

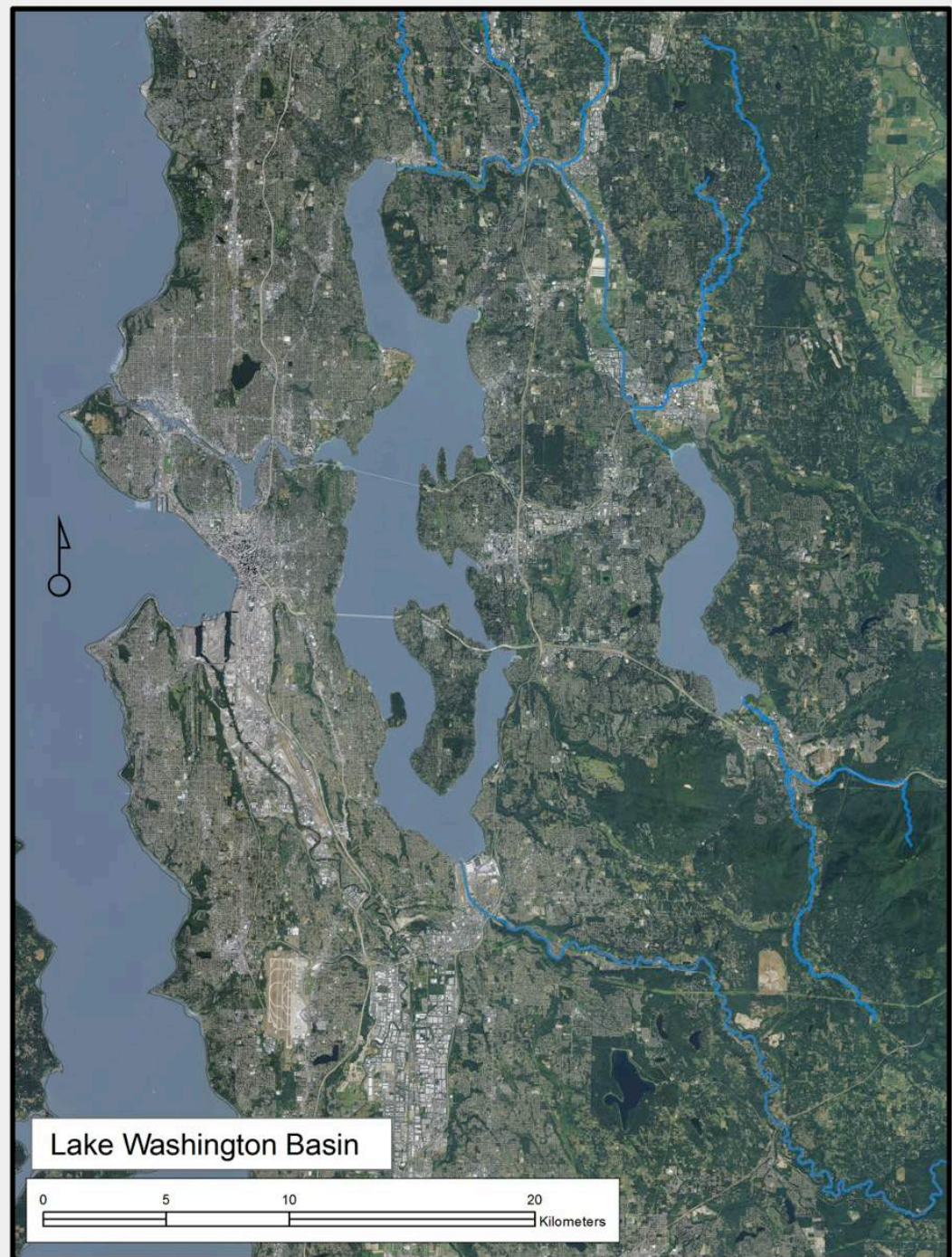
Use of Ultrasonic and Radio Telemetry as an Independent Assessment of Sockeye Spawner Abundance Estimation



Eric Warner
Muckleshoot
Indian Tribe

Lake Washington Basin

- 1,800 km² basin
- 1.4 million people
- Cedar R. dammed and rerouted
- Estuary eliminated
- 1,300 km of rivers and creeks
- 8,000 km of roads



