



Adapting to Sea Level Rise in Southern Maine's Historic Waterfront Communities: *A Look at Portland's Waterfront*

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Keeping History Above Water Conference



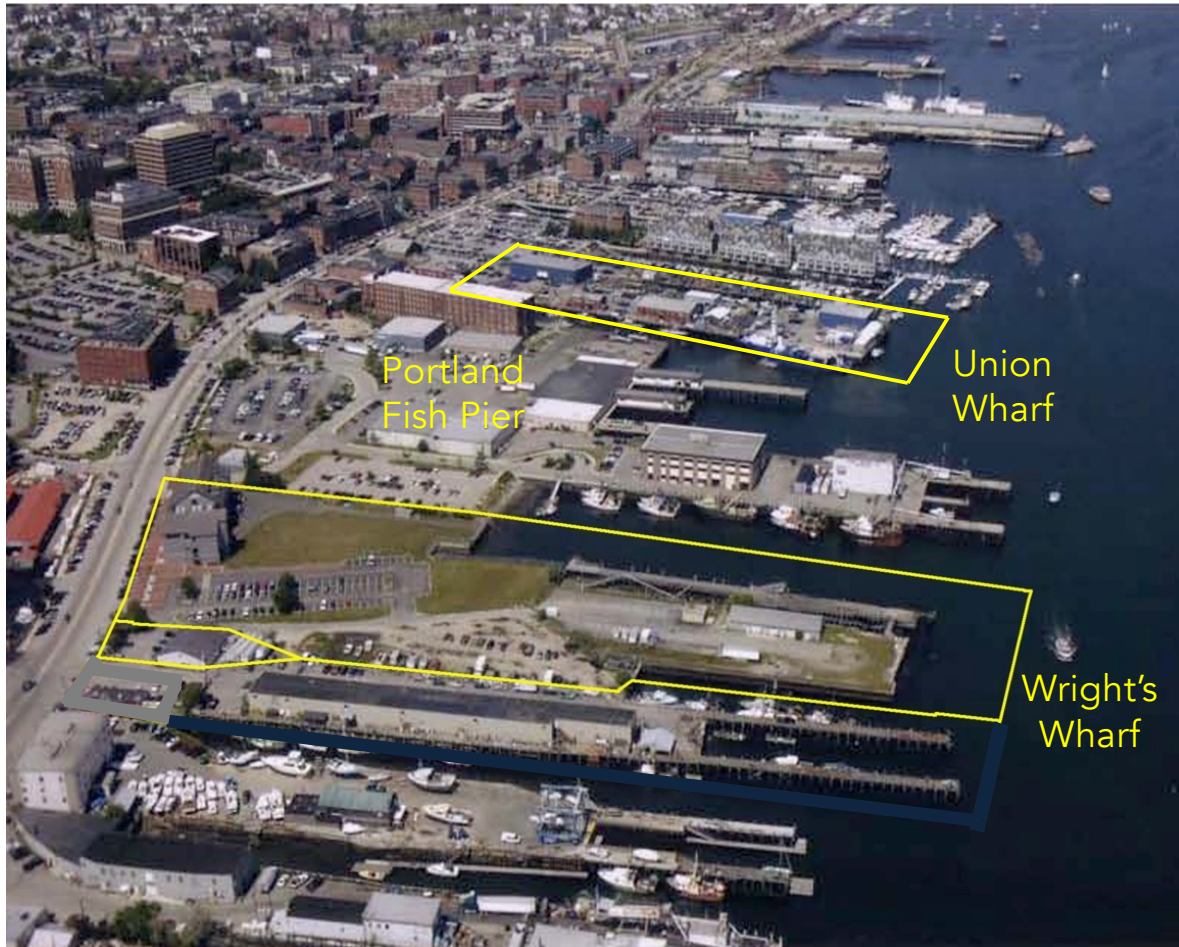
**Gulf of Maine
Research Institute**

Science. Education. Community.

