

Restoring Resilience to Tillamook Bay: Incorporating Climate Change in the Restoration Design and Construction at Kilchis Estuary Preserve, Tillamook County

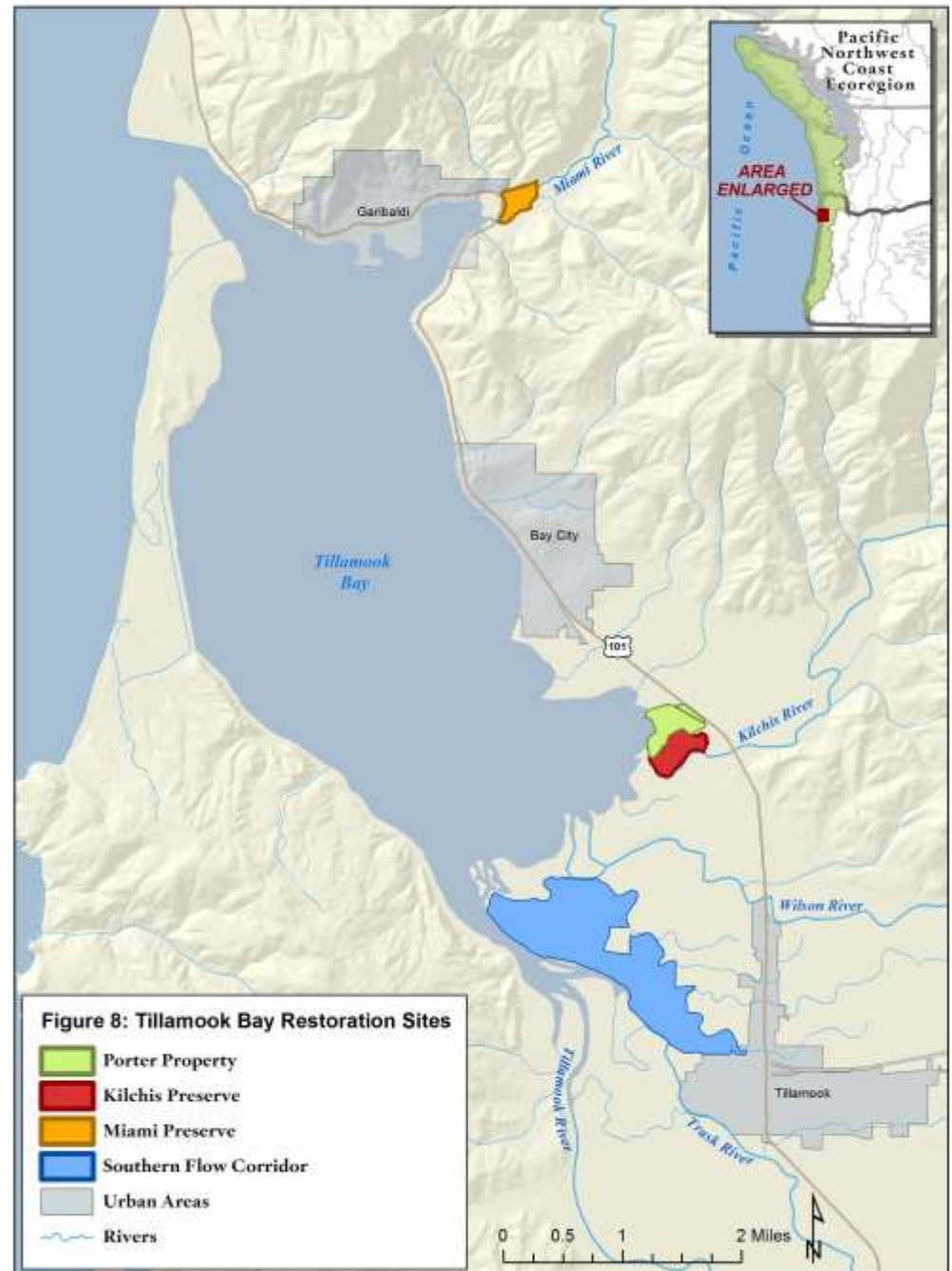


Dick Vander Schaaf, Curtis Loeb, Hunter White
Columbia River Estuary Conference, 4-12-18



