

2015

Adapting Maine's coastal communities to sea level rise and storm surge (2015 State of the Bay Presentation)

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Adapting Maine's coastal communities to sea level rise and storm surge

Mobilizing Community Support for Casco Bay
State of the Bay Conference
Casco Bay Estuary Partnership



Maine Department of Agriculture, Conservation and Forestry

Maine Geological Survey

Peter A. Slovinsky, Marine Geologist

C. Adams, 2015

Coastal flooding due to both *precipitation* and *tides* is increasing

100-year 24-hour rainfall has increased by about 25% (TP-40 to Atlas 14)



Brunswick Public Works



Wmtw.com



4.8" of rain (within 6 hours!) and an 11.6 ft tide with 0.5 ft of surge!



C. Adams, MGS

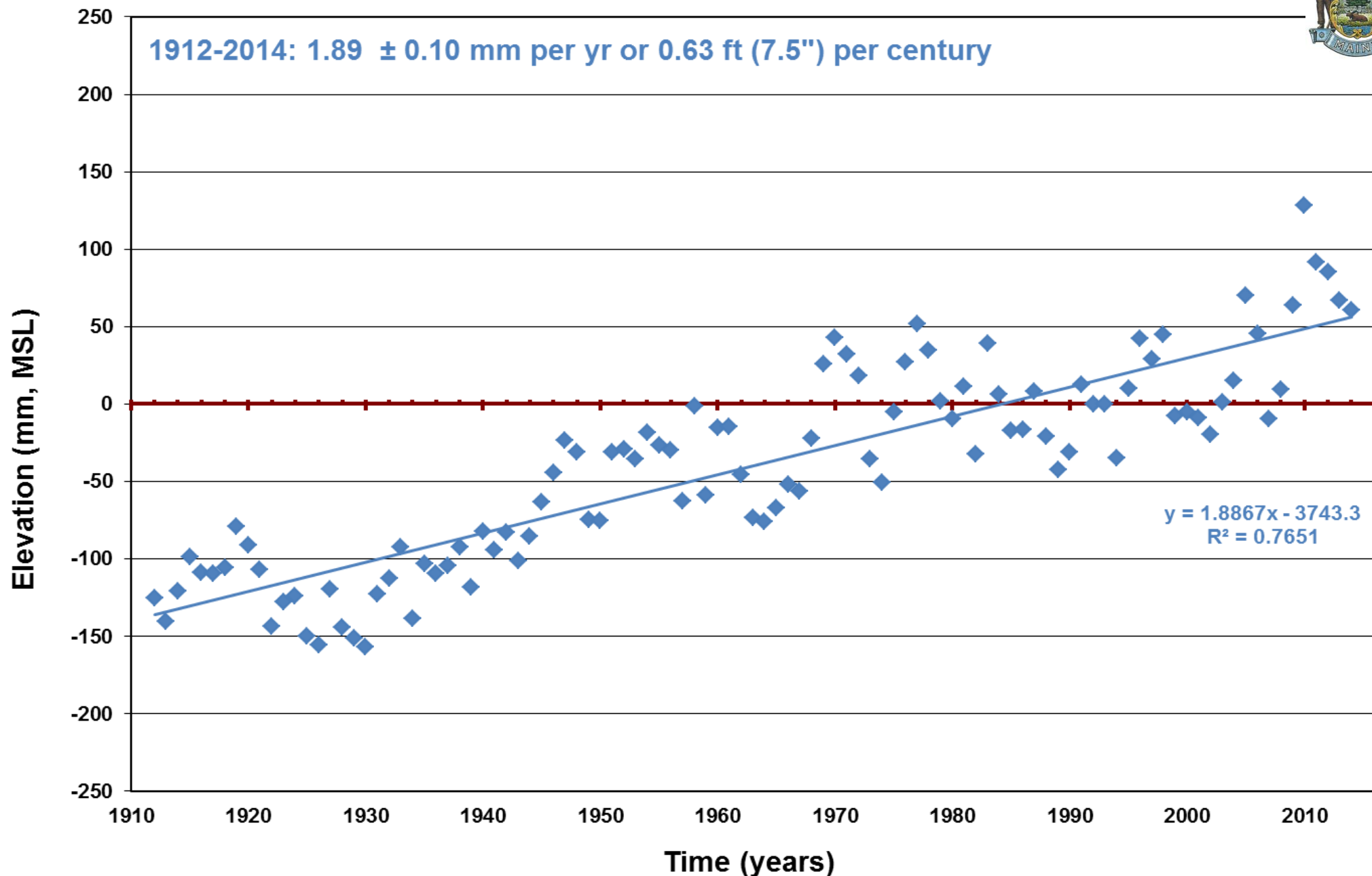
Sea level is rising in the long term...

Sea Level, Portland, Maine

1912-2014 (through December 31, 2014)