Chittenden Locks

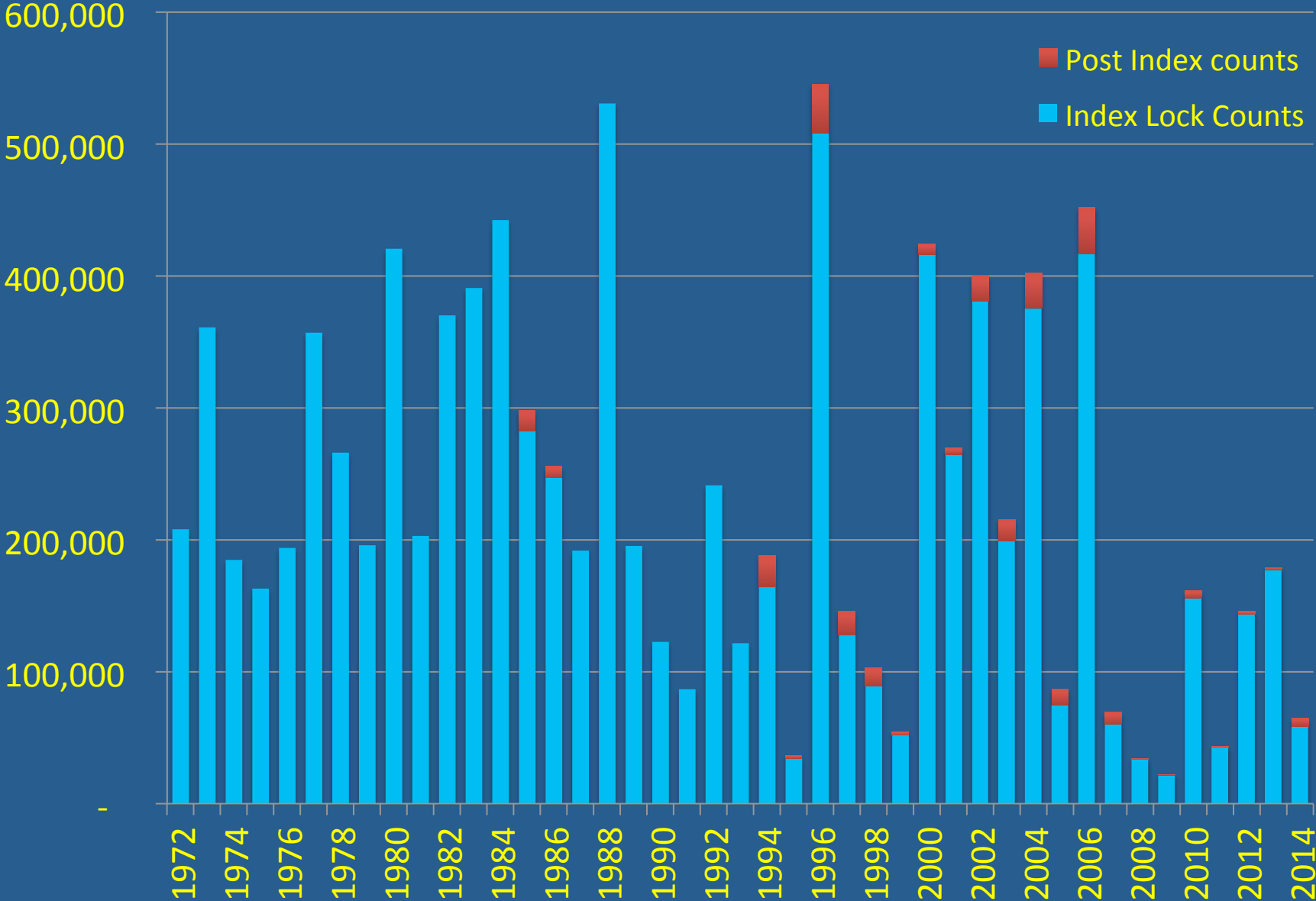
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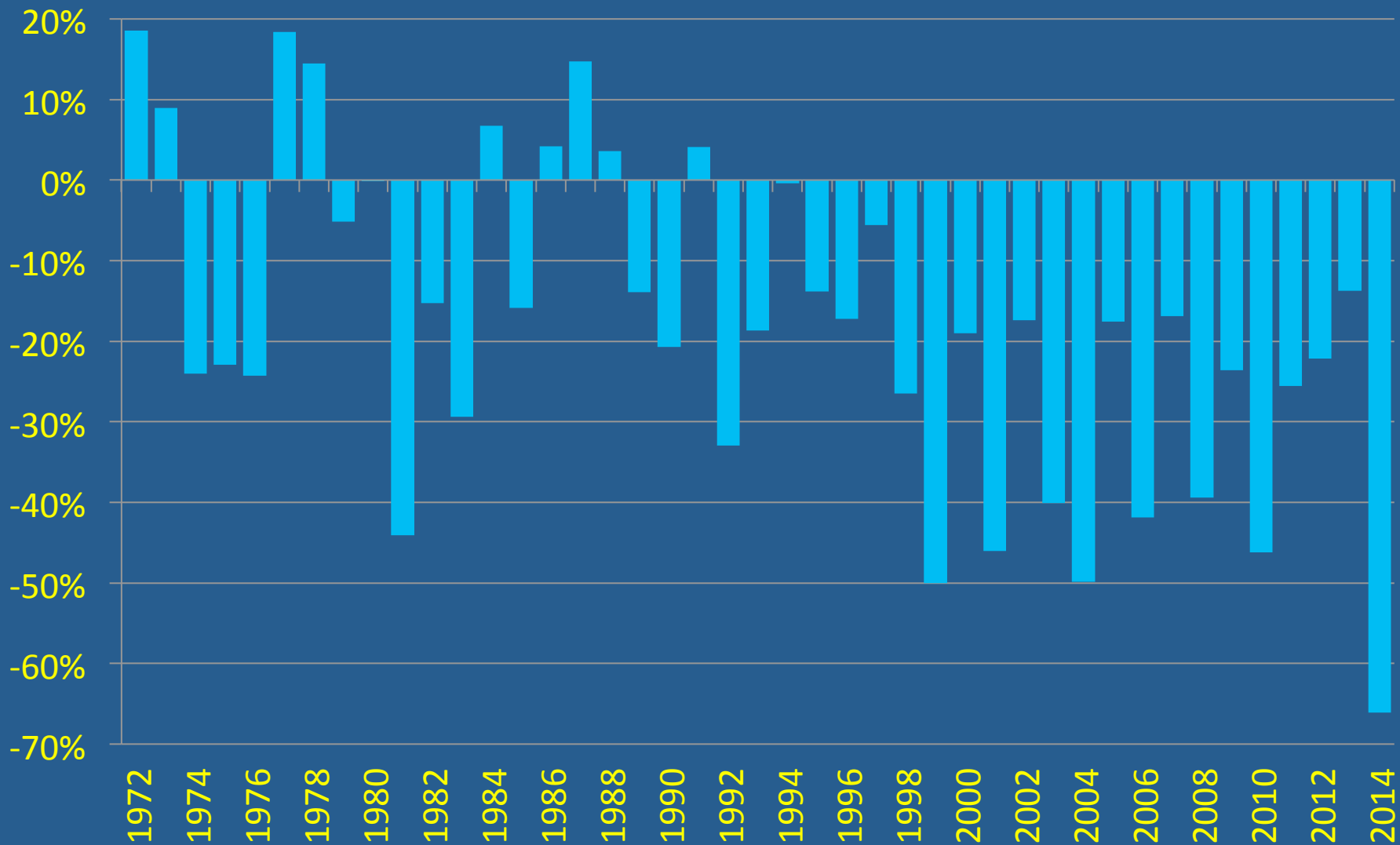
Chittenden Lox



