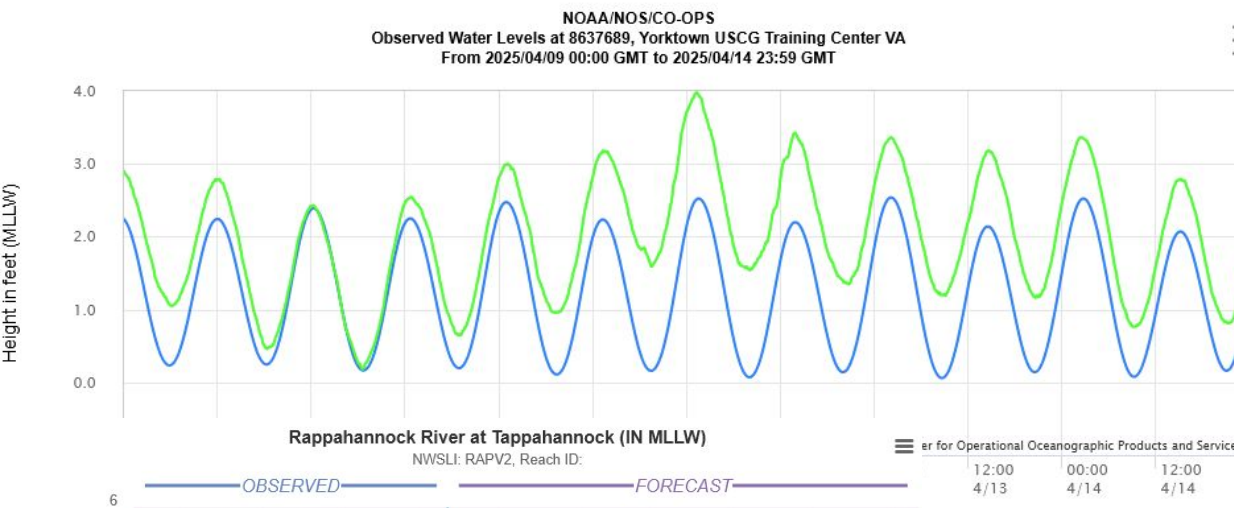
Rising Waters & Living Shoreline Design

June 25, 2025

Erin Reilly
Conservation and Restoration Coordinator

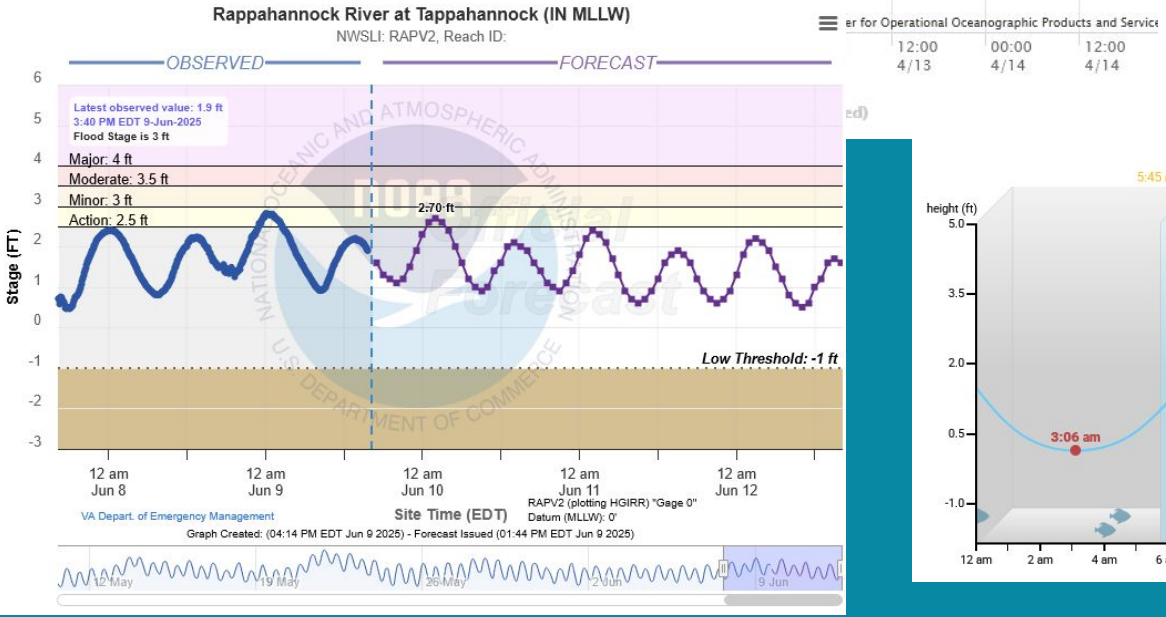
CHESAPEAKE BAY
NATIONAL ESTUARINE
RESEARCH RESERVE
VIRGINIA

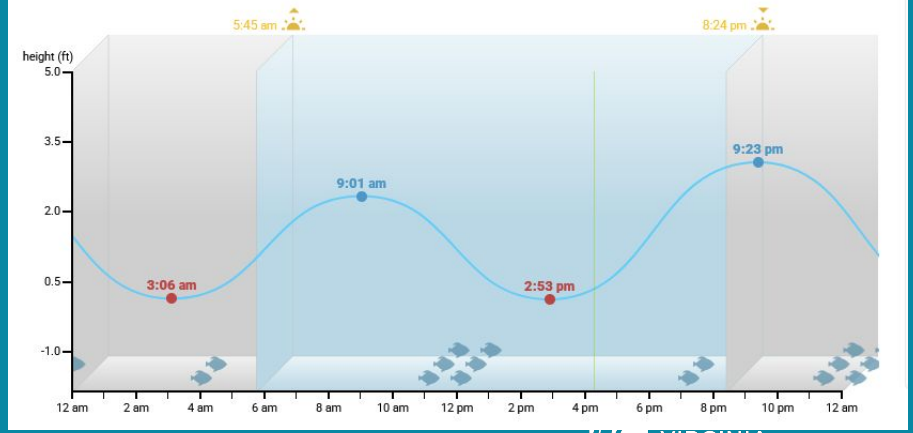


Norfolk, VA Tides - Jun 2025

< May 2025 | Print this Tide Chart | Jul 2025 >

Date		High Tide				Low Tide				Sun		Moon
		AM	ft	PM	ft	AM	ft	PM	ft	Rise	Set	
5	Thu	5:57	2.3	6:34	2.8	12:04	0.4	12:01	0.4	5:44	8:23	
6	Fri	6:49	2.3	7:19	2.9	12:55	0.4	12:44	0.4	5:44	8:23	
7	Sat	7:36	2.3	8:00	3.0	1:43	0.3	1:25	0.3	5:44	8:24	
