Patterns and Trends in Snowpack Water Equivalent at a Northern Vermont site, 1960–2002

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ABSTRACT

Snow depth and water equivalent have been monitored at two high-elevation sites in the Sleepers River Research Watershed in northeastern Vermont since 1960. The sites are at 552 and 632 m. Previous analysis comparing these sites to lower elevation sites at Sleepers River indicated a strong positive correlation between annual maximum snow water equivalent (SWE_{max}) and elevation, and less year-to-year variability in annual SWE_{max} at the higher elevations. During the complete 42-year record at the two sites, SWE_{max} has varied in cycles, reflecting the 1960s drought, a snowy period from the late 1960s to late 1970s, a low-snow period in the early 1980s, and a generally more stable period from 1984 to 2000, punctuated by a high SWE_{max} in 2001. Prior to 2001, the eight years with the greatest annual SWE_{max} occurred in the first one-half of the record; SWE_{max} exceeded 40 cm in both 1971 and 1978. The 2001 winter was the first winter since 1978 to reach the high SWE levels observed in the 1960s and 1970s. Despite the many high-SWE winters early in the record, there was no monotonic trend in annual SWE_{max} with time, even if the 2001 winter is excluded. Annual SWE_{max} at the 552-m site was positively correlated with winter (December through March) precipitation amount and negatively correlated with winter temperature. Winter precipitation amount and winter temperature both display significant increasing trends during the 42-year period at the 552-m site as well as at a 214-m elevation site in St. Johnsbury, Vermont, 13 km to the southeast. These trends have opposing effects on SWE_{max}, with the result of no trend in SWE_{max} itself.

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