

Fish, Aquatic Ecosystem Response

Connections between headwater systems and downstream fish habitat

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Headwater systems sustain downstream fish habitat by exporting heat, sediment, nutrients, and organic matter. Organic matter includes particulate matter, instream biota, and large wood. We describe and, where possible, quantify regimes of each in the Calapooia River, Oregon watershed, which has been studied recently (>10 publications). Stream temperatures in summer establish a strong gradient throughout the watershed from headwaters 15-16°C maxima to above 23°C in upper mainstem. Differences are attributable to reach scale shading, as mainstem temperatures are highly correlated with insolation and bedrock substrate. Nutrients were measured in multiple studies, both extensively and intensively. Nutrient export was low — close to detection thresholds — as watershed-scale results found water quality leaving the forest to be high. Fine sediment was measured physically and biologically. Fine sediment was low (< 17%) in tributaries and lower (< 5%) in the upper mainstem, which has substantial bedrock substrates (11.3%). Fine sediment moves through the watershed efficiently. Drift macroinvertebrate biomass was low with 65% in five taxa groups, yet richness was high, including 57 chironomid taxa and 28 terrestrial families. Macroinvertebrate drift concentrations (per m³) were similar at baseflow in headwaters and mainstem. Large wood regime in fish bearing waters in the Calapooia watershed has been defined by the transport of primary forest logs scouring the channel and flood disturbances (e.g. 1963 and 1996) creating pulses of large wood. Current mainstem wood loadings are very low and future supply unclear. The extent, seasonality, frequency, and duration of each regime is described with Calapooia data and from the literature.