Tidal Barrier Correction in WA, OR and CA: Identifying Best Practices and Design Standards for Tidal Restoration

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River Restoration Northwest | 17th Annual Stream Restoration Symposium | February 7, 2018

Tidal Can Be Tricky

ANADROMOUS SALMONID
PASSAGE FACILITY DESIGN

7.6.2 Specific Criteria and C
7.7 Miscellaneous Culverts/Road
7.7.1 Specific Criteria and C
8. TIDE GATES (WORK IN PROC
9. COLUMBIA AND SNAKE RIVI
9.1 Introduction.....
9.2 Mainstem Upstream Passage

3.3 Culvert Conditions that Make
There are a number of site conditions that
B assessments, or require a more sophistica
of. These conditions are addressed below.
culverts.

Culverts in Tidal Areas
Currently there is no barrier assessment pro
variable conditions of tidally influenced cul
are not applicable. At this time WDFW su
photos taken of the culvert outlet at both lo
WDFW.

Fish Passage Barrier and Surface Water Diversion Screening Assessment and Prioritization Manual

WASH

2013

ign Guidelines

sh and Wildlife

Water Crossing Design Guidelines

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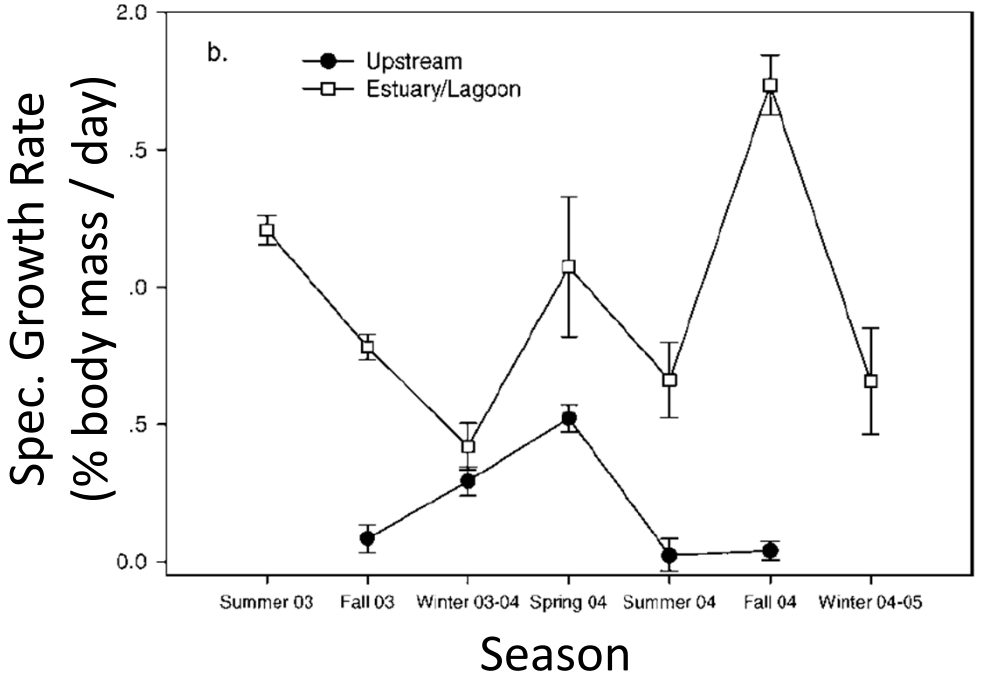
discernable
Appendix D. For

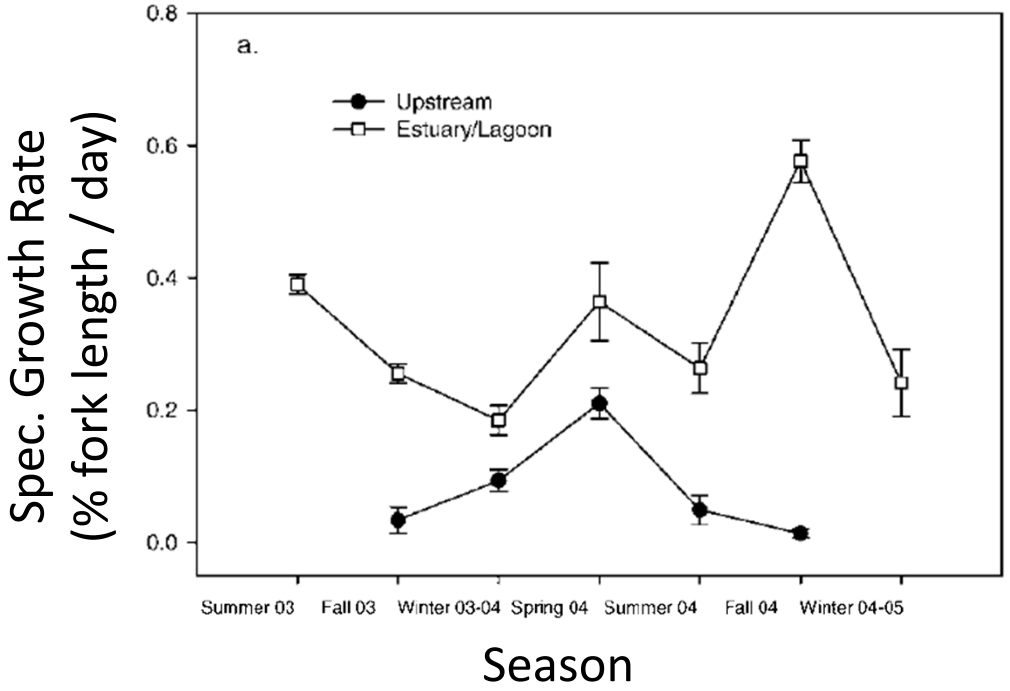
Estuaries – Not Just Highway Rest Stops Any More

