

The 2007 Eastern US Spring Freeze: Increased Cold Damage in a Warming World?

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- Extensive regional damage to vegetation throughout the eastern US from an unusual spring freeze was documented (the 'Easter freeze')
- Unusual warmth caused plants to break dormancy too early, exposing vulnerable plant tissues and organs to subsequent killing frost and causing large-scale, sustained damage
- Implications of the damage for current-year and long-term productivity are discussed
- Large fluctuations in spring temperatures represented by the event may occur in a warming climate and may be important to represent in ecosystem models



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Plant ecologists have long been concerned with a seemingly paradoxical scenario in the relationship between plant growth and climate change: warming may actually increase the risk of plant frost damage. The underlying hypothesis is that mild winters and warm, early springs, which are expected to occur as the climate warms, may induce premature plant development, resulting in exposure of vulnerable plant tissues and organs to subsequent late-season frosts. The 2007 spring freeze in the eastern United States provides an excellent opportunity to evaluate this hypothesis and assess its large-scale consequences. In this article, we contrast the rapid pre-freeze phenological advancement caused by unusually warm conditions with the dramatic post-freeze setback, and report complicated patterns of freeze damage to plants. The widespread devastation of crops and natural vegetation occasioned by this event demonstrates the need to consider large fluctuations in spring temperatures a real threat to terrestrial ecosystem structure and functioning in a warming climate.

Lianhong Gu, Paul J. Hanson, W. Mac Post, Dale P. Kaiser, Bai Yang, Ramakrishna Nemani, Stephen G. Pallardy, Tilden Meyers. The 2007 eastern US spring freeze: Increased cold damage in a warming world? *BioScience* (in press)