Agenda

5:30-6:30pm – Presentations

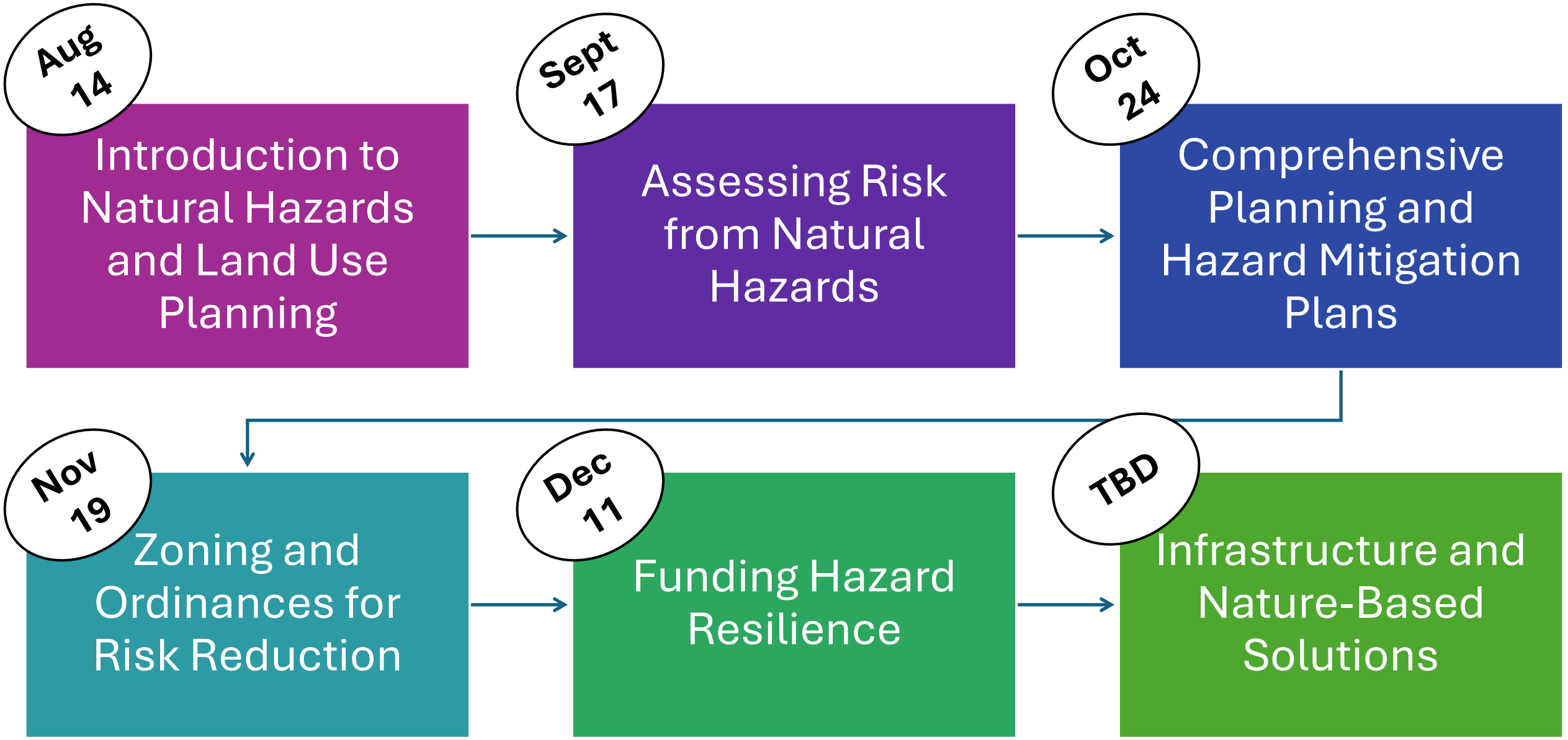
1. Hazard key terms
2. Social vulnerability
3. Wildfire
4. Flooding
5. Erosion and landslides
6. Stream barriers and tidal restrictions
7. Questions & next steps

6:30-7:30pm – Risk assessment tool demonstration

Natural Hazards 101 Series

Session #2: Assessing Risk from Natural Hazards

September 17, 2024


Aug 14
Introduction to Natural Hazards and Land Use Planning
Sept 17
Assessing Risk from Natural Hazards
Oct 24
Comprehensive Planning and Hazard Mitigation Plans
Nov 19
Zoning and Ordinances for Risk Reduction
Dec 11
Funding Hazard Resilience
TBD
Infrastructure and Nature-Based Solutions

Natural Hazard Key Terms

Presented by Rachael Hamilton

NOAA Coastal Management Fellow, Maine Coastal Program

Hazard vs. Disaster

Hazard – "an act or phenomenon that has the potential to produce harm or other undesirable consequences to a person or thing. Hazards exist with or without the presence of people and land development."

Natural hazard – "caused by natural events that pose a threat to lives, property, and other assets", such as hurricanes

Disaster – "serious disruption to the functioning of a community"

Definitions from the Federal Emergency Management Agency's Emergency Management Institute – Independent Study Program Glossaries (training.fema.gov)

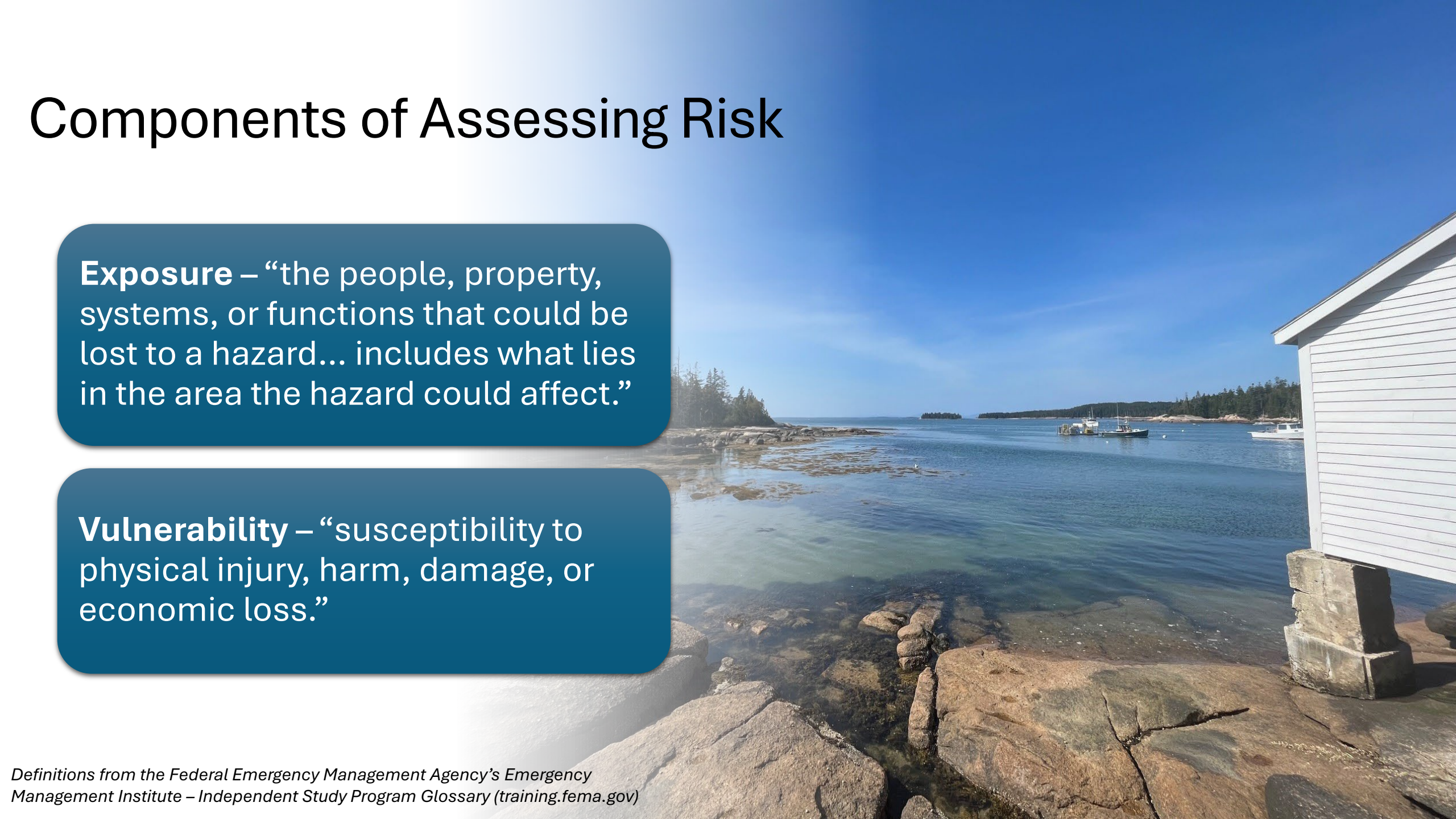
[An overview of the Winooski River in Richmond, Vermont on June 27, 2019 (left) and on July 11, 2023, after heavy rains triggered flooding]

Boyle, L. (2023, July 13). *Vermont's catastrophic flooding is visible from space*. The Independent. https://www.independent.co.uk/climate-change/news/vermont-montpelier-flooding-northeast-b2374194.html

Components of Assessing Risk

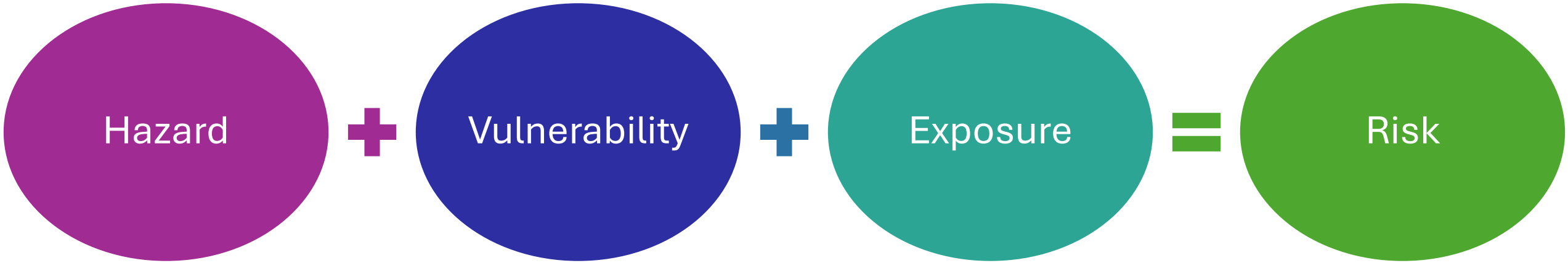
Exposure – "the people, property, systems, or functions that could be lost to a hazard… includes what lies in the area the hazard could affect."

Vulnerability – "susceptibility to physical injury, harm, damage, or economic loss."



Definitions from the Federal Emergency Management Agency's Emergency Management Institute – Independent Study Program Glossary (training.fema.gov)

Risk – "estimated impact a hazard would have on people, services, facilities, and structures in a community… likelihood of a hazard event resulting in an adverse condition"



Definitions from the Federal Emergency Management Agency's Emergency Management Institute – Independent Study Program Glossaries (training.fema.gov)

Lastly...

Frequency and severity of impacts worsening

Exacerbated by climate change and unplanned urbanization

Impacts can be reduced, if action taken ahead of time

Every $1 invested in mitigation saves between $2 and $13 in remediation (MHMC, 2019)

Multi-Hazard Mitigation Council (2019). *Natural Hazard Mitigation Saves: 2019 Report*. National Institute of Building Sciences. www.nibs.org

Social Vulnerability

Presented by Jessica Brunacini

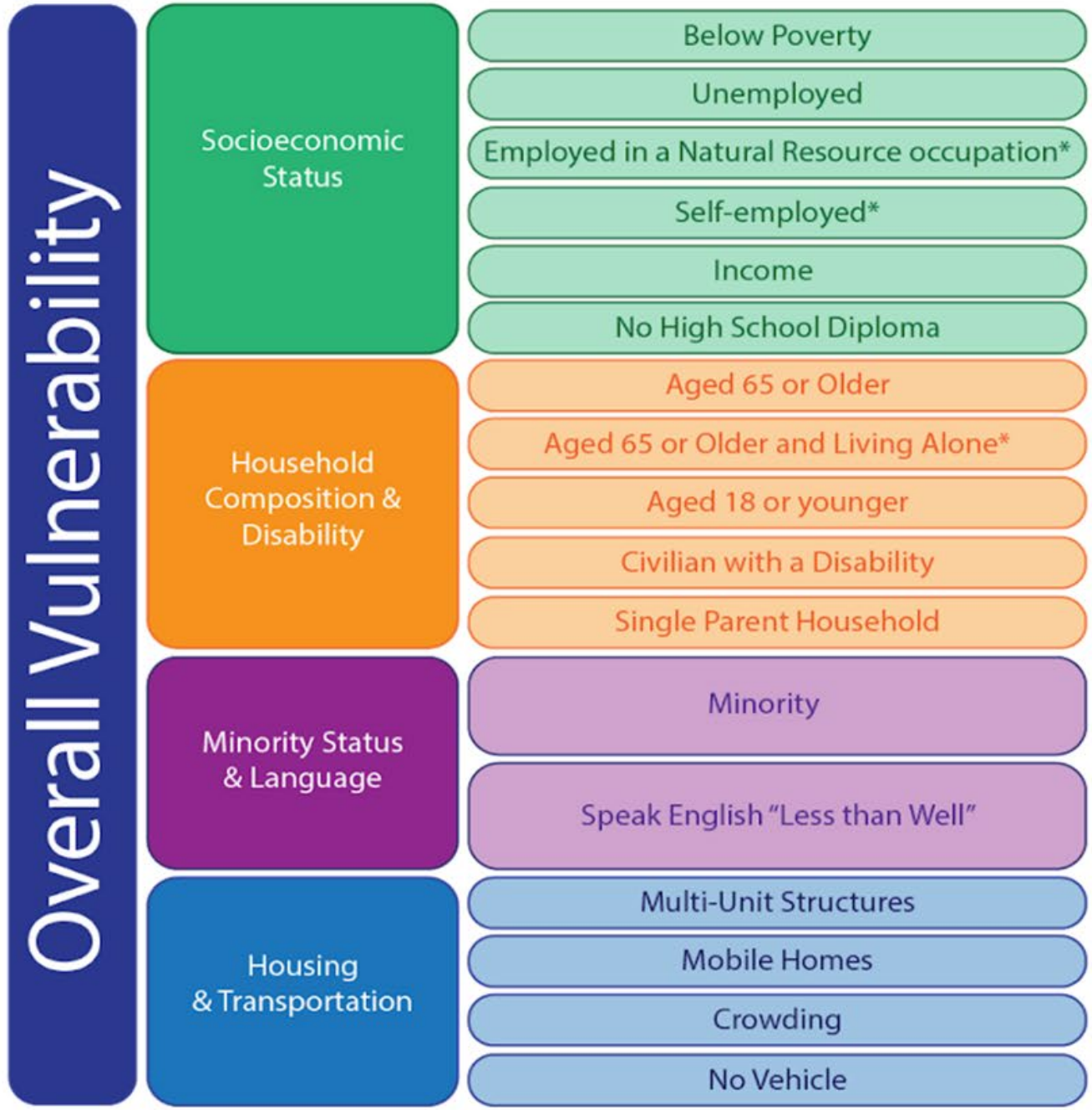
Coastal Training Program Director

Wells National Estuarine Research Reserve

Social Vulnerability:

Certain conditions or circumstances that affect an individual or community's capacity to anticipate, confront, repair, and recover from the effects of a stressor or shock (including natural hazards and climate-related disasters). (Johnson et al. 2022)

Maine Social Vulnerability Index



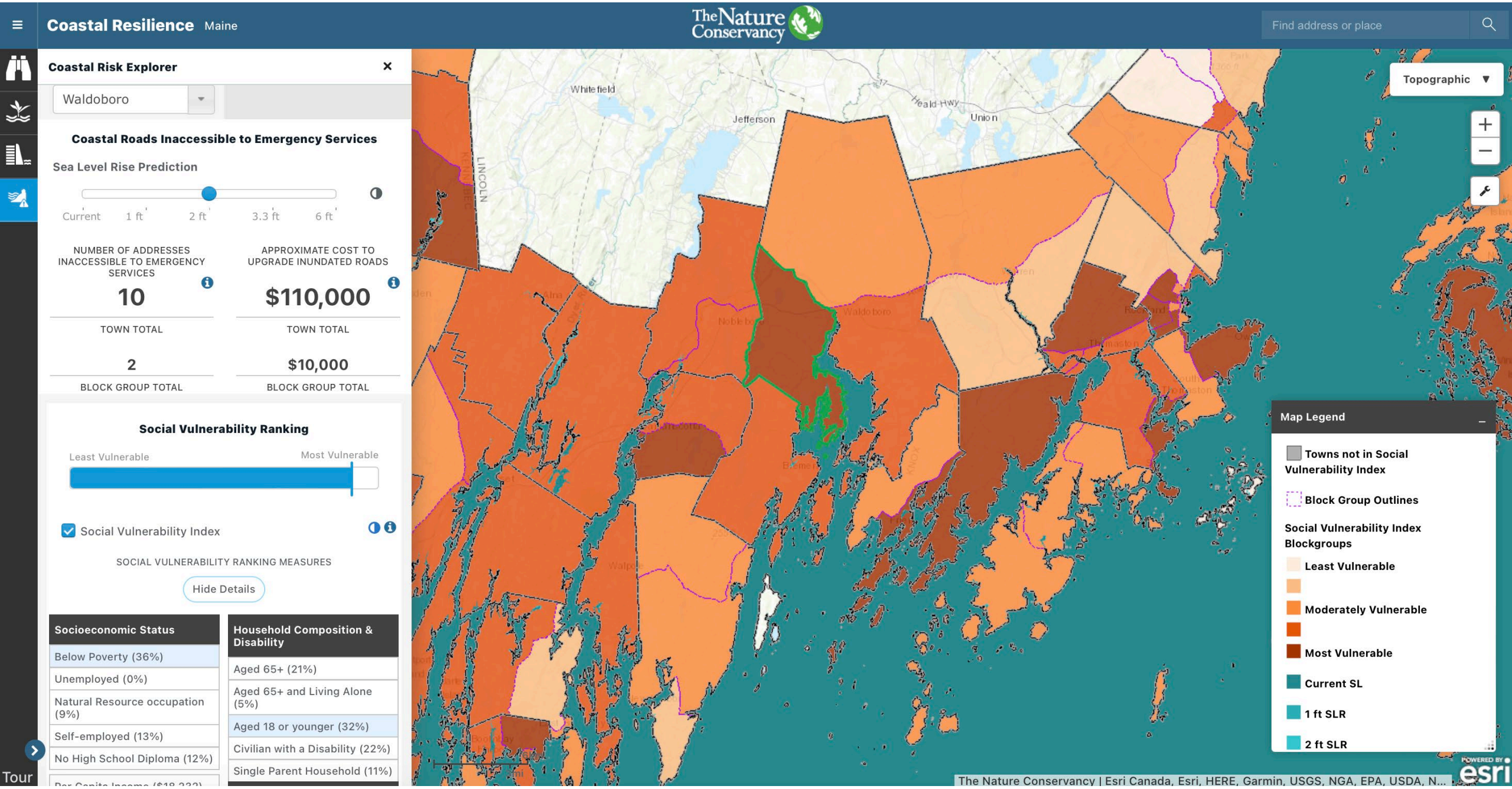
Source: Johnson, Bell, and Hertz 2016 (adapted from CDC/ATSDR SVI

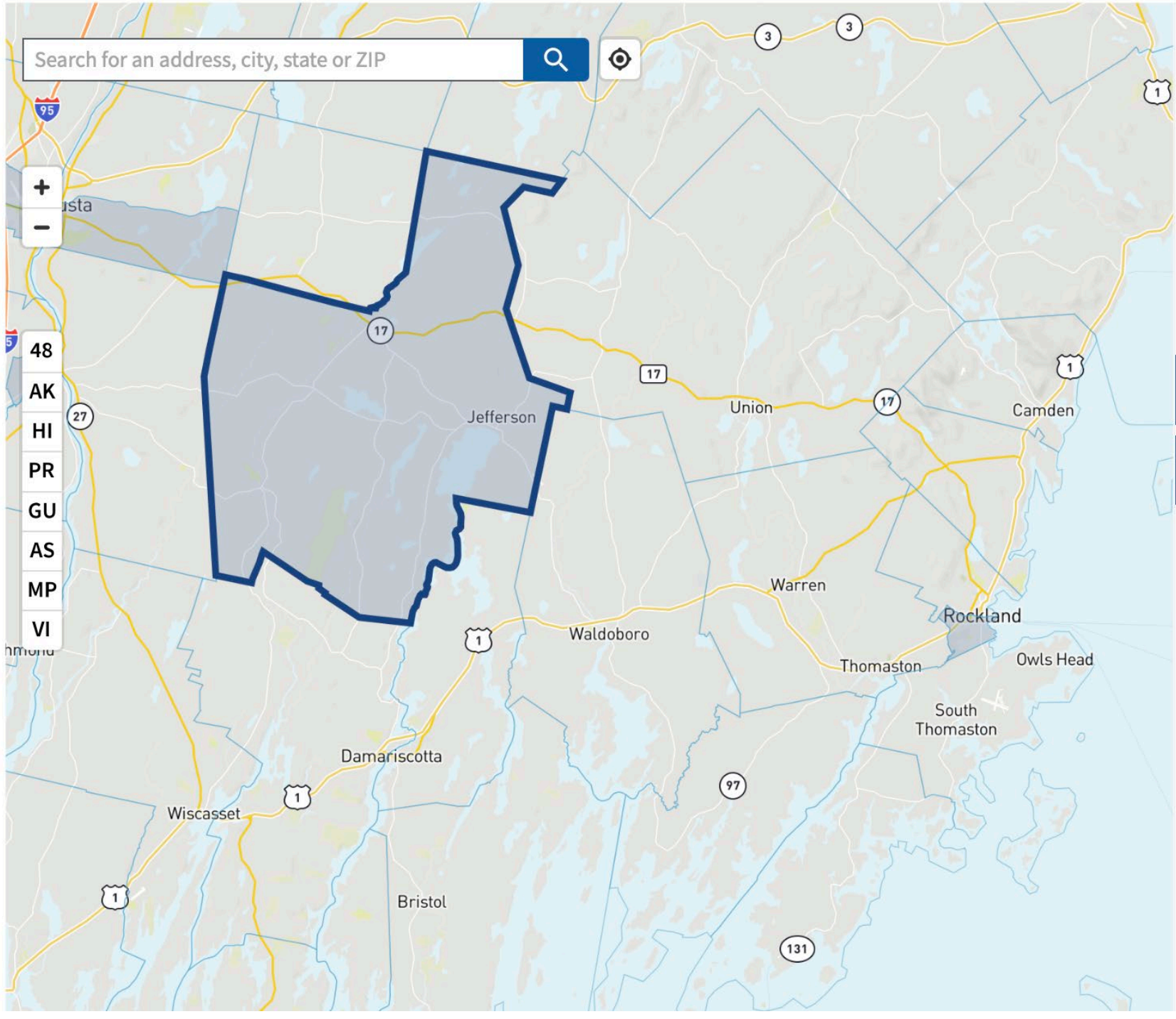
Maine Climate Council Equity Subcommittee: *Priority Populations*

Individuals and Households:
Households with low-income individuals, older adults (age 65+), people with asthma or other health vulnerabilities, people with disabilities, people with limited access to transportation, Black, Indigenous and People of Color (BIPOC), people with limited English proficiency, low-income residents of rental housing (especially multifamily), mobile home residents, low-income homeowners, unhoused individuals, and families. Individual worker characteristics include employment and work authorization status, students, people with limited English proficiency including New Mainers, gender, people transitioning from prison or in recovery, and/or migrant workers.

