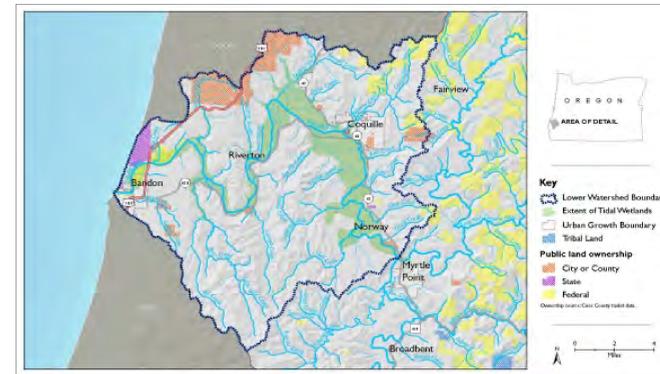


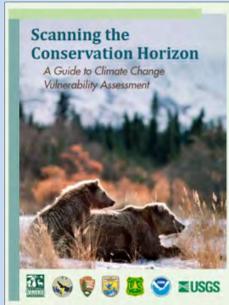
# Assessing Climate Change Vulnerability in a Small Estuary by 2050: Lessons Learned from a Pilot Project in Coquille, Oregon

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## Project Goals

1. Provide useful climate change information on species and habitats of concern to local natural resource managers in the Coquille Estuary
2. Pilot a methodology for conducting low-budget climate change vulnerability assessments for small coastal watersheds (10-digit HUC)



## Process Used to Conduct the CCVA

Based on 2011 NWF publication, *Scanning the Conservation Horizon*

1. Set the stage: Identify stakeholders and interests, determine target species and habitat, choose spatial and temporal scales, and determine assessment methods
2. Gather relevant data and expertise
3. Assess components of vulnerability

## The Setting: Coquille Estuary and Valley

- Drowned river mouth valley on the SW Oregon coast
- Freshwater tidal influence extends past river mile 40
- Wetland habitat for waterfowl, coho salmon, shorebirds and others
- A State focus area for coho salmon recovery
- Bandon Marsh National Wildlife Refuge located at the estuary mouth
- Intensive agricultural activity, primarily cattle grazing, since the 1800s
- Extensive diking confines much of the river; large areas of wetlands lost
- Located in Cascadia Subduction Zone – currently experiencing tectonic uplift

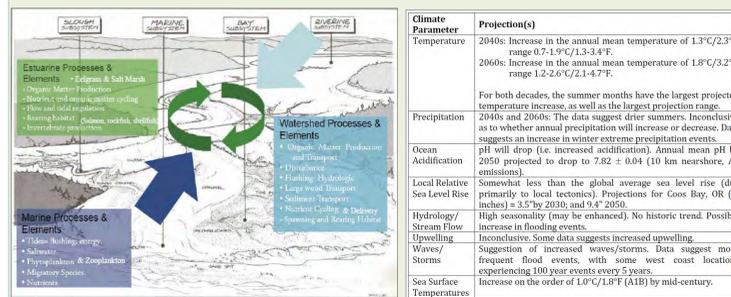


1. Conservation Targets and Scales: species and habitat listed below in the Coquille Estuary by 2050. These were chosen in meetings with local agency, NGO and Tribal resource managers.

Habitats	Species
Estuarine open water	Dungeness crab
Tidal flat	Coho salmon
Low tidal salt marsh	Pacific Lamprey
High tidal saltmarsh	Mallard
Tidal freshwater wetlands	Western sandpiper
Nontidal freshwater wetlands	Beaver
Fringing riparian areas	

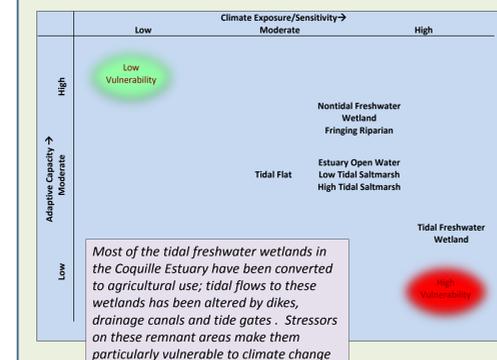
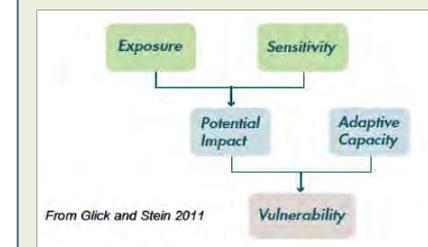
## 2. Gathering Relevant Data for Expert Review

- Conceptual ecological model of estuary function
- Downscaled climate data for the Coquille Valley, prepared by the Oregon Climate Change Research Institute
- SLAMM modelling of projected wetland changes due to sea level rise



