THE WASHINGTON COASTAL RESILIENCE PROJECT

New Relative Sea Level Projections for Washington State

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with

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Harriet Morgan, Climate Impacts Group
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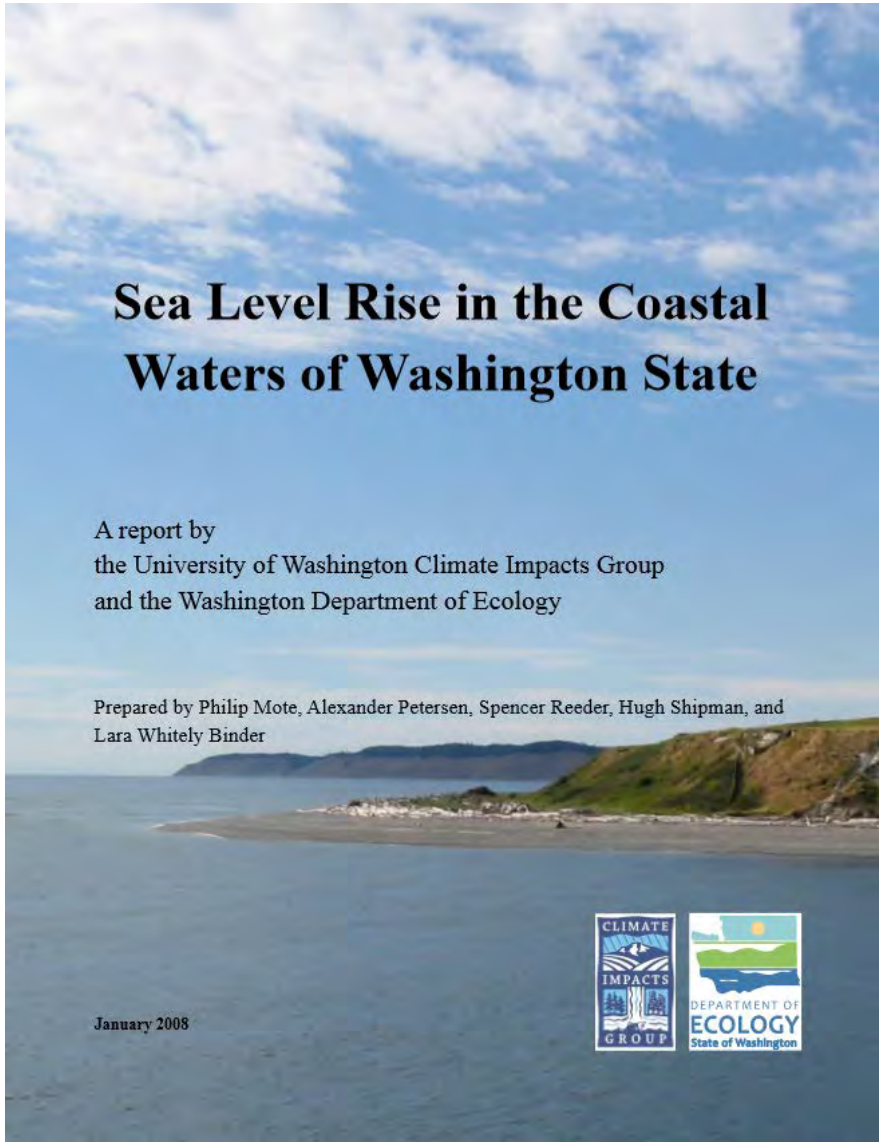
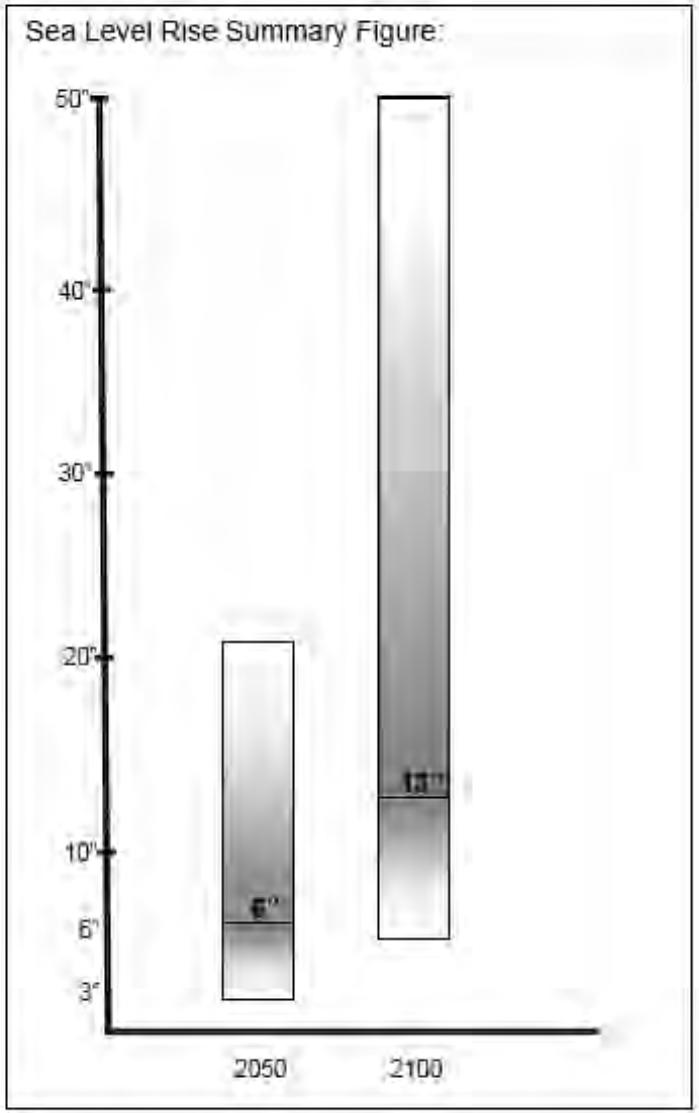
Mark Welch, University of Washington (former)
Eric Grossman, US Geological Survey

Why Sea Level?