1912-2014: 1.89 ± 0.10 mm per yr or 0.63 ft (7.5") per century

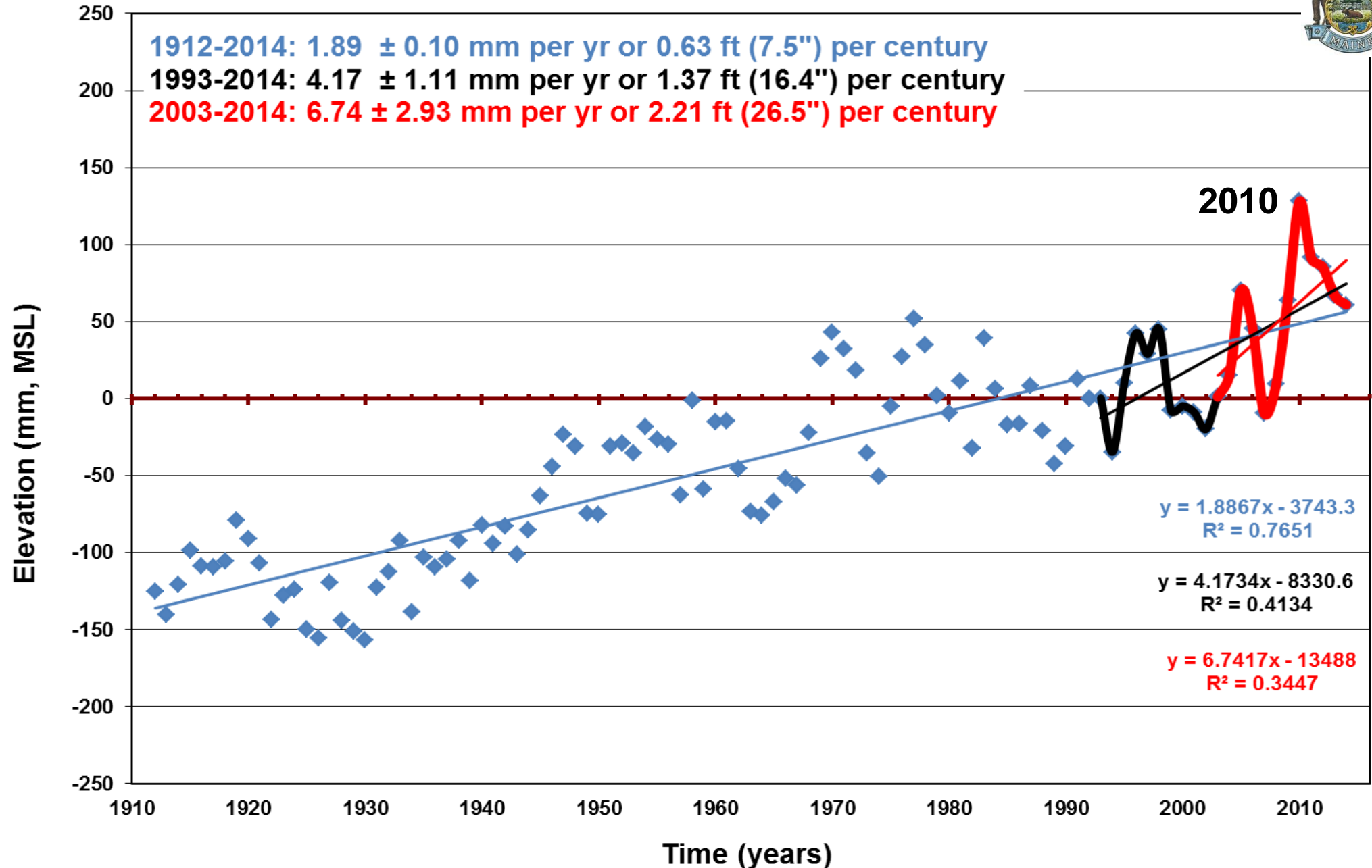


...is rising faster in the short term...

Sea Level, Portland, Maine 1912-2014 (through December 31, 2014)



1912-2014: 1.89 ± 0.10 mm per yr or 0.63 ft (7.5") per century
1993-2014: 4.17 ± 1.11 mm per yr or 1.37 ft (16.4") per century
2003-2014: 6.74 ± 2.93 mm per yr or 2.21 ft (26.5") per century

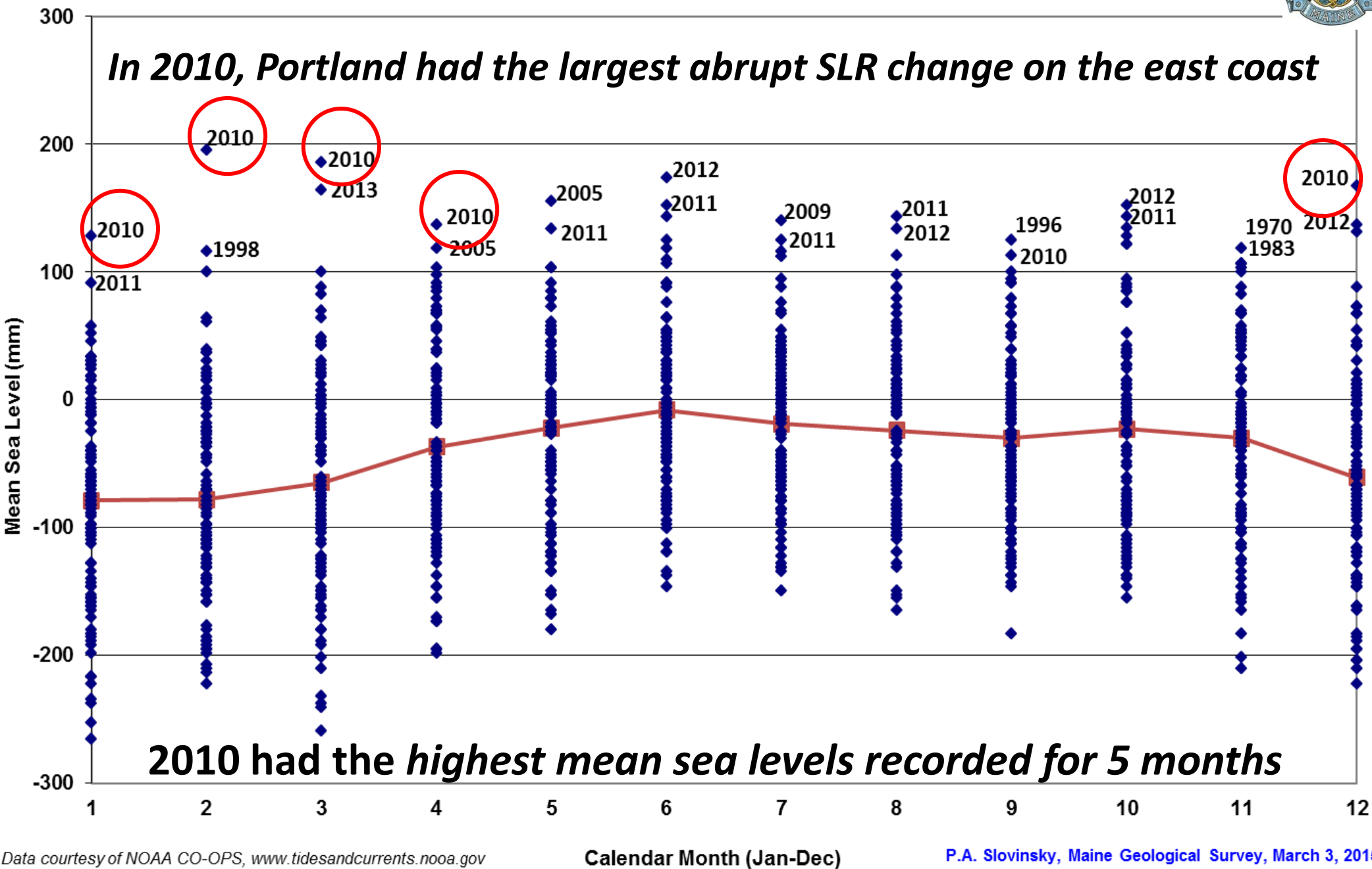


...can rise rather *abruptly*...

Portland, Maine Sea Level Variability by Month
(1912-2014)