Geographic Areas and Communities:
Low-income communities, rural communities, small towns with limited staff capacity, disadvantaged communities, climate-frontline communities, and/or Tribal and Indigenous communities.

Businesses:
Businesses in the natural resource industries like agriculture, forestry, and fishing, clean energy industry (including energy efficiency), small businesses, minority- or women-owned business enterprises (MWBEs).


Coastal Resilience Maine
The Nature Conservancy
Find address or place
Coastal Risk Explorer
Waldoboro
Coastal Roads Inaccessible to Emergency Services
Sea Level Rise Prediction
Current
1 ft
2 ft
3.3 ft
6 ft
NUMBER OF ADDRESSES INACCESSIBLE TO EMERGENCY SERVICES
10
TOWN TOTAL
2
BLOCK GROUP TOTAL
APPROXIMATE COST TO UPGRADE INUNDATED ROADS
$110,000
TOWN TOTAL
$10,000
BLOCK GROUP TOTAL
Social Vulnerability Ranking
Least Vulnerable
Most Vulnerable
Social Vulnerability Index
SOCIAL VULNERABILITY RANKING MEASURES
Hide Details
Socioeconomic Status
Below Poverty (36%)
Unemployed (0%)
Natural Resource occupation (9%)
Self-employed (13%)
No High School Diploma (12%)
Household Composition & Disability
Aged 65+ (21%)
Aged 65+ and Living Alone (5%)
Aged 18 or younger (32%)
Civilian with a Disability (22%)
Single Parent Household (11%)
Topographic
Map Legend
Towns not in Social Vulnerability Index
Block Group Outlines
Social Vulnerability Index Blockgroups
Least Vulnerable
Moderately Vulnerable
Most Vulnerable
Current SL
1 ft SLR
2 ft SLR
Whitefield
Jefferson
Union
Waldoboro
LINCOLN
Tour
The Nature Conservancy | Esri Canada, Esri, HERE, Garmin, USGS, NGA, EPA, USDA, N...
esri



Identified as disadvantaged?

YES

This tract is considered disadvantaged because it meets more than 1 burden threshold **AND** the associated socioeconomic threshold.

Send feedback

Climate change +

Energy −

Energy cost
Average annual energy costs divided by household income

92nd
above 90th percentile

PM2.5 in the air
Level of inhalable particles, 2.5 micrometers or smaller

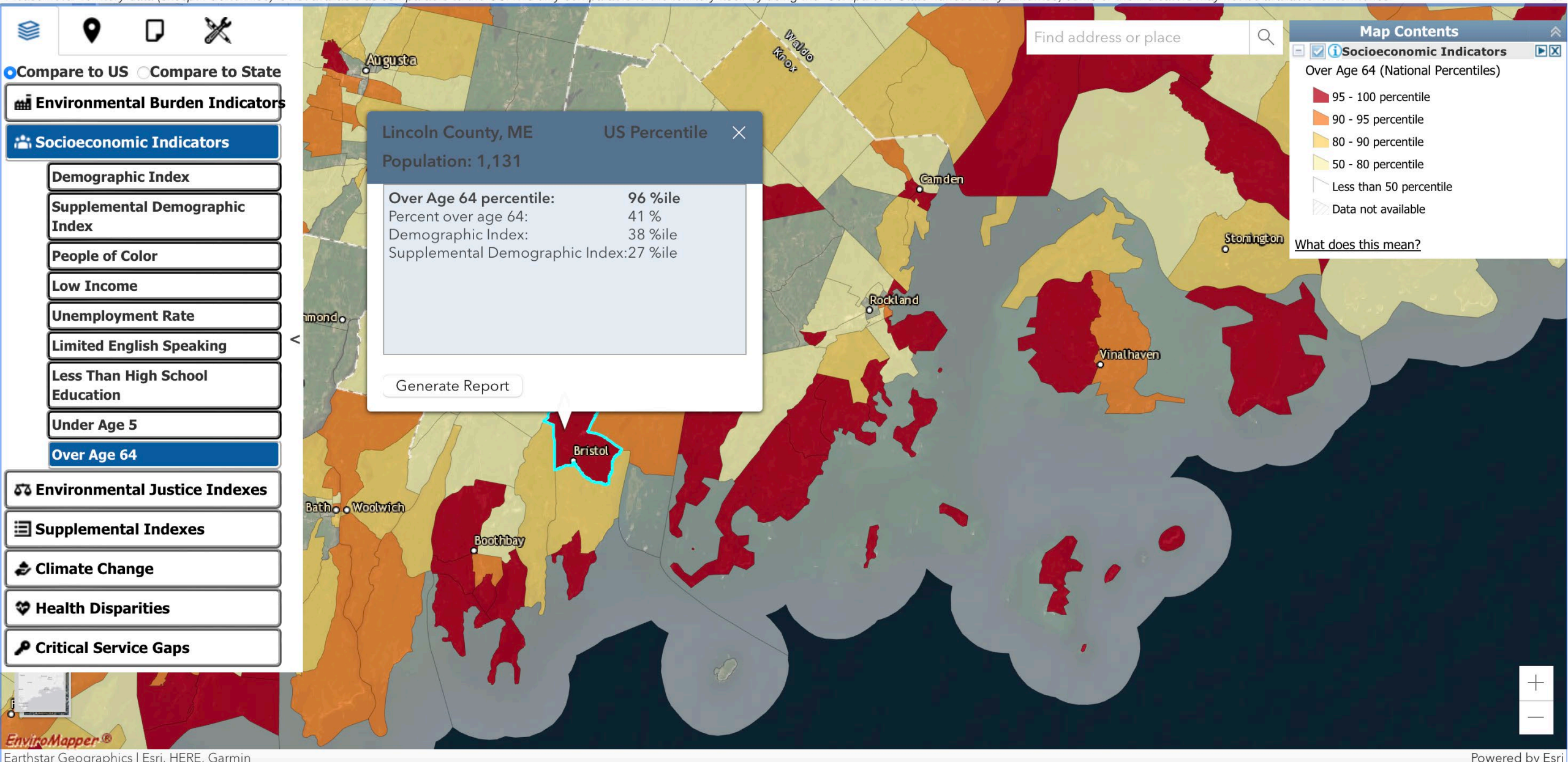
2nd
not above 90th percentile

AND

Low income
People in households where income is less than or equal to twice the federal poverty level, not including students enrolled in higher ed

67th
above 65th percentile

Please note: Territory data (except Puerto Rico) is not available as comparable to the US. It is only comparable to the territory itself by using the 'Compare to State' functionality. Likewise, some of the indicators may not be available for territories. X



Southern Midcoast Social Resilience Project

(Maine Sea Grant, Wells Reserve, Bowdoin College, Blue Sky Planning, CBEP, TNC, KELT)

Source: Southern Midcoast Social Resilience Project Final Report (2022)

Social Vulnerabilities identified by project participants:

- New Mainers
- Individuals new to Maine
- LGBTQ
- Uninsured / underinsured
- Food insecure
- Housing insecure
- Isolated populations
- Seasonal residents
- Small business owners
- Newly vulnerable
- Frontline workers

Assessing Risk from Wildfire:

Information for Land Use Planners

David Ludwig, Senior Climate Planner, Maine DACF

Presented by: Rachael Hamilton, Maine Coastal Program

maine DEPARTMENT OF Agriculture Conservation & Forestry

maine DEPARTMENT OF Agriculture Conservation & Forestry
RESOURCE INFORMATION & LAND USE PLANNING

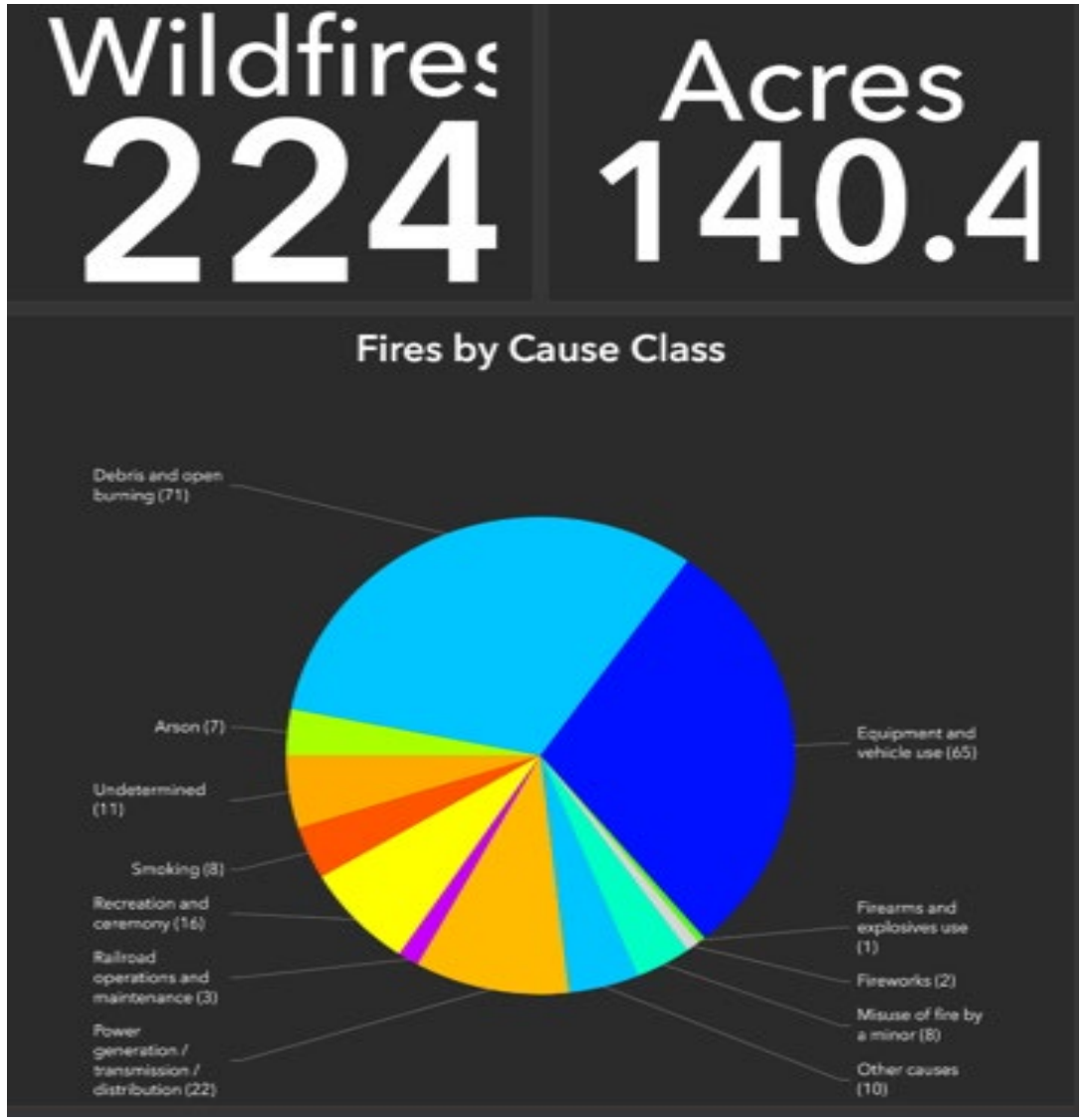


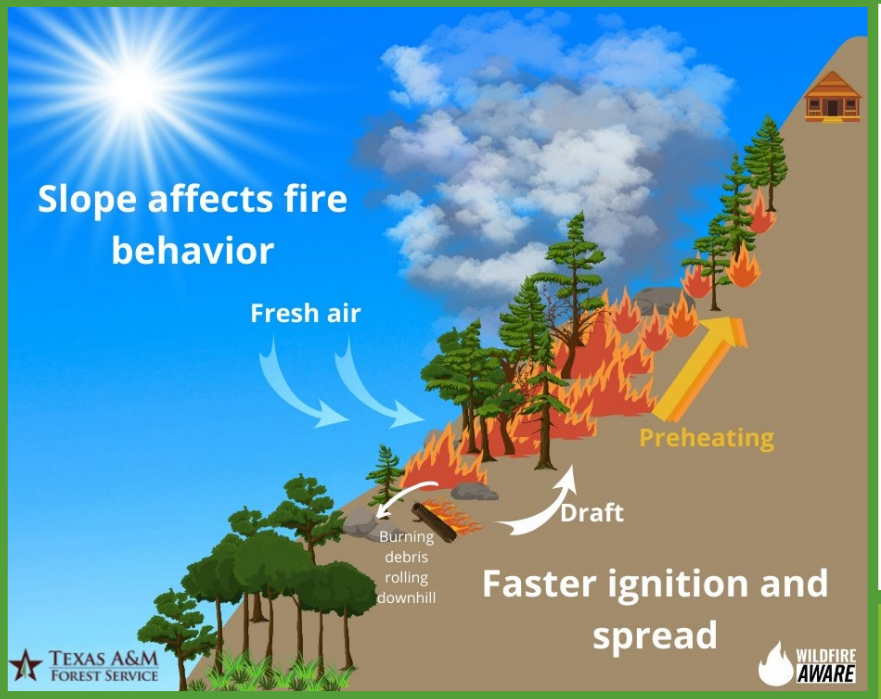
Image: A screenshot showing wildfire causes from a portion of a previous year in Maine. Courtesy of the Maine Forest Service.

What Causes Wildfires?

Causes can include:

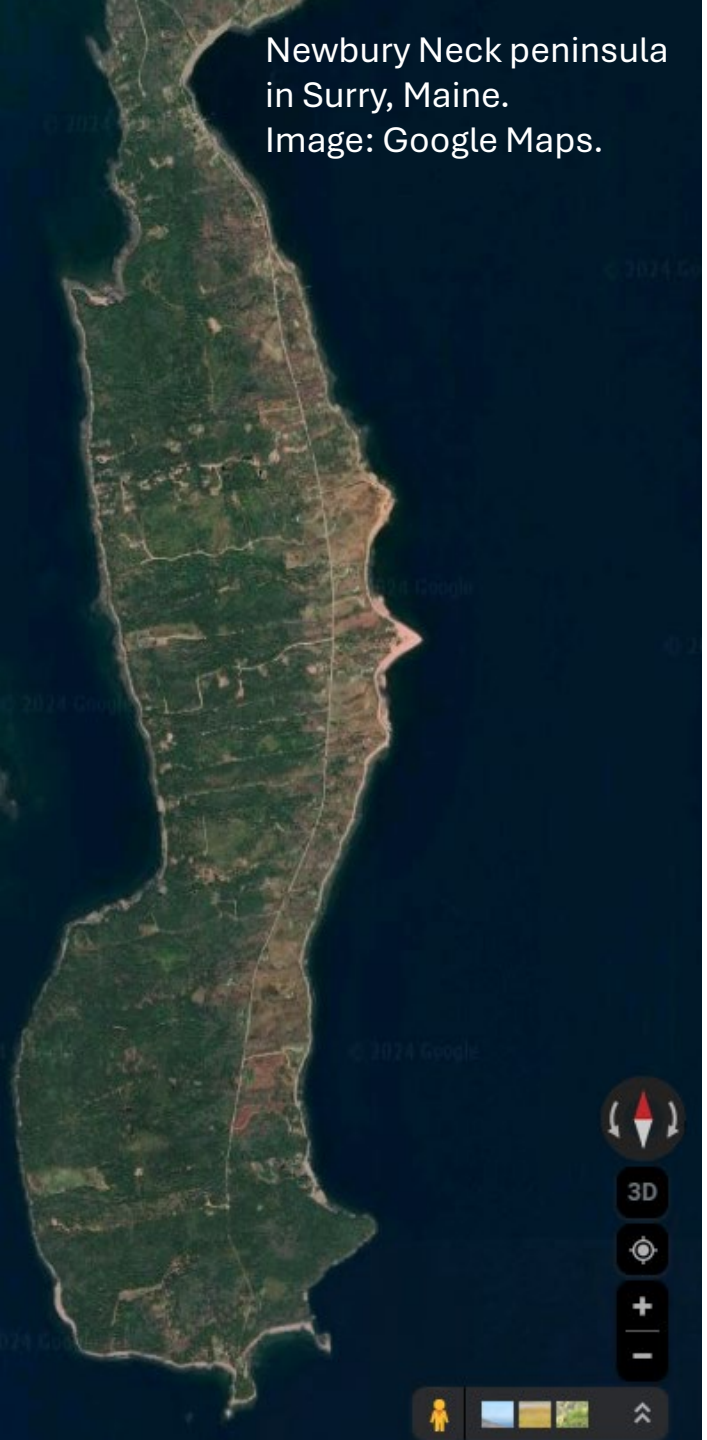
- ★Debris and open burning
- Equipment and vehicle use
- Power generation/transmission
- Arson
- And more

Maine forest rangers investigate and assign causes to wildfires statewide.



Factors Influencing Wildfire Risk

- Topography
- Soil characteristics
  - Sandy, gravelly, or well-drained
- Vegetation type
  - Softwood vs. hardwood trees
- “Fuel” availability
  - Biomass and human infrastructure
  - Storm damage
  - Spot treatment to maintain ecological benefits!



Newbury Neck peninsula in Surry, Maine.
Image: Google Maps.

Municipal Actions: Ingress and Egress

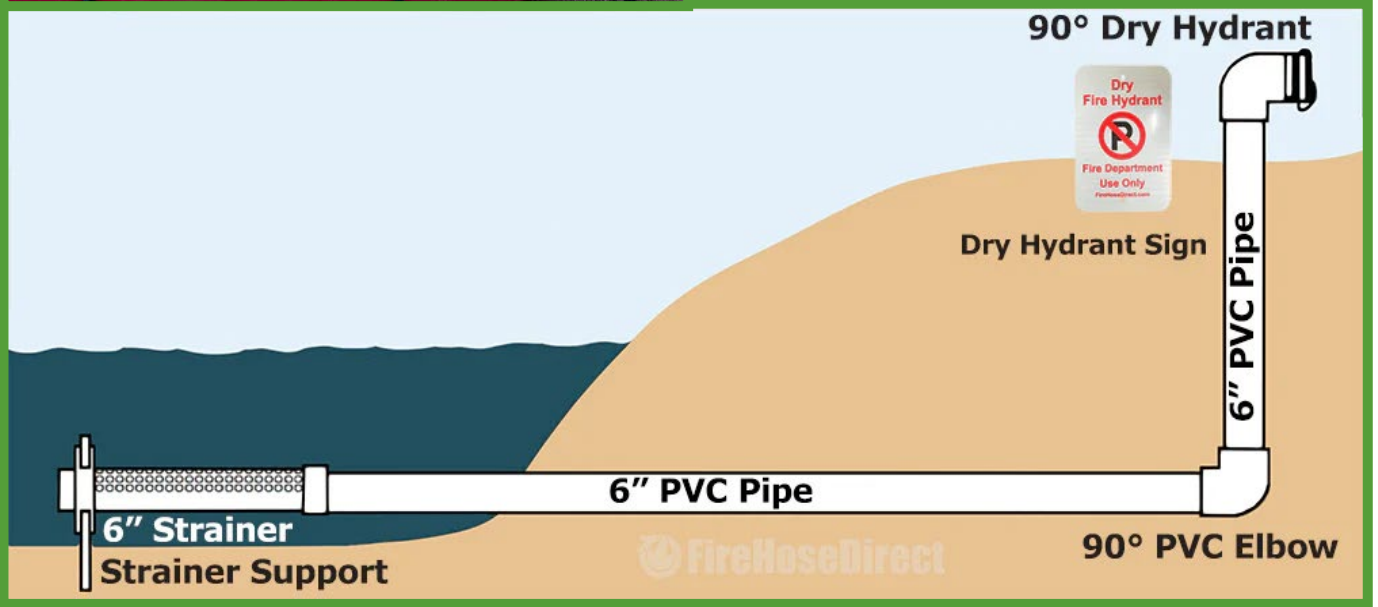
- Remember that evacuation and response co-occur
- Vulnerability increases in communities with one road in and out
  - Balance emergency response with desired traffic patterns
  - e.g., flexible bollards, gates with locks only town/FD can access in emergency, etc.
- Peninsular, bridged, and unbridged island communities may need priority attention for prevention activities.

Island communities are some of our most active partners in fire prevention!

Municipal Actions: Fire Department Capacity

- Distance from nearest fire station
- Staff type – full time or volunteer based
- Know effective mutual aid agreements
- Wildfire versus structure fire
  - Different equipment, training, certifications, and experience

Consider a two-way dialogue between planners and FD. Emergency response has knowledge of local hazards that can be valuable to planners!



Municipal Actions: Water Supply

- **Fire hydrants** – use municipal water
- **Dry hydrants** – draft from ponds
  - More affordable, sometimes only option in rural areas
- **Tankers** – shuttle in water from area fire departments
  - Consider any narrow or overgrown roads
  - Have neighboring departments trained together?

Individual Actions for Risk Reduction

Resources are limited during a major wildfire; taking preventive actions well before a fire ever starts is key!

Defensible space: modifying area around a structure to reduce potential ignitions during a wildfire

- Homes can have landscaping and still maintain defensible space

Home hardening: modifying a structure to resist potential ignitions during a wildfire

- Installing 1/8th inch screening or mesh under decks and over attic vents to prevent embers from entering
- Switching from wooden roof shingles to noncombustible roof shingles
- Removing flammable materials from near homes (firewood piles, trash, leaf piles, etc.)