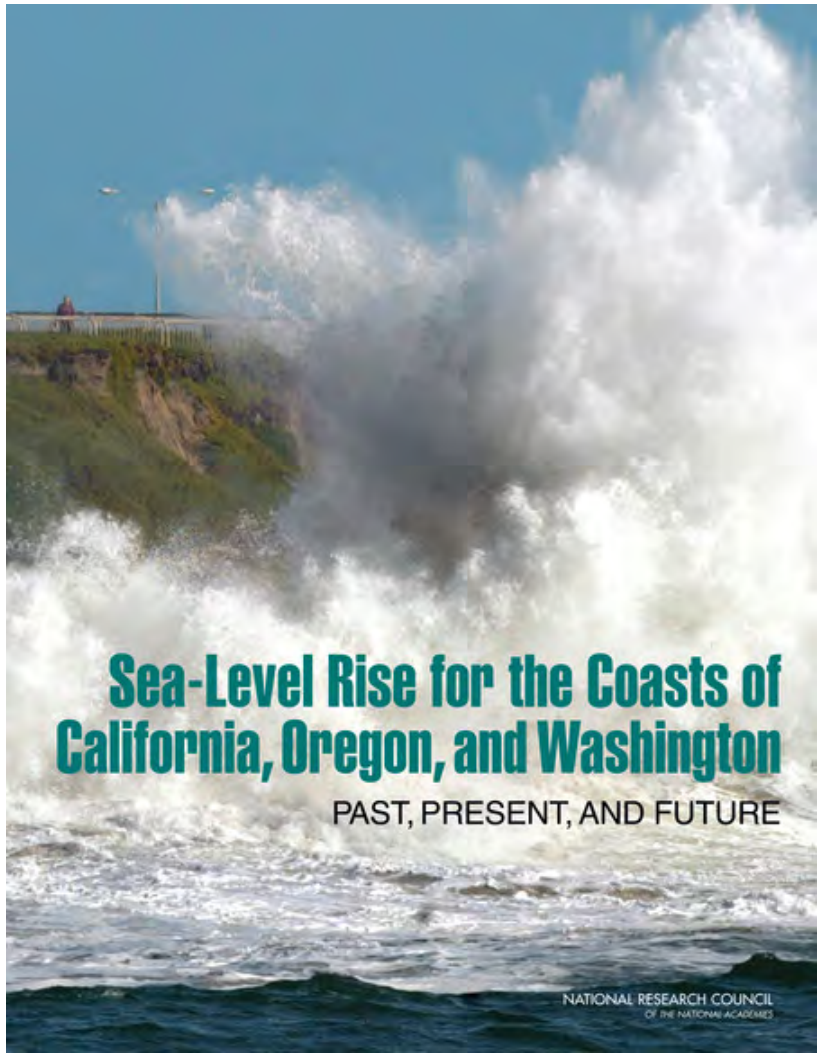


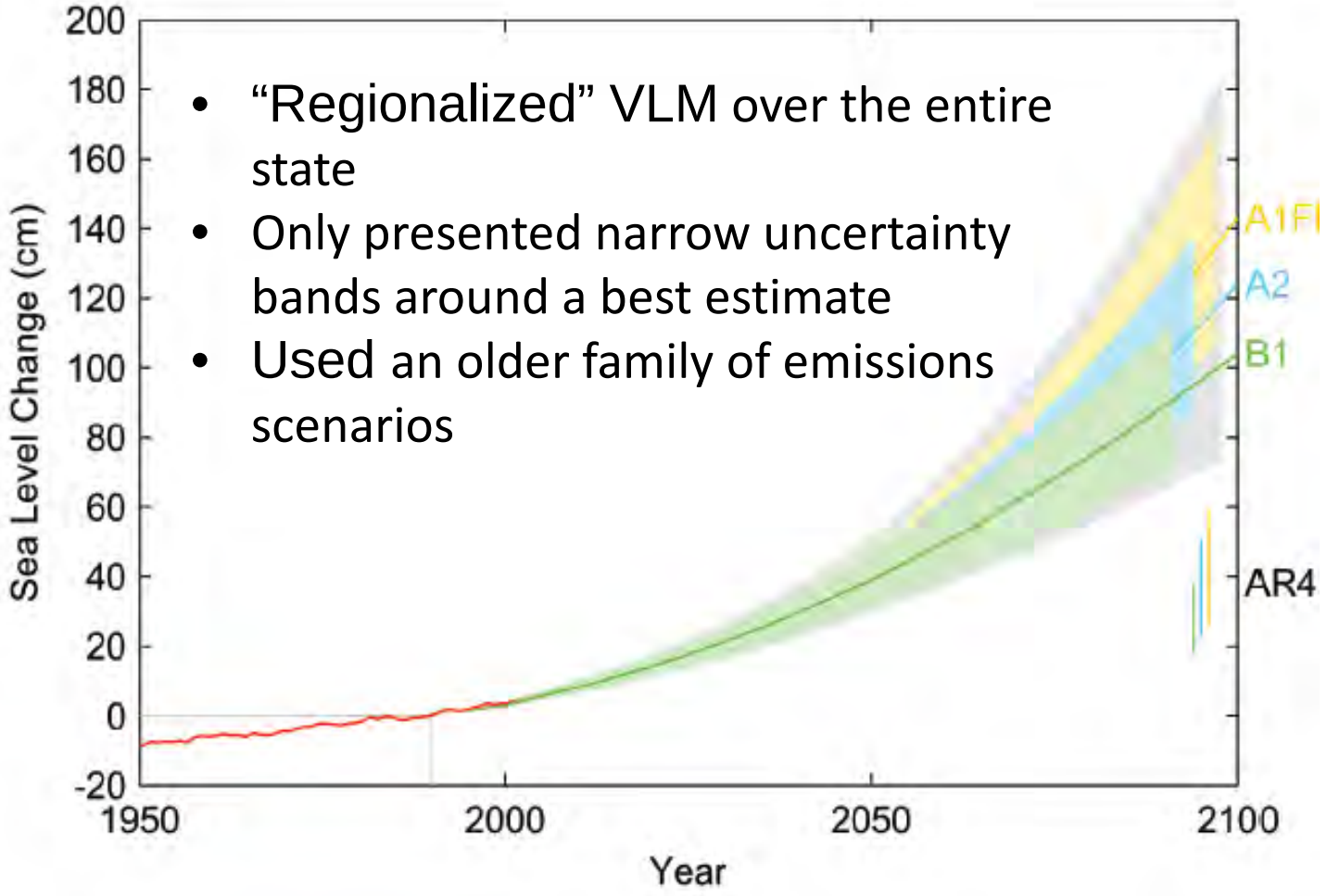


Previous BAS

- Big projections ranges, but little guidance on uncertainty
- Used older assumptions about ice contributions
- Regionalize VLM across poorly defined zones of Washington

Previous Best Available Science





- "Regionalized" VLM over the entire state
- Only presented narrow uncertainty bands around a best estimate
