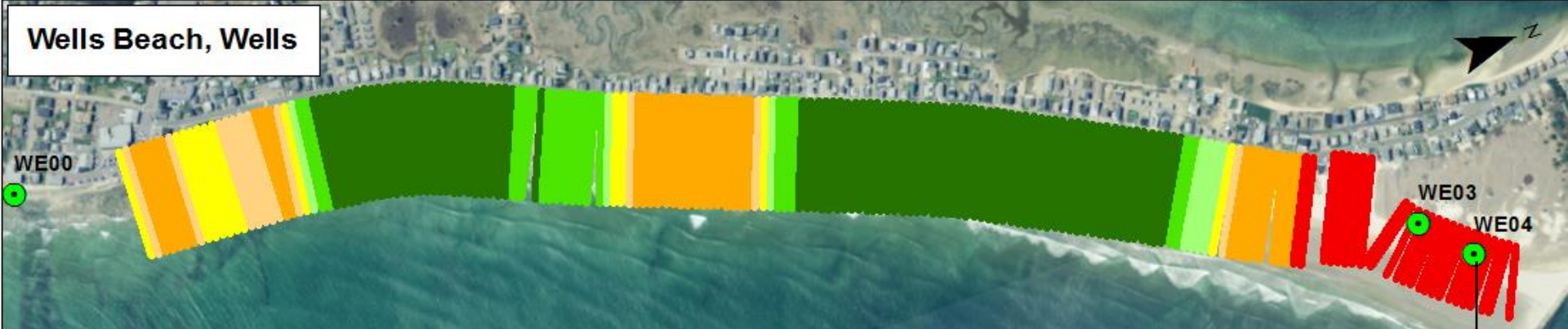
Natural (N) = +8 feet

Walls (W) = -5 feet

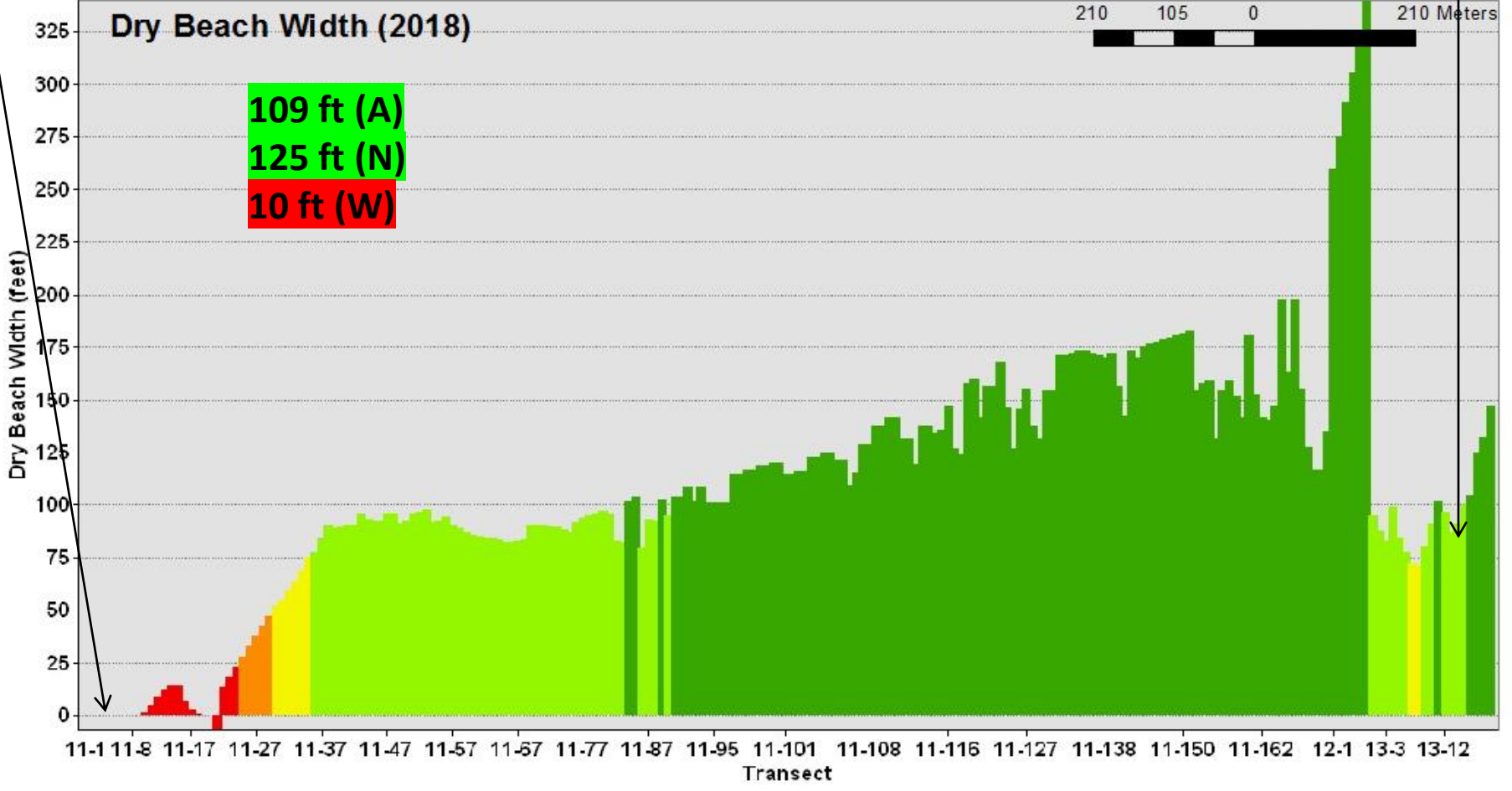
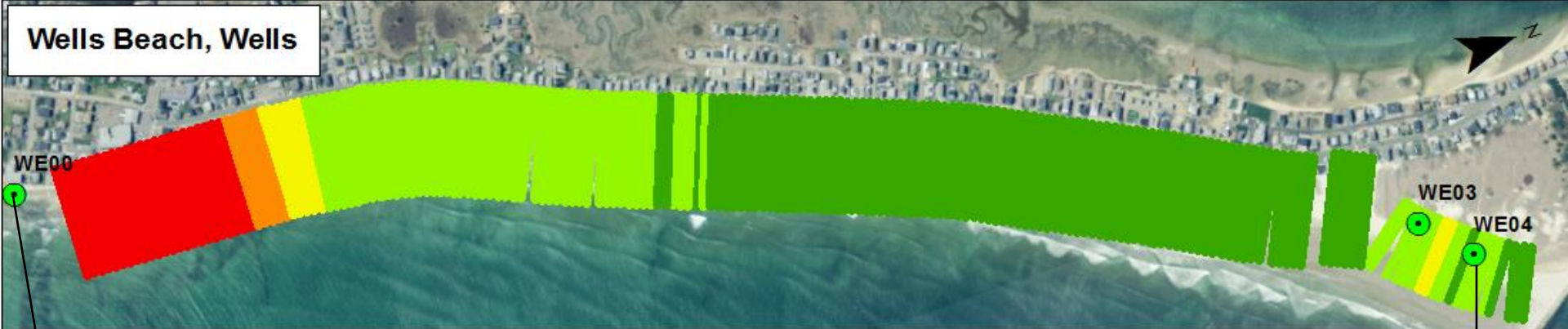
Wells Beach, Wells



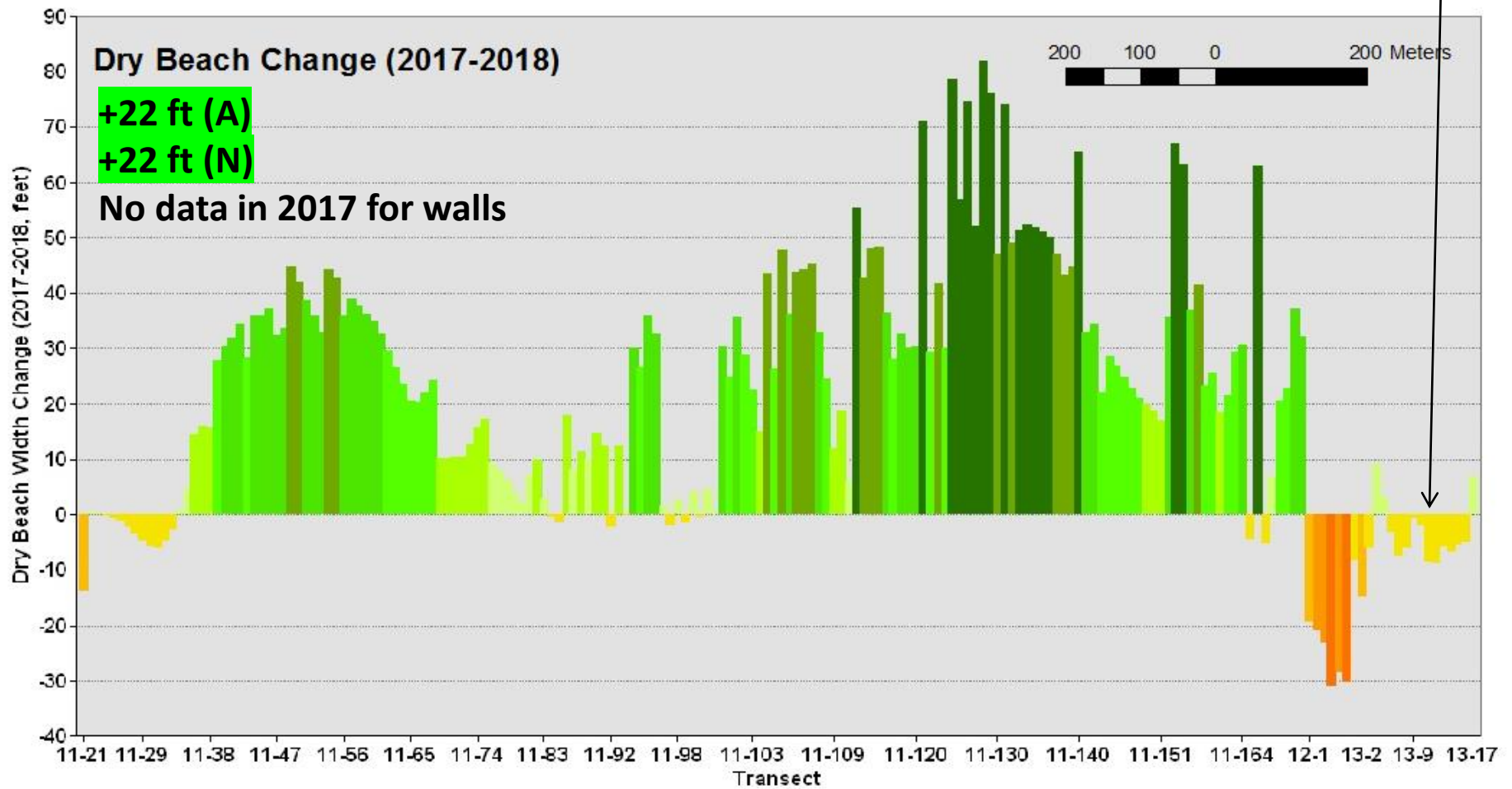
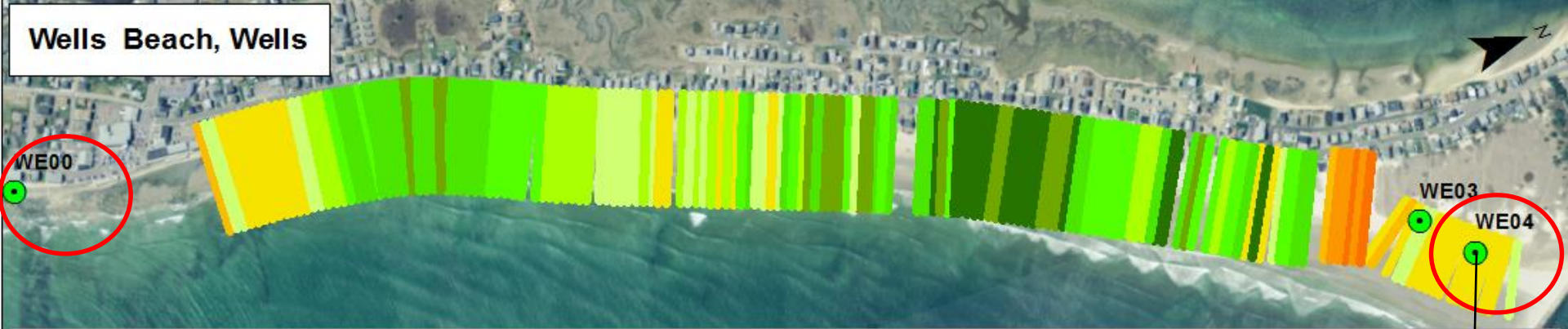
Wells Beach, Wells



