Stock-specific use of tidal freshwater wetlands

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Northwest Fisheries Science Center

Fish Ecology Division

Pt. Adams and Newport Research Stations

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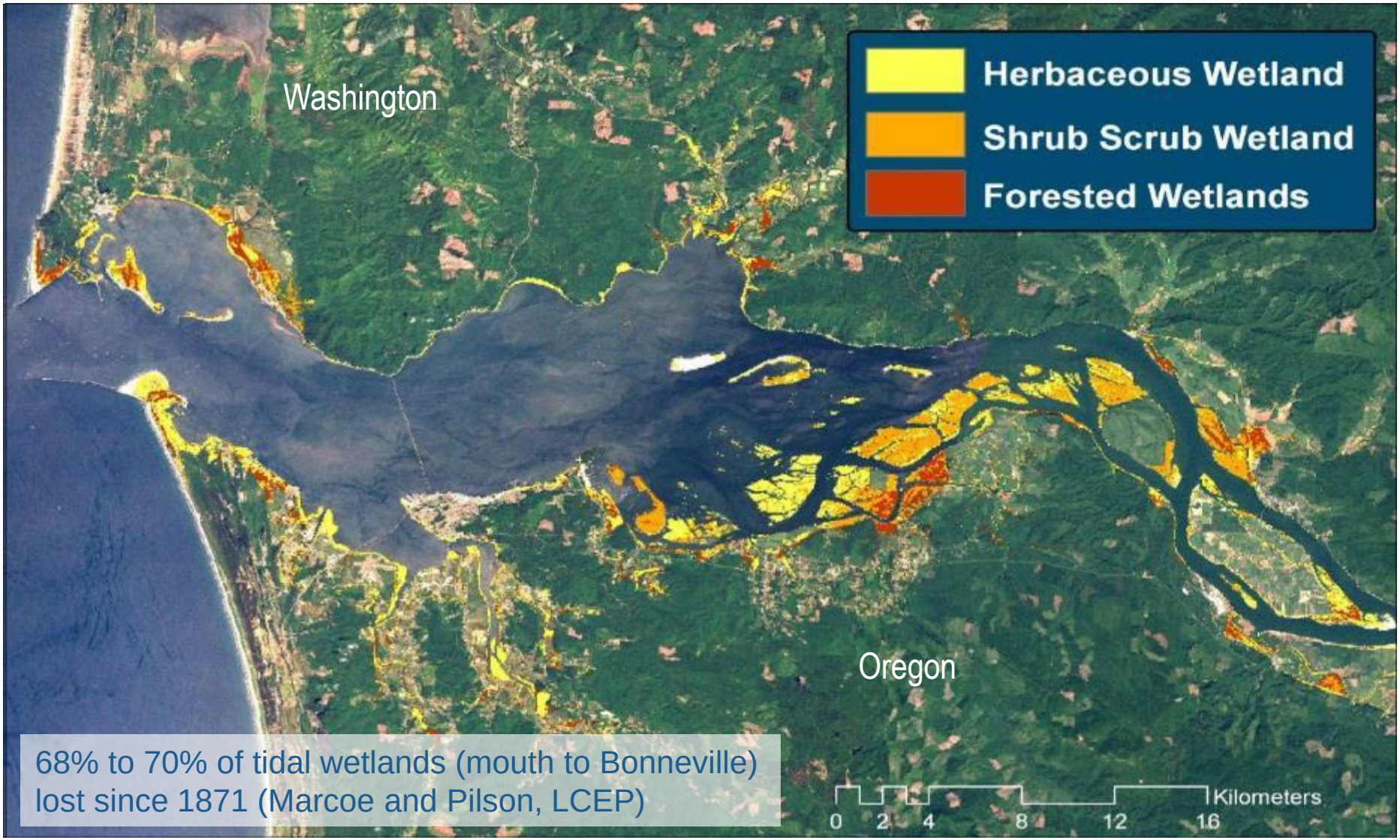
Modern wetlands



68% to 70% of tidal wetlands (mouth to Bonneville) lost since 1871 (Marcoe and Pilson, LCEP)