- Used an older family of emissions scenarios

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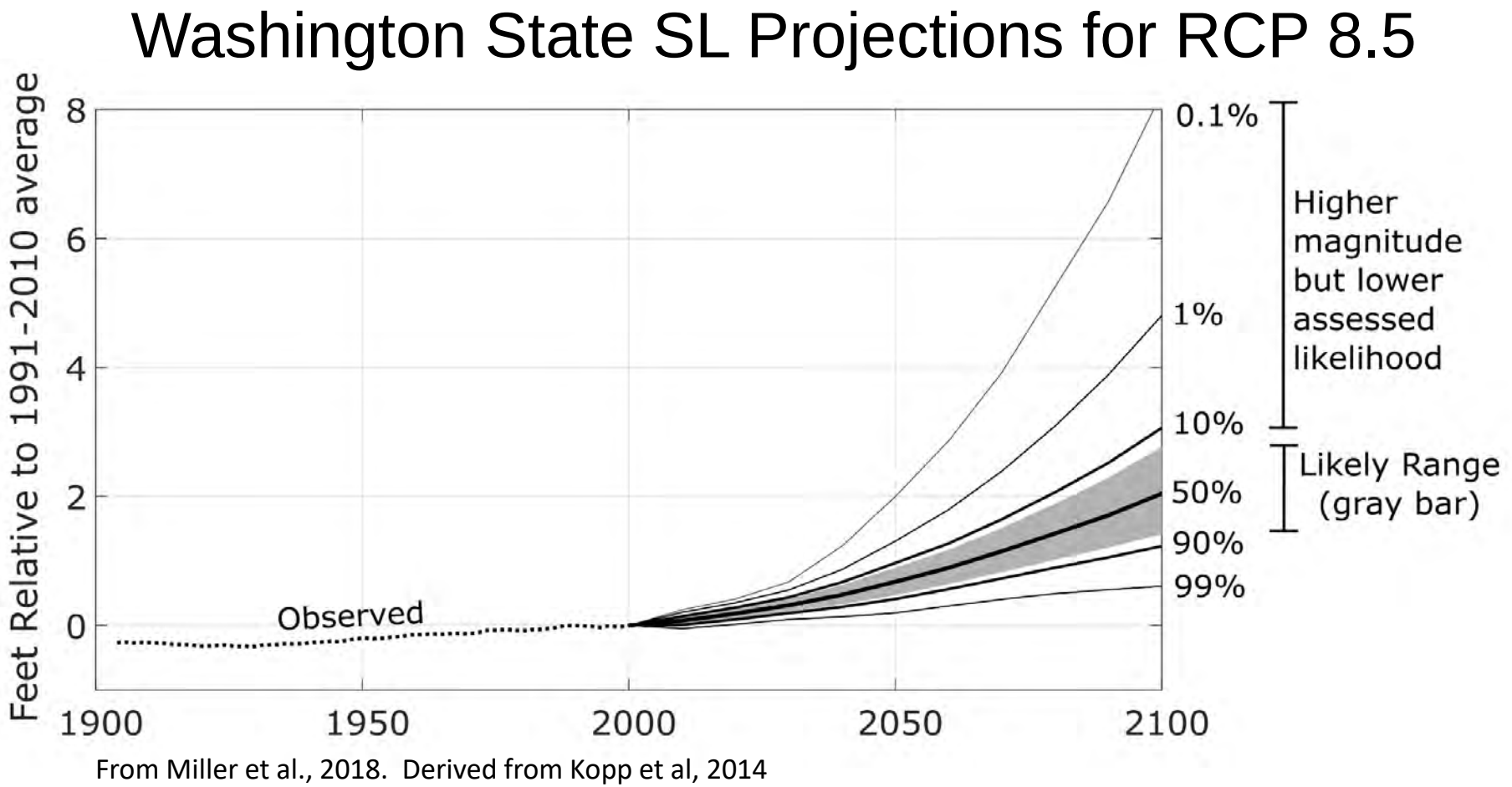
Objective 1

"Fill critical information gaps and improve the communication of risk about coastal hazards and related climate impacts (sea level rise, storm surge, wave impacts and shoreline erosion) that hinder planning and action in Washington's coastal communities."

