

Hydrological impact of Hemlock woolly adelgid (HWA) infestation on downstream freshwater yield: early assessment using a spatially-distributed ecohydrological model

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The hemlock woolly adelgid (HWA) is an invasive destructive insect that has caused a significant increase in mortality of eastern hemlock (*Tsuga canadensis*) in the northeastern United States and Carolina hemlock (*Tsuga caroliniana*) in the southern Appalachian Mountains. HWA was first reported in Richmond, Virginia in 1951, and currently affects about half of the entire eastern hemlock forests in the northeast. Eastern hemlock is a foundation species in the northeast mountainous region that heavily controls local microclimates and therefore biogeochemical cycles. In this study, we report how much freshwater yield has changed due to the loss of eastern hemlock in the Harvard Forest Long Term Ecological Research (LTER) site. We scaled up the stand-scale hydraulic failure into catchment-scale hydrological changes by incorporating the calibrated function into the spatially-distributed process-based ecohydrological model (RHESSys). This study highlights that the distributed ecohydrological model can be an adequately tool to represent the impact of the HWA infestation on freshwater yields for the hemlock-dominated regions in the northeastern United States.