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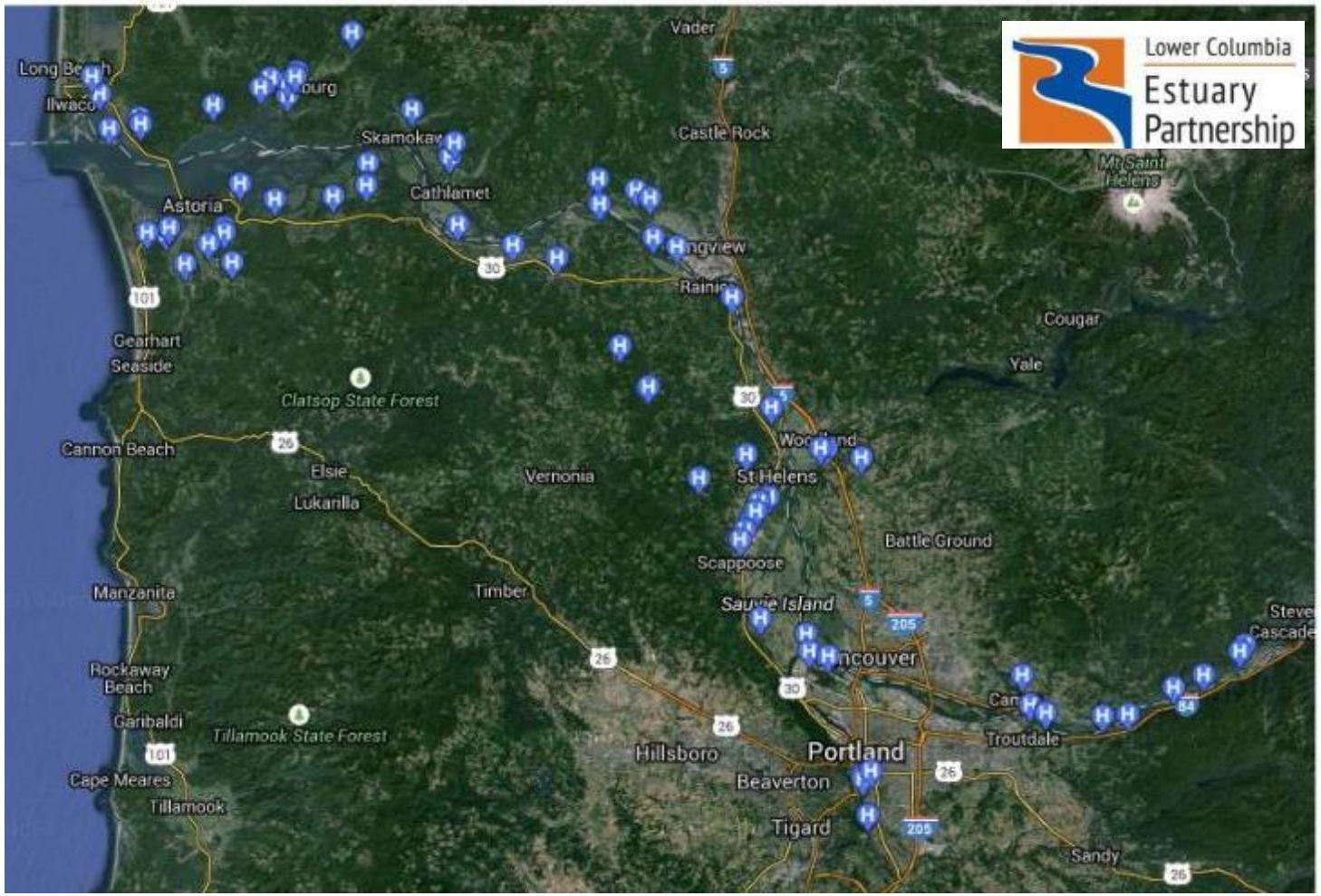
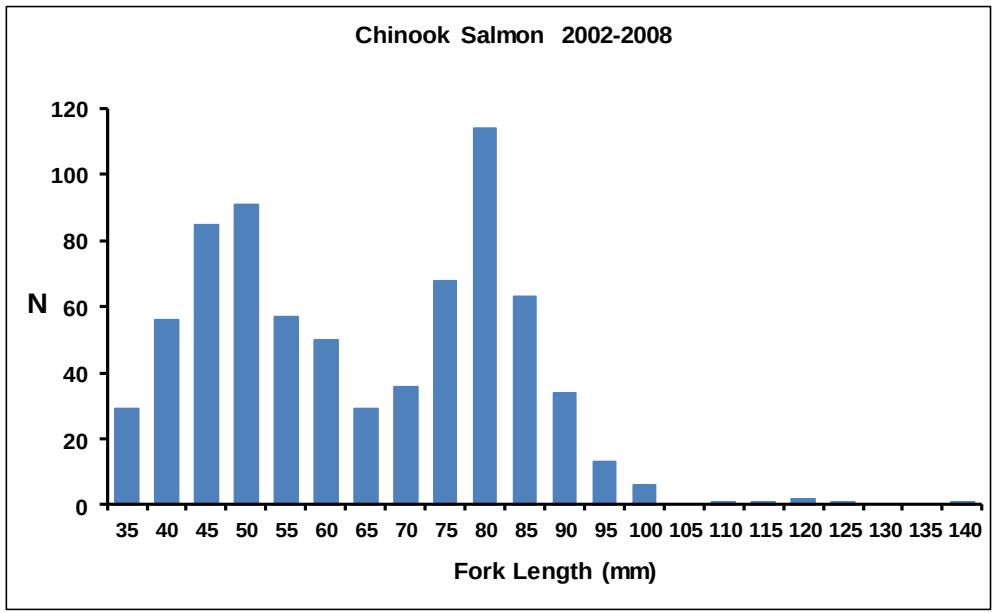
Image by: J. Burke, UW; Historical data from Thomas (1983)

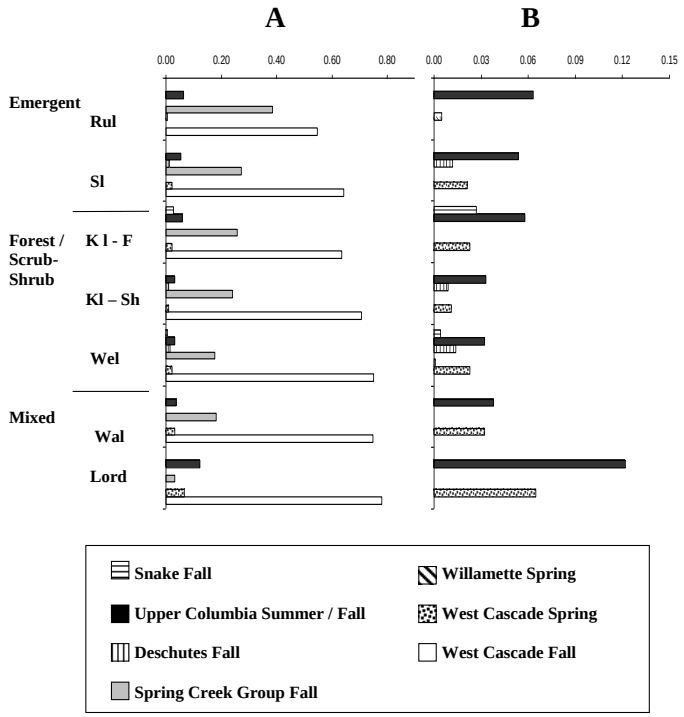
Restoration efforts in the estuary are underway…



… but which stocks benefit?

