Testing Delayed Mortality of Snake River Chinook Salmon in the Coastal Ocean

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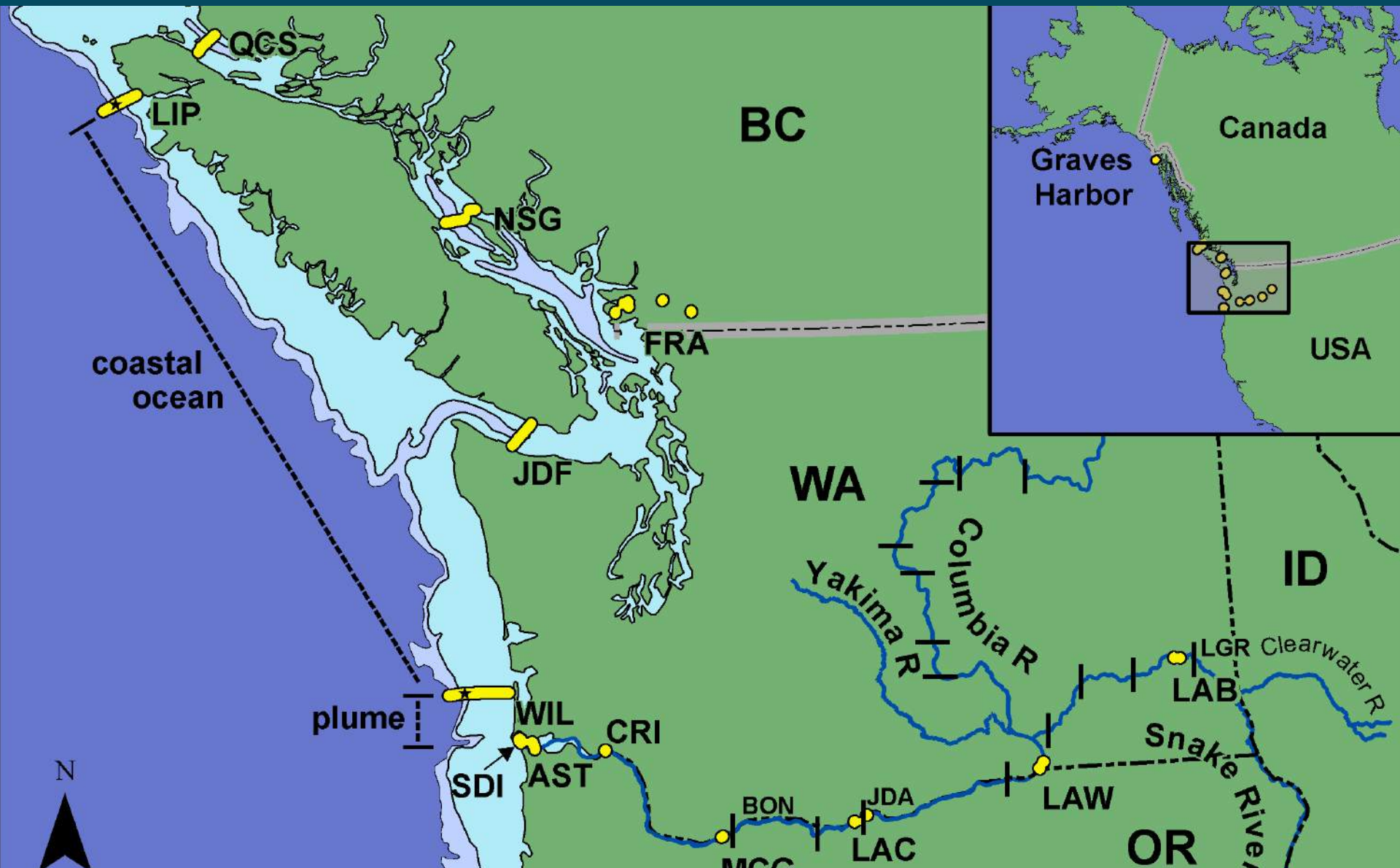
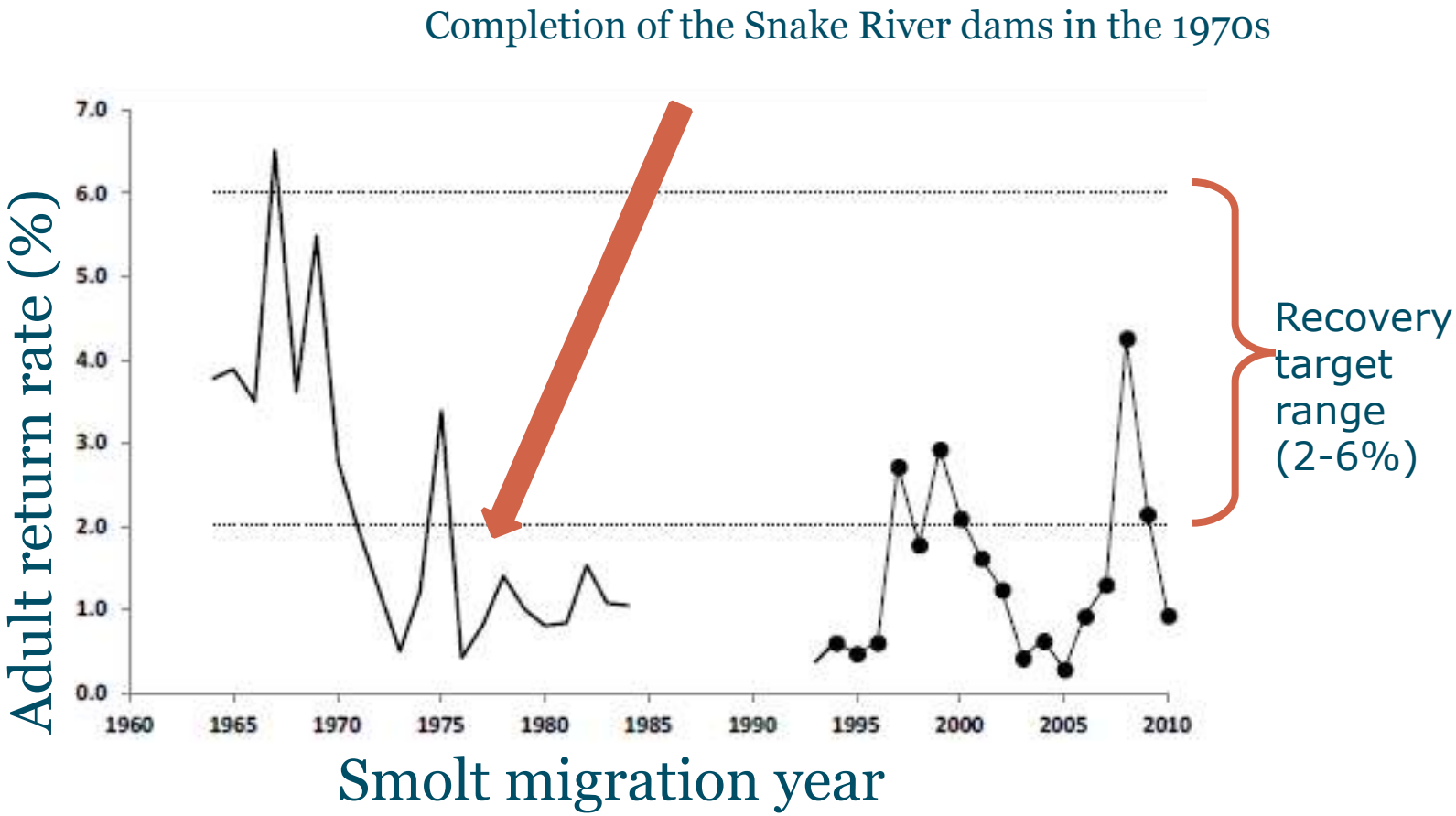
KINTAMA