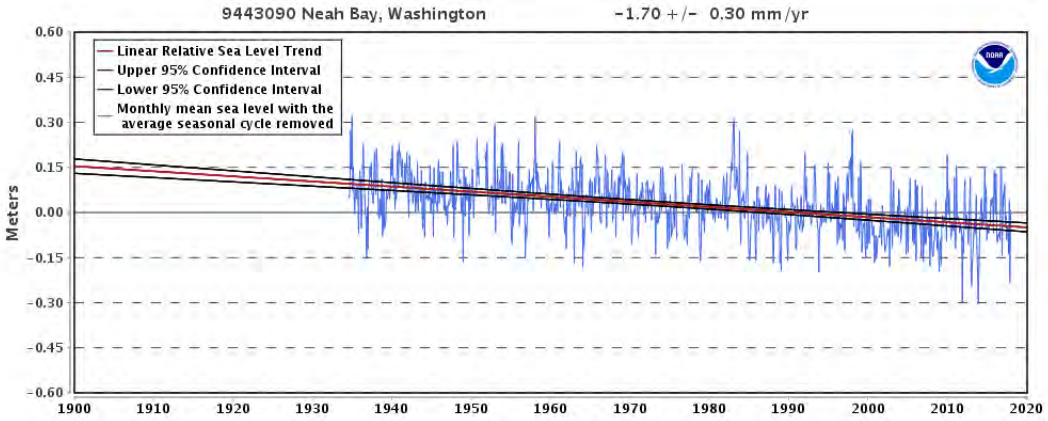
Innovation 1: Kopp's Probabilistic Framework



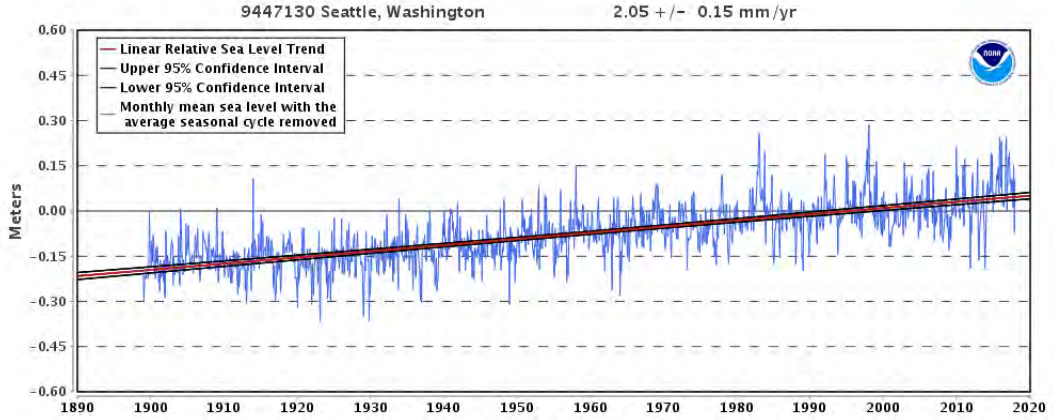
From Miller et al., 2018. Derived from Kopp et al, 2014

