

When and Where Do Enhanced Warming and Snowmelt Occur in Rocky Mountain National Park?

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Abstract. The seasonal snowpack in Rocky Mountain National Park is critical to the local and downstream water supply, the ecosystem of the park, and for winter recreational opportunities. Recent regional studies have illustrated that temperatures are rising and snow accumulation is decreasing, averaging on the order of 2 to 4 cm/decade less over recent decades. As well, snowmelt is tending to be earlier, averaging on the order of 2 to 4 days/decade sooner. Data specific to Rocky Mountain National Park show that the warming and melting trends are strongest during the winter shoulder months of November and March, and at higher-elevation sites. From more than 30 years of daily snow water equivalent (SWE) data collected at eight NRCS Snowpack Telemetry (SNOTEL) stations in and near the park, April 1st SWE has been changing by -4.7 to +1.1 cm/decade, with a slight, yet statistically significant, decrease seen at most stations. The spatial and temporal trends are consistent with observations and model simulations that show elevation-dependent warming and melt during periods when the zero-degree isotherm is approaching the elevation of the sites of interest. Snow-albedo feedback is postulated as one mechanism to help explain the trends.