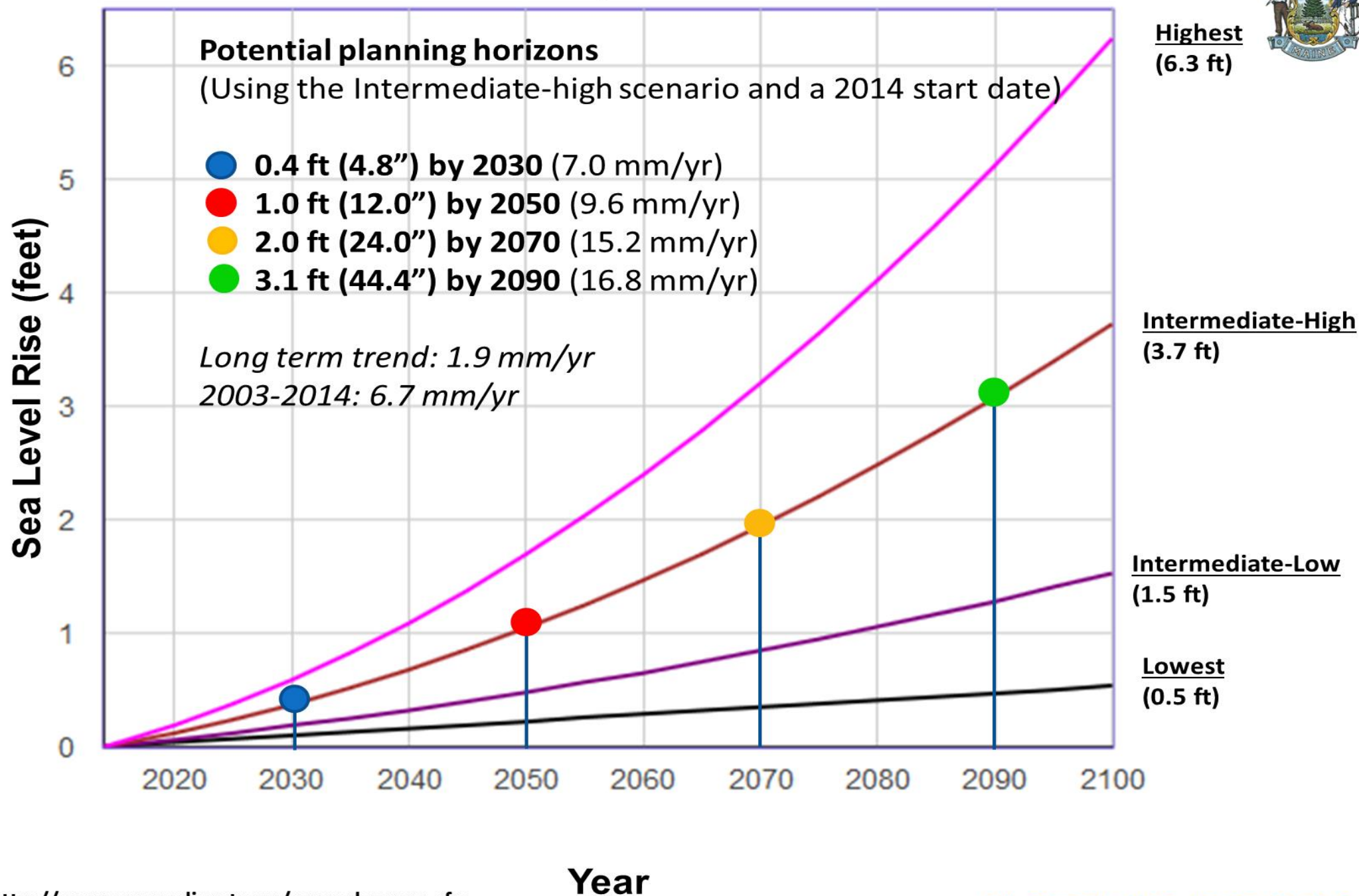


In 2010, Portland had the largest abrupt SLR change on the east coast

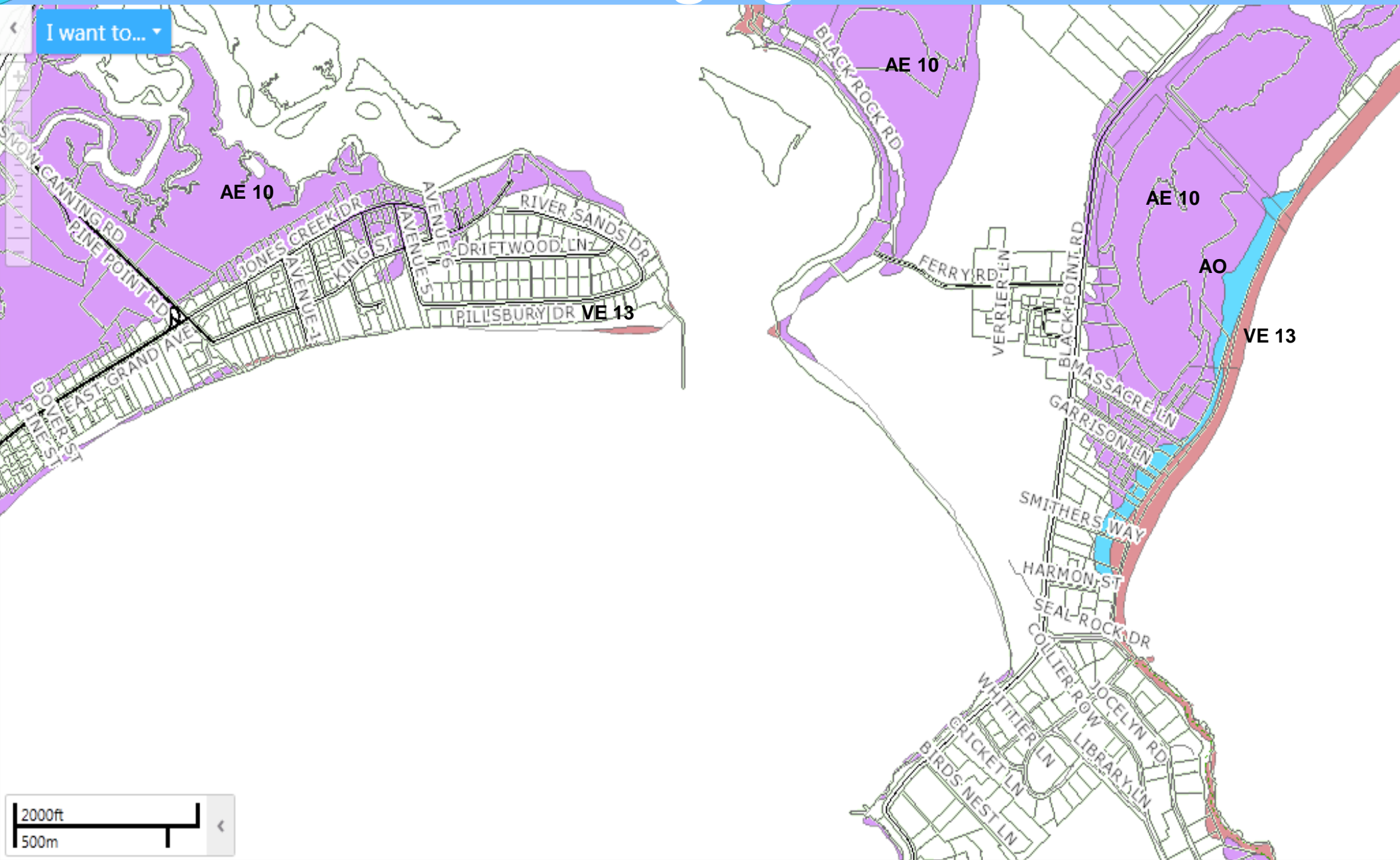


...and is expected to *continue to rise*.