Portland: A City (Partly) Built on Fill



GMRI Properties on Portland Waterfront



Union Wharf

- Earth-filled wharf constructed in 1793
- Hub of Portland's working waterfront, serving marine and fishing industries
- Owned by Poole Family for 150+ yrs
- Purchased by GMRI in 2022 to preserve as working waterfront

Wright's Wharf

- Earth-filled wharf constructed c1852
- Served a variety of uses:
 - 19th century: coal & timber terminal
 - 20th century: Dept of Navy facility
 - 21st century: GMRI (& Coast Guard)

Union Wharf over the past ~100 years



Wright's Wharf over the past ~100 years

1924 - coal



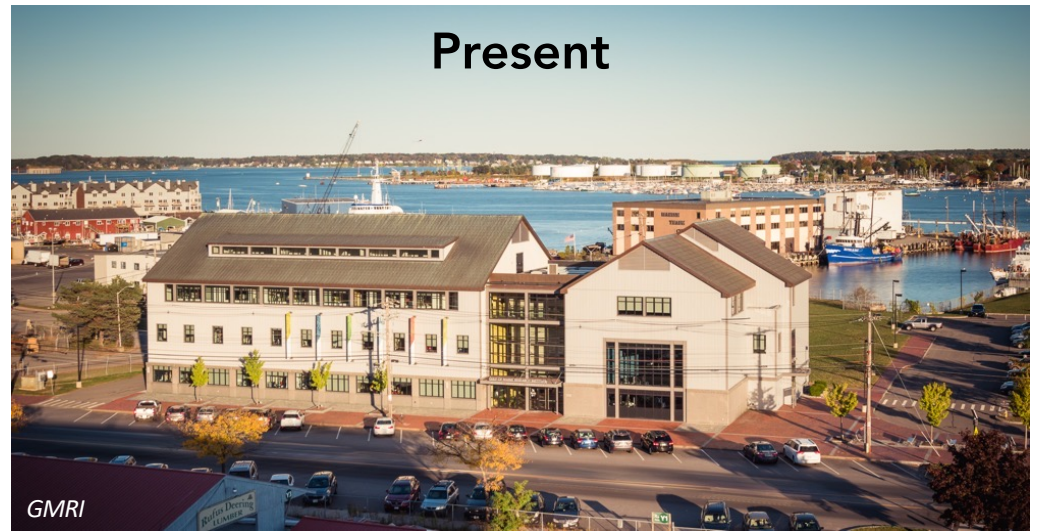
1924 - stable



1924 - lumber



Present

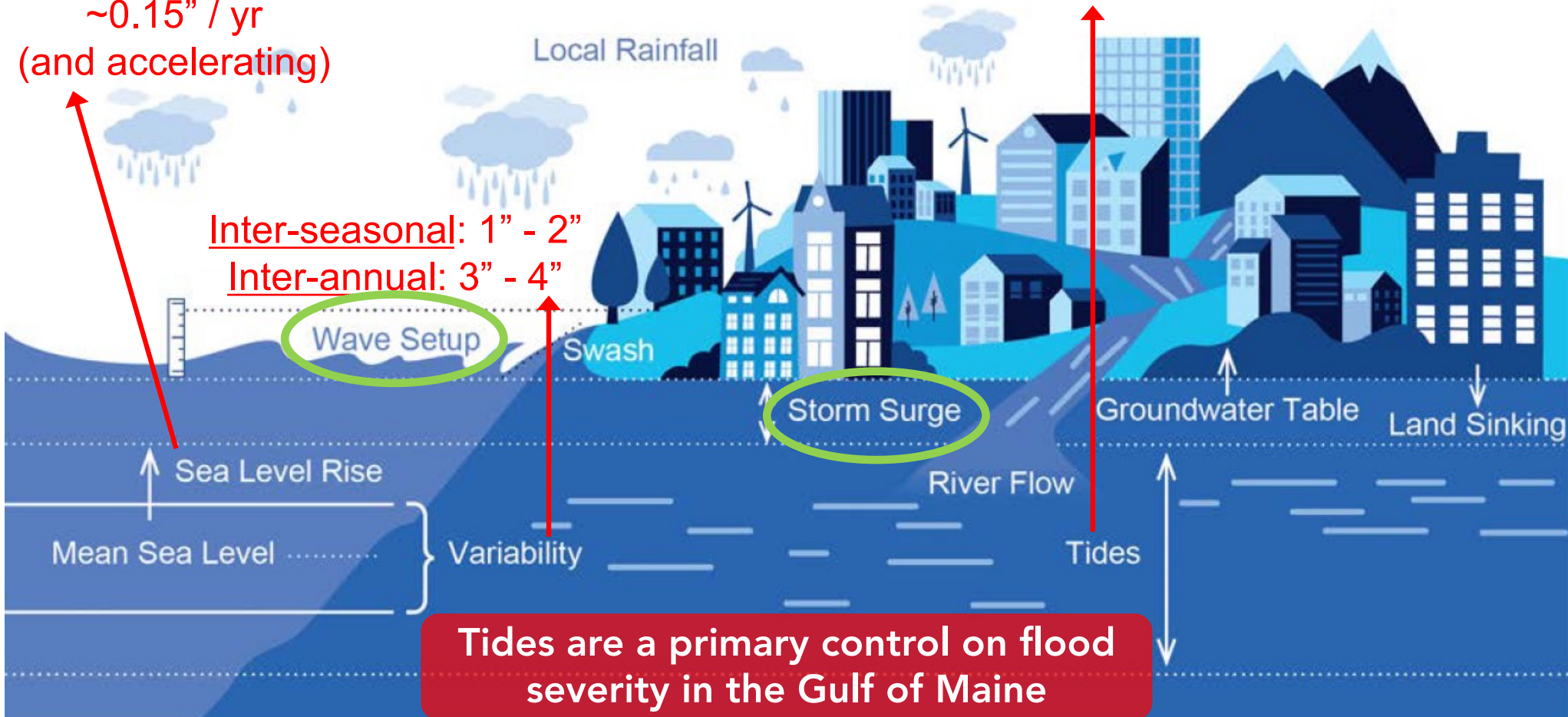


Physical drivers of flooding (in Casco Bay)

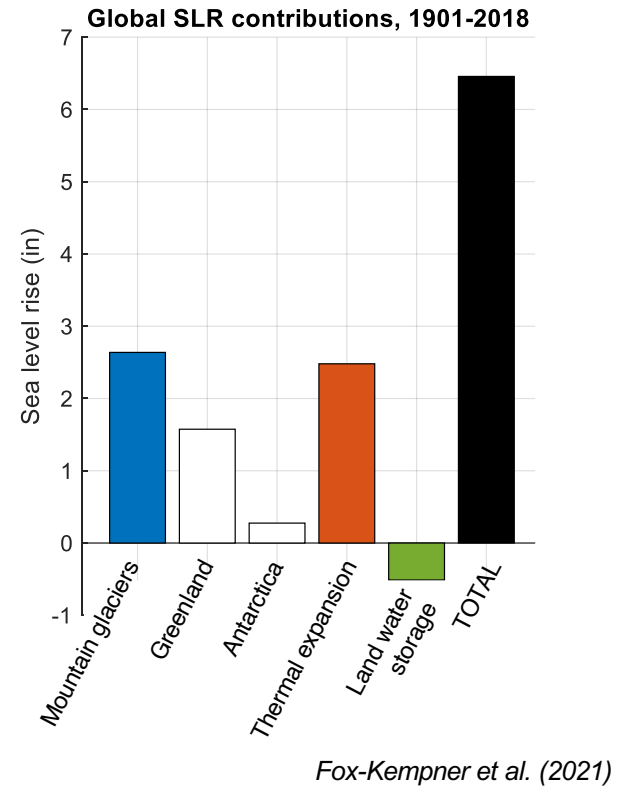
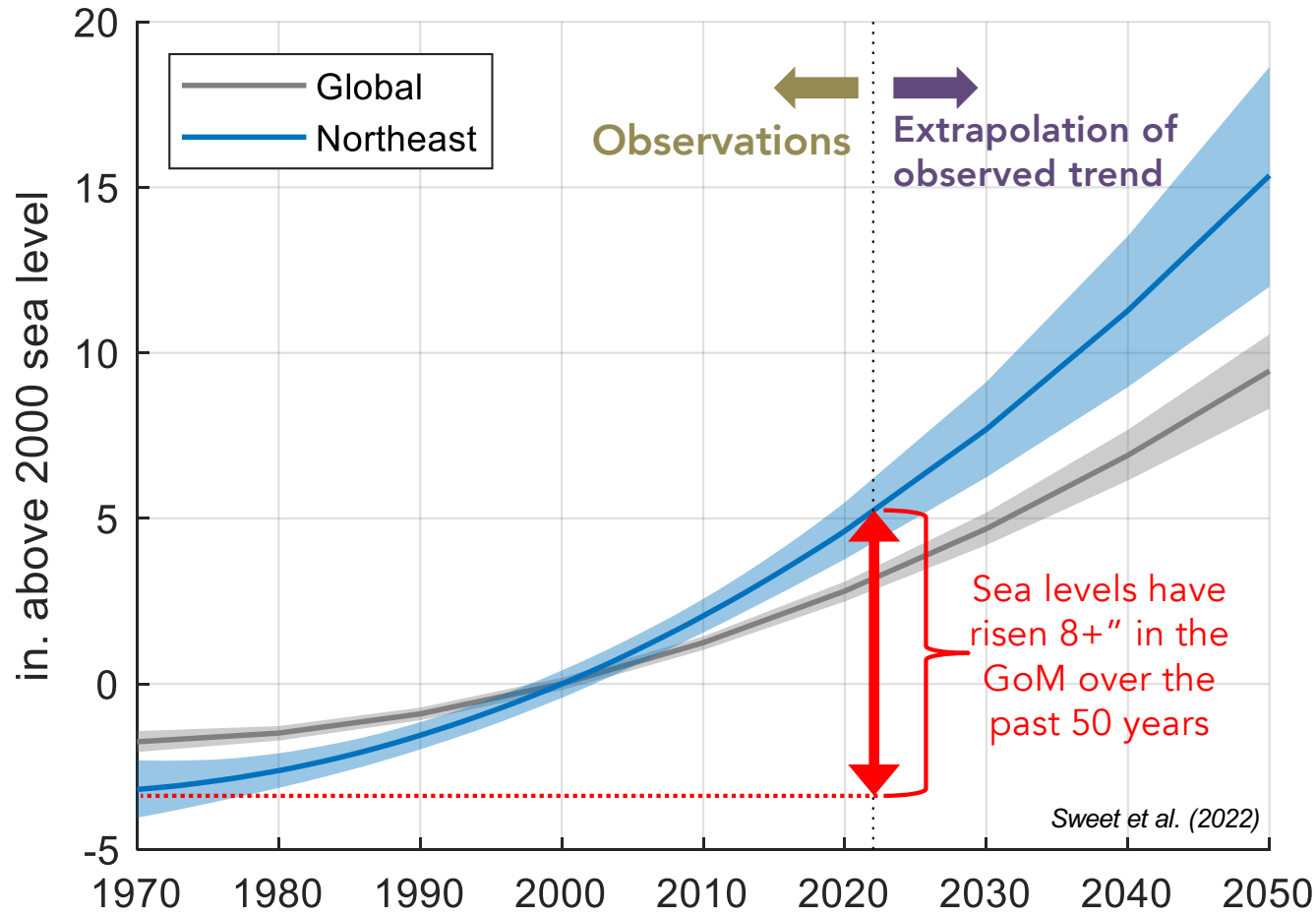
Rate of SLR
~0.15" / yr
(and accelerating)

