Outmigration Survival of Juvenile Salmon and Steelhead in the Yakima River, Washington

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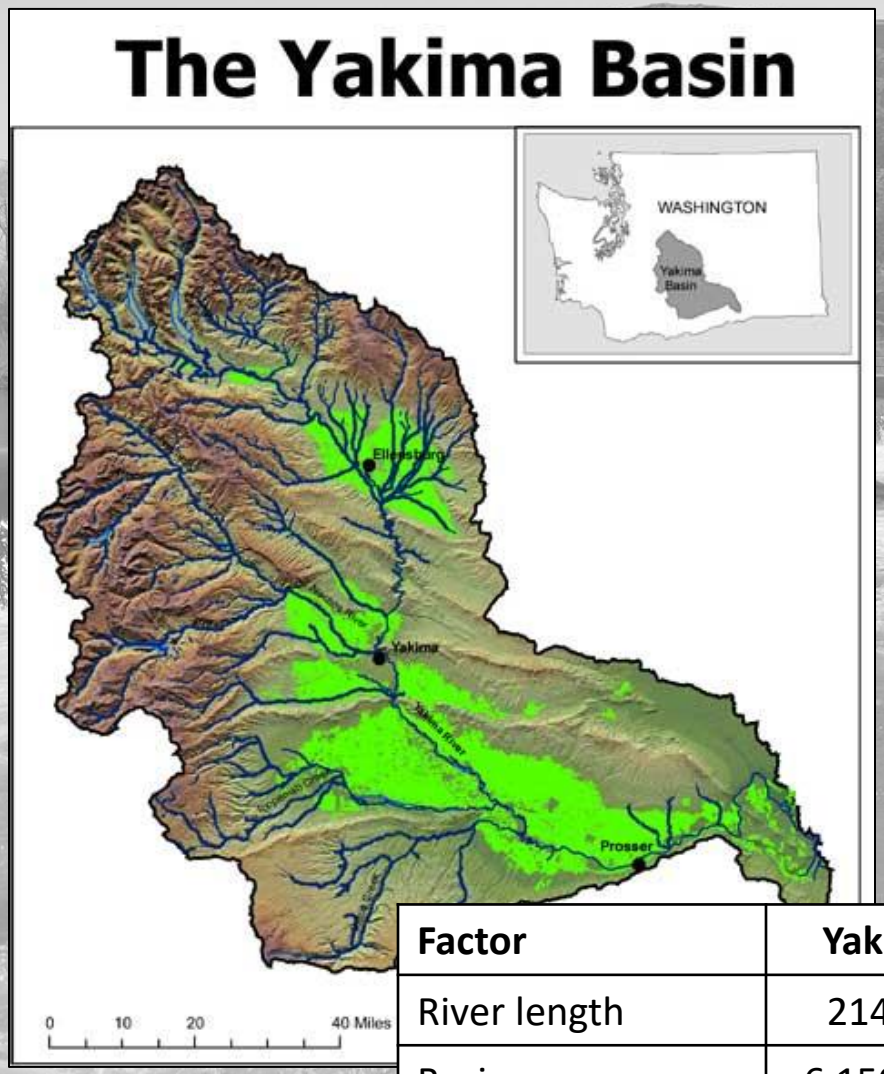
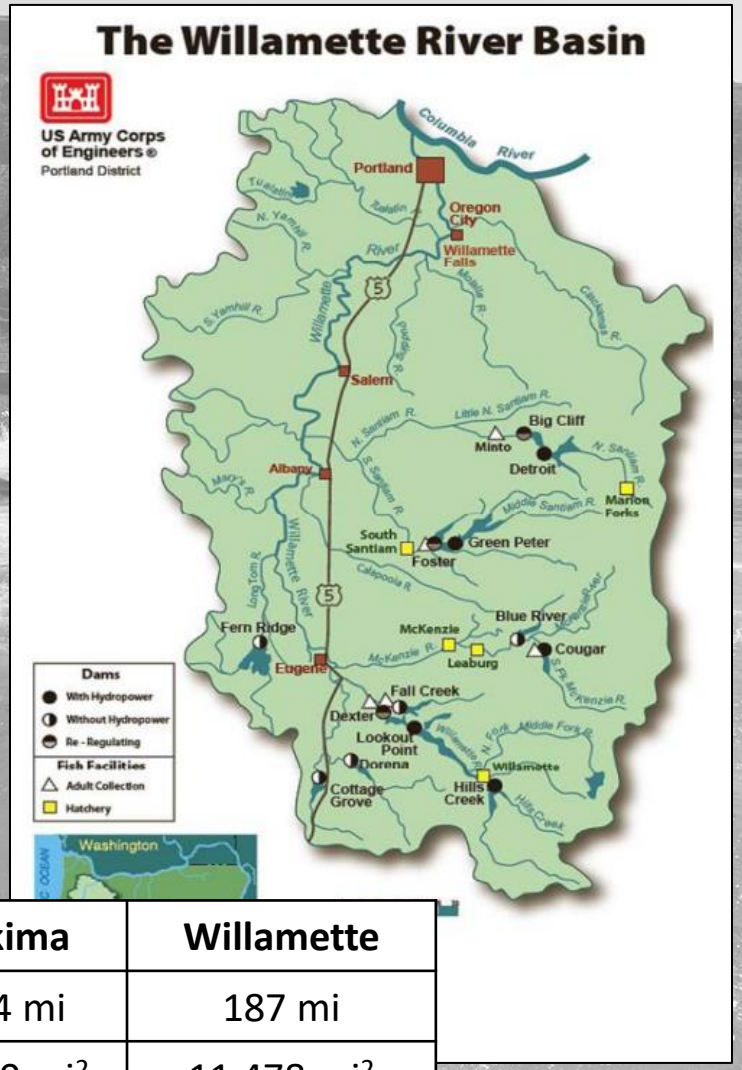
U.S. Department of the Interior
U.S. Geological Survey

Similarities: Yakima and Willamette Rivers





Factor	Yakima	Willamette
River length	214 mi	187 mi
Basin area	6,150 mi^2	11,478 mi^2
Average discharge	3,493 ft^3/s	33,010 ft^3/sec