Columbia and Snake Rivers



Fish transportation barge

Return Rates of Snake River Spring Chinook



* Data from the Fish Passage Center Comparative Survival Reports

Delayed Mortality Hypothesis

Index of Return Rates

* Petrosky et al . 2013. CJFAS

Hypothesis Tests

Spring Chinook from the mid-Columbia R have 3-4x higher return rates

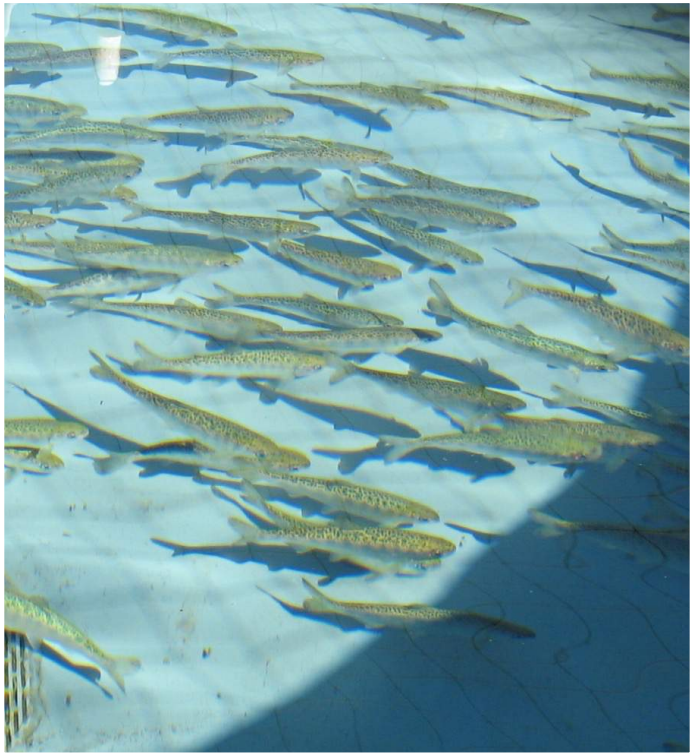
- Does passage through the Snake River dams result in delayed mortality (hydro DM) in the estuary and ocean?

Snake River spring Chinook transported around the dams have marginally better return rates

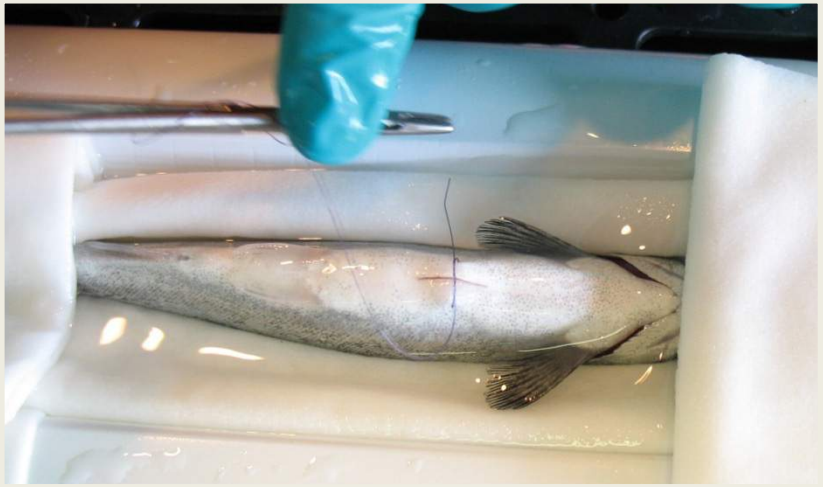
- Does transportation via barge result in delayed mortality (transport DM)?