Tidal range: 4.5 to 7 feet above MSL

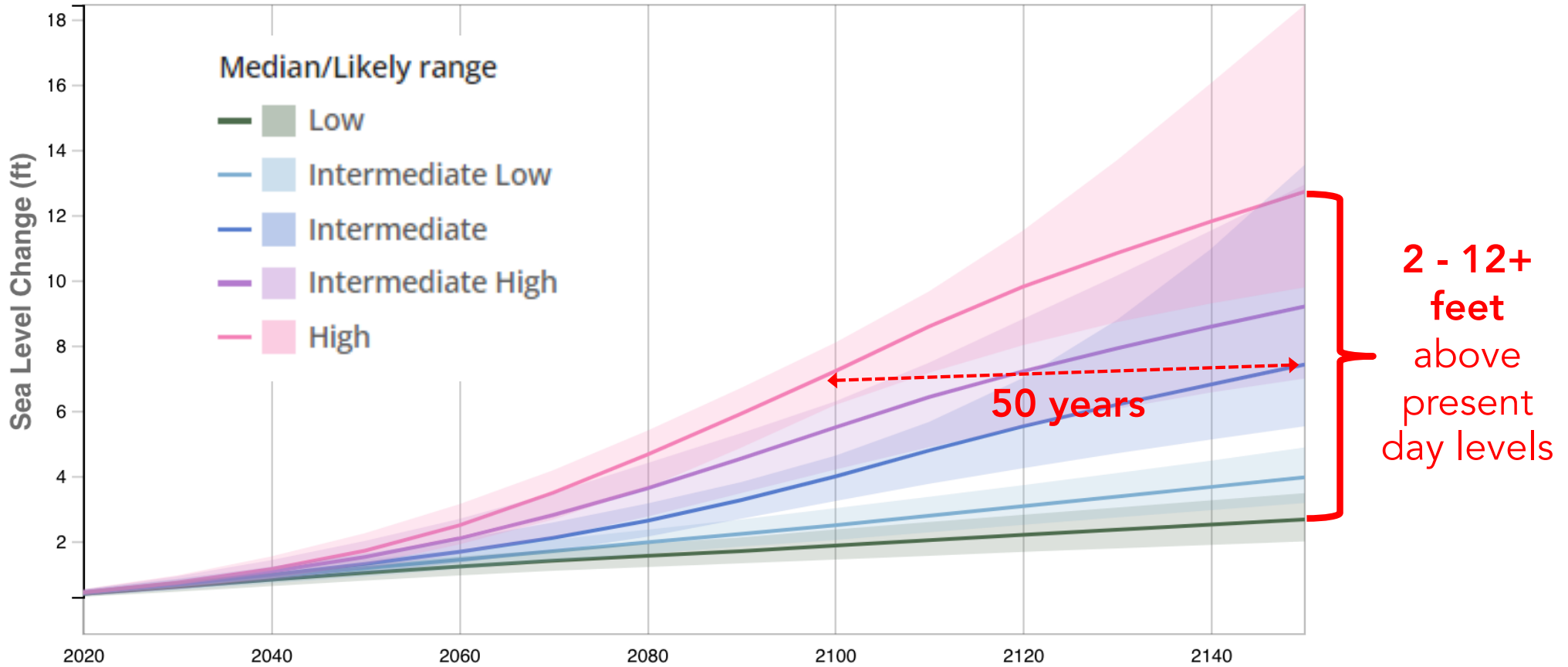
Inter-seasonal: 1" - 2"
Inter-annual: 3" - 4"