Innovation 2: Localizing

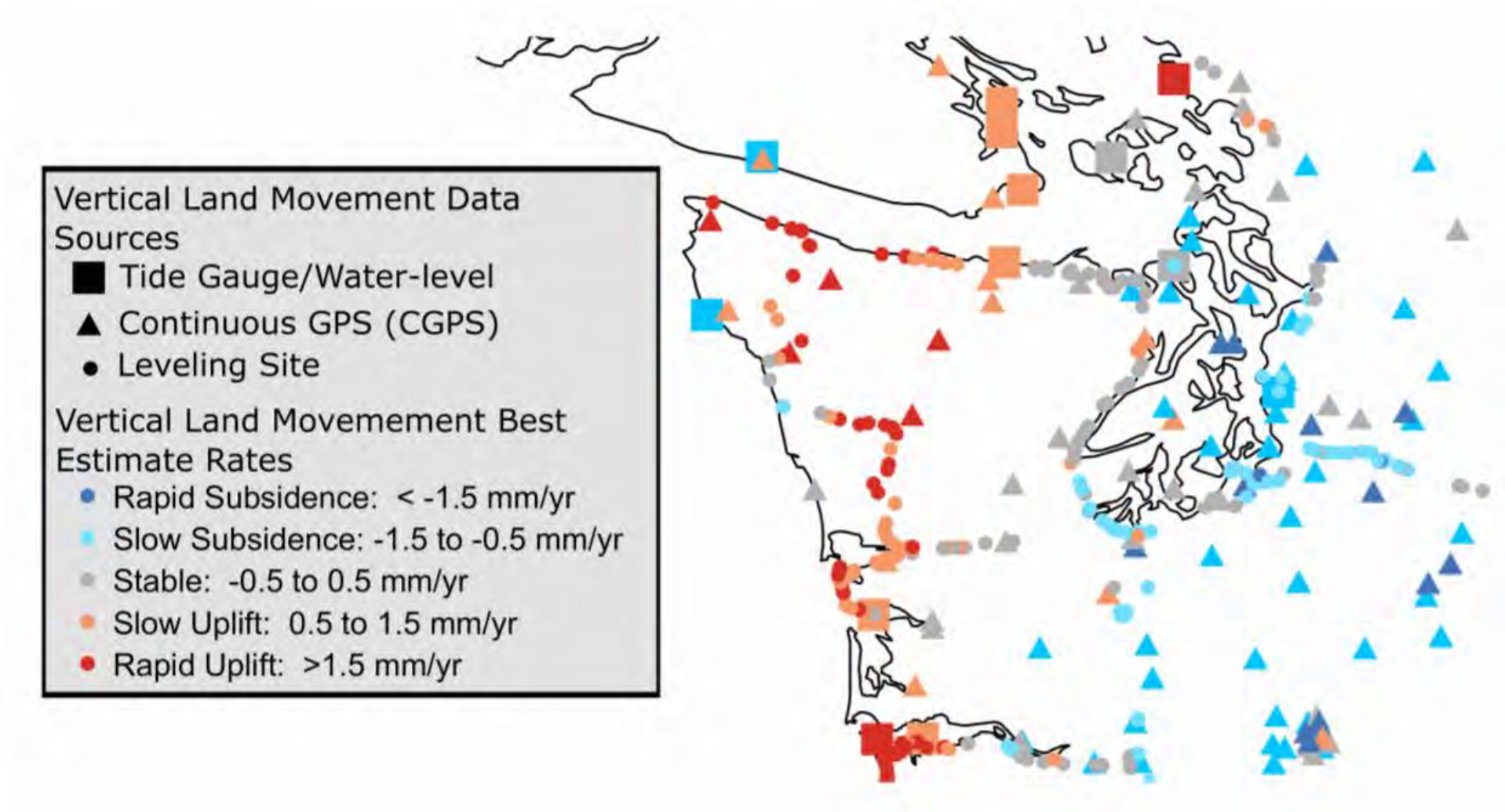
Neah Bay, WA



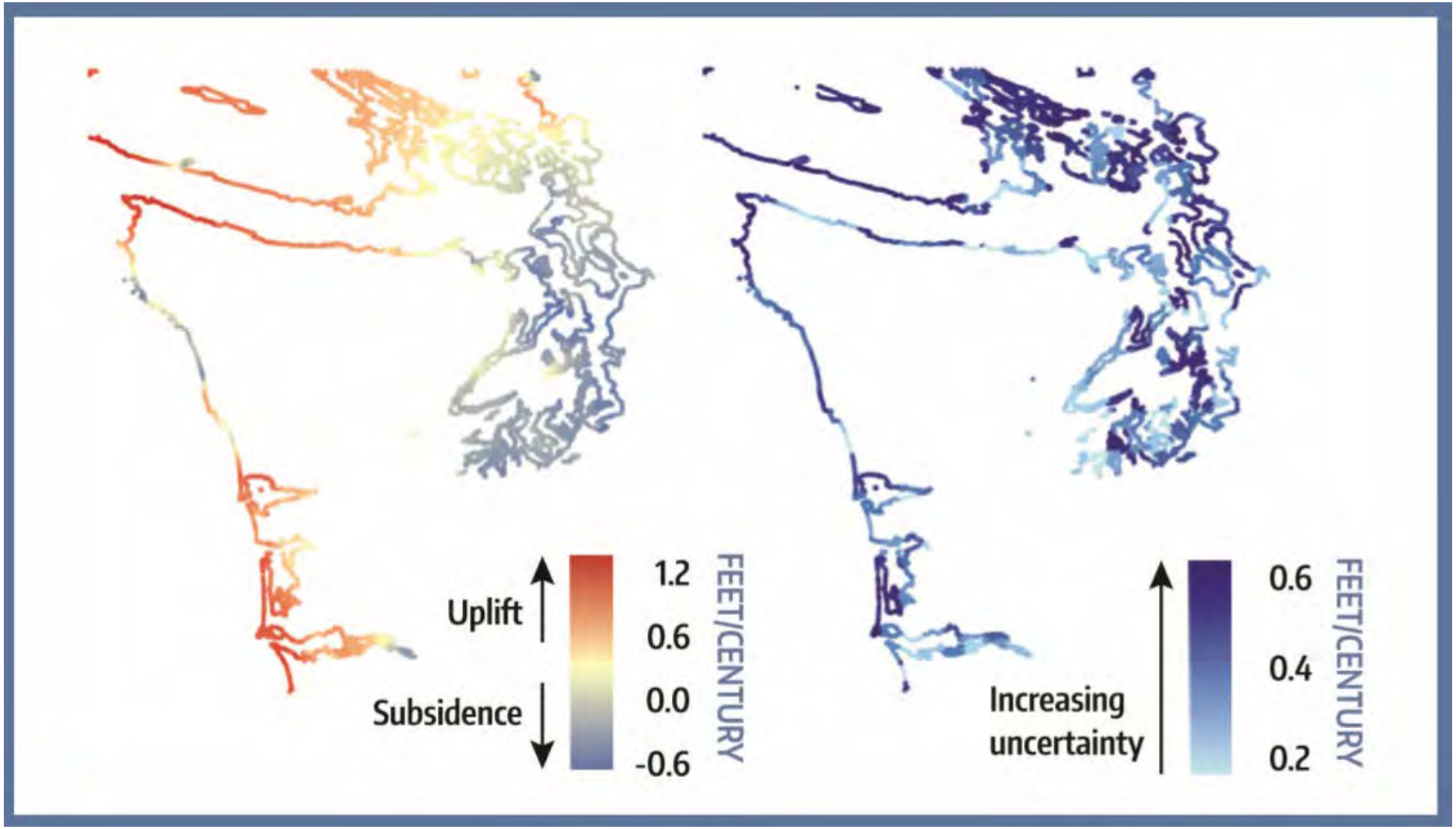