8	Sun	8:20	2.3	8:41	3.1	2:29	0.3	2:07	0.3	5:44	8:24	
9	Mon	9:03	2.4	9:21	3.1	3:12	0.2	2:50	0.3	5:43	8:25	
10	Tue	9:45	2.4	10:01	3.1	3:53	0.2	3:32	0.3	5:43	8:25	
11	Wed	10:25	2.4	10:39	3.1	4:31	0.2	4:13	0.2	5:43	8:26	
12	Thu	11:04	2.5	11:18	3.1	5:07	0.2	4:52	0.2	5:43	8:26	
13	Fri	11:44	2.5	11:57	3.1	5:43	0.2	5:32	0.2	5:43	8:27	
14	Sat			12:25	2.5	6:21	0.2	6:15	0.3	5:43	8:27	





VIRGINIA

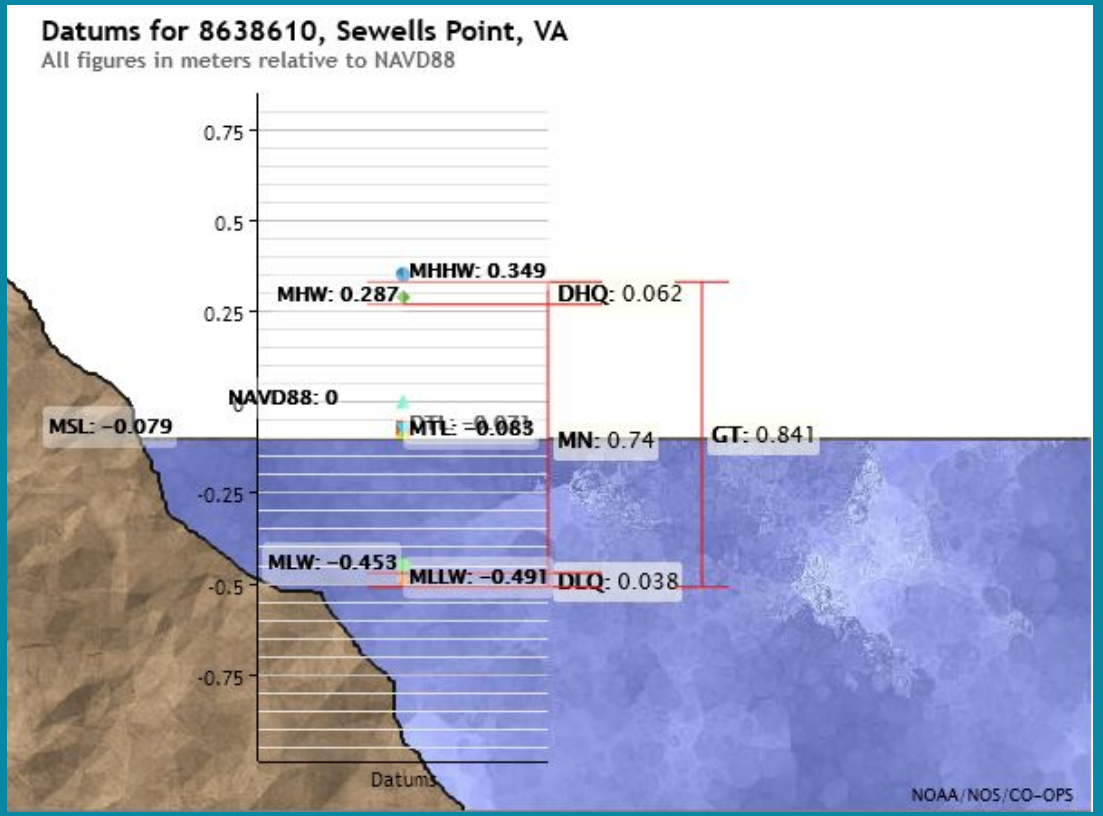
Definitions

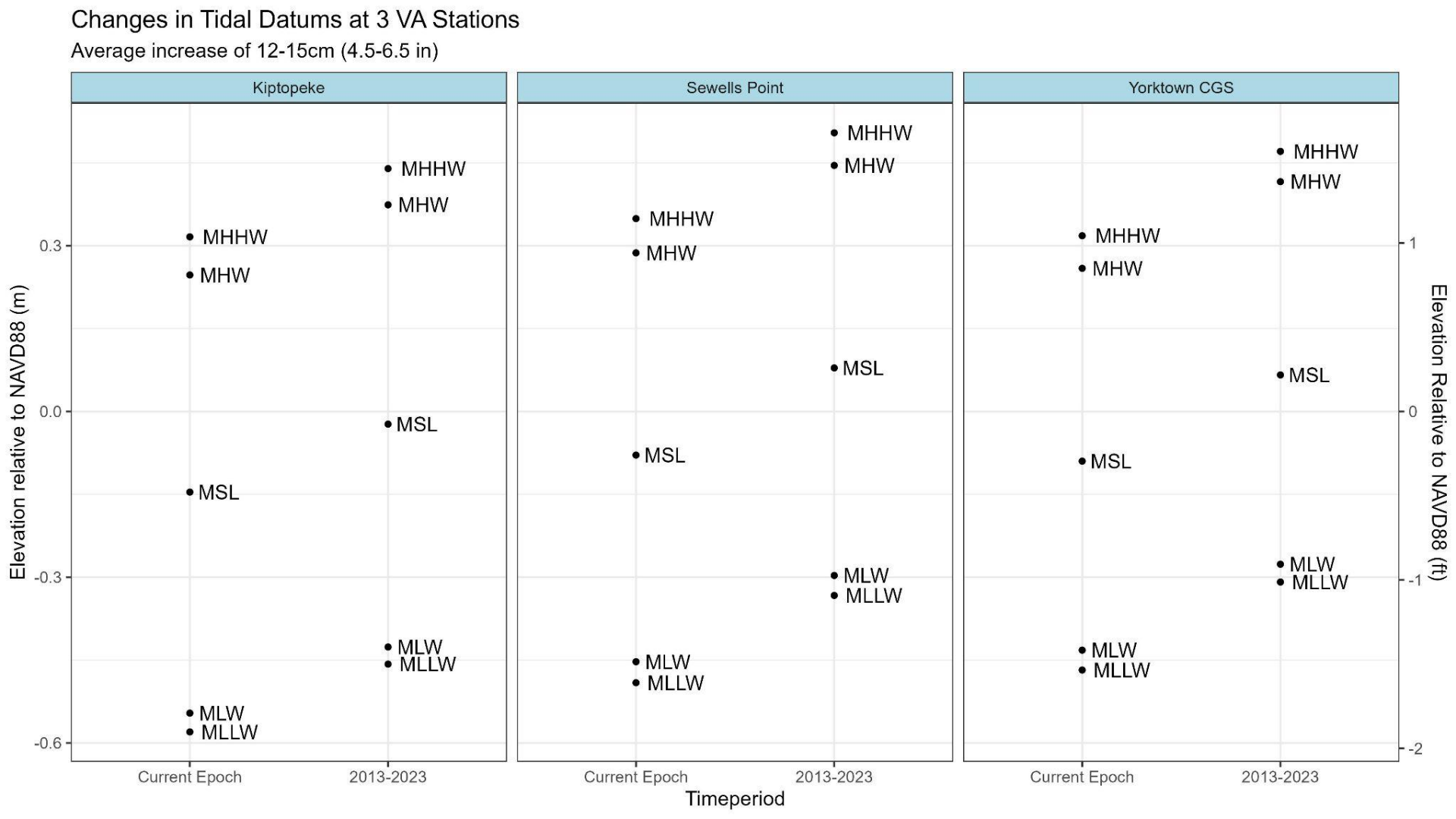
A datum is a base elevation used as a reference from which to determine heights or depths