Observed & Projected Sea Level Rise

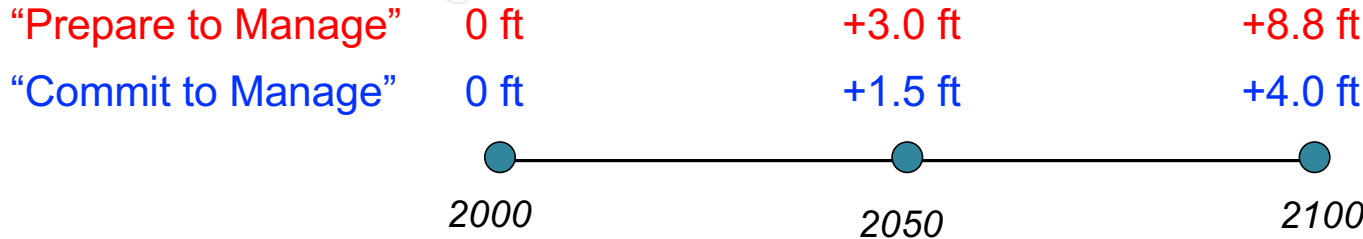


Projected Sea Level Rise from Present Day out to 2150



<https://sealevel.nasa.gov/task-force-scenario-tool>

Codifying SLR Preparedness in Maine Law



APPROVED
JUNE 16, 2021
BY GOVERNOR

CHAPTER
67
RESOLVES

STATE OF MAINE
—
IN THE YEAR OF OUR LORD
TWO THOUSAND TWENTY-ONE
—
H.P. 1169 - L.D. 1572

Resolve, To Analyze the Impact of Sea Level Rise

Preamble. Whereas, the scientific and technical subcommittee of the Maine Climate Council determined it is likely that the sea level in Maine will rise between 3 and 5 feet by the year 2100 based on an intermediate sea level rise scenario, although scenarios of higher rise are physically plausible; and

Whereas, a one-foot increase in sea level in the future will lead to a 15-fold increase in the frequency of nuisance flooding and would cause a 100-year storm flood level to have a probability of occurring once every 10 years; and

Whereas, communities with a strong dependence on waterfront and shorefront industries such as tourism, ports and fishing will be heavily disrupted by increased flood frequency; and

Whereas, sea level rise of 4 feet by 2100 is projected to cause more than \$671,000,000 in cumulative building losses and \$665,000,000 in gross domestic product losses in Maine; and