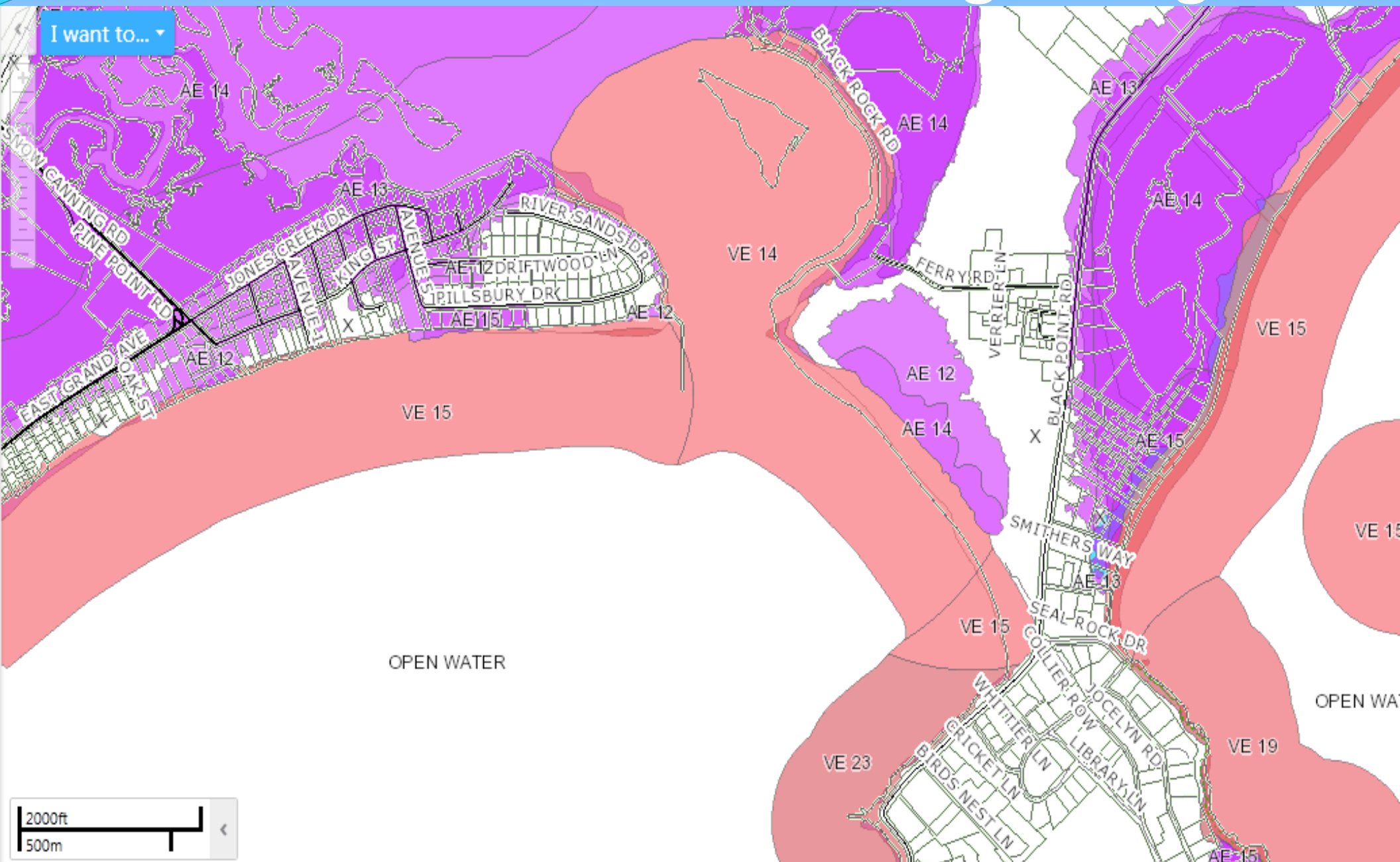
Sea Level Rise Projections for Portland, ME



FEMA Flood Insurance Rate Maps are changing...



...and in general, more areas are mapped as flood zones and are increasing in height.




Coastal Hazard and Resiliency Tools (CHRT) Project

Federal funding (CZMA Section 309)

State funding, planning assistance, scientific and
technical support

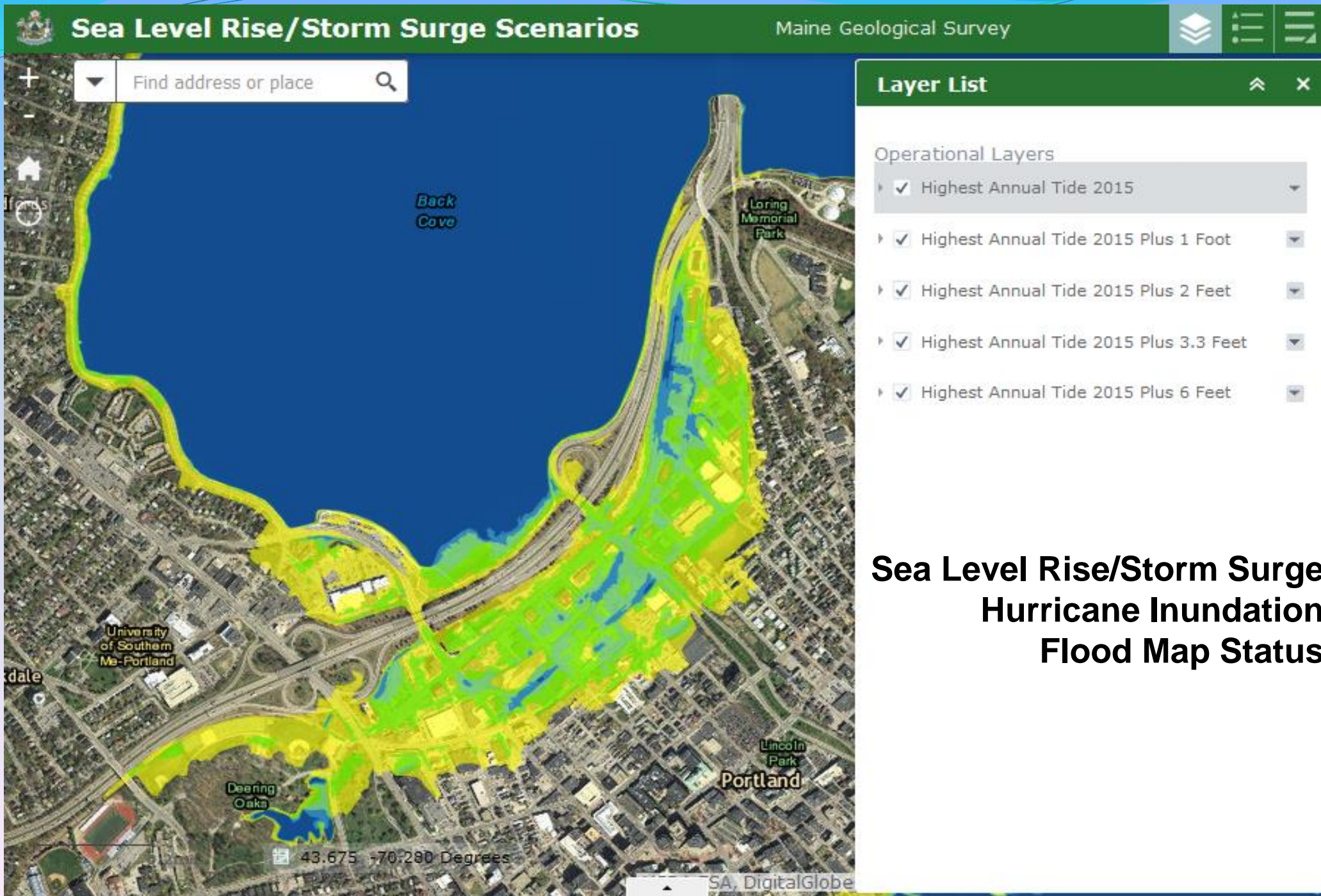
Regional planning organization assistance

Private partners (as needed)

