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Hydroclimatic controls on late-summer low flow in British Columbia, Canada

K. Stahl (1,2), R.D. Moore (1,3), D.M. Allen (4), P. Whitfield (5)

(1) Department of Geography, University of British Columbia, Vancouver BC, Canada, (2) Department of Geosciences, University of Oslo, Norway, (3) Department of Forest Resources Management, University of British Columbia, Vancouver BC, Canada, (4) Department of Earth Sciences, Simon Fraser University, Burnaby BC, Canada, (5) Environment Canada, Vancouver BC, Canada (kerstin.stahl@geo.uio.no)

For catchments in the Pacific Northwest of North America with minimal or no glacier cover, the summer period is typically dominated by low flows associated with the relatively warm, dry summers in that region. In recent years streamflow during this period has been critical in terms of water use and fisheries, and there is increasing concern regarding how future climate change may affect late-summer flows. In particular, it is feared that earlier snowmelt timing in spring causes longer recession periods and consequently lower streamflow during summer. This study examined the sensitivity of late summer flows of 153 unregulated rivers over the period 1976-2003 to hydroclimatic influences by fitting regression models using simultaneous and lagged variables of precipitation and timing and magnitude of the snowmelt. To assess potential additional influences of long-term storage changes the residuals were tested for trends and serial correlation. A decrease in September flows across most of the region is broadly consistent with a decline in September precipitation. The most important control on August flows for all streamflow regimes is August precipitation. Lagged variables including July precipitation and the previous winter's precipitation are also positively but more weakly related to August streamflow. Rain-dominated and hybrid catchments tended to have positive trends in their residuals in August, suggesting an increasing trend in groundwater storage. Snow-melt dominated catchments showed no tendency to trends but the runs test detected a substantial number of stations with non-random residuals. This regional study greatly improves the understanding of the hy-

droclimatic influences on extreme summer low flow in the region. Results suggest that (the less predictable) summer climate is a larger influence than previously assumed. They also help to identify where seasonal snow processes or long-term groundwater storage should be considered in model development, forecasting, and prediction of climate change impacts.