Past…

… and Present

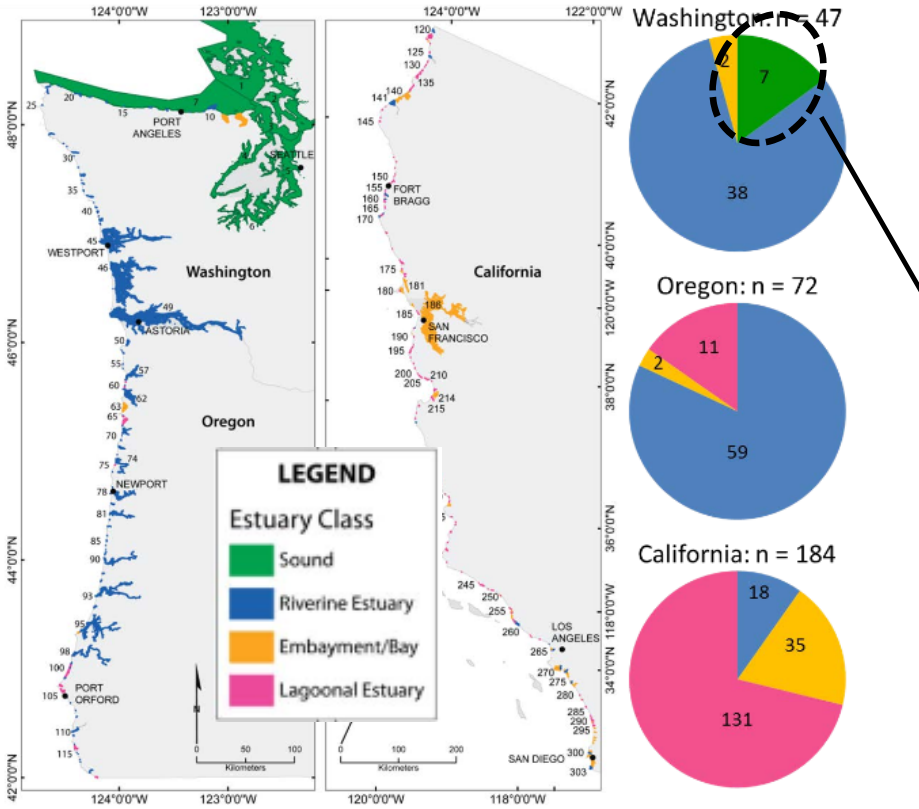
Scott Creek – Steelhead Growth Rates

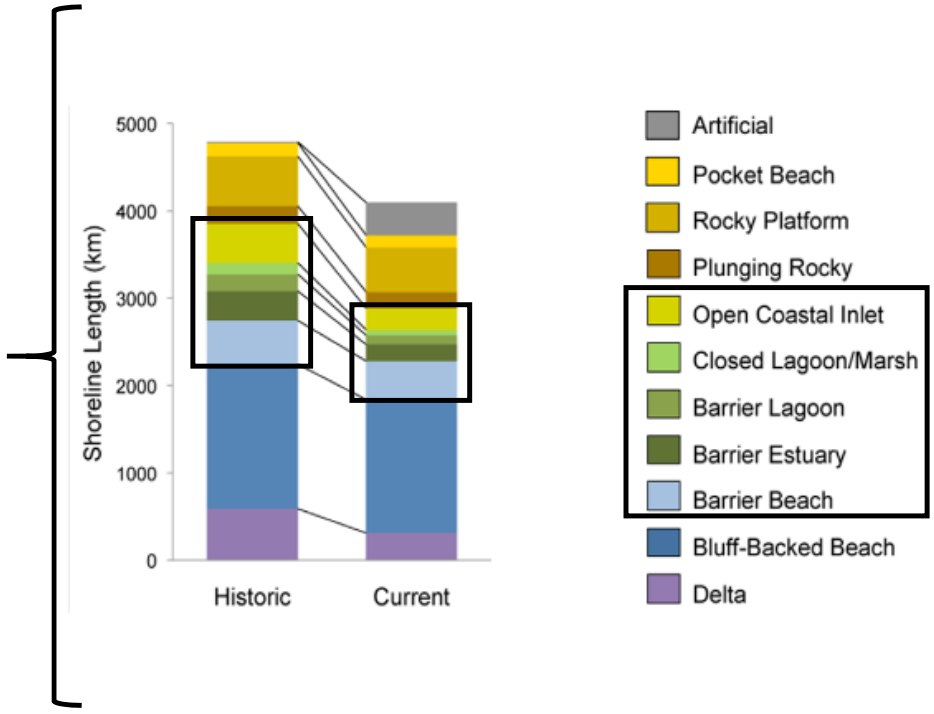




Hayes et al. (2008)