Estuary Habitat Study 2002-2008





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Data from Bottom et al. 2011

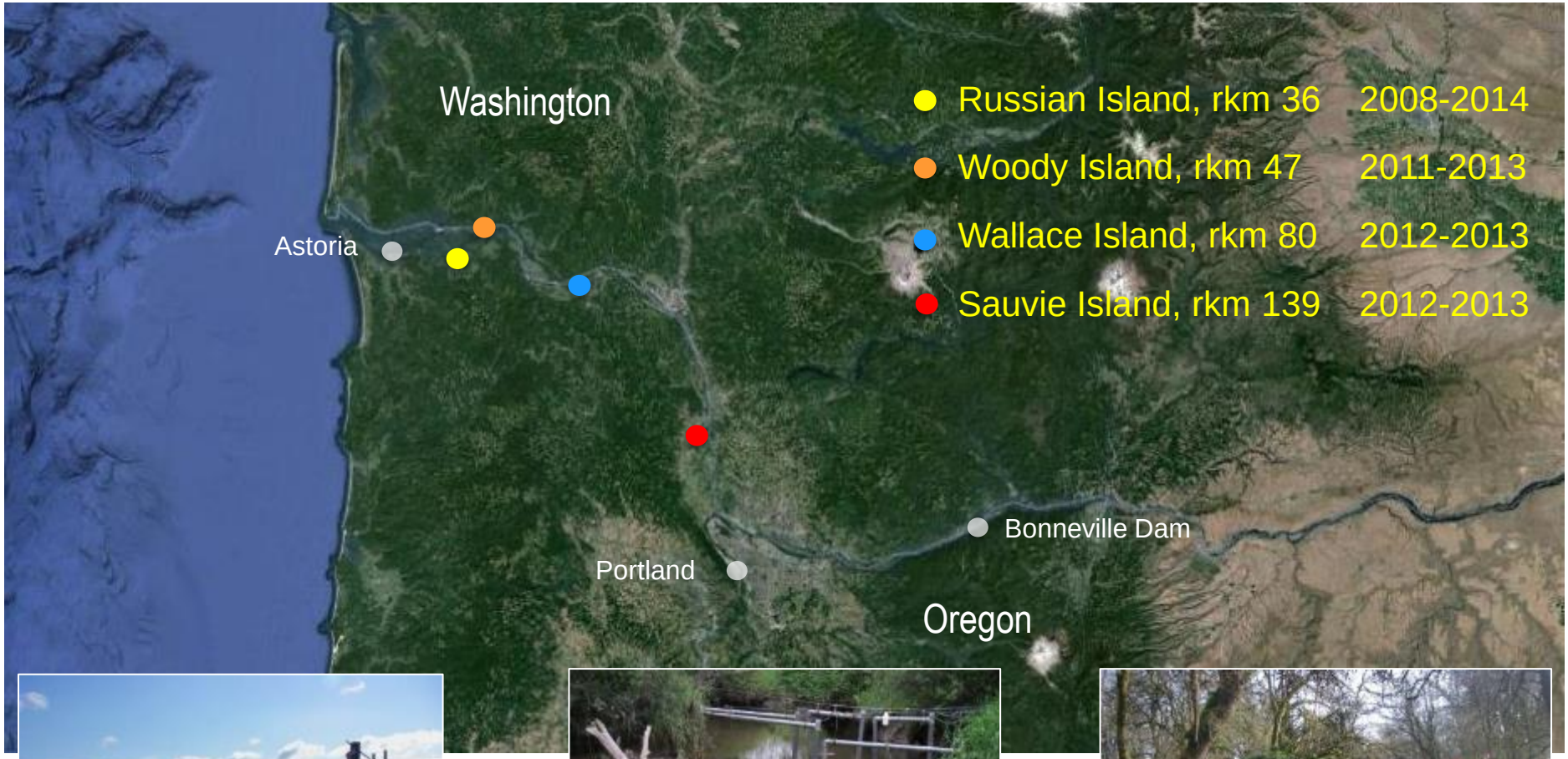
Estuary-wide genetics survey

Table 4. Sample sizes, percentages marked, and estimated percentage composition of the 11 genetic stocks observed in samples of juvenile Chinook salmon collected at main-stem and back-channel sites in the Columbia River estuary, 2010-2012. Data are shown for all surveys and for each reach. Confidence intervals for each estimate are shown in Appendix Table 1.