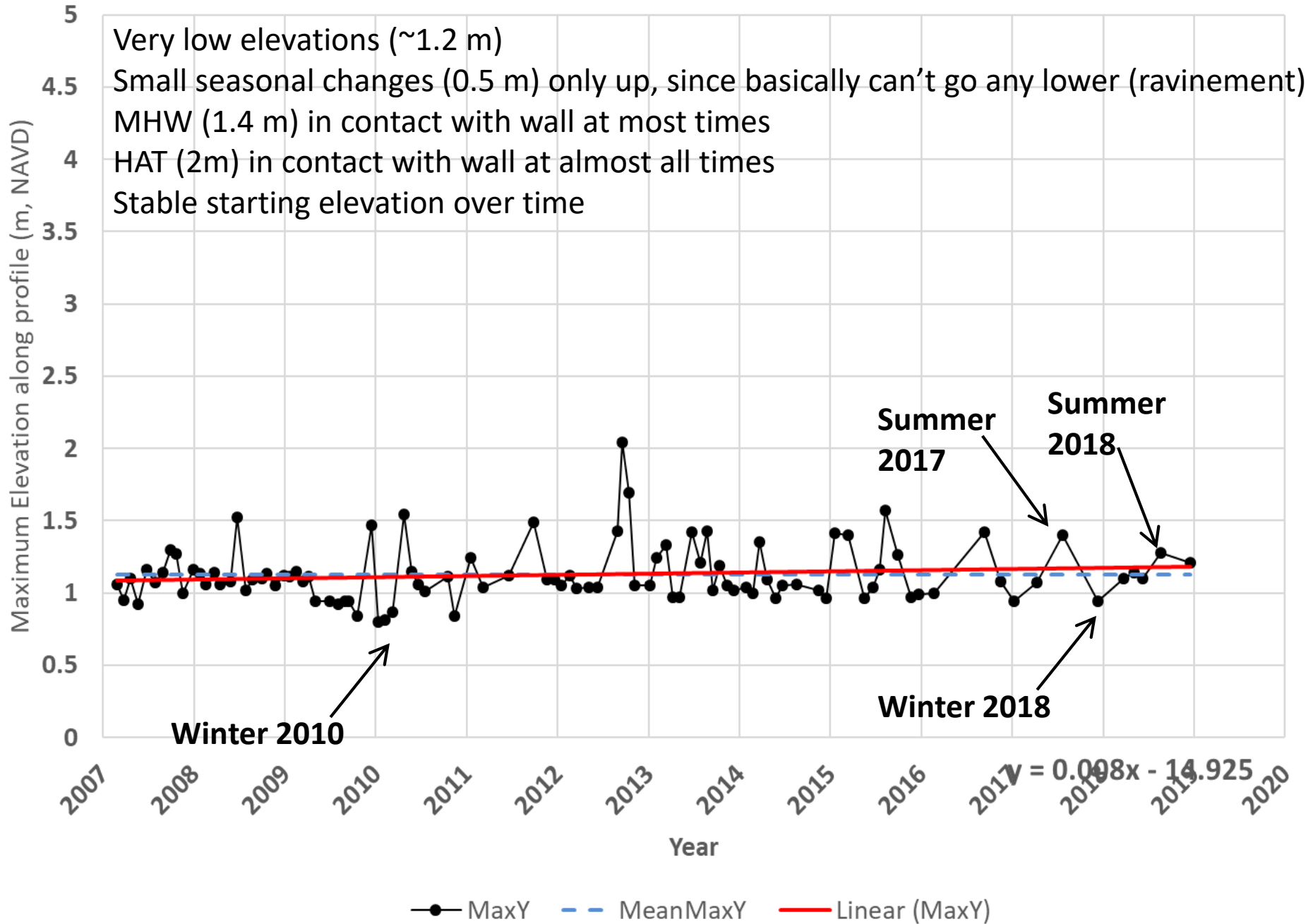
Wells Beach, Wells



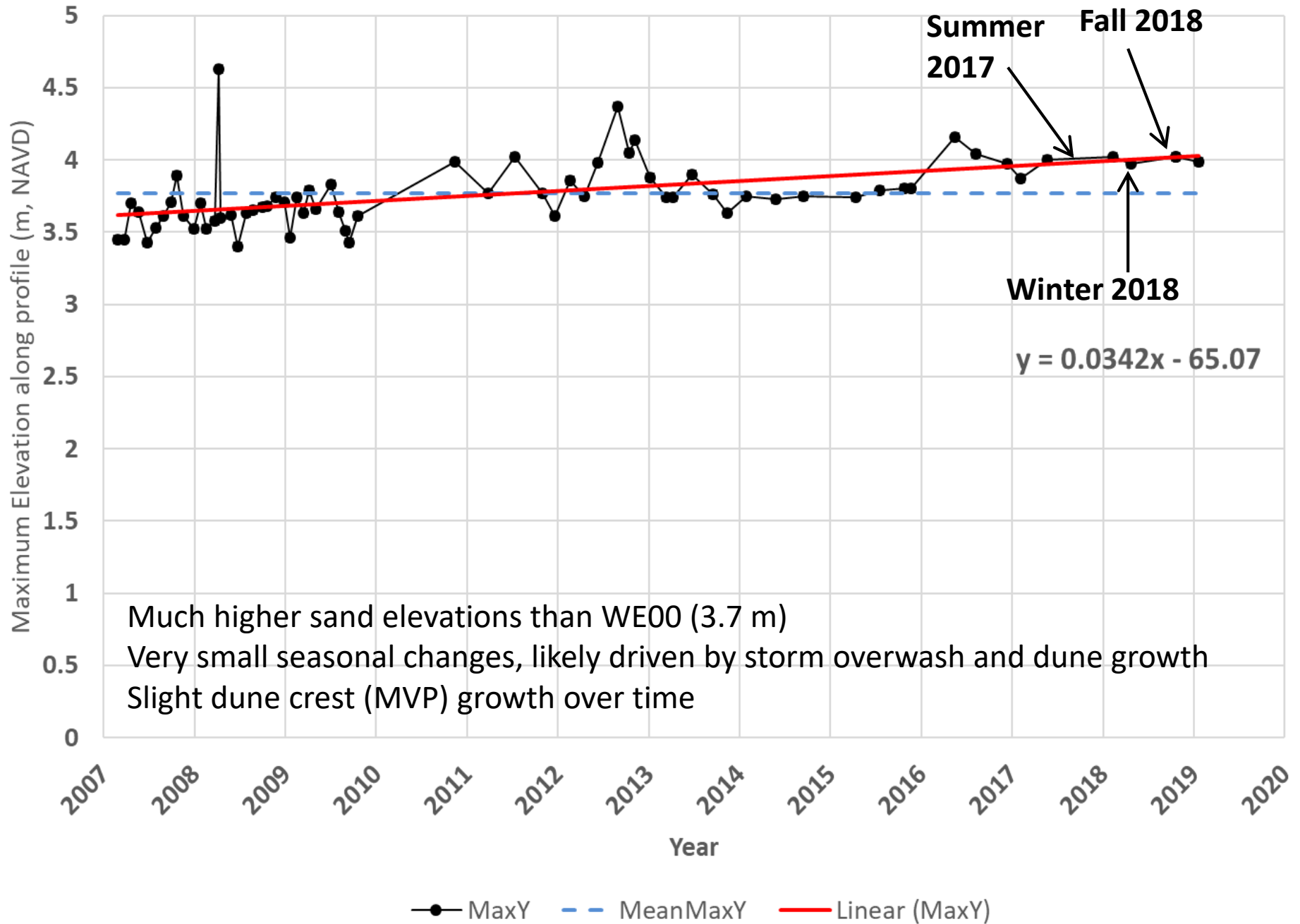
Wells Beach, Wells



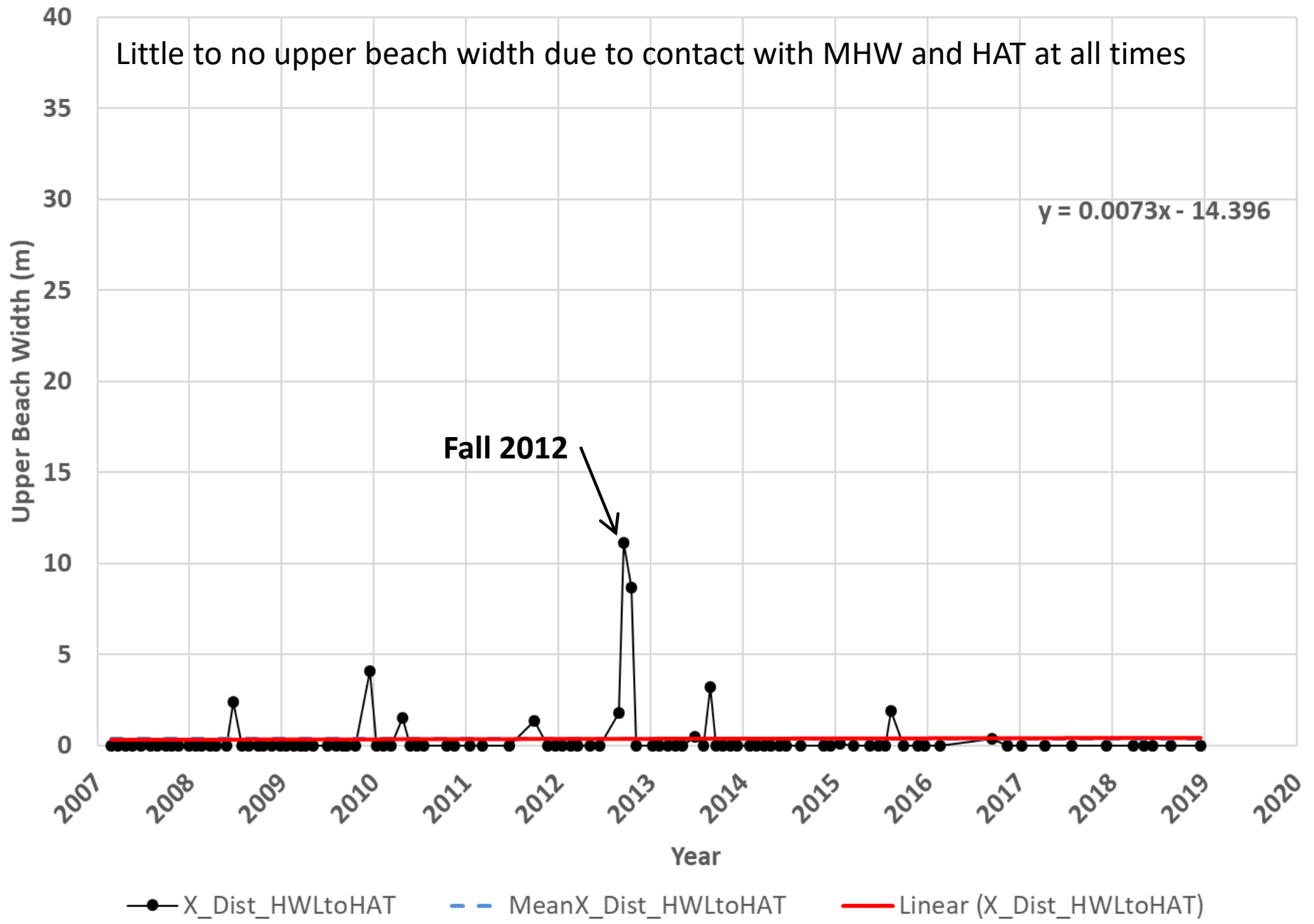
Maximum Vertical Position (NAVD88 M) for WE00