West Coast Distribution of Coastal Inlets & Lagoons

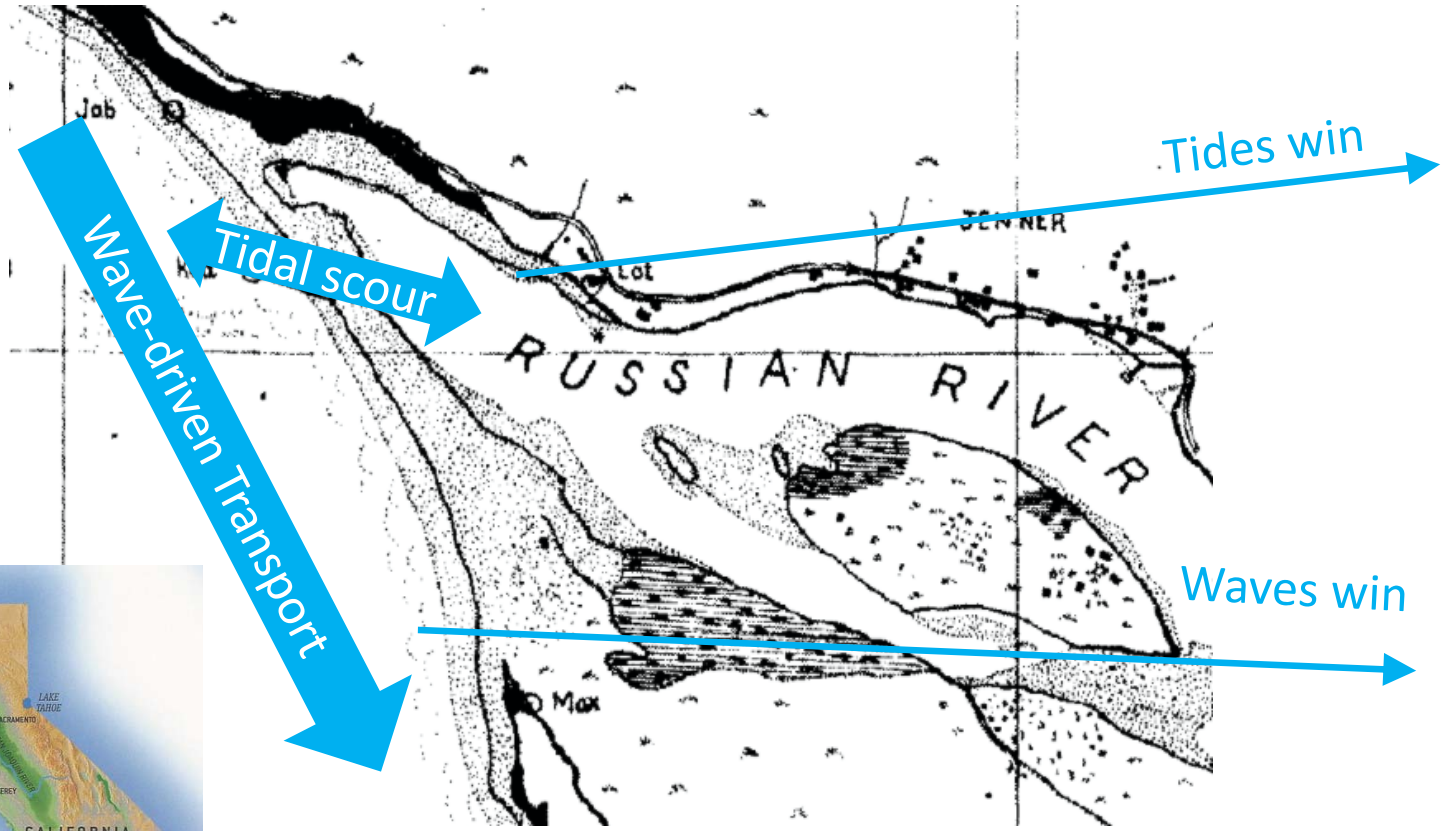




Heady et al. (2014)

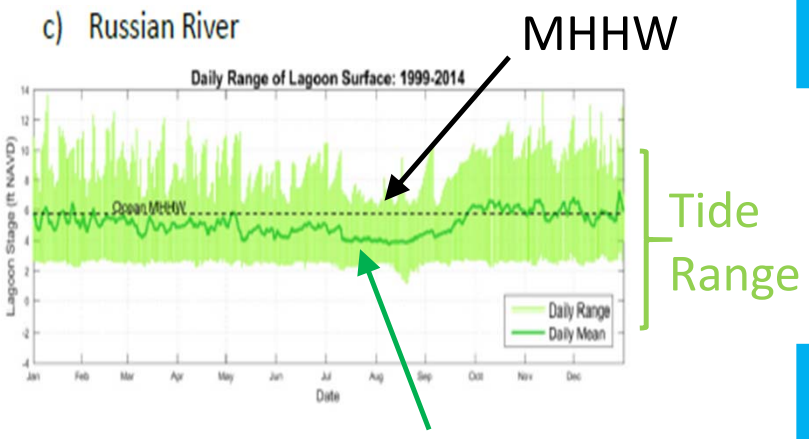
PSNERP (2011)