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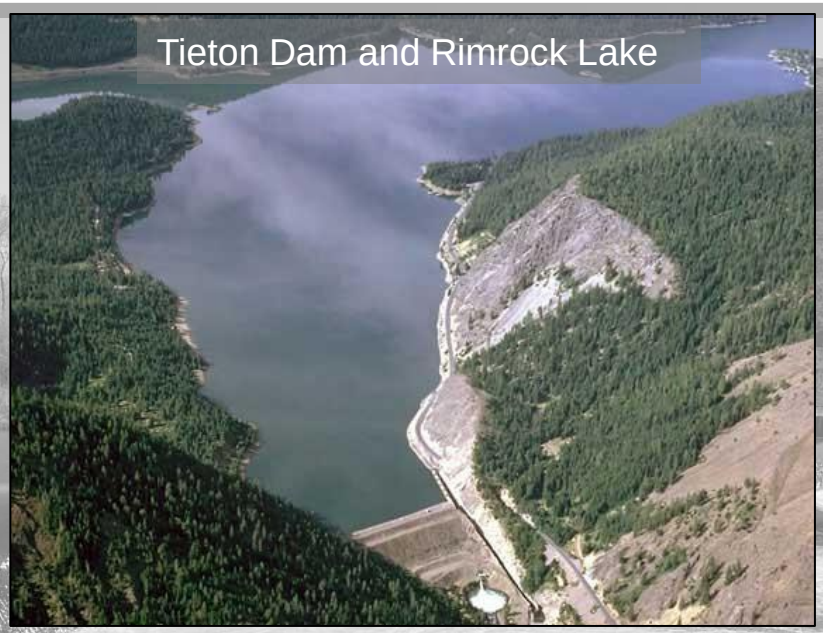
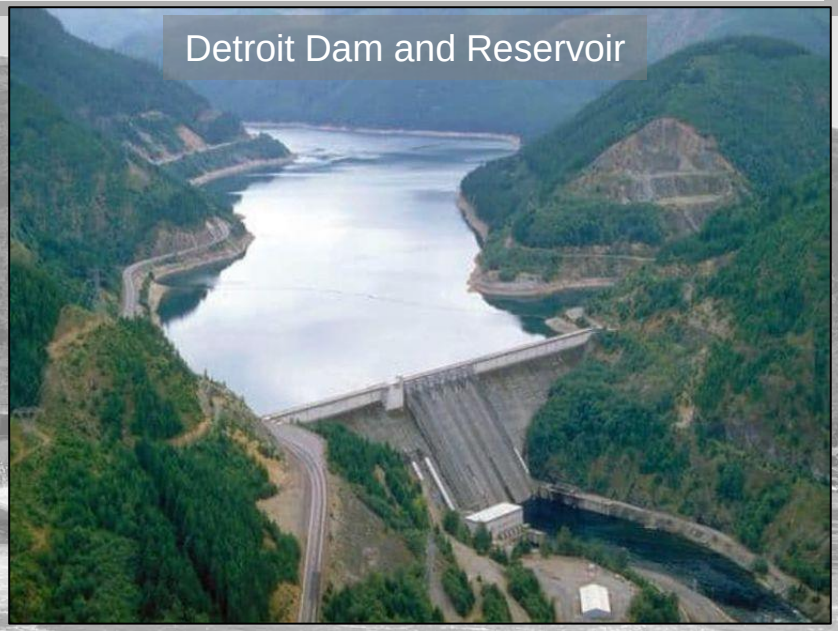
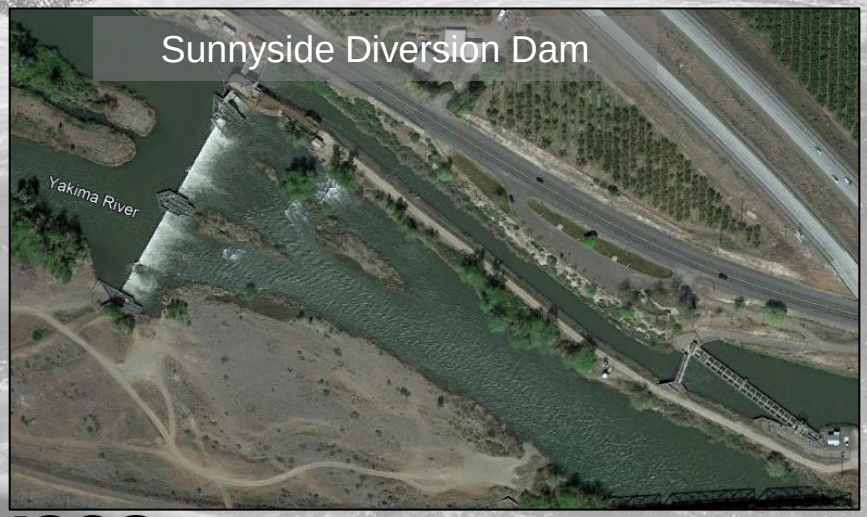
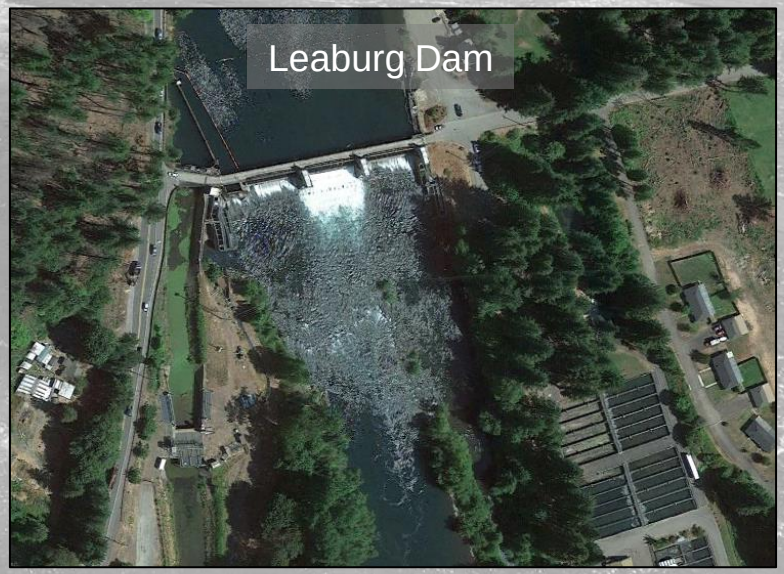
Maps courtesy of the Yakima Basin Fish and Wildlife Recovery Board and U.S. Army Corps of Engineers

High Head Dams, Reservoirs, and Diversion Dams









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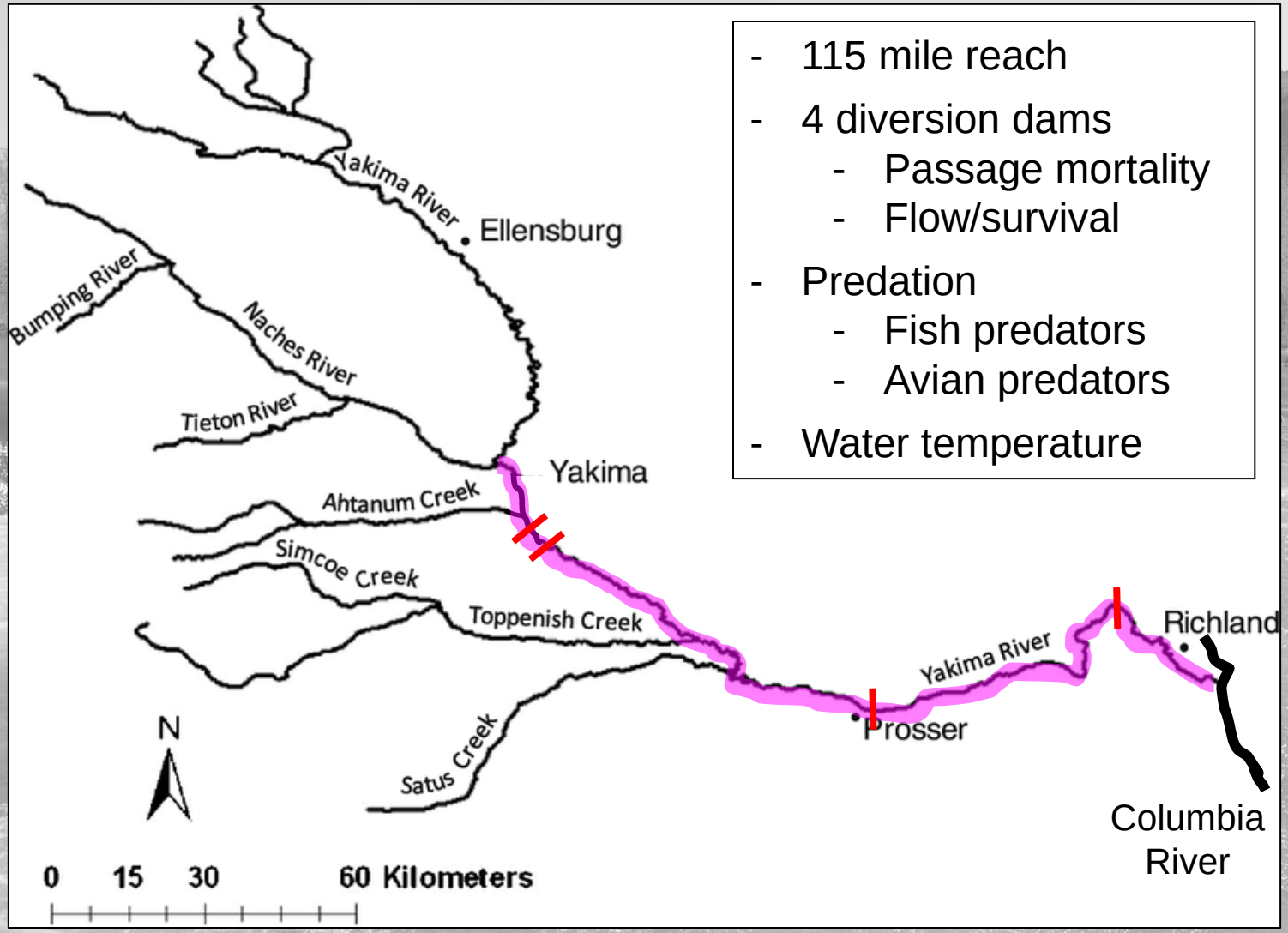
Mainstem Research Focus