Tillamook Bay

- 2nd largest estuary on Oregon coast
- Dairy farming
- 80% loss of tidal marshes
- Home to 5 salmonid species
- Susceptible to flooding and sea level rise



Kilchis Preserve

2015 Restoration

66 acres
former dairy farm
diked, ditched and
subsid



Kilchis Preserve Restoration Goals

- Restore hydrologic function
- Re-create tidal channels and sloughs
- Replant riparian and wetland habitats
- Factor in climate change impacts into design for long-term resilience



Assumption:
natural habitats = enhanced resilience

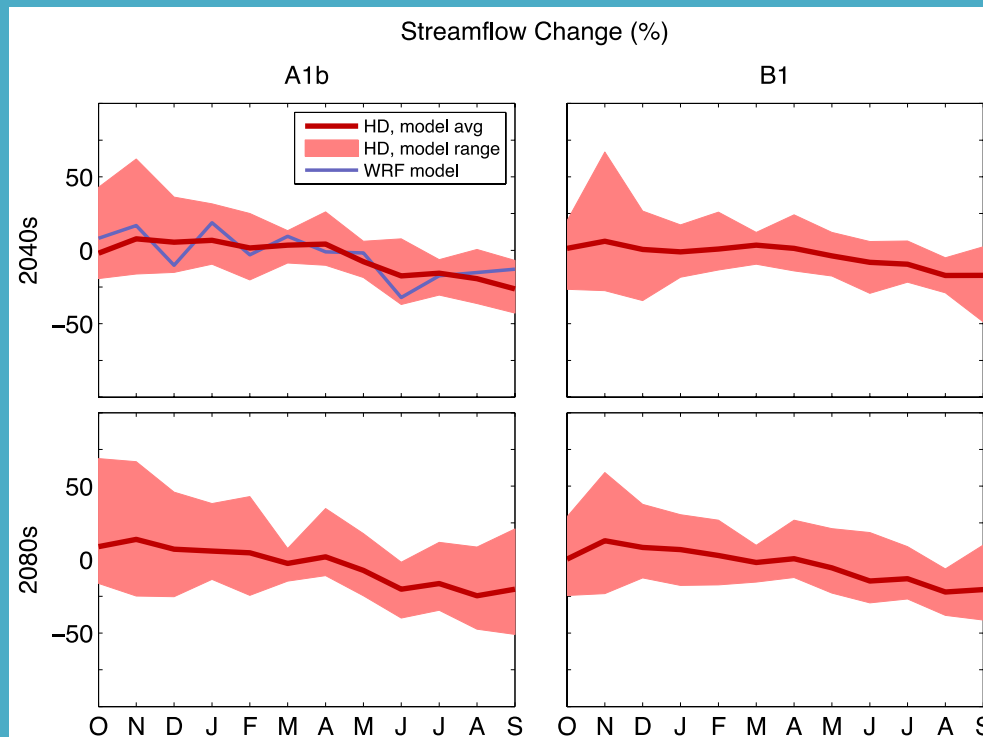
Restoration Planning Using River Flow Modeling

- 2 dimensional hydrodynamic model (Delft3D, 2D mode)
- Include river and tidal flows in model
- Assess restoration scenarios and include climate change impacts
- Use model output to address flooding

