

Improving Wetland Capacity through Integration of Science and Restoration in the Lower Columbia River and Estuary

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Definition

- ▶ Opportunity
- ▶ Capacity – “habitat attributes that promote juvenile salmon production, through conditions that promote foraging, growth, and growth efficiency, and/or decreased mortality.”
- ▶ Realized Function

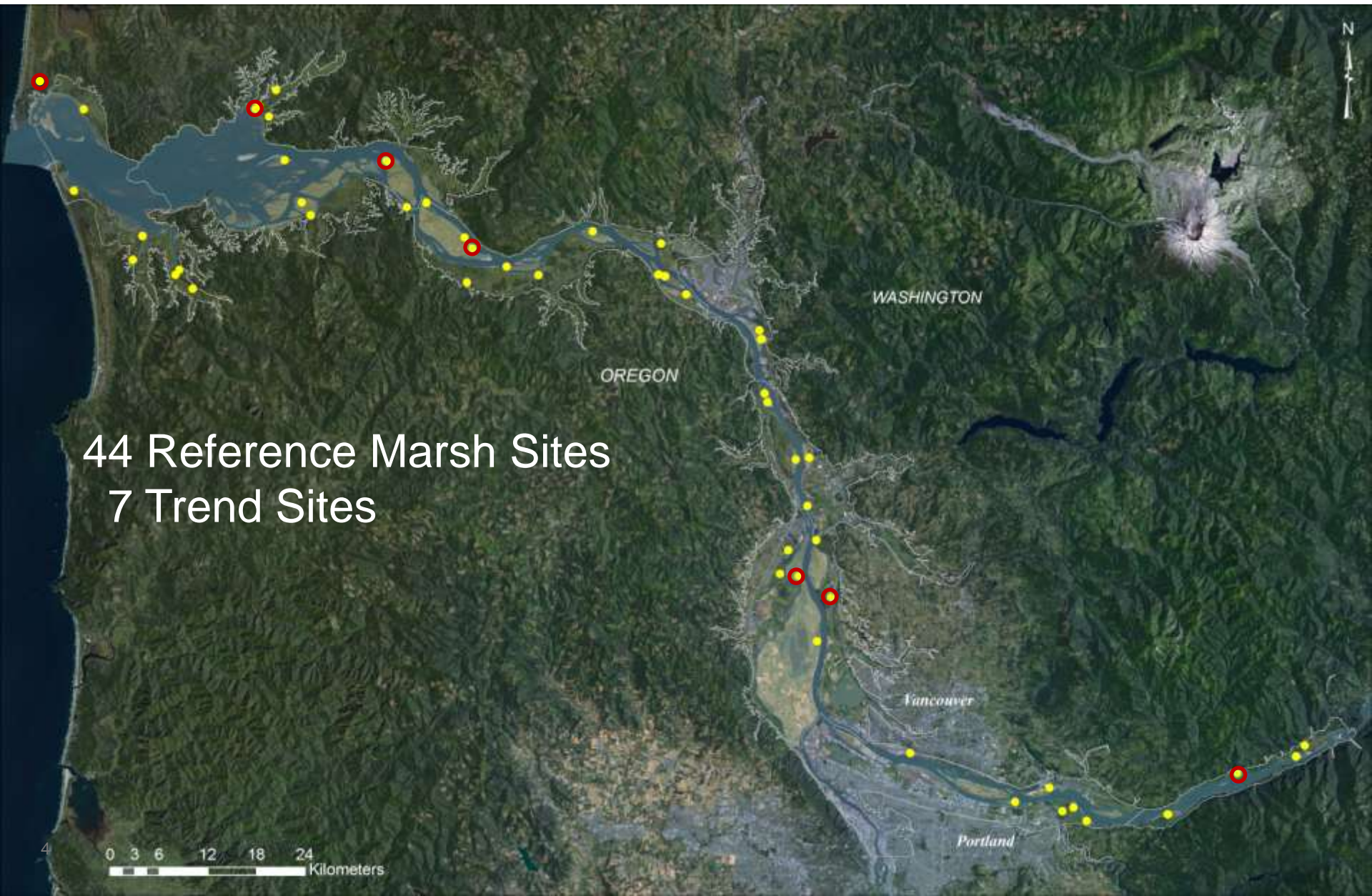
From: Simenstad, CA and Cordell, JR. 2000. Ecological assessment criteria for restoring anadromous salmonid habitat in Pacific Northwest estuaries. *Ecological Engineering*, 15(3), 283-302.

Presentation Overview

- ▶ Study overview
- ▶ Drivers of marsh vegetation composition and distribution
- ▶ Applications of findings
- ▶ Food web study
- ▶ Conclusions



Study Sites



44 Reference Marsh Sites
7 Trend Sites

0 3 6 12 18 24 Kilometers

Metrics

- ▶ Vegetation percent cover surveys
- ▶ Vegetation community mapping
- ▶ Elevation collected with Real Time Kinematic (RTK) GPS, with auto level for areas of high tree cover
- ▶ Referenced to NAVD88
- ▶ Water level sensors were surveyed to evaluate hydrology relative to wetland morphology