How can we test delayed mortality hypotheses?

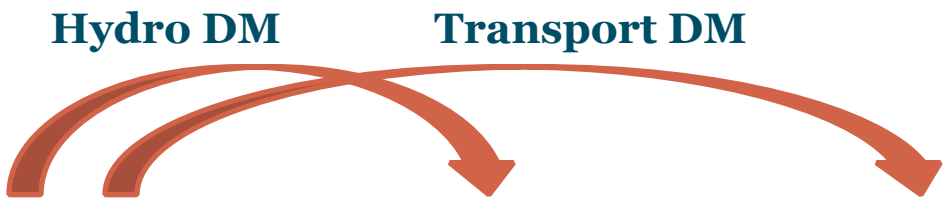
1. Deploy a strategically placed large-scale tracking array
2. Release acoustic tagged smolts
3. Recover data from the array
4. Use detections to estimate survival (CJS)
5. Compare survival estimates in the estuary and ocean
   - Snake River spring Chinook vs. mid-Columbia River
   - Snake River spring Chinook vs. transported Snake River spring Chinook

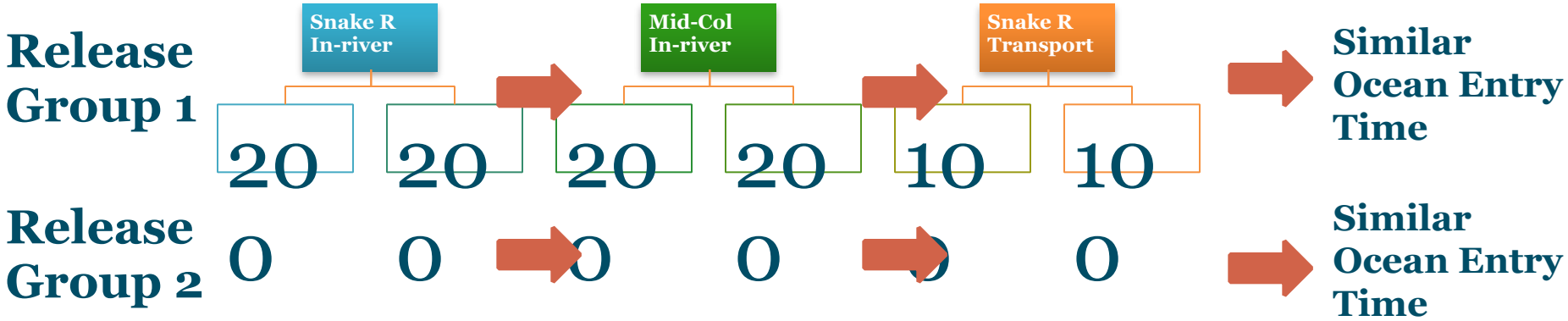


800-1600 fish/year
(6,600 total)



