Relationships Among Juvenile Anadromous Salmonids, Their Freshwater Habitat, and Landscape Characteristics Over Multiple Years and Spatial Scales in the Elk River, Oregon

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Research on the distribution of juvenile salmonids in streams has been dominated by studies examining small areas over short periods. However, information relevant to freshwater influences on population persistence is likely to derive from longer-term, multi-scale studies. Relationships were examined among juvenile anadromous salmonids, their freshwater habitat, and landscape characteristics throughout the Elk River, Oregon over 7 years at multiple spatial scales. Ocean-type chinook salmon (*Oncorhynchus tshawytscha*), coho salmon (*O. kisutch*), coastal cutthroat trout (*O. clarki*) and winter-run steelhead (*O. mykiss*) comprised the salmonid assemblage. Habitat selection was quantified at stream system, valley segment, and channel unit scales by selection ratios estimated with bootstrapping methods. Unconstrained valleys in tributaries and pools in the mainstem were typically selected by each species except steelhead, which often avoided these. Valley segment types generally did not differ for characteristics routinely assessed in stream surveys. Thus, fish probably perceived other biotic or abiotic differences among valley segment types. Evidence suggested competition may have influenced selection by coho and chinook salmon. Discriminant analysis indicated that level of use by juvenile chinook salmon appeared related to valley segment type and spatial position. Unconstrained valleys, nearby valley segments, and valley segments with larger, deeper pools, containing more wood were most highly used by chinook salmon. Mean volume and maximum depth of pools were each directly related to catchment area, which explained more variation than landscape characteristics summarized at any of five spatial scales. At each scale except the most spatially extensive, wood density in valley segments was negatively related to the percent area in resistant rock types and positively related to the percent area in mature to old forests. The most variation was explained with these landscape variables summarized at an intermediate spatial scale (i.e., sub-catchment). Although spatial scales appeared similar in processes affecting wood density, finer scales omitted key source areas for wood delivery, and coarser scales included source areas less tightly coupled to wood dynamics in surveyed channels. If only 1 or 2 years of data or one spatial scale had been examined, as commonly occurs, conclusions may have differed substantially from those in this study.

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I understand that my dissertation will become part of the permanent collection of Oregon State University libraries. My signature below authorizes release of my dissertation to any reader upon request.

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Kelly Marie Burnett

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