

Changing Snow Cover and Stream Discharge in the Western United States –  
Wind River Range, Wyoming

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**Abstract**

Earlier onset of springtime weather has been documented in the western United States over at least the last 50 years. Because the majority (>70%) of the water supply in the western U.S. comes from snowmelt, analysis of the declining spring snowpack has important implications for the management of water resources. We studied ten years of Moderate-Resolution Imaging Spectroradiometer (MODIS) snow-cover products, 40 years of stream discharge and meteorological station data and 30 years of snow-water equivalent (SWE) SNOw Telemetry (SNOTEL) data in the Wind River Range (WRR), Wyoming. Results show increasing air temperatures for the 40-year study period. Discharge from streams in WRR drainage basins show lower annual discharge and earlier snowmelt in the decade of the 2000s than in the previous three decades. Changes in streamflow may be related to increasing air temperatures which are probably contributing to a reduction in snow cover, although no trend of either increasingly lower streamflow or earlier snowmelt was observed *within* the decade of the 2000s. And SWE on 1 April does not show an expected downward trend from ~1980 to 2009. The extent of snow cover derived from the lowest-elevation zone of the WRR study area is strongly correlated ( $r=0.91$ ) with stream discharge on 1 May during the decade of the 2000s. The strong relationship between snow cover and streamflow indicates that MODIS snow-cover maps can be used to improve management of water resources in the drought-prone western U.S.