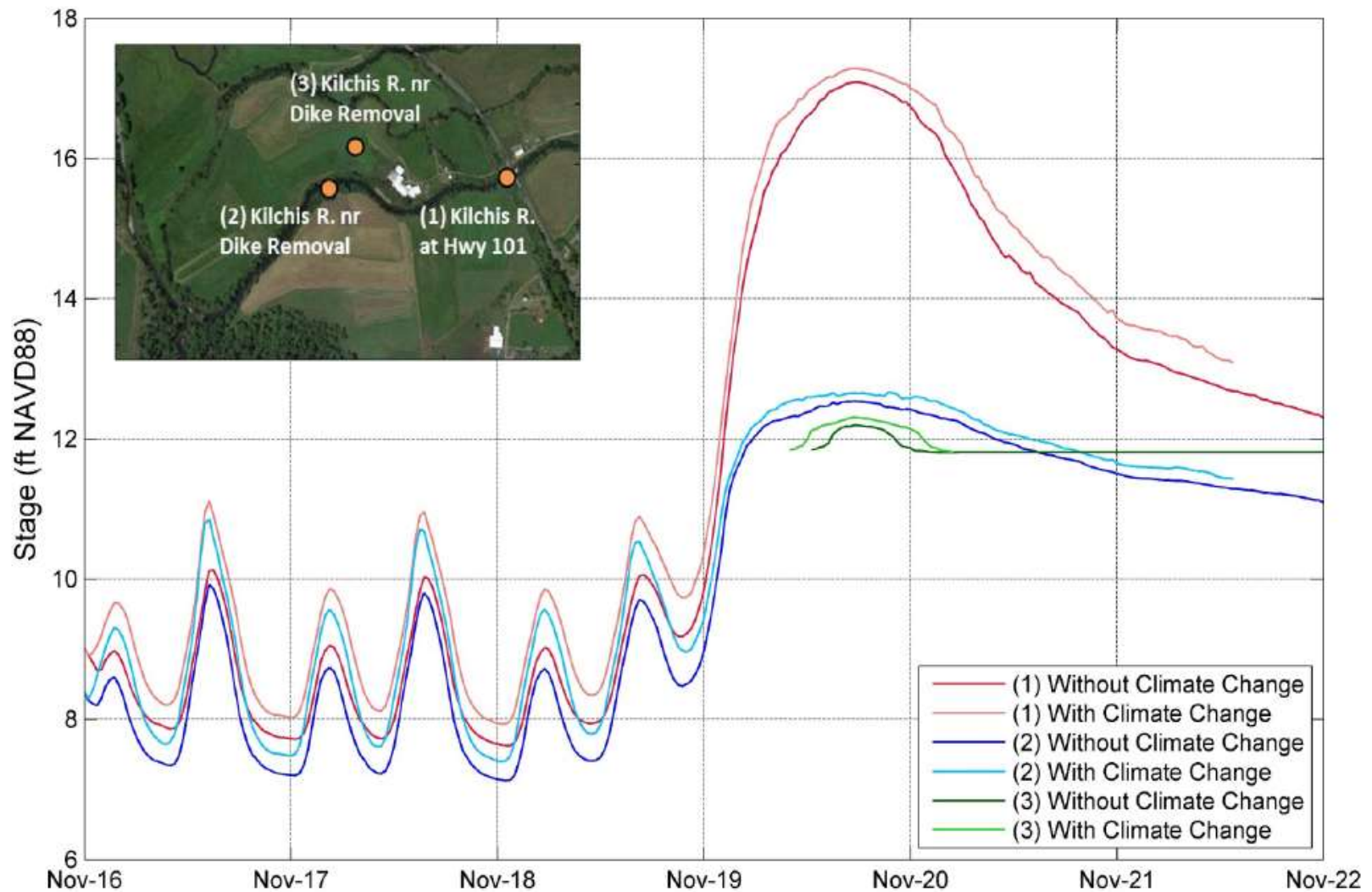


Climate Change Assessment

- Climate Impacts Group, UW, downscaled global climate models to 30km2 grid using A1b (moderate) and B1 (low) emissions scenarios (IPCC 2007)
- Temperature and precipitation parameters
- VIC hydrologic model derived streamflow estimates