Study Design

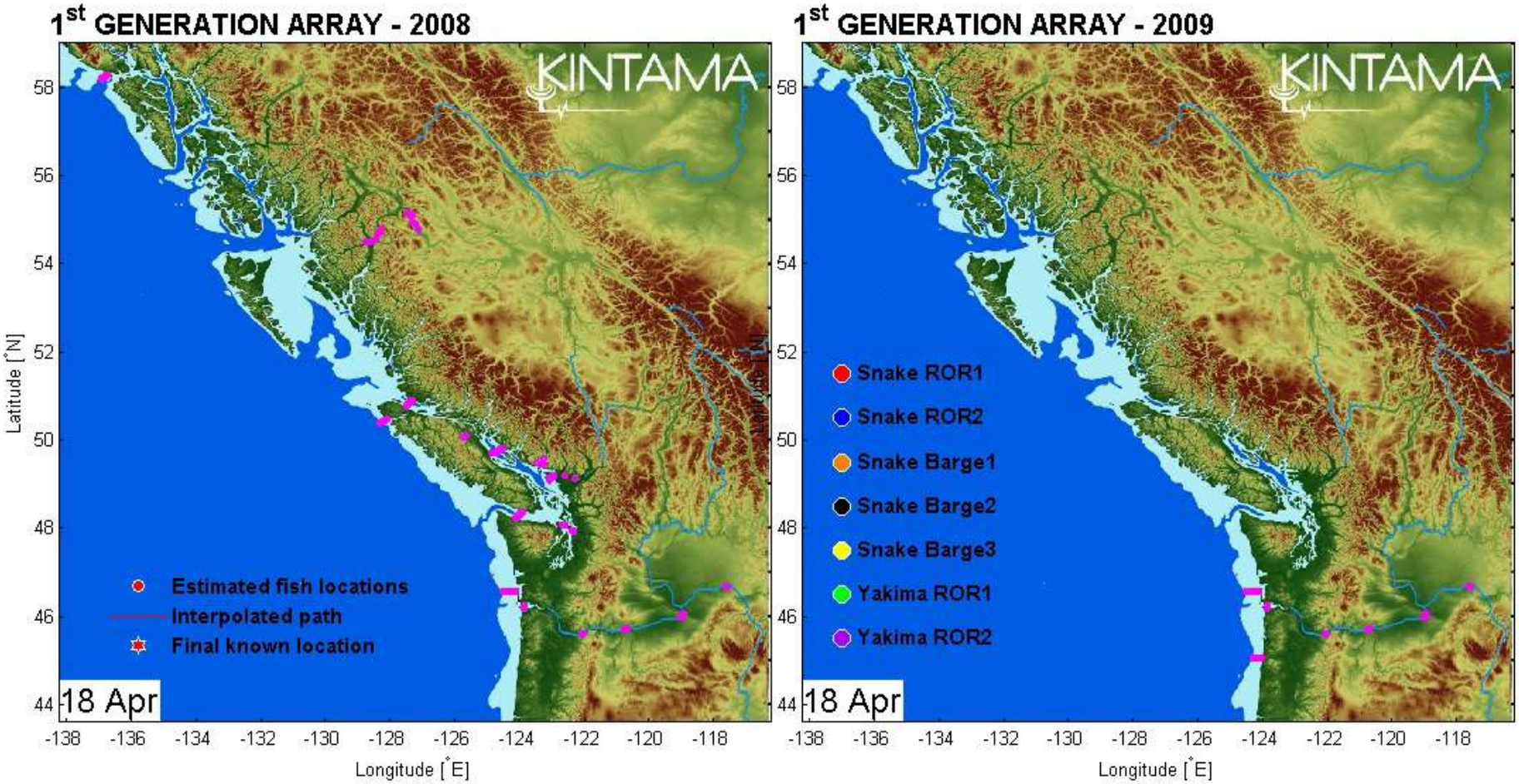





250+ VRs

Map of the Array

Visualizations of Juvenile Migration in 2008 & 2009



Cormack-Jolly-Seber Survival Estimation

release

Sub-array 1

Sub-array 2

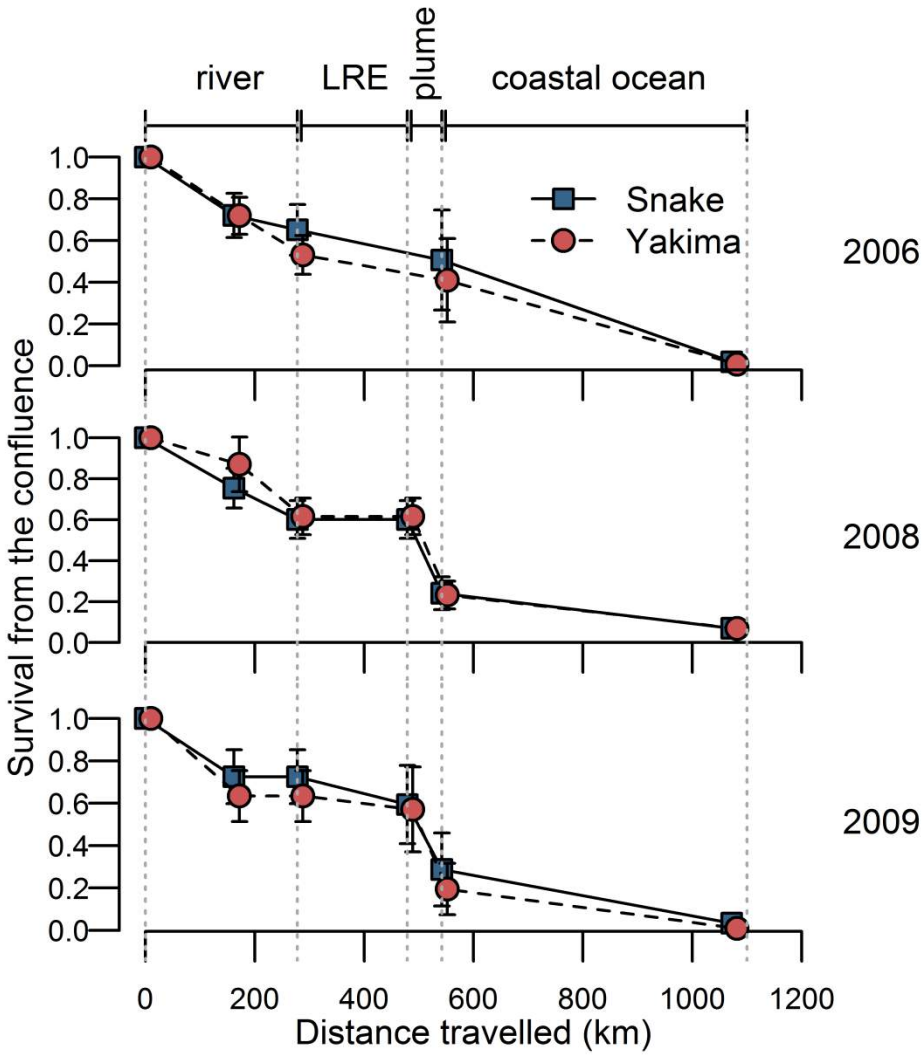
Sub-array 3

$\frac{75}{100} = 75\%$

$SE = \sqrt{\frac{p(1-p)}{n}} = 4\%$