 **Municipal, locally-driven adaptation**



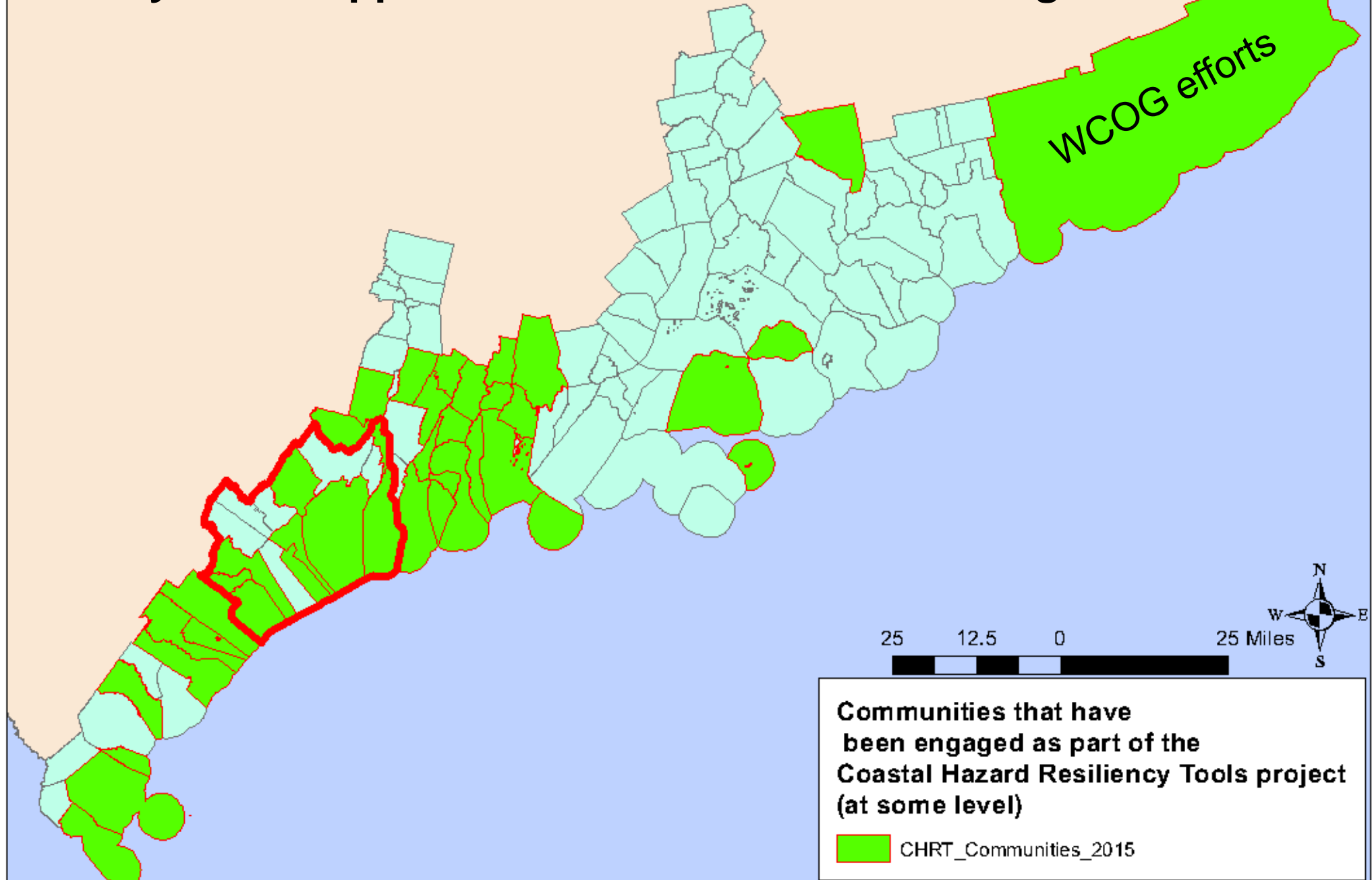
Creation of State-wide datasets and viewers



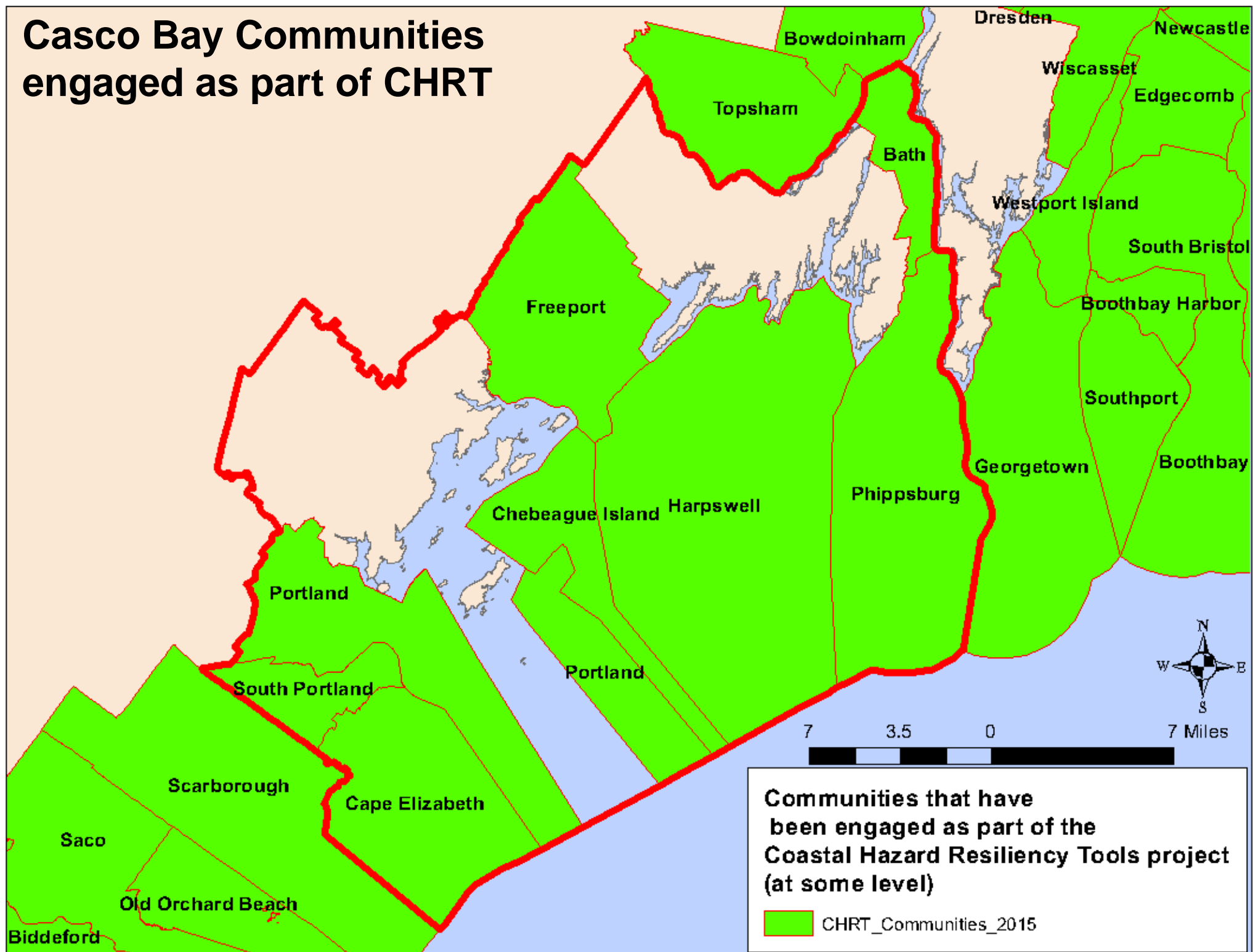
**Sea Level Rise/Storm Surge
Hurricane Inundation
Flood Map Status**

<http://www.maine.gov/dacf/mgs/hazards/coastal/index.shtml>

Communities engaged at some level as part of CHRT
39 different communities in 6 different coastal counties
County-based approaches in Lincoln and Washington counties



Casco Bay Communities engaged as part of CHRT



What have communities done?

