FLOW REGIMES IN COASTAL CALIFORNIA STEELHEAD TROUT STREAMS: SPATIOTEMPORAL PATTERNS IN MAGNITUDE, DURATION AND TIMING

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ABSTRACT

The magnitude, timing and duration of precipitation events can vary considerably across spatial and temporal scales. In lotic ecosystems, such differences in precipitation patterns can strongly influence water availability, which in turn affects the population dynamics of stream biota. Connectivity flow thresholds were developed for the movement of juvenile steelhead trout using hydraulic modelling for 37 coastal California streams. Spatial patterns in magnitude, and spatiotemporal patterns in duration and timing of flows meeting threshold levels were analysed using long-term flow gaging data. Flow thresholds for the movement of juvenile steelhead through riffle sites varied from 0.06 (San Luisito Creek, Elder Creek) to 0.82 (Redwood Creek) cms (cubic meters per second). Flow thresholds increased positively with mean bankfull width, indicating that more water is required for fish movement in wider streams. Precipitation was a dominant driver of flow duration, with flows meeting thresholds longer in wetter regions of the state when compared with drier regions. On the rising limb of the hydrograph, the onset of meeting flow thresholds was influenced by stream width, with thresholds being met earlier in wider streams when compared with narrower streams. On the receding limb of the hydrograph, flow threshold timing was influenced by precipitation, with flows remaining above the threshold later in wetter regions when compared with drier regions. Based on these findings, we recommend that the management of aquatic resources for a broad range of objectives consider regional scales that account for local patterns in precipitation, channel form and prevailing water year conditions to accommodate California's wide spatiotemporal diversity of water availability.

key words: connectivity flows, flow regimes, flow thresholds, steelhead, water availability

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