Maximum Vertical Position (NAVD88 M) for WE04

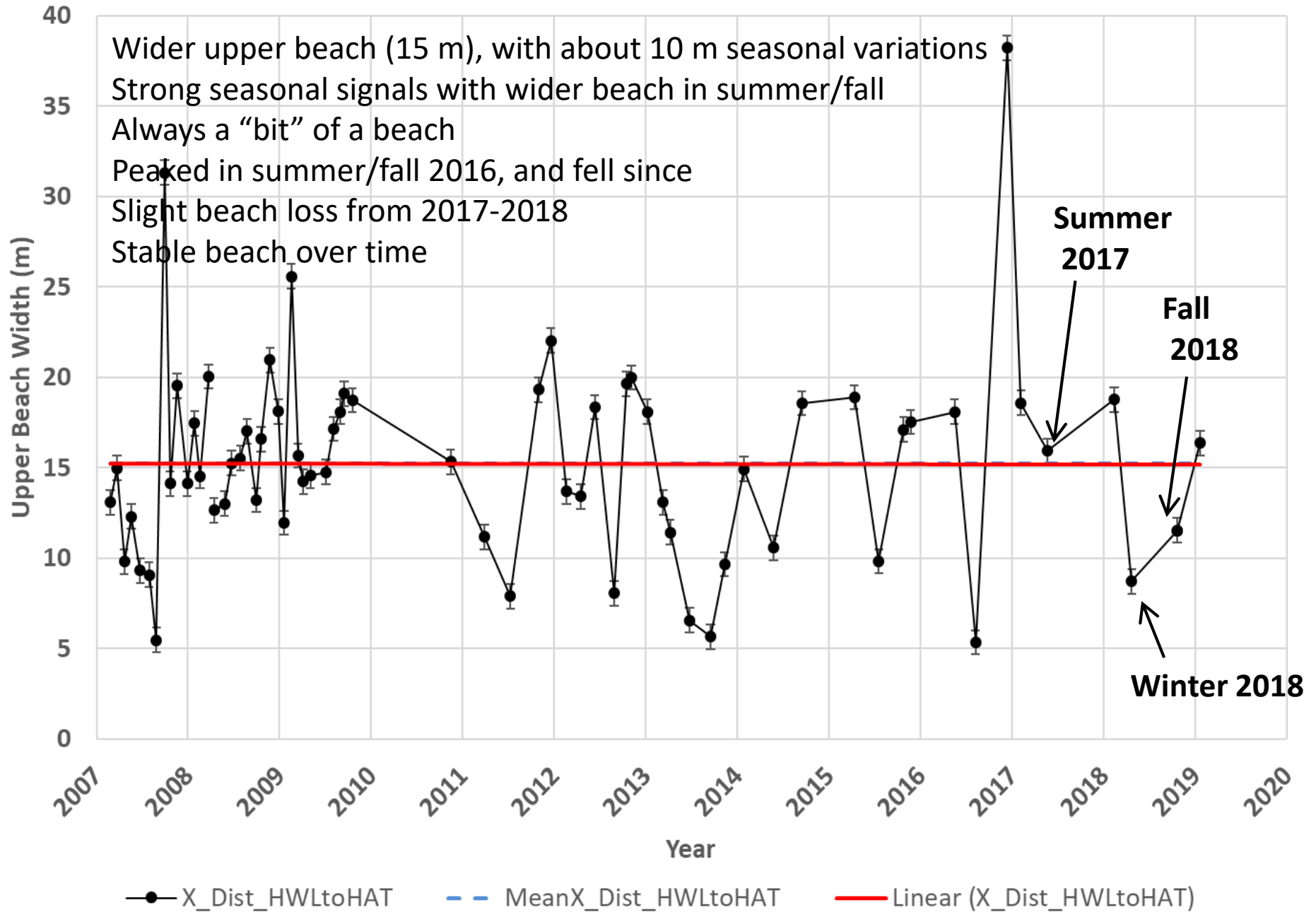


Upper Beach Width (M) for WE00

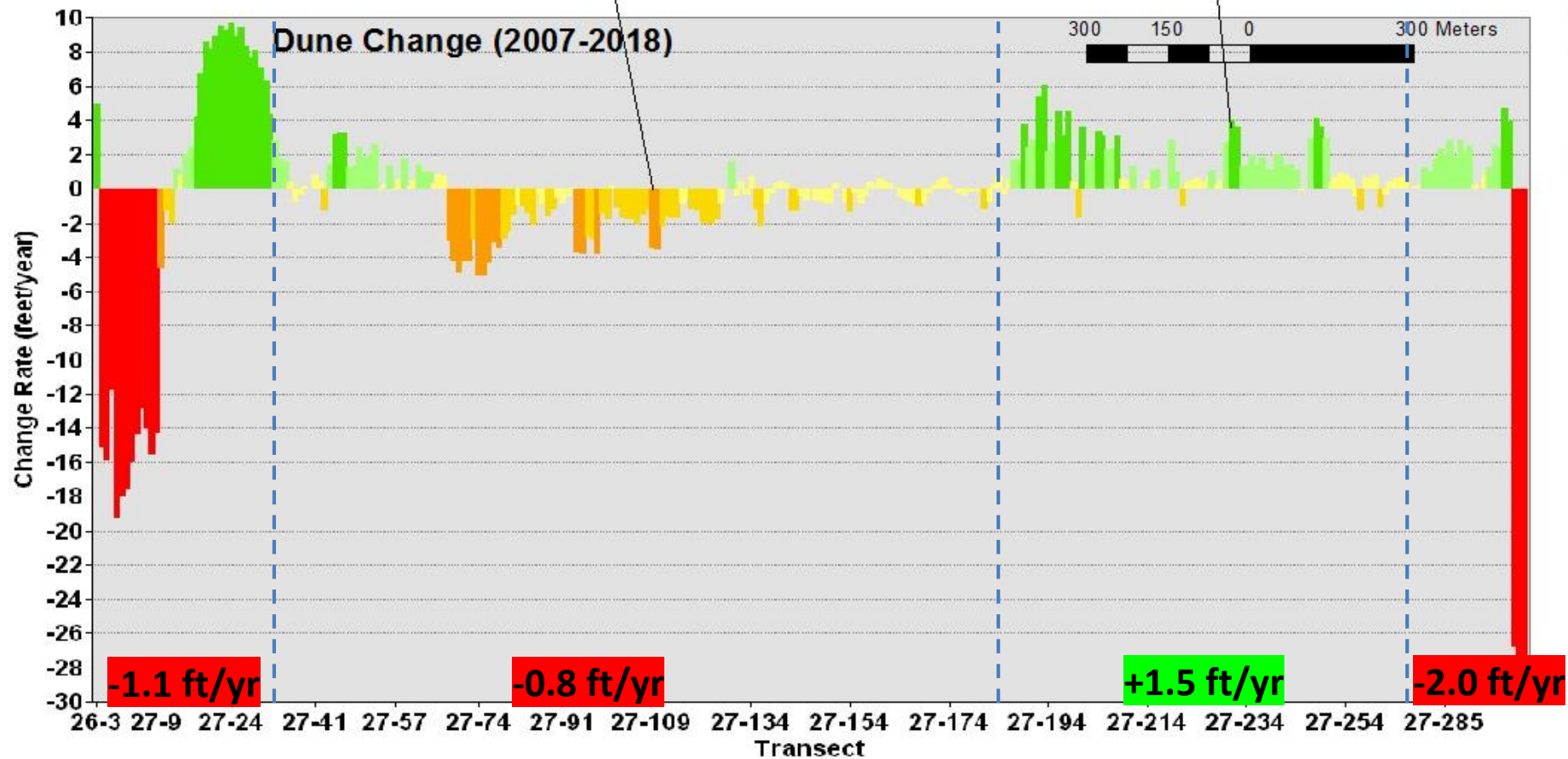
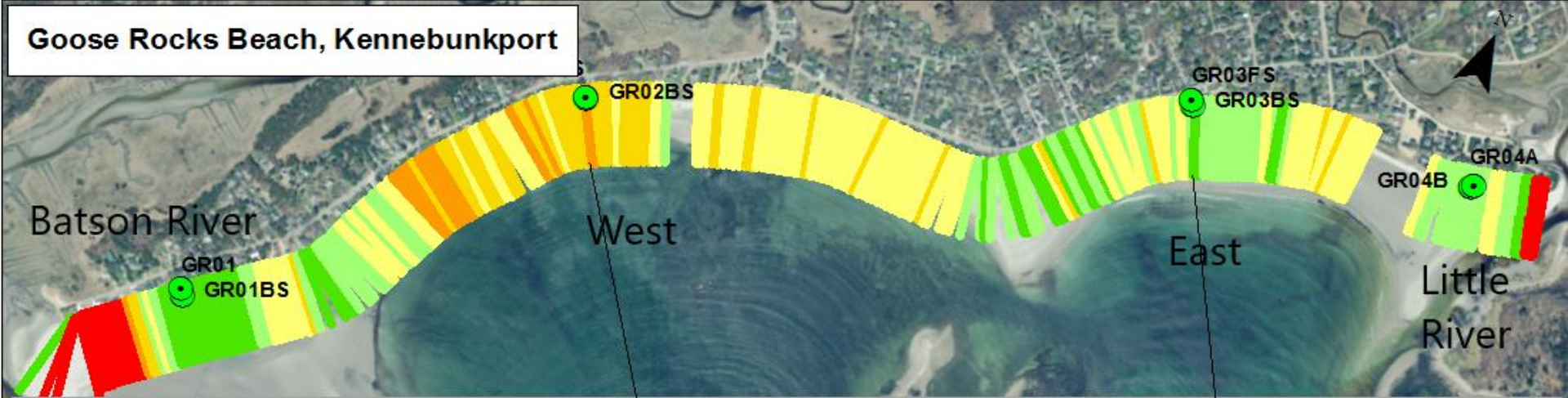


Upper Beach Width (M) for WE04

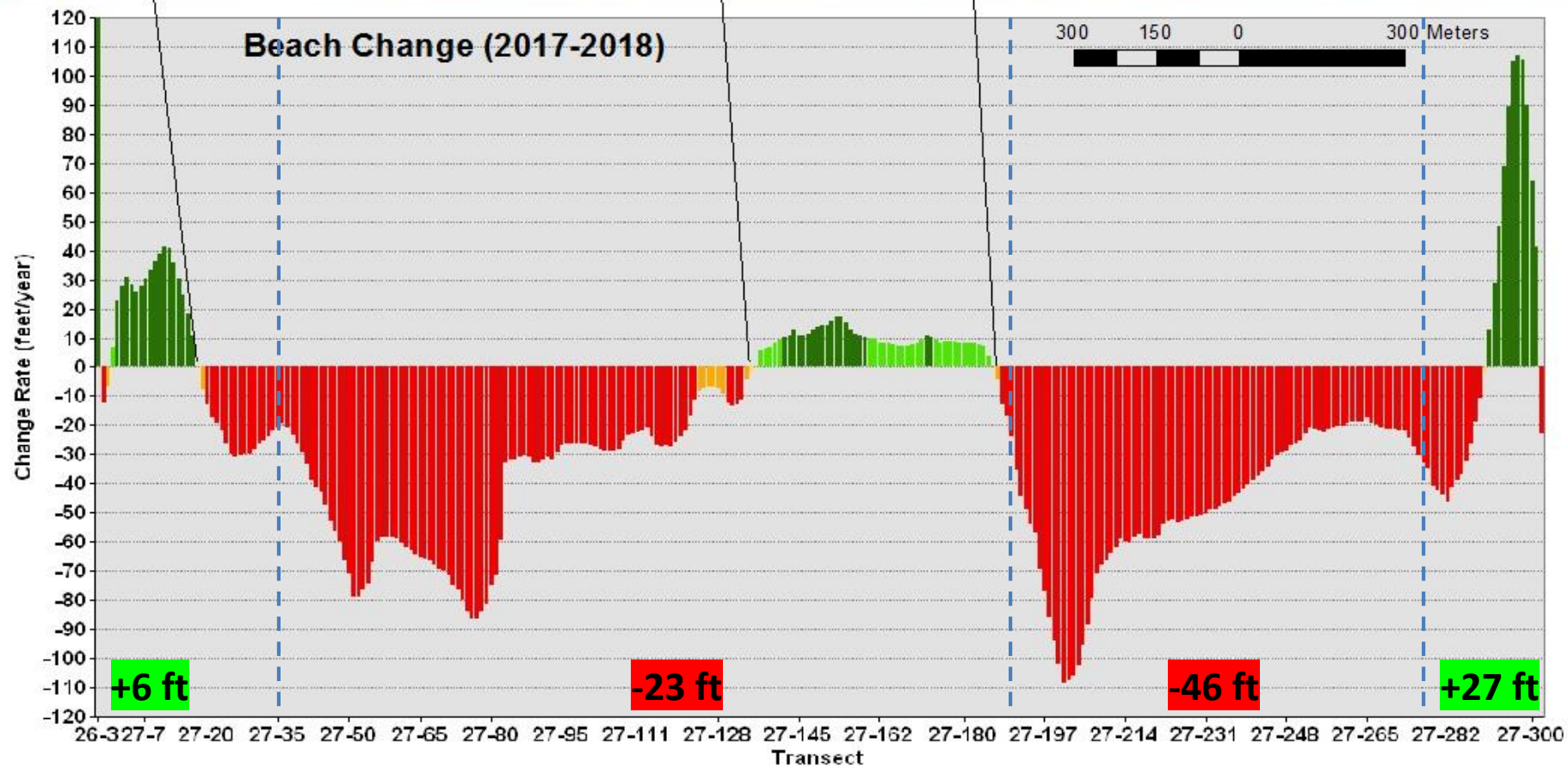
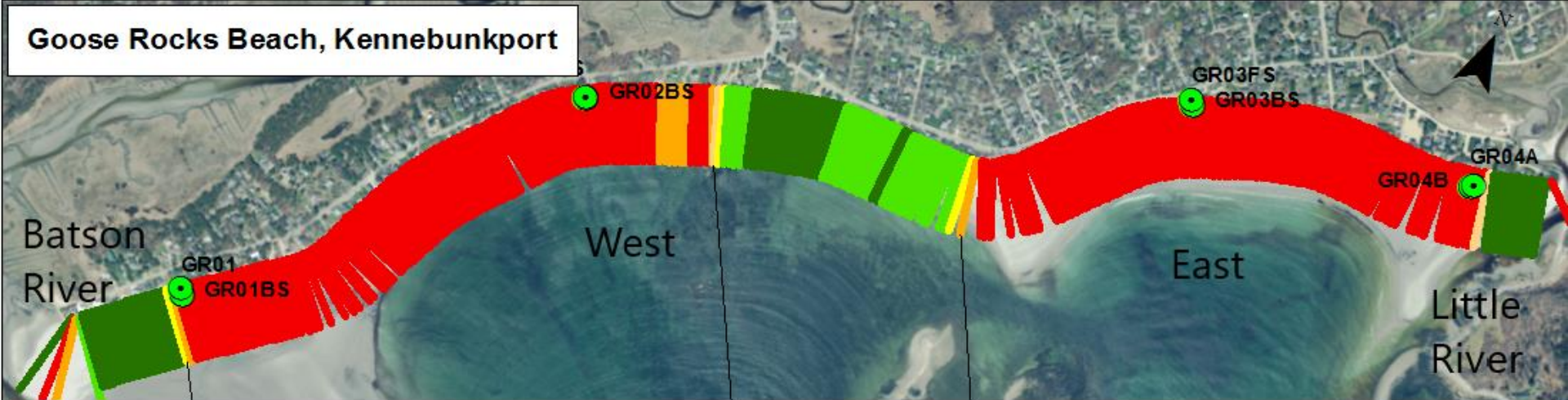
$$y = -0.0004x + 15.973$$