Seattle, WA



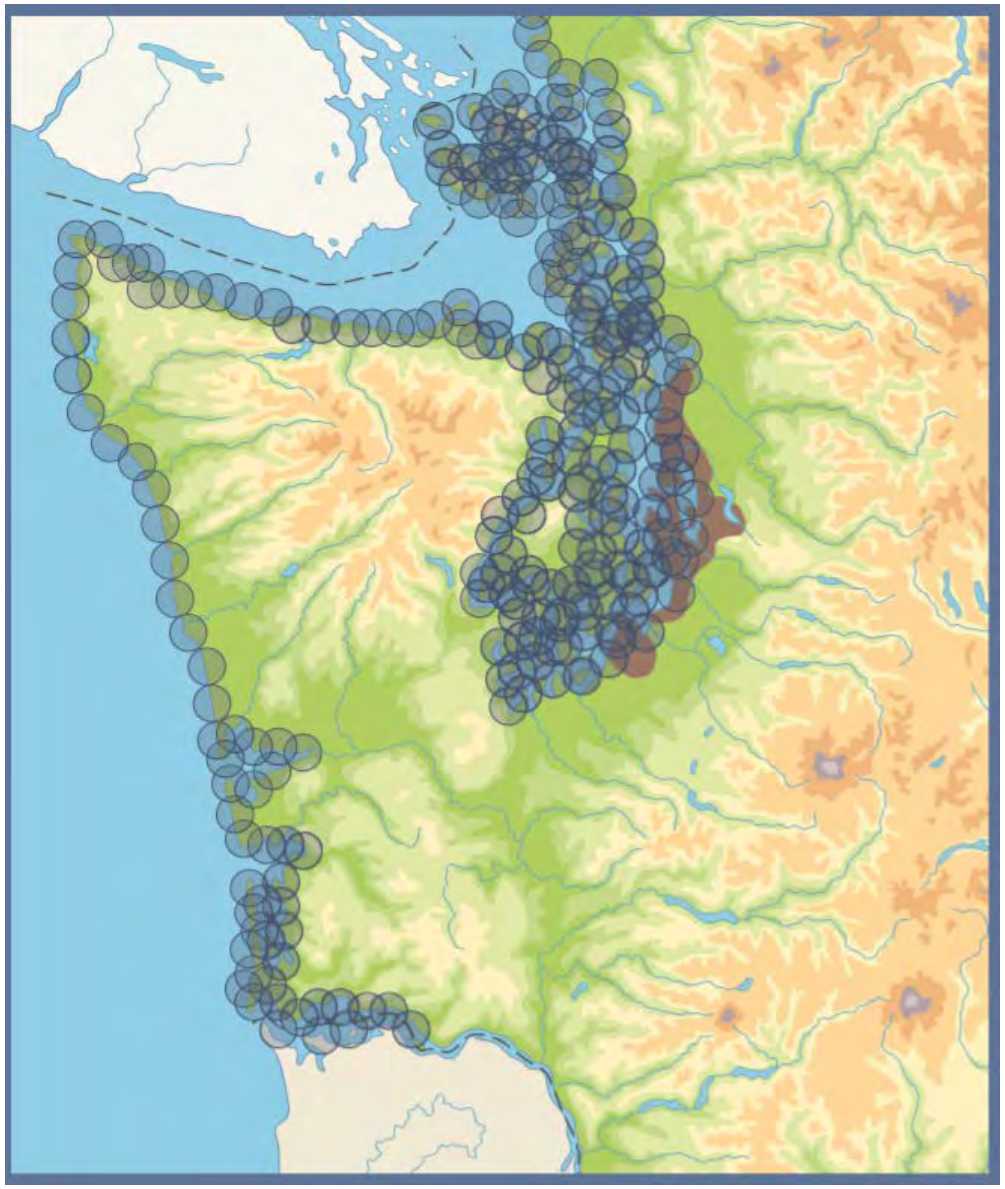
VLM Analysis



Coastal Estimates

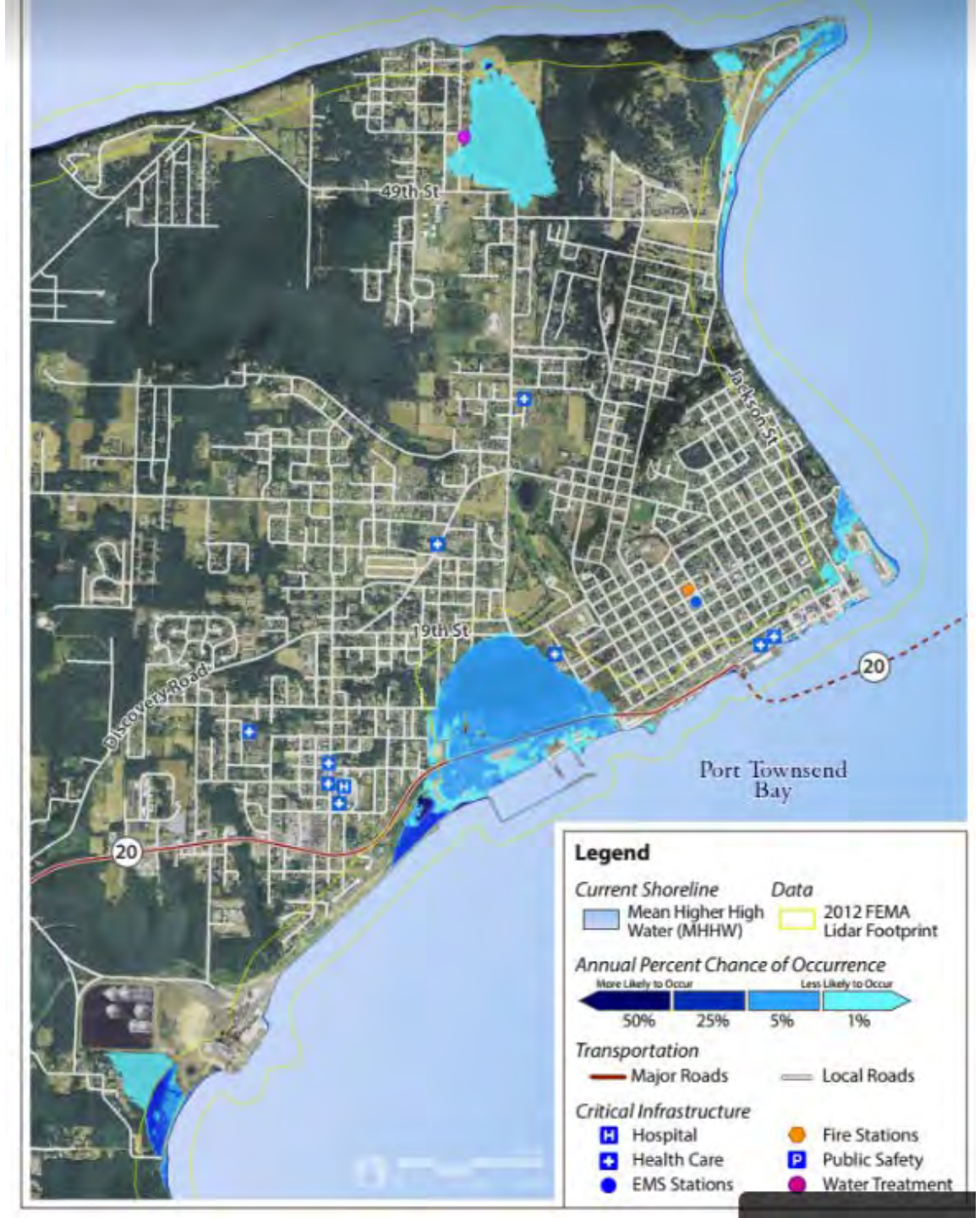