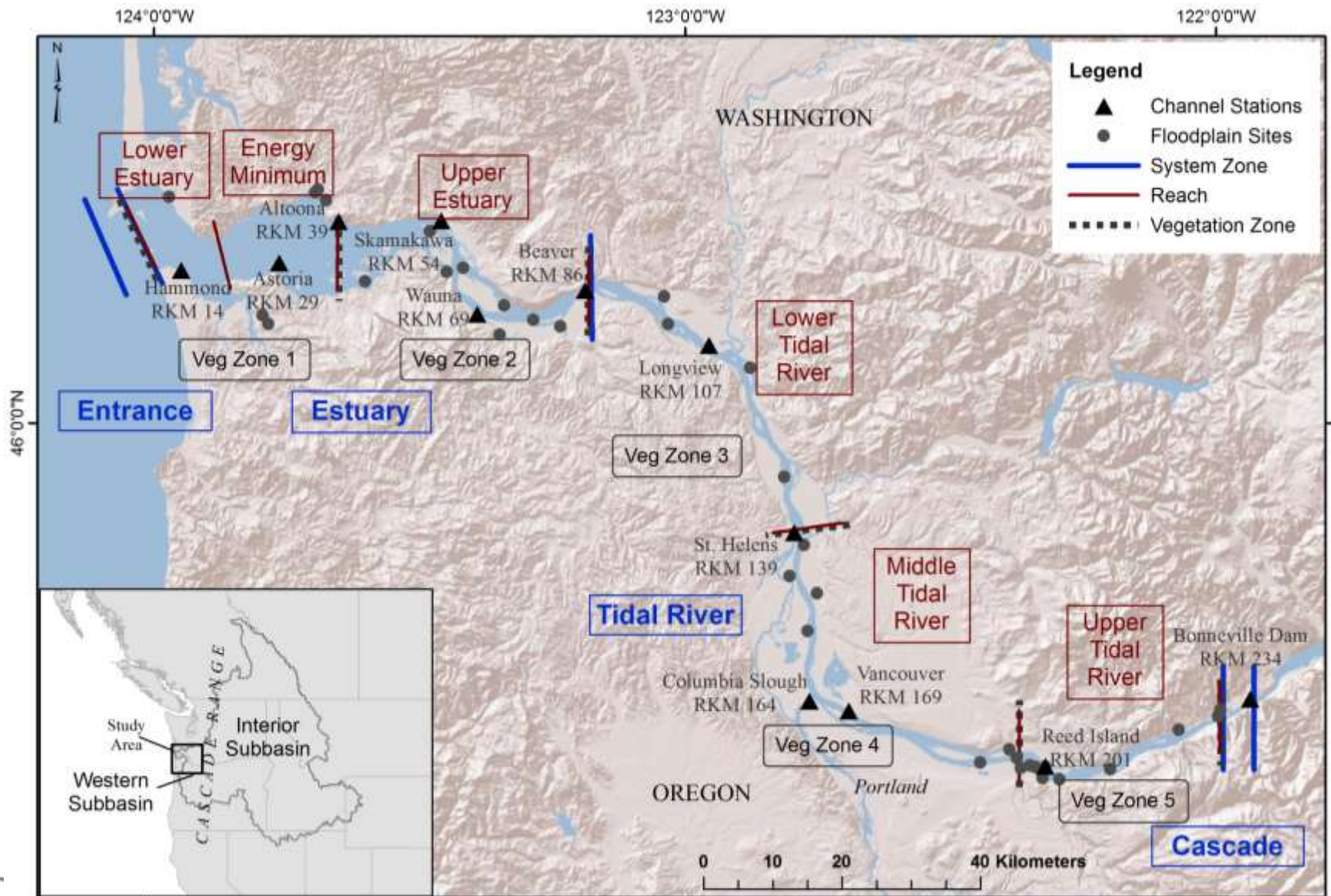
Vegetation

- ▶ 44 marsh sites
- ▶ ~3500 quadrats sampled
- ▶ Reed canary grass occurred in 52% of the quadrats
- ▶ 172 taxa observed
- ▶ 7 taxa made up 68% of the cumulative cover

Common Name	Species Code	Percent Cover	Cumulative Cover
Reed canary-grass	PHAR	28%	28%
Common spikerush	ELPA	21%	49%
Wapato	SALA	10%	59%
Lyngby sedge	CALY	3%	62%
Canada waterweed	ELCA	2%	64%
False loosestrife	LUPA	2%	66%
Slough sedge	CAOB	2%	68%