Community Wildfire Protection Plan (CWPP)

- Create a CWPP!
- Prioritizes areas and makes specific mitigation recommendations
- Increases community eligibility for funding
  - Community Wildfire Defense Grant (CWDG)
- Contact the Maine Forest Service for more information
  - Funding may be available

Understanding and Evaluating Coastal Flood Risk

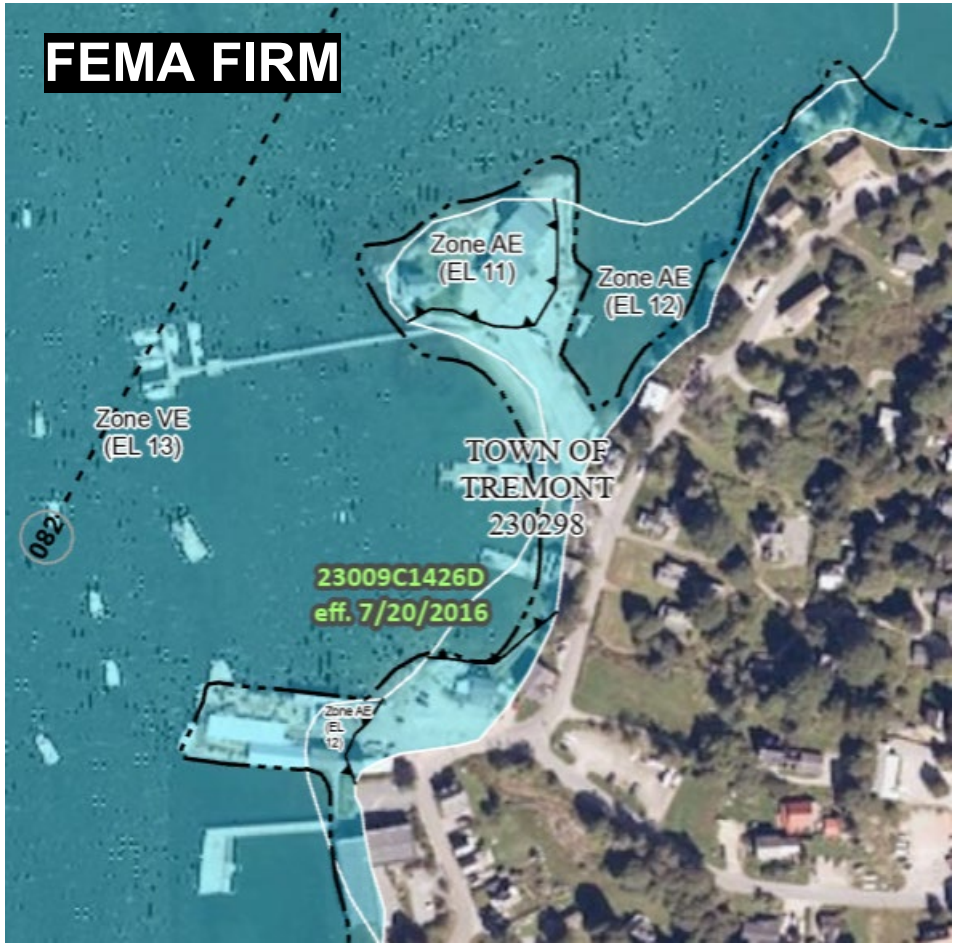
Natural Hazards and Land Use Planning 101 Series
September 17, 2024

Hannah Baranes, Ph.D., Research Scientist
Climate Center, Gulf of Maine Research Institute

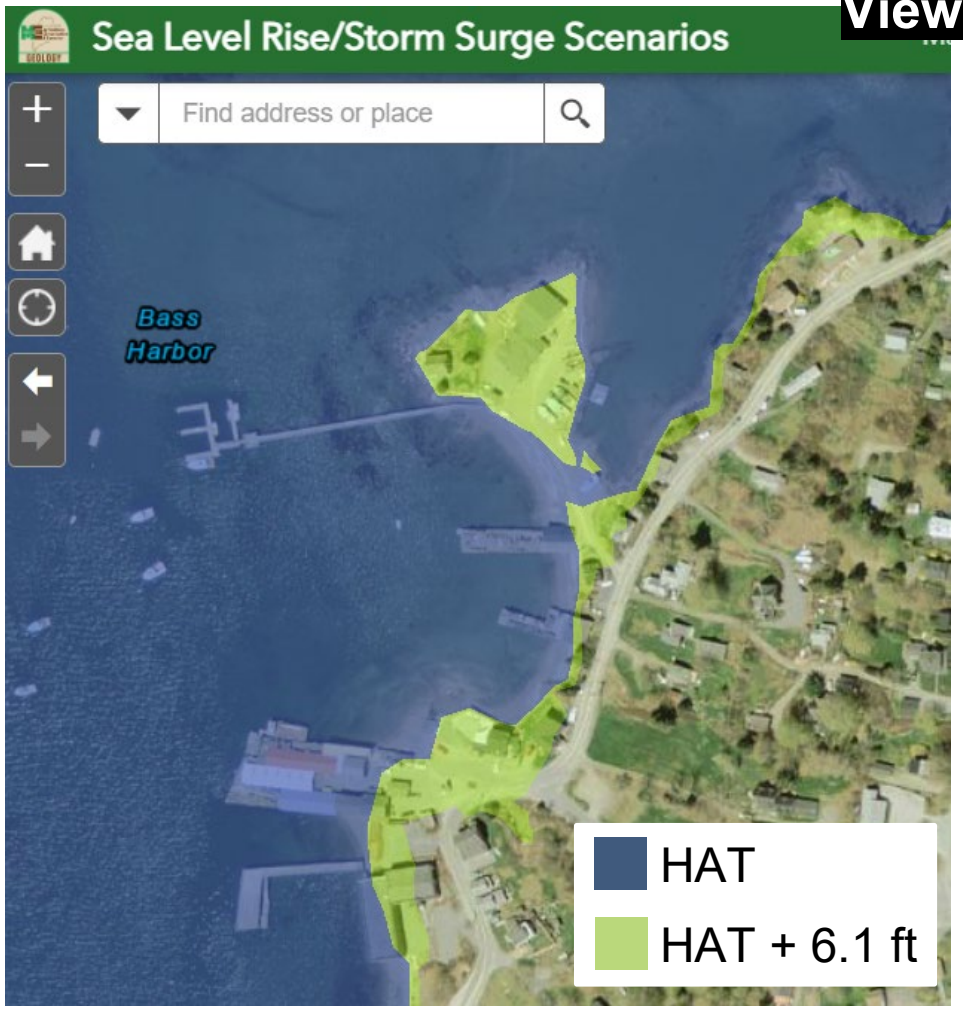
Gulf of Maine Research Institute
Science. Education. Community.

Goals

1. Outline process for conducting a rudimentary coastal flood risk assessment using available tools, data, and models, **with an understanding of their limitations**
2. Understand purpose of new models and tools that will become available



Maine Geological Survey Viewer



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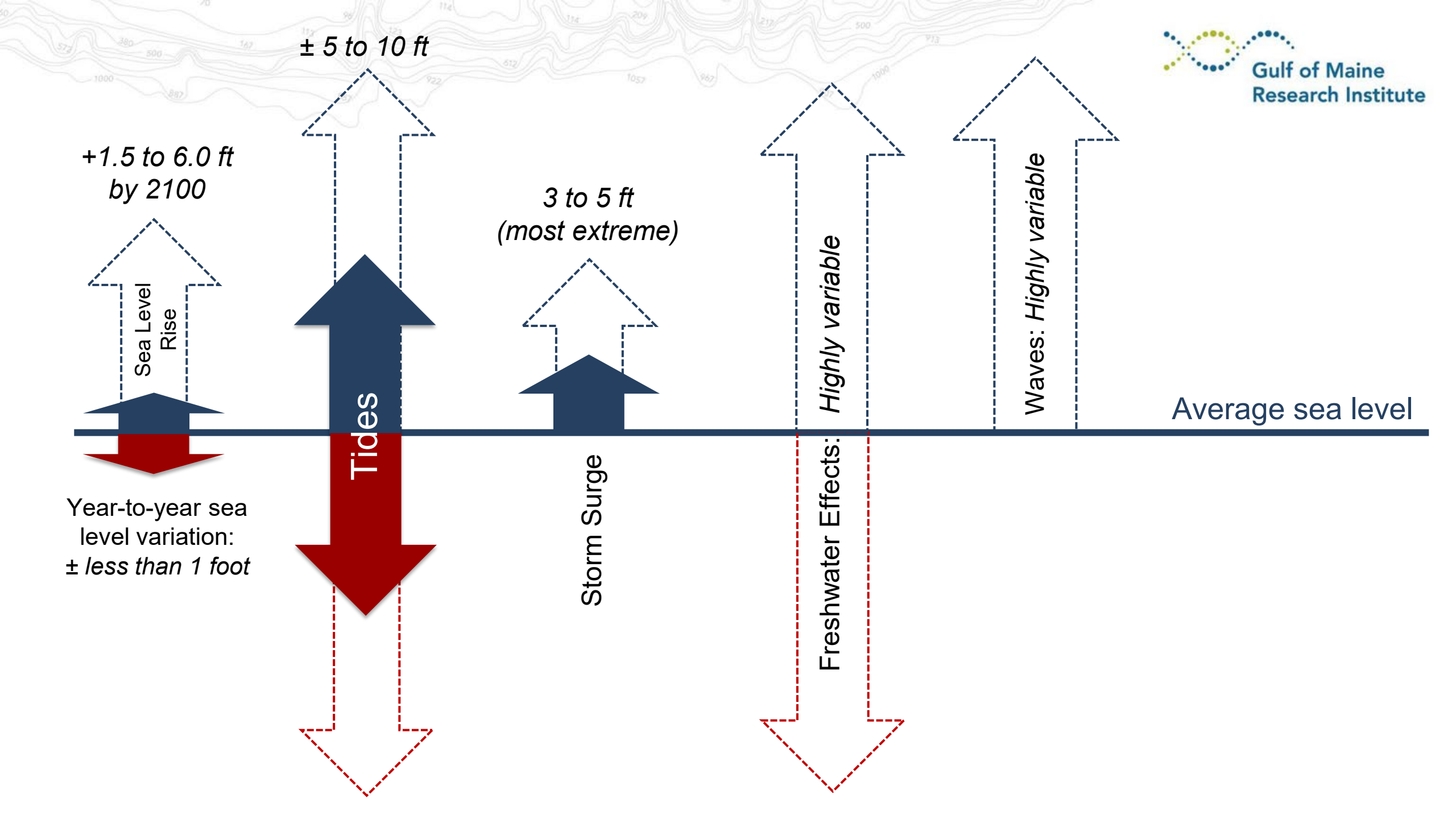
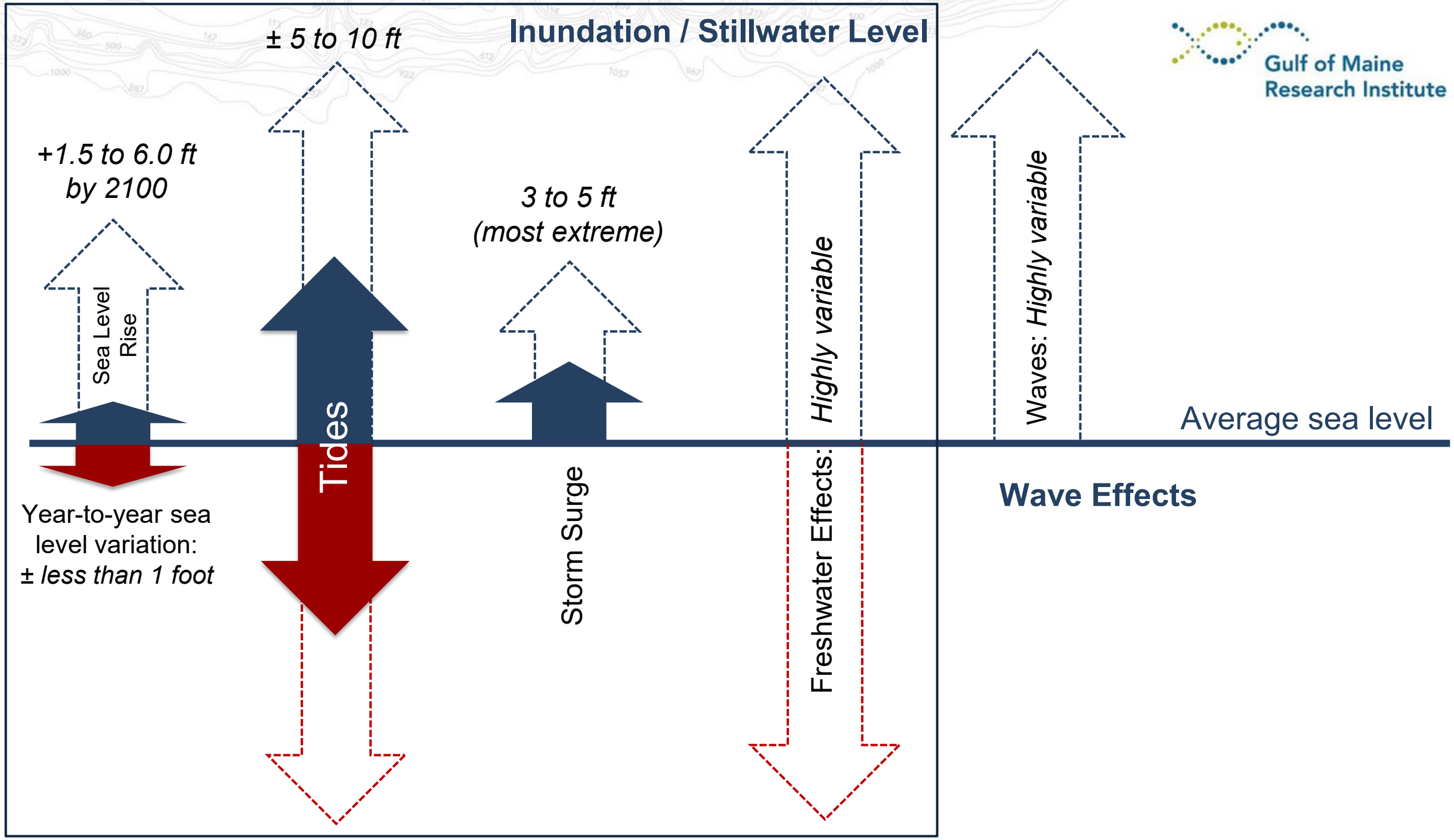
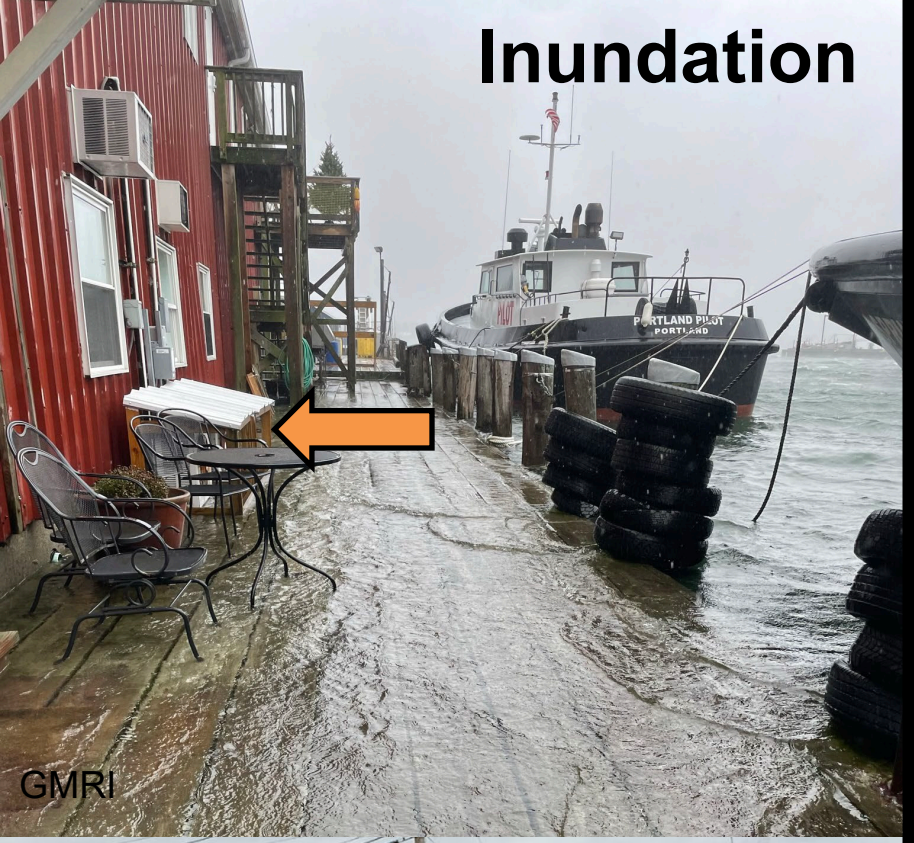
What are the components of coastal water level?

What is (and is not) considered in available resources?


± 5 to 10 ft
+1.5 to 6.0 ft
by 2100
3 to 5 ft
(most extreme)
Sea Level Rise
Tides
Storm Surge
Highly variable
Waves: Highly variable
Average sea level
Freshwater Effects:
Year-to-year sea level variation:
± less than 1 foot
Gulf of Maine Research Institute


Inundation / Stillwater Level
± 5 to 10 ft
+1.5 to 6.0 ft
by 2100
3 to 5 ft
(most extreme)
Sea Level Rise
Tides
Storm Surge
Highly variable
Freshwater Effects:
Waves: Highly variable
Average sea level
Wave Effects
Year-to-year sea level variation:
± less than 1 foot
Gulf of Maine Research Institute