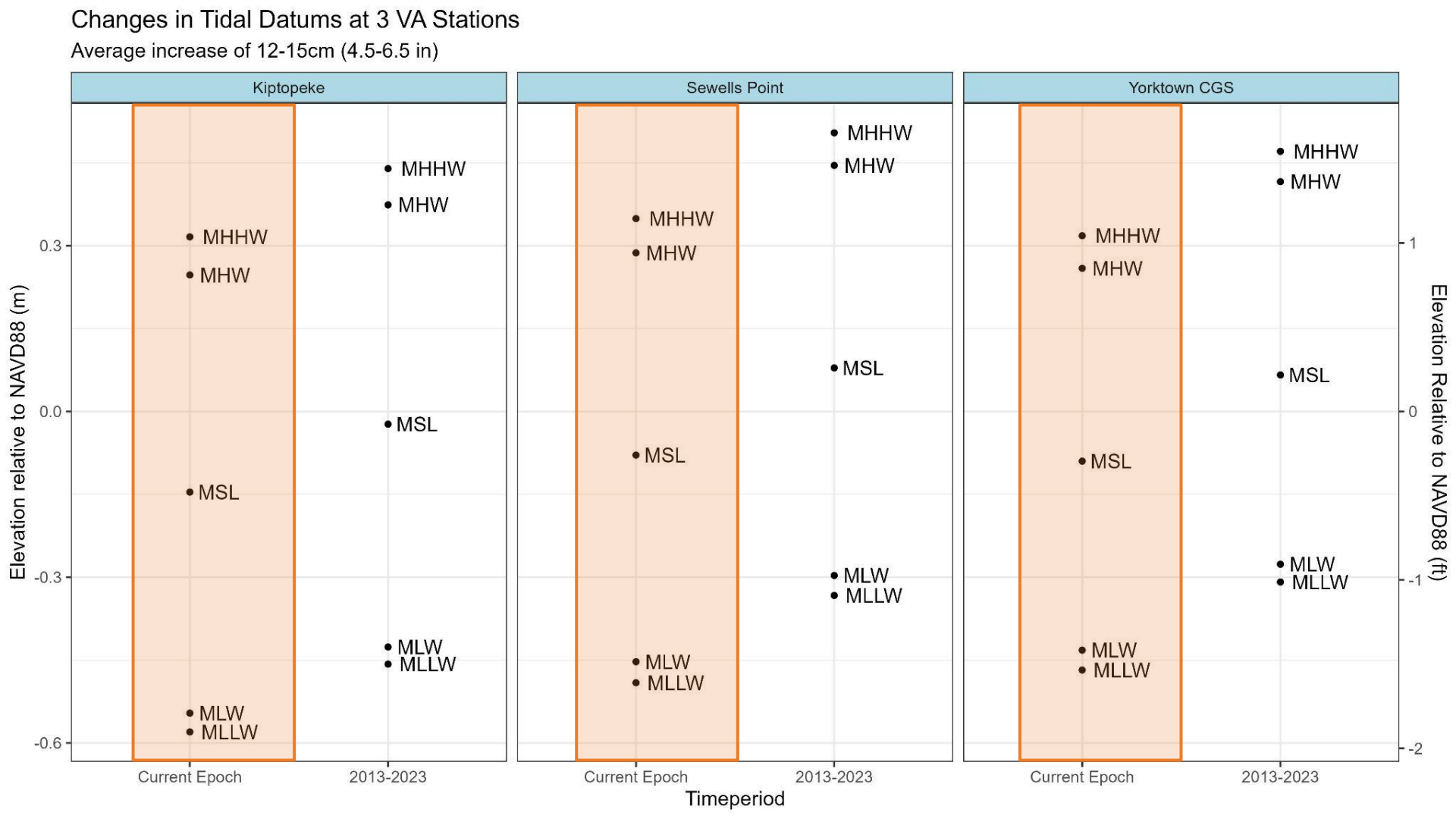
A tidal datum is a standard elevation defined by a certain phase of the tide.