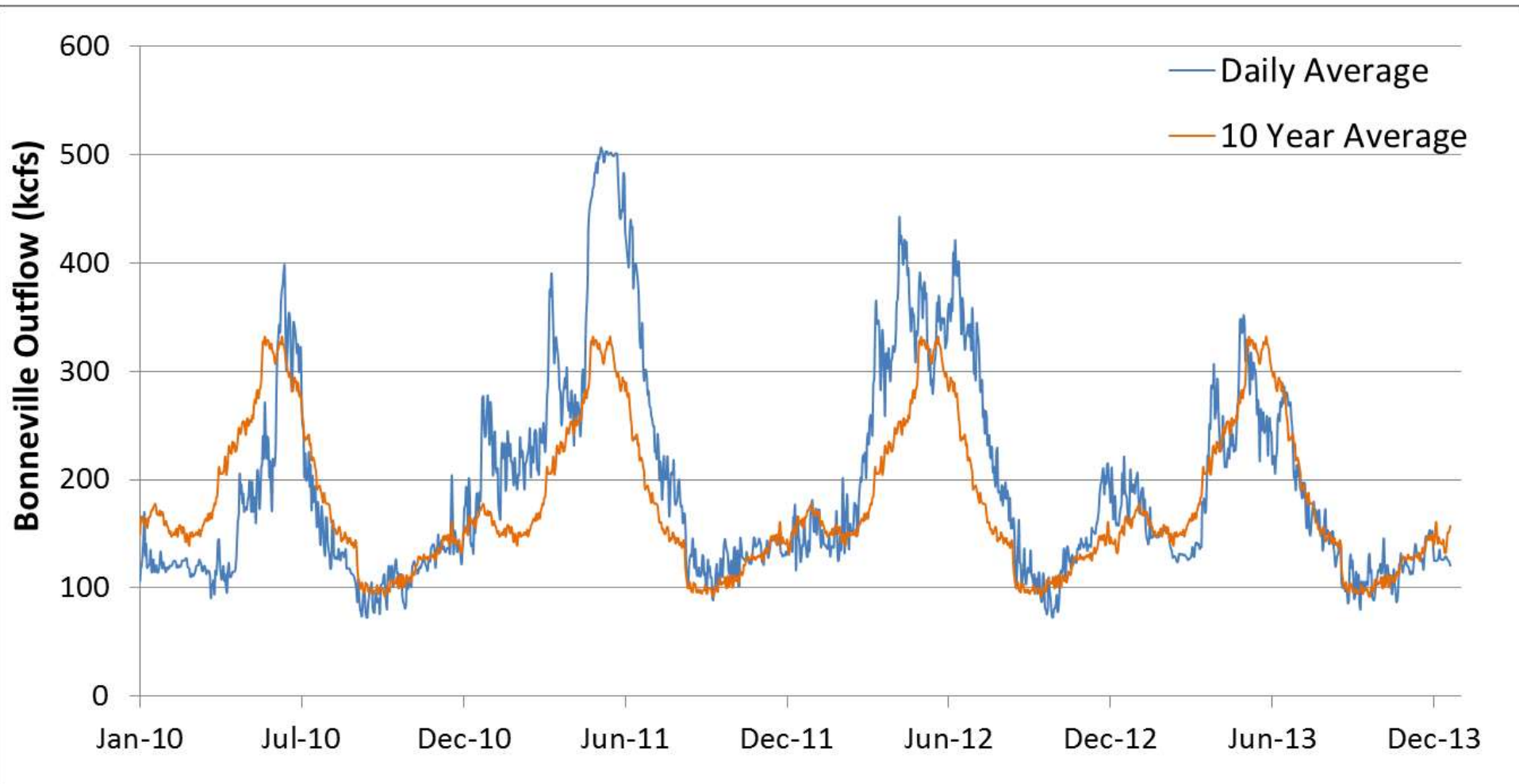


Drivers: Tidal vs. Riverine Zones

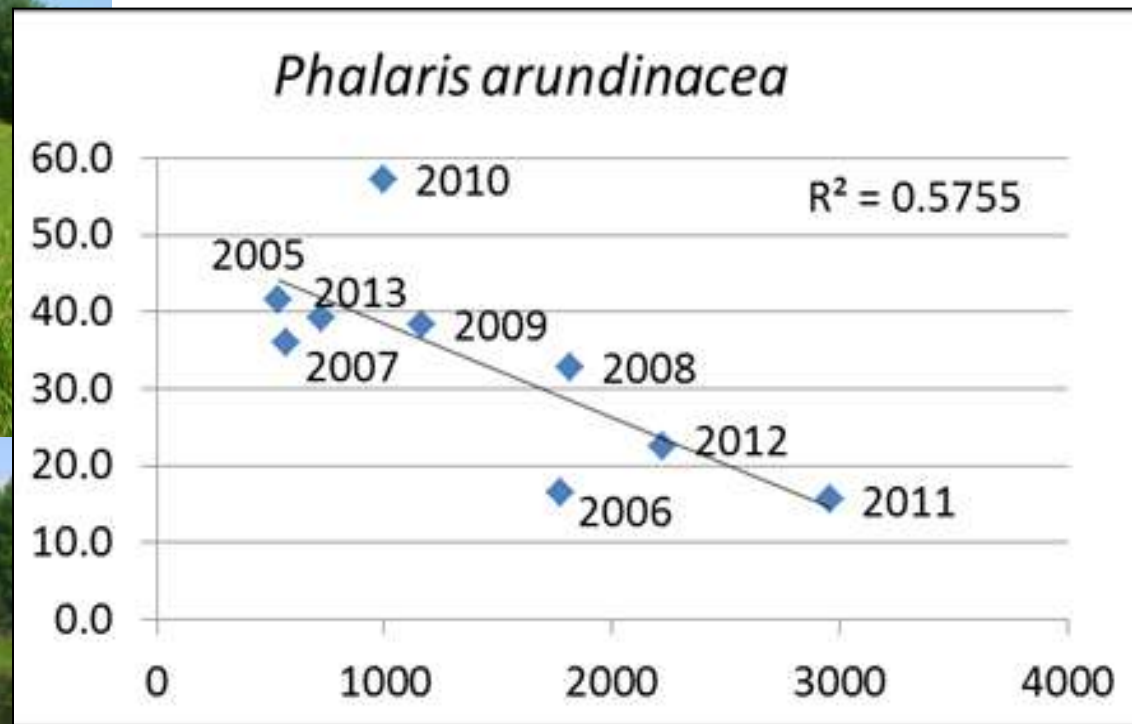


Jay, DA, AB Borde, and HL Diefenderfer. *In Review*. Tidal-Fluvial and Estuarine Processes in the Lower Columbia River II: Water Level Models, Floodplain Wetland Inundation, and Reach Classification. *Estuaries and Coasts*.

Drivers: Seasonal and Interannual Variability

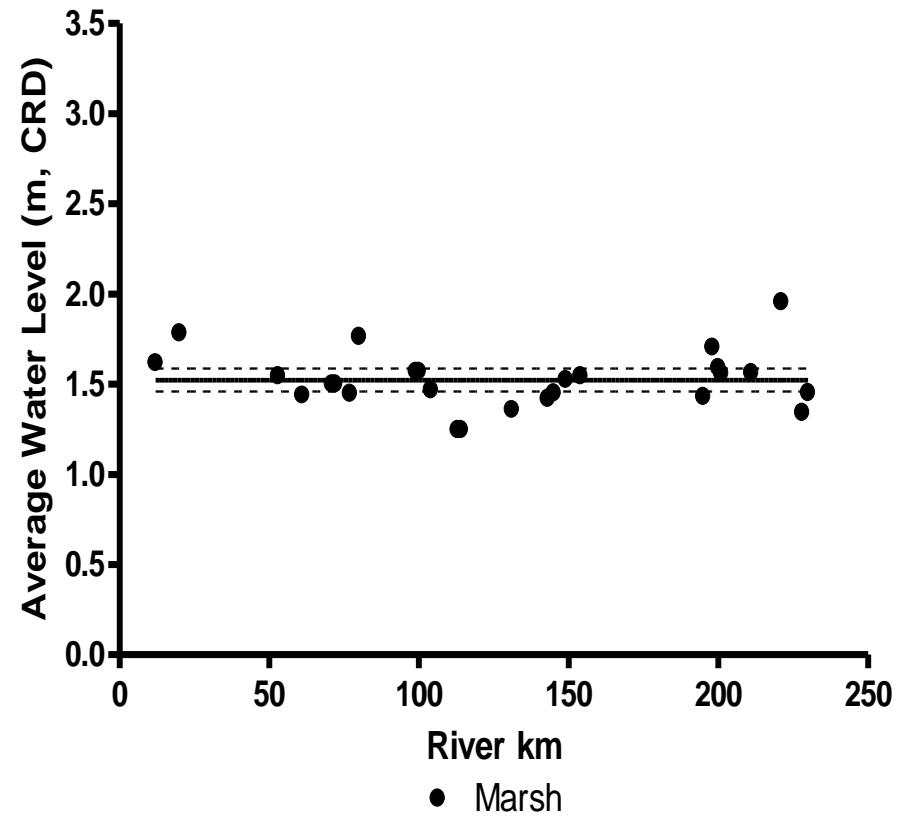
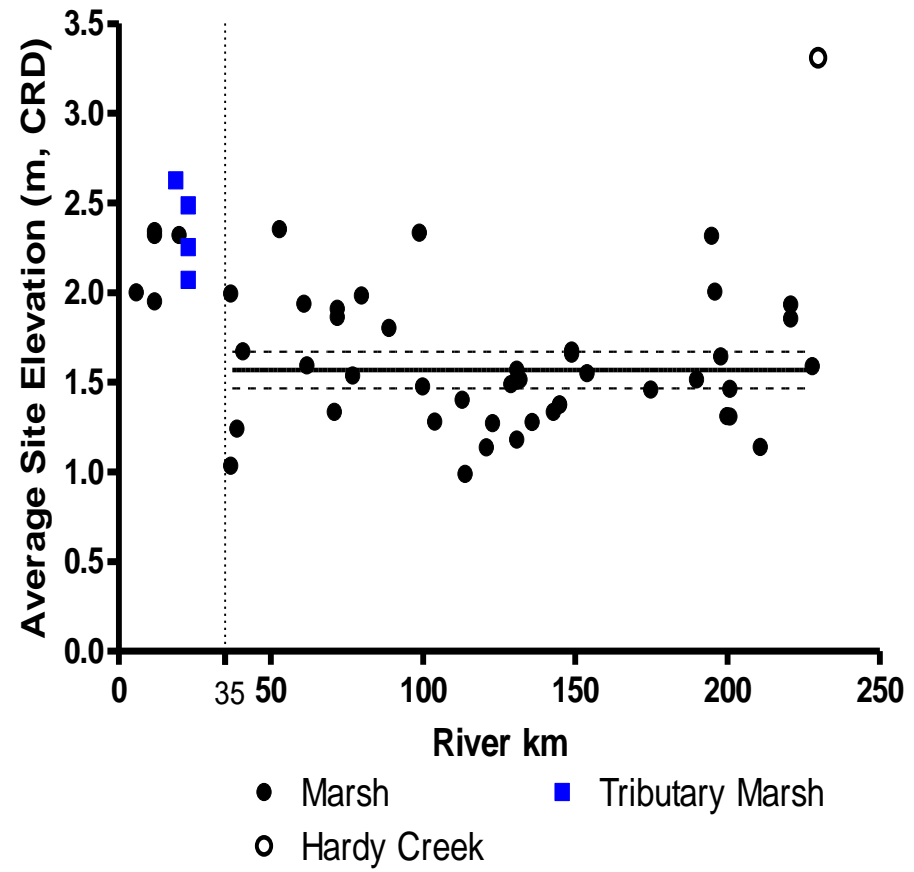