Locks Counts



Post-season run reconstruction as a percent of the index locks counts

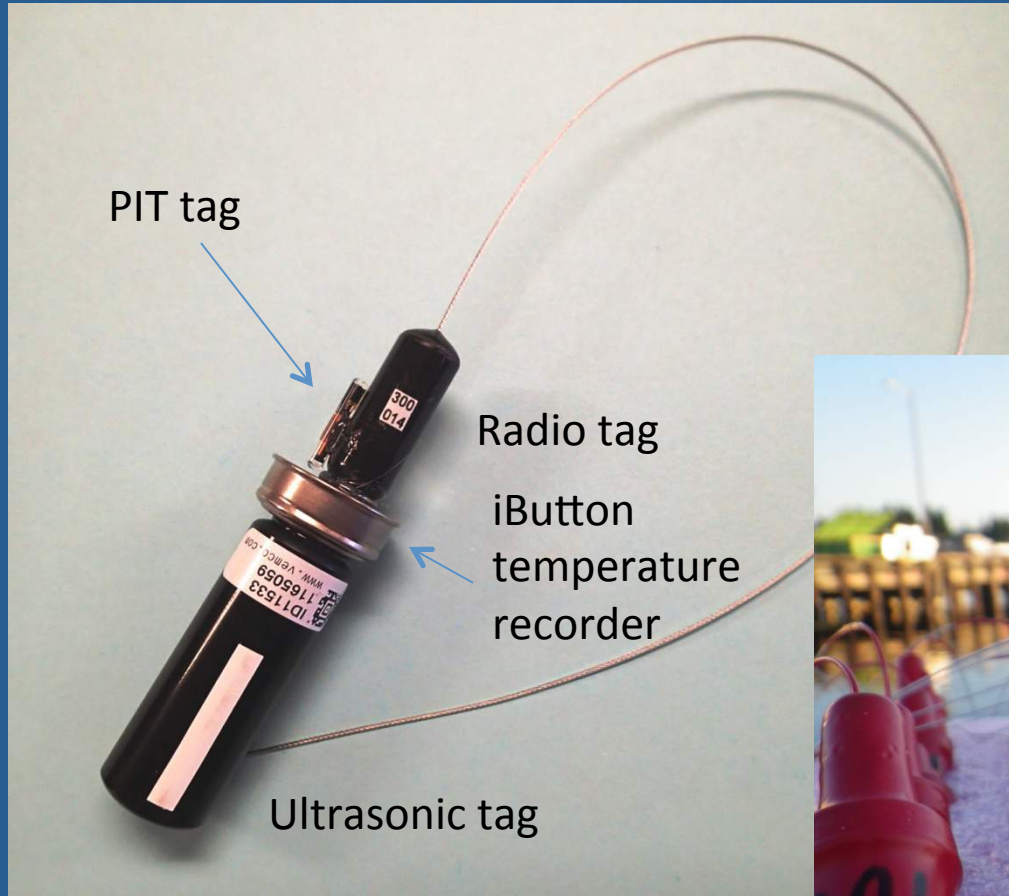


2013-2014 Study Objectives

- Monitor recycling of sockeye through Locks
- Determine relative population size of Cedar and Sammamish stocks
- Improve Cedar River spawning escapement estimates using stream life and mark/recapture