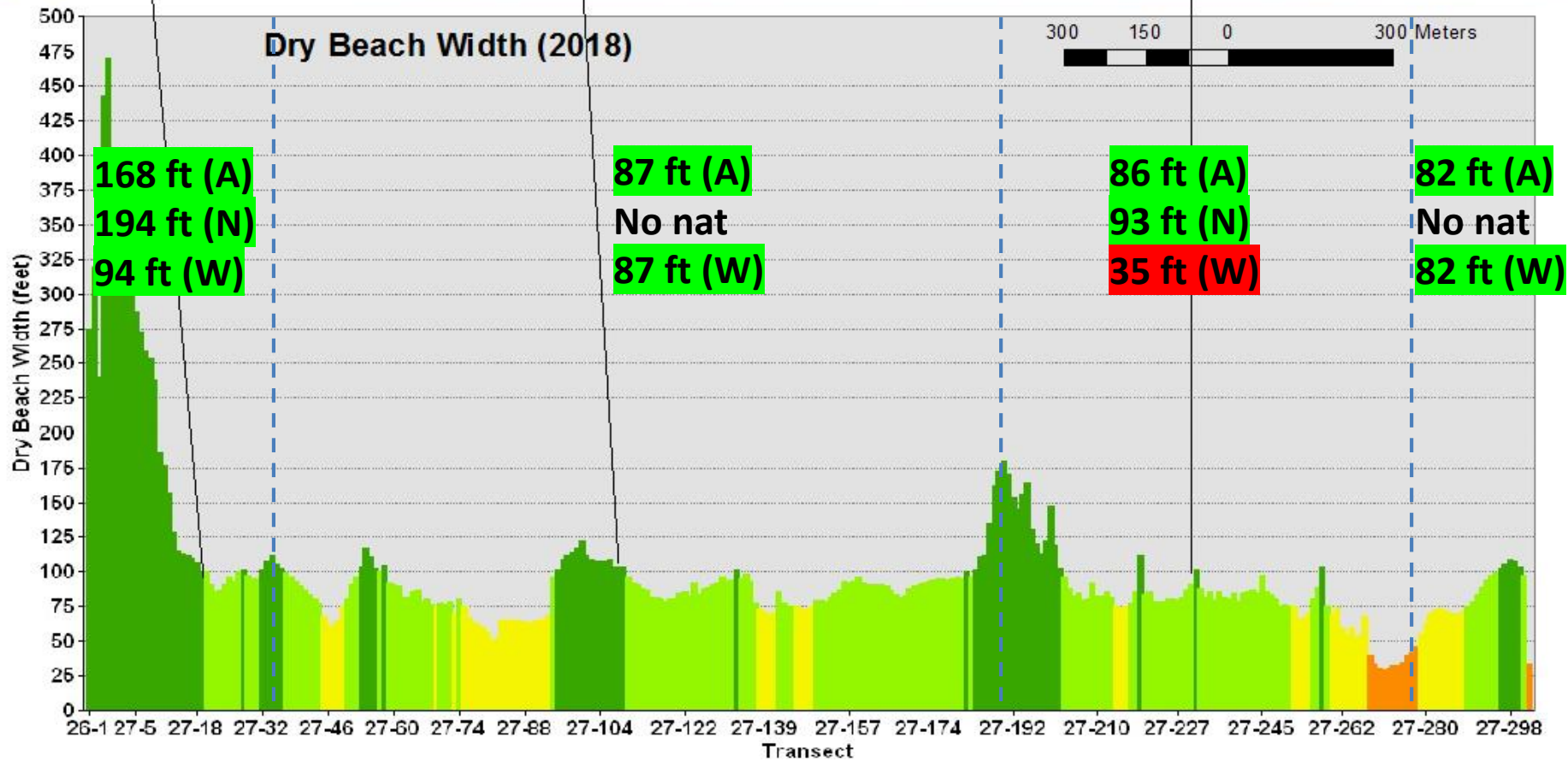
Goose Rocks Beach, Kennebunkport



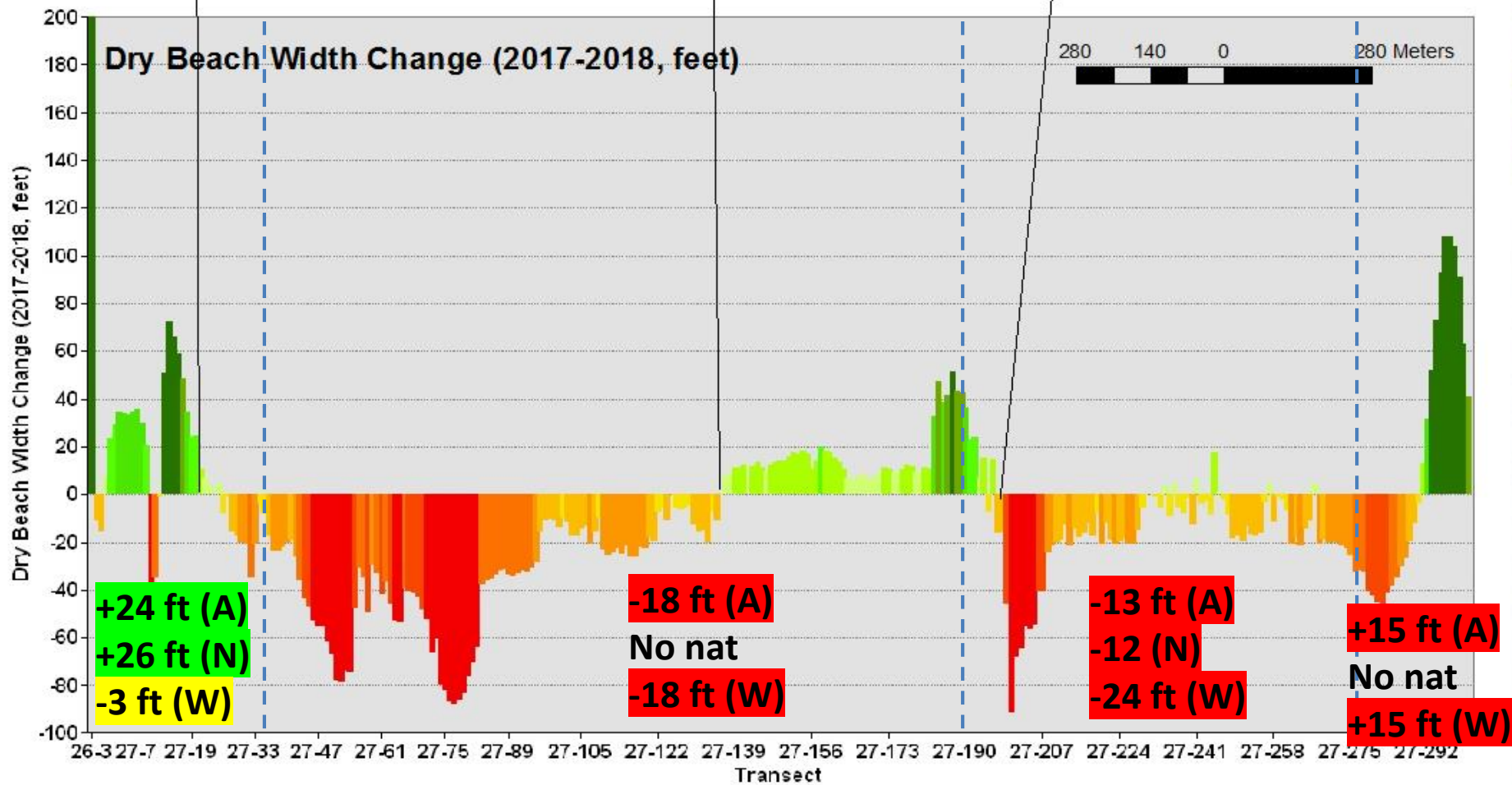
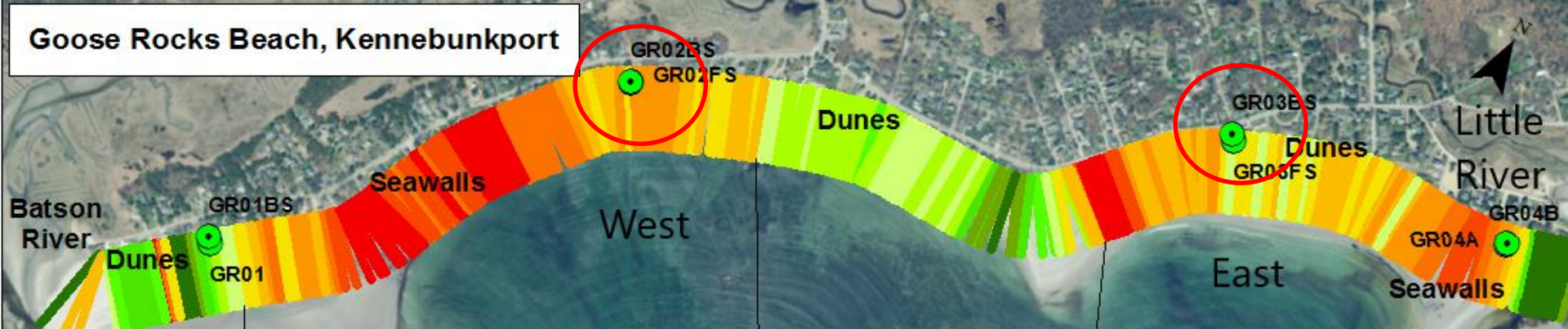
Goose Rocks Beach, Kennebunkport



