Role of Climate in the Dieback of Northern Hardwoods

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Abstract

The incidence of freezing and drought stresses, reconstructed from daily minimum/maximum temperature and precipitation records in areas of severe, recurrent dieback on sugar maple, was not happenstance but clustered at intervals of 8 to 12 years over the 1910 to 1995 period. Initial episodes of severe dieback on sugar maple (Acer saccharum Marsh.), as well as ash (Fraxinus spp.), white/yellow birch (Betula papyrifera Marsh. and B. allegheniensis Brit.), and red spruce (Picea rubens Sarg.) occurred within five years of rotation age and coincided with extreme winter thaw followed by sudden freezing. Regional thaw-freeze events correlated significantly with high El Niño-low Southern Oscillation index, and hence with elements of change in global climate. New insights on biome-wide and century-long patterns of dieback and on climate mechanisms are being applied to innovative management approaches including early warning of risk and optimization of stand resistance to dieback.