Results: Test of hydro DM 2006-2009*

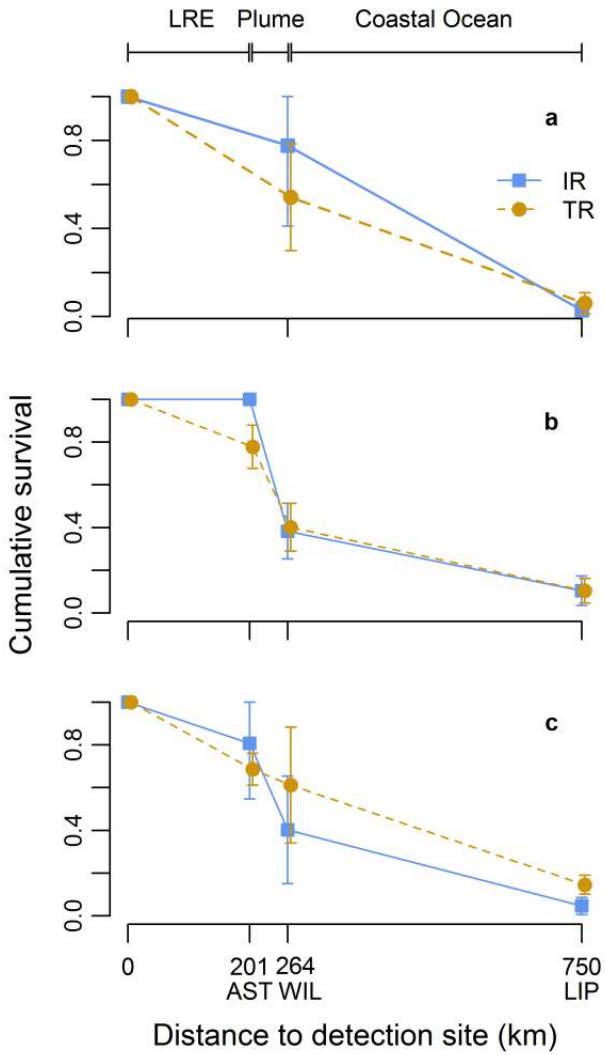
(Snake & Mid-Columbia spring Chinook)



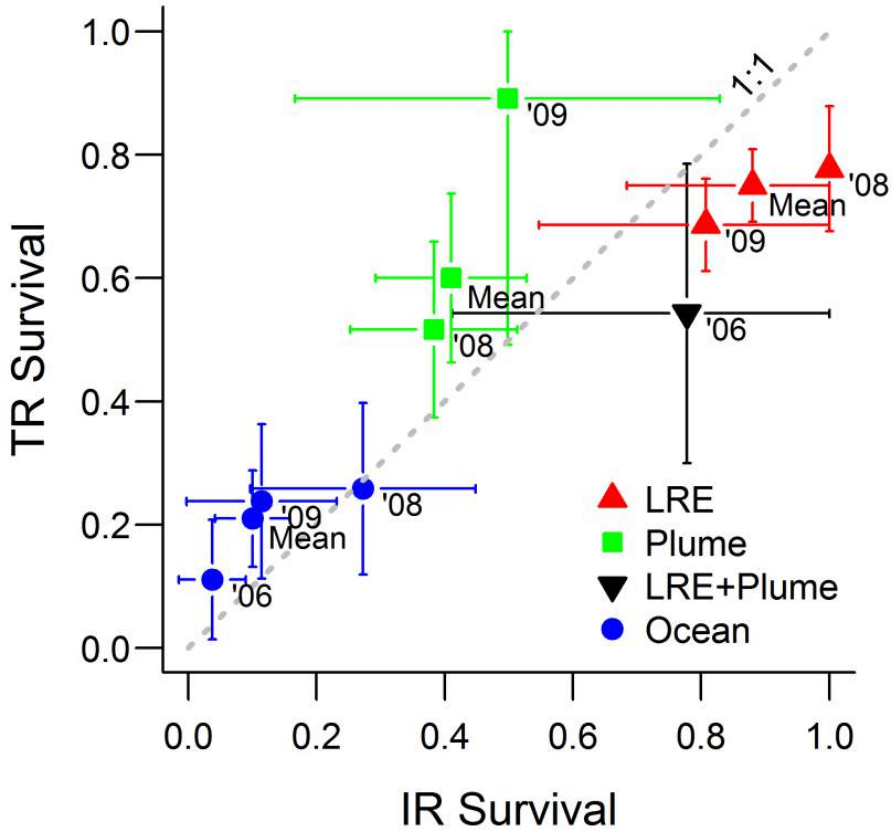
*Rechisky et al. 2013. Proceedings of the National Academy of Sciences.

Results: Test of transport DM 2006-2009*

(Snake and mid-Columbia Spring Chinook)