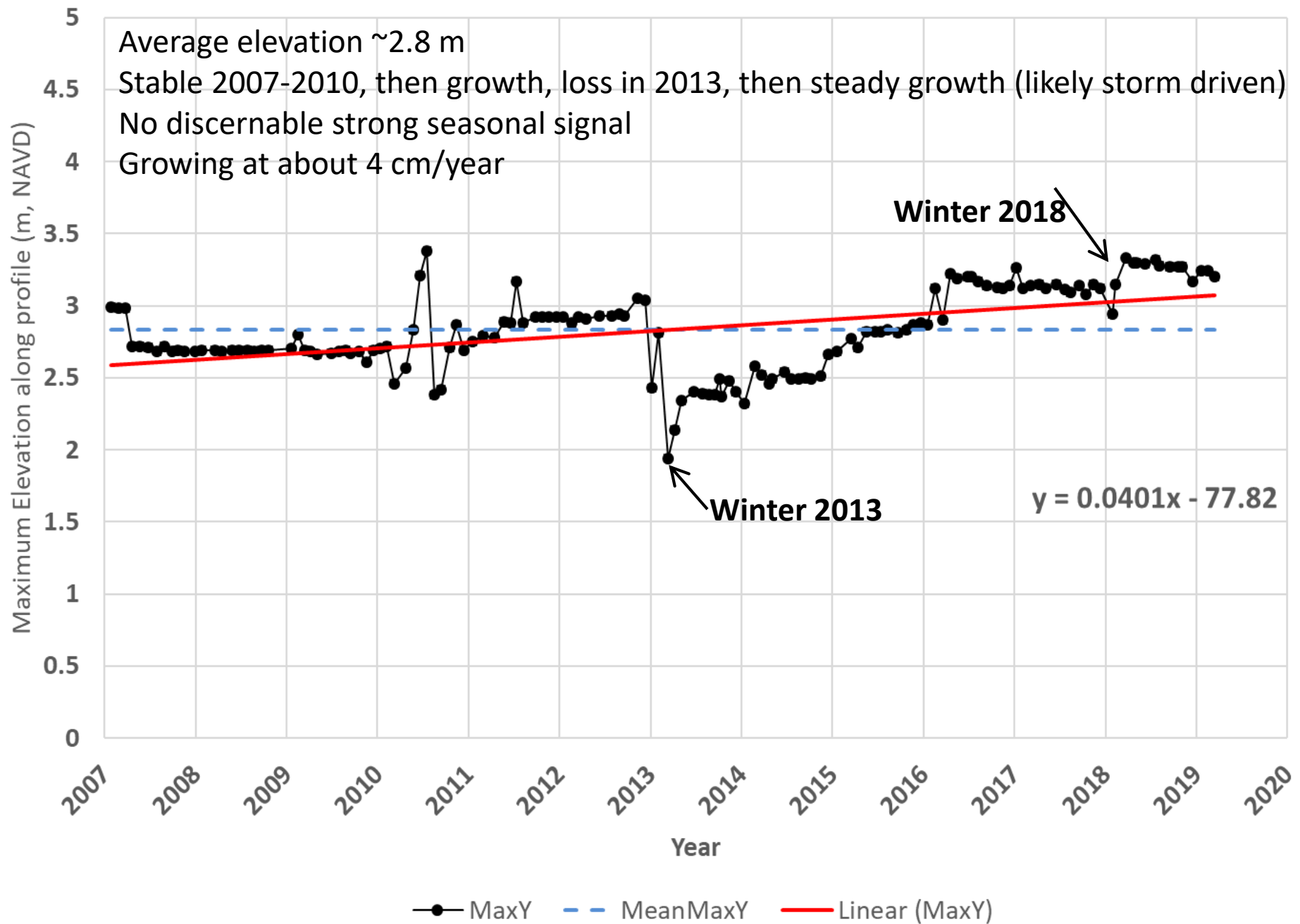
Goose Rocks Beach, Kennebunkport



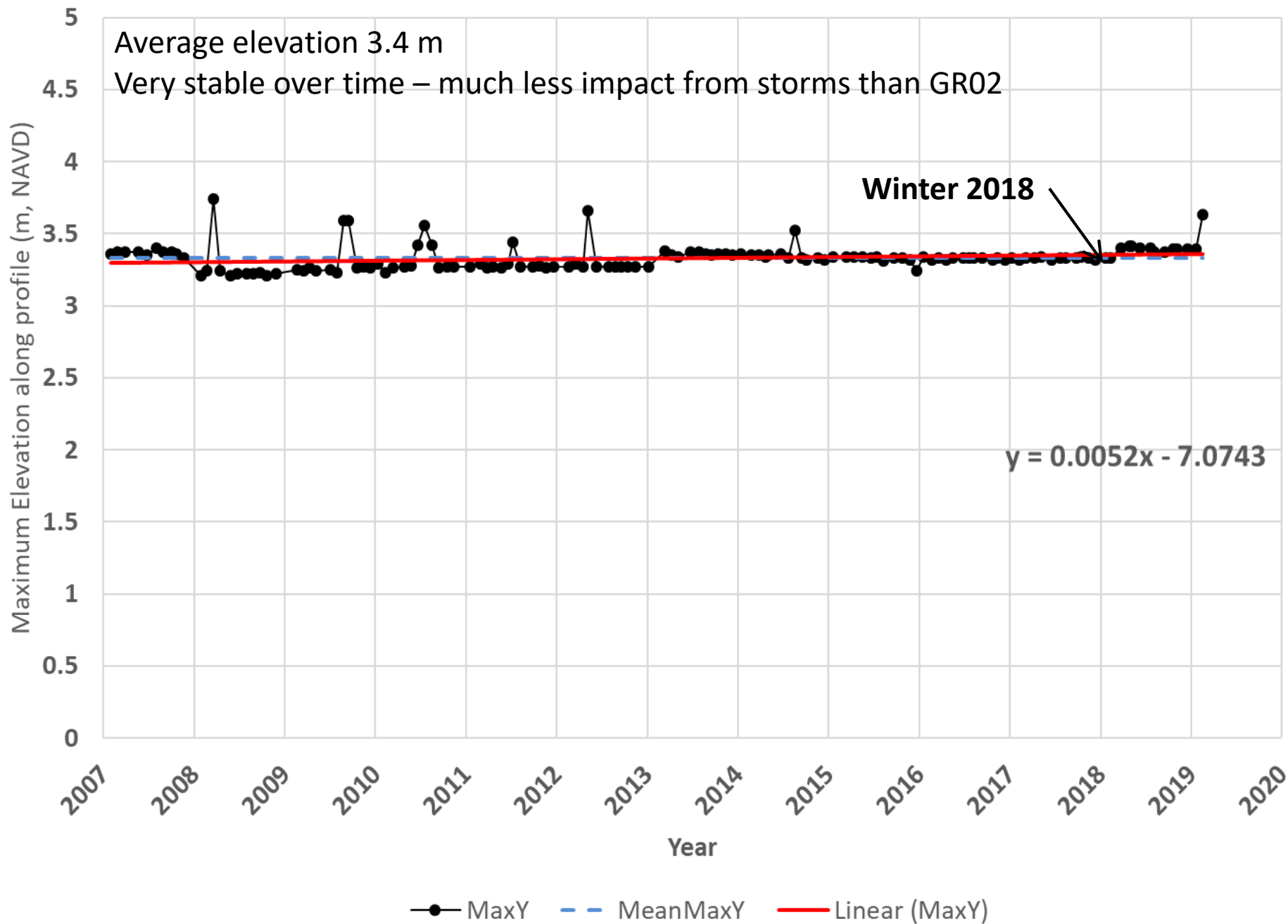
Goose Rocks Beach, Kennebunkport



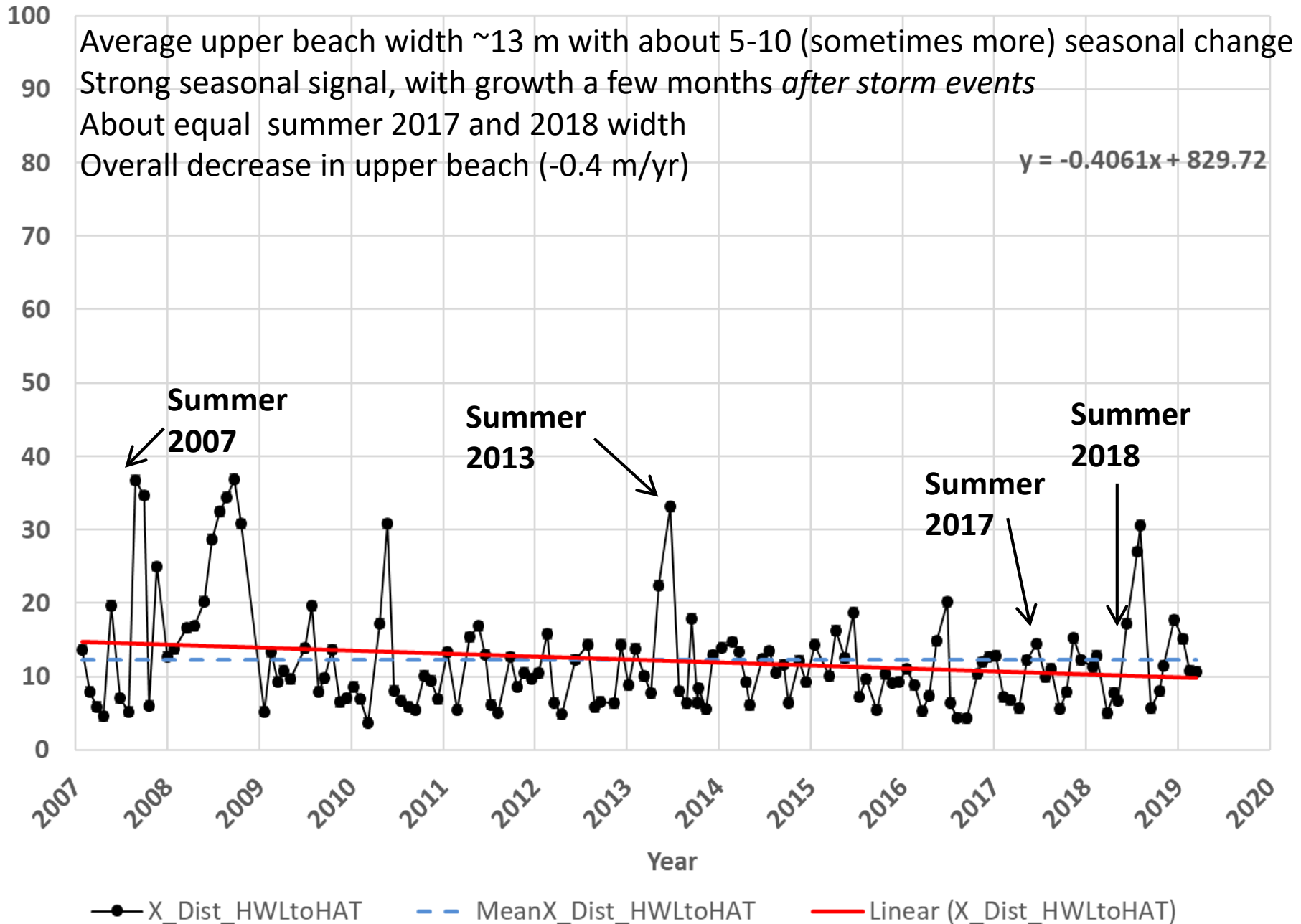
Maximum Vertical Position (NAVD88 M) for GR02



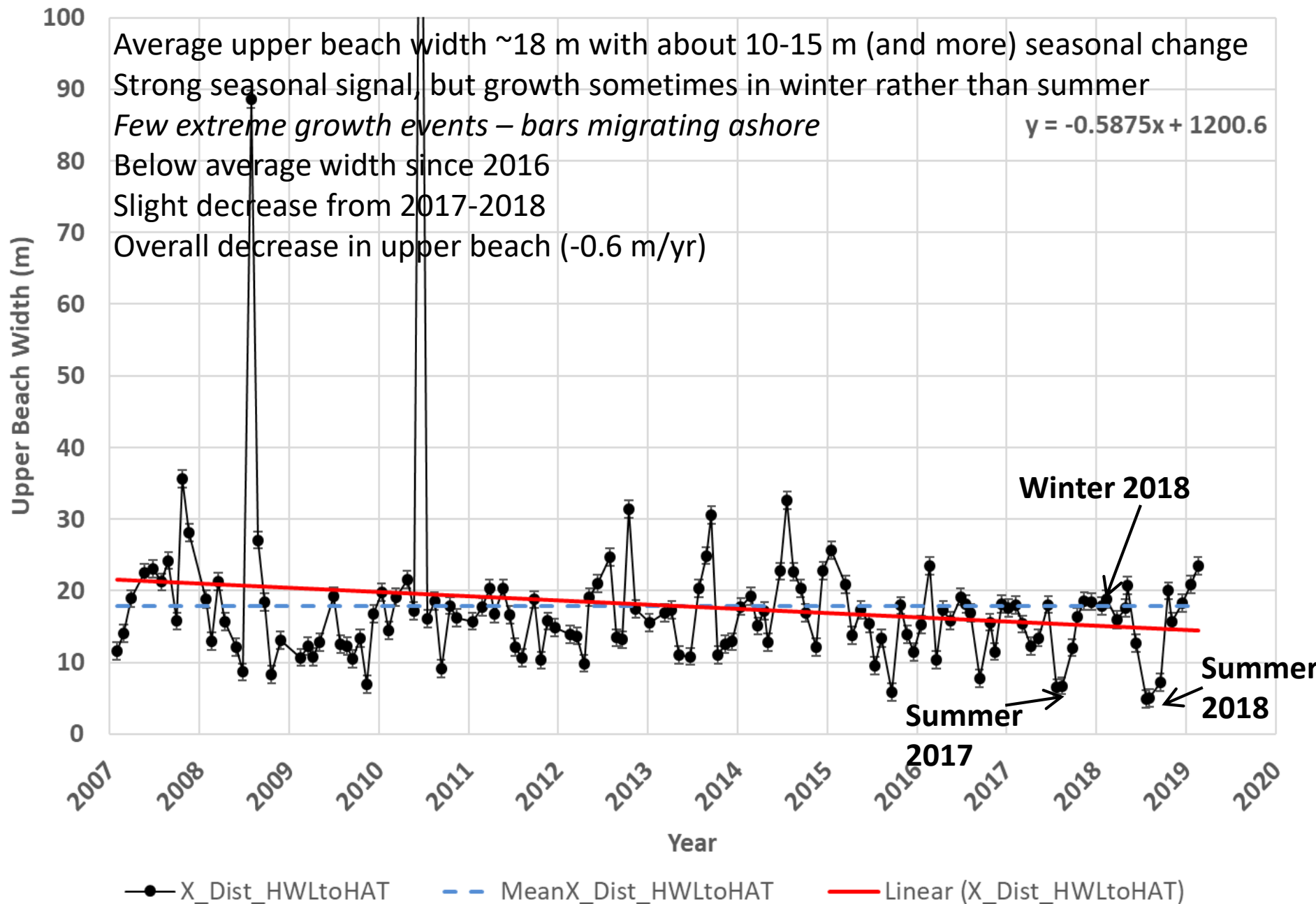
Maximum Vertical Position (NAVD88 M) for GR03



