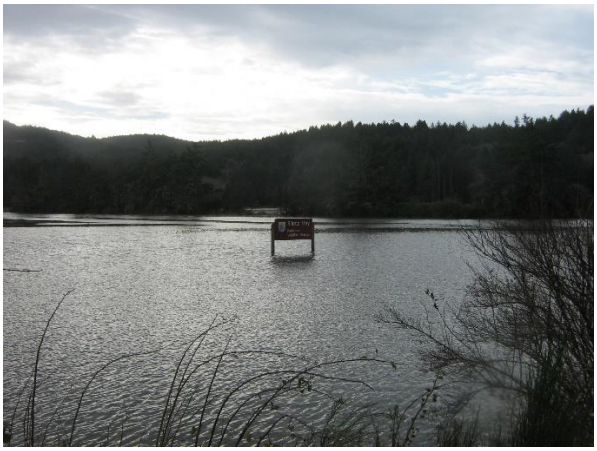
Project Summary

Modeling sea level rise impacts to Oregon's tidal wetlands: Maps and prioritization tools to help plan for habitat conservation into the future



Photos by Cinamon Moffett, 2011

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PROJECT APPROACH AND PRODUCT LINKS

Background: Tidal wetlands are important habitats for salmon and a diversity of other fish and wildlife species. They also trap sediment, buffer coastal communities from flooding and erosion, and perform other valued ecosystem services. Tidal wetlands currently exist just at and above sea level, and healthy tidal wetlands are able to adapt to gradual sea level changes. But if sea level rises too fast, tidal wetland plant communities may not be able to persist at their current locations. To survive, these plants may have to move to areas of higher elevation. These higher areas are called "landward migration zones" ("LMZs"); they are potential future tidal wetlands under sea level rise ("SLR"). This project modeled and prioritized these LMZs. It was sponsored and supported by the MidCoast Watersheds Council (MCWC) and the Pacific States Marine Fisheries Commission and funded by the Oregon Watershed Enhancement Board and the U.S. Fish and Wildlife Service's Coastal Program.

Geographic scope: This project mapped potential future tidal wetlands (LMZs) for 23 estuaries on Oregon's coast south of the Columbia River. From north to south these are: Necanicum River, Nehalem River, Tillamook Bay, Netarts Bay, Sand Lake, Nestucca Bay, Salmon River, Siletz Bay, Yaquina Bay, Beaver Creek, Alsea Bay, Yachats River, Siuslaw River, Umpqua River, Coos Bay, Coquille River, New River Area, Sixes River, Elk River, Rogue River, Pistol River, Chetco River, and Winchuck River.

Modeling approach: This project used an elevation-based method (modified bathtub method) to map current and future tidal wetlands. Elevation was obtained from LIDAR; projected SLR was obtained from recent, authoritative, and region-specific scientific literature. LMZs were modeled for six SLR scenarios that could be expected between now and the year 2160, but this study did not assume any specific timeframe for the scenarios modeled. Both lower and upper boundaries for LMZs were mapped, to allow determination of areas that would be lost due to conversion to mudflat under each SLR scenario.

Wetland types mapped: This project mapped potential future tidal wetlands in three vegetation classes: marsh, shrub and forested. We did not attempt to map the specific locations of each vegetation class, because the necessary data (particularly salinity data) are not yet available. The study did not map seagrass beds, because their distribution is controlled not just by elevation, but also by other factors like water clarity and substrate type. However, the mapping does show areas that transition from vegetated tidal wetland to mudflat with rising sea level.

Diked and developed areas: The mapped LMZs are at appropriate elevations to support vegetated tidal wetlands, but may currently lack a connection to tidal waters (e.g. they might be behind a dike or tide gate). Mapping these areas helped identify lands vulnerable to SLR. The LMZ mapping did not exclude developed areas such as roads, parking lots, urban, industrial, or residential areas. Developed areas within LMZs may be at risk for inundation under SLR, but they are not likely to be suitable as future tidal wetlands. We accounted for developed areas by separately summarizing the area of LMZs on impervious versus non-impervious surfaces.