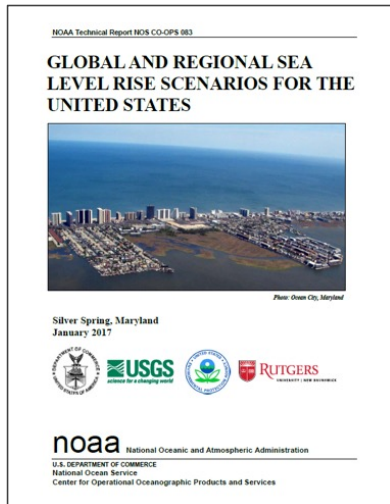
Whereas, 1.5 feet of relative sea level rise by 2050 and 4 feet by 2100 would cause impingement and submersion of land and accompanying materials, structures and facilities that are not currently designed for those conditions and, therefore, present a threat of release of pollutants to the environment; and

Whereas, the scientific and technical subcommittee of the Maine Climate Council has recommended that the State manage for 1.5 feet of relative sea level rise by 2050 and 4 feet by 2100; now, therefore, be it

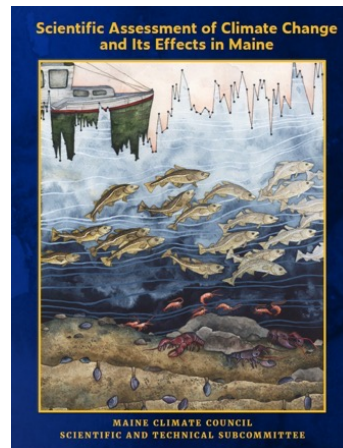
Sec. 1. Department review of laws and rules. Resolved: That the Department of Agriculture, Conservation and Forestry, the Department of Defense, Veterans and Emergency Management, Maine Emergency Management Agency, the Department of Environmental Protection, the Department of Inland Fisheries and Wildlife, the Department of Marine Resources, the Department of Transportation and the Office of the Attorney General shall conduct a review of the laws and rules they are charged with administering under the Maine Revised Statutes and, by January 1, 2022, shall recommend to the Joint Standing Committee on Environment and Natural Resources any changes necessary to:

1. Incorporate consideration of 1.5 feet of relative sea level rise by 2050 and 4 feet by 2100 into administration of those laws and rules; and
2. Implement the strategy designated as “Strategy F3” in the state climate action plan issued by the Maine Climate Council in 2020 pursuant to the Maine Revised Statutes, Title 38, section 577 to enhance community resilience to flooding and other climate impacts.

The Joint Standing Committee on Environment and Natural Resources may report out legislation to implement the recommendations to the Second Regular Session of the 130th Legislature.