			Percentage stock composition of Chinook salmon										
			West Cascade					Mid and Upper Columbia River	Upper Columbia summer/	Snake River			
Estuary Reach	N	Percent marked	fall	spring	Willamette River spring	Spring Creek group fall	Deschutes River fall	spring	fall	fall	spring	Rogue River	Coast
All Reaches	2,644	28	43	6	8	18	2	0	20	2	0	1	0
A	264	53	39	4	2	39	0	0	7	0	0	7	2
C	423	32	73	11	6	7	0	0	2	1	0	0	1
D	546	23	73	9	6	10	0	0	2	0	0	0	0
E	417	30	30	3	17	23	2	0	24	2	0	0	0
F	368	41	30	3	13	26	2	1	23	2	0	0	0
G	324	19	21	4	13	17	5	1	35	4	0	0	0
H	302	35	3	1	0	20	6	0	62	7	1	0	0

Teel et al. 2014

Estuary wetland PIT array locations 2008-2014

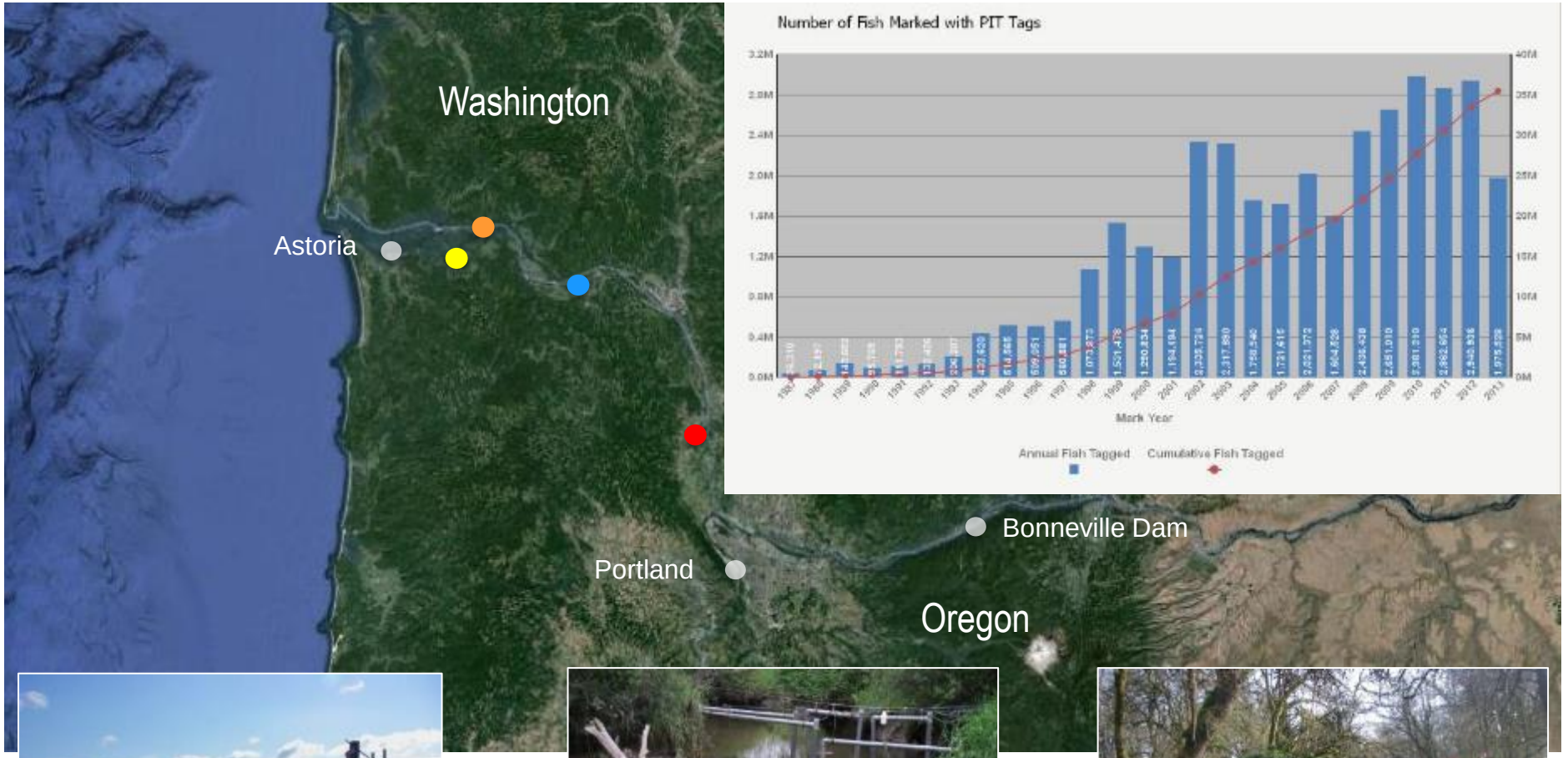


Tagging study metrics

- Wetland residence time
- Secondary channel residence time
- Timing of channel entry/exit
  - Tide
  - Diel
- Growth

McNatt, R. A., D. L. Bottom, and S. A. Hinton. Residency and movement of juvenile Chinook Salmon at multiple spatial scales in a tidal marsh of the Columbia River estuary. Transactions of the American Fisheries Society. In press.