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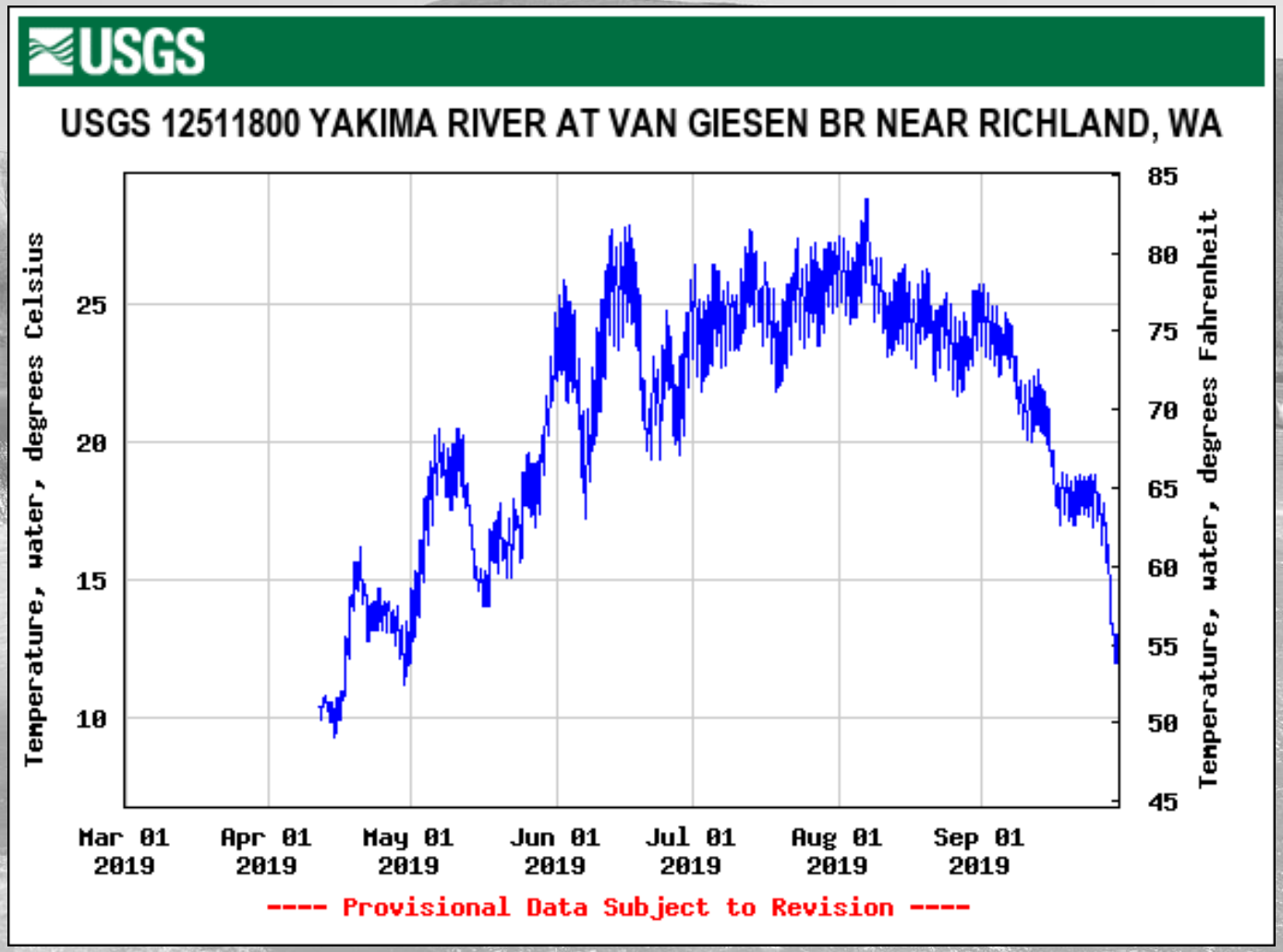
Modified from Hardiman et al. 2013

Elevated Summer Water Temperature



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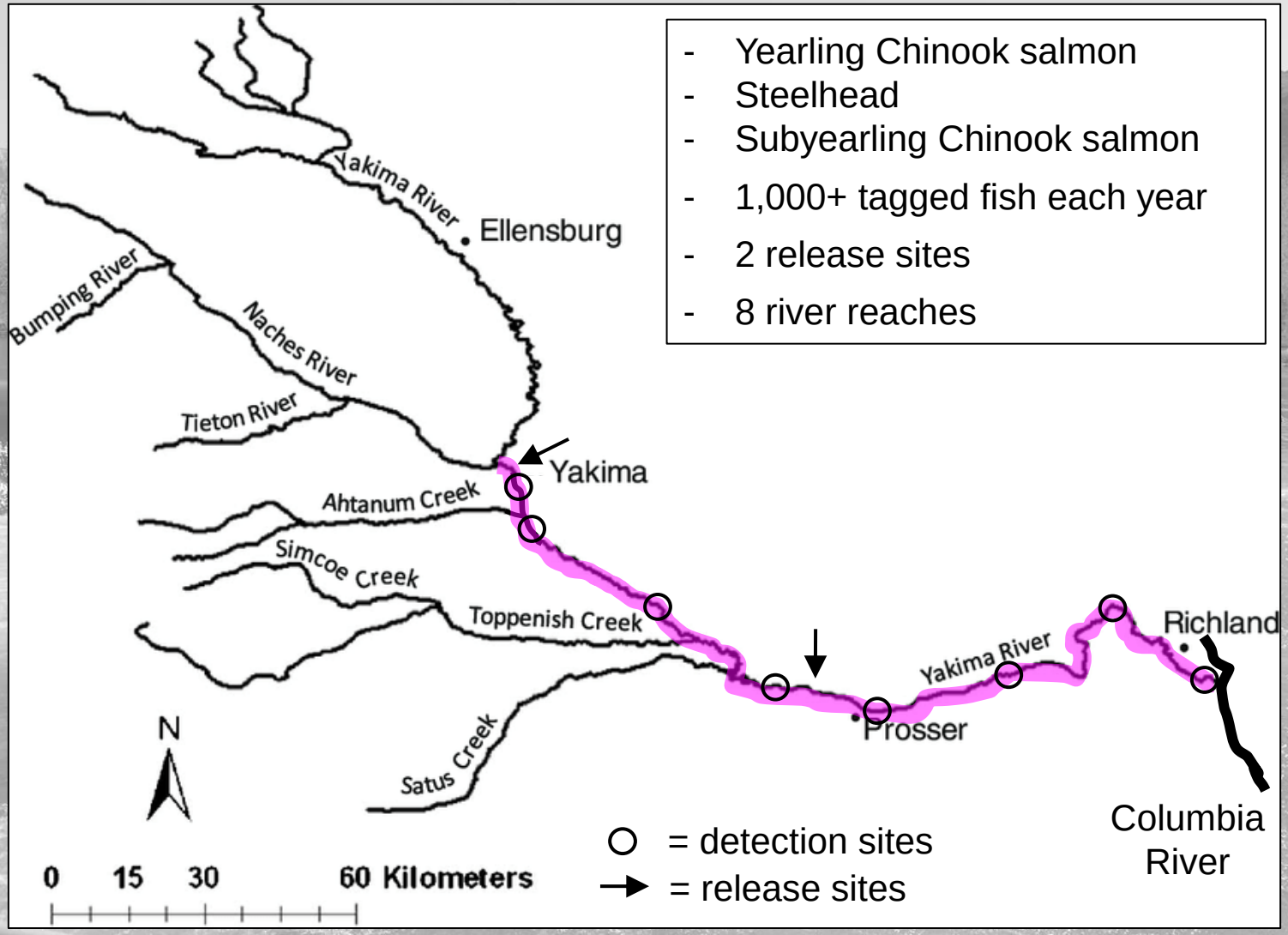
Multiyear Telemetry Study