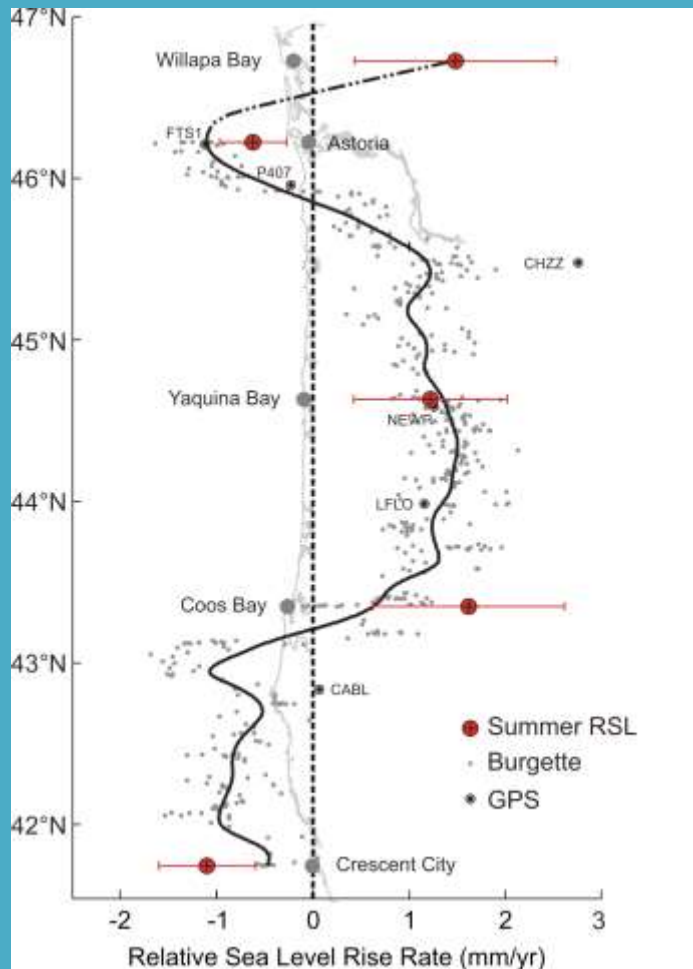
Modeled Streamflow Impacts



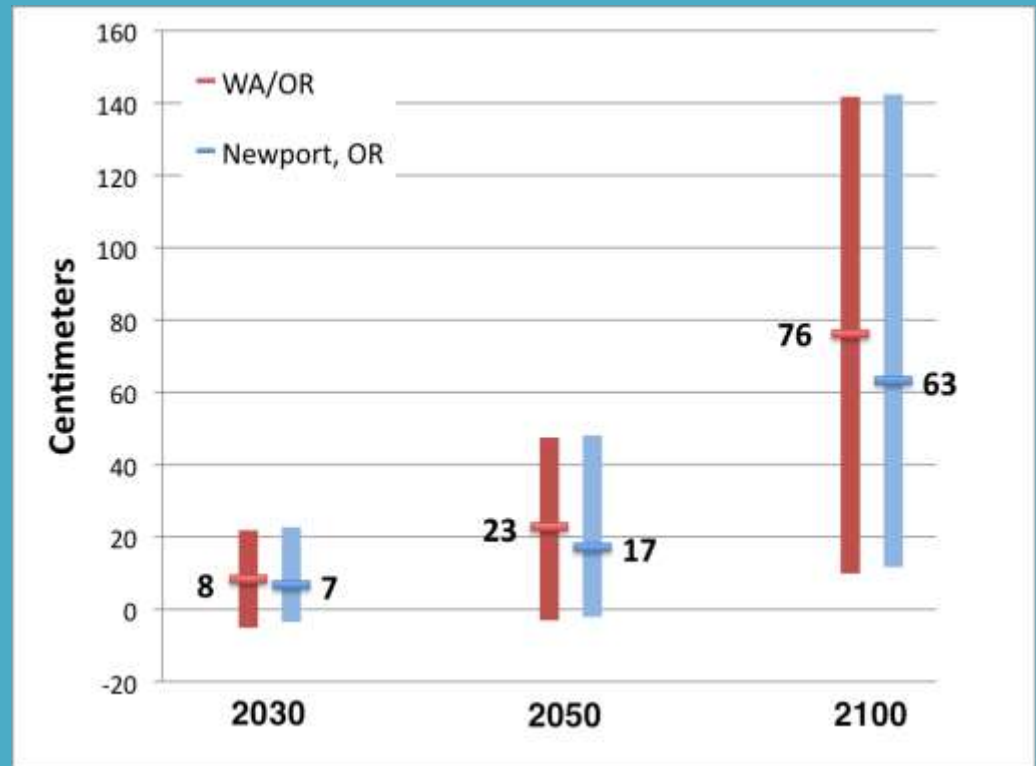
Restored site under Nov. 2012 Q5 Flood Conditions