Tag Bundles

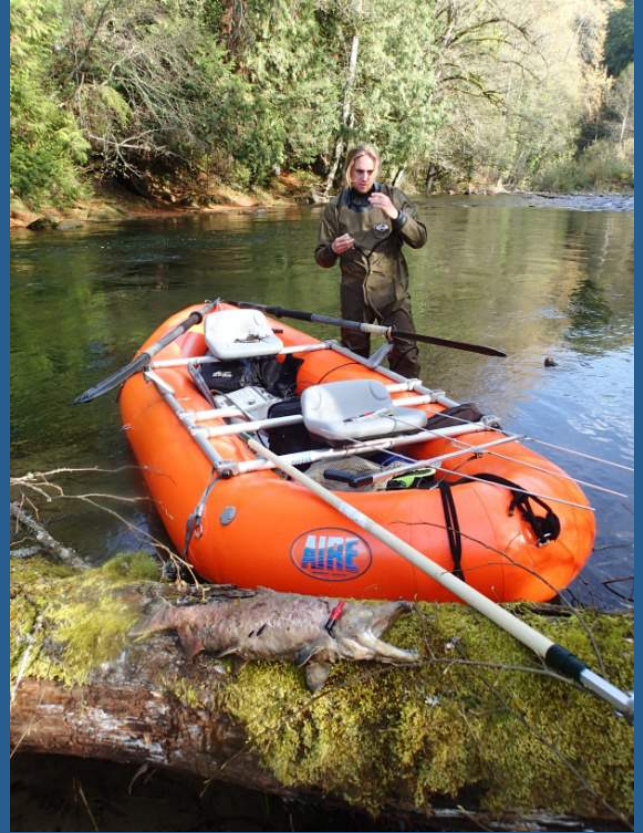






Hydrophone Placement

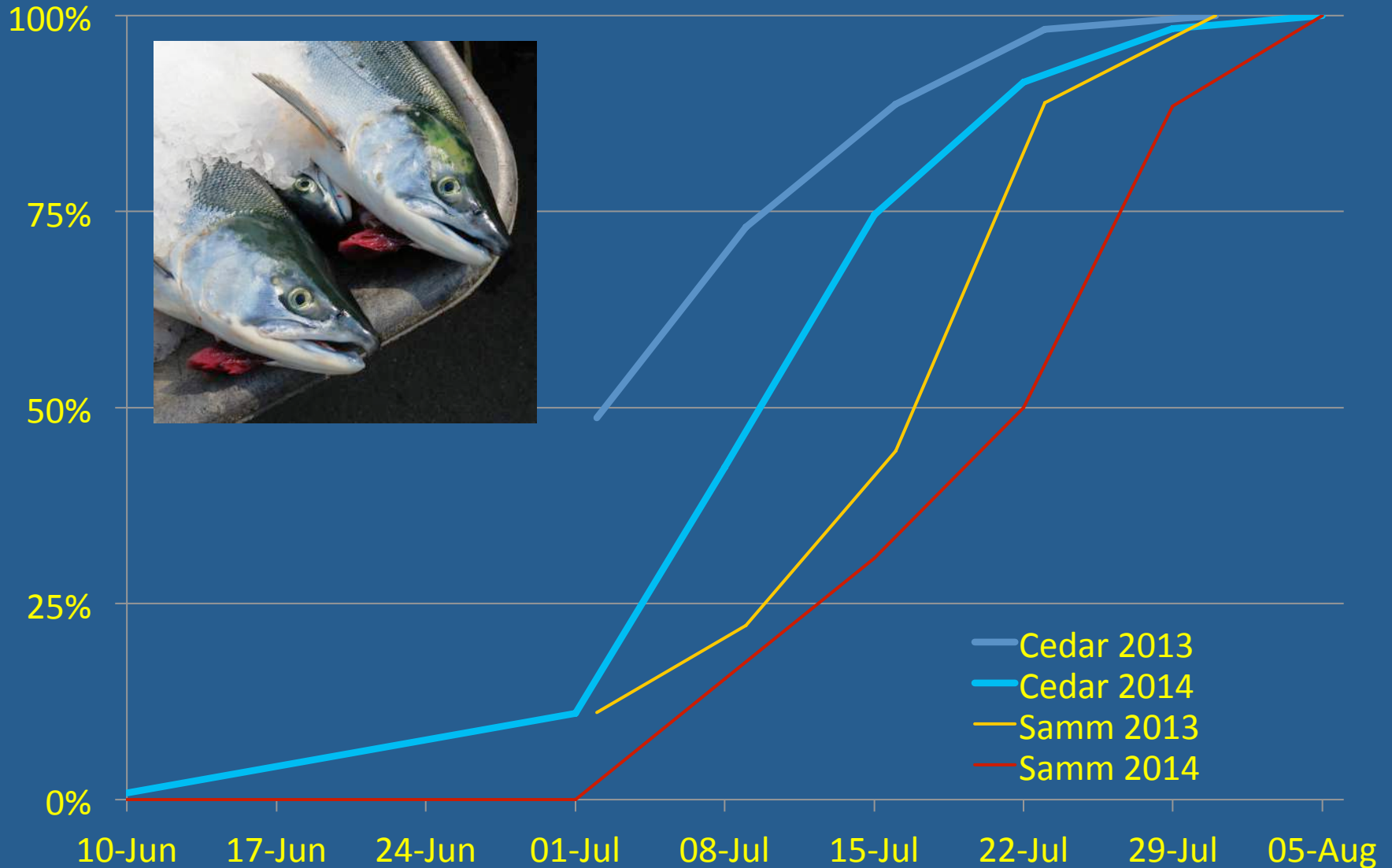




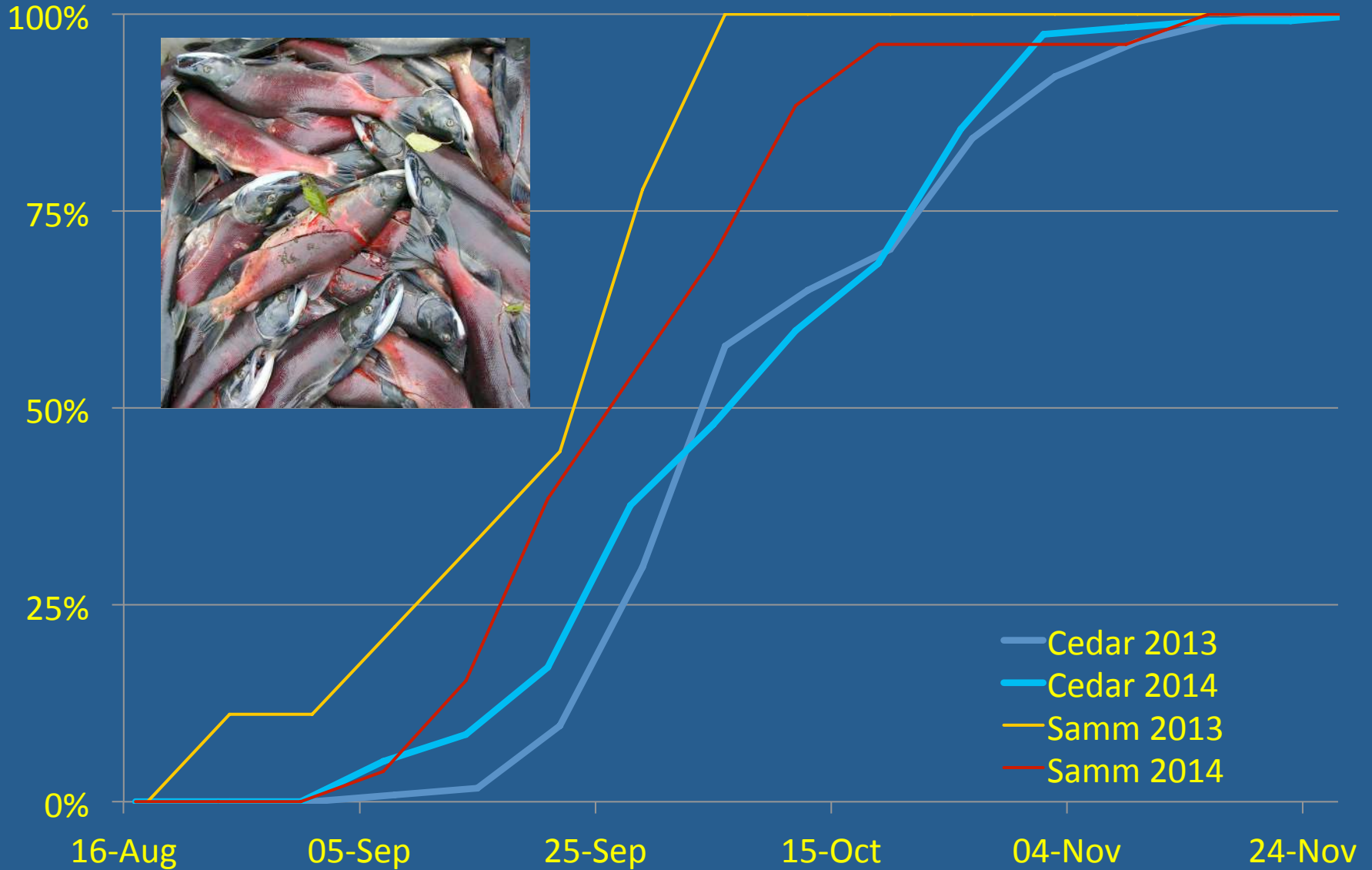
Summary Results

