

QUANTIFYING THE EFFECTS OF FLOW DIVERSION AND CHANNEL GEOMETRY ON AQUATIC HABITAT AND IMPLICATIONS FOR MITIGATION AND ADAPTIVE MANAGEMENT STRATEGIES

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Flow diversions have significantly different effects on the quantity and quality of aquatic habitat in the Lower White River depending on channel geometry, particularly in reaches where the river has been artificially constrained by levees. This study demonstrated that salmonid habitat is not simply determined by discharge, but also the shape of the river. Prior to European colonization the lower White River consisted of an anabranching channel within a forested floodplain. Recruitment of large woody debris introduced flow obstructions that created and sustained perennial and ephemeral side channels. High-resolution topography and hydraulic modeling of the study reach show the presence of numerous abandoned and active side channels that are activated with increasing discharge. The quantity of aquatic habitat (wetted area, channel length, and bank length) increases with discharge. Sensitivity to changes in discharge was found to be greatest within sub-reaches unconstrained by levees. Side-channel activation is particularly sensitive to variations in discharge during low flow conditions when historical water withdrawals were most significant. Discharge-habitat relationships indicate that diversions of 1 m³/s result in a loss of over 500 m of side channel habitat within the 26.9 km middle and upper sub-reaches of the river unconstrained by levees. Variability in channel response to flow between the geomorphically distinct sub-reaches suggested that channel geometry can play a significant role on aquatic habitat as flow regulation. The current regulatory requirement for minimum instream flows does not consider the activation of side-channel habitat. Manipulating geomorphic factors that influence channel migration and alluvial topography such as levee setbacks, reintroduction of large woody debris, and floodplain reforestation offer significant opportunity to mitigate impacts of flow regulation.