

Salmon Life Histories, Habitats, and Food Webs in the Columbia River Estuary

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Throughout the past century, two competing assumptions have directed management efforts in the Columbia River estuary on behalf of salmon: (1) the estuary is irrelevant to conservation because fresh water conditions limit salmon production; and (2) the estuary is a threat to juvenile salmon because bird and mammal predators are concentrated in the narrow lower-river corridor. These ideas have ignored the estuary's role as a productive nursery ground and transitional habitat for salmon stocks throughout the Columbia River Basin. The Columbia River estuary contributes to salmon life history diversity by providing habitat opportunities for juveniles with subyearling-migrant life histories. Small subyearling Chinook salmon seek shallow water rearing habitats and occupy a diversity of emergent, shrub, and forested wetlands throughout the tidal freshwater and brackish areas of the Columbia River estuary. Many estuarine-rearing juveniles feed in wetland channels, grow on average 0.5 mm per day, and reside in the estuary for weeks or months before entering the ocean. Recent estuarine surveys suggest that life history diversity among subyearling Chinook salmon has declined since early in the twentieth century and could limit the resilience of contemporary populations to changing environmental conditions. Numerous changes upriver (e.g., hatchery programs, population losses, flow regulation) and within the estuary (e.g. wetland habitat losses, increased water temperatures) may have contributed to the apparent reduction in life history variation. Loss of tidal wetlands could further limit the capacity of estuarine food webs to support juvenile salmon. Energy flow to salmon is derived from wetland detritus, and juveniles throughout the estuary feed on insect prey that is produced in wetland habitats. Although sources of wetland detritus have declined during the last century, contemporary salmon food webs still rely disproportionately on wetland-derived prey. All Columbia Basin ESUs are represented in estuarine habitats, and a diversity of genetic stock groups, including interior summer/fall stocks, rear in tidal wetland habitats of all types. Recovery of Columbia River salmon will require that sufficient habitat opportunity is provided in the estuary to accommodate the full complement of stocks and life history types in the basin. Among the principal concerns in the estuary for salmon recovery programs are loss of peripheral wetland and tidal floodplain habitats; effects of hatchery programs and flow regulation on patterns of estuarine migration, residency, and habitat use; and the risk of increasing water temperatures on summer and fall rearing opportunities for young salmon.

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