Mean High Water (MHW) - Average of all High Tides

Mean Low Water (MLW) - Average of all Low Tides




Changes in Tidal Datums at 3 VA Stations
Average increase of 12-15cm (4.5-6.5 in)
Kiptopeke
Sewells Point
Yorktown CGS
MHHW
MHW
MSL
MLW
MLLW
0.3
0.0
-0.3
-0.6
1
0
-1
-2
Elevation relative to NAVD88 (m)
Elevation Relative to NAVD88 (ft)
Current Epoch
2013-2023
Timeperiod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Average increase of 12-15cm (4.5-6.5 in)
Kiptopeke
Sewells Point
Yorktown CGS
MHHW
MHW
MSL
MLW
MLLW
0.3
0.0
-0.3
-0.6
1
0
-1
-2
Elevation relative to NAVD88 (m)
Elevation Relative to NAVD88 (ft)
Current Epoch
2013-2023
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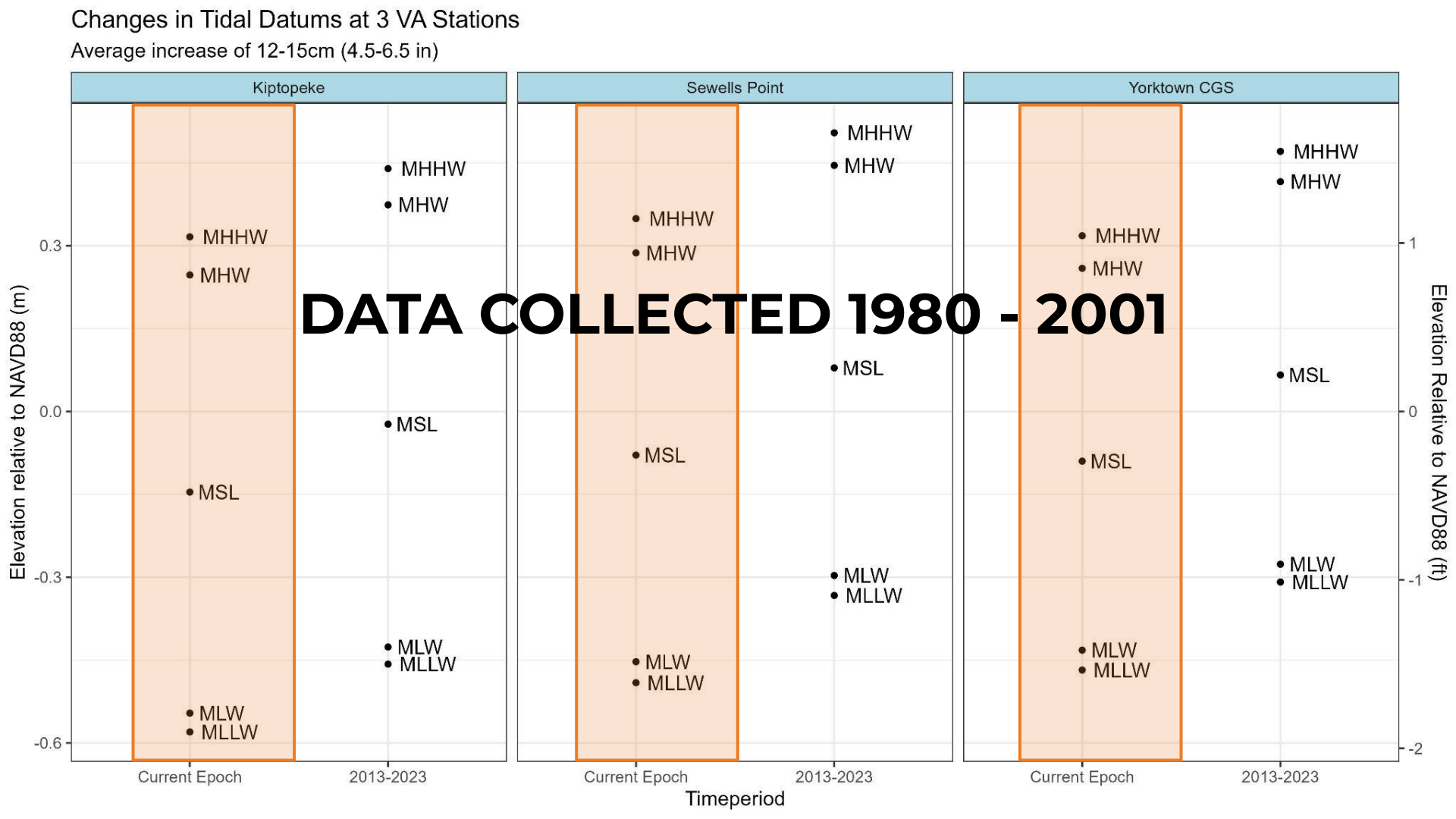
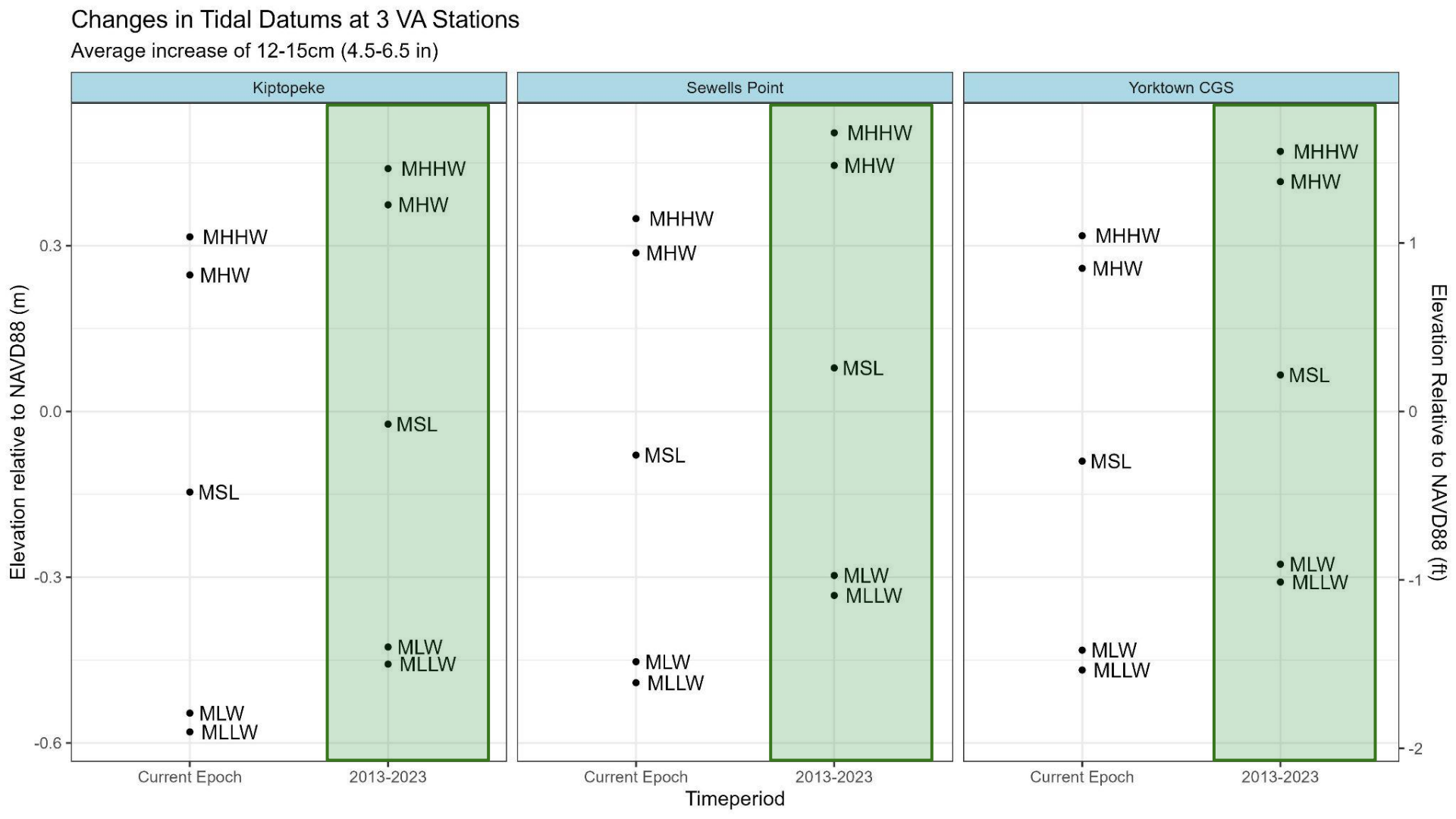
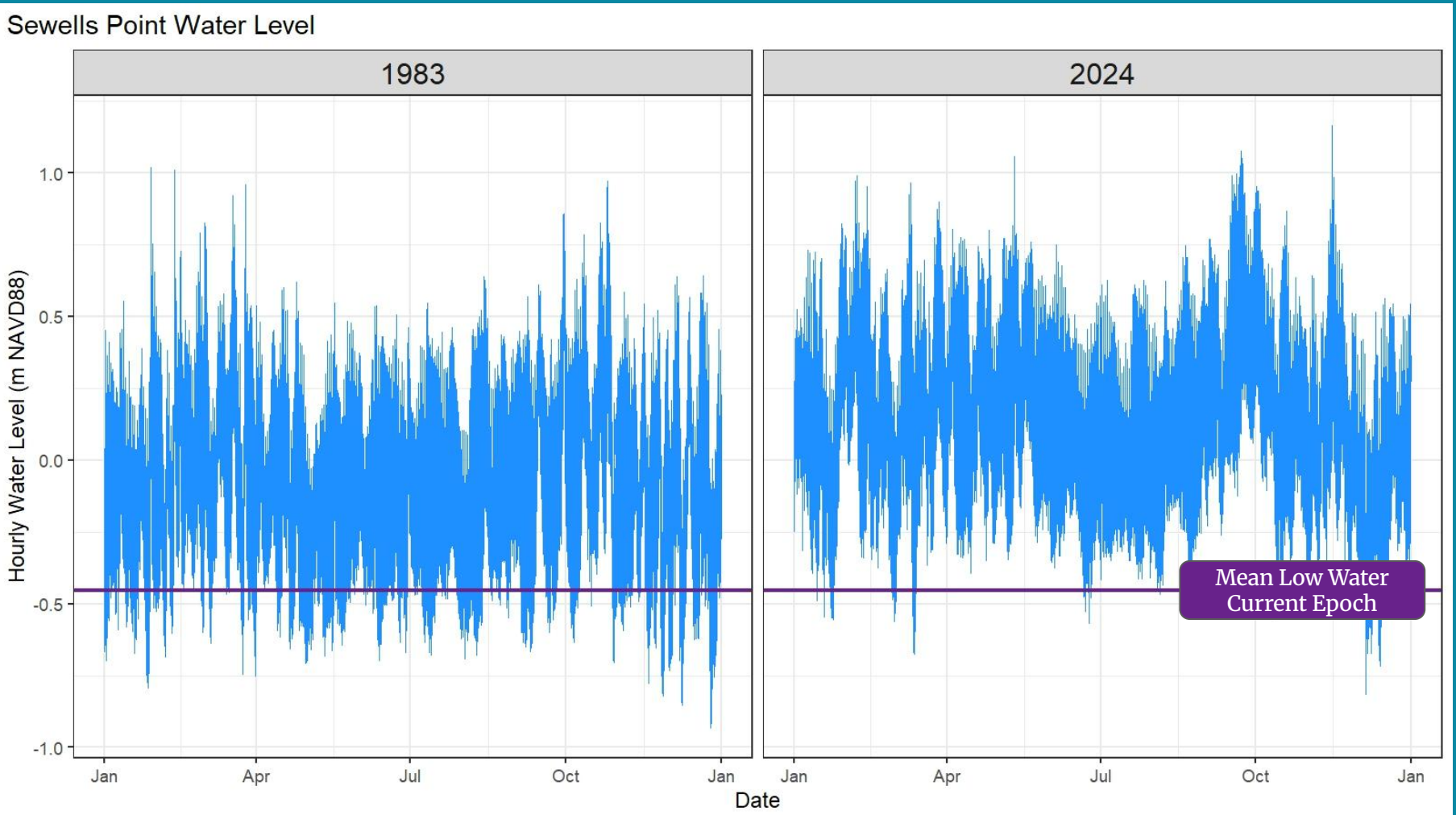
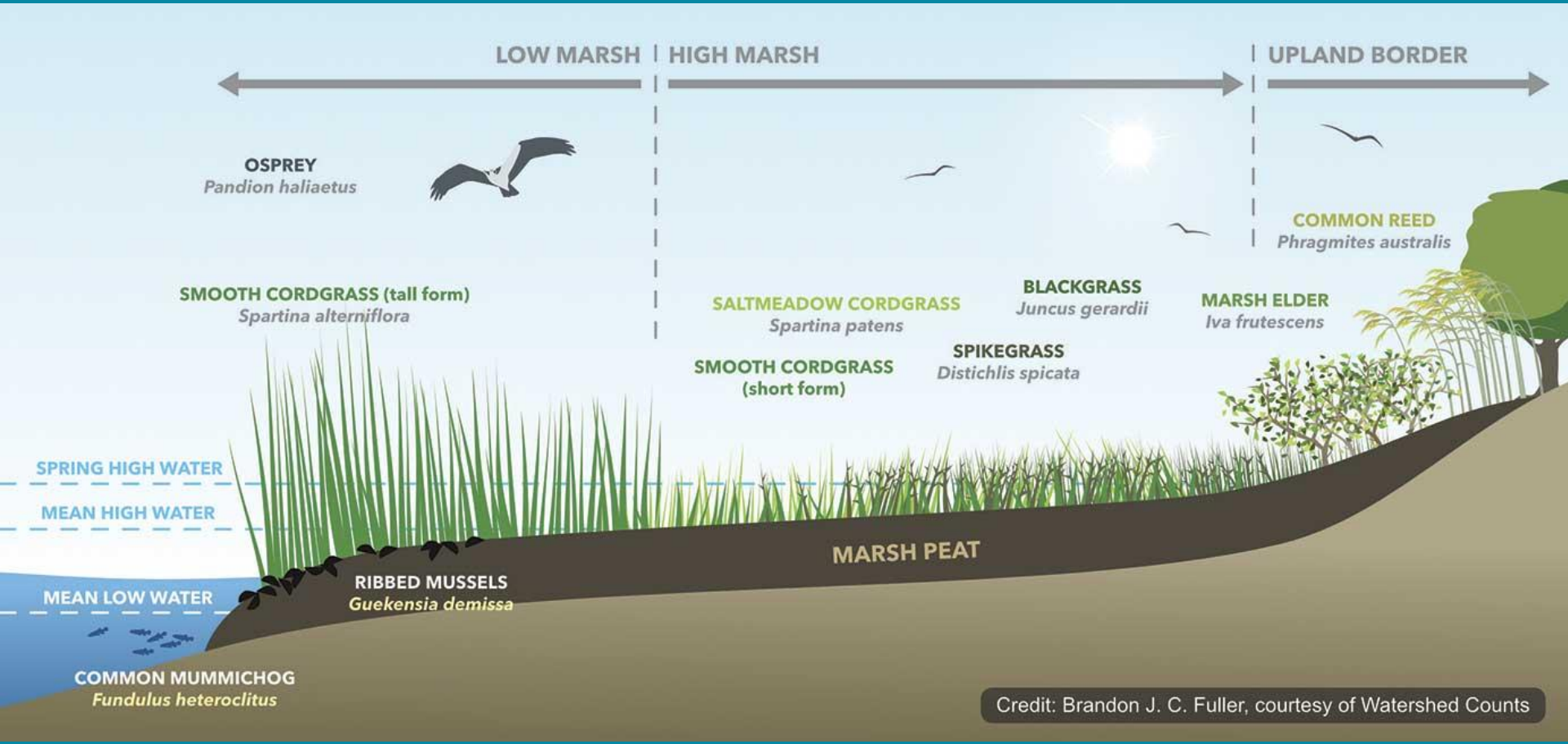