“Just the basics...”

Most communities have completed the basic first step of a sea level rise and storm surge **Vulnerability Assessment**.

“With the Fixins”

Only a few communities have gone further completed **more detailed analyses**.

Even fewer have already undertaken some **type of adaptation towards resiliency**.

What have Casco Bay communities done?

Just the Basics: Cape Elizabeth, South Portland, Portland, Freeport, Harpswell, Phippsburg, Bath

With the Fixins':

- Cape Elizabeth – GPCOG/MGS vulnerability assess.
- Portland – COAST modeling
- South Portland – GPCOG/MGS vulnerability assess.
- Phippsburg – marsh migration public outreach
- Bath – road and infrastructure and COAST modeling

Significant Ordinance Changes or Other:

- **Portland – Resolve on SLR**
- South Portland – Comprehensive Plan Chapter on SLR
- **Cape Elizabeth - Changed Shoreland Zoning**

**RESOLUTION SUPPORTING THE DEVELOPMENT OF A SEA-LEVEL RISE
ADAPTATION PLAN.**

WHEREAS, recorded data in Casco Bay indicates that sea-level rise is occurring in Portland Harbor; and

WHEREAS, international scientific theories indicate that sea-level rise is accelerating and may result in sea-level rise of an additional three to six feet over the next one hundred years; and

WHEREAS, many of Portland's economic, cultural, and ecological resources, and public infrastructure is located at low elevations at or near the shoreline; and

WHEREAS, estimated sea-level rise may cause permanent flooding of certain low elevation areas of the City; and

WHEREAS, potential permanent flooding represents an economic, cultural, ecological, and public infrastructure loss for the City; and

WHEREAS, there is community interest to understand the implications of and prepare for sea-level rise and the City Council believes it is important to understand the implications of sea-level rise; and

WHEREAS, communities around Maine, New England and throughout the world are currently grappling with sea-level rise adaptation and provide feasible models for Portland's citizens to consider; and

WHEREAS, there are financial and technical resources available to conduct a sea-level rise study;

NOW THEREFORE BE IT RESOLVED, that the Portland City Council supports the development of a sea-level rise adaptation plan; and

BE IT FURTHER RESOLVED, that a draft timetable and draft scope of work shall be developed and presented to the Energy and Environmental Sustainability Committee no later than September 1, 2011; and

BE IT FURTHER RESOLVED, that the City should seek to coordinate planning efforts with the City of South Portland, the Greater Portland Council of Governments, Southern Maine Regional Planning Commission, the New England Environmental Finance Center, and other coastal communities in Casco Bay as practical and feasible and learn from sea-level rise planning efforts already undertaken in Maine.

Timeline

2011 – Resolve passed

2012 – MGS detailed mapping efforts;
COAST modeling by NEEFC

2012 – Draft Framework for SLR adaptation

2014 – Urban Land Institute Resiliency Study

2014 – current DHS Casco Bay RRAP

Cape Elizabeth's Shoreland Zoning

Normal High Water Line of Coastal Waters: That line on the shore of tidal waters which is the apparent extreme limit of the effect of the tides, *i.e. the top of the bank, cliff or beach above high tide*

Maine's Mandatory Shoreland Zoning Act (MSZA) defines the upper SZ boundary in tidal waters as the *upland edge of a coastal wetland, including all areas affected by tidal action* (the upper edge of coastal wetland is defined by the Highest Annual Tide).



Recommendation to Cape:

Instead of using the predicted **Highest Annual Tide** (which changes each year), consider using the **Highest Astronomical Tide**, which is the highest tide level for the effective 19 year National Tidal Datum Epoch (1983 – 2001, made effective in April 2003). This occurs during the spring tide when the sun and moon are closest to the earth during an 18.6 year tidal cycle which accounts for all significant variations in moon and earth orbits. *The NTDE is recalculated every 20-25 years.*

“The elevation of the highest predicted astronomical tide expected to occur at a specific tide station over the National Tidal Datum Epoch.”

http://tidesandcurrents.noaa.gov/datum_options.html#HAT



Chapter 19

Zoning Ordinance

Town of Cape Elizabeth, Maine

Normal High Water Line: *Adjacent to tidal waters, the normal high water line shall be the **topographic line located at the Highest Astronomical Tide, plus three (3) vertical feet upland.***

This is an elevation which can be determined using tidal station data and approximated, using LiDAR, along the Cape Elizabeth shoreline.

Comparing Elevations

Water Level	Elevation, ft MLLW
Existing HAT (2015)	11.5
Existing HAsT	11.6
HAsT+3 ft SLR	14.6
10% (10 yr) SWL*	12.6
2% (50 yr) SWL*	13.2
1% (100 yr) SWL*	13.5
0.2% (500 yr) SWL*	14.2

**from 11/5/2013 preliminary FEMA Flood Insurance Study*

conversions from NAVD to MLLW using Portland Head Light location and NOAA's VDATUM tool

What have other communities done that is transferable to Casco Bay?

Some locally-derived and driven strategies:

Infrastructure Adaptation:

- Ogunquit – Worked to adapt WWTP (Wiscasset under way)
- Saco Bay - road infrastructure vulnerability
- Damariscotta – Worked to adapt historic downtown

Significant Ordinance Changes:

- York, Bowdoinham, South Portland – Wrote Comprehensive Plan Chapters on SLR and storm surge
- **Saco, Damariscotta, Berwick - Increased floodplain ordinance to 3 ft over BFE**

Resiliency Strategy: Incorporating more freeboard into municipal floodplain ordinances to account for storms or increased SLR

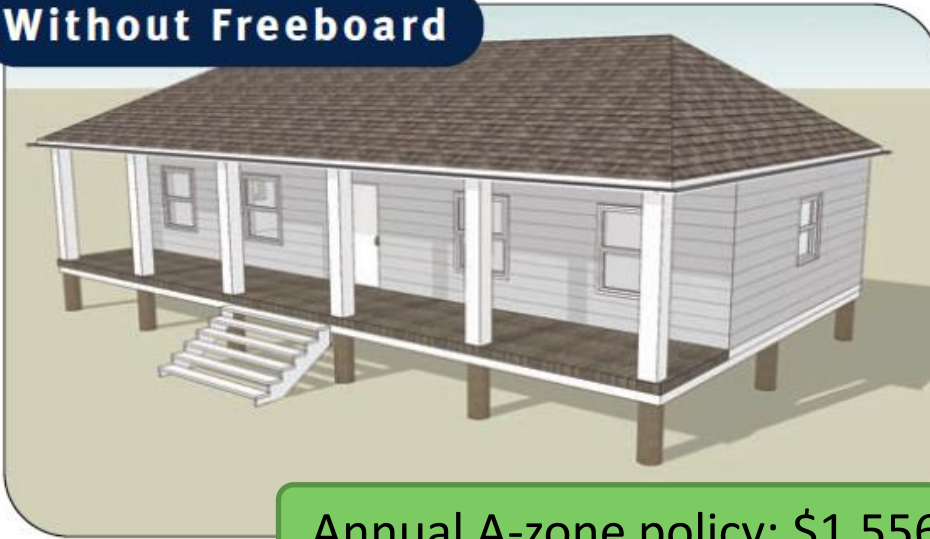


The City of Saco made ordinance changes to increase freeboard to three feet above the 100-year Base Flood Elevation (BFE). Also done in South Berwick.