Sea Level Rise Impacts

Tectonic uplift effects
on SLR

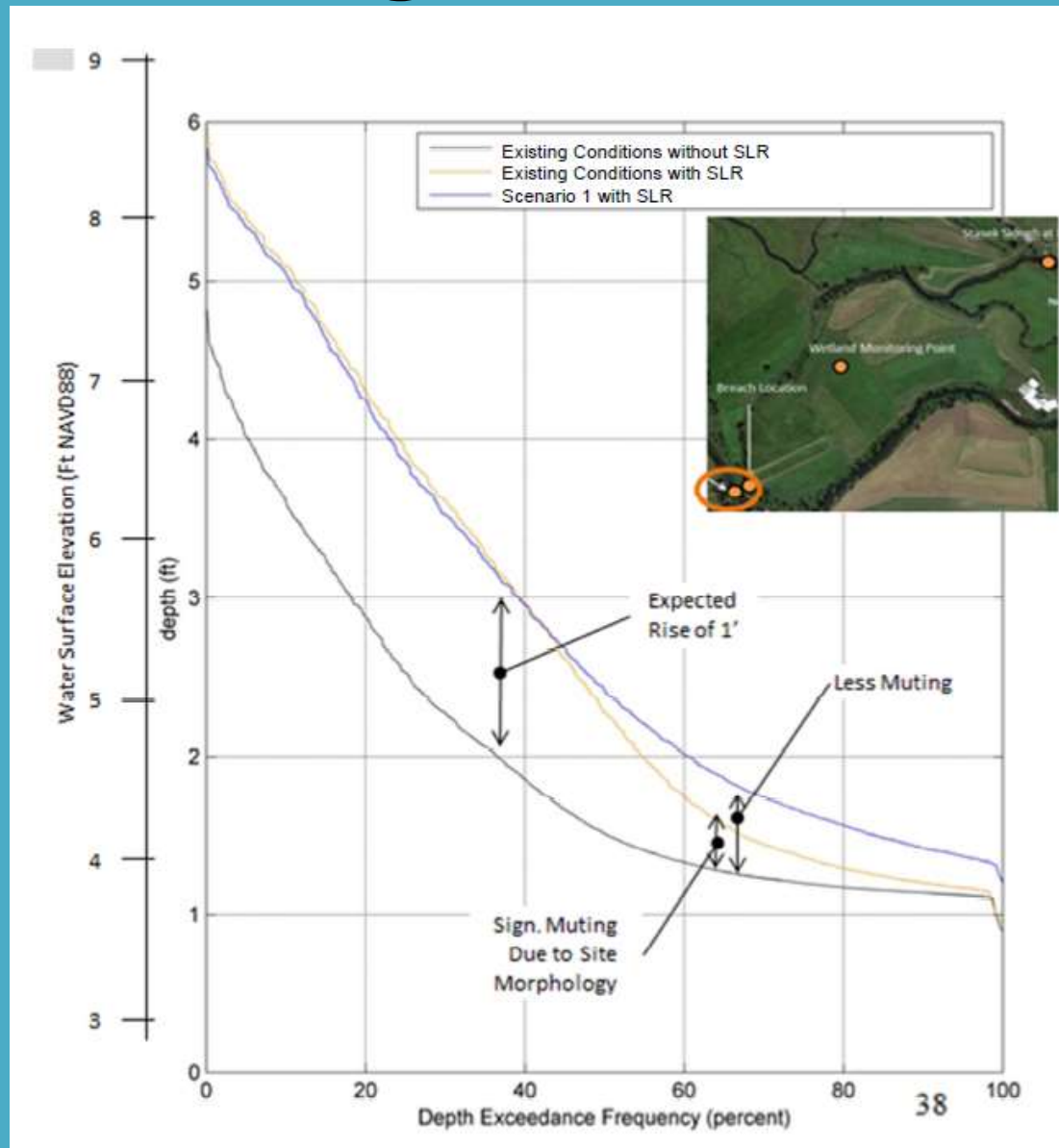


Sea level rise based on A1b
mid-range scenario



NRC 2012

Modeled Effects of Sea Level Rise at Stasek Slough Breach Location



Tidal Inundation

Summer low flow
under restored
conditions, MHHW

- No SLR →



- 1' SLR →

2050 predictions

(NRC 2012)

Result: additional
5 acres inundated at
site



Climate Change Impacts in Kilchis Tidelands

- Streamflow
2040s (2030-2059)
2080s (2070-2099)