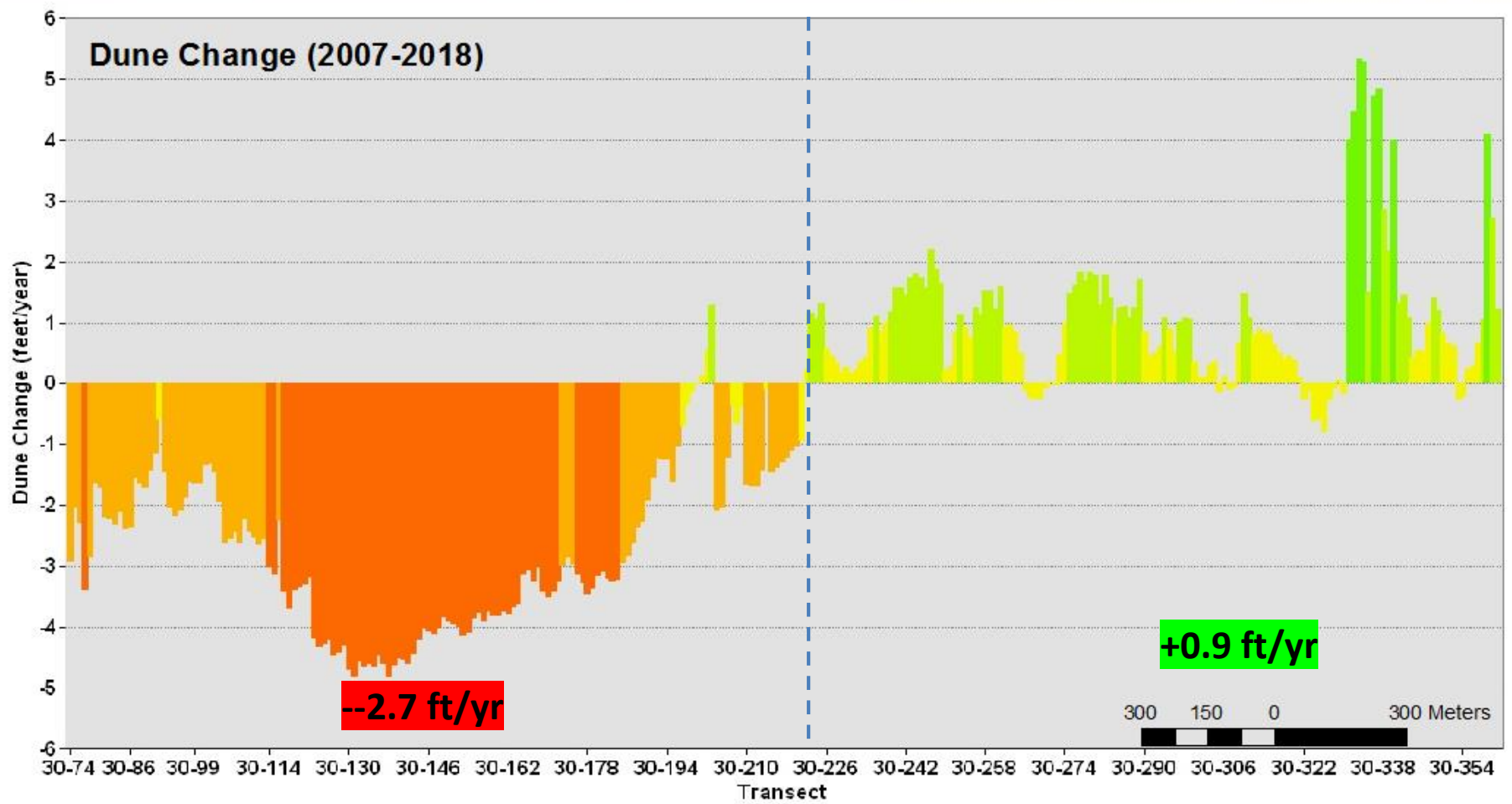
Upper Beach Width (M) for GR02



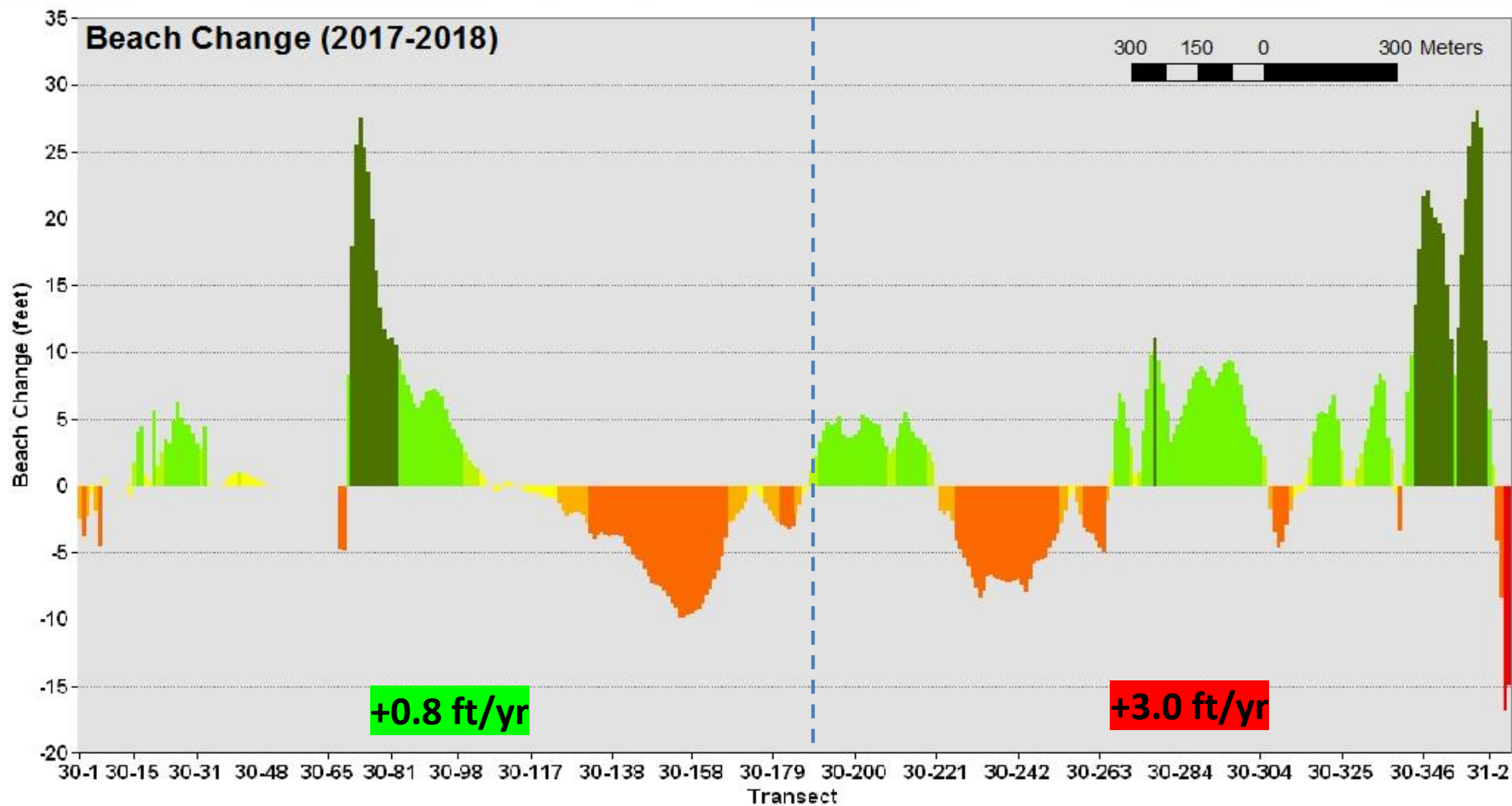
Upper Beach Width (M) for GR03



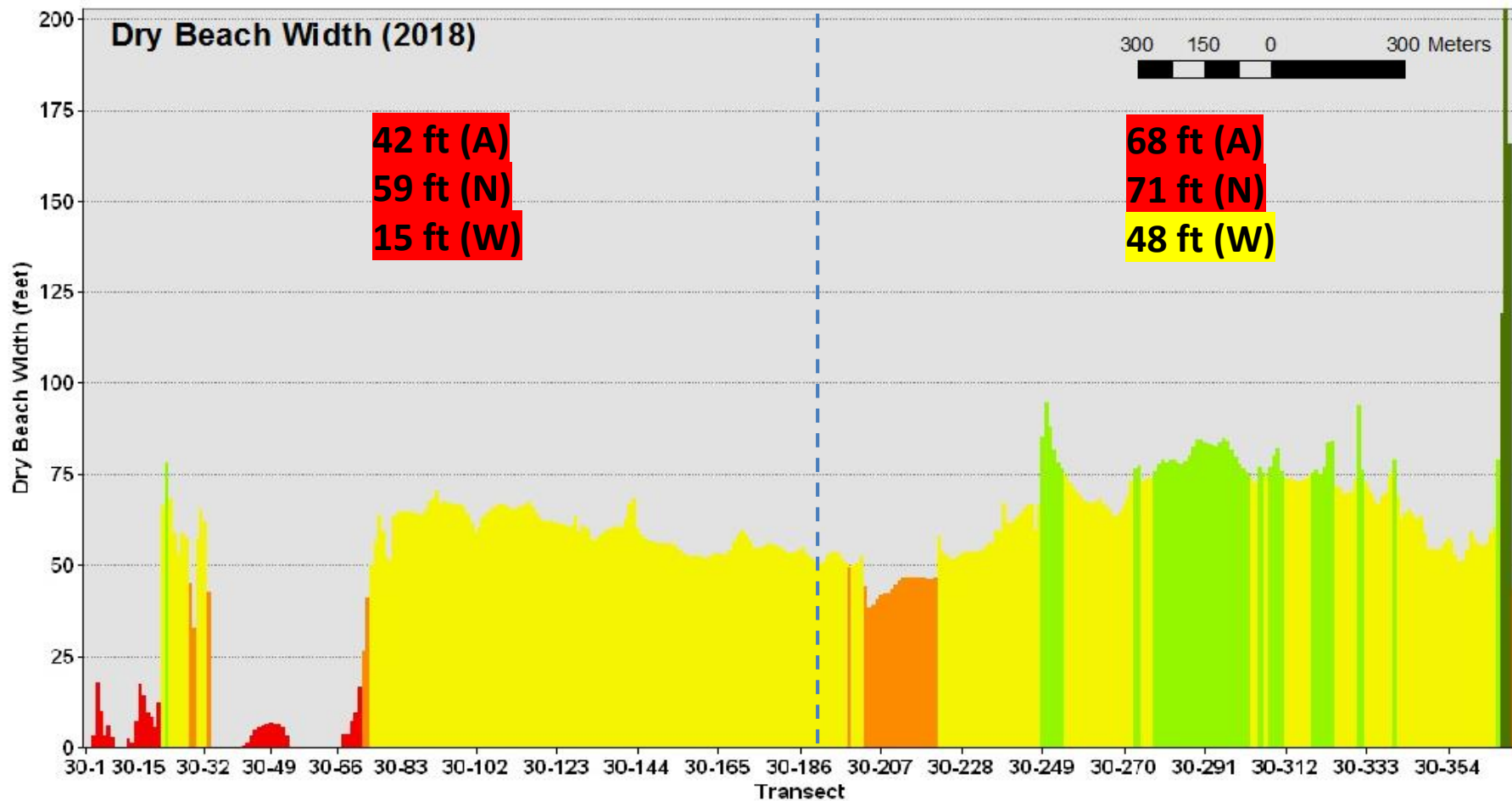
Saco Beaches, Saco



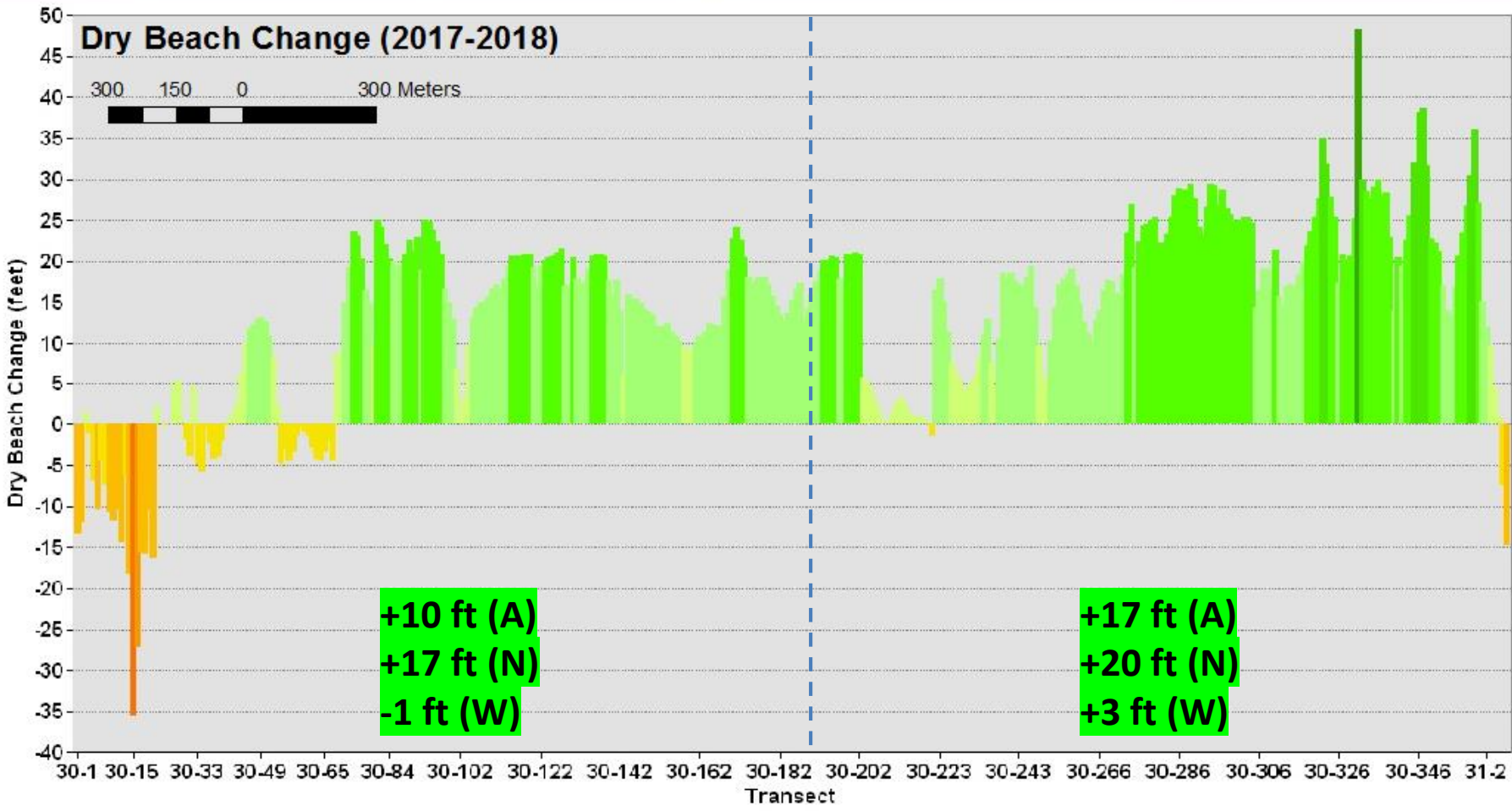
Saco Beaches, Saco



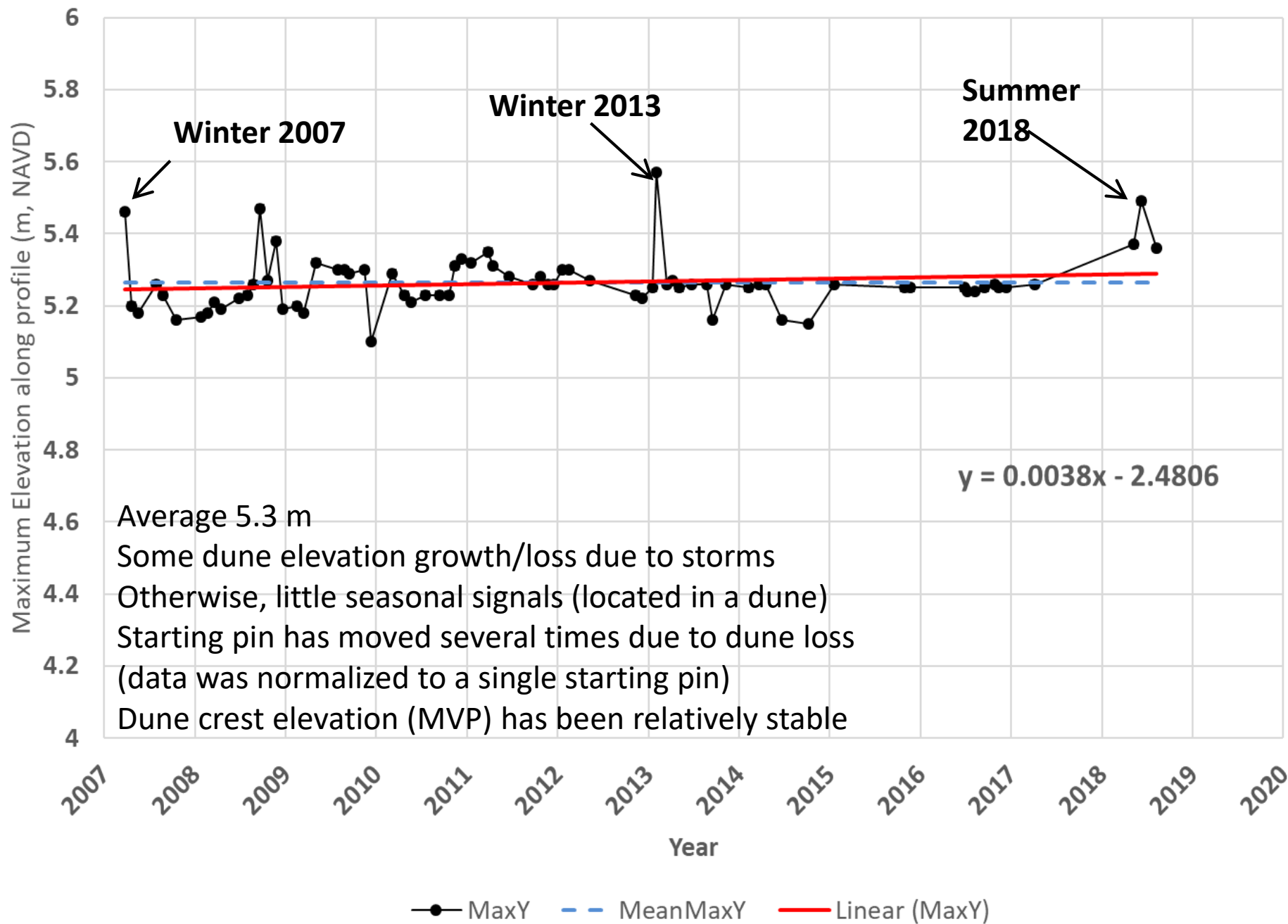
Saco Beaches, Saco



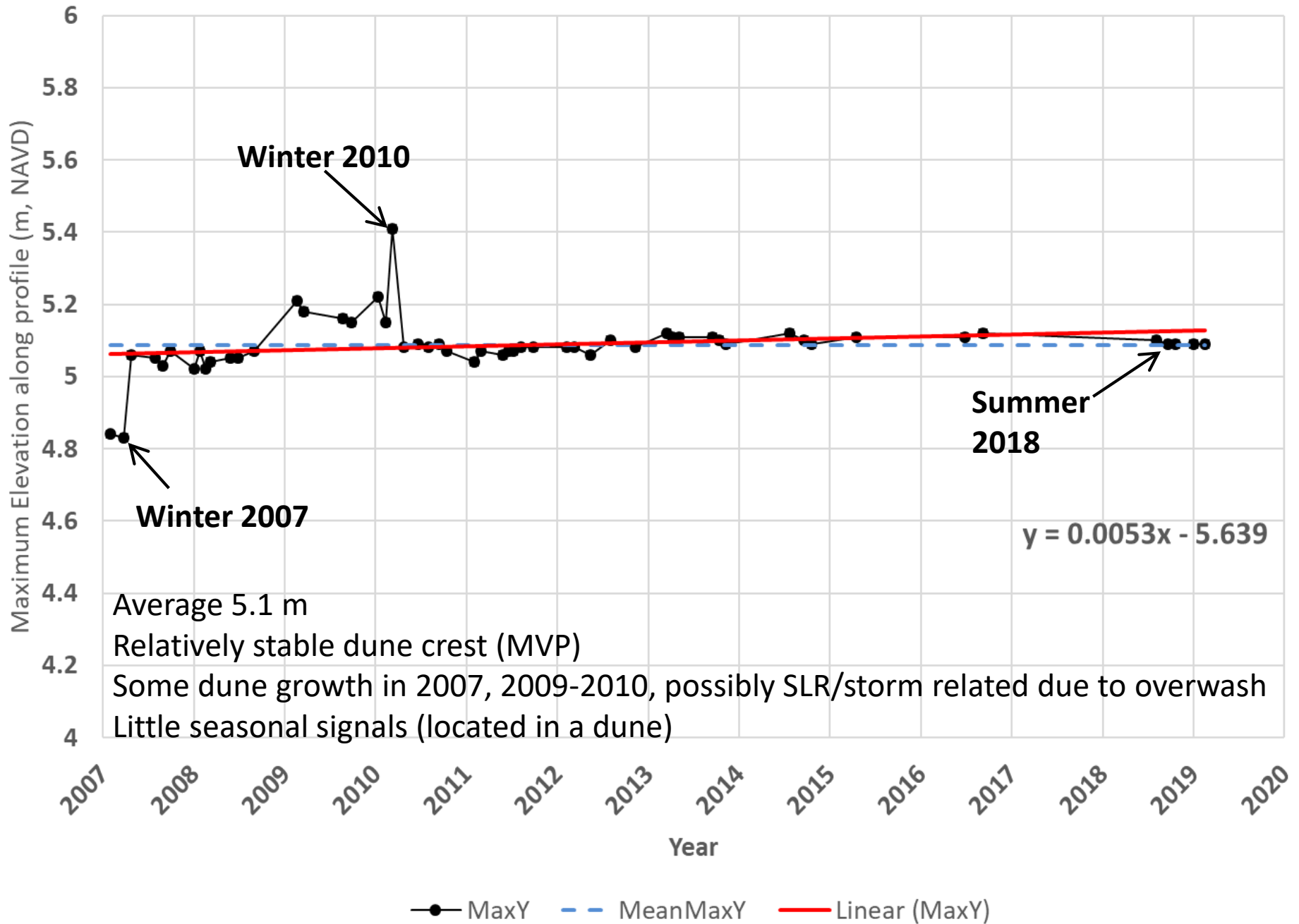
Saco Beaches, Saco



Maximum Vertical Position (NAVD88 M) for FE02



Maximum Vertical Position (NAVD88 M) for KS02