Tidal Inlets – Tidal Scour v. Wave-Driven Transport



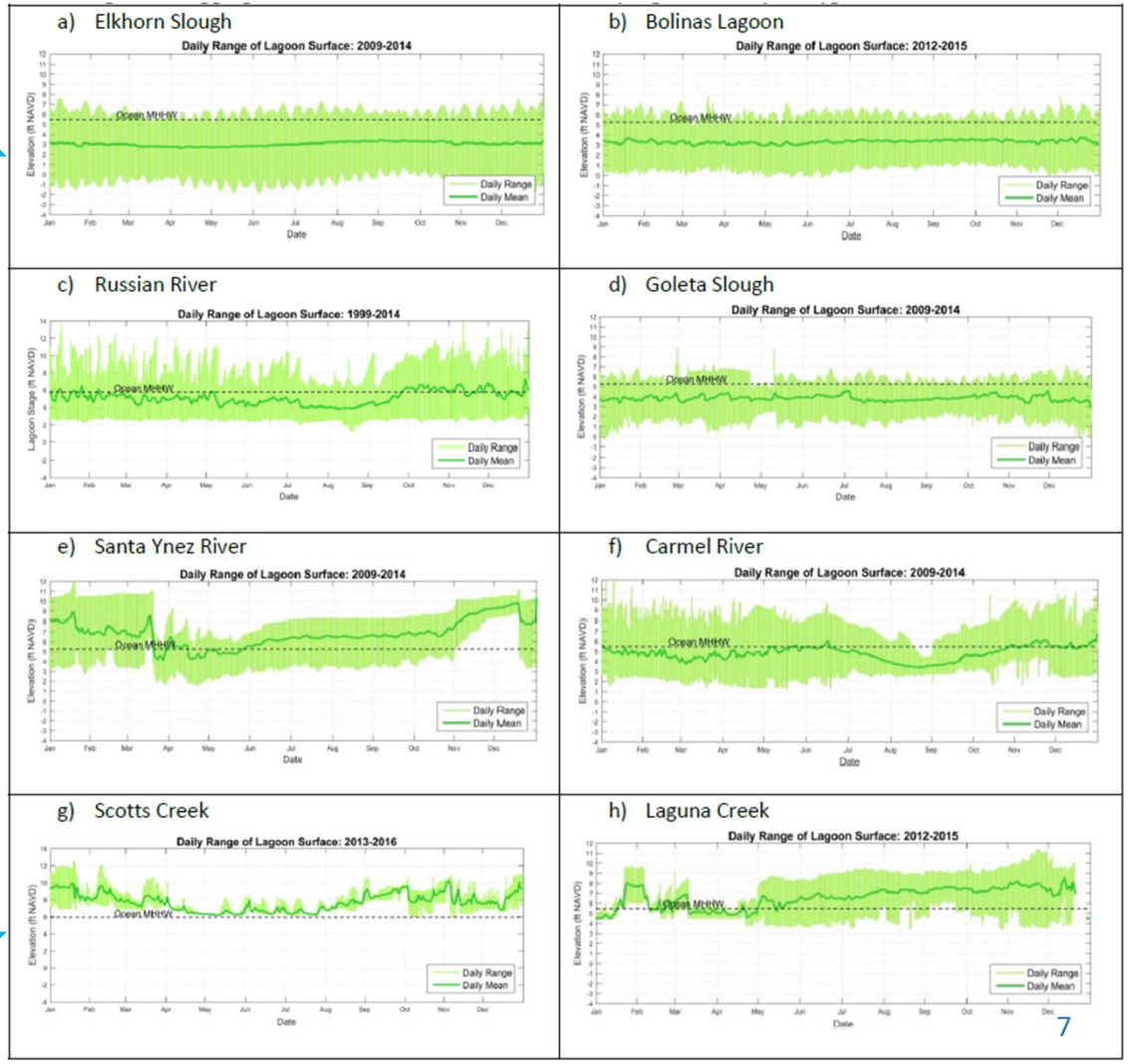
NGS (1930)