2017 NOAA Technical Report

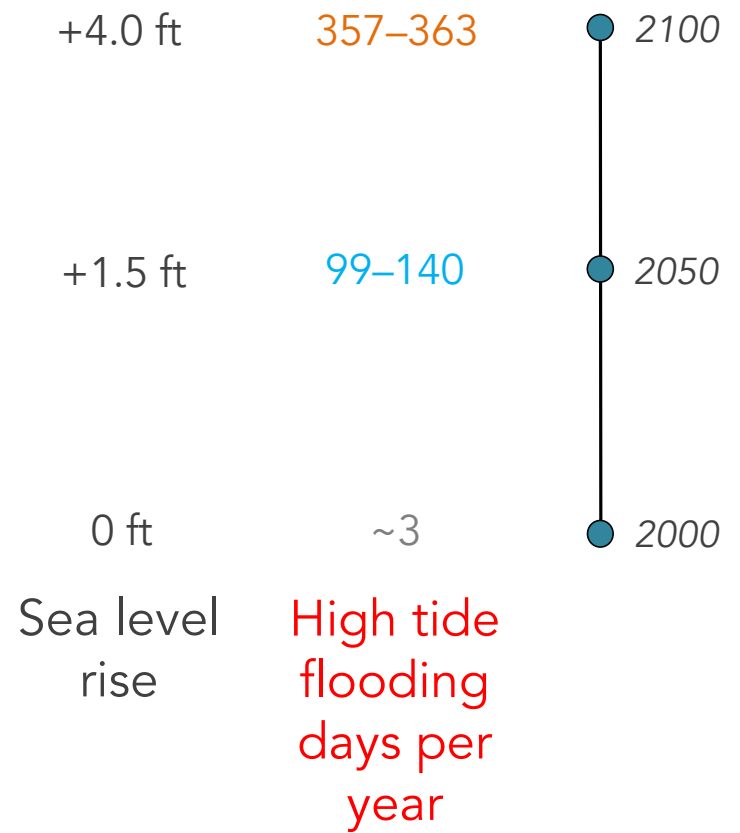
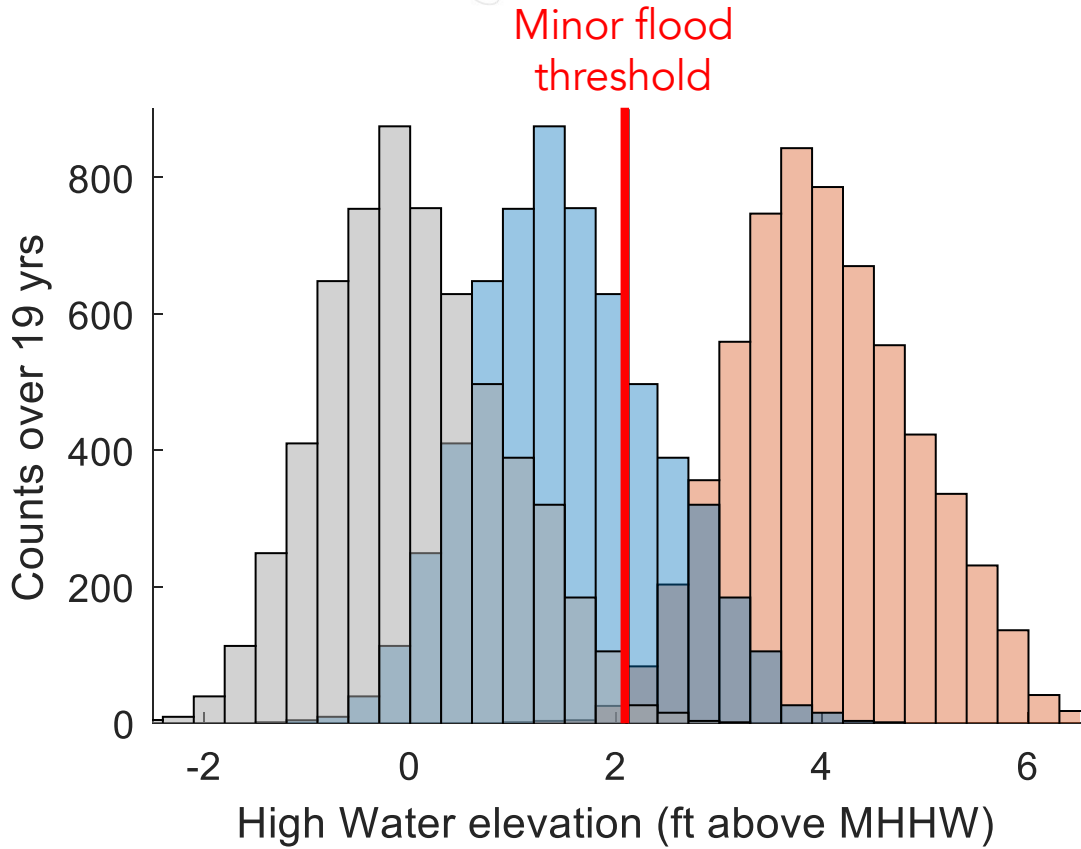


Maine Climate Council adopts sea level planning targets based on Scientific and Technical Subcommittee report



Legal mandate to incorporate “commit to manage” scenarios into state agency regulations

Flooding in Portland under "Commit to Manage"