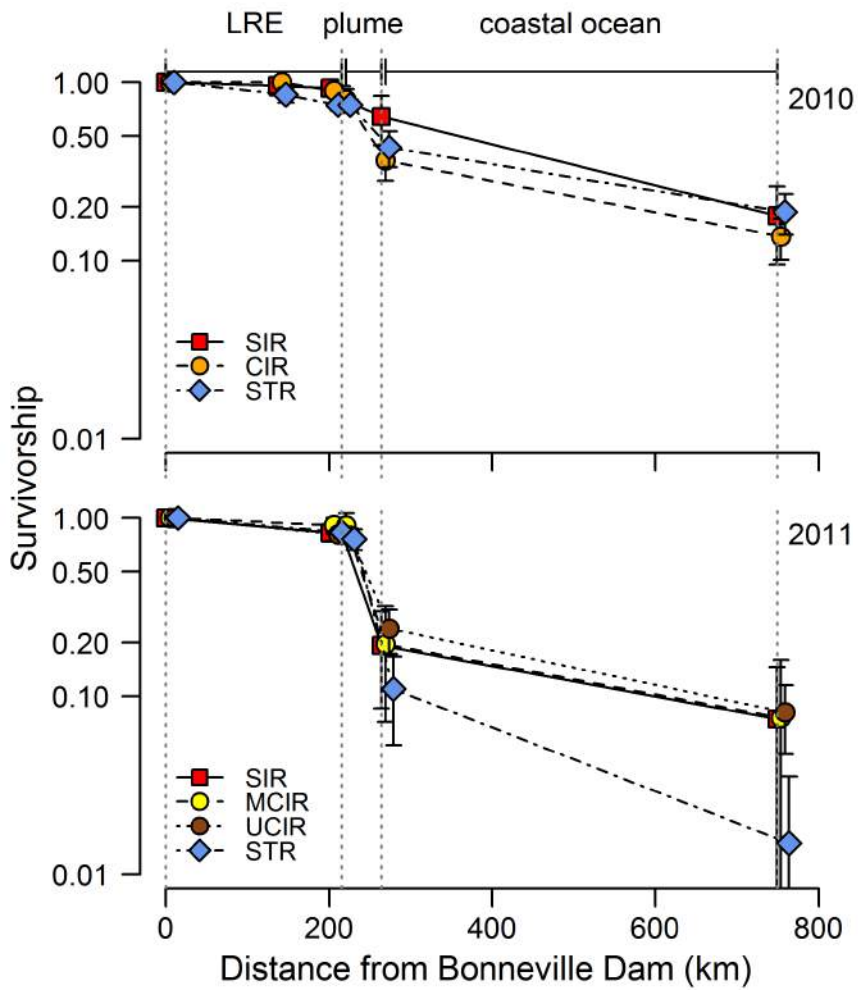
Relative survival



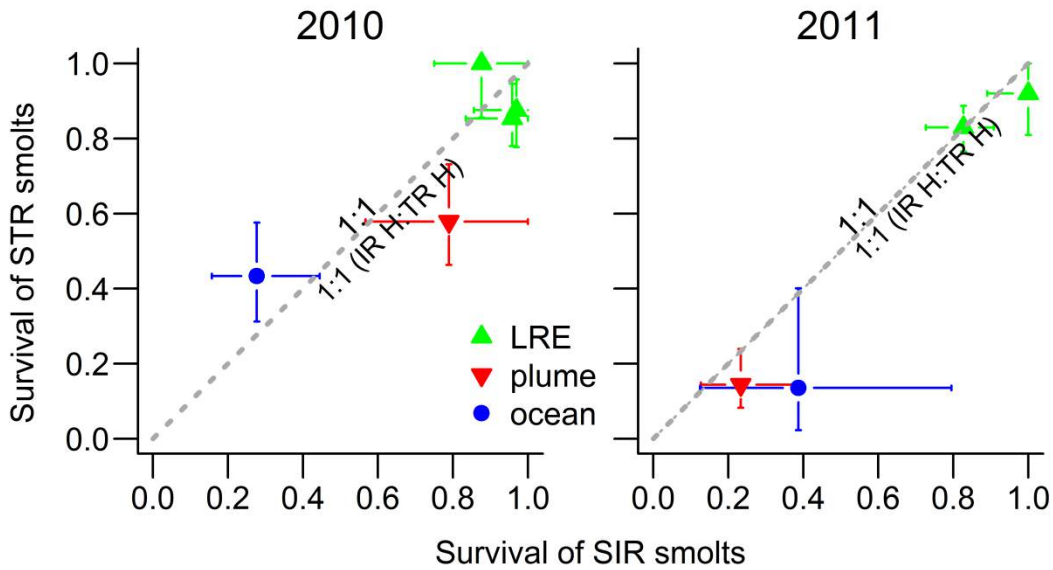
*Rechisky et al. 2012. Nature Scientific Reports

Results: Test of transport DM 2010-2011*

(Snake & Columbia yearling Chinook collected at dams)