Drivers: Seasonal and Interannual Variability



Inundation (SEV, m water/growing season)

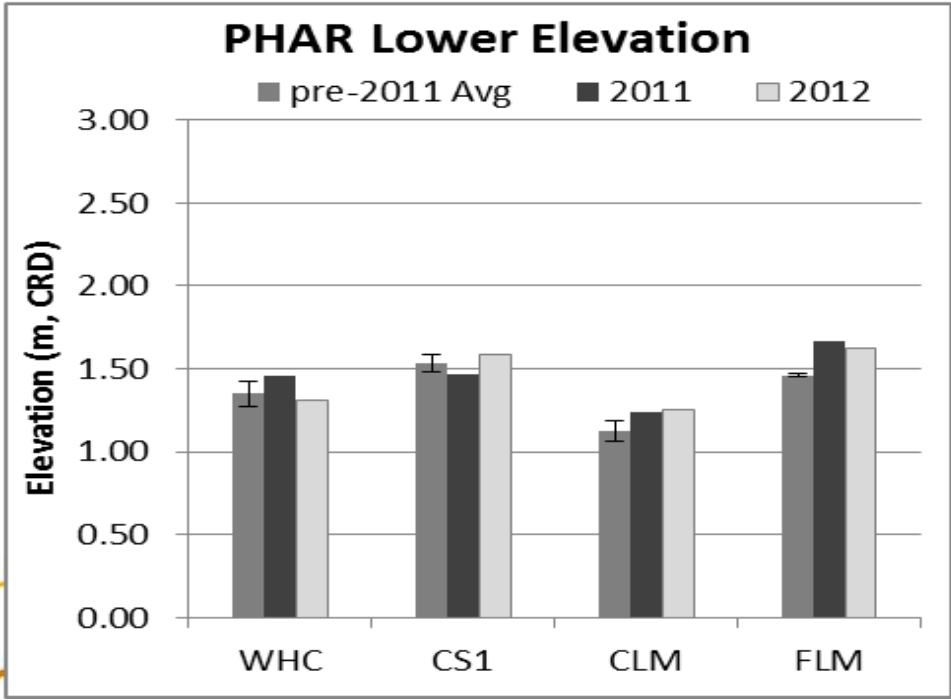
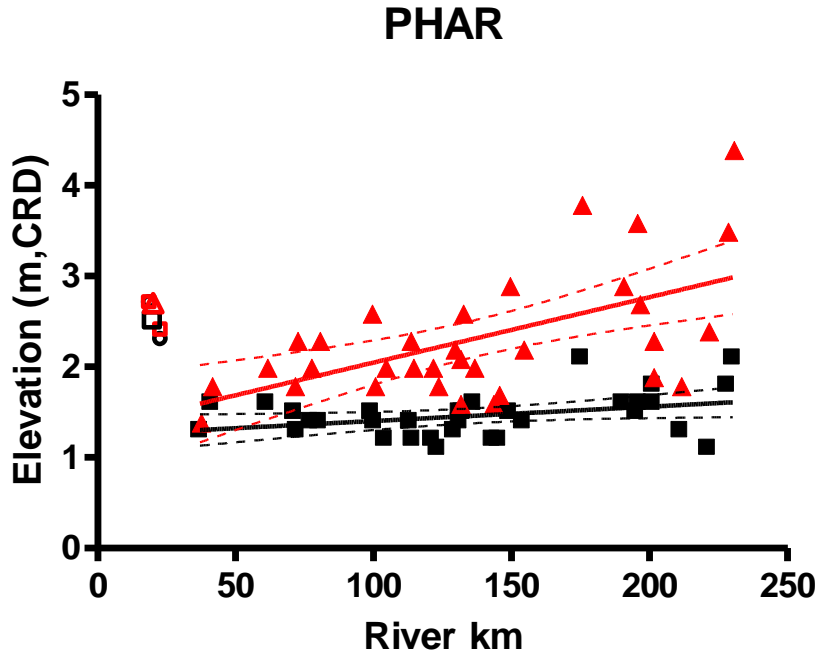
Drivers: Elevation



Drivers: Elevation

Reed Canary Grass

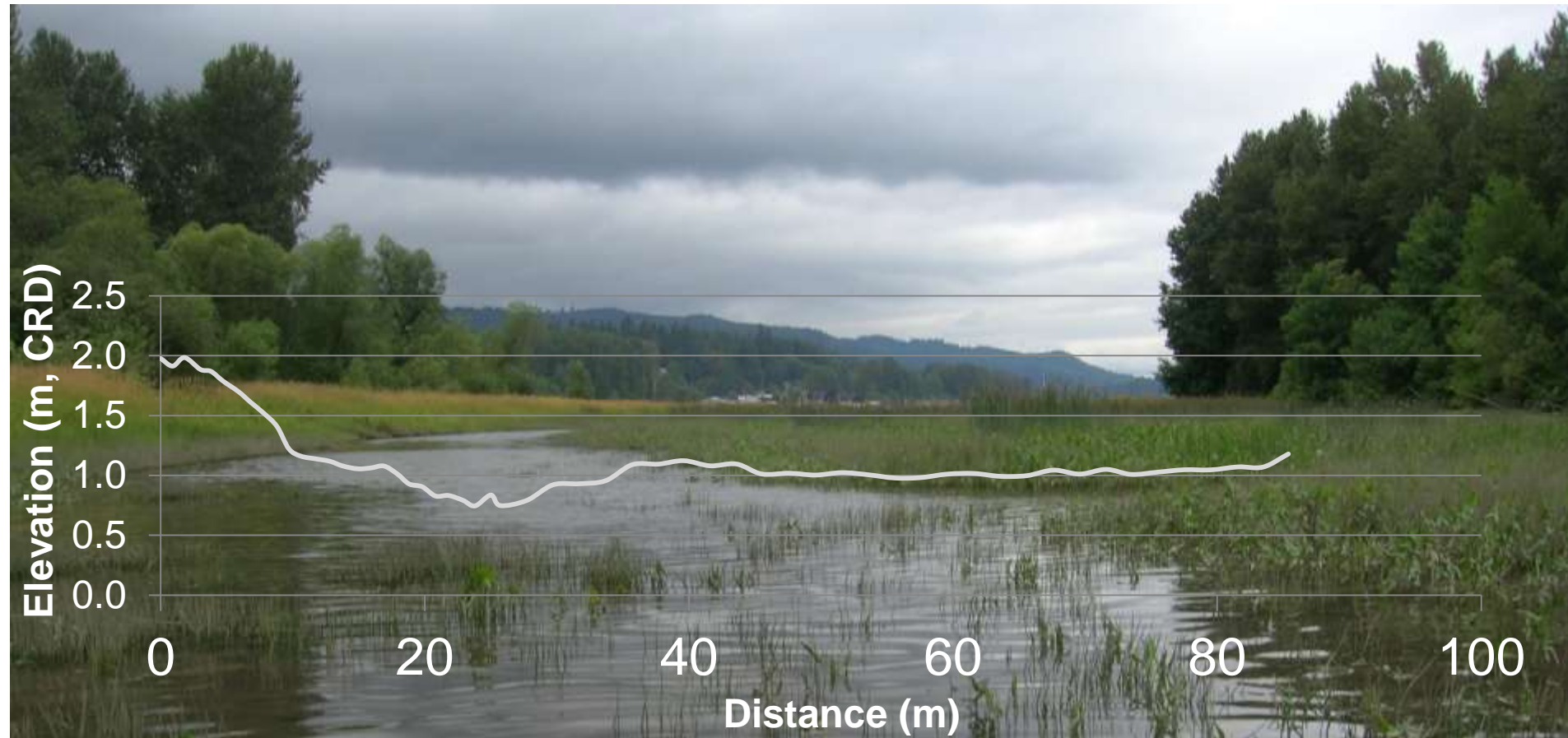
- Invasive, non-native
- Dominant Species in LCR
- Accounts for 28% of cover