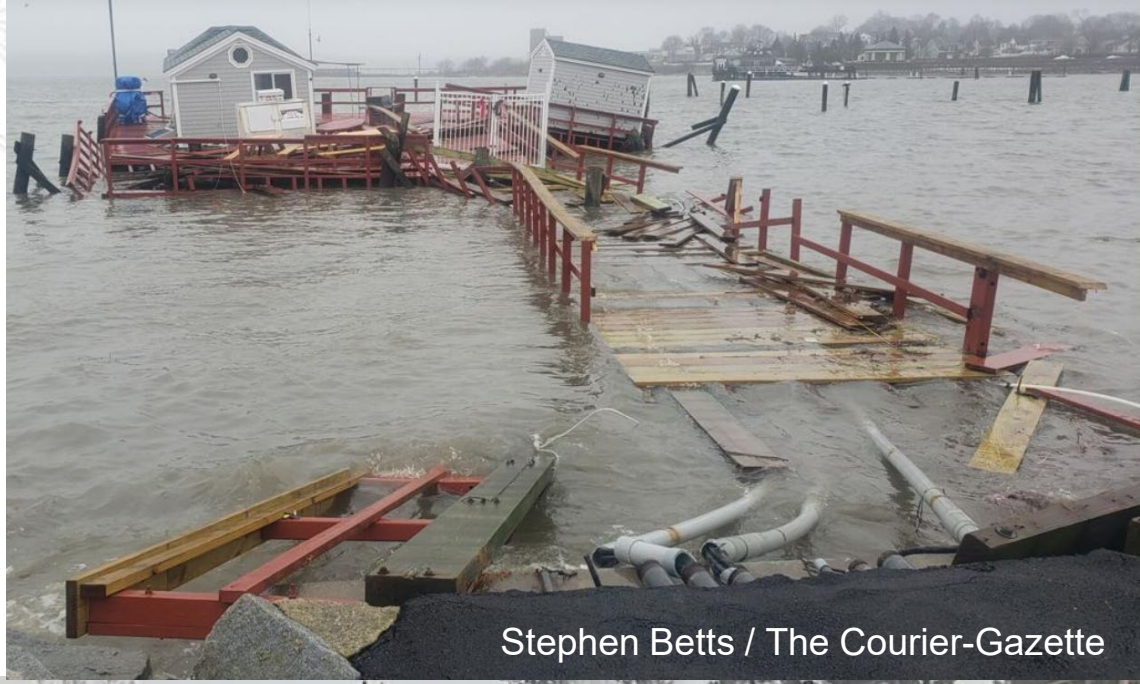
Inundation



GMRI

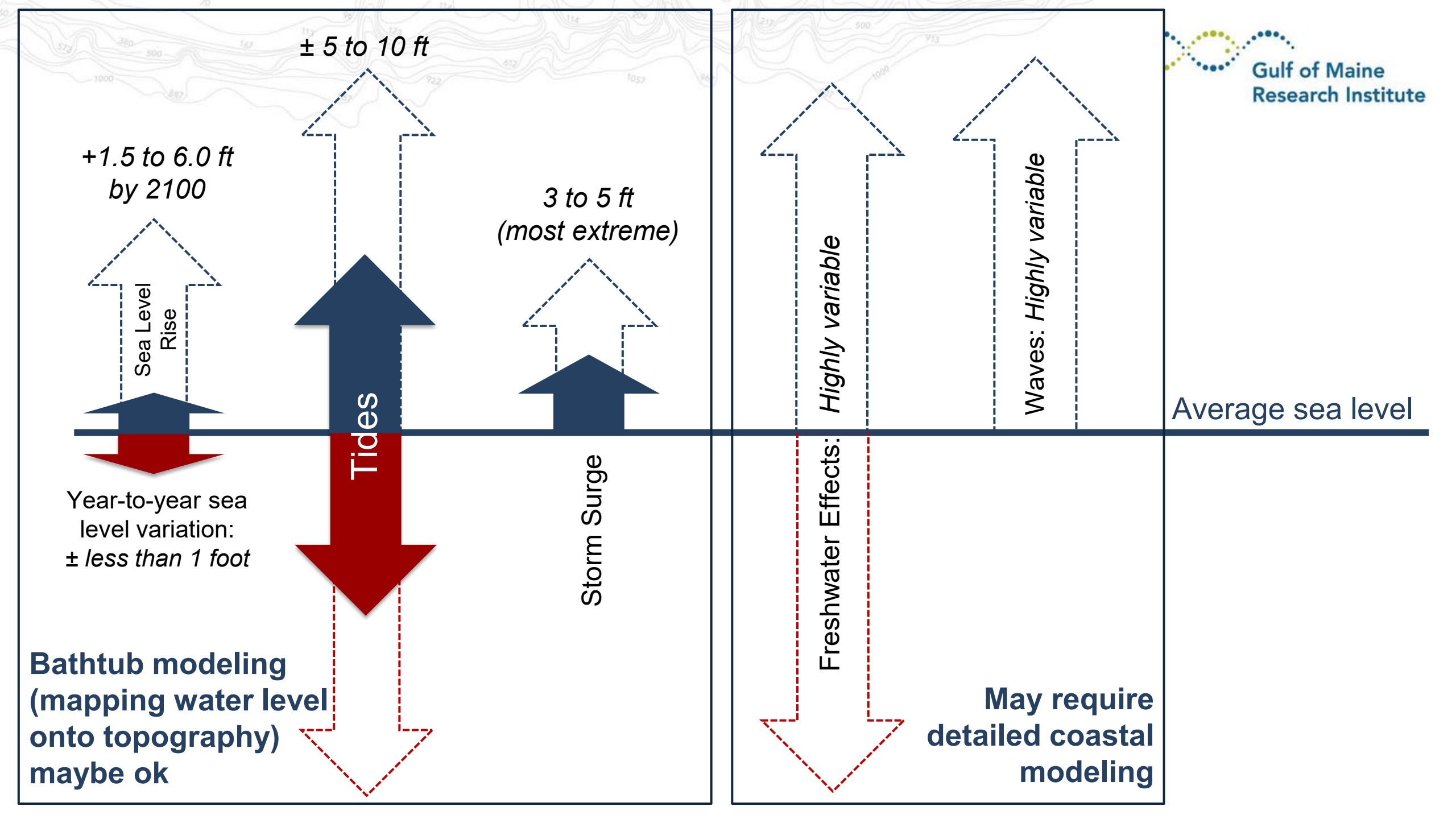
GMRI

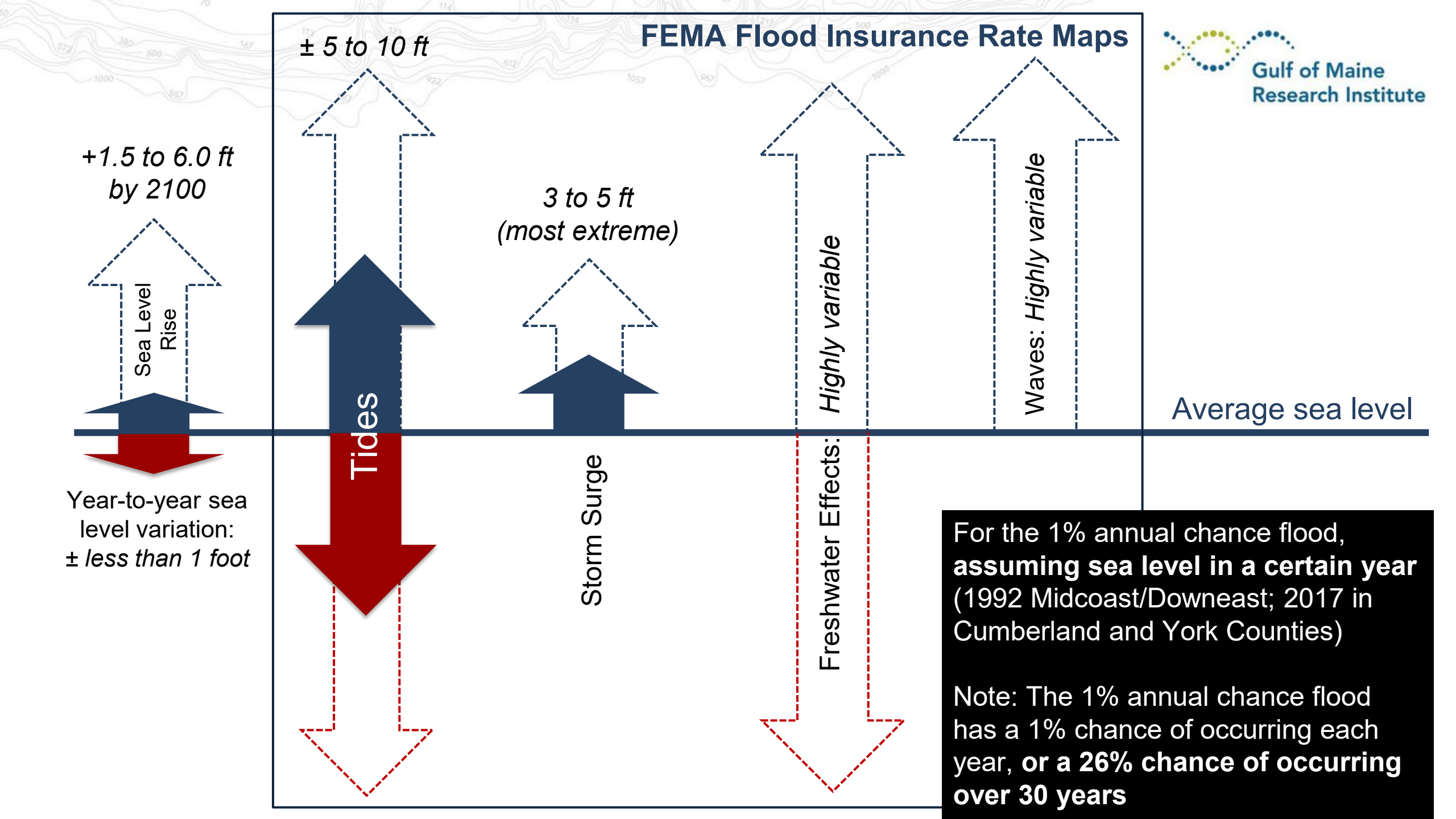
Inundation + Waves



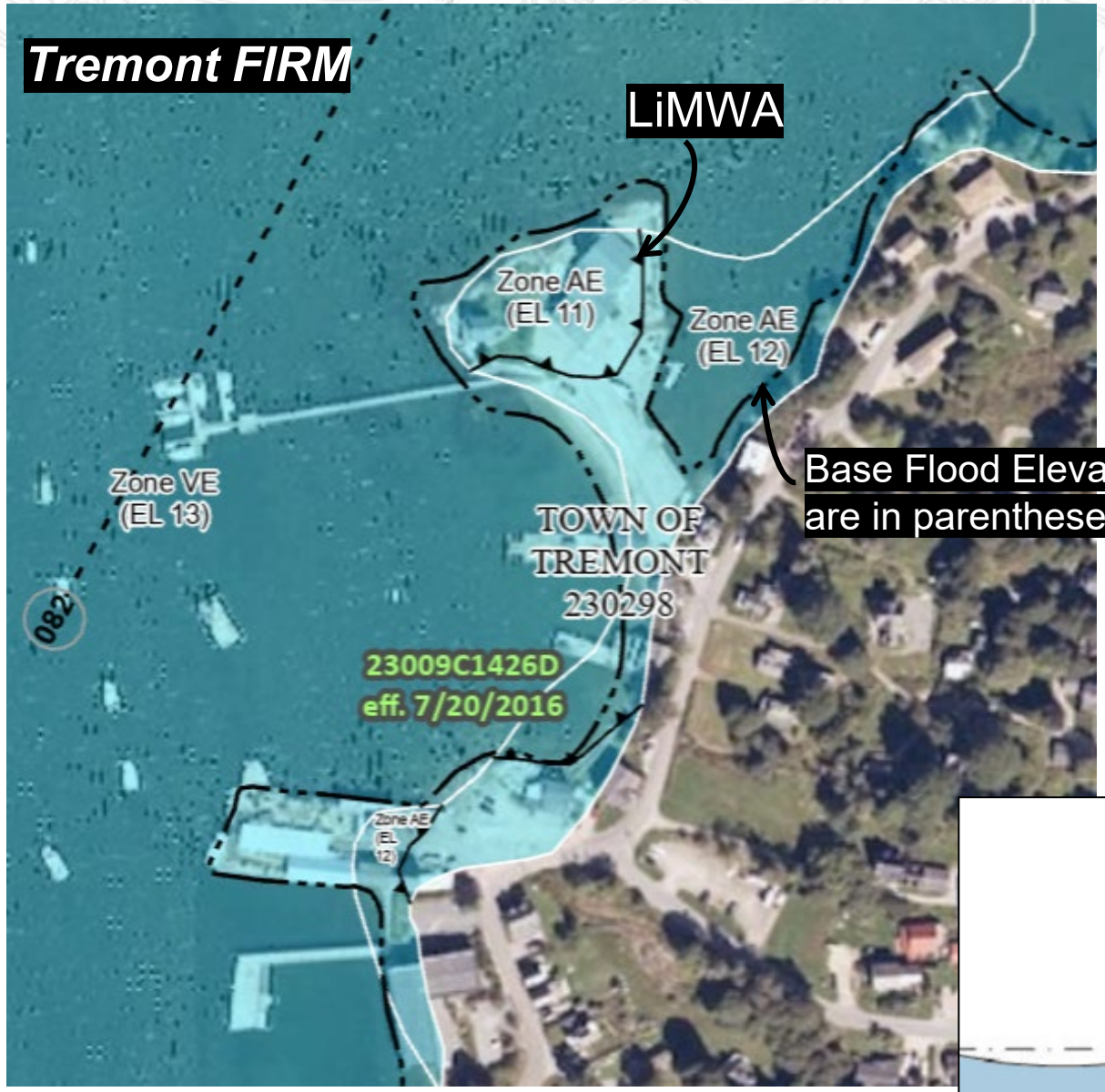
Stephen Betts / The Courier-Gazette

Brett Ciccotelli / Gouldsboro Shore


± 5 to 10 ft
+1.5 to 6.0 ft
by 2100
3 to 5 ft
(most extreme)
Sea Level Rise
Tides
Storm Surge
Highly variable
Waves: Highly variable
Average sea level
Year-to-year sea level variation:
± less than 1 foot
Freshwater Effects:
Bathtub modeling (mapping water level onto topography) maybe ok
May require detailed coastal modeling
Gulf of Maine Research Institute


FEMA Flood Insurance Rate Maps
Gulf of Maine Research Institute
± 5 to 10 ft
+1.5 to 6.0 ft by 2100
3 to 5 ft (most extreme)
Sea Level Rise
Tides
Storm Surge
Highly variable
Waves: Highly variable
Freshwater Effects:
Average sea level
Year-to-year sea level variation: ± less than 1 foot
For the 1% annual chance flood, assuming sea level in a certain year (1992 Midcoast/Downeast; 2017 in Cumberland and York Counties)
Note: The 1% annual chance flood has a 1% chance of occurring each year, or a 26% chance of occurring over 30 years

FEMA Flood Insurance Rate Maps

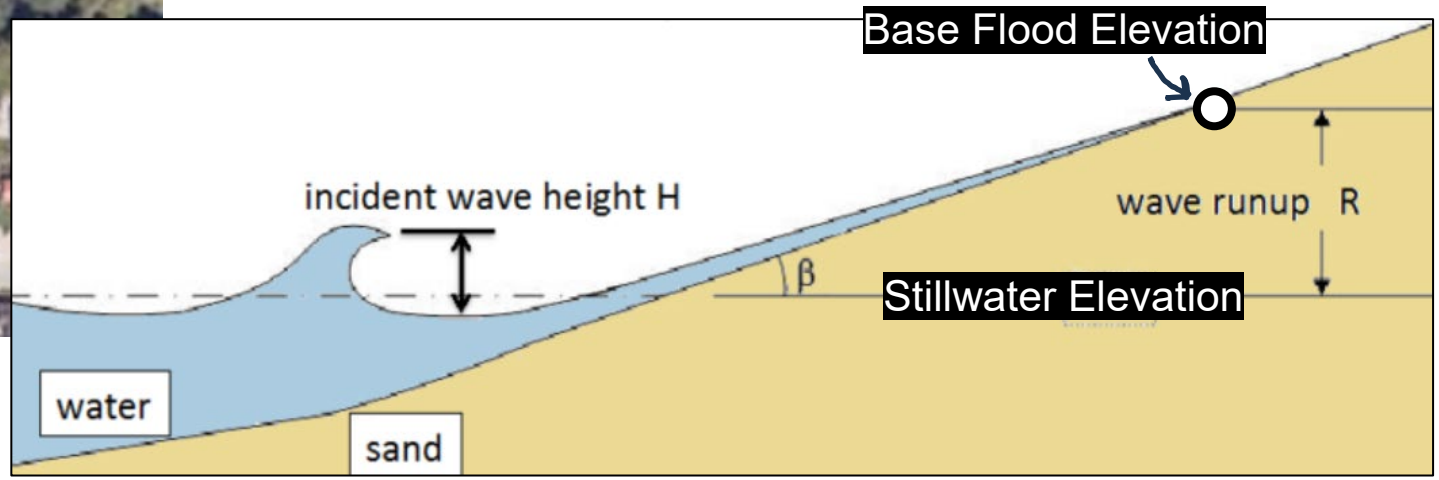


AE Zone: Waves 0-3 feet. Limit of Moderate Wave Action (LiMWA) shows where waves are greater than 1.5 ft.

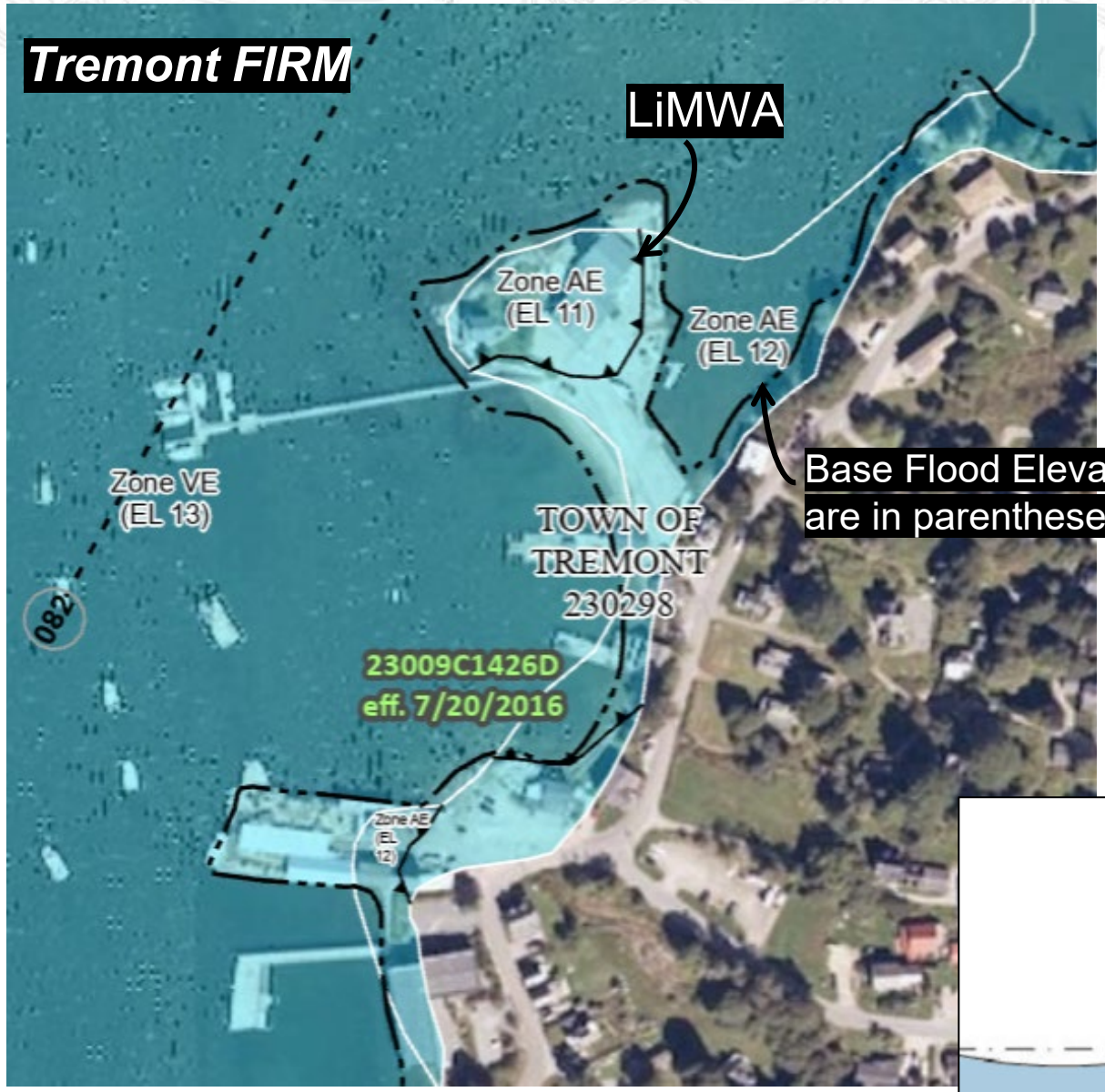
VE Zone: Waves greater than 3 feet

Base Flood Elevation: Total water surface elevation with a 1% chance of occurring each year, including waves

Note: The **1% Stillwater Elevation** is provided in the accompanying Flood Insurance Study

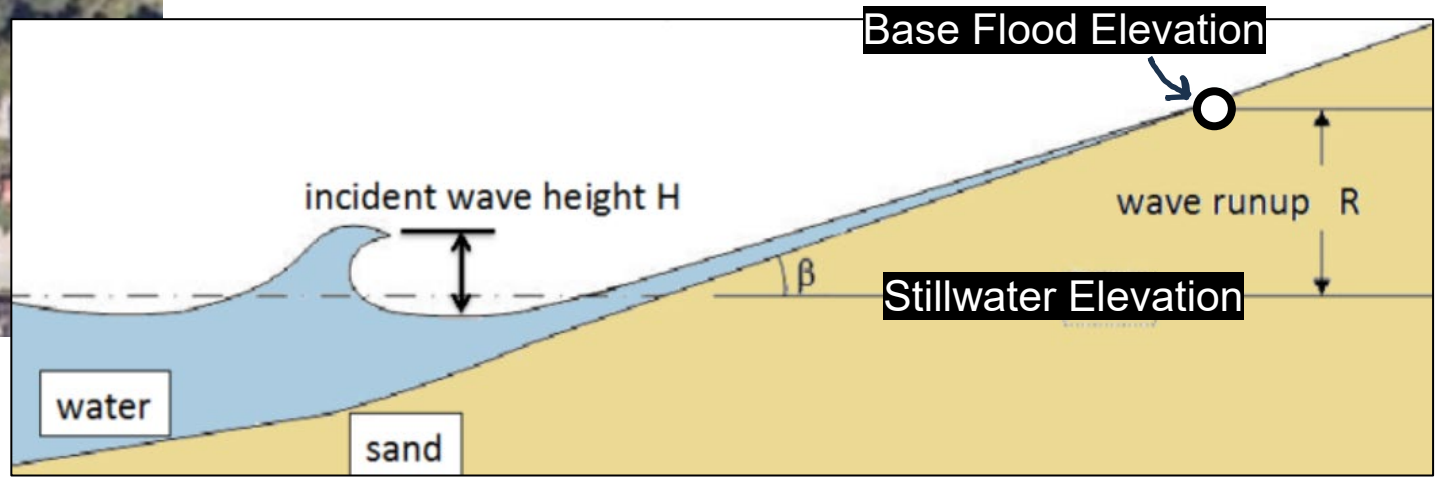


FEMA Flood Insurance Rate Maps



Limitations

- No information about future flood risk
- Not sufficient for determining site-level impacts, such as inundation depths or wave loads on specific structures
- Methodology (and therefore reliability) differs across counties



Rudimentary risk assessment questions & tools

Gulf of Maine Research Institute

1) Are there damaging waves (waves over 1.5 or 3 ft)? If yes, consider a detailed engineering study.
    - Local knowledge
    - FEMA Flood Insurance Rate Maps (FIRMs) (Note: LiMWA is not always available)

Rudimentary risk assessment questions & tools

Gulf of Maine Research Institute

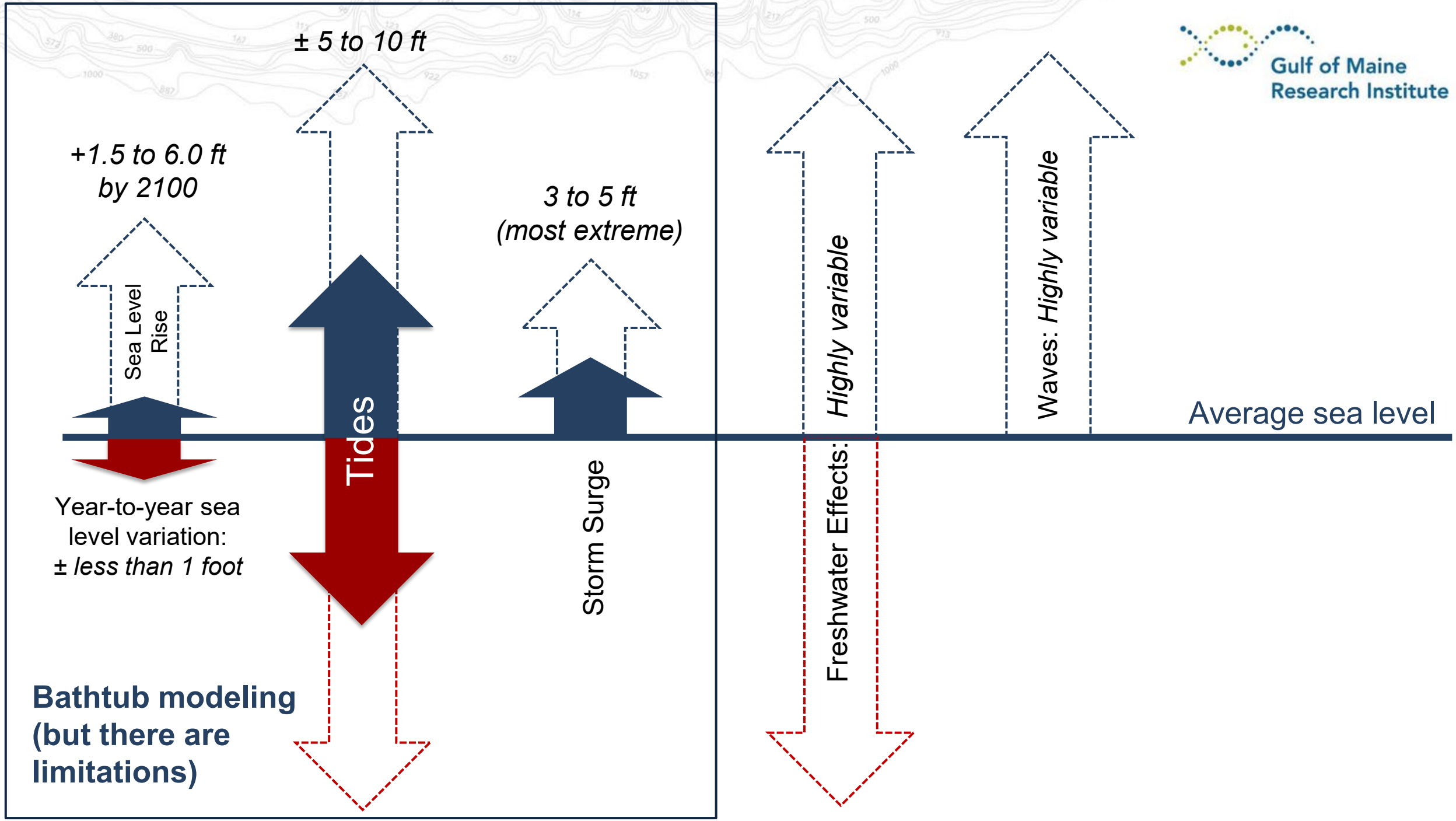
1) Are there damaging waves? (waves over 1.5 ft)

2) What gets inundated routinely?

3) What gets inundated by extreme events?

- Present-day sea level
- Future sea level (Intermediate and High Scenarios?)

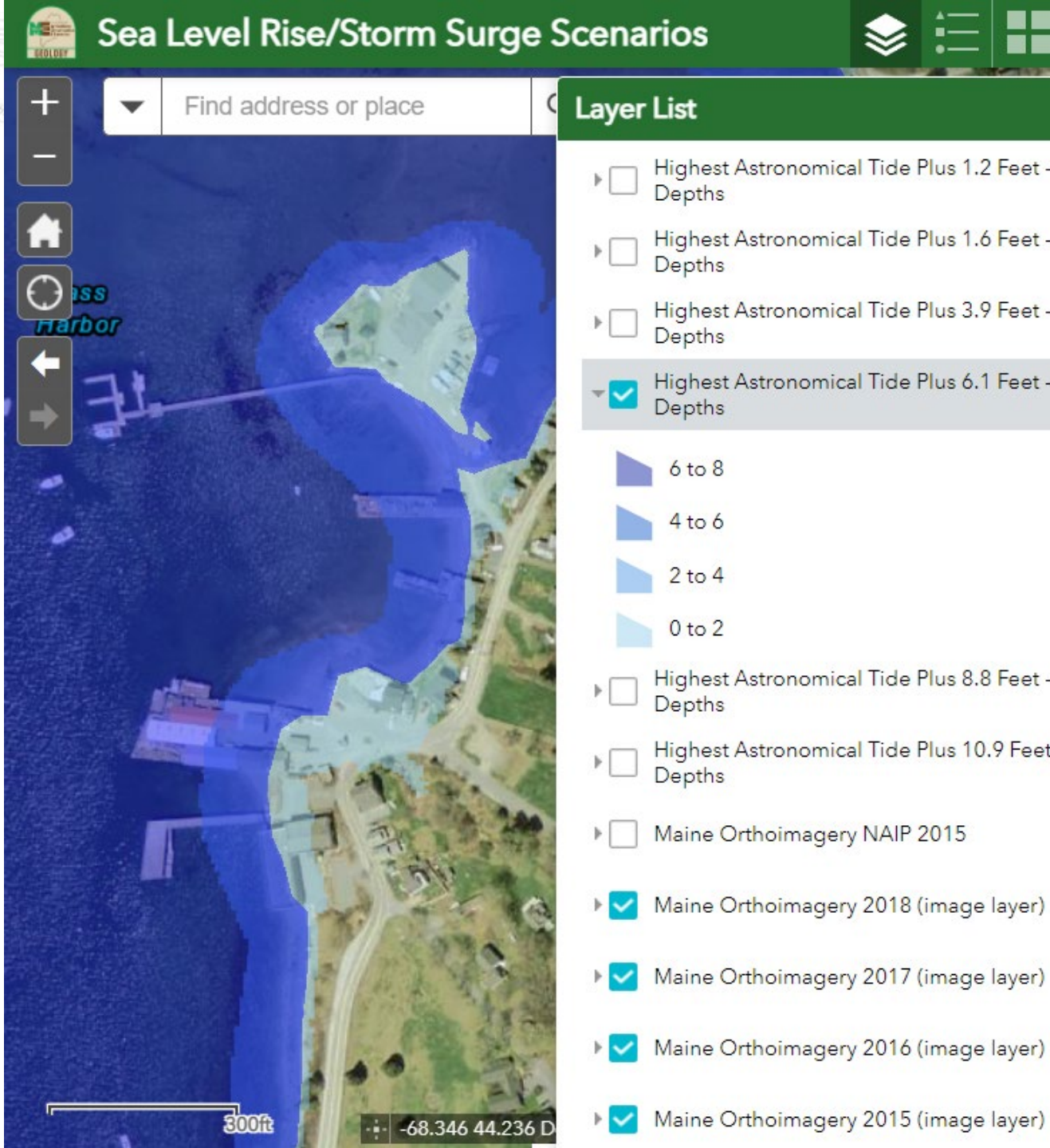
4) What specific functions/assets/infrastructure are at risk?