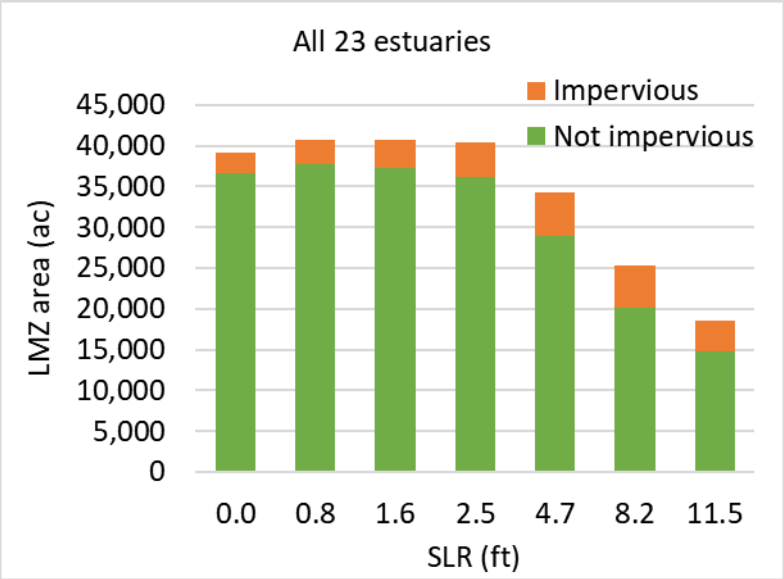
Sediment accretion: Although this study did not account for rates of sediment accretion, results were compared to models that do account for sediment accretion. Accretion is an important factor; however data on variability in accretion rates on the Oregon coast are lacking. Local groups may wish to incorporate local accretion data when interpreting study results.

Product links:
- Project report: https://ir.library.oregonstate.edu/concern/technical_reports/tt44ps38k
- Geospatial data for potential future tidal wetlands (LMZs) for all SLR scenarios modeled: https://ir.library.oregonstate.edu/concern/datasets/zw12zb20h (scroll to bottom of page for all datasets)
- PDF maps of LMZs and tidal wetland losses for the 4.7 ft SLR scenario for each estuary, PDF prioritization map for each estuary, and slideshow explaining the project: http://www.midcoastwatersheds.org/landward-migration-zones

SUMMARY OF RESULTS

General pattern across all 23 estuaries

Summed across all estuaries studied, projected LMZ area (potential tidal wetland area) rises slightly during the three lowest SLR scenarios (0.8 to 2.5 ft) as tidal inundation spreads onto slightly higher land surfaces (see figure below). Starting at the 4.7 ft SLR scenario, LMZ area declines sharply, with 21% loss at 4.7 ft, 45% loss at 8.2 ft, and 60% loss at 11.5 ft.



Change in LMZ area by SLR scenario

Patterns in the 13 largest estuaries

Projected losses are greater for the larger estuaries. The table below shows the change in LMZ area, summed across the 13 largest estuaries (baseline LMZ >100 ha), by SLR scenario (non-impervious surfaces only):

	SLR scenario (ft)						
	0.0	0.8	1.6	2.5	4.7	8.2	11.5
Area (ac)	35,968	36,530	35,449	33,612	24,455	14,949	11,398
% change	0%	2%	-1%	-7%	-32%	-58%	-68%

An unsurprising, yet important result is that future tidal wetlands will not be in the same locations as current tidal wetlands:

- At 4.7 ft SLR, of the 34,229 acres of potential future tidal wetlands, only 11,362 acres (33%) are in the same locations as their current equivalents.
- At 8.2 ft SLR and 11.5 ft SLR, there is ***no overlap*** with current wetlands.

For full results, see the products linked on page 2 of this summary.

For an example map, see page 4 of this summary.

EXAMPLE MAP: UMPQUA RIVER ESTUARY

(for maps of all 23 estuaries go to http://www.midcoastwatersheds.org/landward-migration-zones)