Drivers: Elevation

Sandy Island – Rkm 121

Very little reed canary grass



Drivers: Elevation

Reed Island – Rkm 202

Very little reed canary grass

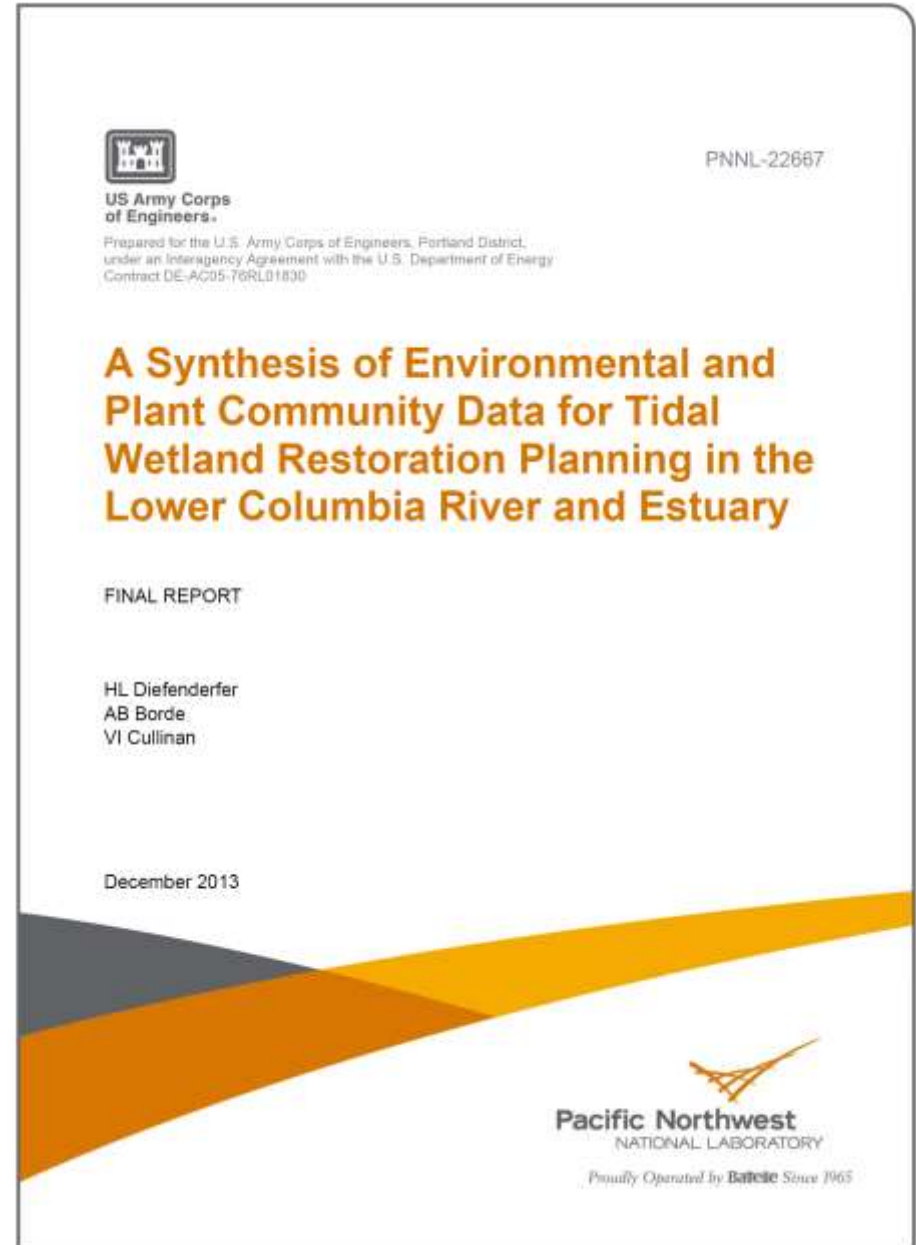


1.5 m, CRD

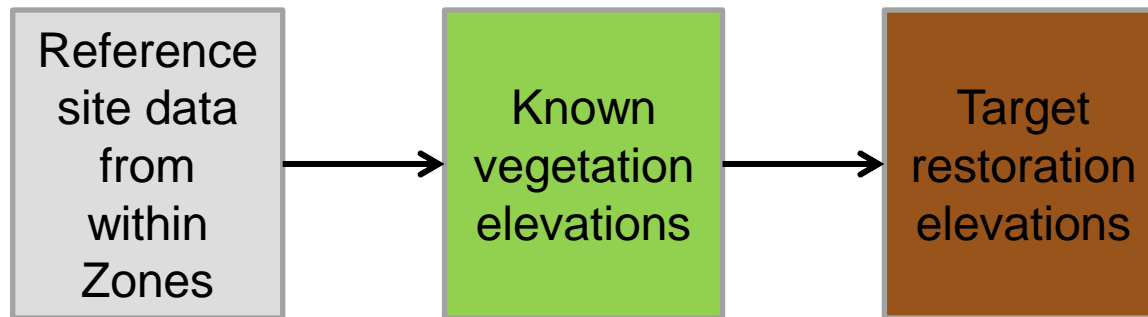
1.0 m, CRD

Application: Inform Restoration

- ▶ Plant species elevation ranges by Zone
- ▶ Inundation ranges by Zone
- ▶ Elevations and dimensions of channels