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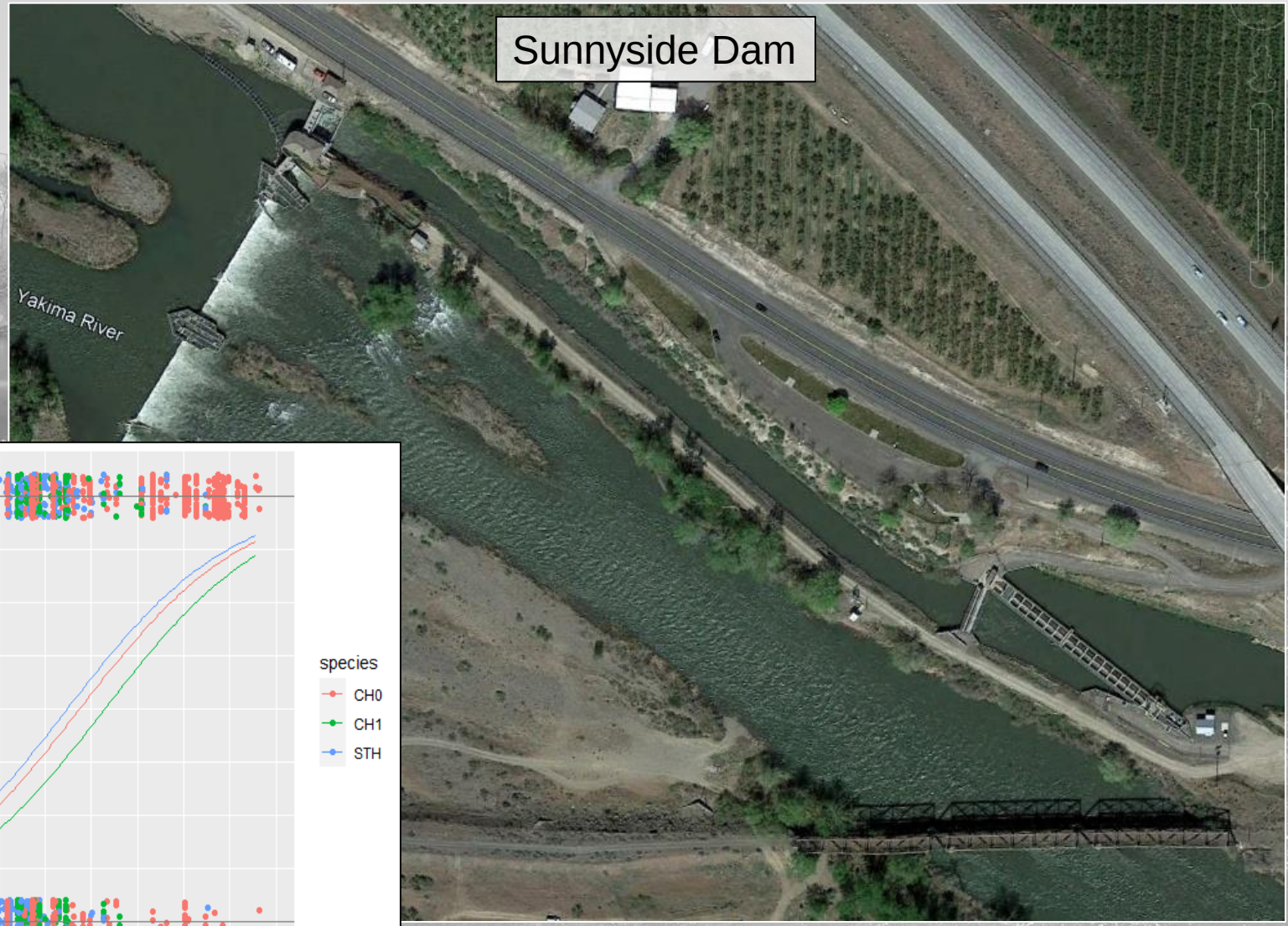
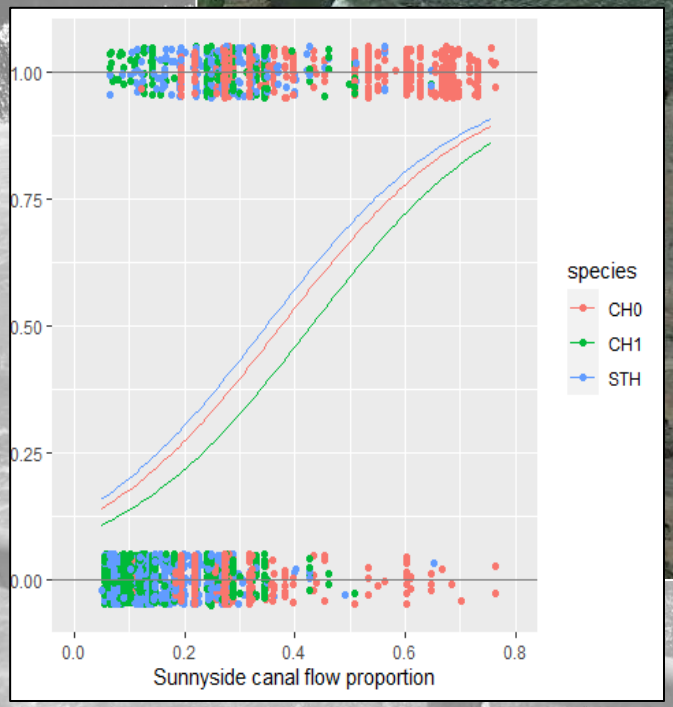
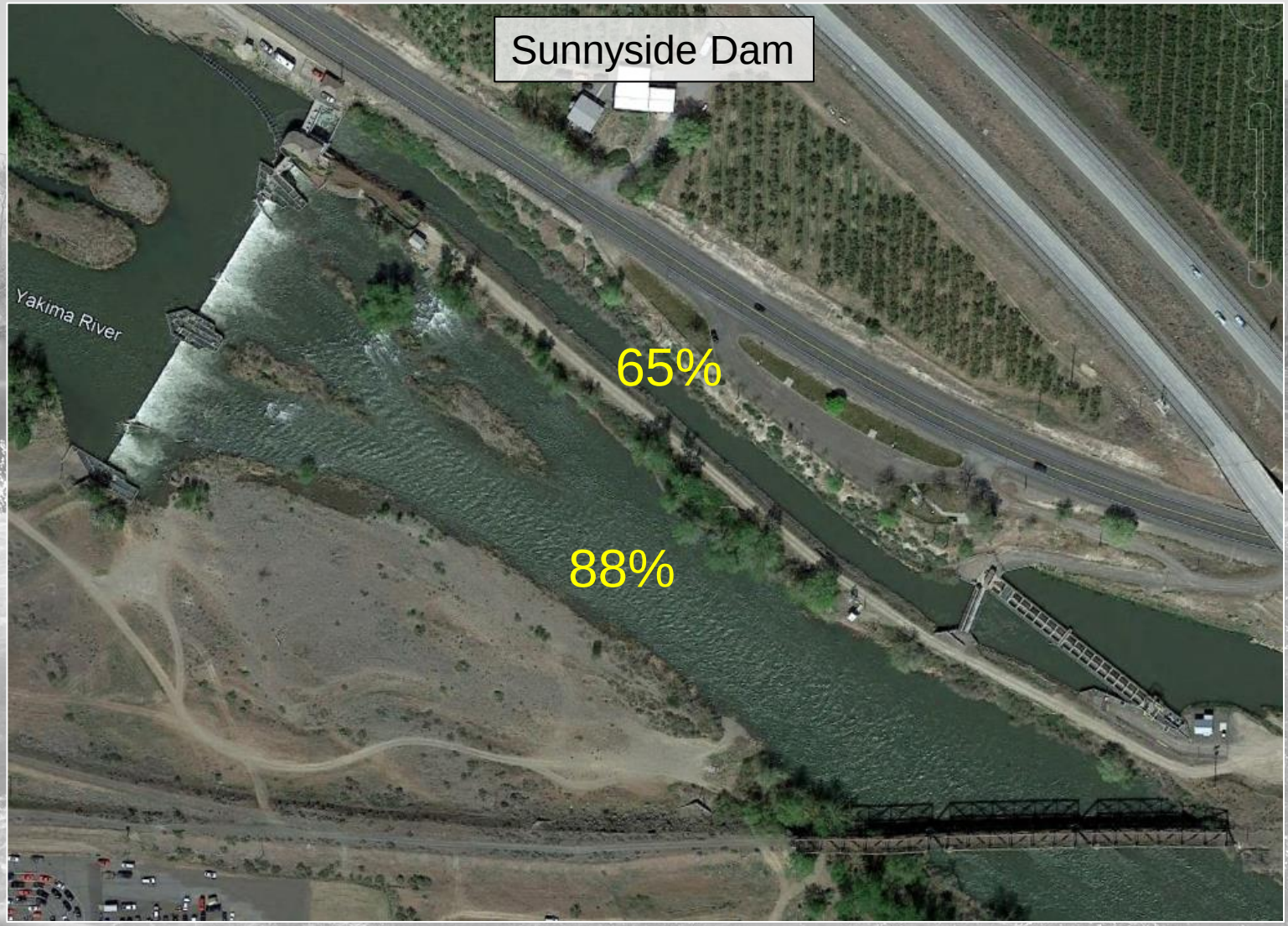
Modified from Hardiman et al. 2013