Estuary wetland PIT array locations 2008-2014



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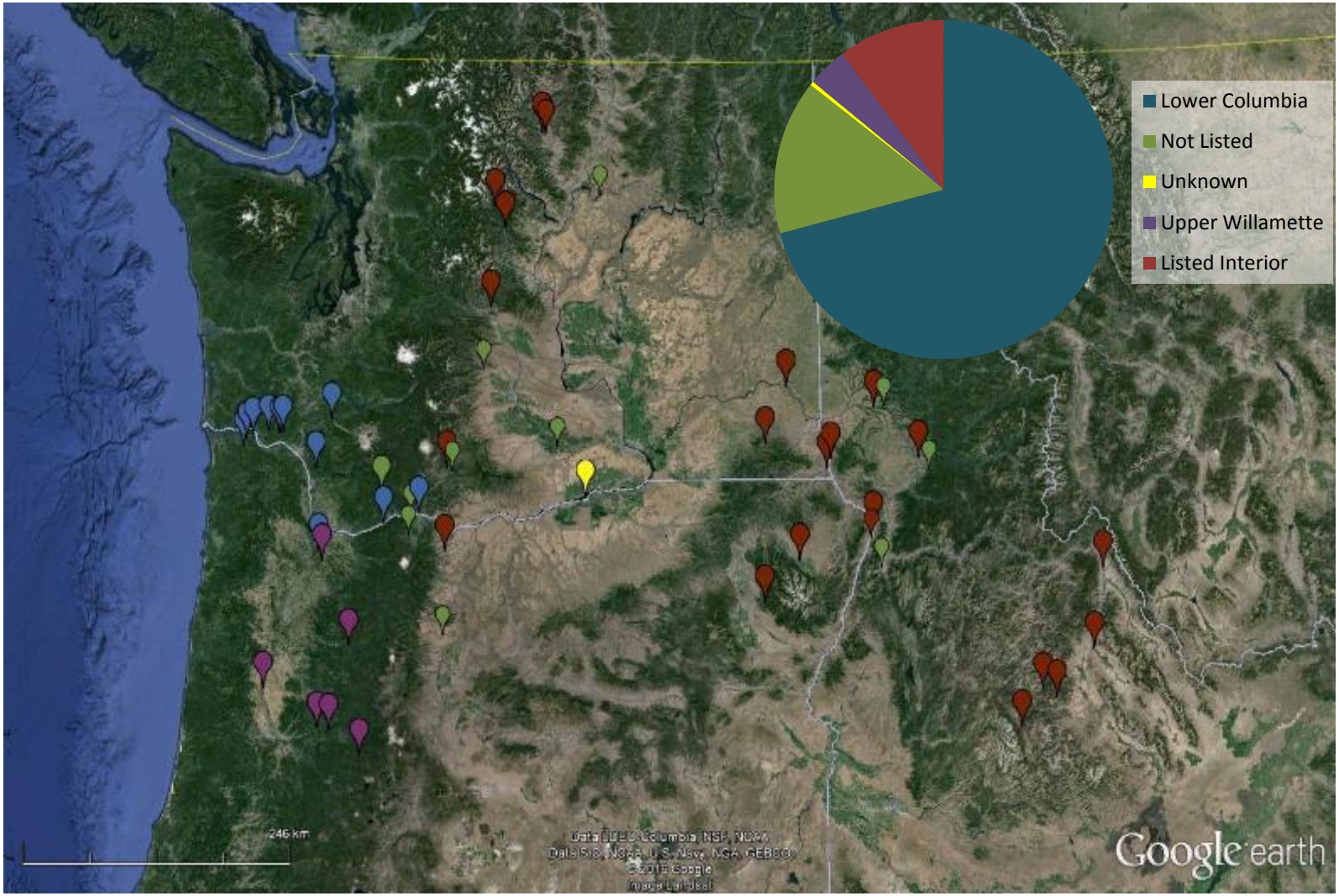
Sources of fish detected in estuary wetlands