	2013		2014	
Sockeye tagged	140		225	
Recycled	1	1%	18	8%
Transited Ship Canal	137	98%	217	96%
Entered Cedar	114	81%	120	53%
Entered Sammamish	9	6%	26	12%
Tags recovered	106	76%	89	40%
Pre-spawning mort F	1 out of 54		6 out of 13	

Cedar and Sammamish Stock Timing at Freshwater Entry



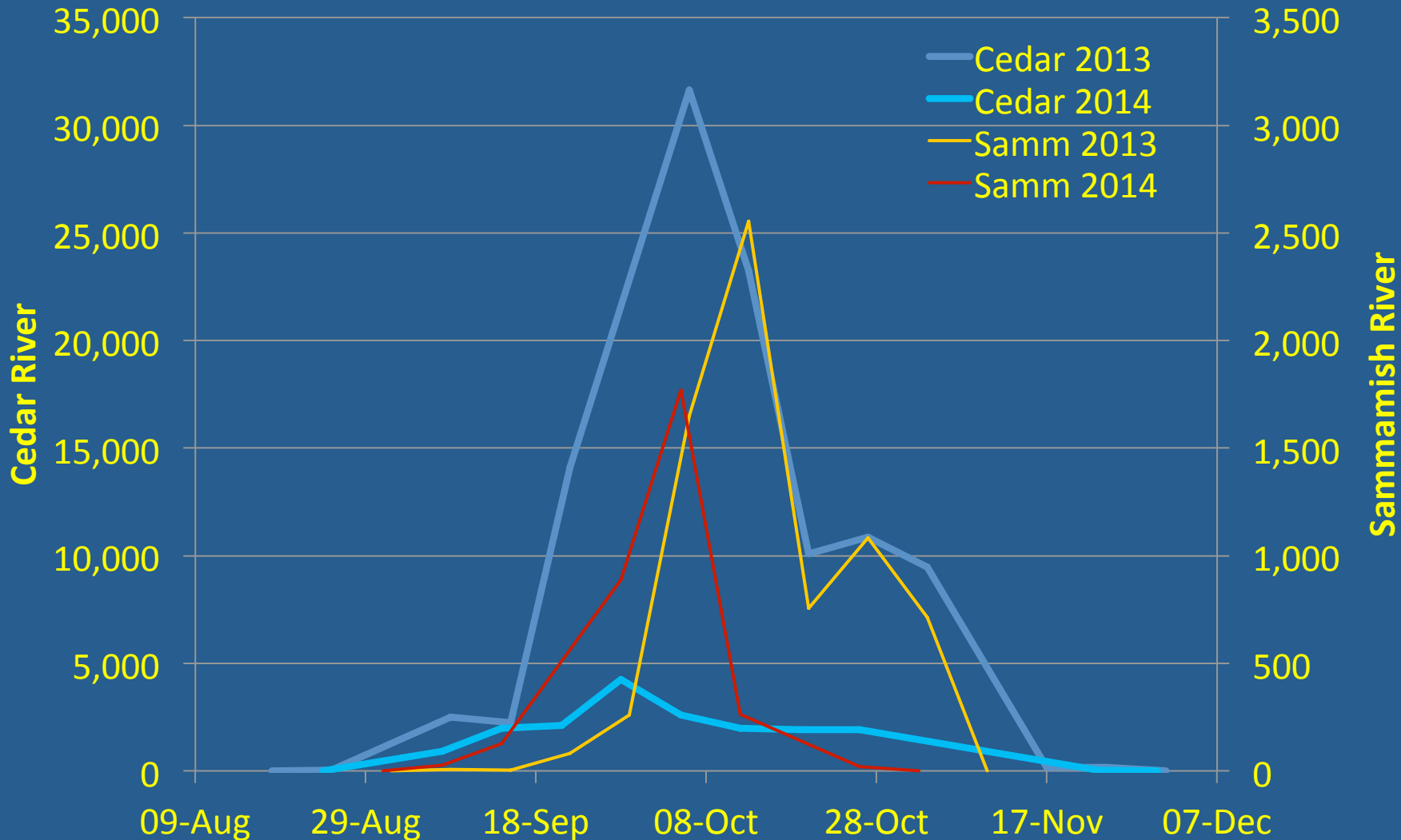
Cedar and Sammamish Timing Entering Rivers