Entrainment Probabilities





Survival Implications



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Testing Canal Exclusion Devices

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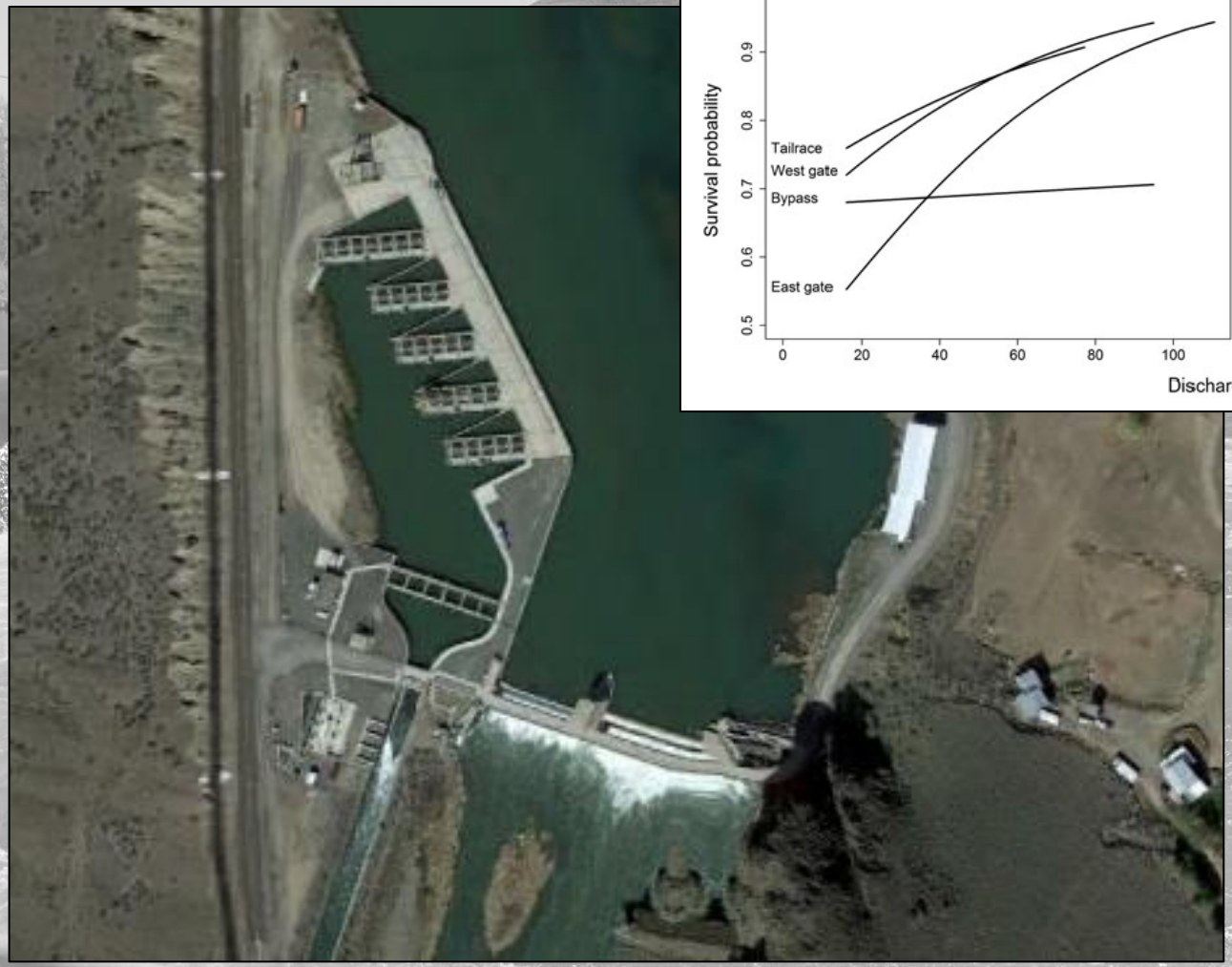
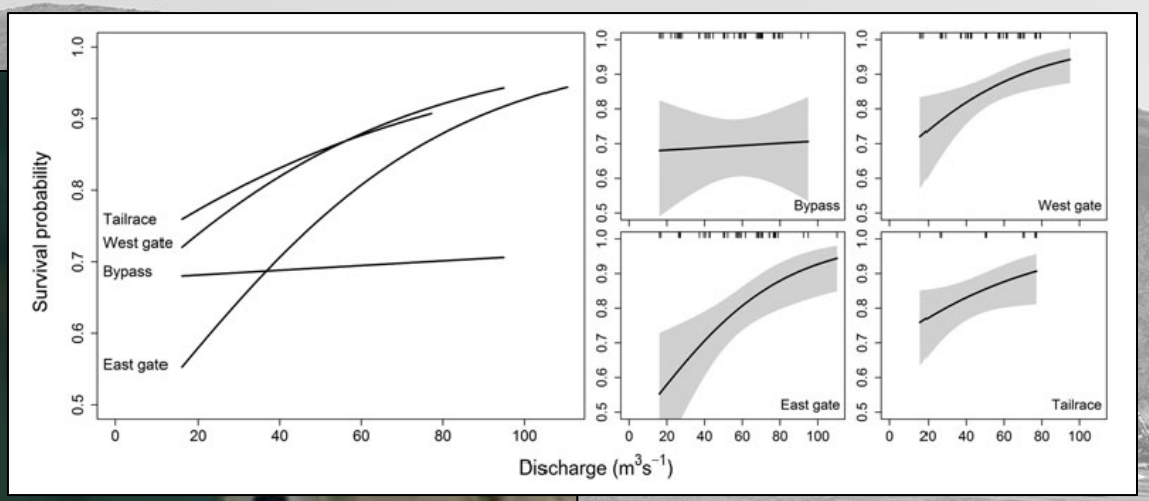
Diversion Dam Passage Survival





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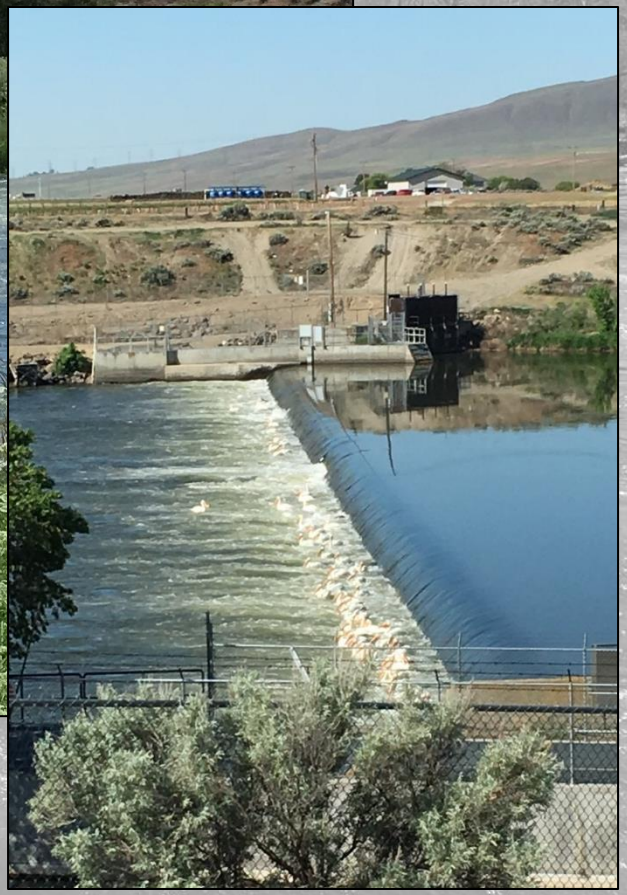
Predator Concentrations