A Range of Inlet States & Water Levels

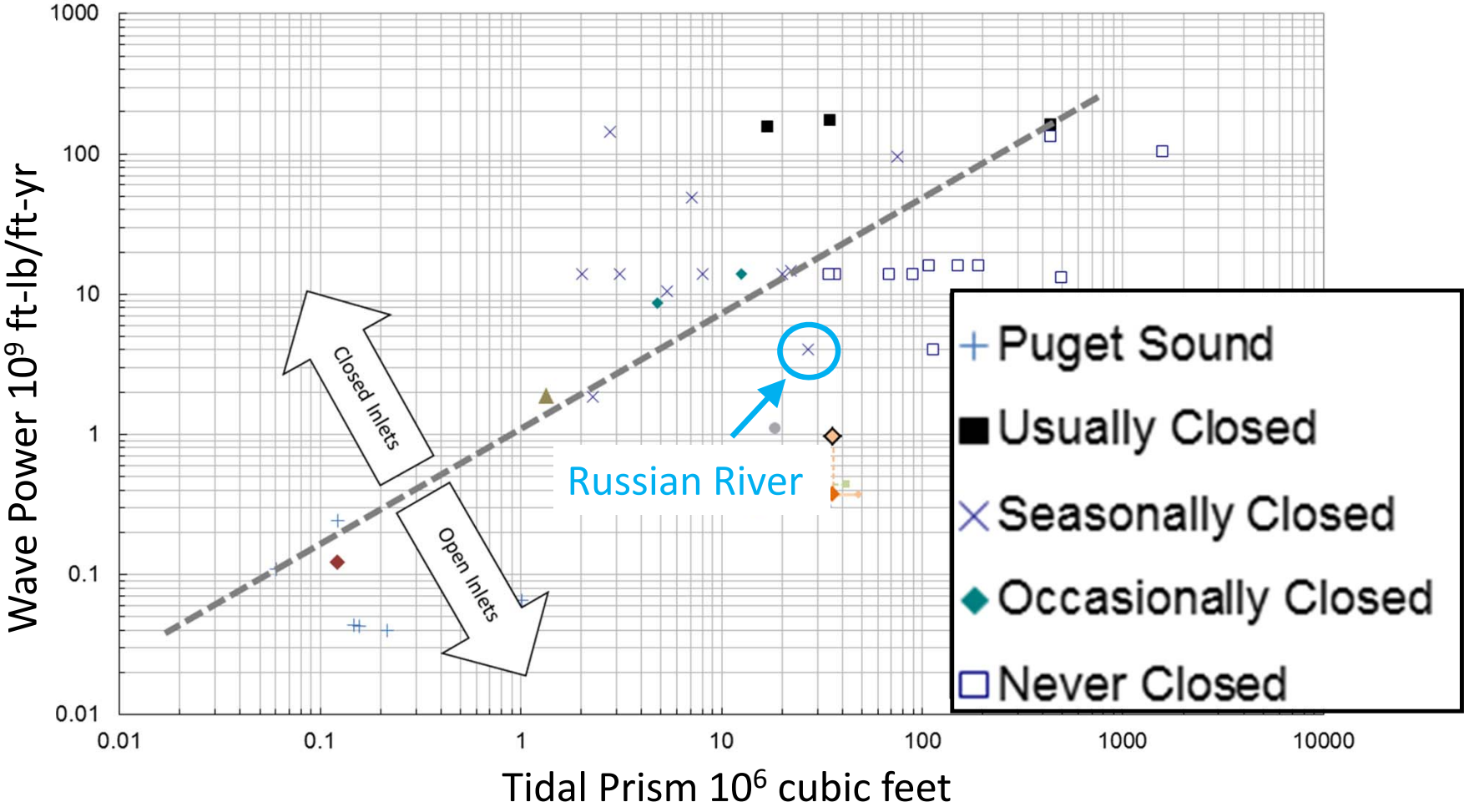


More Open

More Closed



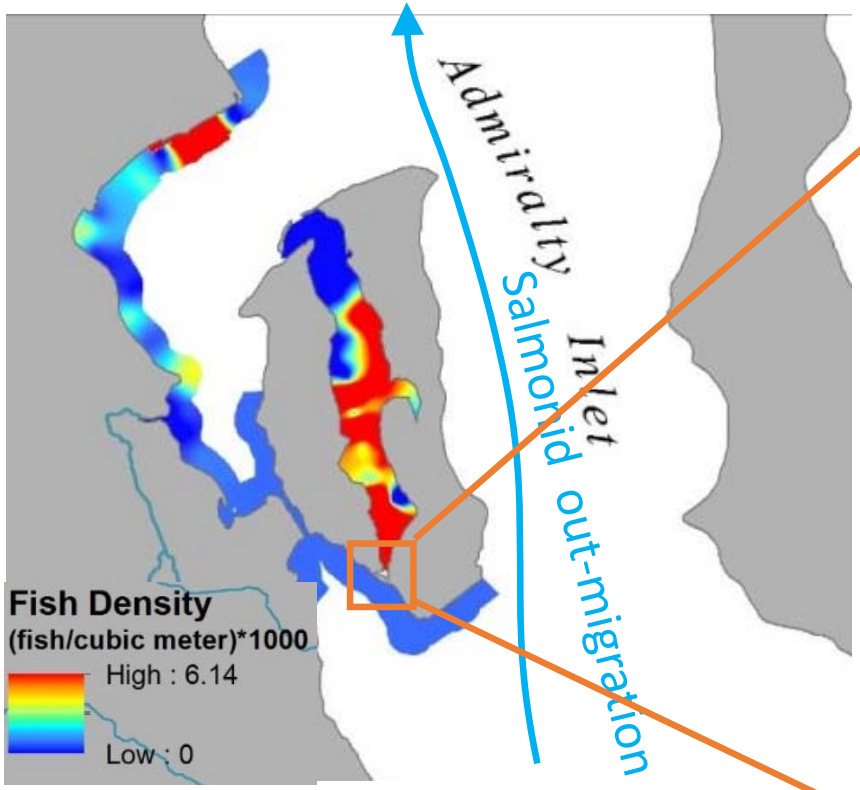
Wave Power vs Tidal Prism



Johnson (1973), ESA (2015)