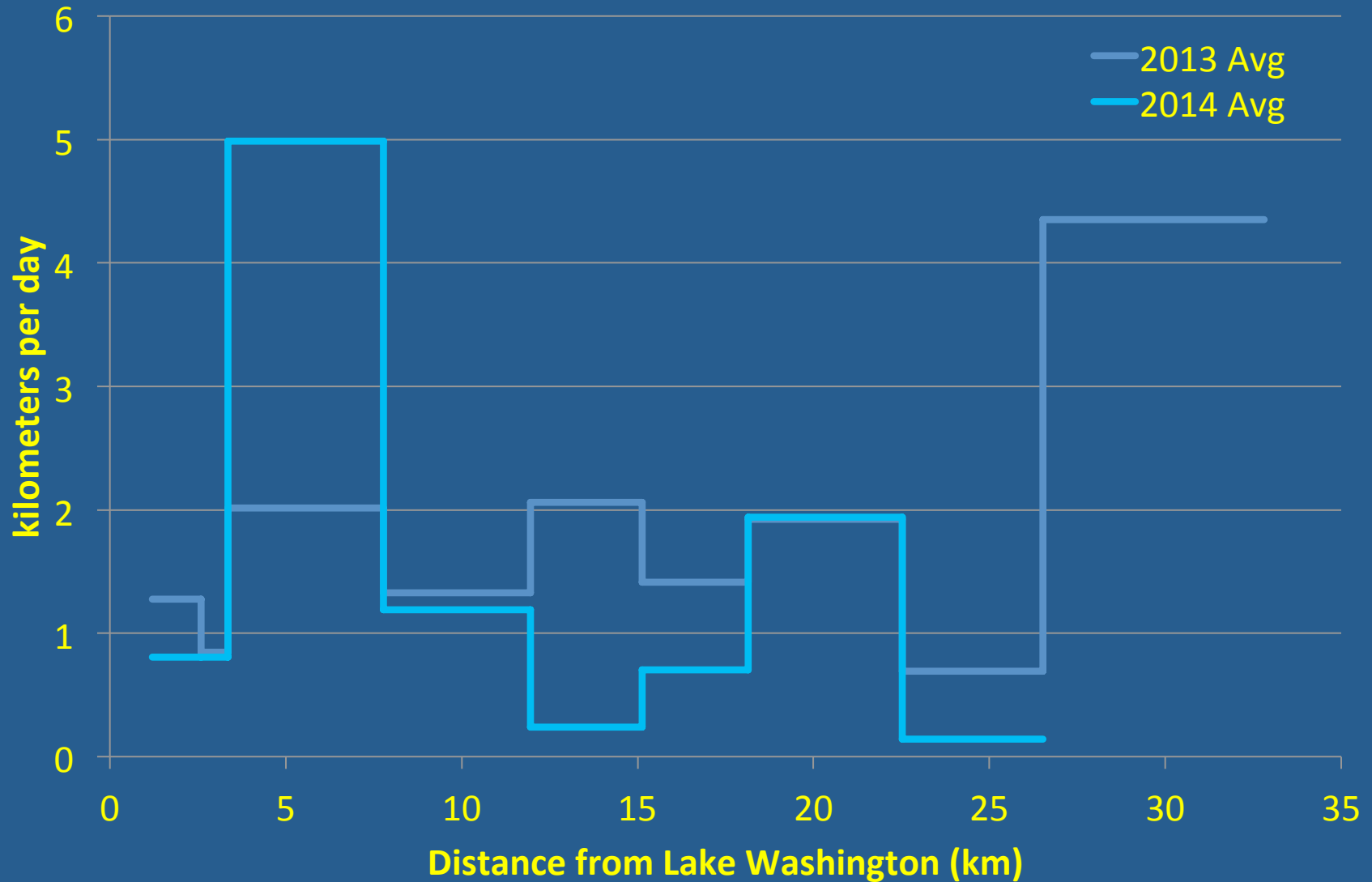
Mark/Recapture

	2013		2014	
	Index	Total	Index	Total
Lock Counts	177,349	179,203	58,442	64,670
	AUC Spawner Survey Est	M/R Est	AUC Spawner Survey Est	M/R Est
Return to Cedar	147,056	145,922	16,791	34,848
Return to Sammamish	5,964	11,520	3,012	7,550
Percent in Sammamish	4%	7%	15%	18%
Dead/shed/MIA		21,760 (12.3%)		22,361 (38.3%)