Spatially Distributed RSLR Projections



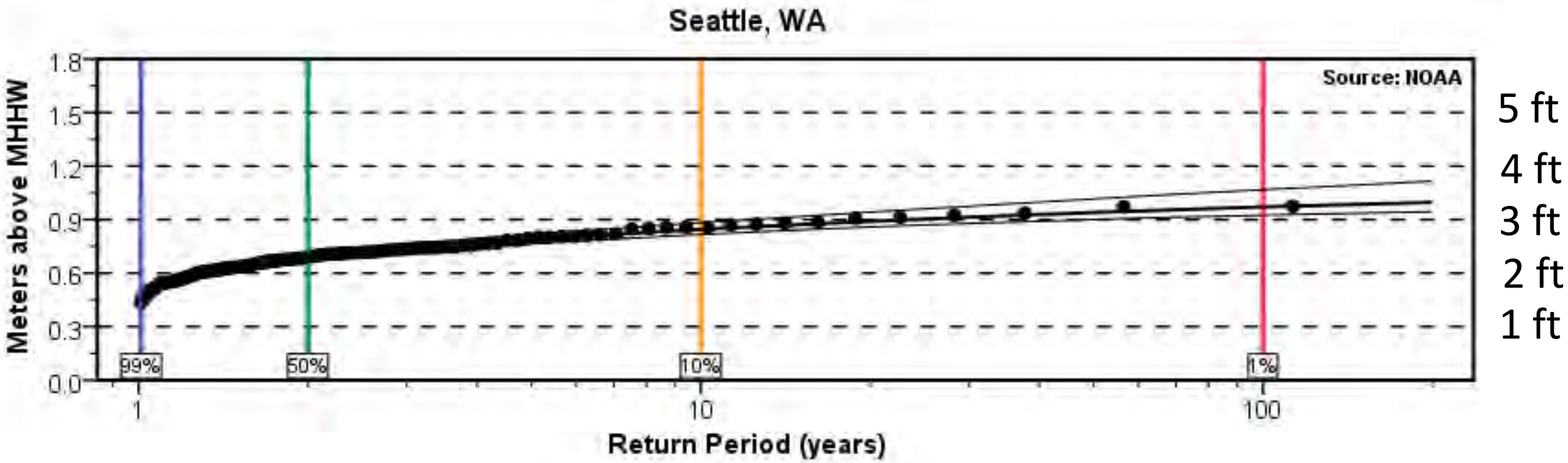
Visualizing possibilities on the landscape