Gulf of Maine Research Institute

Routine Inundation:
Highest Astronomical Tide

- The highest water level can go from only the astronomical tide (no weather influence)
- Can occur 0 to 20 times per year
- **Relative to <u>1983-2001 sea level</u>** (~0.4 ft lower than today)

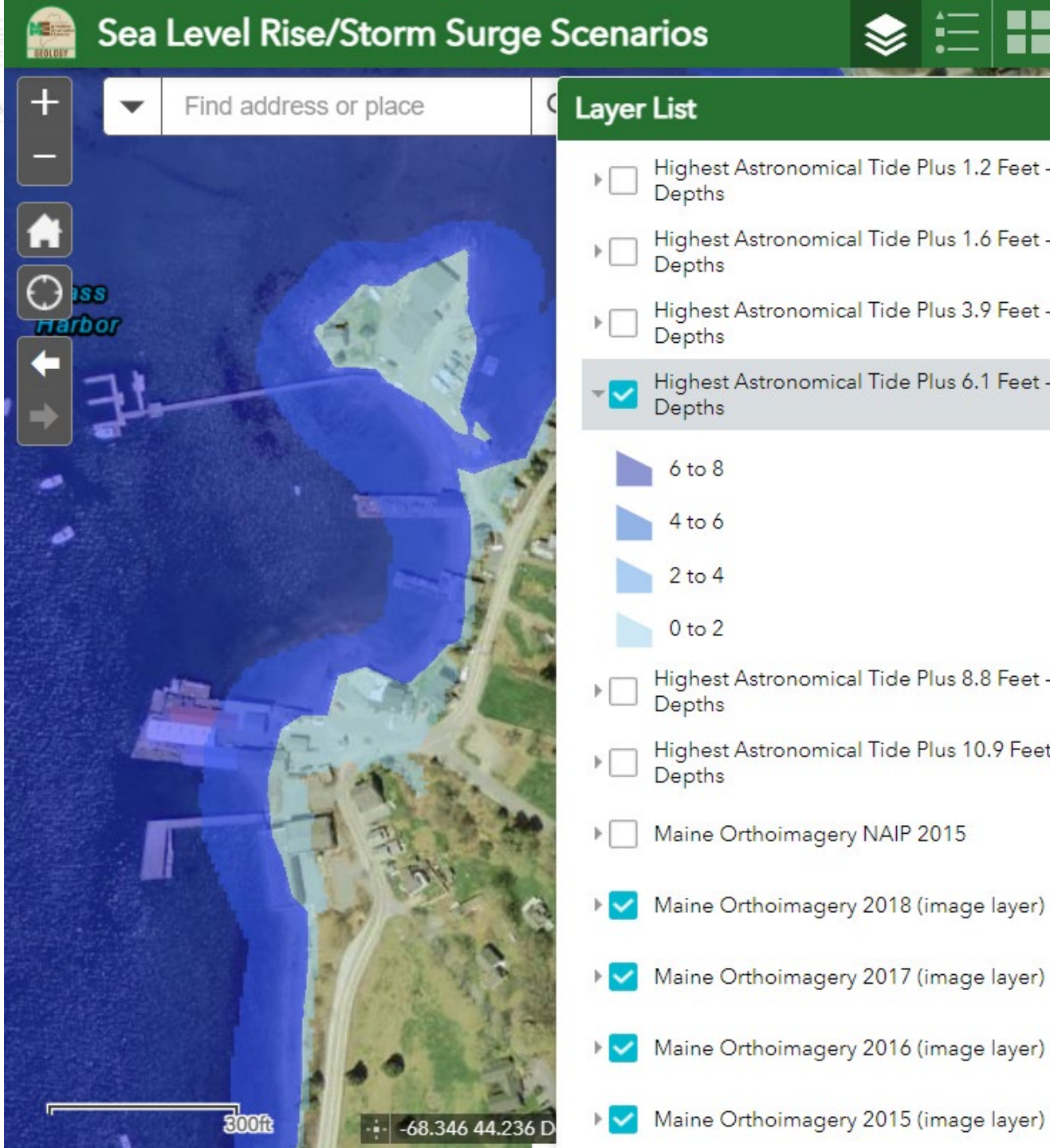


Questions with the current State viewer:

- How do I assess the severity and/or time frame of the water levels relative to Highest Astronomical Tide?

  For example, which layer would represent a severe event in 2070 under the Intermediate sea level rise scenario?

- What is the ground surface elevation at my site?



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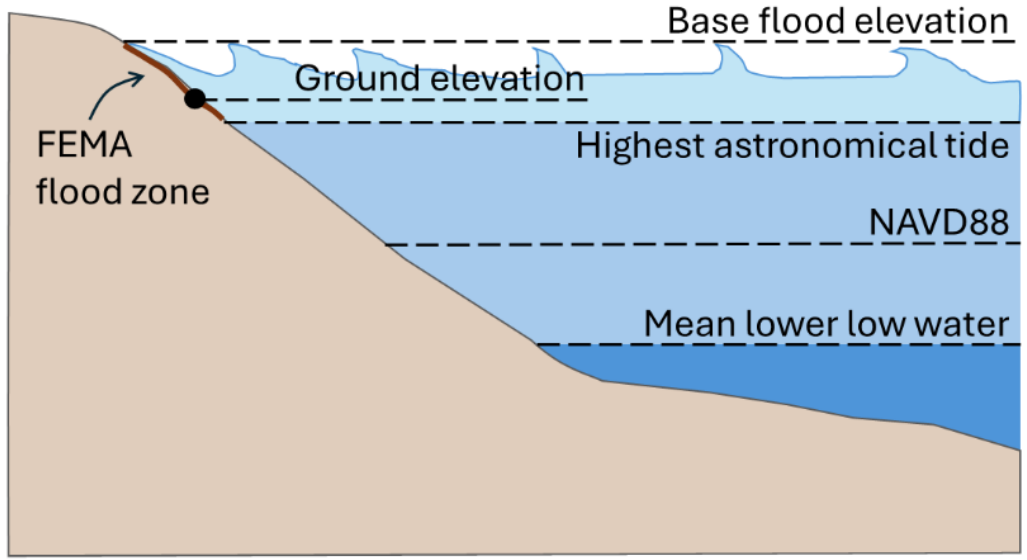
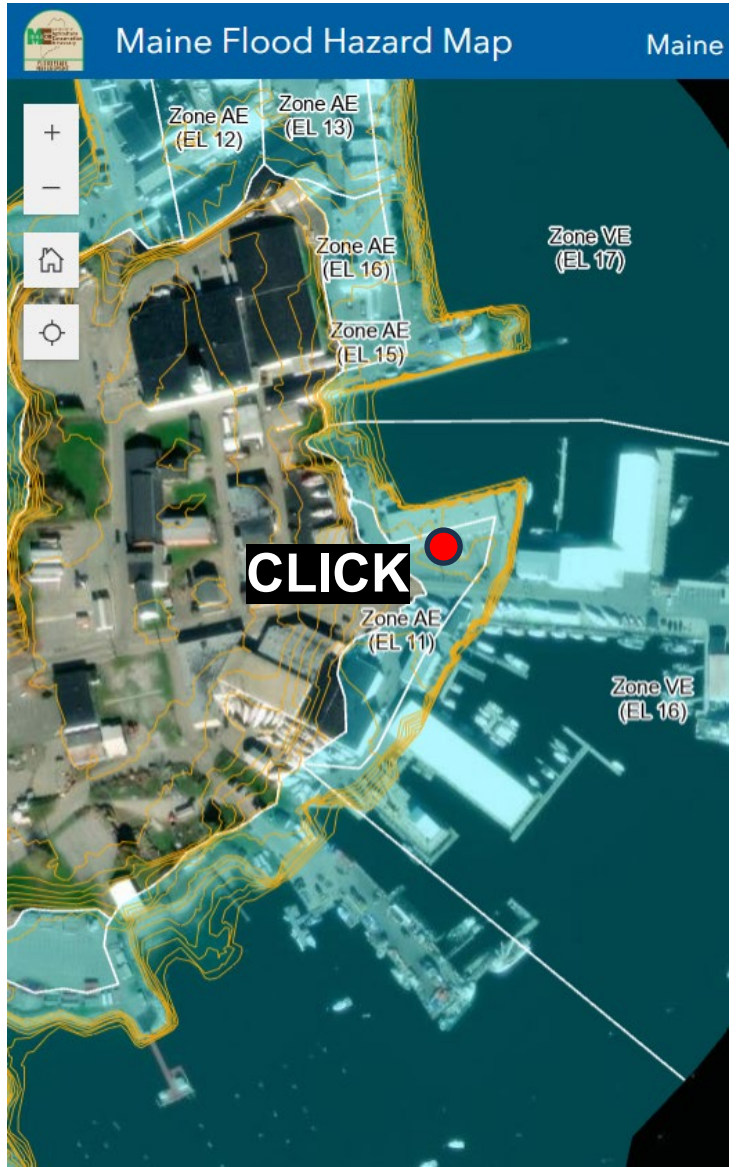
New viewer under development (MGS + GMRI)

- Education hub that provides context for water levels
- Layer of FEMA flood zones
- 2-foot elevation contours
- Click on map to get ground surface elevation, base flood elevation, and conversions among MLLW, NAVD88, and HAT



	Elevation (ft above MLLW)	Elevation (ft above NAVD88)
BFE	17	12
Ground	15.0	10.0
HAT	12.0	7.0
NAVD88	5.0	0.0
MLLW	0.0	-5.0



Rudimentary risk assessment questions & tools

Gulf of Maine Research Institute

1) Are there damaging waves? (waves over 1.5 ft)

2) What gets inundated routinely?

3) What gets inundated by extreme events?

- Present-day sea level
- Future sea level (Intermediate and High Scenarios?)

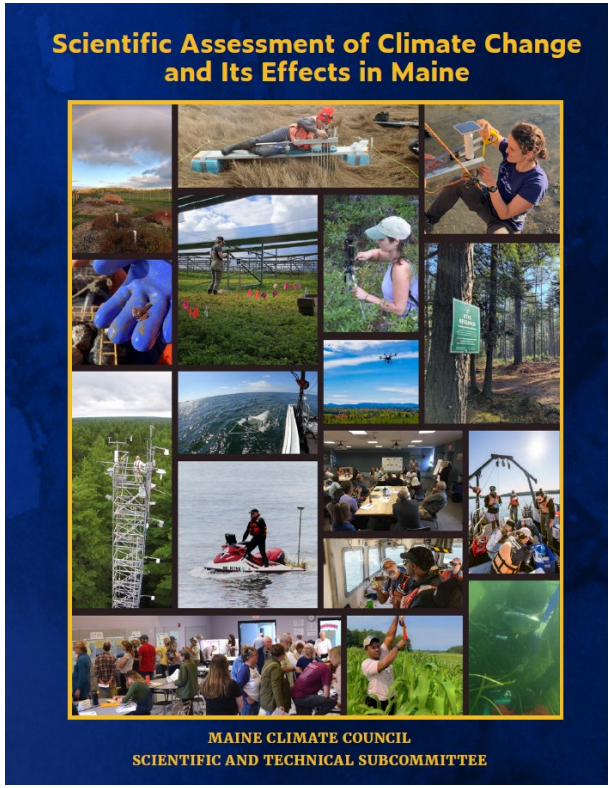
4) What specific functions/assets/infrastructure are at risk?

Sea Level Rise

Applying Sea Level Rise Scenarios

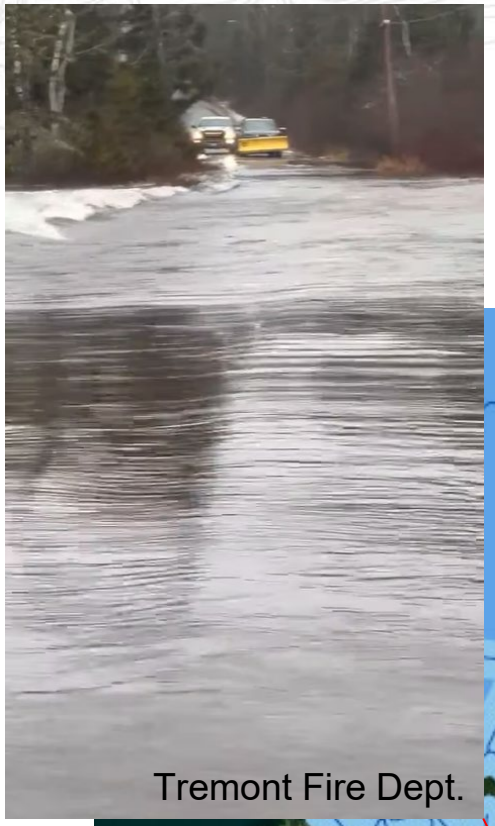
The recommended "commit to manage" and "prepare to manage" sea level rise values provide general statewide guidance for the years 2050 and 2100. For planning applications at specific locations and over specific time periods, Sweet et al. (2022) provides more locally accurate projections (i.e., smaller-scale than the state level) at a decadal time resolution (every 10 years). The state's "commit to manage" targets are consistent with the Sweet et al. (2022) Intermediate scenario, and "prepare to manage" targets are consistent with the High scenario. The choice of which scenario to use depends on the risk associated with flooding of the asset under consideration.

MCC STS (2024)

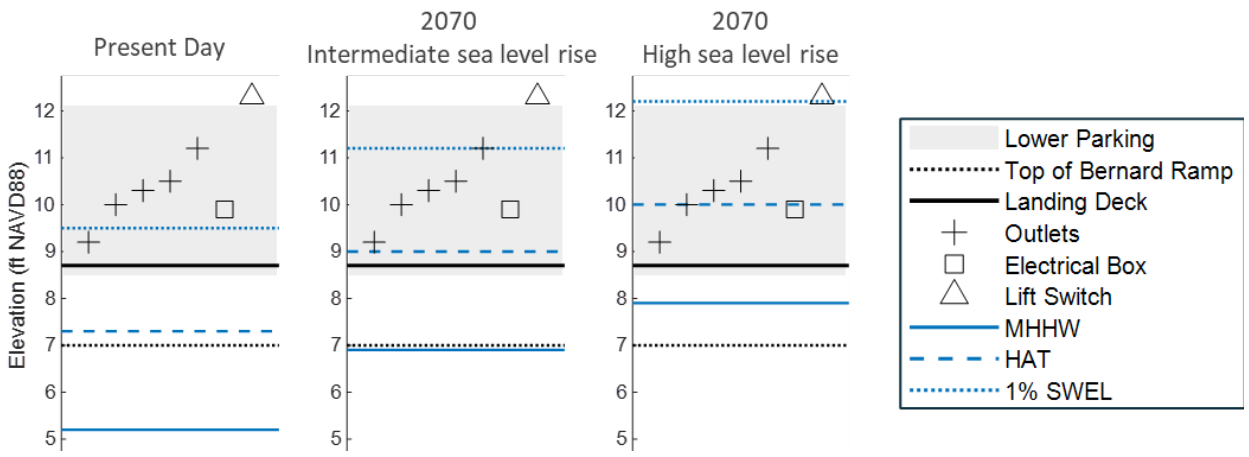


	Kittery to Freeport		Harpswell to St. George		St. George to Camden		Lincolnville to Gouldsboro		Millbridge to Lubec	
	Intermediate	High	Intermediate	High	Intermediate	High	Intermediate	High	Intermediate	High
2030	0.58 (0.39, 0.78)	0.61 (0.40, 0.86)	0.63 (0.44, 0.82)	0.66 (0.44, 0.91)	0.58 (0.39, 0.77)	0.61 (0.39, 0.85)	0.61 (0.42, 0.81)	0.64 (0.42, 0.88)	0.64 (0.45, 0.84)	0.68 (0.46, 0.92)
2040	0.85 (0.60, 1.11)	0.97 (0.64, 1.36)	0.91 (0.67, 1.18)	1.040 (0.7, 1.43)	0.84 (0.59, 1.10)	0.96 (0.63, 1.35)	0.88 (0.64, 1.15)	1.00 (0.67, 1.40)	0.93 (0.69, 1.20)	1.05 (0.72, 1.45)
2050	1.13 (0.83, 1.47)	1.42 (1.01, 1.95)	1.21 (0.91, 1.56)	1.51 (1.09, 2.03)	1.12 (0.81, 1.46)	1.41 (0.98, 1.93)	1.18 (0.87, 1.52)	1.47 (1.04, 1.99)	1.24 (0.93, 1.58)	1.53 (1.10, 2.05)
2060	1.46 (1.09, 1.87)	2.06 (1.50, 2.69)	1.56 (1.19, 1.98)	2.17 (1.59, 2.81)	1.45 (1.08, 1.86)	2.03 (1.45, 2.67)	1.52 (1.15, 1.94)	2.11 (1.52, 2.75)	1.59 (1.22, 2.01)	2.19 (1.60, 2.83)
2070	1.84 (1.41, 2.33)	2.88 (2.12, 3.68)	1.96 (1.53, 2.46)	3.00 (2.24, 3.83)	1.82 (1.39, 2.32)	2.82 (2.05, 3.65)	1.90 (1.47, 2.40)	2.92 (2.14, 3.73)	1.99 (1.56, 2.50)	3.01 (2.22, 3.84)
2080	2.30 (1.79, 2.85)	3.84 (2.83, 4.83)	2.44 (1.92, 3.00)	3.99 (2.97, 5.02)	2.28 (1.75, 2.83)	3.76 (2.74, 4.80)	2.38 (1.84, 2.94)	3.87 (2.83, 4.92)	2.48 (1.94, 3.04)	3.97 (2.92, 5.04)
2090	2.87 (2.21, 3.48)	4.93 (3.60, 6.15)	3.03 (2.36, 3.67)	5.11 (3.76, 6.34)	2.83 (2.17, 3.48)	4.81 (3.46, 6.07)	2.95 (2.28, 3.60)	4.93 (3.57, 6.22)	3.07 (2.39, 3.72)	5.06 (3.68, 6.36)
2100	3.49 (2.59, 4.23)	5.98 (4.40, 7.35)	3.67 (2.76, 4.45)	6.19 (4.61, 7.59)	3.44 (2.53, 4.23)	5.88 (4.27, 7.30)	3.58 (2.66, 4.36)	6.03 (4.39, 7.46)	3.71 (2.79, 4.50)	6.16 (4.50, 7.61)
2110	4.21 (3.02, 5.22)	7.18 (5.19, 8.78)	4.42 (3.21, 5.45)	7.42 (5.38, 9.06)	4.17 (2.97, 5.20)	7.03 (5.02, 8.72)	4.31 (3.10, 5.36)	7.19 (5.15, 8.90)	4.46 (3.24, 5.52)	7.35 (5.28, 9.07)
2120	4.86 (3.42, 6.48)	8.22 (5.94, 10.30)	5.09 (3.64, 6.75)	8.49 (6.14, 10.58)	4.80 (3.34, 6.46)	8.07 (5.74, 10.16)	4.97 (3.50, 6.64)	8.25 (5.90, 10.36)	5.13 (3.65, 6.82)	8.43 (6.05, 10.56)
2130	5.45 (3.80, 8.20)	9.29 (6.45, 12.40)	5.72 (4.03, 8.49)	9.60 (6.71, 12.73)	5.42 (3.73, 8.16)	9.13 (6.35, 12.26)	5.59 (3.89, 8.35)	9.34 (6.51, 12.50)	5.77 (4.06, 8.56)	9.53 (6.72, 12.70)
2140	5.95 (4.16, 10.30)	10.10 (6.95, 14.47)	6.25 (4.41, 10.63)	10.41 (7.28, 14.89)	5.91 (4.08, 10.24)	9.91 (6.84, 14.43)	6.11 (4.25, 10.48)	10.14 (7.01, 14.69)	6.30 (4.43, 10.70)	10.36 (7.16, 14.91)
2150	6.51 (4.49, 12.82)	10.82 (7.5, 16.74)	6.82 (4.73, 13.18)	11.12 (7.81, 17.21)	6.45 (4.39, 12.75)	10.59 (7.37, 16.69)	6.65 (4.58, 13.02)	10.85 (7.56, 16.97)	6.86 (4.78, 13.28)	11.06 (7.75, 17.20)

Assessing vulnerability

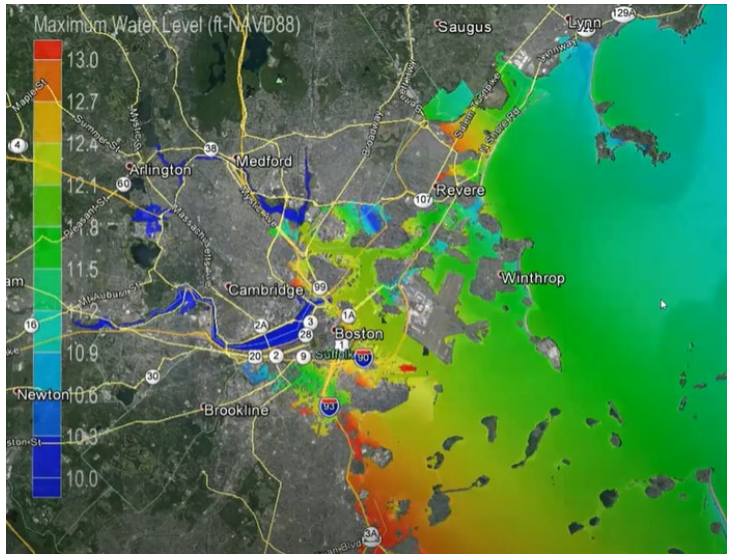


Tremont Fire Dept.