Changes in Tidal Datums at 3 VA Stations
Average increase of 12-15cm (4.5-6.5 in)
Kiptopeke
Sewells Point
Yorktown CGS
DATA COLLECTED 1980 - 2001
MHHW
MHW
MSL
MLW
MLLW
0.3
0.0
-0.3
-0.6
1
0
-1
-2
Elevation relative to NAVD88 (m)
Elevation Relative to NAVD88 (ft)
Current Epoch
2013-2023
Timeperiod


Changes in Tidal Datums at 3 VA Stations
Average increase of 12-15cm (4.5-6.5 in)
Kiptopeke
Sewells Point
Yorktown CGS
MHHW
MHW
MSL
MLW
MLLW
0.3
0.0
-0.3
-0.6
1
0
-1
-2
Elevation relative to NAVD88 (m)
Elevation Relative to NAVD88 (ft)
Current Epoch
2013-2023
Timeperiod


Sewells Point Water Level
1983
2024
Hourly Water Level (m NAVD88)
1.0
0.5
0.0
-0.5
-1.0
Jan
Apr
Jul
Oct
Jan
Jan
Apr
Jul
Oct
Jan
Date
Mean Low Water
Current Epoch

So what does this mean for Living Shoreline Design?

Plant Physiology



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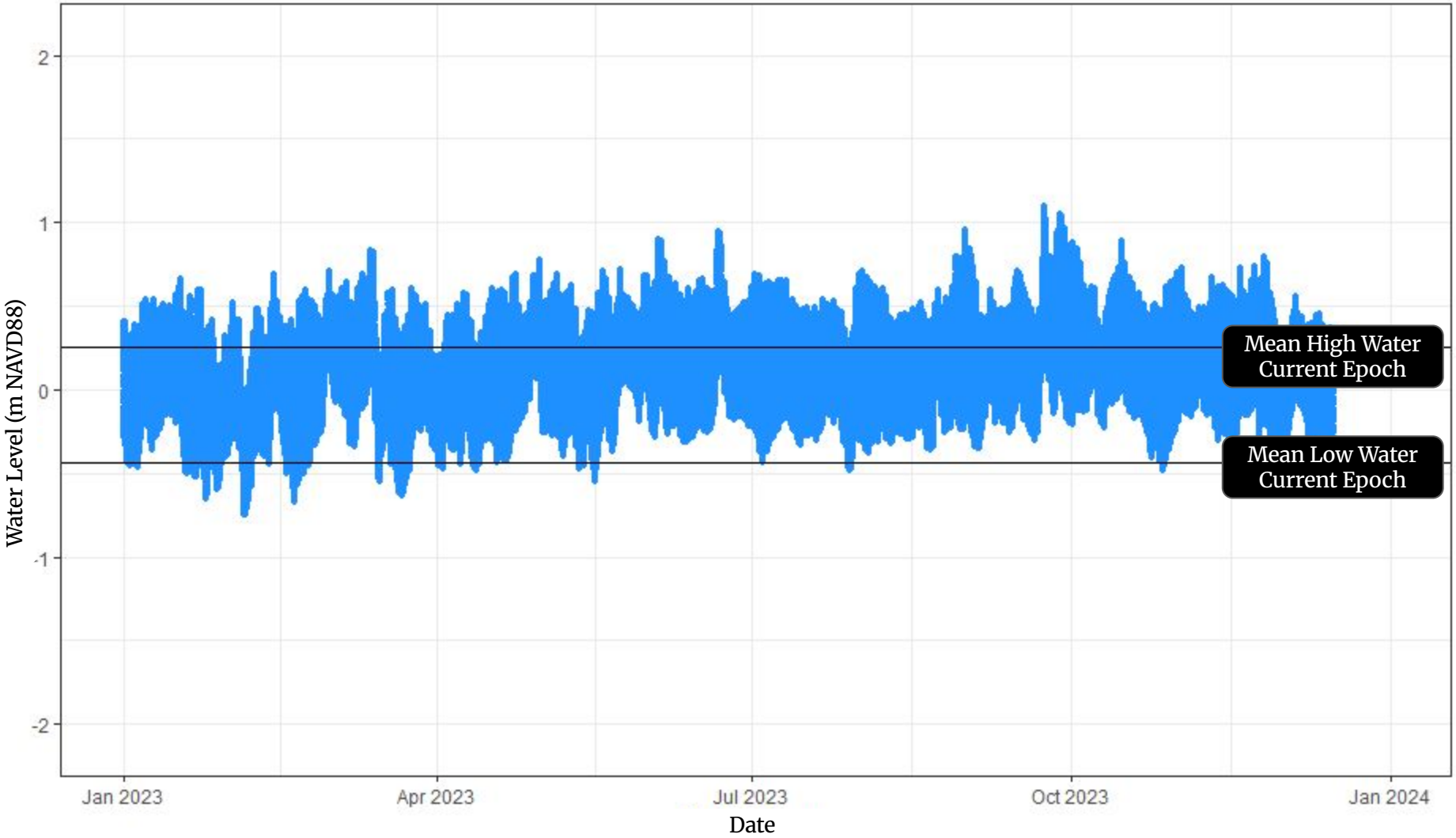
Water Level Gage
Catlett Islands Component
Chesapeake Bay National Estuarine Research Reserve - VA


