

The Mountain Pine Beetle, Warming, and the Threatened American Forest

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The mountain pine beetle *Dendroctonus ponderosae* threatens the survival of coniferous forest in the southwestern United States. The loss of these coniferous forests may feedback to enhance global warming by reducing the carbon storage of the terrestrial biosphere. Mountain pine beetle population size is limited by cold thresholds which, when reached, prevent further beetle-induced destruction. Previous research indicates this cold winter temperature as -35°C . However, cold-induced beetle die-offs occurred throughout much of the southwest United States in 2011 without temperatures going below this critical temperature. Using daily minimum temperature data provided by the North American Land Data Assimilation System (NLDAS-2) for 1979-2014, we show that the coldest temperatures of 2011 were by far the coldest since at least 1979. Record-low temperatures in 2011 and a subsequent decrease in beetle-induced tree mortality throughout much of Southwest Forests, as inferred from aerial surveys from the United States Forest Service, suggest a link between cold temperatures decline in beetle population size throughout much of the Southwest. Interestingly, the coldest temperature of 2011 did not fall below the critical winter temperature threshold of -35°C , which suggests that the critical threshold temperature is warmer than -35°C in the Southwest. Future research will include more detailed analyses of beetle population and correlations with climate conditions. Climate model projections will be used to assess how changing minimum temperatures will impact beetle populations and, by implication, western forest health.