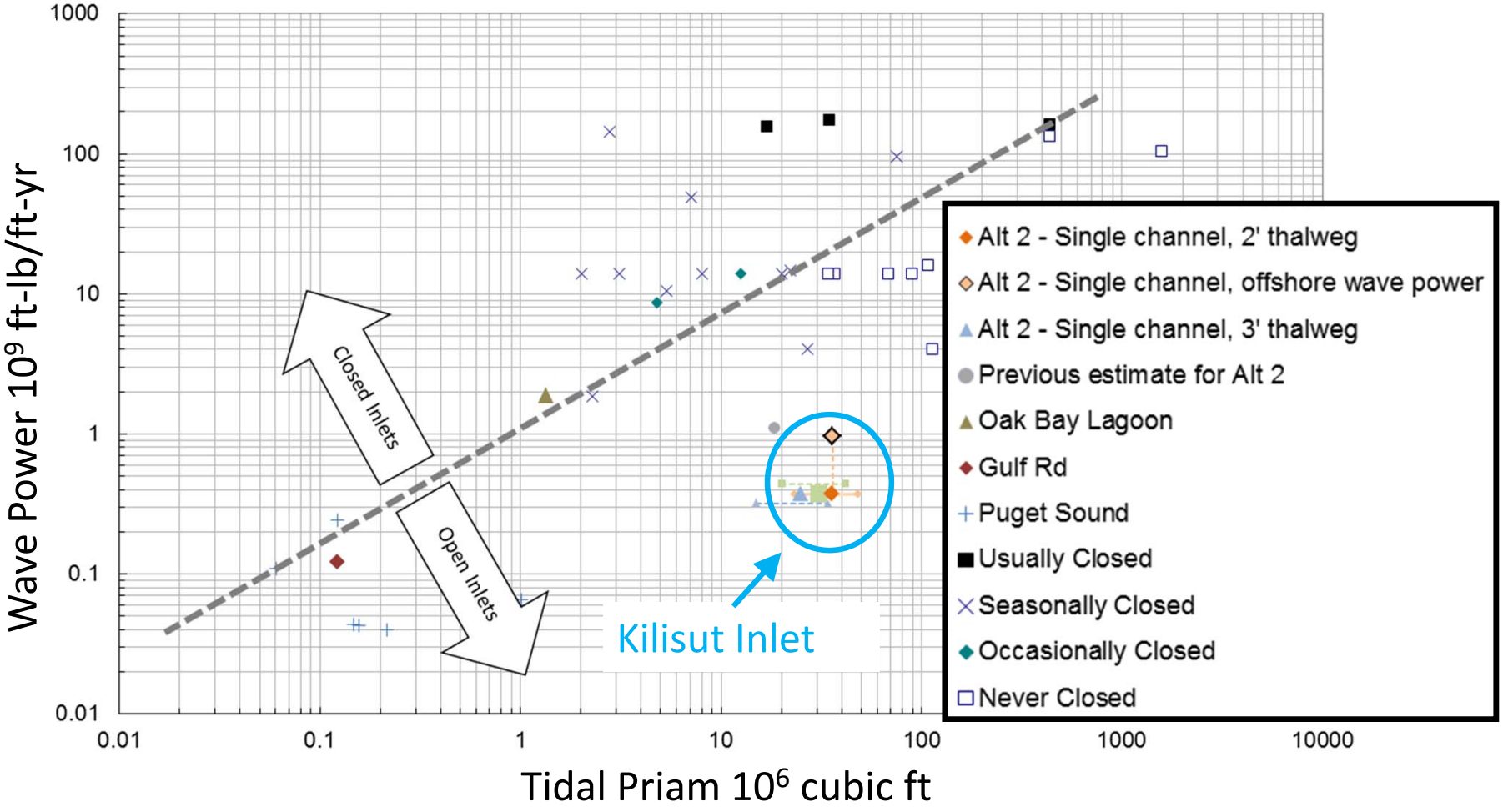
Russian River Management Challenges

Kilisut Harbor Fish Habitat



Daubenberger et al. (2017)

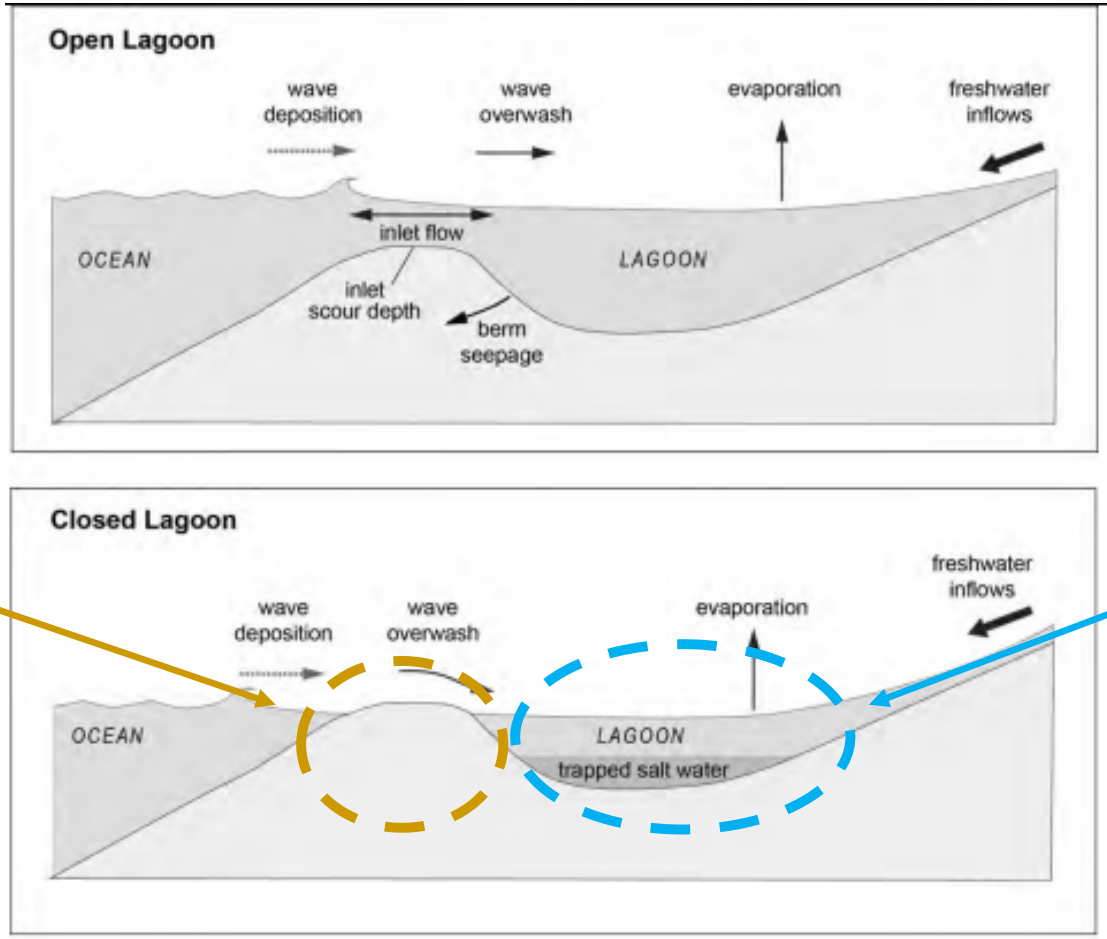
Wave Power vs Tidal Prism



Johnson (1973), ESA (2015)