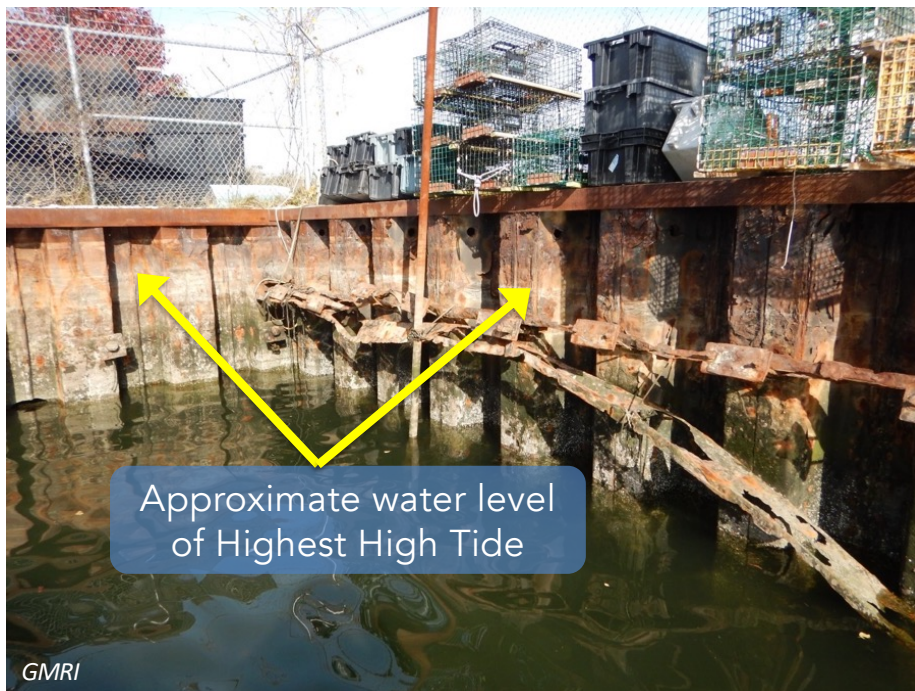


<https://sealevel.nasa.gov/flooding-days-projection/>

Preserving Wright's Wharf: Bulkhead Replacement

"I've been assuming a sea level rise of 0.1"/yr or 10-12" over 100yr. Now I'm hearing reports it could be twice that rate. A sheet pile wall with a lifespan of 75 years could see 1-2 feet of sea level rise.

The question is how high to make the wall?"



Union Wharf: December 23, 2022

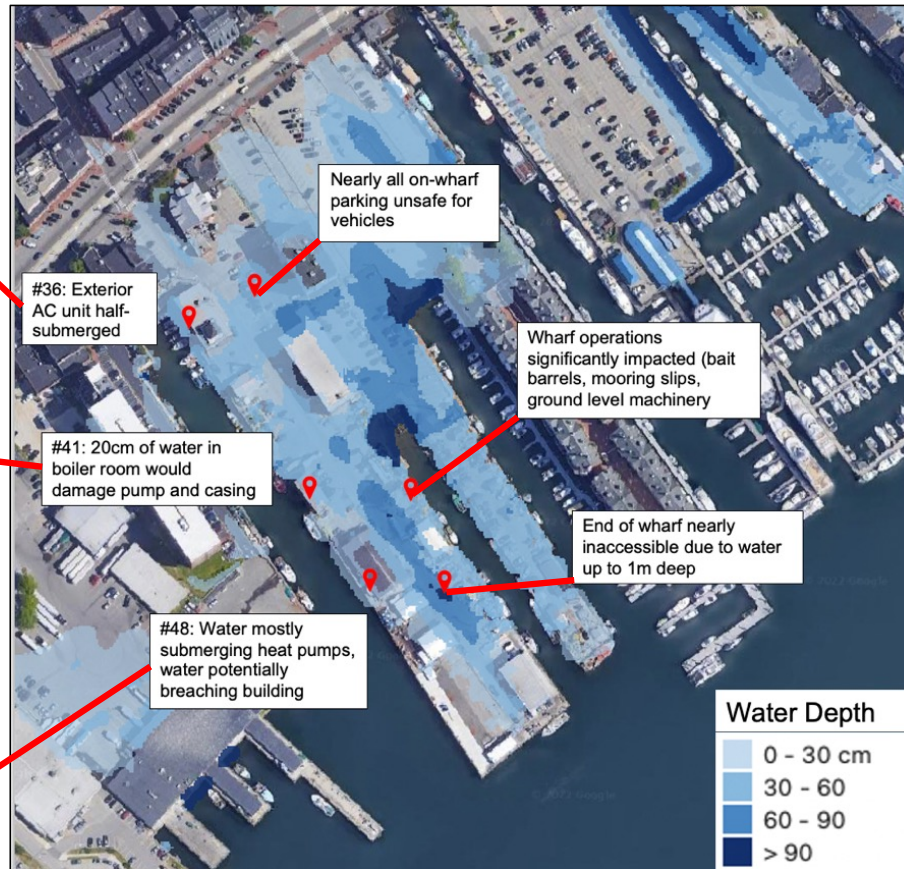


Photo credits: Tim Reich, GMRI

Protecting Union Wharf: Flood Risk Analysis



4.6 ft above MHHW
(2031 median 10% annual chance storm tide)



Next step

Create a transferable and replicable process for developing a Union Wharf SLR adaptation strategy that can support climate-smart working waterfronts throughout the region.



Thank You!

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gmri.org/climate



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