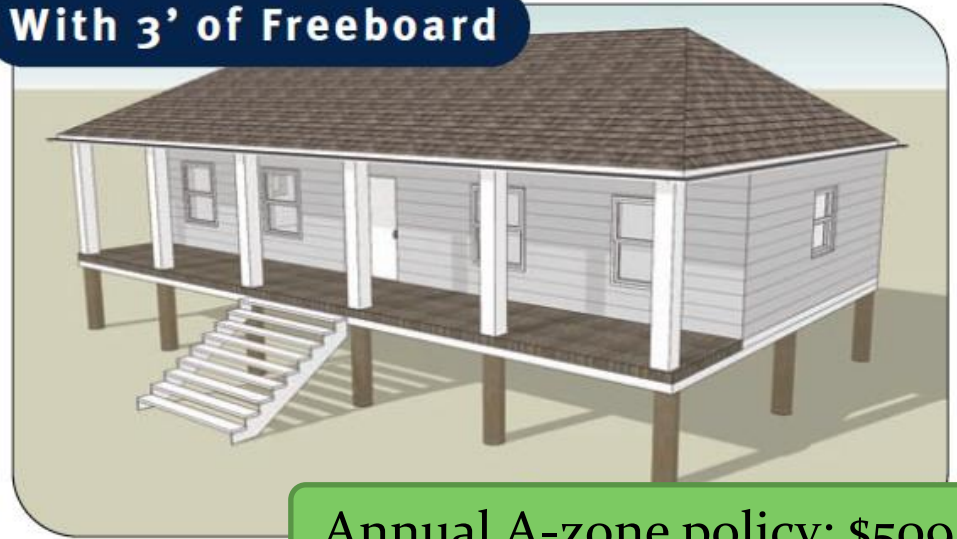
“Low Hanging Fruit” : Flood Insurance Premium Benefits

Without Freeboard



Annual A-zone policy: \$1,556

With 3' of Freeboard



Annual A-zone policy: \$509

Elevating a home a few feet above legally mandated heights has very little effect on its overall look, yet it can lead to substantial reductions in flood insurance, substantially decrease the chances the home will be damaged by storms and flooding, and help protect against sea level rise.

Scenario	V-zone			A-zone		
	Annual Policy	Savings (%)	30-year savings	Annual Policy	Savings (%)	30-year savings
No Freeboard	\$7,747	\$0 (0%)	\$0	\$1,556	\$0 (0%)	\$0
1 ft freeboard	\$5,331	\$2,416 (31%)	\$72,480	\$799	\$757 (49%)	\$22,710
2 ft freeboard	\$3,648	\$4,099 (53%)	\$122,970	\$574	\$982(63%)	\$29,460
3 ft freeboard	\$2,635	\$5,112 (66%)	\$153,360	\$509	\$1,047(67%)	\$31,410

Based on 2012 rates for a one-floor residential structure, no basement, post-FIRM, \$1,000 deductible with \$250,000 coverage and \$100,000 contents.

Flood policy rating quotes graciously provided to Maine Floodplain Management Program by Chalmers Insurance Group, www.chalmersinsurancegroup.com



Increase Freeboard (above 100-year BFE)

- **One foot (minimum state standard):** South Portland, Falmouth, Yarmouth, Freeport, Brunswick, Harpswell, Phippsburg, Bath, West Bath
- **Two foot (1 foot above state standard):** Cape Elizabeth, Portland, Cumberland
- **Three feet:** none.

There's room for improvement!

New 2015-2017 Adaptation Strategy Effort

With more properties being located in the 1% flood zone (and higher flood zones!) due to FEMA Flood Insurance



Rate Map remapping, it makes sense to focus on creating community resiliency through **existing incentive programs that relate to flood mapping.**

National Flood Insurance Program

Community Rating System

A Local Official's Guide to
Saving Lives

Preventing Property Damage

Reducing the Cost of Flood Insurance

FEMA 573



Project goal: **get more communities to participate** in the voluntary FEMA Community Rating System program, and **increase scores for participating communities.**

The National Flood Insurance Program Community Rating System (CRS)

CRS has three goals:

- **Reduce flood damage to insurable property;**
- **Strengthen and support the insurance aspects of the NFIP, and**
- **Encourage a comprehensive approach to floodplain management.**

The National Flood Insurance Program Community Rating System (CRS)

TABLE 2. CRS PREMIUM DISCOUNTS

CLASS	DISCOUNT	CLASS	DISCOUNT
1	45%	6	20%
2	40%	7	15%
3	35%	8	10%
4	30%	9	5%
5	25%	10	—

SFHA (Zones A, AE, A1-A30, V, V1-V30, AO, and AH): Discount varies depending on class.

SFHA (Zones A99, AR, AR/A, AR/AE, AR/A1-A30, AR/AH, and AR/AO): 10% discount for Classes 1-6; 5% discount for Classes 7-9.*

Non-SFHA (Zones B, C, X, D): 10% discount for Classes 1-6; 5% discount for Classes 7-9.