Additional Puget Sound Restoration Sites Affected by Inlets

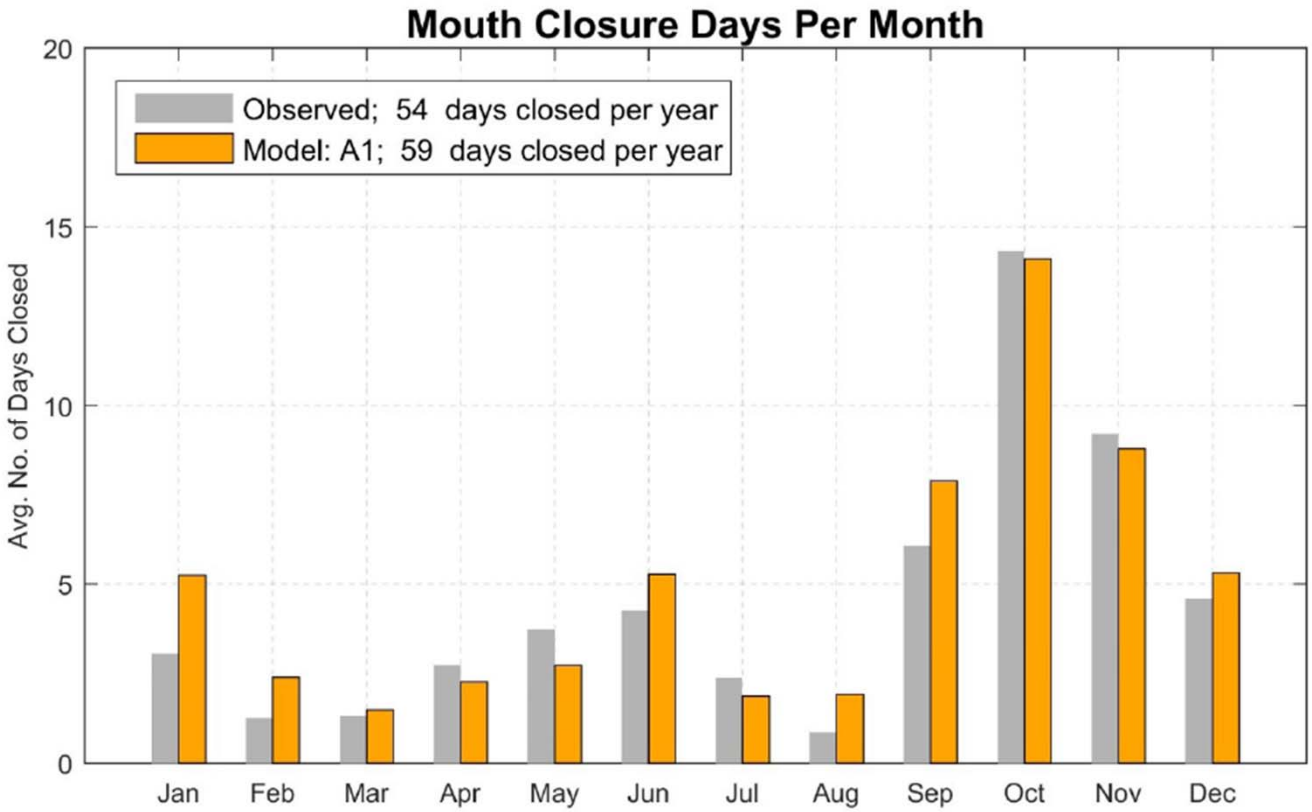
Inlet morphology and lagoon water levels: a quantified conceptual model (QCM)