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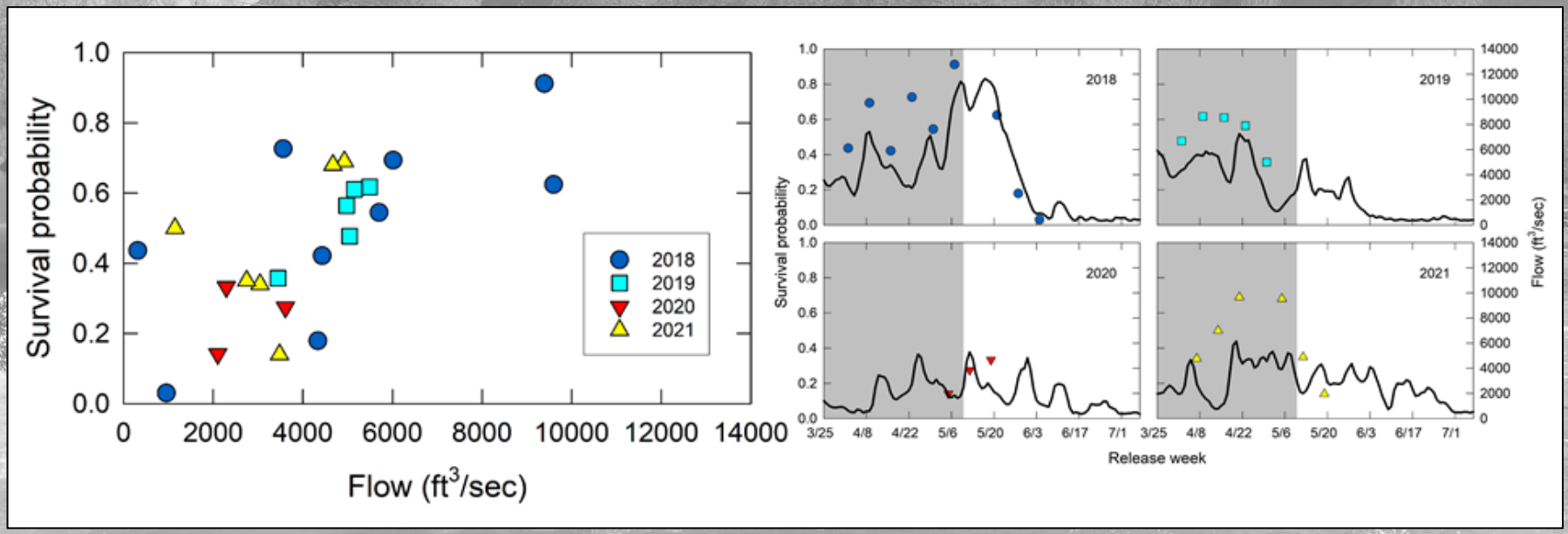
Cumulative Survival

Yearling Chinook Salmon



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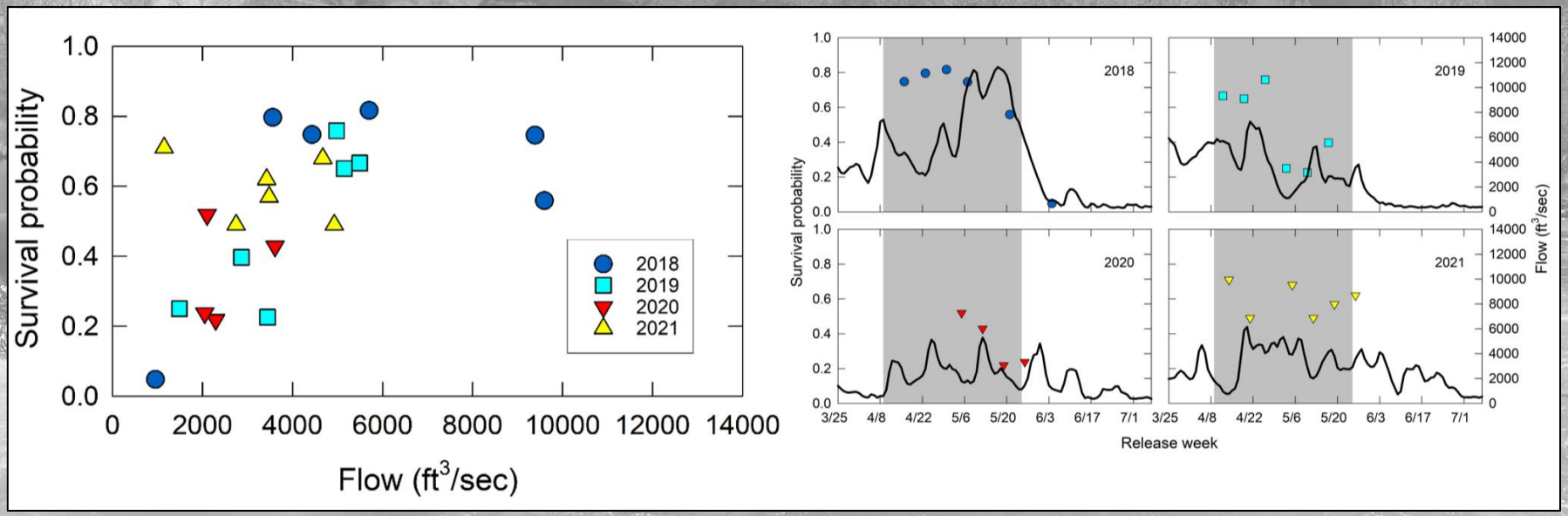
Cumulative Survival

Juvenile Steelhead



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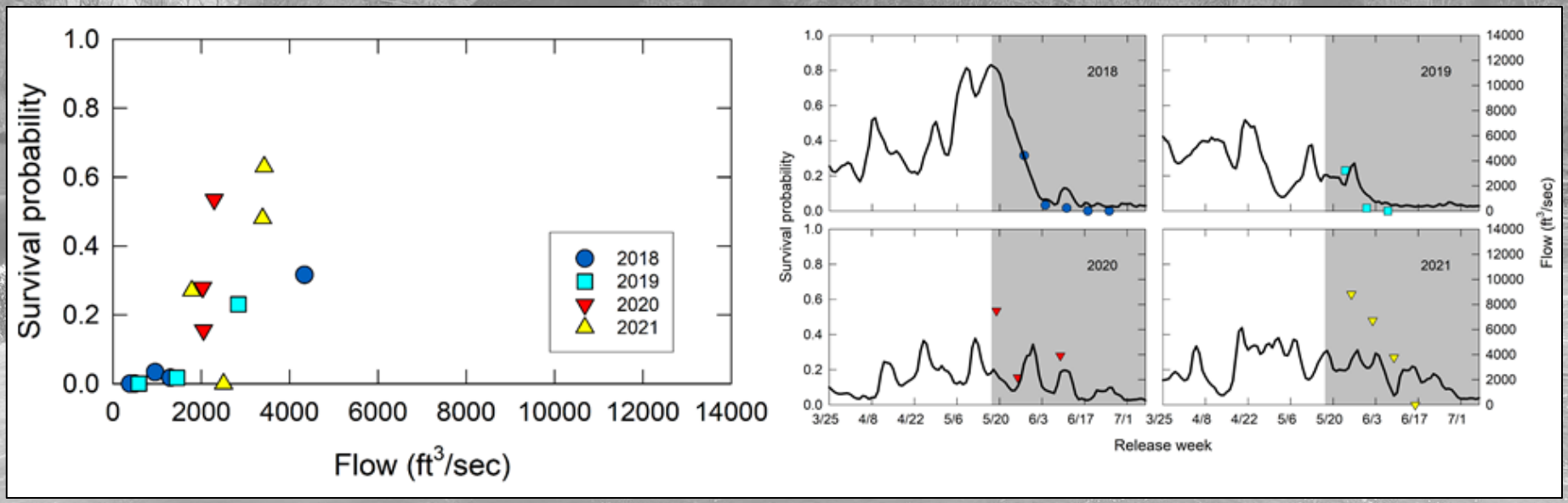
Cumulative Survival