Application: Inform Restoration Full Hydrologic Connectivity

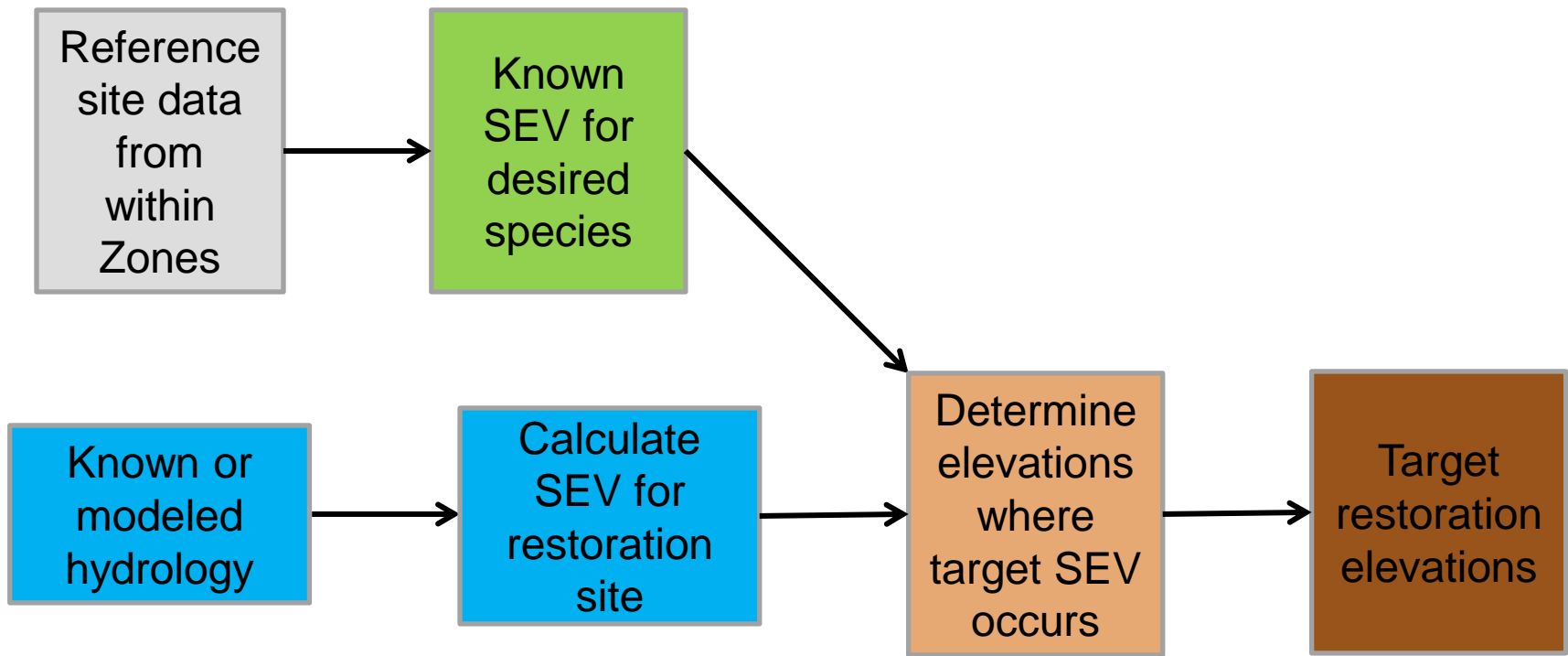


Application: Inform Restoration

Full Hydrologic Connectivity

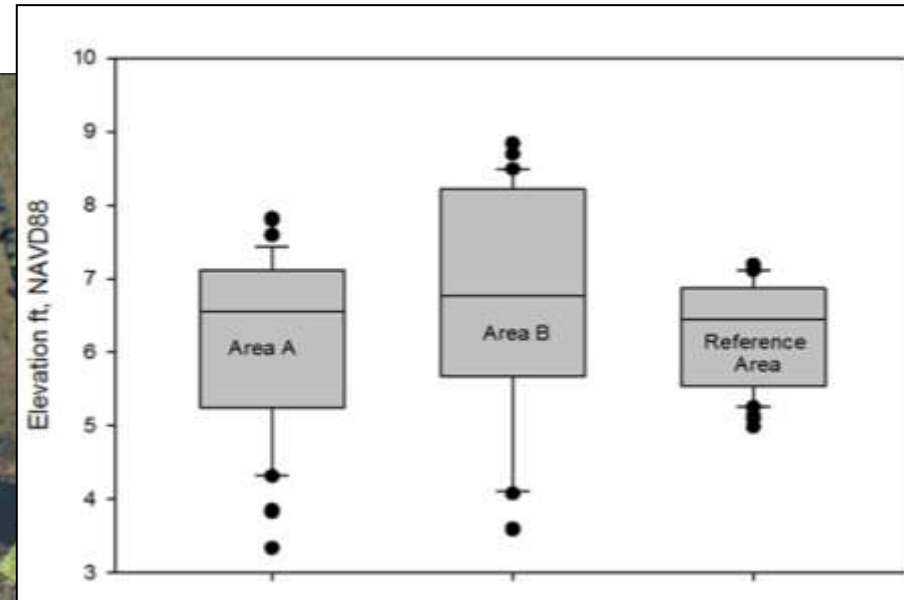
Kandoll NA m, NAVD88	Steamboat rkm 55 m, CRD	Dibblee rkm 104 m, CRD	North Unit rkm 144 m, CRD	Target Elevation ft, NAVD88
Conversion:	-0.30	-0.86	-1.29	
1.2	0.9	0.4	-0.1	4
1.4	1.1	0.5	0.1	4.5
1.5	1.2	0.7	0.2	5
1.7	1.4	0.8	0.4	5.5
1.8	1.5	1.0	0.5	6
2.0	1.7	1.1	0.7	6.5
2.1	1.8	1.3	0.8	7
2.3	2.0	1.4	1.0	7.5
2.4	2.1	1.6	1.1	8
2.6	2.3	1.7	1.3	8.5
2.7	2.4	1.9	1.5	9
2.9	2.6	2.0	1.6	9.5
3.0	2.7	2.2	1.8	10

Application: Inform Restoration Altered Hydrologic Connectivity



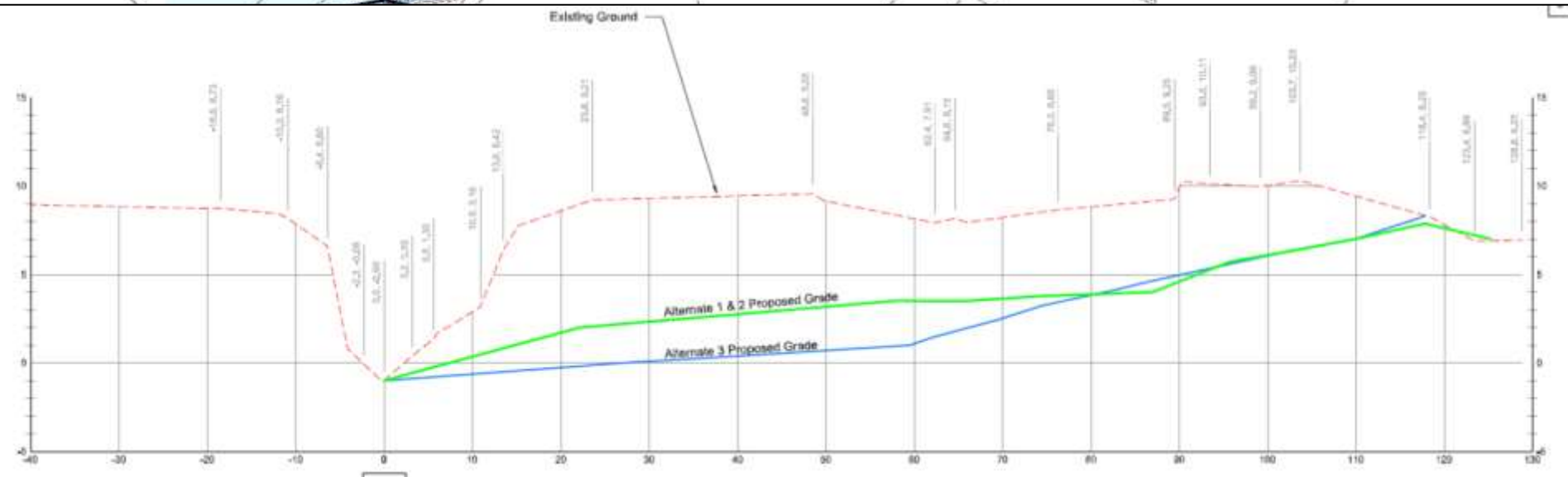
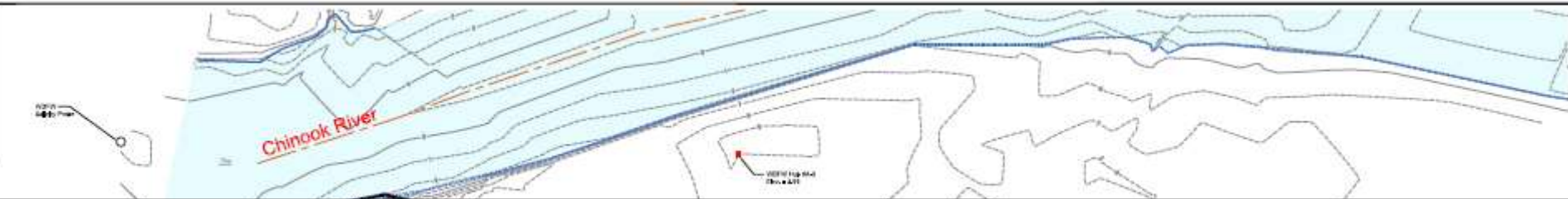
Application: Inform Restoration Altered Hydrologic Connectivity