Upper Beach Width (M) for FE02

Average ~ 5 m with only small (2 m) seasonal variations
No strong seasonal signals since 2008
Unclear changes 2017-2018 due to lack of data
Overall beach loss over time (-0.2 m/year)

$$y = -0.2096x + 426.57$$

Upper Beach Width (m)

2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020

Year

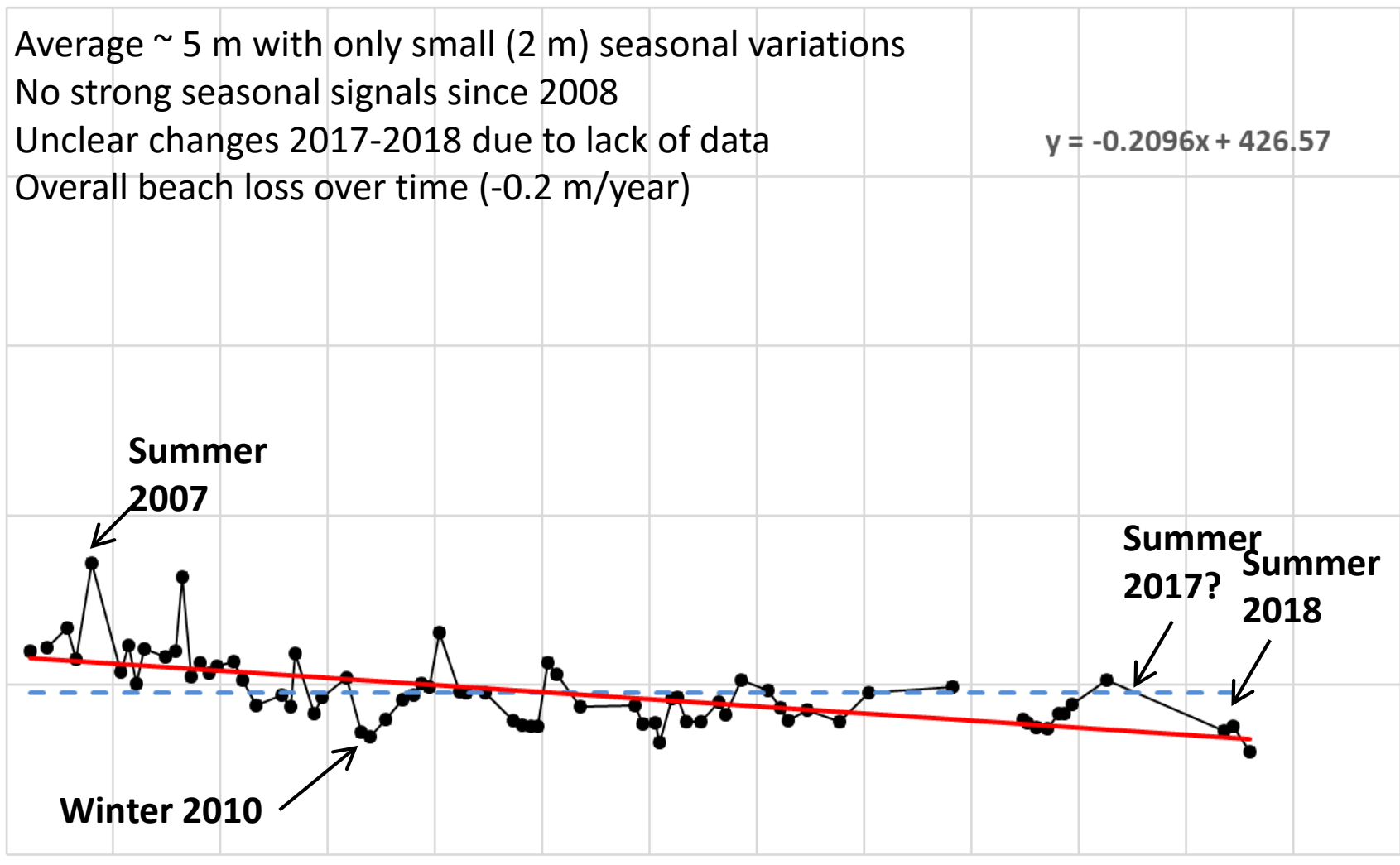
● X_Dist_HWLtoHAT - - - MeanX_Dist_HWLtoHAT — Linear (X_Dist_HWLtoHAT)

Summer 2007

Winter 2010

Summer 2017?