2
1
0
-1
-2
Water Level (m NAVD88)
Mean High Water
Current Epoch
Mean Low Water
Current Epoch
Jan 2023
Apr 2023
Jul 2023
Oct 2023
Jan 2024
Date

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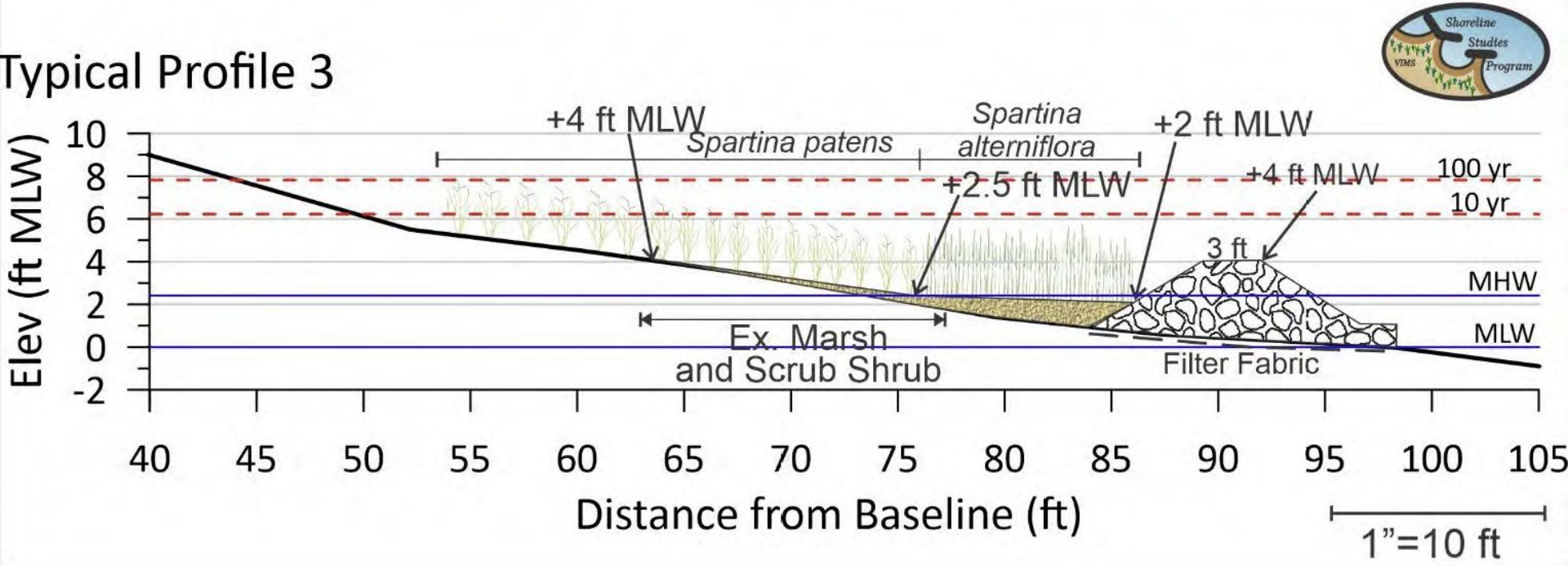
Catlett South Island
Shoreline Management Plan
Profiles
Proposed Structures
Breakwater
Brill
Sand Fill
Sill
Brill 1
Sand Fill
Breakwater 1
Breakwater 2
P1
Limit of Fill
Breakwater 3
Brill 2
Breakwater 4
Sand Fill
Brill 3
P2
Limit of Fill
Southwest Facing Shoreline
Breakwater 5
Breakwater 6
Limit of Fill
Sand Fill
Limit of Fill
Sill 3
Sill 4
Sill 5
Sill 6
Breakwater 10
Breakwater 9
Breakwater 8
P4
Brill 4
P3
Brill 5
Sill 1
Sill 2
Breakwater 7
South Facing Shoreline
0
250
500
Feet
N
W
E
S
York River
Shoreline Studies Program
VIMS
Virginia Geographic Information Network (VGIN)

Typical Profile 3



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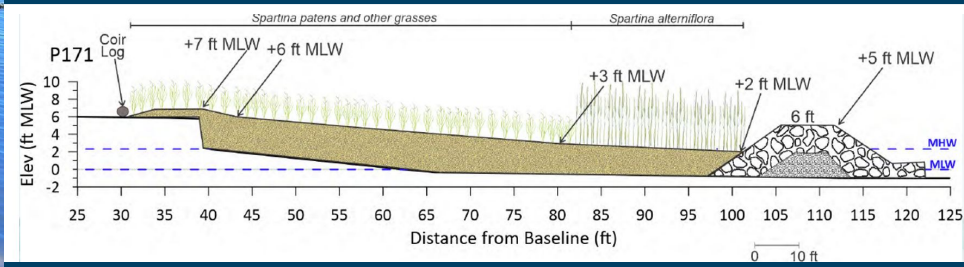

