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The role of climate and hydrogeomorphic disturbance on riverine forest dynamics and landscape pattern in the Carmanah Valley temperate rainforest of coastal British Columbia, Canada.

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Riparian communities are among the most diverse, productive, and spatially heterogeneous ecosystems in the landscape. Within the river corridor a mosaic of vegetation patches grows on a variety of fluvial landforms. This heterogeneity can be attributed to the range of hydrogeomorphic disturbance processes that operate on near stream vegetation. The development and succession of floodplain forests is highly linked to processes of landscape evolution which, in a pluvial hydroclimate, are ultimately controlled by climate events and resulting floods. The aim of this study is to examine how the composition and structure of riparian vegetation is controlled by hydrogeomorphic disturbance regimes and to assess how increased storm frequencies, as predicted by climate change models, may affect riverine forests.

The riverine landscape of the Carmanah Creek watershed on the west coast of Vancouver Island, British Columbia, Canada was examined to reveal how channel migration and the historic and contemporary hydroclimate perpetuate the shifting-mosaic of habitat types seen within this relatively small area. The Carmanah watershed is a 67 km^2 temperate rainforest catchment whose half kilometer wide valley bottom is home to the tallest trees (*Picea sitchensis*) in Canada. Thirty-eight plots containing 4509 trees were sampled for forest structure, composition, age, understory composition, substrate characteristics, and elevation above the contemporary channel. These field data, including a vegetation chronosequence spanning over 500 years, were used to refine a conceptual model that describes forest dynamics in relation to contemporary and historic river channel position. Relationships between flood frequency and understory as well as canopy species are also examined. This model quantifies successional processes in relation to the unrelenting piecewise geomorphic reworking of the valley bottom. Comparisons with riverine systems of contrasting hydroclimate and basin area reveal visible signatures in riparian species composition and landscape pattern.

Field based research is complemented by a landscape scale, multi-decadal analysis which examines changes in the extent of specific habitat types using an aerial photographic record spanning 70 years. Landscape change was correlated with hydrologic and precipitation records in order to examine the relationship between hydroclimate and landscape scale vegetation composition. Correlations between periods of heightened disturbance and global climate cycles such as the El Nino Southern Oscillation are also examined. This study supports predictions of the effects of climate change on landscape patterns in riverine forests in this and other Pacific coastal watersheds.