Complexities to consider

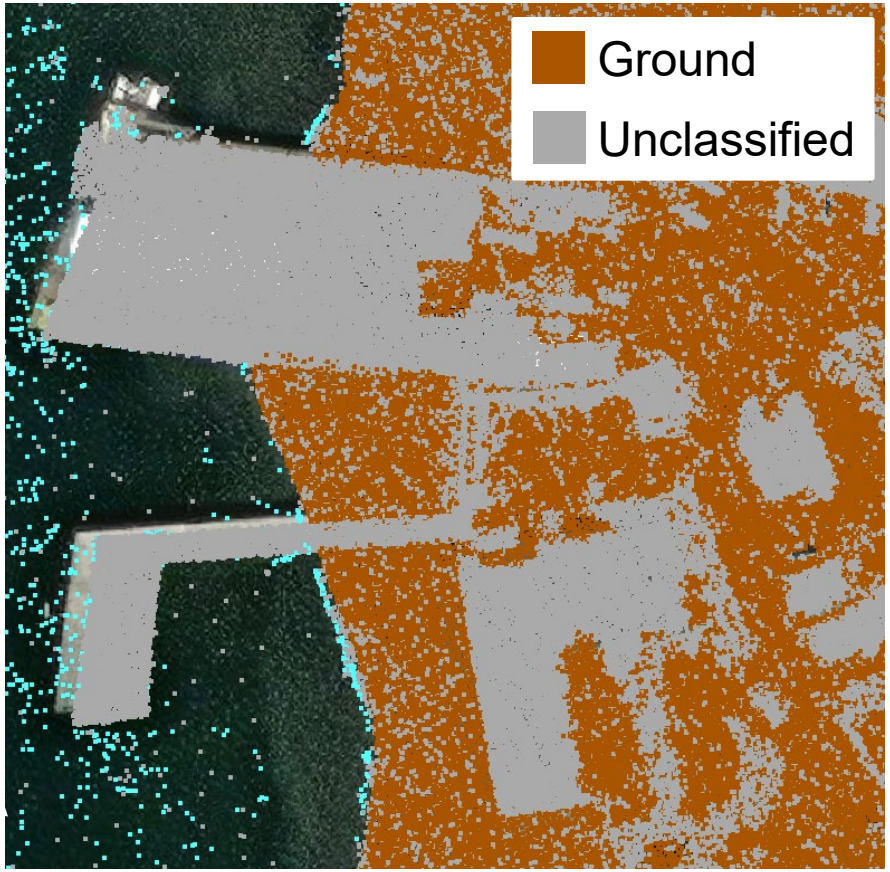
Dynamic water surface (storms don't, in reality, raise water level evenly like filling up a bathtub)



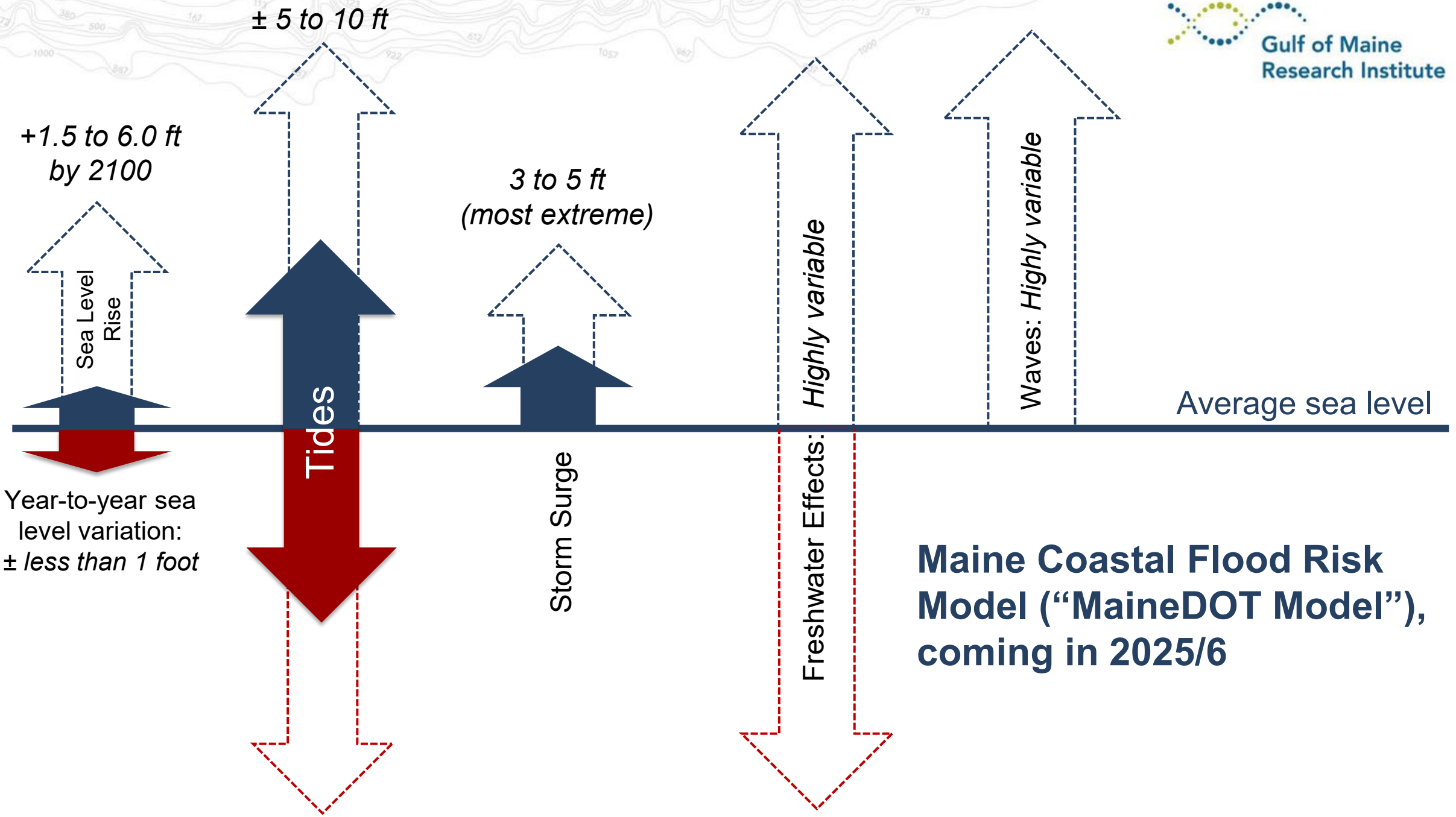
Credit: Woods Hole Group

Tidal restrictions, flood protection structures, shallow water effects

Coastal Pier and Bridge Elevations



Excluded from lidar-based DEM (raster) → look at point cloud



Gulf of Maine Research Institute

Maine Coastal Flood Risk Model ("MaineDOT Model"), coming in 2025/6

Breakout session

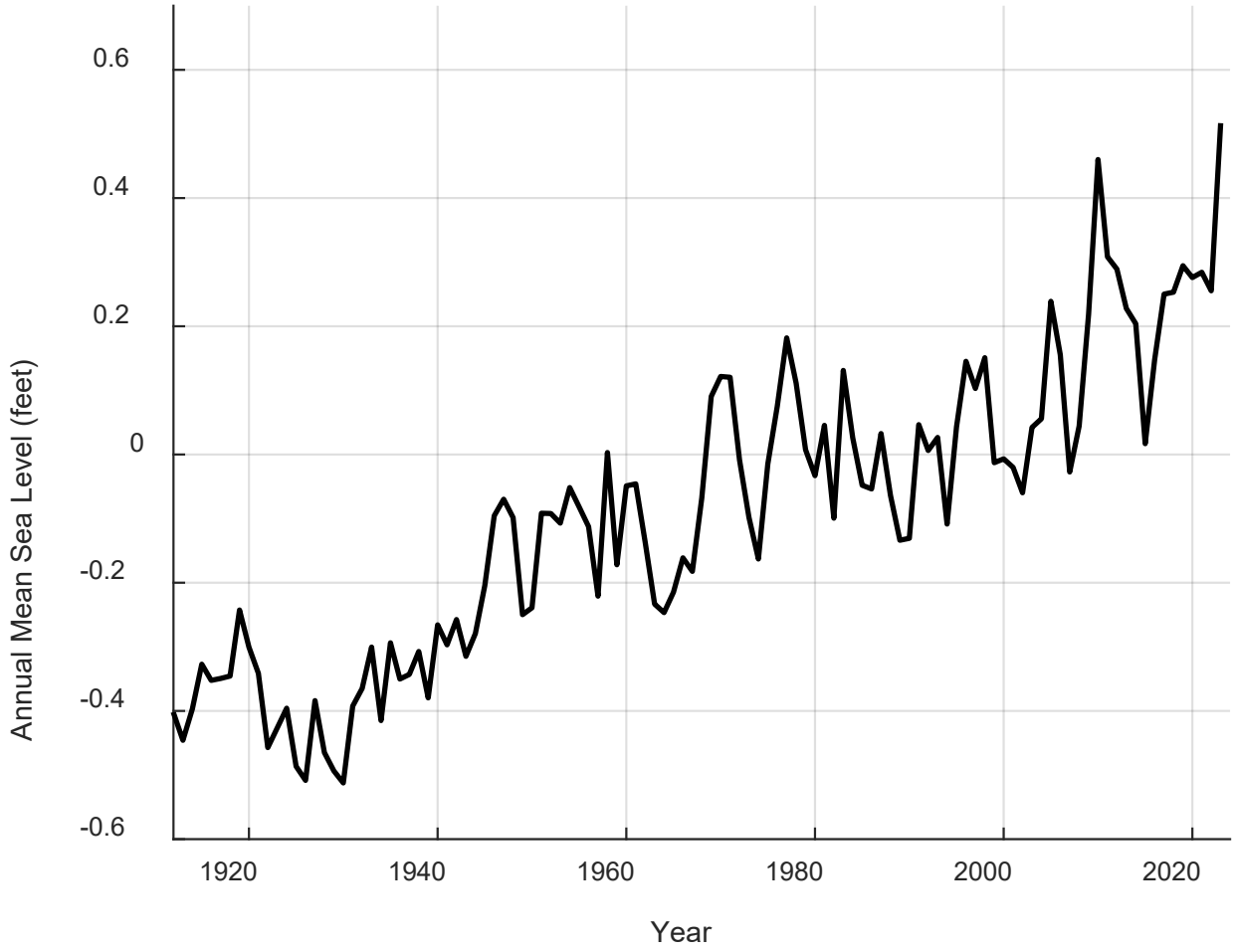
Gulf of Maine Research Institute

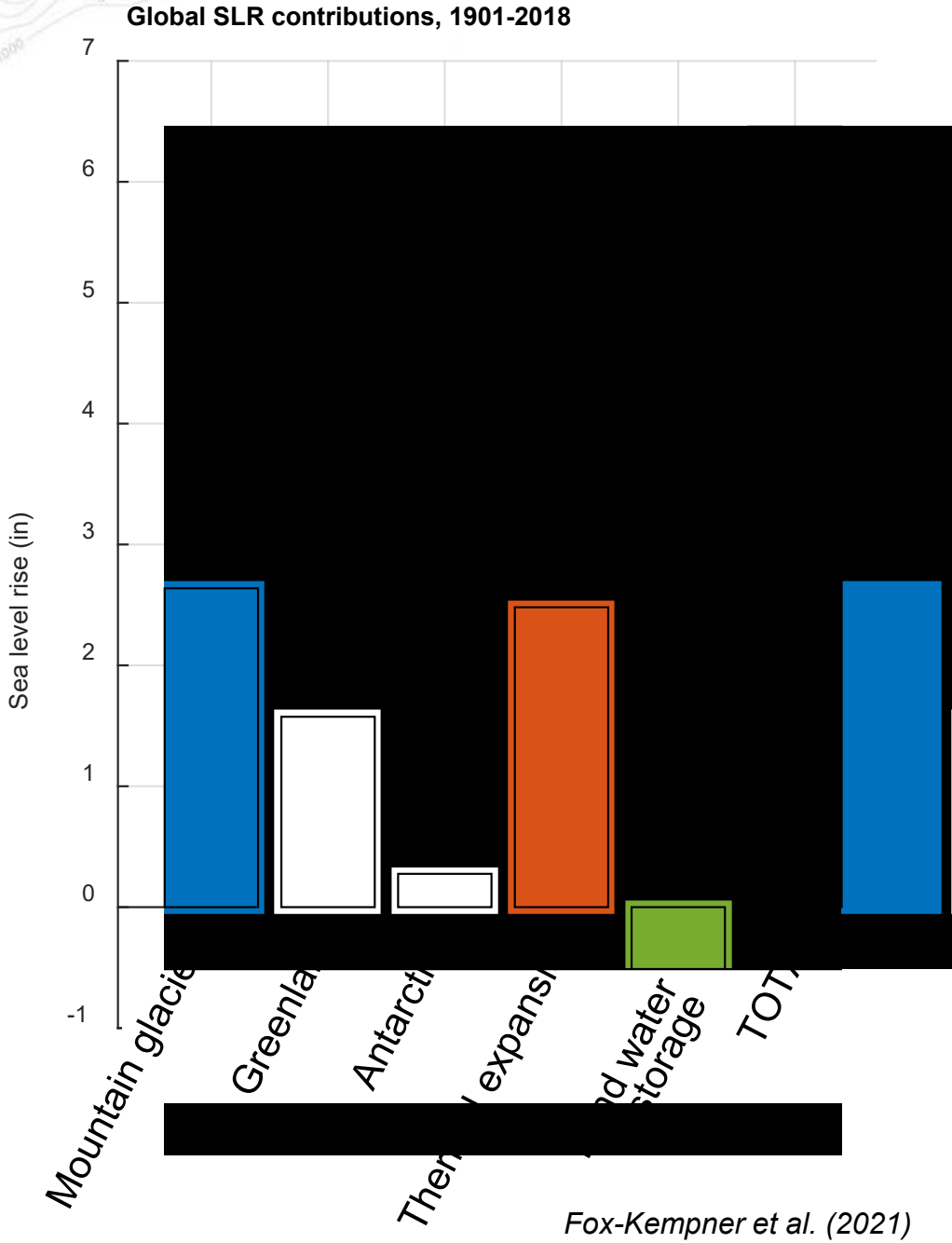
- Open-ended Q&A on this material
- Walk through determining design water levels for a specific site

Thanks!

hbaranes@gmri.org

Gulf of Maine
Research Institute
Science. Education. Community.



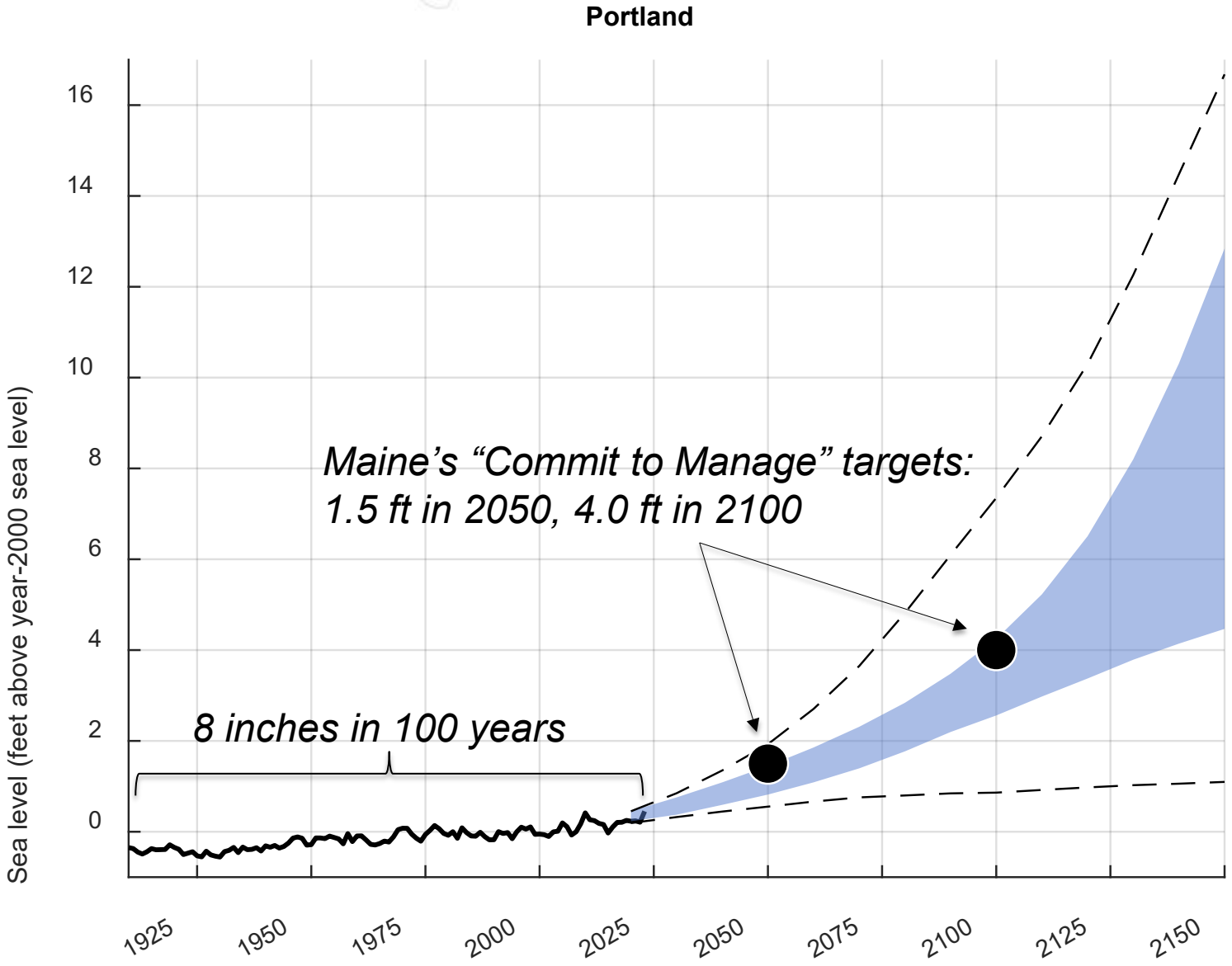


Fox-Kempner et al. (2021)

Measured sea level

Range of **modeled future sea level** for Maine's adopted scenario*

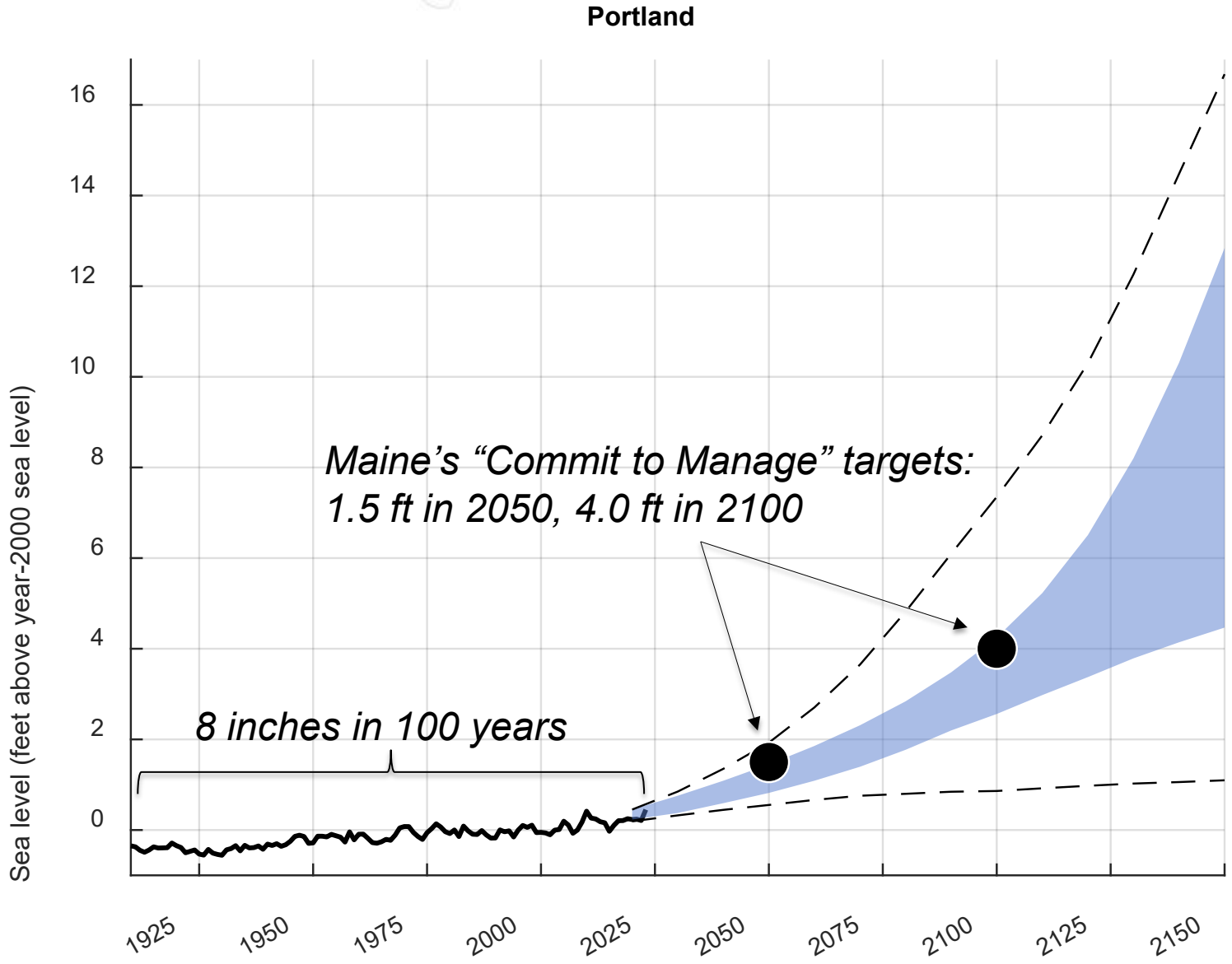
Gulf of Maine Research Institute

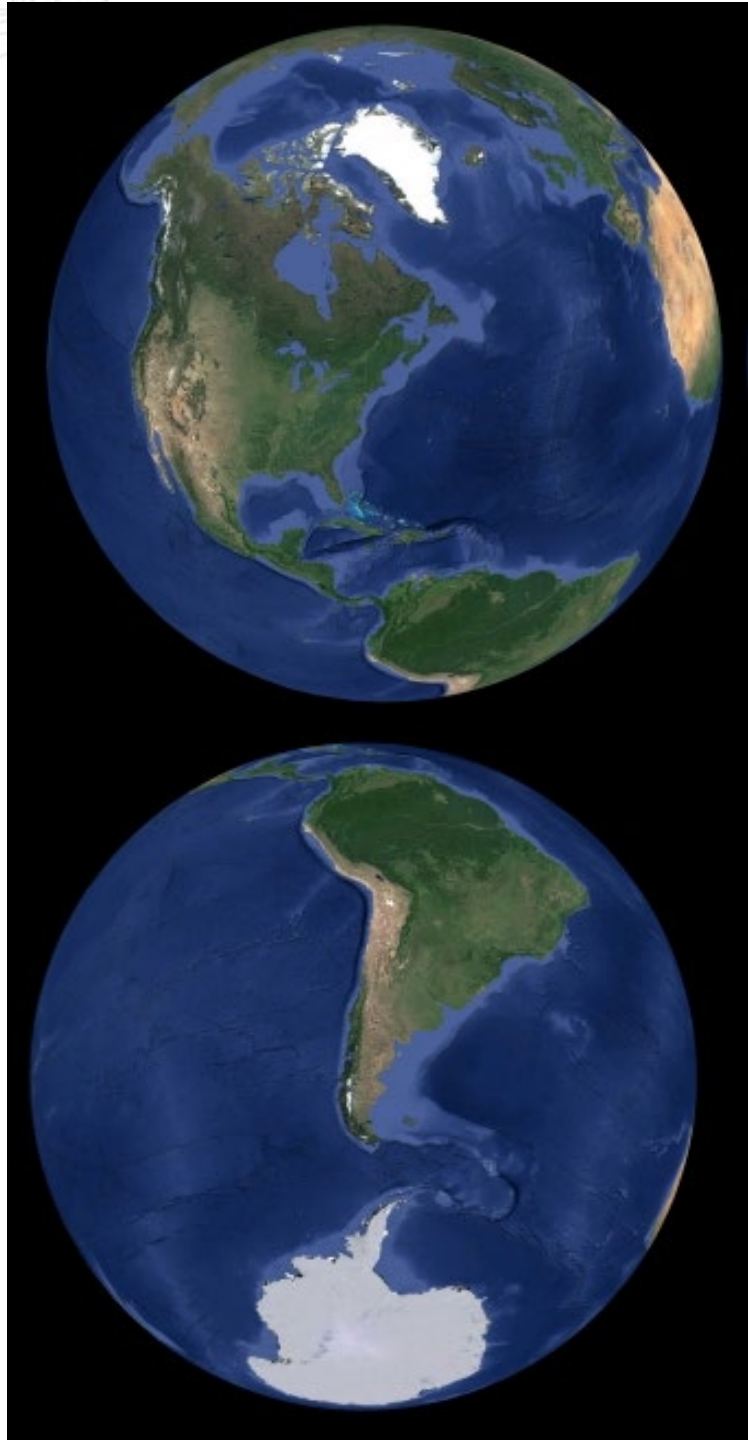


*US Interagency Task Force Intermediate Scenario (Sweet et al., 2022)

Measured sea level

Range of **modeled future sea level** for Maine's adopted scenario*





Original Research

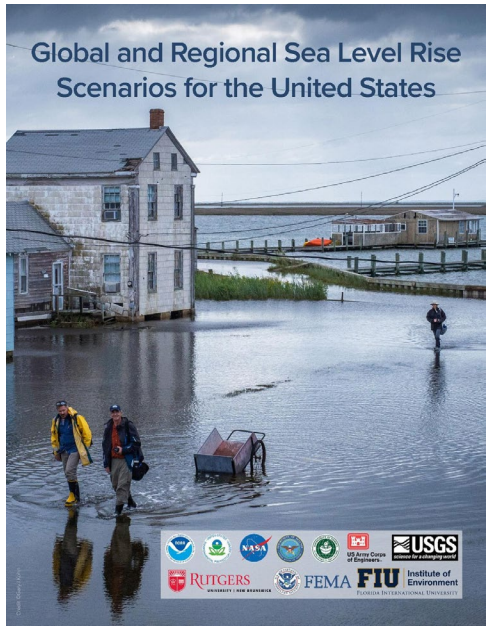
IPCC
INTERGOVERNMENTAL PANEL ON climate change