- 264 fish
- > 50 release sites, 11-1400 km
- 10% Listed Interior Stocks

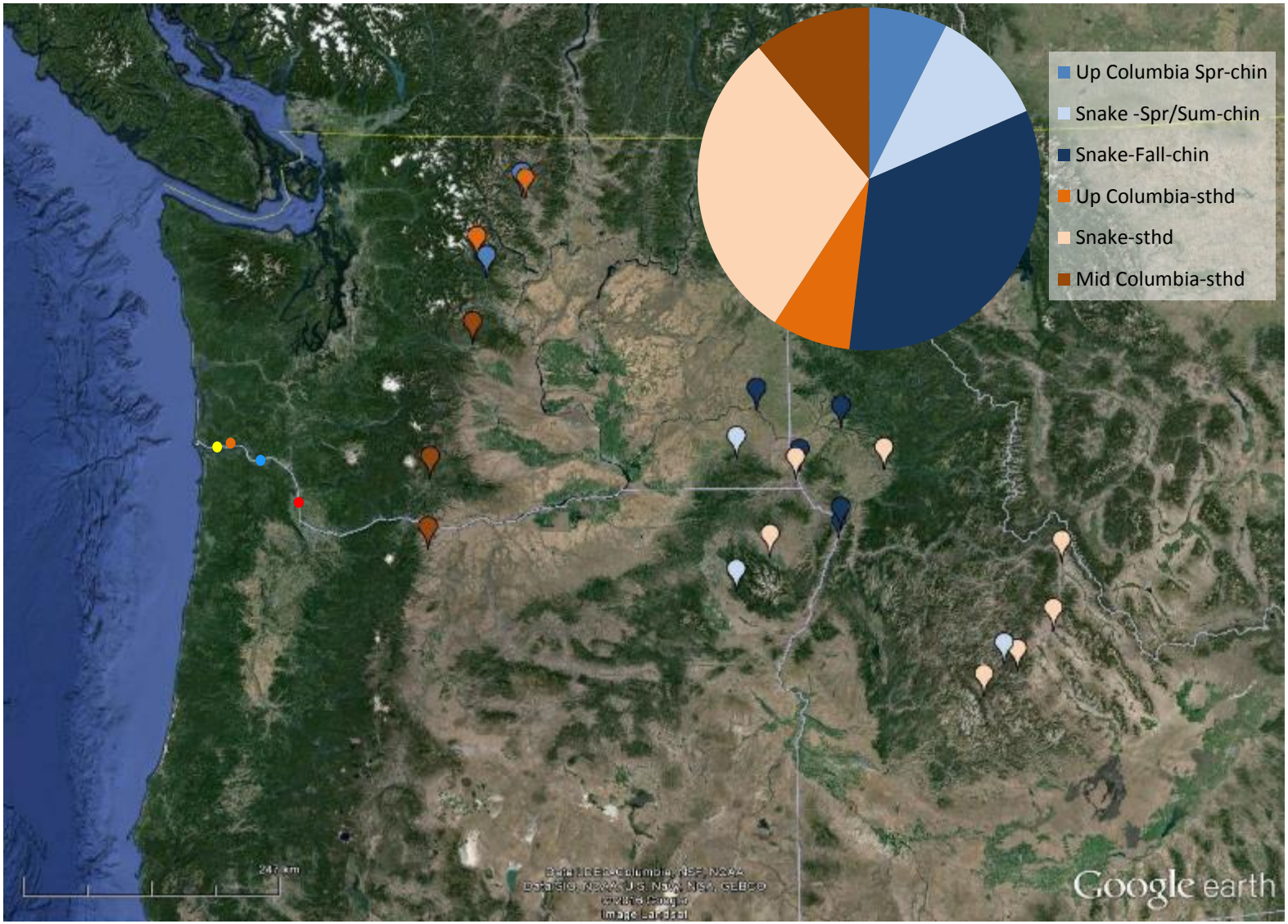


ESA-listed interior stocks detected

Site	N
Russian	14
Woody	7
Wallace	2
Sauvie	4
Total	27

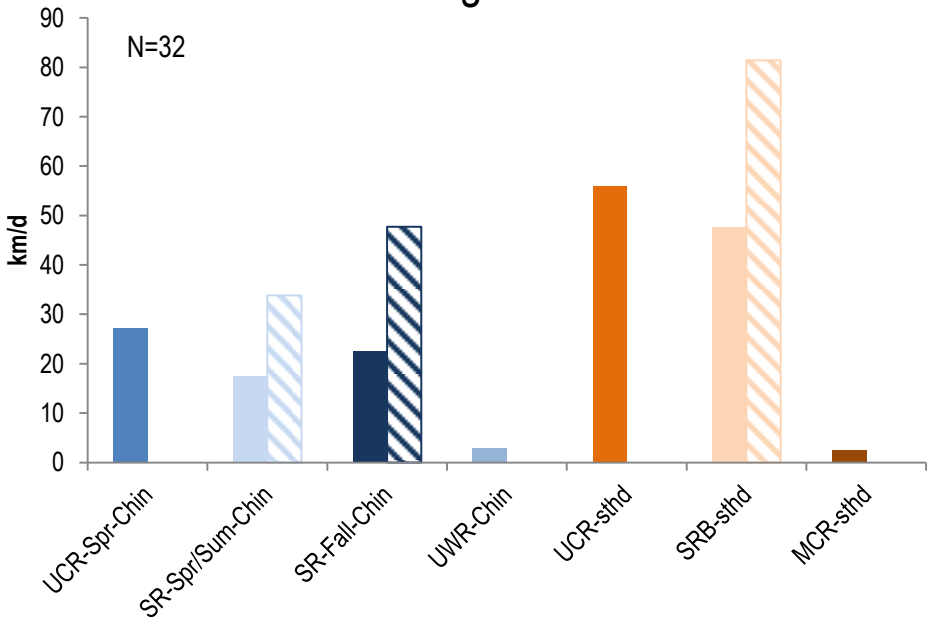
Juveniles = 25

Adult steelhead = 2

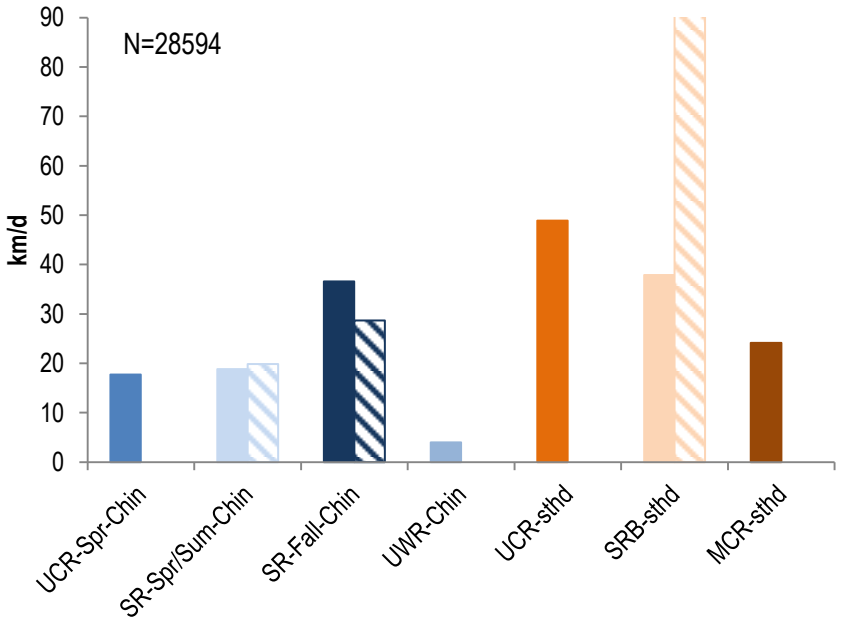


Median travel rate 2008-2014

Solid = run-of-river