Chinook River Estuary



Application: Inform Restoration Altered Hydrologic Connectivity

Chinook River Estuary



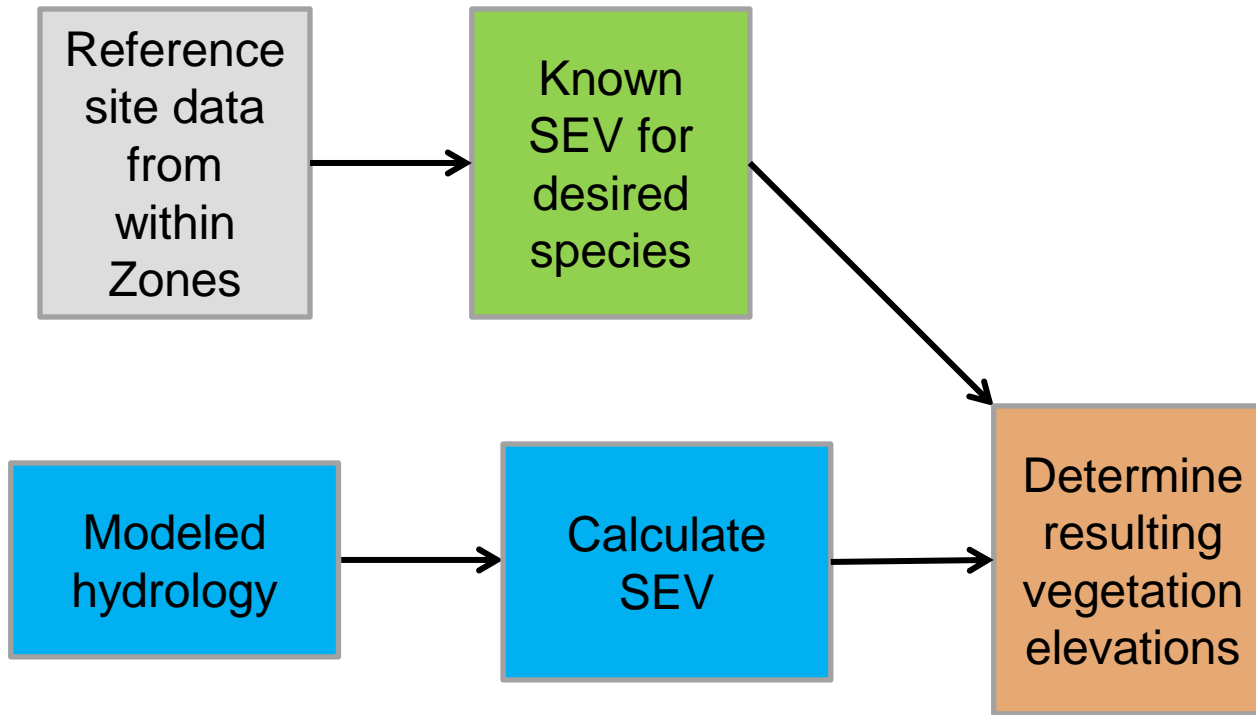
Alternative 3:
Remove  to match upstream channel form
Earthwork Excavation area = 71,973 sf.
Excavation volume (Cut) = 7,592 cy.

STATE OF WASHINGTON
DEPARTMENT OF FISH & WILDLIFE
HABITAT PROGRAM
CHINOOK RIVER ESTUARY RESTORATION


Drawn by: _____ Date: _____
Checked by: _____ Date: _____
Approved by: _____ Date: _____

CHANNEL A RESTORATION PLAN VIEW - ALTERNATIVE 3

Application: Predict Effects of Hydrologic Change



Application: Predict Effects of Hydrologic Change

-  Potential Marsh Community (1.3 - 2.6m)
-  Lower LiDAR Boundary (0.1m)