Relative survival



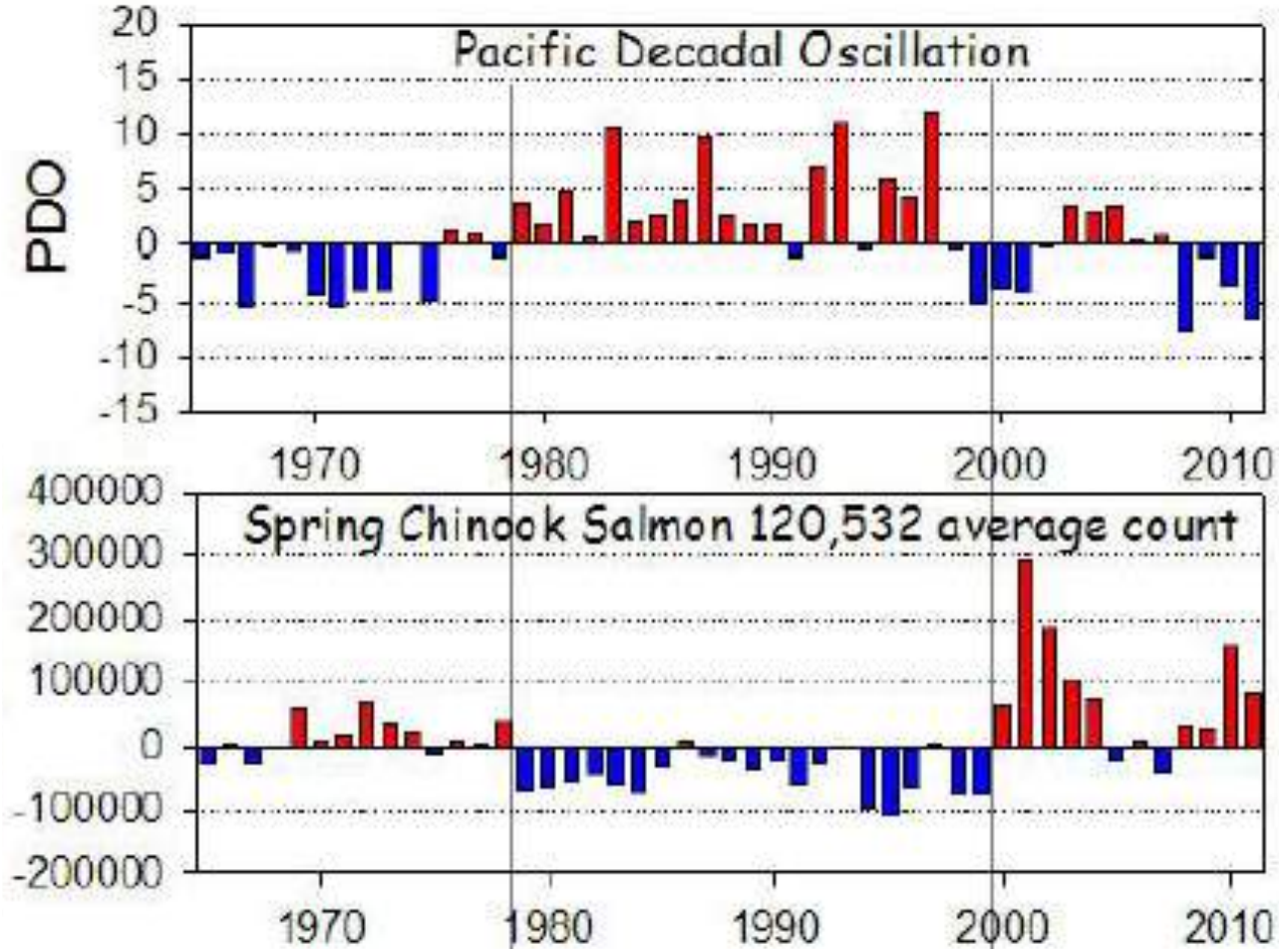
*Rechisky et al. 2014. Marine Ecology Progress Series

Conclusions

- Purpose built, large-scale array to address critical uncertainties
- No evidence of delayed mortality for smolts migrating through 8 dams
- No transportation delayed mortality in 4 of 5 years
- Early marine mortality is high
- Differences in adult return rates may develop far from the Columbia River…

Ocean Conditions

Anomaly of number of adults returning to Spawn



Peterson et al. 2012 NOAA

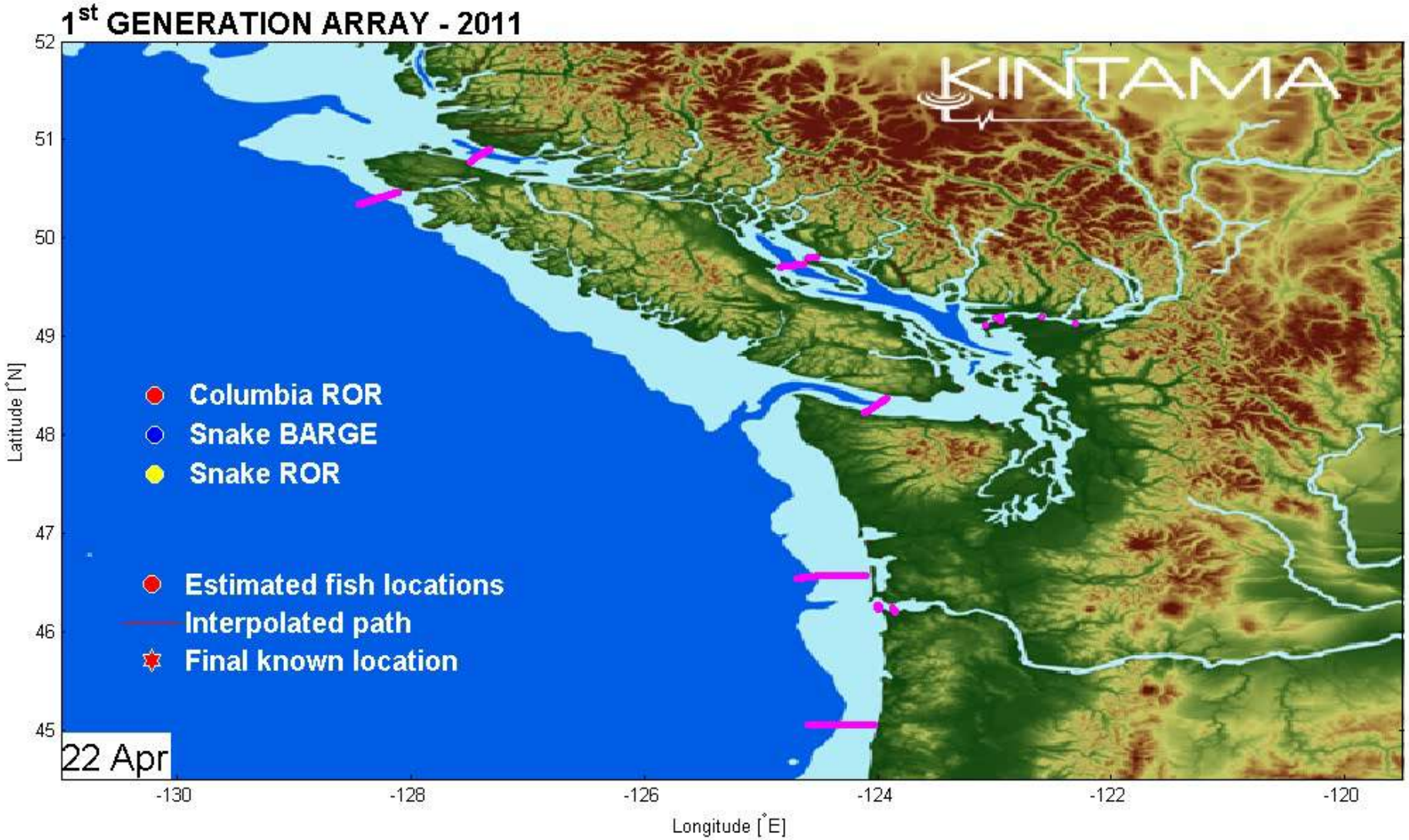
Thank You!