Subyearling Chinook Salmon



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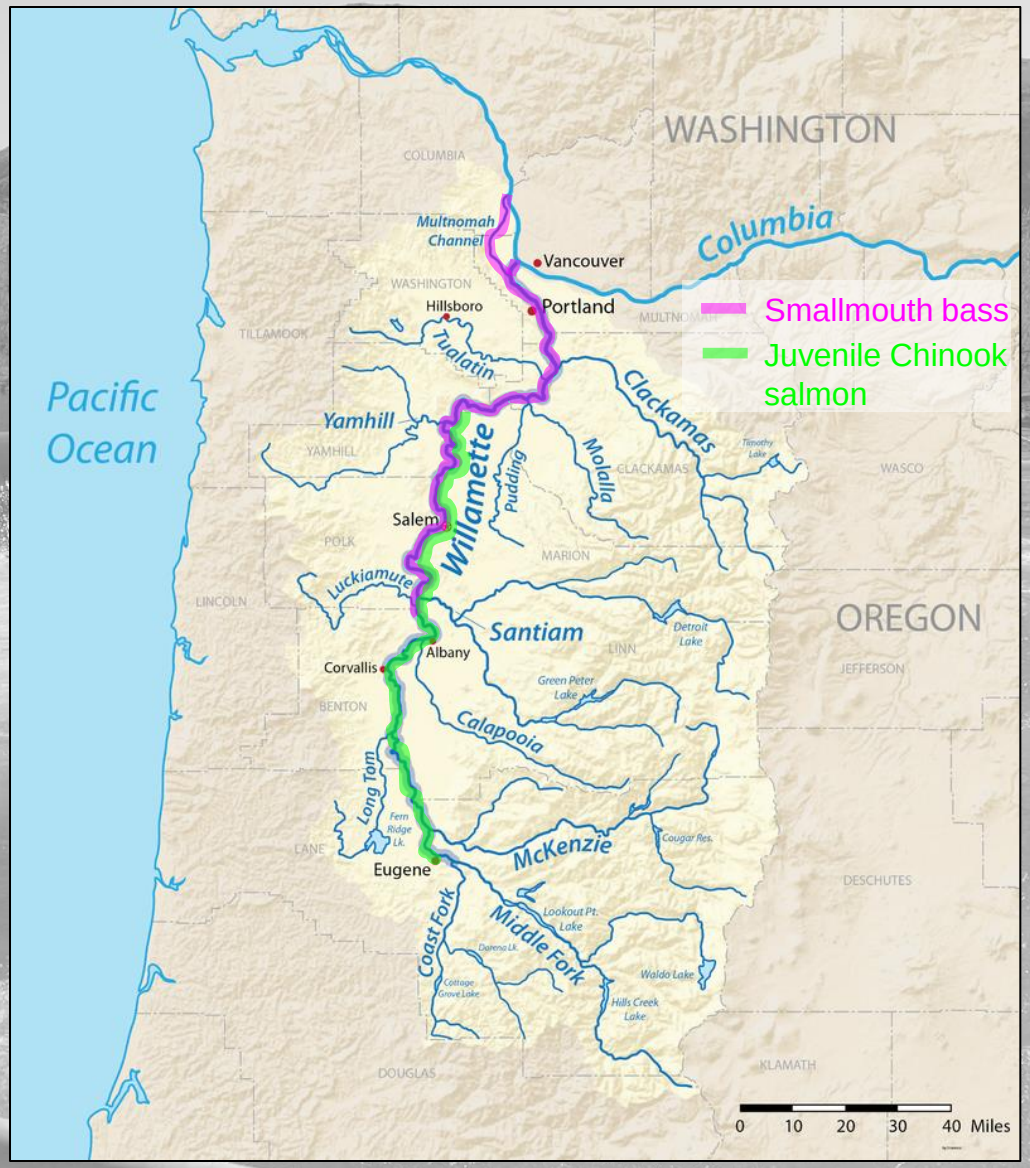
Relevance to the Willamette?



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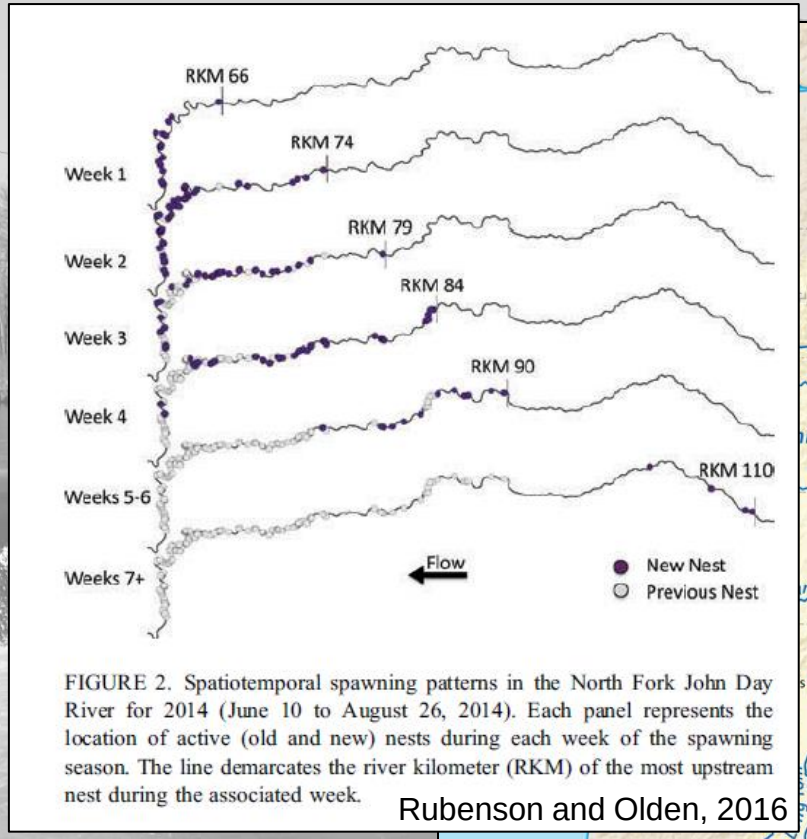
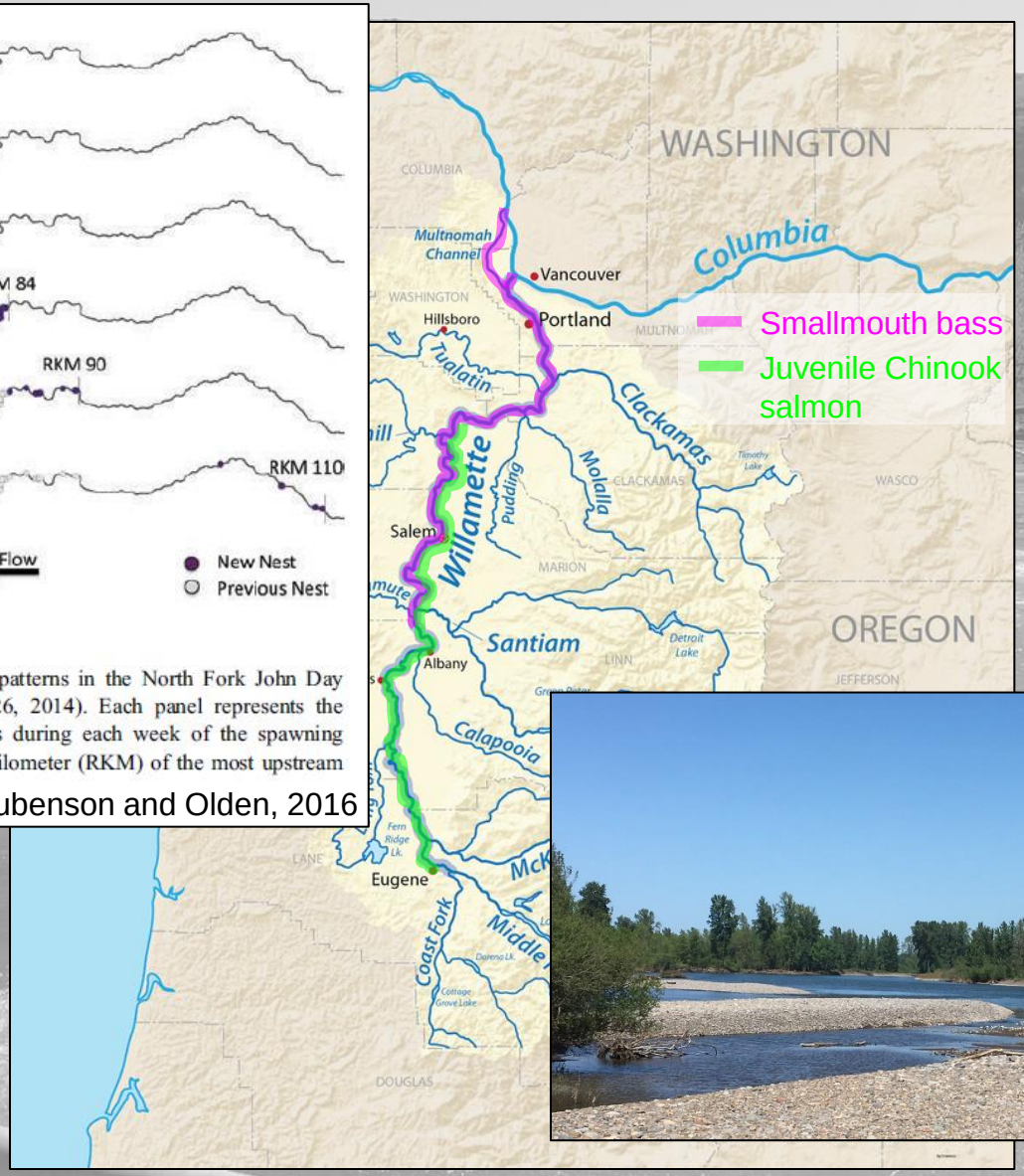