+0.0 m



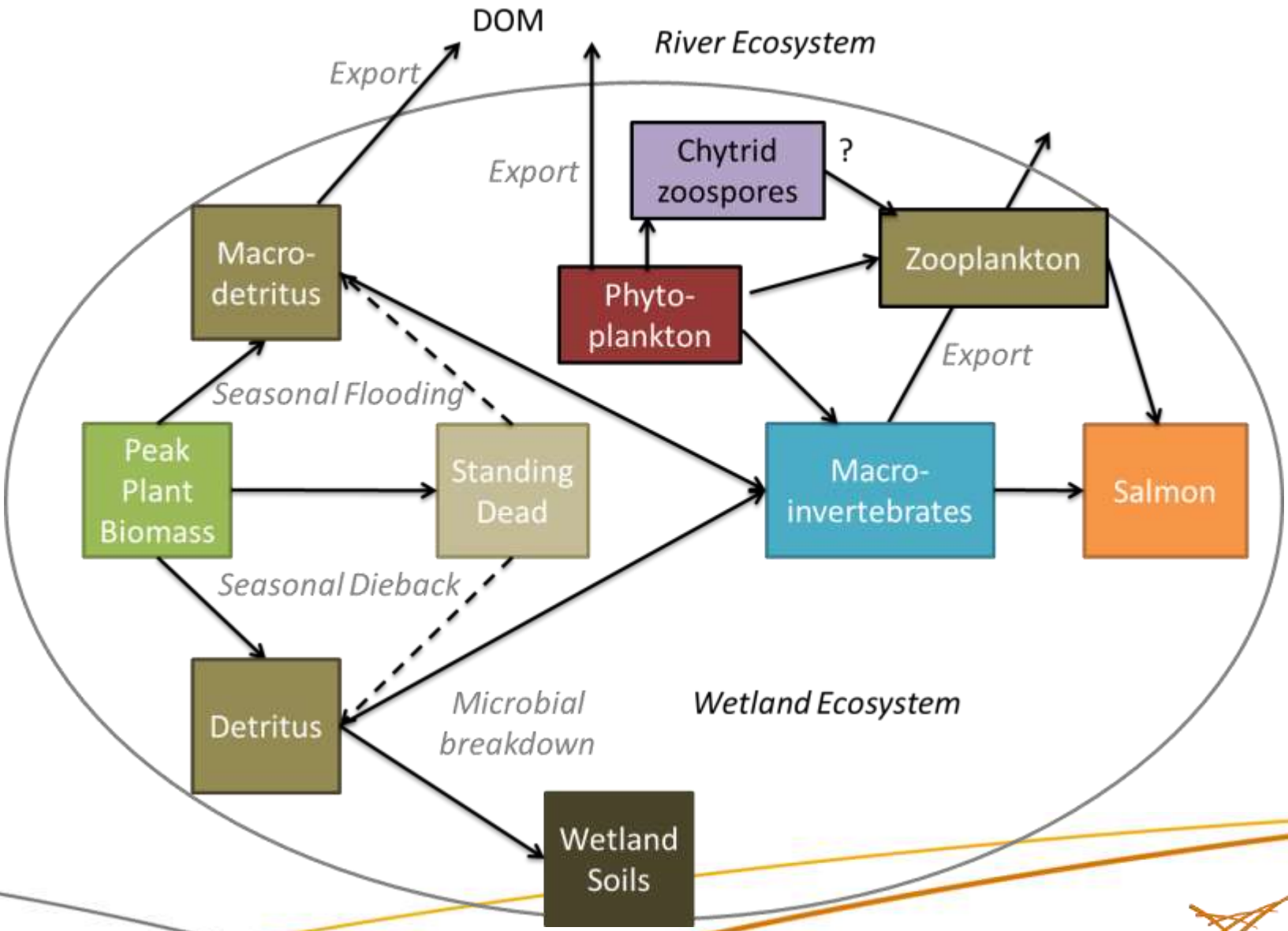
+0.12 m



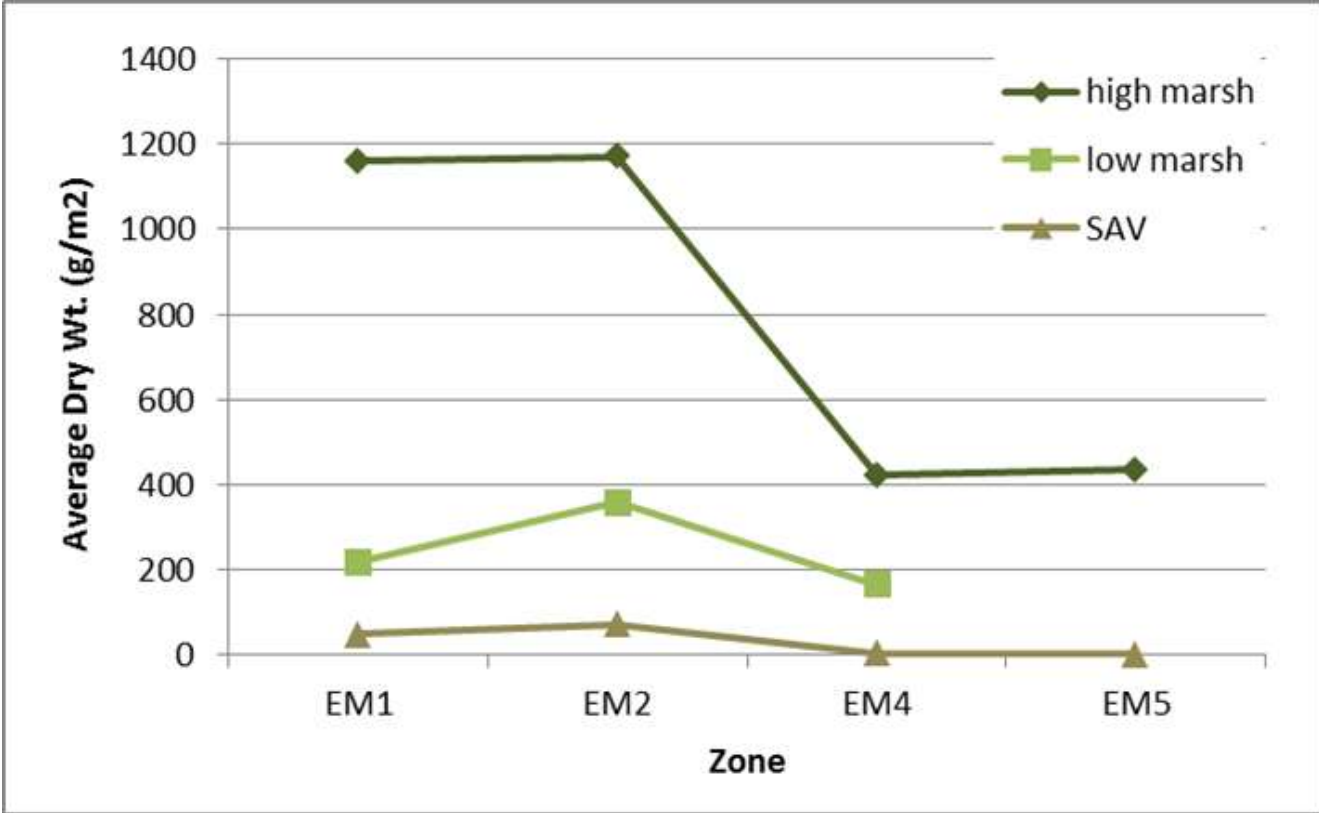
+0.50 m



Food Web Research



Food Web Research



Food Web Research

Annual Detrital Contribution

Species/Strata	Average Summer/Winter Difference in Biomass (g/m ²)					
	BBM	SRM	WI2	WHC	CS1	FLM
<i>Carex lyngbyei</i> (CALY)	840	1557	776	909		
<i>Carex lyngbyei</i> / <i>Agrostis stolonifera</i>	656.2					
<i>Polygonum amphibium</i>						472
<i>Phalaris arundinacea</i> / High Marsh				254		
<i>Phalaris arundinacea</i> Low Marsh		260		489	309	74
<i>Schoenoplectus</i> <i>tabernaemontani</i>		287				
<i>Eleocharis palustris</i>					483	75
<i>Eleocharis palustris</i> / <i>Sagittaria latifolia</i>					222	
<i>Sagittaria latifolia</i>				124		

Conclusions

- ▶ Reference site data useful for informing restoration and predicting tidal marsh response to hydrologic change
- ▶ Macro-detritus production is greater in high marsh versus low marsh
- ▶ Restoration should consider targeting a diversity of marsh communities
 - High marsh restoration beneficial for increasing macro-detritus production, but will require active management to control reed canary

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