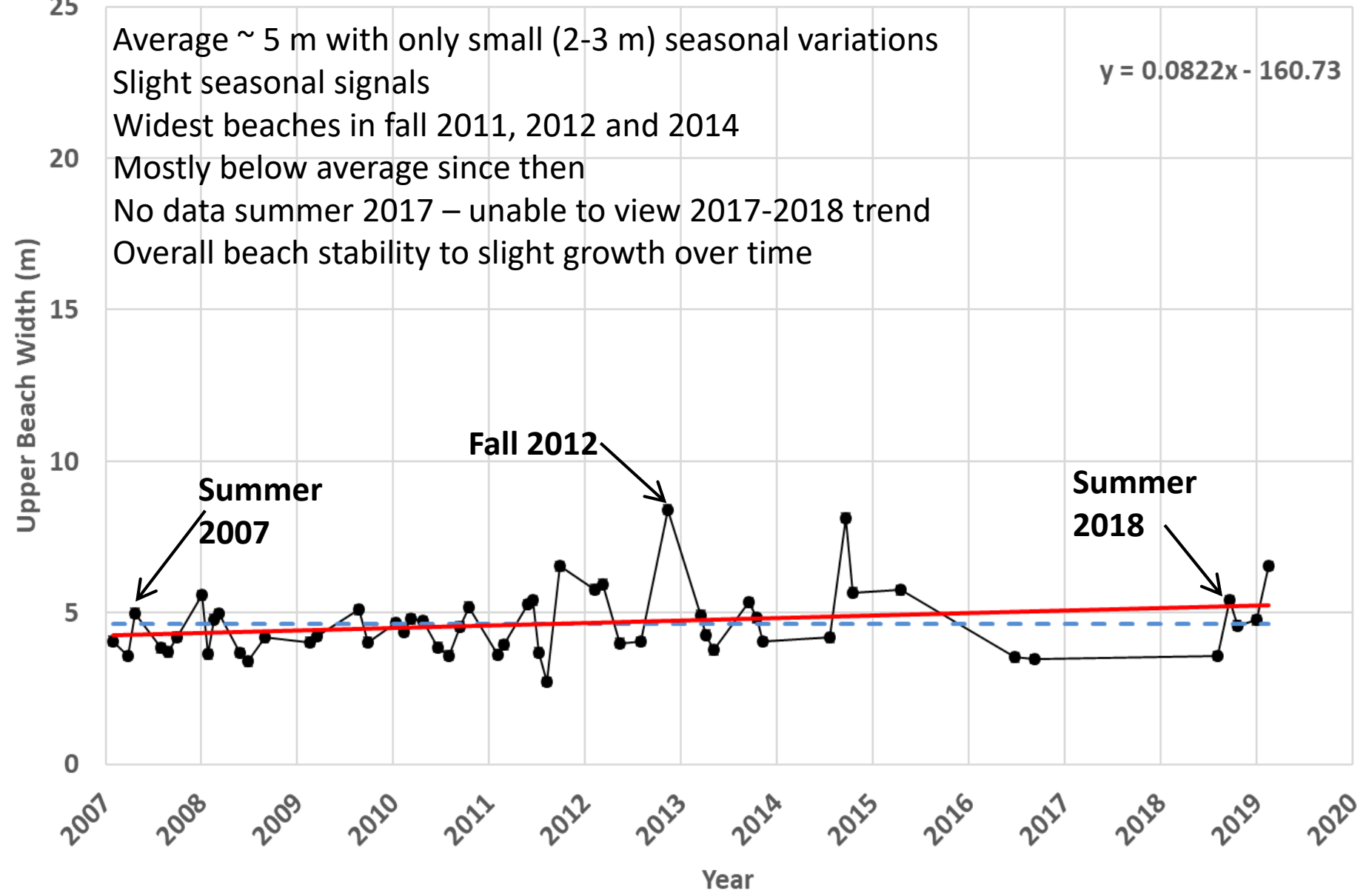
Summer 2018



Upper Beach Width (M) for KS02

Average ~ 5 m with only small (2-3 m) seasonal variations
Slight seasonal signals
Widest beaches in fall 2011, 2012 and 2014
Mostly below average since then
No data summer 2017 – unable to view 2017-2018 trend
Overall beach stability to slight growth over time

$$y = 0.0822x - 160.73$$



● X_Dist_HWLtoHAT - - - MeanX_Dist_HWLtoHAT — Linear (X_Dist_HWLtoHAT)

MBMAP Summary – Kittery to Saco

Beach	Municipality	Avg. Δdune 2007-2018 (feet/year)	Avg. Δbeach 2017-2018 (feet)	Avg. 2018 DBW Overall (feet)	Avg. 2018 DBW Natural Area (feet)	Avg 2018 DBW Wall Areas (feet)	Avg. ΔDBW Overall 2017- 2018 (feet)	Avg. ΔDBW Natural Areas 2017-2018 (feet)	Avg. ΔDBW Wall Areas 2017-2018 (feet)
Crescent	Kittery	0.8	-1.6	56.2	56.2	N/A	5.0	5.0	N/A
Seapoint	Kittery	-0.5	-2.9	70.7	70.7	N/A	4.5	4.5	N/A
Long Sands - South	York	0.8	0.3	51.2	75.9	32.3	-2.9	-1.2	-4.3
Long Sands - North	York	N/A	-7.4	40.3	N/A	40.3	-18.9	N/A	-5.7
Ogunquit	Ogunquit	0.1	2.5	101.8	114.5	40.1	14.4	17.4	-16.3
Wells	Wells	1.0	9.2	109.2	124.6	10.3	21.7	21.7	N/A
Drakes Island	Wells	-0.1	-8.5	59.1	99.8	43.3	-5.7	4.5	-9.6
Laudholm	Wells	-3.3	5.7	52.7	52.7	N/A	15.6	15.6	N/A
Crescent Surf	Kennebunk	-9.8	-19.6	58.1	68.5	18.1	-2.7	-7.2	-16.8
Parsons	Kennebunk	-13.0	-19.3	66.8	67.8	64.4	-7.9	-5.4	-17.7
Goochs	Kennebunk	-0.9	-11.6	40.6	64.2	35.8	-10.1	-4.9	-11.0
Goose Rocks - Batson River	Kennebunkport	-1.1	5.9	168.4	194.2	94.2	24.2	25.9	-2.6
Goose Rocks - West	Kennebunkport	-0.8	-23.2	86.7	N/A	86.7	-18.4	N/A	-18.4
Goose Rocks - East	Kennebunkport	1.5	-46.3	85.8	92.7	35.4	-13.2	-11.7	-24.4
Goose Rocks - Little River	Kennebunkport	-2.0	26.6	81.7	N/A	81.7	15.5	N/A	15.5
Fortunes Rocks - West	Biddeford	1.3	6.2	71.6	90.0	58.7	10.2	12.7	8.6
Fortunes Rocks - East	Biddeford	1.2	-5.0	36.9	65.3	17.8	4.3	11.1	-0.3
Hills - South	Biddeford	0.3	1.6	41.2	41.2	N/A	10.3	10.3	N/A
Hills - North	Biddeford	1.4	1.2	34.0	52.0	16.2	8.7	14.9	1.9
Camp Ellis and Ferry Beach	Saco	-2.7	0.8	42.3	59.1	14.5	10.3	16.9	-0.5
Bayview and Kinney Shores	Saco	0.9	3.0	67.8	71.2	47.6	17.6	19.9	3.5
Average (for all beaches monitored)		-0.1	-2.3	76.0	84.7	52.4	4.0	7.7	-5.2

LEGEND



Below state average

Above state average

At State average (or very close to state average)

MBMAP Summary – Old Orchard to Bristol

Beach	Municipality	Avg. Δdune 2007-2018 (feet/year)	Avg. Δbeach 2017-2018 (feet)	Avg. 2018 DBW Overall (feet)	Avg. 2018 DBW Natural Area (feet)	Avg 2018 DBW Wall Areas (feet)	Avg. ΔDBW Overall 2017- 2018 (feet)	Avg. ΔDBW Natural Areas 2017-2018 (feet)	Avg. ΔDBW Wall Areas 2017-2018 (feet)
Ocean Park and West Grand	Old Orchard	1.2	22.8	121.0	121.0	N/A	27.3	27.3	N/A
Old Orchard and East Grand	Old Orchard	3.5	0.9	92.5	92.5	N/A	12.2	12.2	N/A
East Grand Beach	Scarborough	2.5	7.1	57.0	57.0	N/A	21.3	21.3	N/A
Pine Point Beach	Scarborough	-0.6	-2.0	56.9	56.9	N/A	11.9	11.9	N/A
Ferry	Scarborough	0.4	2.3	19.1	19.1	N/A	6.3	6.3	N/A
Western	Scarborough	-1.2	-12.9	77.8	77.8	N/A	-20.6	-20.6	N/A
Scarborough	Scarborough	0.9	2.1	52.5	66.0	18.1	5.7	11.0	-8.9
Higgins	Scarborough	-6.1	20.0	77.0	122.0	40.0	20.0	108.0	-23.0
Crescent	Cape Elizabeth	0.1	11.4	74.3	74.3	N/A	17.3	17.3	N/A
Willard	South Portland	1.3	-0.3	45.5	49.0	9.9	6.2	6.6	3.3
Small Point	Phippsburg	4.3	N/A	96.7	96.7	N/A	N/A	N/A	N/A
Popham - West Beach	Phippsburg	-17.1	-1.1	102.7	102.7	N/A	-91.1	-91.1	N/A
Popham - Center Beach	Phippsburg	-3.8	3.5	11.1	11.1	N/A	6.1	6.1	N/A
Popham - Spit Area	Phippsburg	-19.2	18.4	733.5	733.5	N/A	-8.6	-8.6	N/A
Popham - East Beach	Phippsburg	-9.9	-4.6	141.2	141.2	N/A	13.3	13.3	N/A
Popham - Hunnewell	Phippsburg	-5.3	-47.8	109.2	125.9	65.2	-46.8	-46.2	-49.3
Popham - Riverside	Phippsburg	3.4	-26.2	89.1	89.1	N/A	-15.7	-15.7	N/A
Reid - Little River	Georgetown	-0.2	7.9	49.0	49.0	N/A	10.4	10.4	N/A
Reid - Half Mile	Georgetown	3.0	-49.0	107.2	107.2	N/A	-32.7	-32.7	N/A
Reid - Mile Stretch	Georgetown	1.3	-9.6	110.9	110.9	N/A	-1.6	-1.6	N/A
Pemaquid	Bristol	0.1	0.5	61.5	61.5	N/A	0.5	0.5	N/A
Average (for all beaches monitored)		-0.1	-2.3	76.0	84.7	52.4	4.0	7.7	-5.2

LEGEND		Below state average		
		Above state average		
		At State average (or very close to state average)		

MBMAP Summary Overall

Dune Changes – average score was -0.1 feet per year

17 beaches (42%) were below the state average

5 beaches (12%) were about average

19 beaches (46%) were above the state average

1 beach was not scored

Beach Changes – average score was -2.3 feet

14 beaches (34%) were below the state average

3 beaches (7%) were about average

24 beaches (59%) were above the state average

1 beach was not scored

MBMAP Summary Overall

Dry Beach Width – average score was 76.0 feet

22 beaches (54%) were below the state average

4 beaches (10%) were about average

16 beaches (39%) were above the state average

Dry Beach Width (Natural) – average score was 84.7 feet

22 beaches (56%) were below the state average

2 beaches (5%) were about average

15 beaches (39%) were above the state average

3 beaches were not scored

Dry Beach Width (Wall) – average score was 52.4 feet

14 beaches (66%) were below the state average

1 beach (5%) was about average

6 beaches (29%) were above the state average

21 beaches were not scored

MBMAP Summary Overall

Dry Beach Width Change (Overall) – average score was +4.0 feet

16 beaches (38%) were below the state average

9 beaches (21%) were about average

17 beaches (41%) were above the state average

Dry Beach Width Change (Natural) – average score was 7.7 feet

13 beaches (34%) were below the state average

10 beaches (26%) was about average

15 beaches (40%) were above the state average

4 beaches were not scored

Dry Beach Width Change (Wall) – average score was -5.2 feet

10 beaches (50%) were below the state average

3 beaches (15%) was about average

7 beaches (35%) were above the state average

22 beaches were not scored

SMBPP - Maximum Vertical Position (MVP) Changes

Increasing trends overall:

Ogunquit Beach, Wells Beach, Goose Rocks Beach, Kinney Shores, and East Grand Beach

Stable or stable to slightly increasing trends overall :

Long Sands Beach, Goochs Beach, Ferry Beach (Saco), West Grand Beach, Scarborough Beach, and Willard Beach

Slightly decreasing or mostly decreasing trends overall:

Drakes Island, Higgins Beach

Decreasing trends overall:

Laudholm Beach, Fortunes Rocks Beach

SMBPP - Upper Beach Width (UBW) Changes

Increasing trends overall:

Fortunes Rocks Beach, Higgins Beach (Spurwink River)

Stable or stable to slightly increasing trends overall:

Wells Beach, Kinney Shores, Scarborough Beach, and Willard Beach

Slightly decreasing or mostly decreasing trends overall:

Long Sands Beach, Ogunquit Beach, Goochs Beach, Goose Rocks Beach, West Grand Beach, East Grand Beach

Decreasing trends overall:

Drakes Island Beach, Laudholm Beach, Ferry Beach

How can you access all this information?

Visit the posters in the exhibition area!

2019 State of Maine's Beaches Report:

<http://www.maine.gov/dacf/mgs/explore/marine/beaches19/contents.htm>

2019 Beach Profile Report

https://digitalmaine.com/mgs_publications/571/

SMBPP Beach Profile Database:

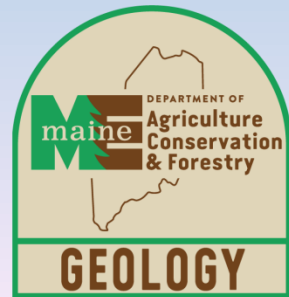
<http://www.mainecoastdata.org/reports/BeachProfileGraph.aspx>

MBMAP Online Viewer:

http://www.maine.gov/dacf/mgs/hazards/beach_mapping/index.shtml



Acknowledgements



With additional financial support from participating coastal communities.