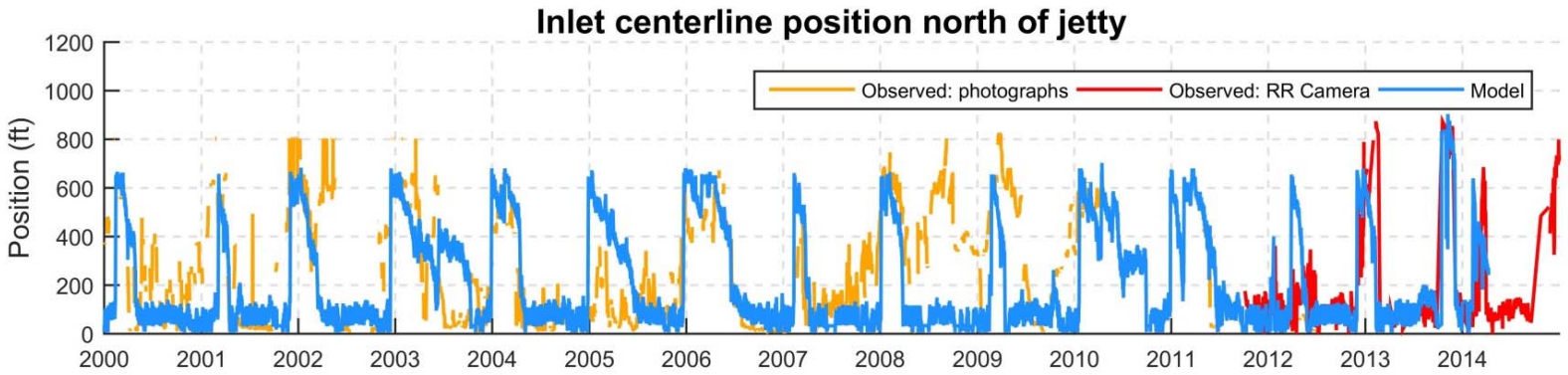
Inlet sand balance

Water balance

Lagoon Model Predictive Skill: Russian River



Lagoon Model Predictive Skill: Russian River

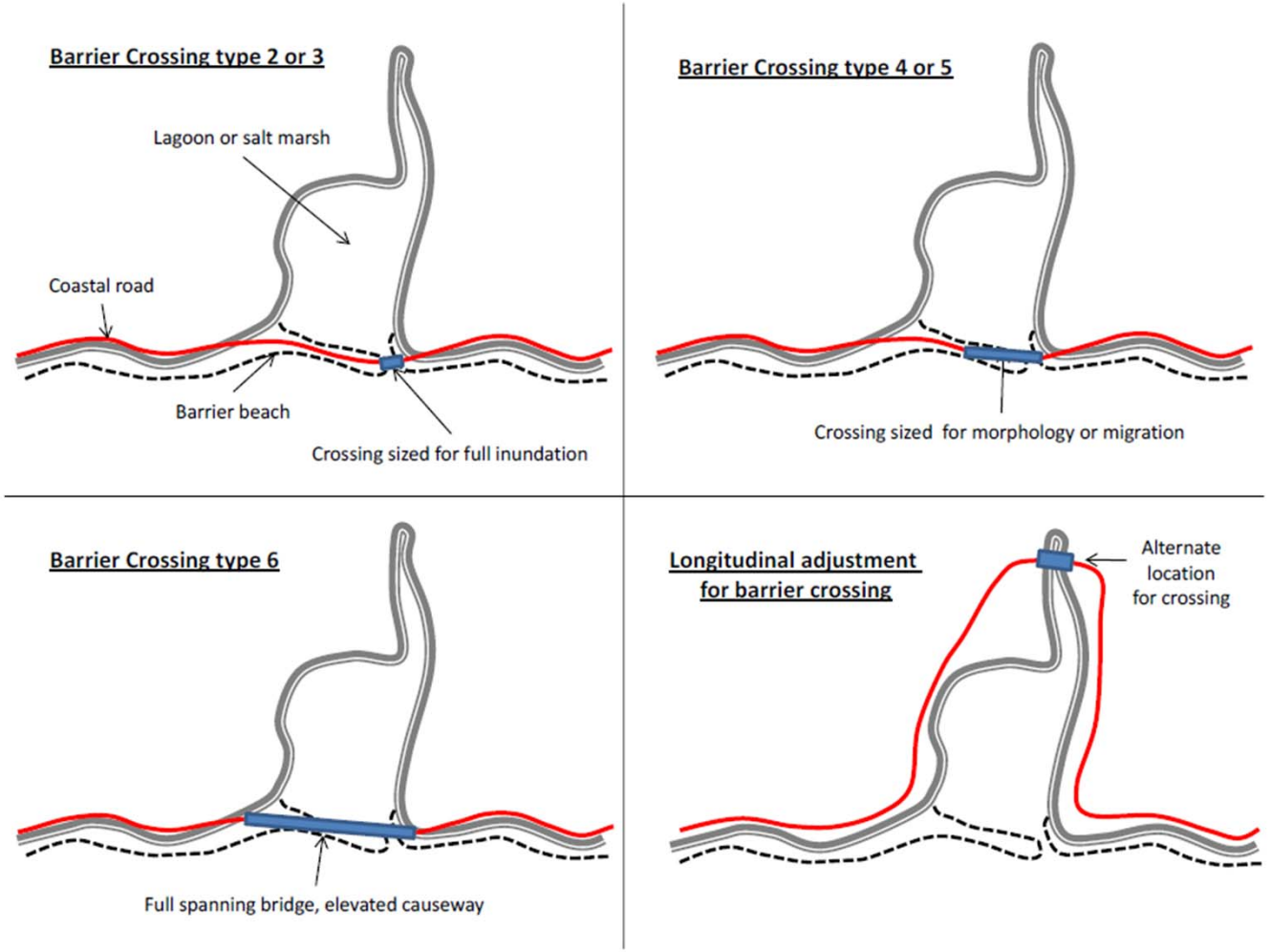


Deveraux Slough Restoration Design

Pre-restoration

Post-restoration

Alternatives for Barrier Beach Estuary Crossings



WDFW (2013)
Appendix D

Hierarchy of Benefits

Assessment process

- Level 1 - a qualitative assessment of tidal effects
- Level 2 - a more sophisticated engineering approach
- Level 3 - quantitative assessment with computer modeling

		0 Existing culverts	A 76 ft bridge	B 535 ft bridge	C 760 ft bridge	D Full restoration
Tidal inundation	WA Harbor tidal prism	0	0.9	1	1	1
	Internal tidal range					
	Exchange rate					
Habitat connectivity		0	0.5	0.7	0.9	1
Transport of sediment		0	0.2	0.8	0.9	1
Transport of wood		0	0.2	0.8	0.9	1
	Sum of ecological benefits	0	1.8	3.3	3.7	4.0
	Relative sum of benefits	0%	45%	83%	93%	100%

Lessons Learned & Best Practices

- In tidal areas, generalizing guidance can be challenging.
- Estuary shorelines and wetlands can also be influenced by waves.
- A geomorphic approach establishes framework for management.
- Empiric geomorphic analyses illuminate hydrologic function.
- Empiric tools require data from reference sites.
- Geomorphic interpretation can inform management & restoration.
- Geomorphology x fish data = better management.

Thank You. Questions?