- Increased winter flows in warm, rain-dominated coastal systems

- Sea Level Rise
2050



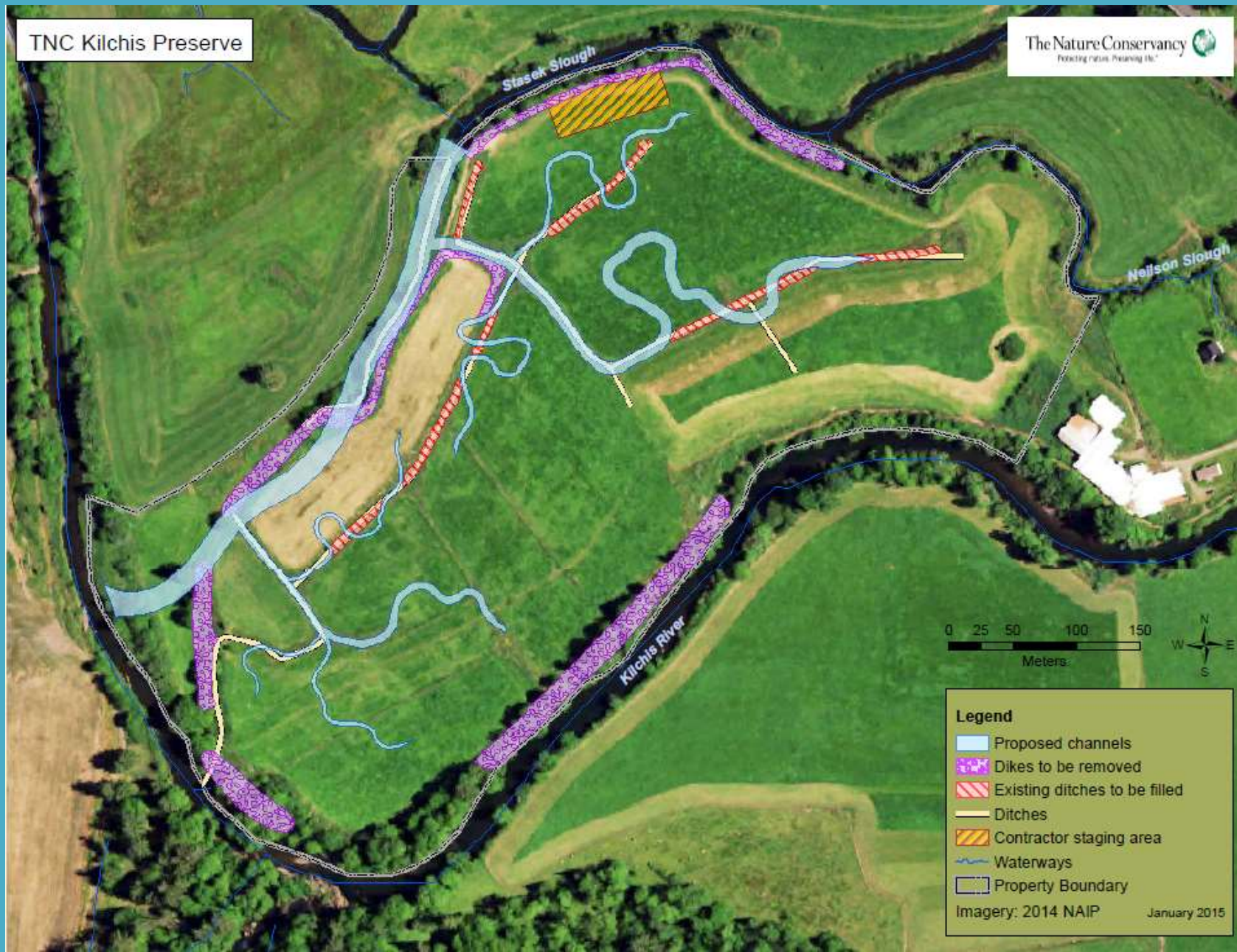
- Mostly affects summer high tide levels. Masked by high river flows in winter

- Extreme weather events
(floods and low flows)

