

## **The Current State of Knowledge on How Juvenile Salmon Use the Columbia River Estuary and Plume Habitats**

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The Council conducted an Estuary Science-Policy Exchange in September 2007. The primary conclusions from that workshop were: 1) fish from throughout the Columbia River Basin use estuary habitat for varying amounts of time before ocean entry; 2) river and estuary management should emphasize diversity (i.e., one size will not fit all) and assume there is an optimum time of residence in the estuary; and 3) policies should connect the upriver hydropower system to the lower river estuary, synthesizing available scientific knowledge in order to direct future research and policy-making (e.g., some Snake River fall Chinook are spending up to a year in the estuary). In general, these conclusions remain valid and formed the basis for updating the Council's Fish and Wildlife Program in 2009.

Since 2007, work by multiple entities has continued to identify restoration sites with the greatest potential to recover at-risk salmon stocks, under the assumption that improved performance in the estuary (i.e., feeding, growth, and survival) will promote recovery of at-risk salmon populations. Preliminary genetic data suggests that Chinook salmon stocks may not be distributed uniformly across the estuary from the mouth to Bonneville Dam, and upper Columbia River stocks appear more prevalent in upper-estuary collections. However, the majority of the restoration activities are concentrated in the lower estuary. Thus, future research activities need to focus on: 1) defining stock distributions throughout the estuary through use of synoptic surveys, 2) identifying whether salmon life history, habitat use, and performance vary by stock, and 3) assessing how increased opportunity to express life history diversity contributes to adult returns. Informing these questions will identify which restoration strategies will benefit the full diversity of Columbia River stocks and help identify the amount of restoration needed for various types of habitat and stocks. This will fulfill the requirements of the 2008 FCRPS Biological Opinion and aid salmon recovery in the basin.

In addition to these habitat use and restoration issues, key additional areas to focus on in the future include: 1) identifying why salmon smolt-to-adult rates vary with ocean entry timing (i.e., what conditions in the plume lead to improved survival that can be measured and used to adjust actions taken in freshwater (e.g., transportation, hatchery release timing, flow timing and volume?)); 2) estimating the survival of adult salmon through the estuary and any potential loss to marine mammal predation; 3) determining whether contaminant loadings affect juvenile salmon growth and survival through the estuary; and 4) identifying management actions that address increased predation on juvenile salmon due to cormorants and pelicans.