Patterned= barged



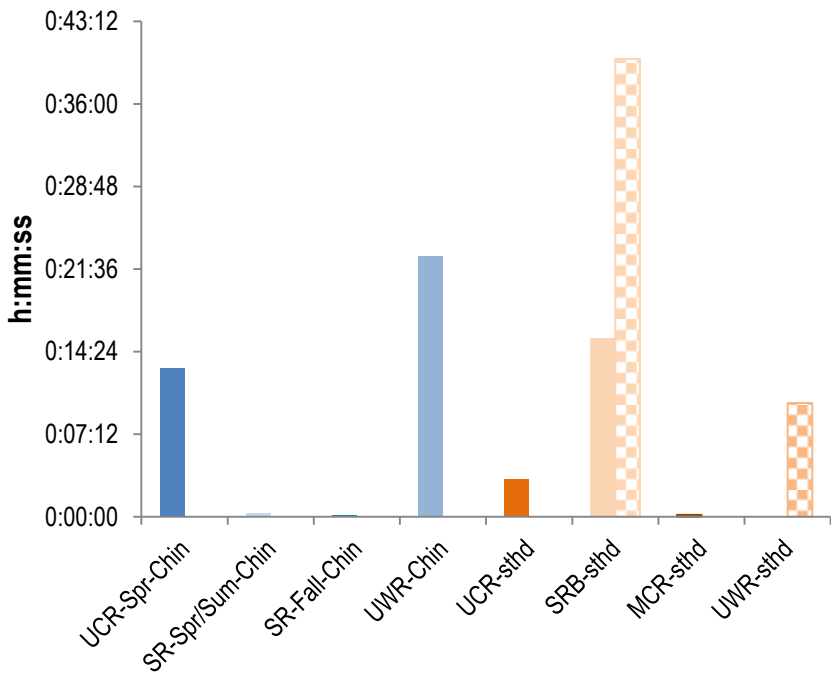
Outmigrating juveniles detected in wetland channels



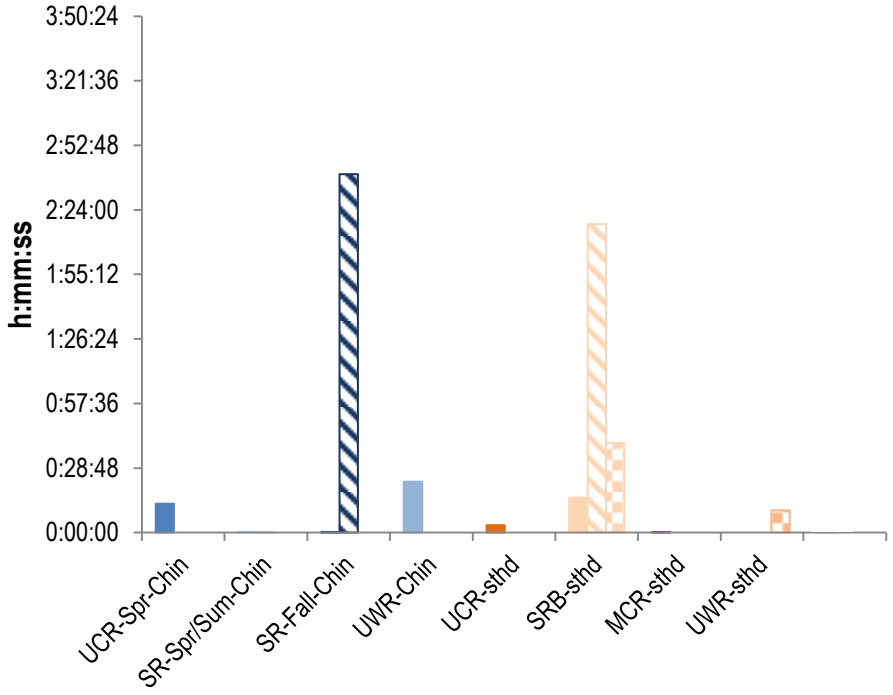
Outmigrating juveniles detected in main stem estuary PIT-trawl rkm 75

Median channel residence time, 2008-2014

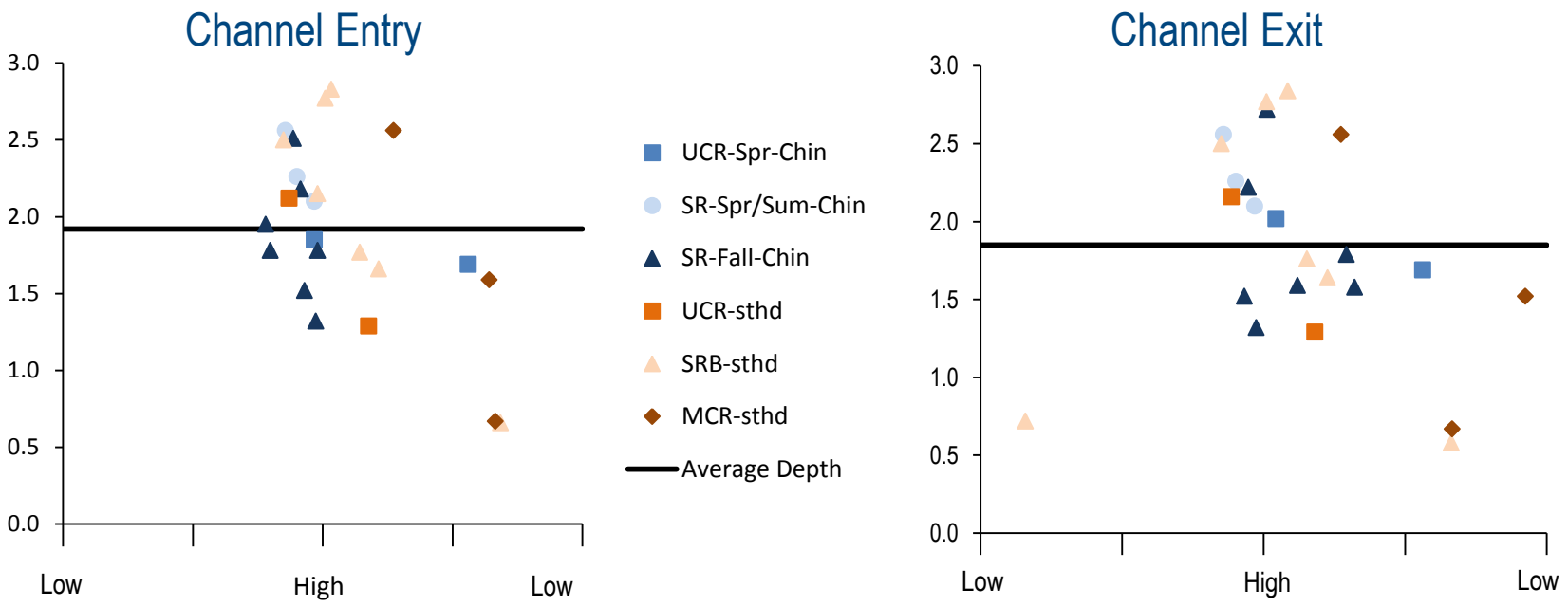
Solid = run-of-river juveniles
Checkered = adults