Participation in the CRS Program

Statewide

**17 communities of 889*
(2%)**

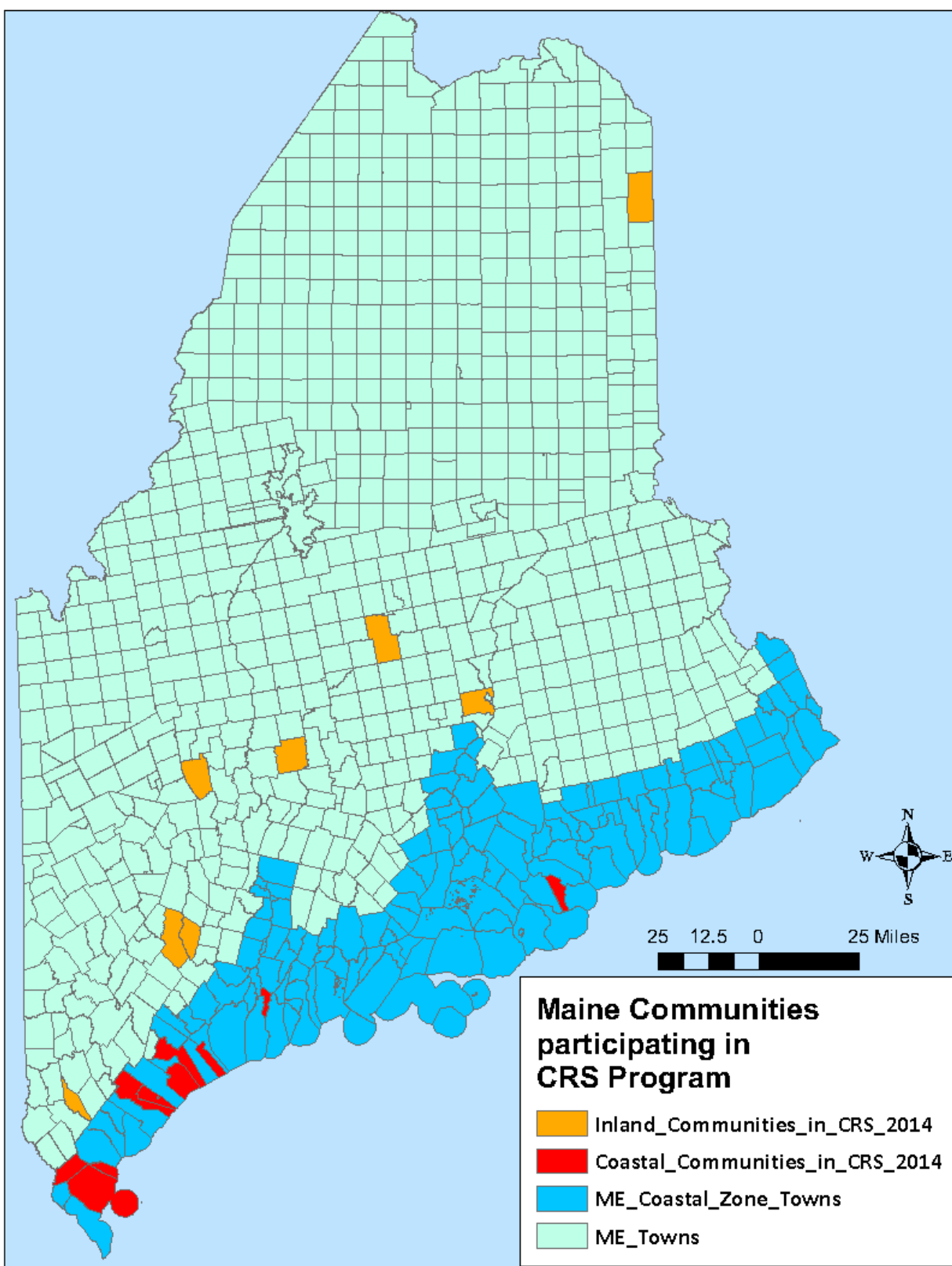
In the Coastal Zone

**9 coastal communities of
141* (6%)**

In Casco Bay

**As of April 1, 2015, only
Cape Elizabeth (Class 8)
and Portland (Class 8)
participate in CRS!**

** includes unorganized and unincorporated
territories that participate in the NFIP.*



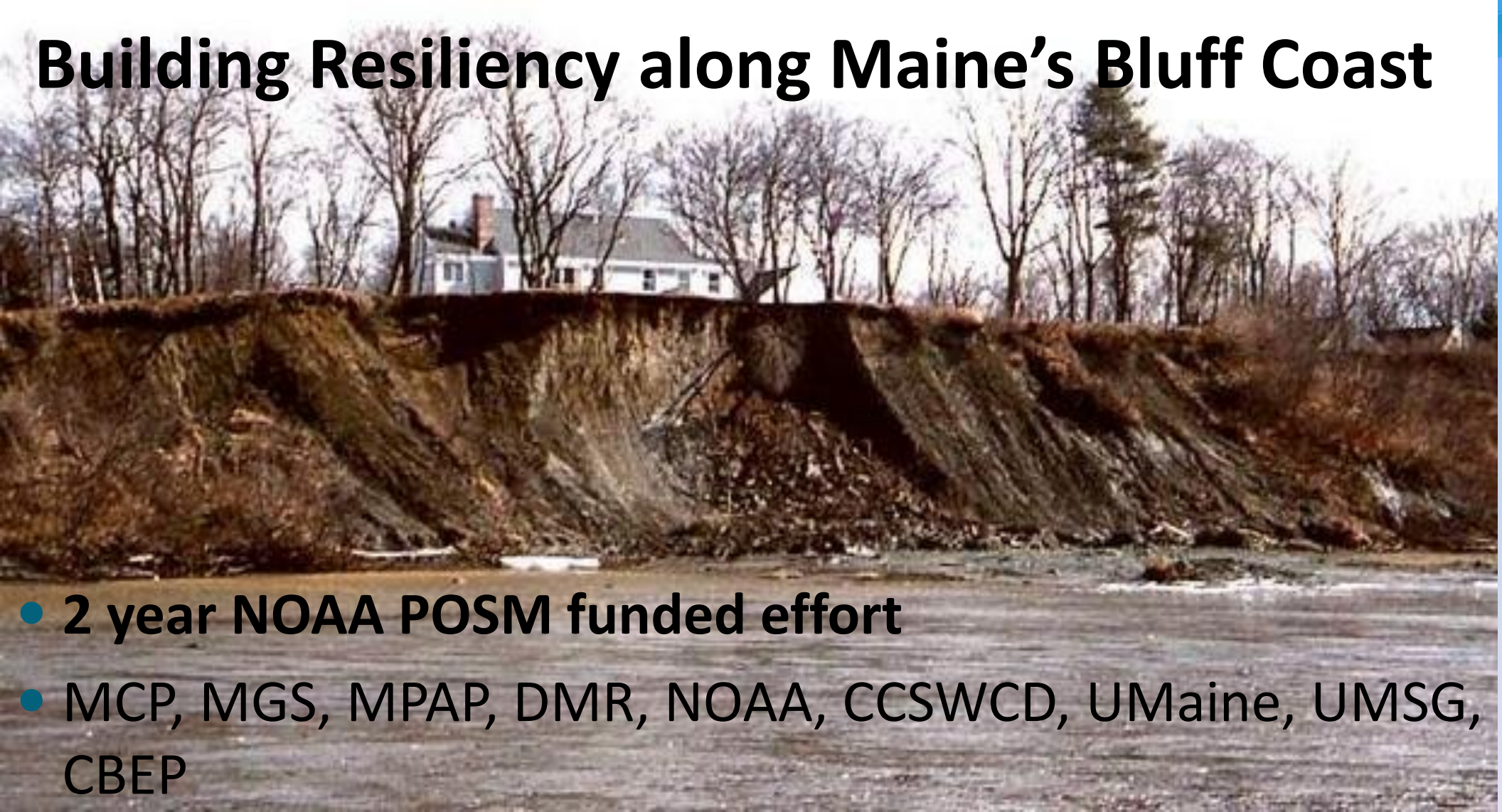
Many communities are already doing things that would help earn points towards CRS but *don't even know it...*

- Shoreland Zoning and open space preservation
- Meeting state minimum freeboard standards
- Building codes (but no state standard)
- Outreach Projects and Floodplain Mapping activities (making information available to the public)
- Comprehensive Planning (certain components)
- Stormwater/MS4 efforts (certain components)

Challenges for the CRS Program in Maine

- **Lack of knowledge** of the program
- **The amount of documentation required** by FEMA to enter the program or maintain annual membership
- **Technical capability and lack of time** or staffing capacity for communities to dedicate to the effort
- **“Unsavory” municipal and citizen views of FEMA**

Building Resiliency along Maine's Bluff Coast



- 2 year NOAA POSM funded effort
- MCP, MGS, MPAP, DMR, NOAA, CCSWCD, UMaine, UMSG, CBEP
- Develop more scientifically sound **bluff erosion hazard prediction models, maps, and ordinances**
- Work with selected **municipalities to develop a locally-driven effort** to create more resilient Casco Bay bluffs

Thank you!



C. Adams, MGS



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