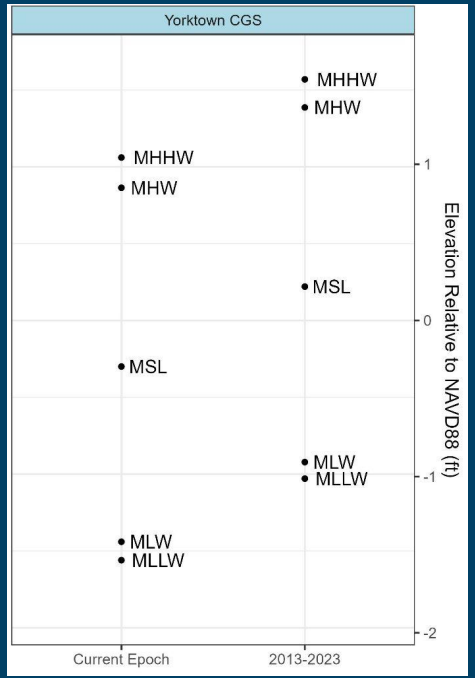

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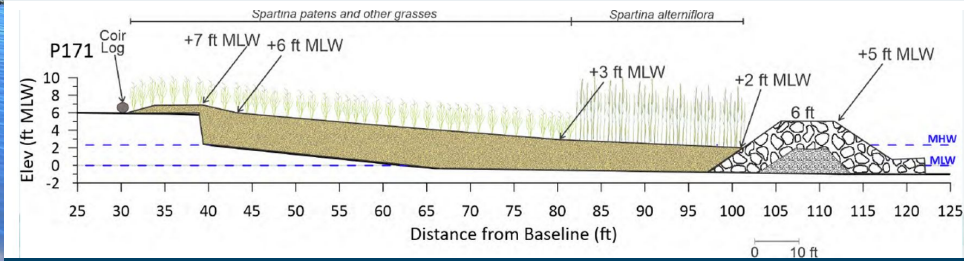

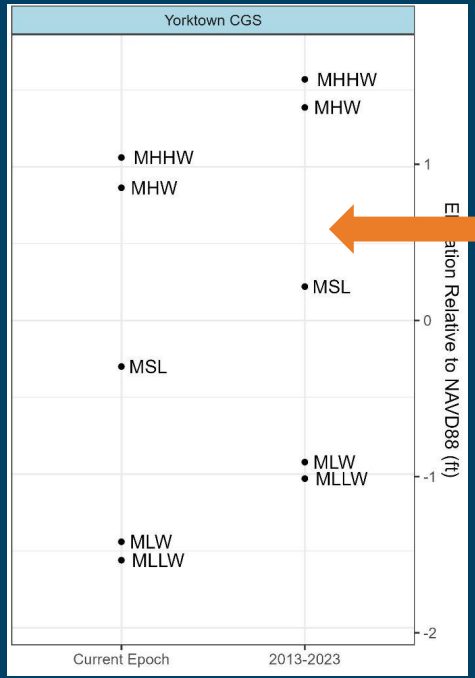

~ MLW +2ft

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Where to get updated Water Levels?

- NOAA Tides and Currents
- USGS
- vDatum (still on current epoch)
- Put out Water level loggers
- VIMS VECOS and Tidewatch
- Assume a similar increase in water levels
- https://access.co-ops.nos.noaa.gov/datumcalc/
- R package VulnToolkit

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What about Sea Level Rise and Future Conditions?

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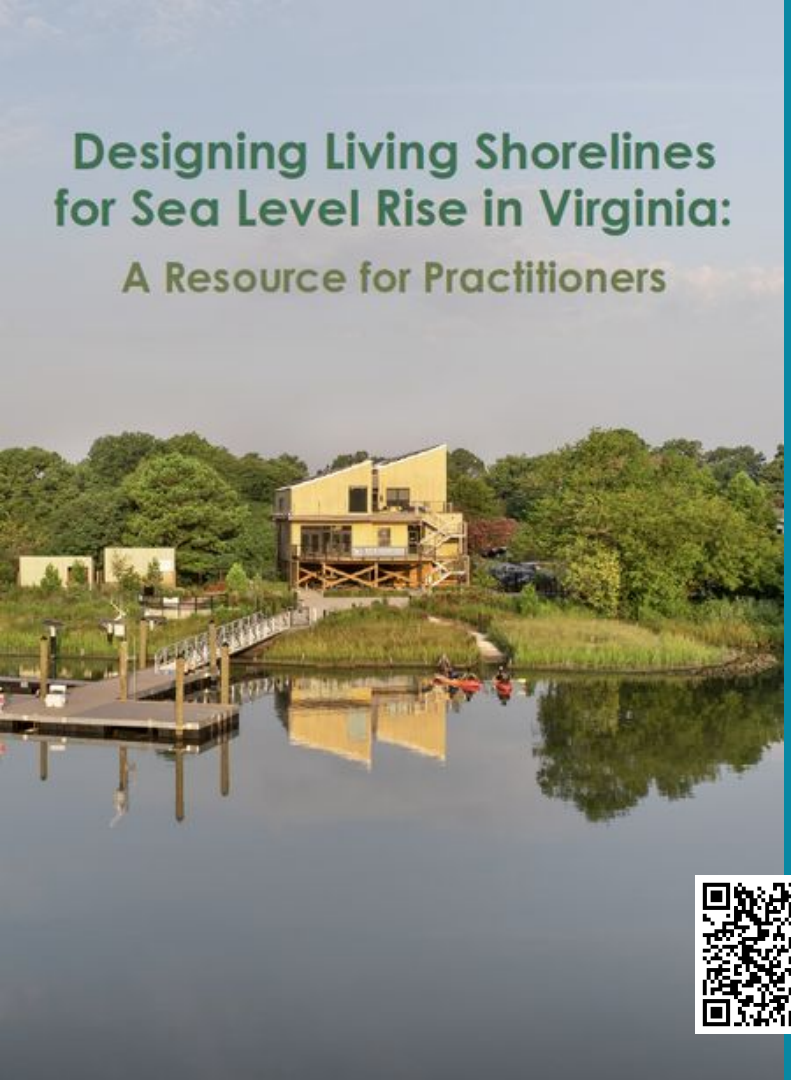

Recently Completed:

- NOAA Project of Special Merit funded through Virginia CZM and spearheaded by Wetlands Watch
- Purpose is to help design and construction professionals design and install living shorelines that can adapt to and recover from coastal hazards.
- 26 Case Studies that demonstrate adaptive design approaches implemented on various site conditions
- https://www.wetlandswatch.org/designing-living-shorelines-for-sea-level-rise

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Strategies Identified:

- Slopes that promote migration
- Planting zones that promote migration
- Elevate marsh
- Increase Marsh width
- Design sills for future storms
- Use multiple strategies

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