Striped = barged juveniles

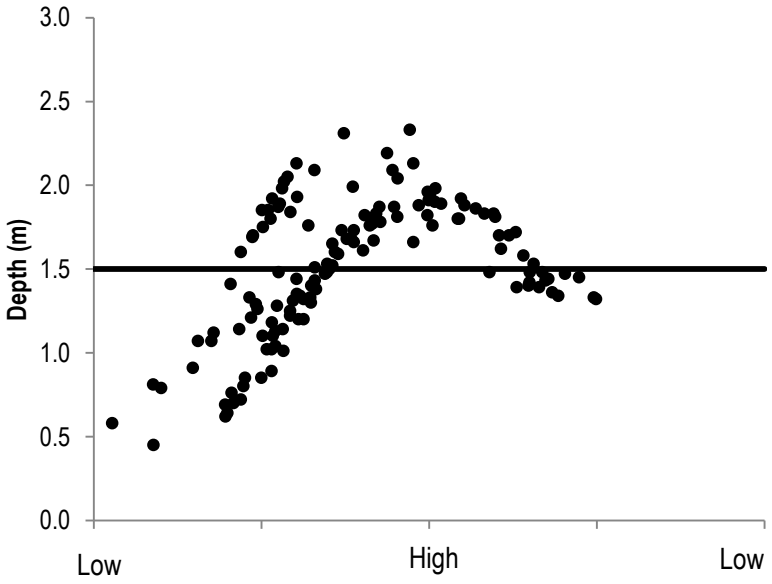


Channel entry/exit timing

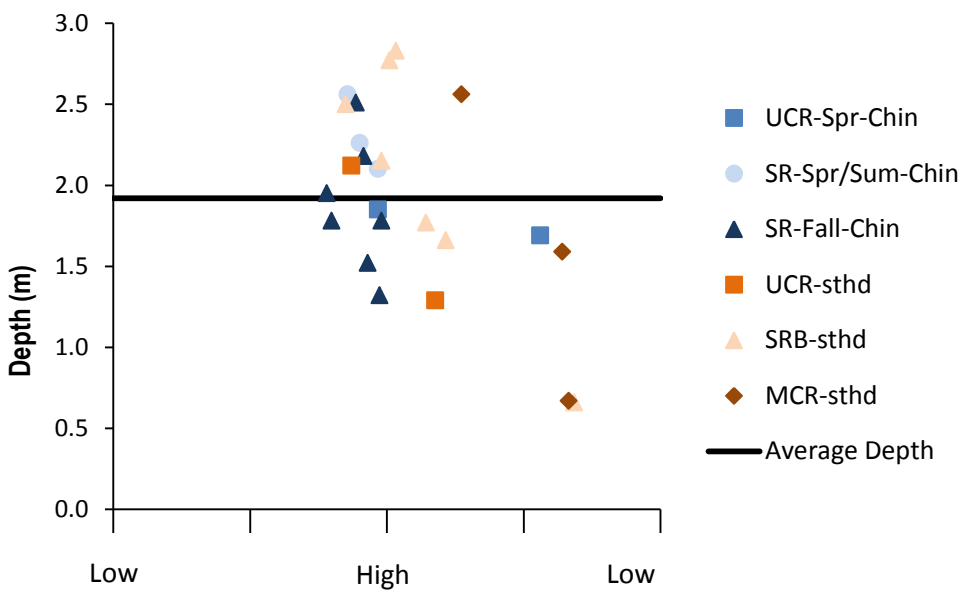


Stock-specific timing of channel use

Lower river Chinook 2008



Interior stocks 2008-2014



- Water depth?
- Fish size?

Implications of stock-specific channel use and future study

- Excluded interior stocks from previous surveys?
- Underestimate presence of interior stocks in tidal wetlands?
- Further study to determine the mechanism of varying wetland use by multiple stocks
  - Fish size
  - Water depth/high tide
  - Size of channel
  - Distance to marsh edge

Conclusions

- Recorded Chinook and steelhead stocks from all reaches of the Columbia River Basin in estuary wetlands
- Fish with faster travel rates, especially barged migrants, may have greater reliance on estuary wetlands for rearing prior to ocean entry
- Interior stocks use small wetland channels during the latter part of tide cycle
  - Sampling bias may have led to an underestimate of interior stock abundance in tidal wetlands
- Further study to identify mechanism of stock-specific use of tidal wetlands
  - Feed into restoration design
- Through the lens of climate change
  - Population resiliency through life history diversity
  - Estuaries may become increasingly more important for interior stocks

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