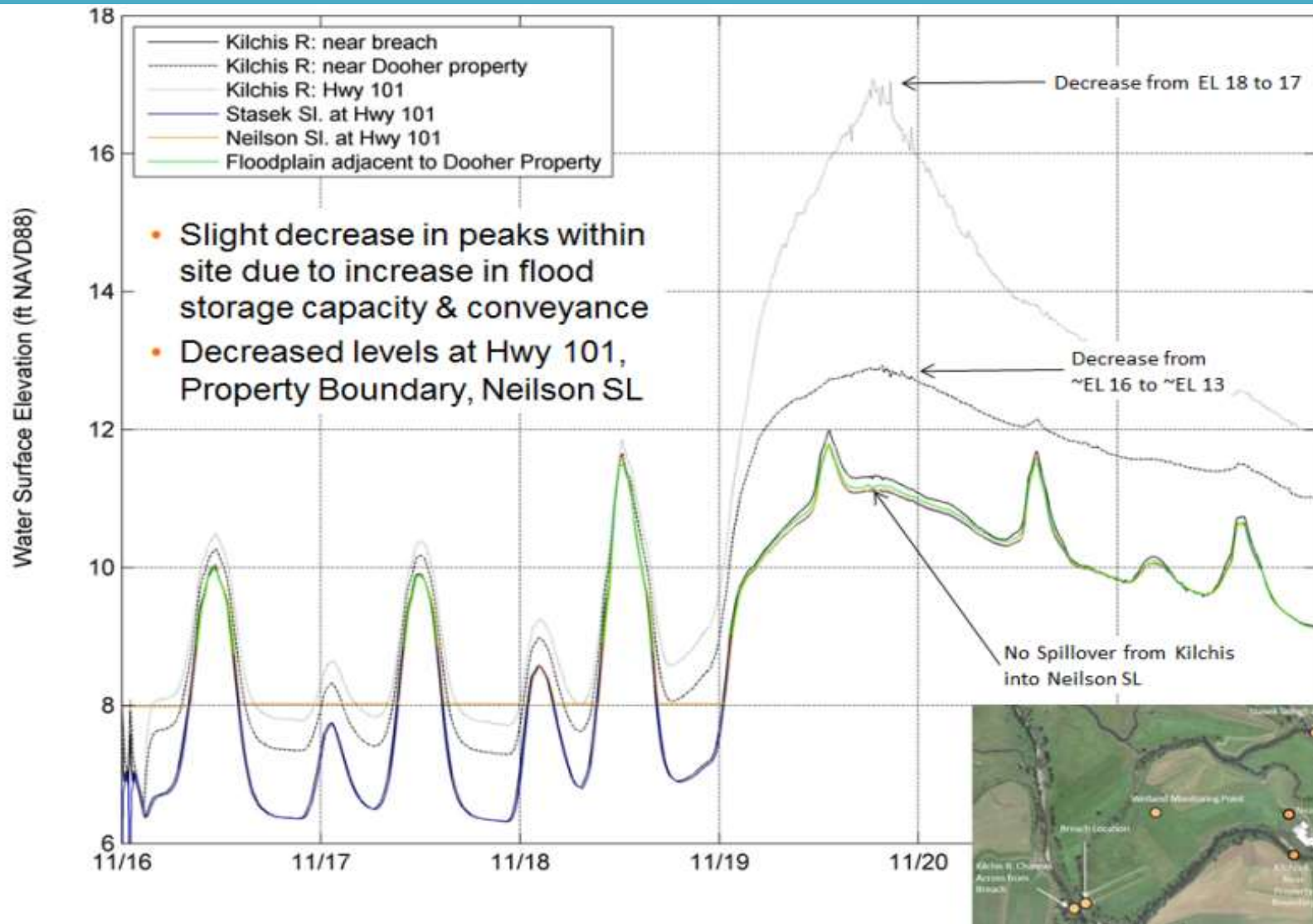


- Both flood and **low flow** events will increase in frequency and magnitude

Kilchis Wetland Restoration Plan



Modeling Restoration Effects



Alternative 2. Full dike removal + Stasek Slough breach under 5 yr (Q5) flood event with 11.6' tide

Construction Phase of Restoration



53,980 cy earth moved



2015 Flood at Kilchis Preserve



Re-Vegetation Phase

Uncertainty due to Climate Change



Plant More Willows!

Does Tidal Marsh Restoration Make Sense in the Face of Climate Change?



Does Tidal Marsh Restoration Make Sense in the Face of Climate Change?



- Restoring marshes now sets them up to accumulate sediments and adapt to SLR
- Immediate benefits for fish and wildlife

Acknowledgements

Oregon Watershed Enhancement Board

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Wildlife Conservation Society

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Tillamook Estuaries Partnership

Oregon Department of Fish & Wildlife

Northwest Oregon Restoration Partnership

Environmental Science Associates

The Nature Conservancy