- Dworshak and Kooskia NFH staff
- Yakama Nation, Prosser Hatchery and Chandler Juvenile Fish Monitoring Facility staff
- Smolt Monitoring Facility staff at Lower Granite, John Day and Bonneville dams
- Columbia River Inter-Tribal Fish Commission- Jon Hess, Shawn Narum

BONNEVILLE POWER ADMINISTRATION

- Funding: Dept. of Energy, Bonneville Power Administration

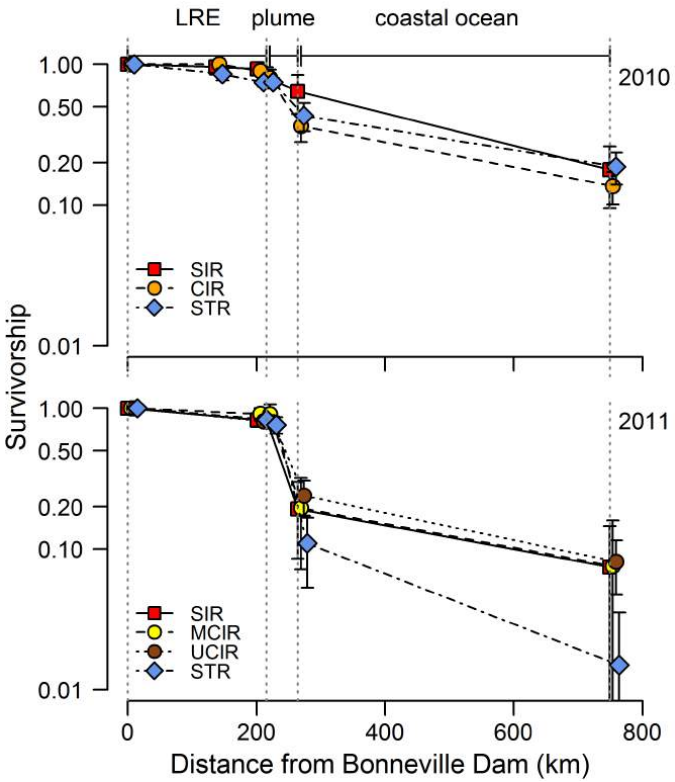
Visualization of Juvenile Migration in 2011



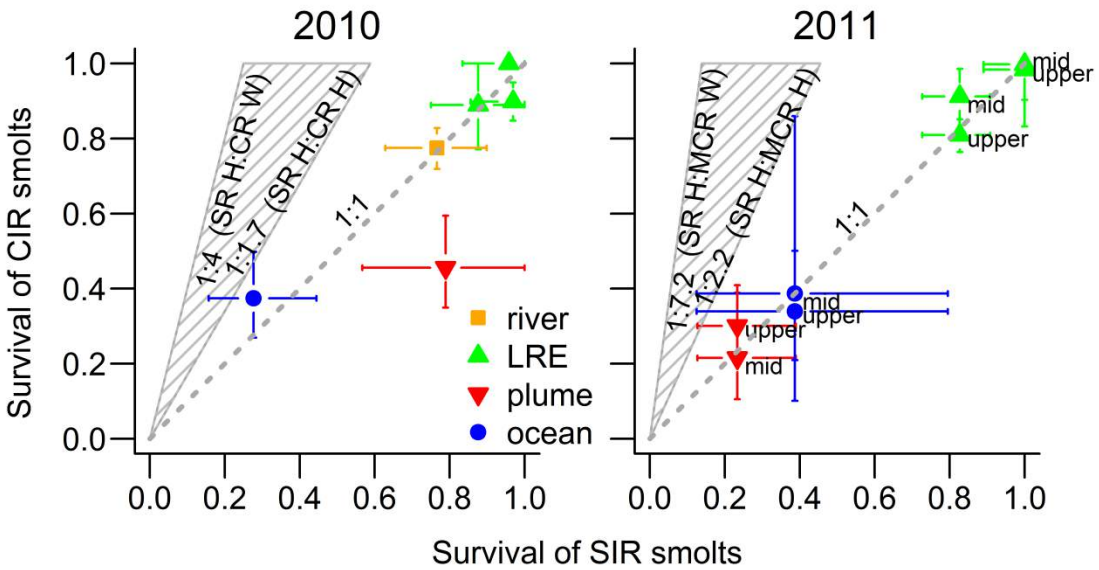
Results: Test of hydro DM 2010-2011*

(Snake & Columbia yearling Chinook collected at dams)

Post-Bonneville Dam cumulative survival



Relative survival



*Rechisky et al. 2014. Marine Ecology Progress Series