2100 MHHW projections for Port Townsend for RCP 8.5



Innovation 3: The impacts of sea level are really at the extremes

Seattle's high STILL water "return-frequency" curve



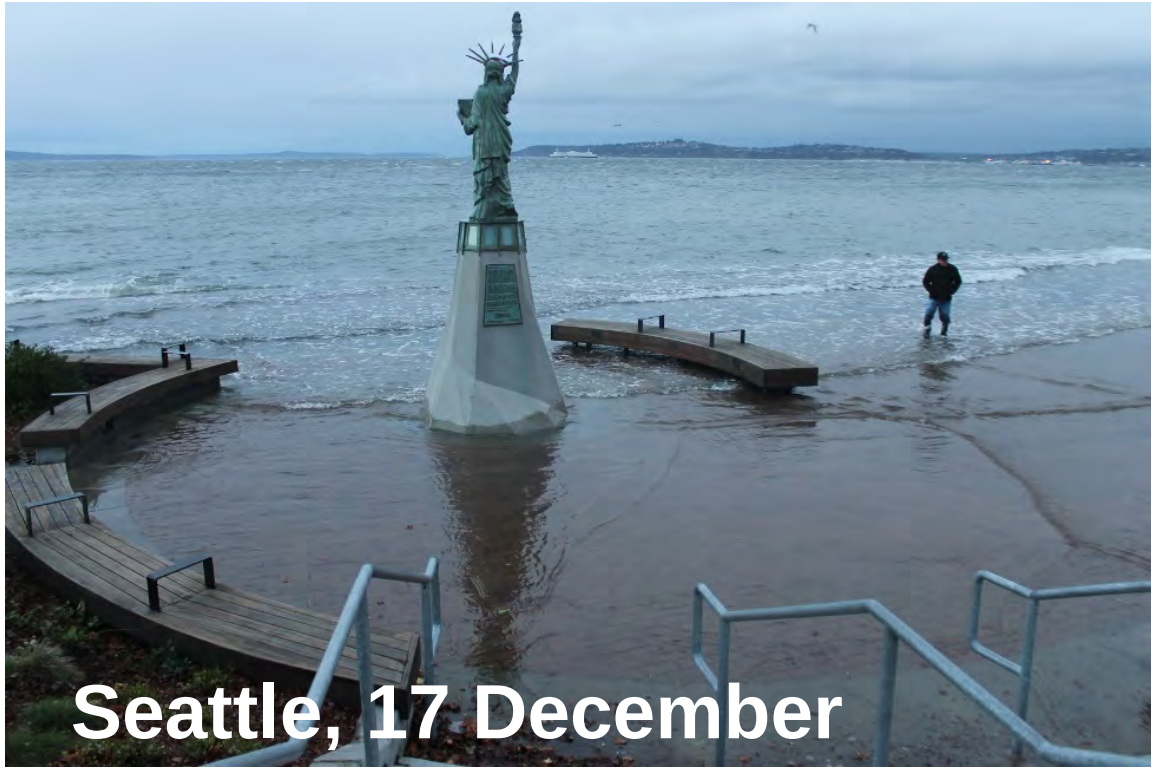
A Puget Sound “Extreme Event”

Tools to assess the change in frequency of an existing event

Sea-level scenario	Still Water (i.e. tides + surge) Return Frequency in feet relative to MHHW				
	1-yr	5-yr	20-yr	50-yr	100-yr
0	*0.8*	*2.2*	*2.6*	*2.9*	*3.2*
0.5	*1.3*	*2.7*	*3.1*	*3.4*	*3.7*
1	*1.8*	*3.2*	*3.6*	*3.9*	*4.2*
1.5	*2.3*	*3.7*	*4.1*	*4.4*	*4.7*
2	*2.8*	*4.2*	*4.6*	*4.9*	*5.2*
2.5	*3.3*	*4.7*	*5.1*	*5.4*	*5.7*
3	*3.8*	*5.2*	*5.6*	*5.9*	*6.2*
4	*4.8*	*6.2*	*6.6*	*6.9*	*7.2*
5	*5.8*	*7.2*	*7.6*	*7.9*	*8.2*
6	*6.8*	*8.2*	*8.6*	*8.9*	*9.2*
7	*7.8*	*9.2*	*9.6*	*9.9*	*10.2*
8	*8.8*	*10.2*	*10.6*	*10.9*	*11.2*
9	*9.8*	*11.2*	*11.6*	*11.9*	*12.2*
10	*10.8*	*12.2*	*12.6*	*12.9*	*13.2*

Every Day at High Tide

What CoSMOS was born to do



Thank you

- *We've developed an updated SLR assessment for Washington State*
- *Our projections are localized*
- *The probabilistic approach allows users to evaluate future possible sea level in the context of an assessment of likelihood*
- *We are currently focused on developing tools that allow users to assess future exposure to sea level + extreme water level processes*

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Sea Grant Washington

Responding to demand for an updated approach with better resolution

CGPS (N=165):
UN RENO Group
JPL
PANGA
SOPAC (Scripps)

Individual estimates averaged. Uncertainty = SD

VLM Point Estimates with uncertainty (N=607 observations + Locking Model)

Tied to an absolute reference frame using CGPS

Water Level (N=17): All coastal estimates!

Tectonic Locking Model: at 1/10th degree intervals, bedrock vertical movement estimates. Courtesy of David Schmidt and Ray Weldon

Physically derived model. Arbitrary uncertainty of 2 mm/yr

Interpolated VLM field with uncertainty estimate

Tied to an absolute reference frame using CGPS

Leveling (N=425): Unpublished data courtesy of David Schmidt and Ray Weldon