WMO UNEP

2007, 2014, **2021**

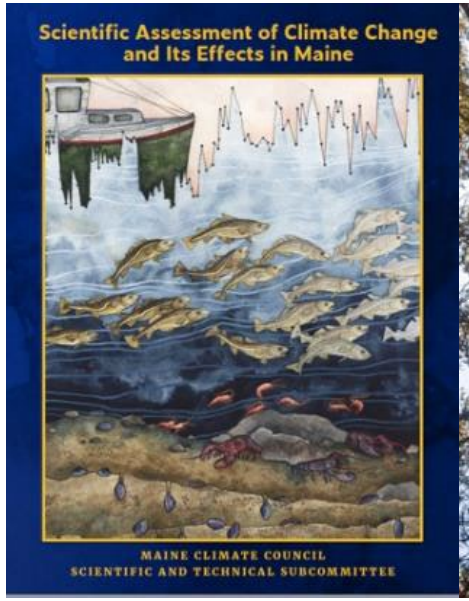
U.S. Global Change Research Program
National Climate Assessment

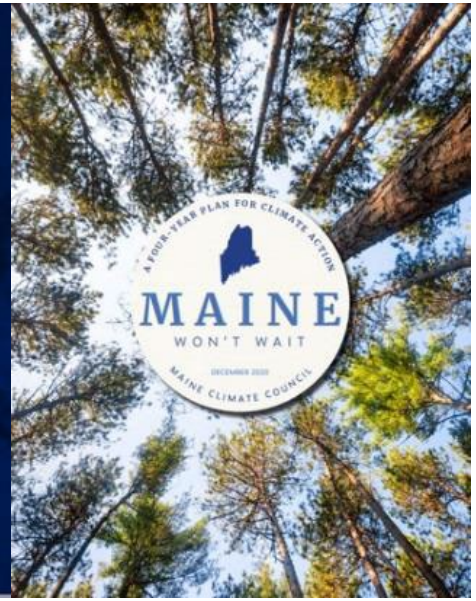
2014, 2018, **2023**

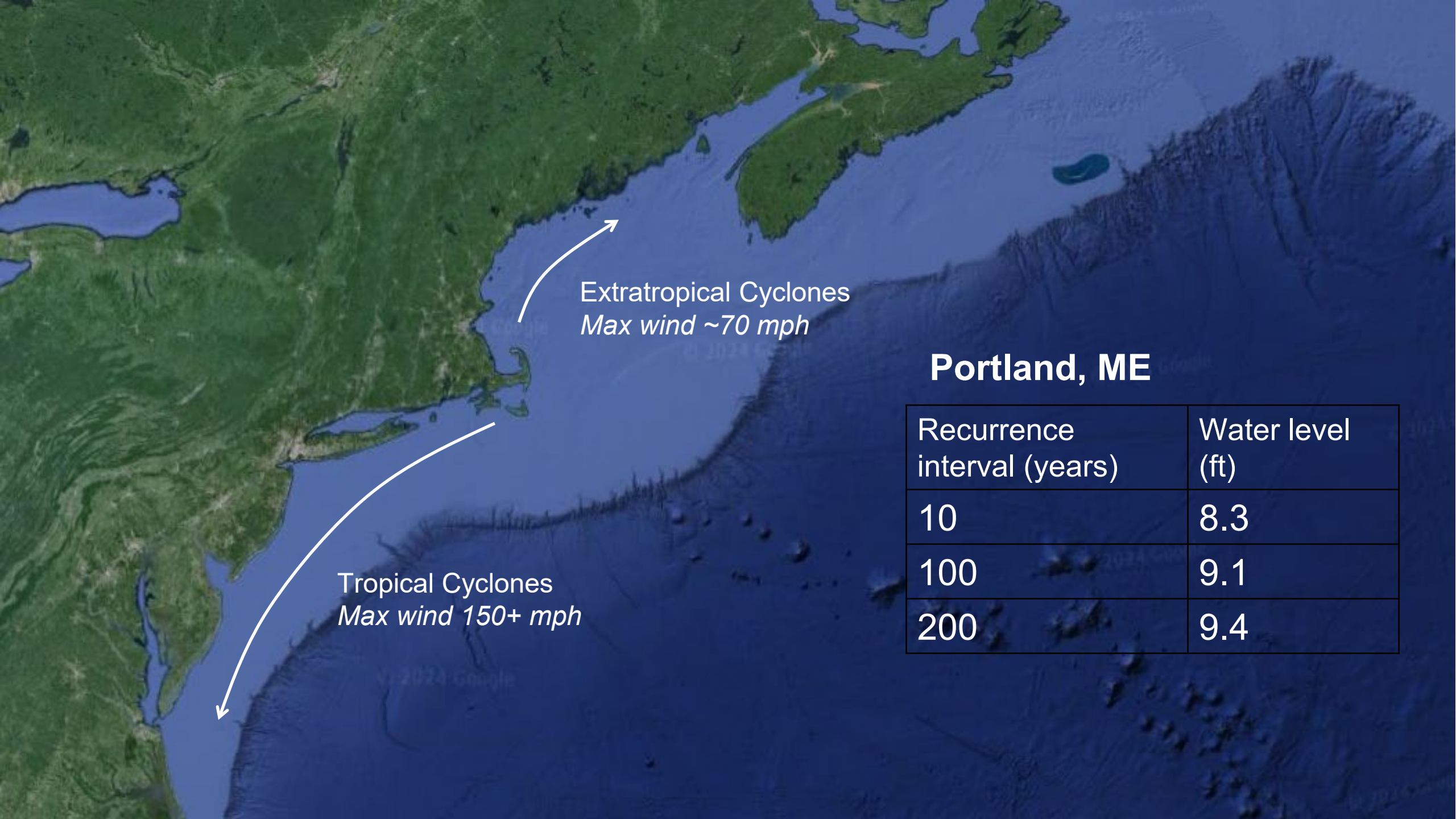


2017, **2022**

2020, **2024**



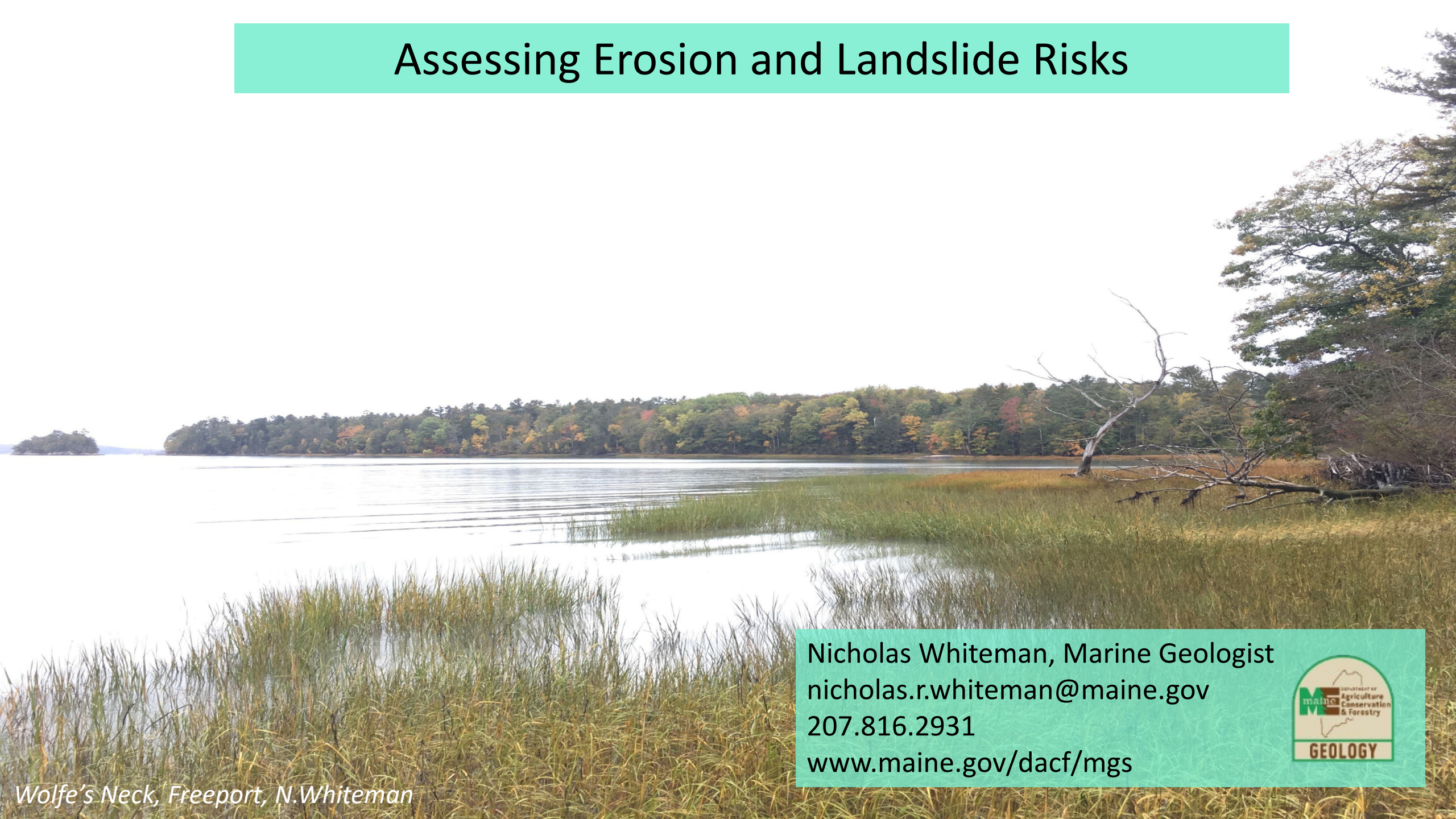




Portland, ME

Recurrence interval (years)	Water level (ft)
10	8.3
100	9.1
200	9.4

Assessing Erosion and Landslide Risks



Nicholas Whiteman, Marine Geologist
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207.816.2931
www.maine.gov/dacf/mgs

Wolfe's Neck, Freeport, N.Whiteman

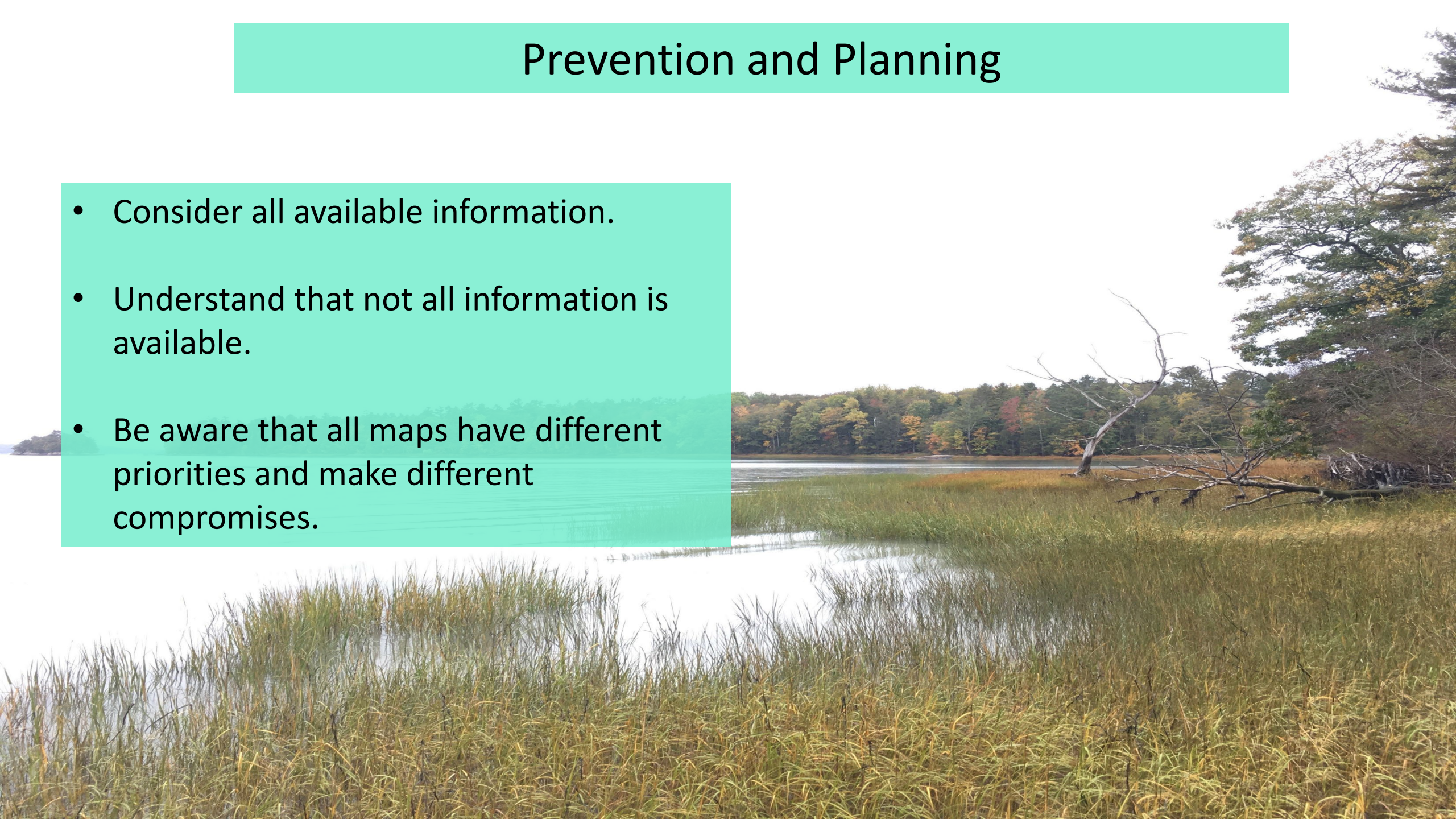
Prevention and Planning

- Unable to predict landslide events, our goal is to understand risk.
- Landslides may be common to some areas, while not a concern in others.
- Be considerate of Harm's Way.
- Landslides are not just a coastal phenomenon.

Image: giphy.com (2024)

Prevention and Planning

- Consider all available information.
- Understand that not all information is available.
- Be aware that all maps have different priorities and make different compromises.



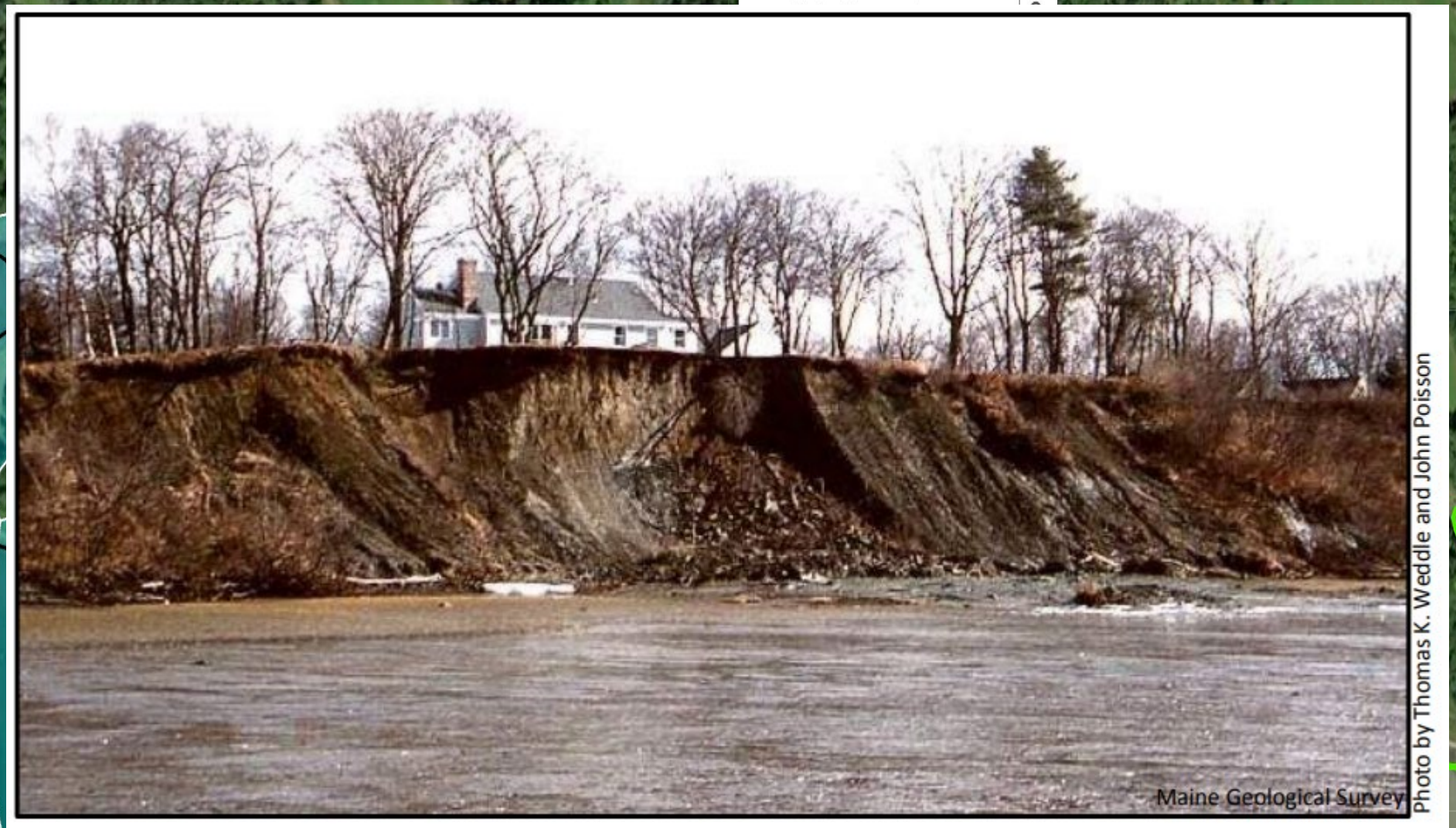
A flood map concerned with lowlands may not effectively communicate a hazard where the sea meets tall bluffs.

Maine Flood Hazard Map

Maine Floodplain Management Program

Maine Coastal Bluffs and Landslides

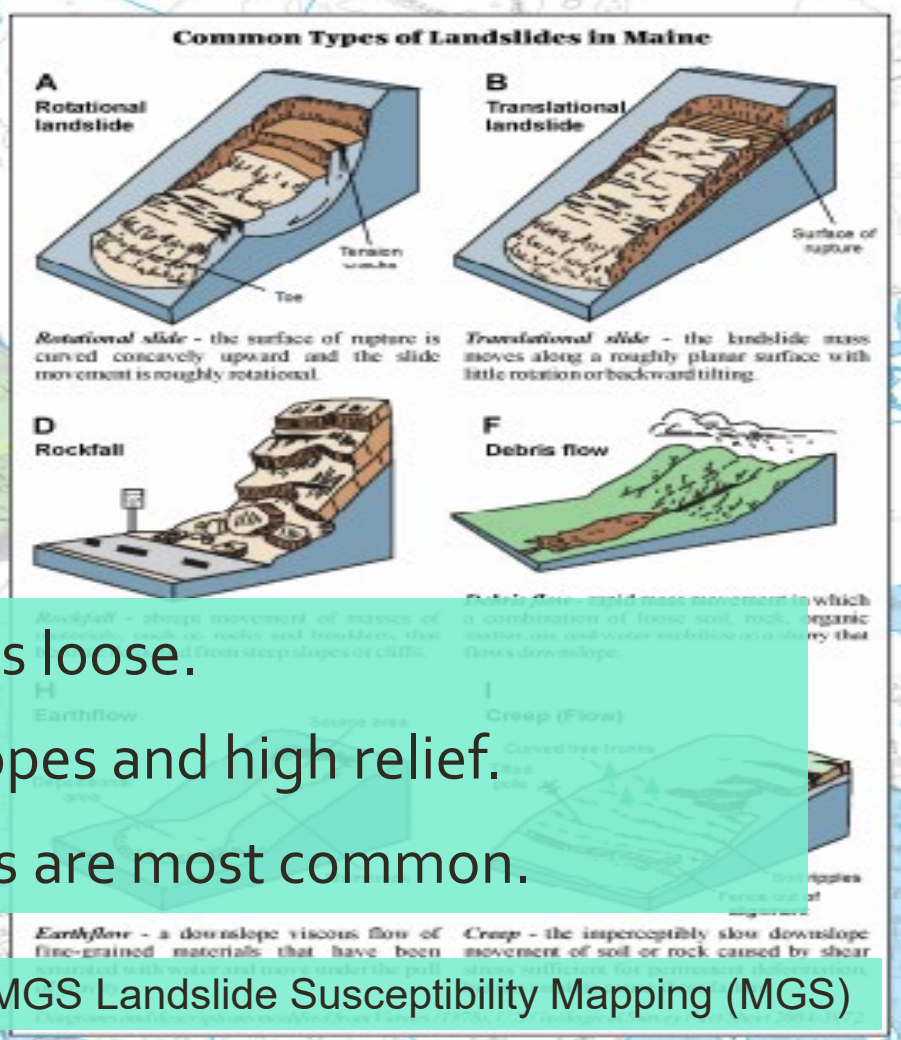
Maine Geological Survey



(EL 19)

A flood map concerned with lowlands may not effectively communicate a hazard where the sea meets tall bluffs.

We use maps to help understand risk.



- Surficial Geology maps identify areas where material is loose.
- Elevation and terrain models help us identify steep slopes and high relief.
- Historical records and reporting track where landslides are most common.

MGS Geologists are available to help explain these maps and resources.

Image: MGS Landslide Susceptibility Mapping (MGS)

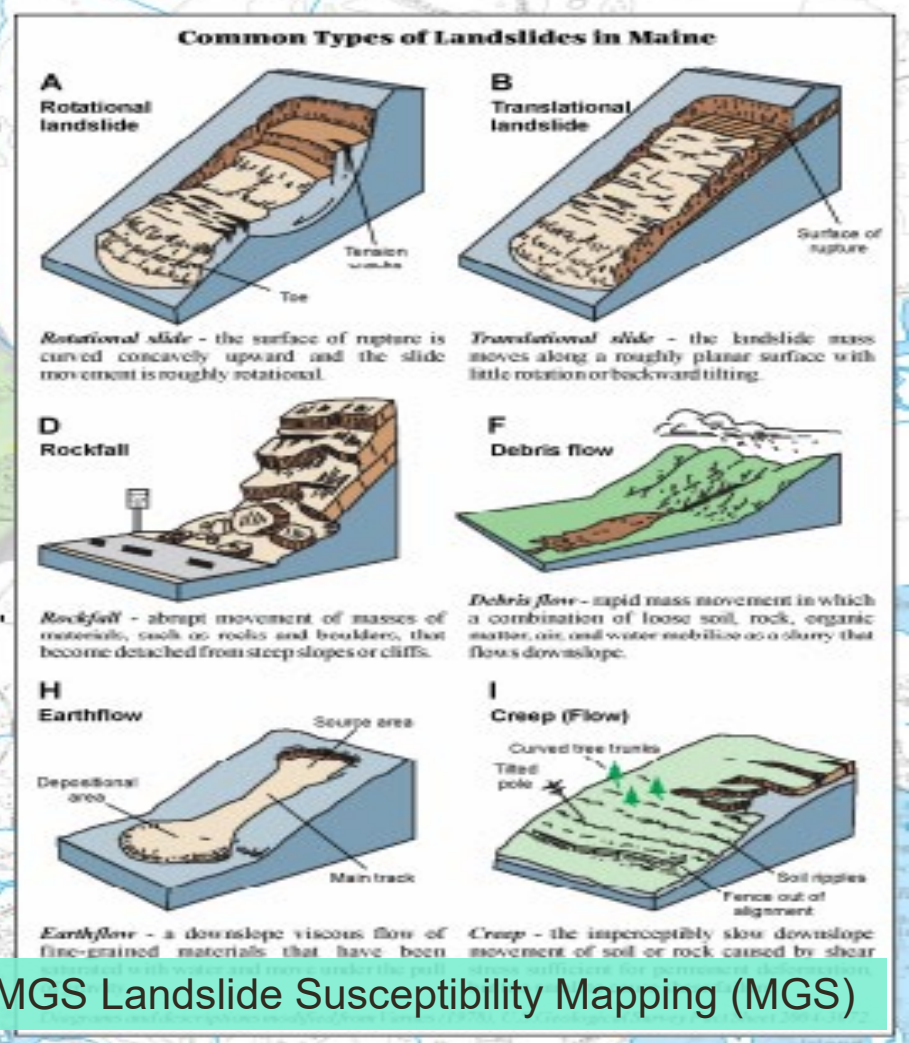
Landslides are most likely to occur..