FIGURE 2. Spatiotemporal spawning patterns in the North Fork John Day River for 2014 (June 10 to August 26, 2014). Each panel represents the location of active (old and new) nests during each week of the spawning season. The line demarcates the river kilometer (RKM) of the most upstream nest during the associated week.

Rubenson and Olden, 2016



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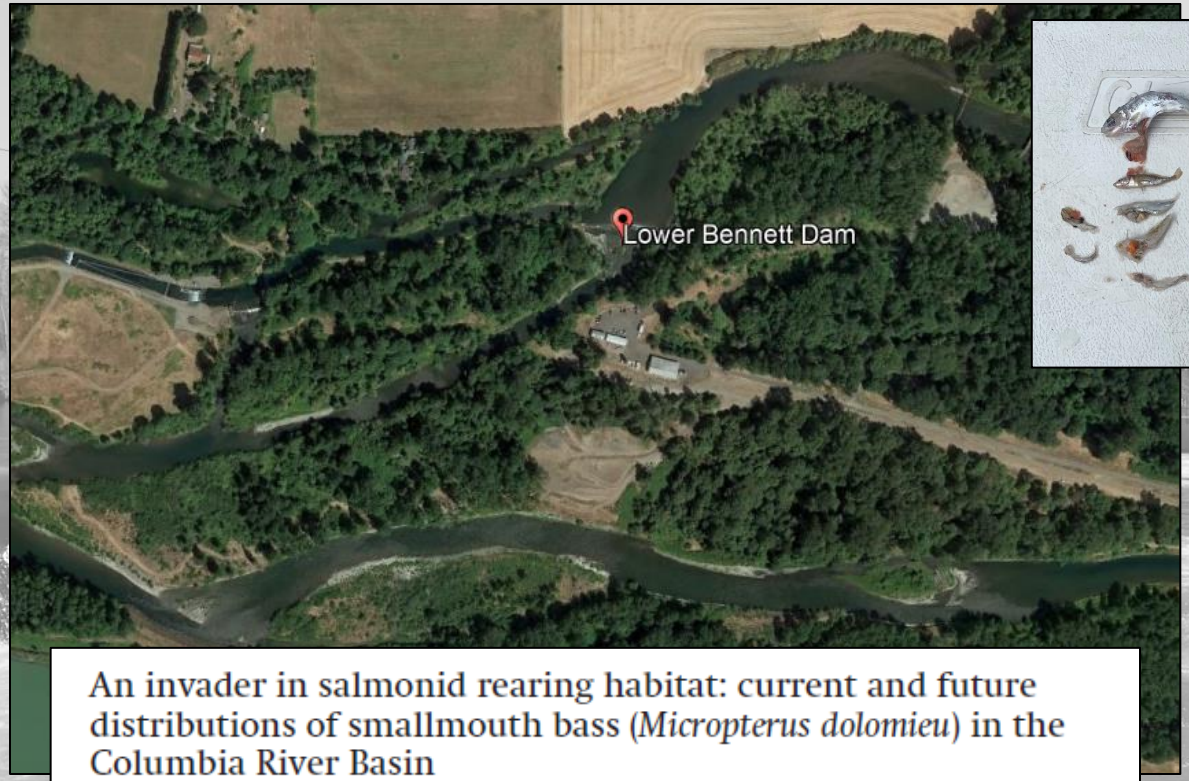
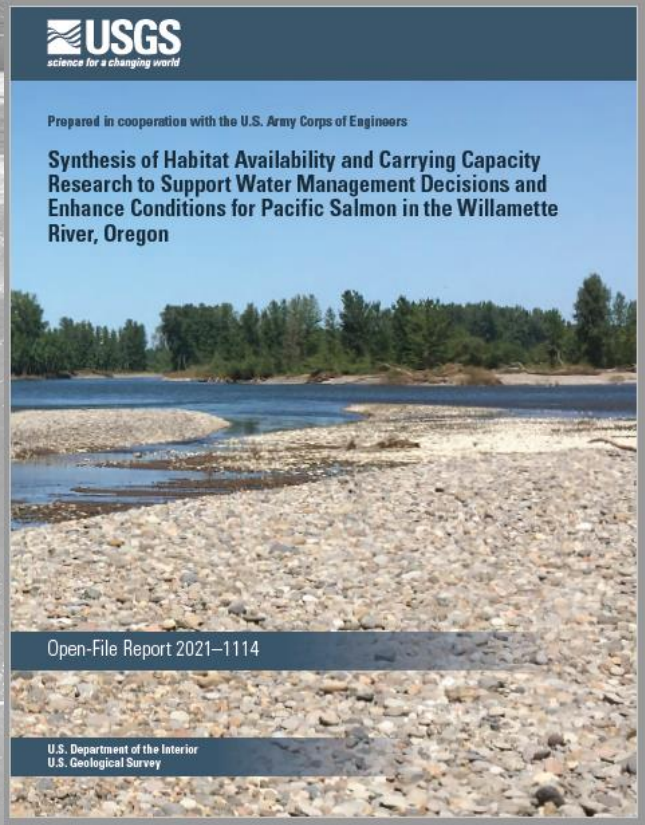
Final Thoughts



An invader in salmonid rearing habitat: current and future distributions of smallmouth bass (*Micropterus dolomieu*) in the Columbia River Basin

Erika S. Rubenson and Julian D. Olden

Abstract: Invasive species and climate change are leading threats to freshwater ecosystems. In the Columbia River Basin (CRB), nonnative fishes are a critical consideration in salmon recovery, yet managers lament a lack of distribution information. Combining a species distribution model (SDM) with environmental DNA (eDNA), we locate range boundary regions of nonnative smallmouth bass (*Micropterus dolomieu*) and evaluate its overlap with native salmonids. A combination of thermal, hydrological, and geomorphic variables predict that smallmouth bass is distributed across ~18 000 river kilometres and overlaps with 3%–62% of rearing habitat of salmonids (species-dependent) in the CRB. Under a moderate climate change scenario, smallmouth bass is predicted to expand its range by two-thirds (totaling ~30 000 river kilometres) by 2080. Basin-wide models were sufficiently accurate to identify upstream invasion extents to within 15 km of the eDNA-based boundary, and including eDNA data improved model performance at critical range boundary regions without sacrificing broadscale model performance. Our study highlights how eDNA approaches can supplement large geospatial data sets to result in more accurate SDM predictions, guiding nonnative species management.



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