Hydraulic and Habitat Modeling to Understand Habitat Overlap between spring Chinook Salmon and Smallmouth Bass Along the Willamette River

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Smallmouth Bass (*Micropterus dolomieu*) are a nonnative fish that are widely distributed in rivers, reservoirs, and lakes throughout the Pacific Northwest of the United States. These predatory fish are pervasively present throughout juvenile Pacific salmon (*Oncorhynchus* spp.) habitat in the region and have been shown to be a significant source of predation mortality. Interactions between Smallmouth Bass and juvenile salmon increase during spring and summer as water temperatures warm. During this seasonal period, Smallmouth Bass become increasingly active (behaviorally and metabolically) as spawning begins and they expand their range to include habitat that was thermally unsuitable during fall and winter. This has led to concerns about population-level effects of Smallmouth Bass predation on Pacific salmon and other native fish species. These concerns are compounded by predictions that Smallmouth Bass will expand their range by two-thirds in the Columbia River Basin under future climate change scenarios.

Habitat overlap between juvenile Chinook Salmon (*O. tshawytscha)* and Smallmouth Bass is of concern in the Willamette River Basin where spring-run Chinook Salmon are listed as 'threatened' under the U.S. Endangered Species Act. Several studies have shown that juvenile Chinook Salmon spend a substantial amount of time rearing in Willamette River tributaries and the mainstem river. Other studies have shown that Smallmouth Bass are pervasive in the mainstem Willamette River and thus present a chronic predation threat to rearing juvenile Chinook Salmon.

This work aims to quantify the extent of habitat overlap between Smallmouth Bass and juvenile Chinook Salmon using coupled hydraulic and stream temperature models, which provide a basis for examining streamflow management strategies that may limit predation potential. Preliminary results show that there is extensive Smallmouth Bass habitat throughout the Willamette River and that the amount of habitat overlap between Smallmouth Bass and juvenile Chinook Salmon is not sensitive to streamflow. We find augmented streamflow may result in less thermally suitable conditions for Smallmouth Bass, however, the spatial and temporal magnitude of this reduction is relatively small. We also document the expansion of Smallmouth Bass populations into important Chinook Salmon rearing reaches as revealed through repeat fish sampling between 2008 – 2022.