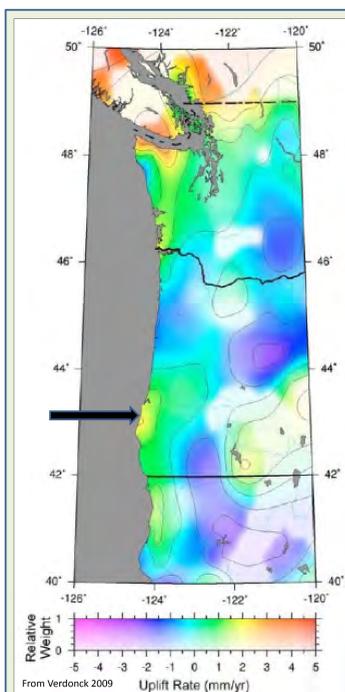
Climate Parameter	Projection(s)
Temperature	2040s: Increase in the annual mean temperature of 1.3°C/2.3°F, range 0.7-1.9°C/1.3-3.4°F. 2060s: Increase in the annual mean temperature of 1.8°C/3.2°F, range 1.2-2.6°C/2.1-4.7°F.
Precipitation	For both decades, the summer months have the largest projected temperature increase, as well as the largest projection range. 2040s and 2060s. The data suggest drier summers. Inconclusive as to whether annual precipitation will increase or decrease. Data suggests an increase in winter extreme precipitation events.
Ocean Acidification	pH will drop (i.e. increased acidification). Annual mean pH by 2050 projected to drop to 7.82 ± 0.04 (10 km nearshore, A2 emissions). Somewhat less than the global average sea level rise (due primarily to local tectonics). Projections for Coos Bay, OR (in inches) = 3.5' by 2030; and 9.4' 2050. High seasonality (may be enhanced). No historic trend. Possible increase in flooding events.
Local Relative Sea Level Rise	Inconclusive. Some data suggests increased upwelling. Waves/ Storms: Suggestion of increased waves/storms. Data suggest more frequent flood events, with some west coast locations experiencing 100 year events every 5 years.
Hydrology/ Stream Flow	Increase on the order of 1.0°C/1.8°F (A1B) by mid-century.
Upwelling	
Sea Surface Temperatures	

## 3. Assessing Components of Vulnerability – using expert review



## Expert Review Team

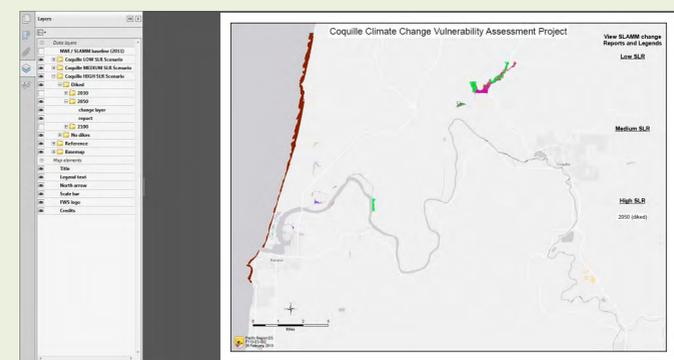
- Coquille Watershed Council
- Coquille Tribe
- South Slough NERR
- Oregon Dept. of Fish and Wildlife
- US Fish and Wildlife Service
- US Geological Survey
- Oregon Coastal Management Program
- The Nature Conservancy
- Portland State University



**SLAMM Surprise**  
Due to localized tectonic uplift and extensive agricultural diking, the Coquille Estuary is not predicted to be substantially impacted by sea level rise by 2050. However, this could change if dikes are not maintained, if there is a major earthquake and associated subsidence (Oregon is due for one), or if sea level rise rates accelerate.

Sea Level Rise Scenario:	Low	Medium	High
Level of Protection:	2030	2050	2100
Projected Year:	0.20m	0.40m	1.47m
Local Projected SLR (High):			

Change Category	Acres
Inland Fresh Marsh to Regularly Flooded Marsh	139
Inland Fresh Marsh to Tidal Flat	16
Inland Fresh Marsh to Transitional Salt Marsh	70
Inland Open Water to Estuarine Water	11
Regularly Flooded Marsh to Regularly Flooded Marsh	23
Ocean Beach to Open Ocean	678
Riverine Tidal to Estuarine Water	49
Swamp to Regularly Flooded Marsh	85
Swamp to Tidal Flat	13
Swamp to Transitional Salt Marsh	32
Undeveloped Dryland to Inland Fresh Marsh	100
Undeveloped Dryland to Ocean Beach	11
Undeveloped Dryland to Open Ocean	25
Undeveloped Dryland to Regularly Flooded Marsh	21
Undeveloped Dryland to Tidal Flat	13
Undeveloped Dryland to Transitional Salt Marsh	19



## Lessons Learned

- All of the Coquille Estuary habitats and species considered were judged by experts to be at least moderately vulnerable to climate change, which suggests that climate change has the potential to affect the estuary
- Changes in the Coquille since the mid-19<sup>th</sup> century have already had significant effects on species and habitats
- In order to for these results be properly implemented, vulnerability assessments are needed for socio-economic assets and functions
- Future projects need to ensure there are sufficient resources to keep up project momentum and to provide enough time for the expert panel to do their reviews
- We spent a lot of time and resources compiling a summary of climate change information for the Coquille; that kind of information is now more readily available through online resources, etc.
- There are several sources of uncertainty in trying to assess the effects of climate change on habitats and species, but there is still sufficient certainty to support the integration of climate change into management policies and decisions

Learn more at our project website: <http://ecoadapt.org/programs/awareness-to-action/Lower-Coquille-Vulnerability-Project>