Outmigration Survival of Juvenile Salmon and Steelhead in the Yakima River

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The Yakima and Willamette rivers share several common features. Both are primary tributaries to the Columbia River, their streamflows are highly regulated with high-head dams located in upper tributaries and diversion dams located farther downstream, and each supports important populations of salmon and steelhead in the Columbia Basin. However, research to describe fish behavior and survival of juvenile salmon and steelhead (hereafter juvenile salmon) is distinctly different between these two rivers. In the Yakima River, juvenile salmon are primarily produced downstream of high-head dams and research has focused on the mainstem river where factors influencing survival include passage at diversion dams, streamflow, water temperature, and predation. In the Willamette River, research has focused on behavior and survival in large storage reservoirs and at high-head dams, and little is known about survival through the mainstem.

We have been evaluating outmigration behavior and survival of juvenile salmon in the Yakima River since 2012 with tagging efforts focused on yearling and subyearling Chinook salmon, juvenile steelhead, and juvenile coho salmon. These studies have provided insights into route-specific mortality rates at diversion dams (Figure 1), described entrainment probabilities into canals at diversion dams (Figure 2), and provided information that supports a flow-survival relationship (Figure 3). This presentation will summarize results from the multiyear study on the Yakima River which may be relevant to contemporary issues on the Willamette River that are not currently being assessed.

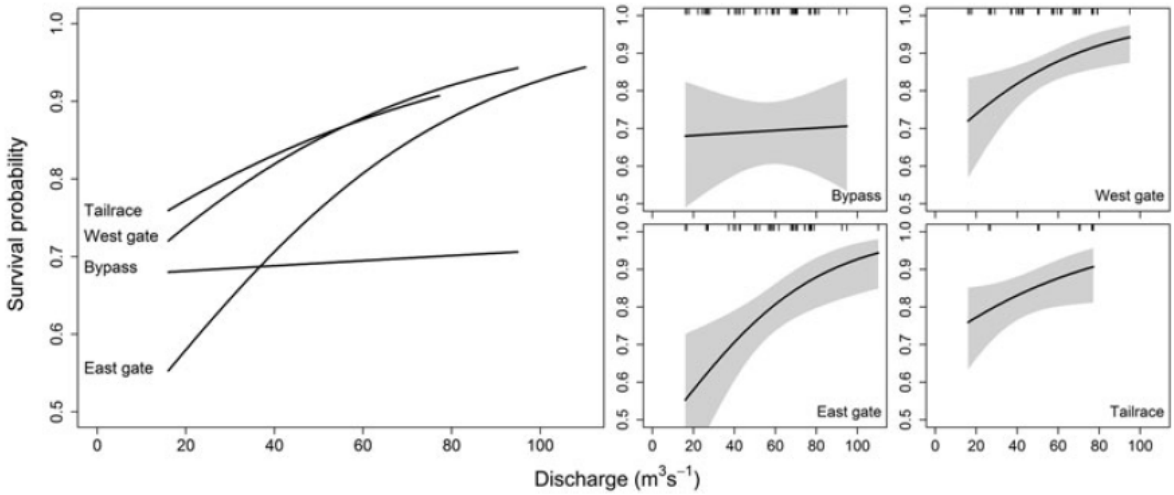

Figure 1.—Relationship between streamflow and route-specific survival of juvenile salmon at Roza Dam during 2012–2014.

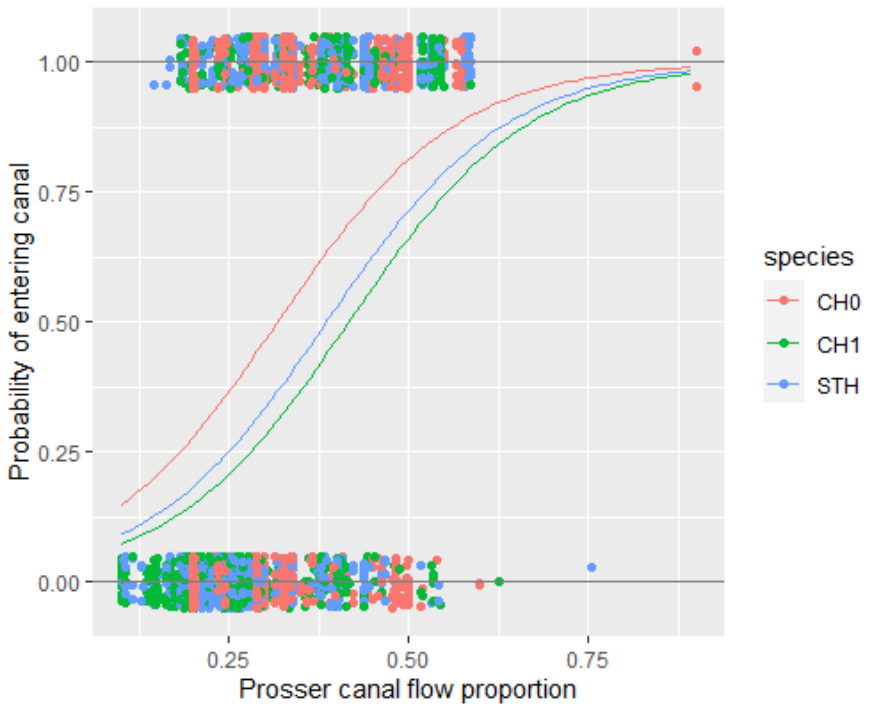

Figure 2.—Relationship between the proportion of streamflow diverted into Prosser Canal and the proportion of juvenile salmon entrained into the canal during 2018–2021.

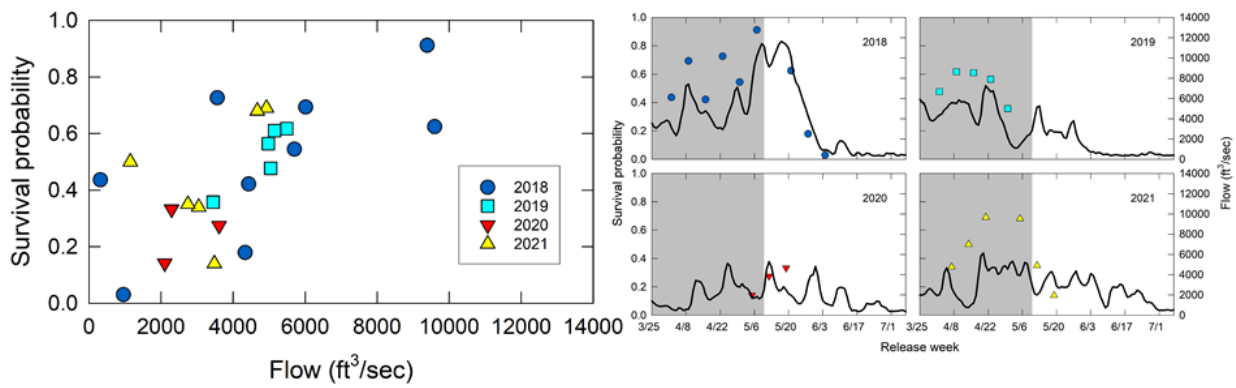

Figure 3.—Estimates of survival and relationship to streamflow at the time of release for weekly release groups of juvenile Chinook salmon in the Yakima River during 2018–2021.