Landslides are most likely to occur..

- **When:** wet periods, such as spring and early summer, on warm winter thaw days, or following intense soaking rainfall from hurricanes and nor'easters.
- **Where:** steep sided slopes, banks of shorelines and rivers subject to chronic erosion, and recently cleared lots.
- Any bank with **20ft.** or more of relief is considered to carry an inherent landslide risk.
- Alteration of a slope, whether by natural or human drivers, can provoke landslides in vulnerable areas.

MGS Landslide Hazard Resources

- MGS Hazards Page
- Maine Landslide Guide, FAQs, and Fact Sheets
- MGS Landslide Susceptibility Mapping
- MGS Maine Landslides Storymap
- Contribute to the MGS Landslide Inventory
- (links provided at the end)



MGS Geologists are available to help explain these maps and resources.

Image: MGS Landslide Susceptibility Mapping (MGS)

Response

- Bluffs have long been prime real estate!
- The Bluff Stability Map Series was made in response to increasing public proximity to landslide risk.
- Reminder that a risk can be defined by how close you are to it.
- Monitoring is a relatively low cost and effective first step.
- Preventative action and planning saves money and time.

Image: N.Whiteman, May 2024

Maine's Coastal Bluffs

- Nearly half of the Maine coast is comprised of unconsolidated sediments.
- Cut back into steep bluffs by erosion, they carry a landslide risk.
- Landslides are a natural part of the erosion process.

We use maps to help understand risk.

- Bluff stability mapping was conducted along the coast
- Bluffs rated on their stability in a color-coded system.
- A particularly tall bluff may be identified as a landslide risk – but the risk at a given location is not calculated.

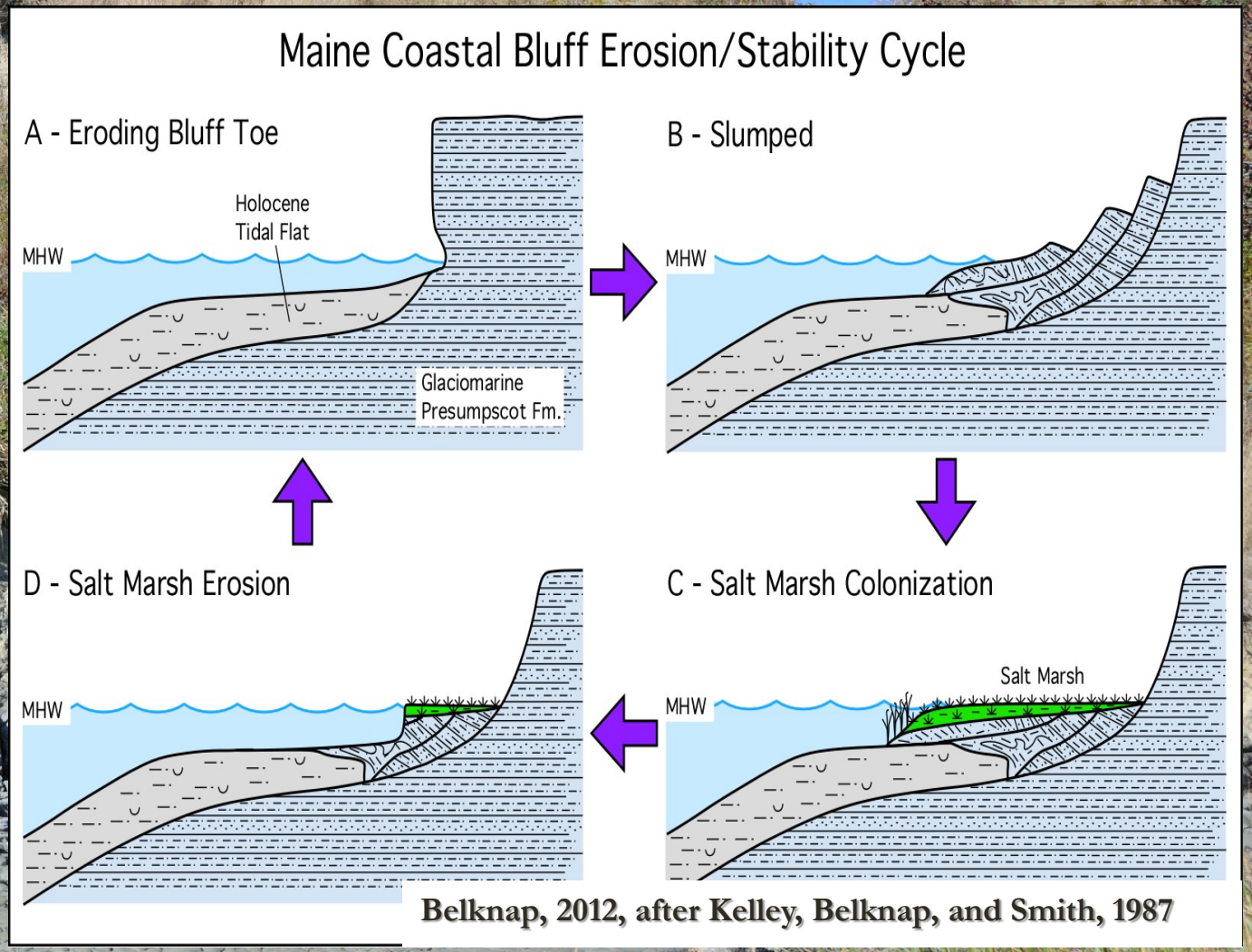
We use maps to help understand risk.

- MGS produces both a Coastal Bluff Stability Map series and a Coastal Landslide Hazard Map series.
- Coastal Bluff Stability maps erosion activity at the **face** of the bluff.
  - Erosion is a natural process and only a hazard if it threatens something nearby.
- Coastal Landslide Hazard Maps consider additional factors and work to describe **internal** risk.

Images: MGS Coastal Bluffs and Landslides Web Map Application (MGS)

The Coastal Bluff Erosion Cycle.

- Bluff stability **varies** over time.
- The top of the bluff and the toe of the bluff can erode at different rates.
- Bluffs stability does not necessarily worsen.
- Landslides are how a bluff protects itself and sustains nearby intertidal resources.
- Sea level governs this process.



Sea level defines the shoreline

Sea level defines the shoreline

For regulatory purposes, the **Highest Annual Tide** and the **Highest Astronomical Tide** are used.

Shoreline stability becomes a challenge when the sea level is unstable.

Traditionally, stabilization efforts have been placed landward of these lines to "avoid the resource."

We understand now that this interferes with the sediment transport and negatively affects adjacent resources.

Any "Hold the line" strategy – grey or green – will face deeper water over time, leading to environmental conversion.

We call this "Coastal Squeeze."

Habitat and Nature Based Solutions work to strength over time and 'blur the line.'
Who doesn't want more shoreline?

Years apart

Wolfe's Neck, Freeport, N.Whiteman

Years apart

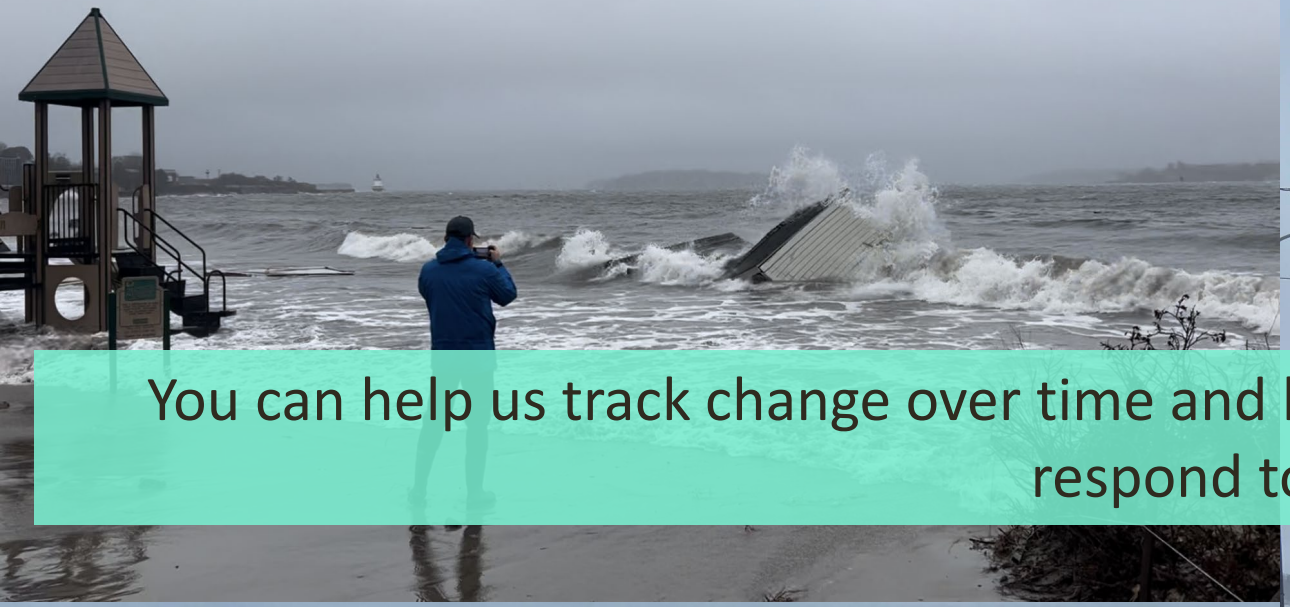
Feb 2017

Aug 2023

F

Mar 2024

Natural processes are often out of sight and mind until they’re considered a problem.



You can help us track change over time and better understand how these environments respond to change.

Better awareness of local conditions helps long term planning and preparation efforts.

Beginning with Habitat

Corinne Michaud-LeBlanc, Climate Coordinator

BEGINNING WITH HABITAT

Maine Coast Heritage Trust
A Statewide Land Conservation Organization

USDA United States Department of Agriculture
Natural Resources Conservation Service

MaineDOT

Maine Woodland Owners

Maine Department of Agriculture, Conservation & Forestry

The Nature Conservancy
Protecting nature. Preserving life.

Maine Audubon

Maine Coastal Program

Be Woods Wise!

Our Services

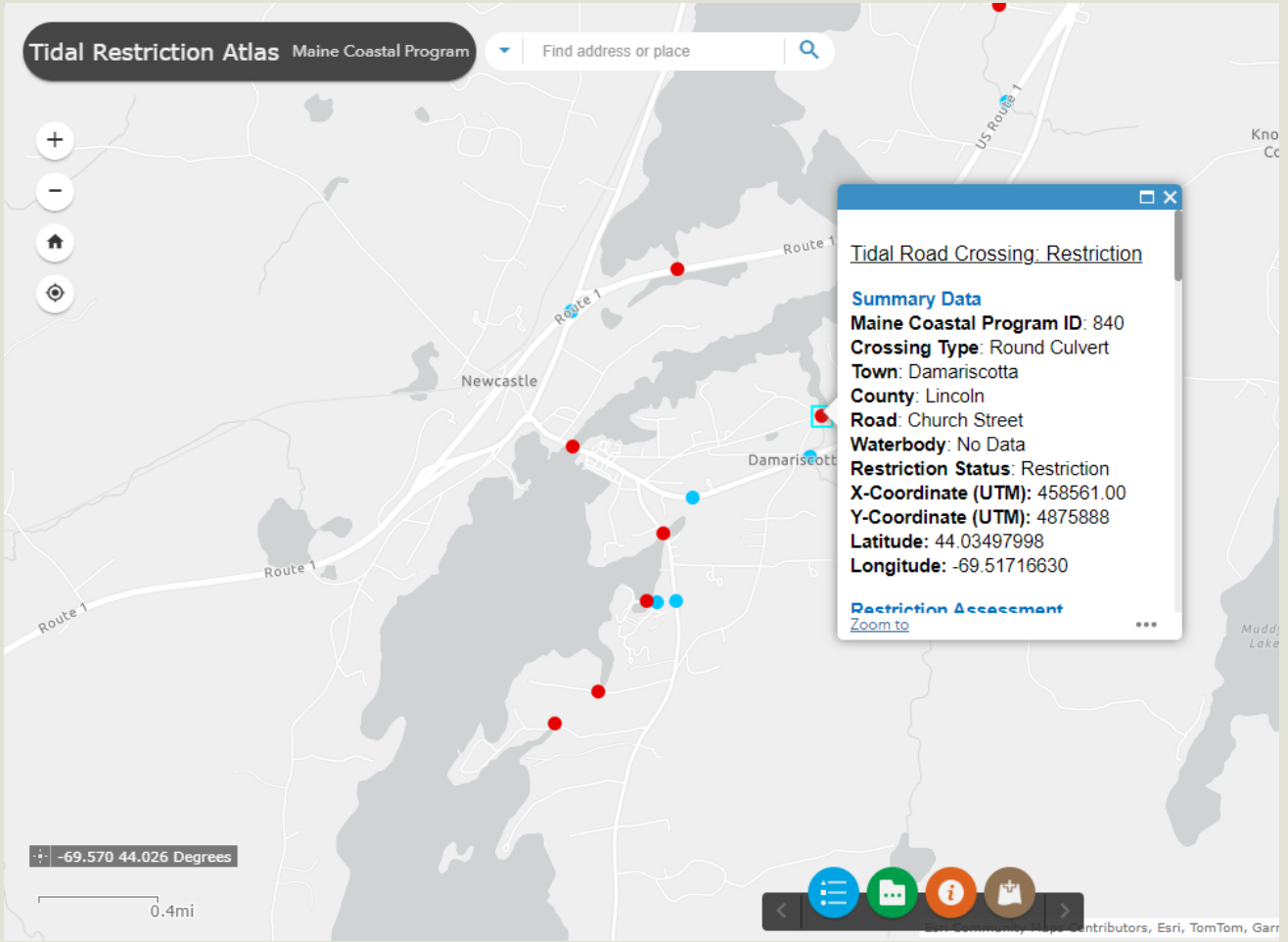
- Information
- Spatial Data
- Technical Assistance

Our Users

- Municipalities
- Landowners
- Land Trusts

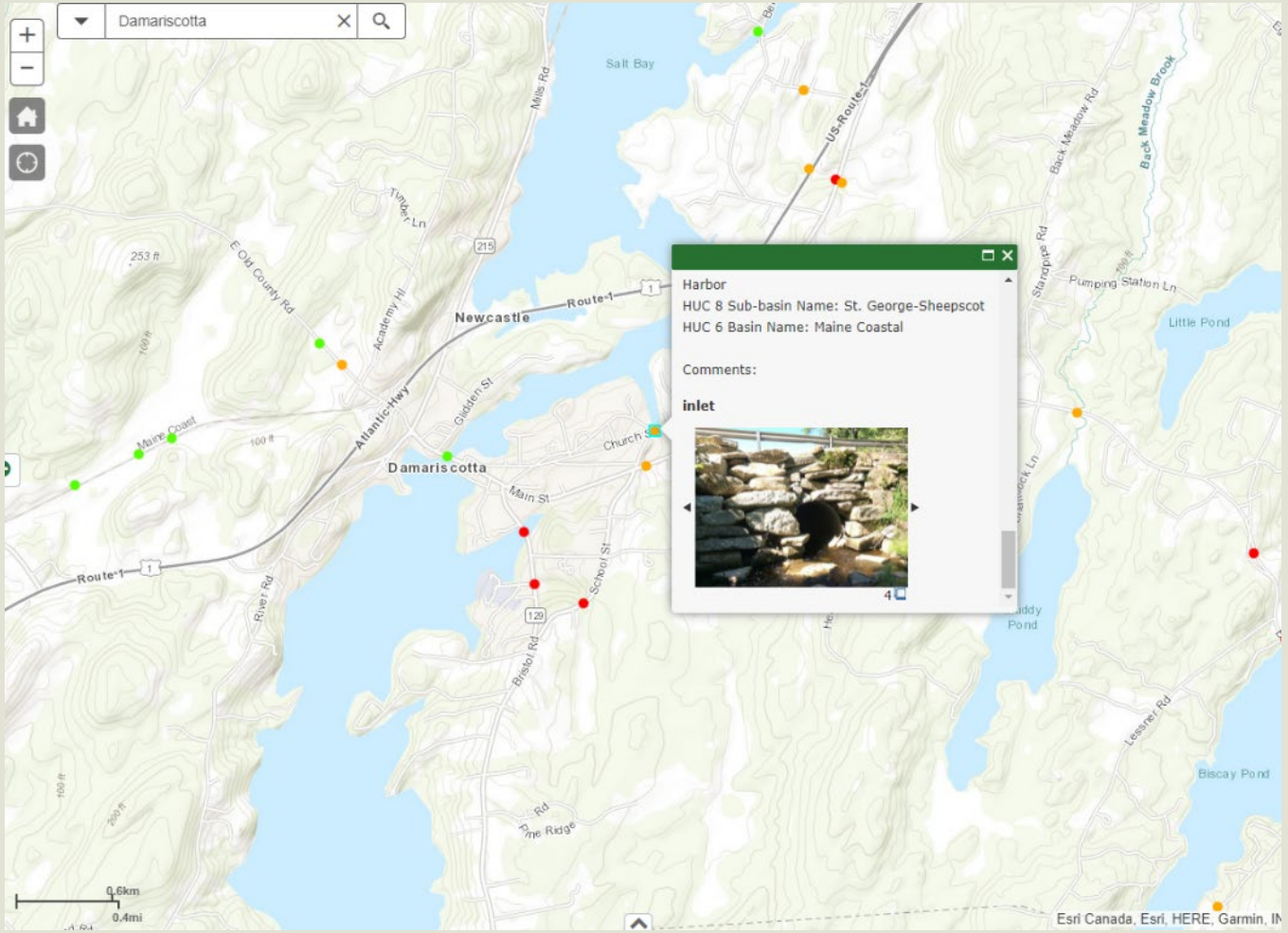
Maine Tidal Restriction Atlas

- Tidal restrictions limit or prevent daily water exchange between upstream and downstream habitats
- Extreme precipitation, storm surge, and sea level rise are exacerbating impacts on aquatic habitats as well as flooding, water quality, and road conditions
- This tool can help identify and prioritize current and future tidal restrictions for replacement or upgrade



Maine Stream Habitat Viewer

- Stream barriers present problems for aquatic species as well as flooding, erosion, water quality, and infrastructure maintenance
- This tool can help identify and prioritize opportunities for crossing upgrades and restoration statewide
- Addressing barriers can alleviate flooding, improve infrastructure resilience and water quality, and connect habitat



Presenter Contact Information

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Corinne Michaud-LeBlanc – Climate Coordinator
Maine Beginning with Habitat
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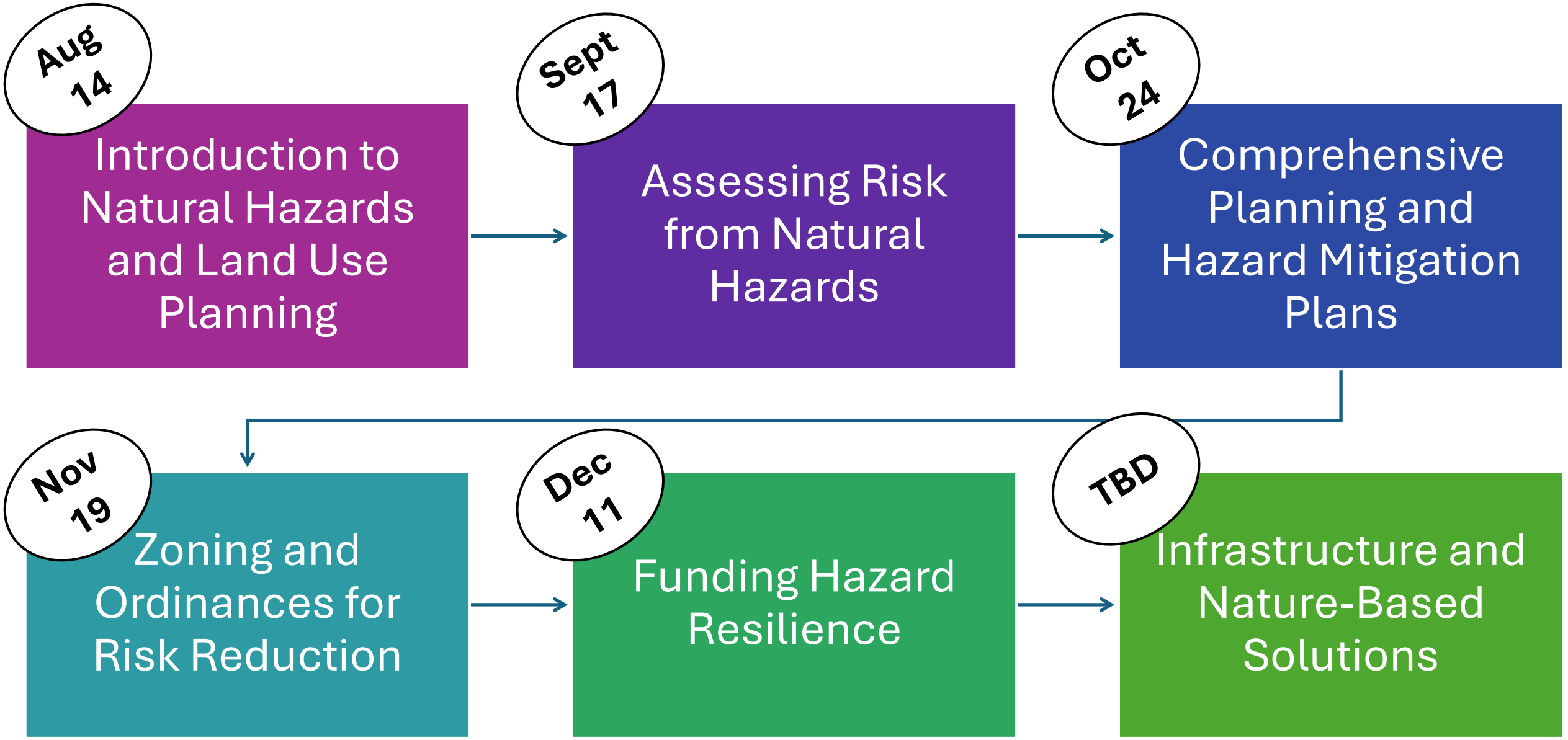
Aug 14
Introduction to Natural Hazards and Land Use Planning
Sept 17
Assessing Risk from Natural Hazards
Oct 24
Comprehensive Planning and Hazard Mitigation Plans
Nov 19
Zoning and Ordinances for Risk Reduction
Dec 11
Funding Hazard Resilience
TBD
Infrastructure and Nature-Based Solutions

Tool Demonstration Breakout Groups

Jessica Brunacini – Maine Social Vulnerability Index, environmental justice

Rachael Hamilton – MEMA Risk Map, wildfire, extreme heat, air quality

Hannah Baranes – Flood Insurance Rate Maps, National Flood Hazard Layers

Nick Whiteman – Recognizing symptoms of erosion and landslide hazards

Corinne Michaud-LeBlanc – Maine Tidal Restriction Atlas, Stream Habitat Viewer