Restoring Resiliency of Tillamook Bay by Incorporating Climate Change into Tidal Wetland Restoration Design

RAE Summit, Nov. 2014, Dick Vander Schaaf, The Nature Conservancy
Tidal Wetland Restoration Basics

- Enhance resiliency of coastal environments
- Resource and time intensive
- Conversion from Ag lands
- Climate change
Tillamook Bay

- 2nd largest estuary in Oregon
- Dairy farms
- 80% tidal marsh loss
- Home to 5 salmon species
- Basin susceptible to flooding and sea level rise
Kilchis Estuary Preserve
66 acres
former dairy farm, diked and ditched
Habitat Losses
Kilchis Preserve Restoration Goals

• Restore hydrologic function, both riverine and tidal
• Re-create tidal channels and sloughs to benefit fish and wildlife
• Replant riparian and wetland habitats
• Factor in climate change impacts into design for long-term resiliency
Climate Change Impacts in Estuaries

Climate Impacts Group, UW, downscaled global climate models using A1b (moderate) and B1 (low) emissions scenarios (IPCC 2007). VIC hydrologic model.

**Temperature Changes**

**Precipitation Changes**
Sea Level Rise Predictions

Tectonic uplift effects on SLR

Sea level rise based on A1b mid-range scenario

NRC 2012
Restoration Planning Based on River Flow Modeling--ESA

- 2 dimensional hydrodynamic model (Delft3D, 2D mode)
- Include river and tidal flows in model
- Assess restoration scenarios including climate change
- Output can also address flooding concerns
Model Inputs

Reasonable peaks
Hathaway Slough, near confluence with Kilchis R.
Underestimated lows
Kilchis R. at confluence with Squeedunk Slough

(No November 2012 Observed Data At Kilchis R. -Squeedunk)

Apeas Cr.
Modeling Results

- Slight decrease in peaks within site due to increase in flood storage capacity & conveyance
- Decreased levels at Hwy 101, Property Boundary, Neilson SL

Alternative 2. Full dike removal + Stasek Sl breach
Sea Level Rise Effects

- More pronounced during drier summer months when tidal influence dominates site
- But SLR + storm surge will increase 100 yr extreme sea level events to 5 yr return interval by 2050
Tidal Inundation

Summer low flow under restored conditions, MHHW

- No SLR
- 1’ SLR

2050 predictions (NRC 2012)

Result: 5 ac more inundation in 66 ac site
CC analysis: spread excavated materials to raise marsh levels; channels and plantings designed for 2100 scenario
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
Project Funders and Partners

• Oregon Watershed Enhancement Board
• Dept. of State Lands
• Wildlife Conservation Society
• ESA
• Wild Salmon Center
• Tillamook Estuaries Partnership
• The Nature Conservancy