Spawner Surveys

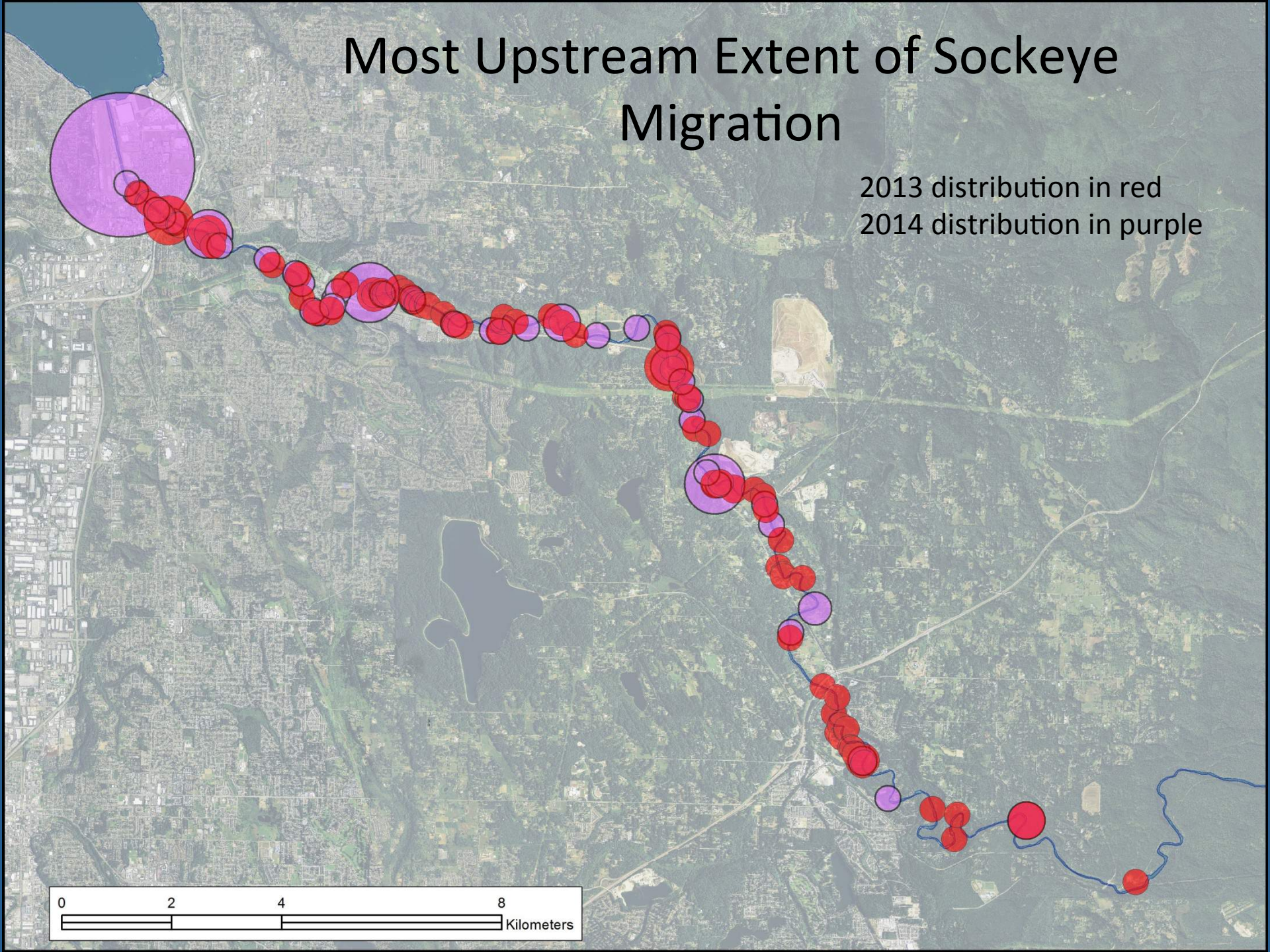
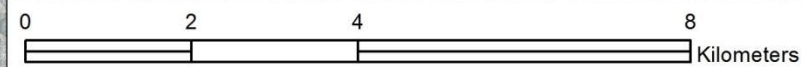


Longitudinal Migration Rate in Cedar



Most Upstream Extent of Sockeye Migration

2013 distribution in red
2014 distribution in purple



Cedar Survey (Stream) Life

	Sex	Count	Average (days)	Minimum (days)	Maximum (days)
2013	Female	59	20.4	5.8	36.6
	Male	28	20.4	9.6	47.4
	Both	87	20.4	5.8	47.4
2014	Female	18	14.4	4.6	29.7
	Male	6	17.7	7.9	47.3
	Both	24	15.2	4.6	47.3

•Data based only on carcasses where time of death could be predicted.



Conclusions

- Recycling occurs primarily at the end of the run after the index counts are complete.
- In a 'normal' year, there is little loss between the Locks and the spawning grounds.
- Sammamish sockeye are a larger percentage of the run than expected.
- Assuming the Lock counts are correct, there are more fish on the spawning grounds than we are currently estimating.
- The 15-day survey life estimate used for AUC escapement estimation is likely too low. It follows then that the live count must be an underestimate.



Acknowledgements

Cavanaugh Pond sockeye, Christmas Eve, 2014

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 - Paul Faulds
- US Army Corps of Engineers
- Lion's Club on the Cedar
- Mercer Island Police

- And many others

