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Reconstructing the history of precipitation across a steep moisture gradient in the coastal temperate rainforest complex of western North America

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Pollen data from a comprehensive spatial network of surface samples from Vancouver Island, Canada, were used to develop a ratio index of precipitation, DWHI (Douglas fir-western hemlock index). DWHI ratios were combined with interpolated estimates of mean annual precipitation to develop pollen-based precipitation transfer functions. The optimal regression model, with a predictive range of 960-2600 mm, was applied to 10 Holocene lake sediment records distributed across a $\sim$150 km long coastal-inland precipitation gradient. Predicted precipitation was spatially modelled in a geographic information system to examine the spatio-temporal history of precipitation from this representative portion of the coastal temperate rainforest (CTR) complex of western North America. The reconstructions show widespread early Holocene dry conditions between 11,000-7000 years ago, with maximum dryness between 11,000-9000 years ago. A pattern of eastwardly increasing precipitation is observed at this time, culminating in the establishment of the modern precipitation gradient 7000 years ago. These results show that the CTR complex has experienced marked short-distance east-west changes in precipitation in the past. Changes in the abundance of arboreal and non-arboreal vegetation, as well as fire disturbance, are often concomitant with changes in Holocene precipitation, illustrating the sensitivity of the complex to changes in climate. Given the precipitation and vegetation history of the region, conservation initiatives should focus on the moist outer coastal zone since it appears to have the greatest amount of resilience to perturbations in precipitation, whereas monitoring programs

for signs of climate change should be initiated in central areas as they appear sensitive to changes in the moisture regime.