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An investigation of recent, widespread balsam fir (*Abies balsamea*) mortality in North America and its implications for understanding forest vulnerability to climate change

In the spring of 2018, a widespread balsam fir mortality event was reported across western New Brunswick, eastern Maine and Wisconsin. The drivers of the mortality event are unknown.

- The mortality was patchy at the stand-level, killing only certain individuals or small groups of trees. The wide-scale synchrony of mortality suggests climate is likely to be the primary driver with stand-level vulnerability controlled by local site conditions and tree characteristics.
- Foliage remained intact but turned bright red suggesting that mortality was not driven by spruce budworm as this takes four to five years of consistent defoliation (MacLean, 1980).

Photo courtesy of Wisconsin DNR, 2018

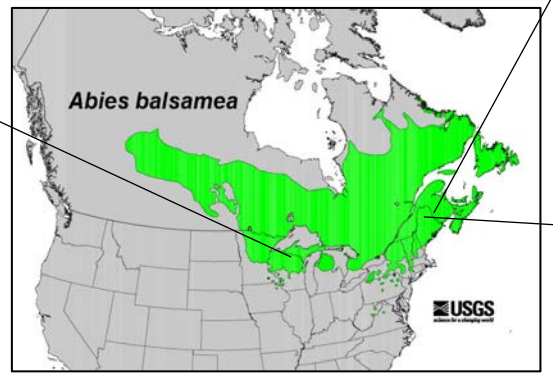


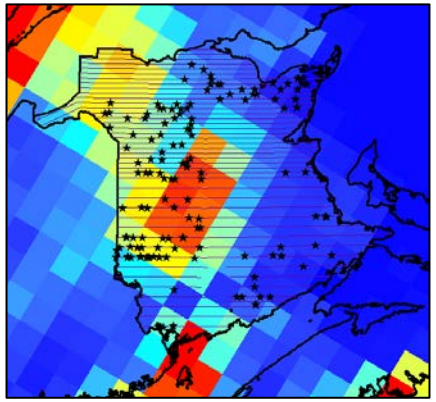
Photo courtesy of Taylor and Lavigne, 2018

Photo courtesy of Maine Forest Service, 2018

Chapter 1 – Climate Drivers

Species distribution modelling techniques and Boosted Regression Tree (BRT) analysis will determine climate variables associated with mortality.

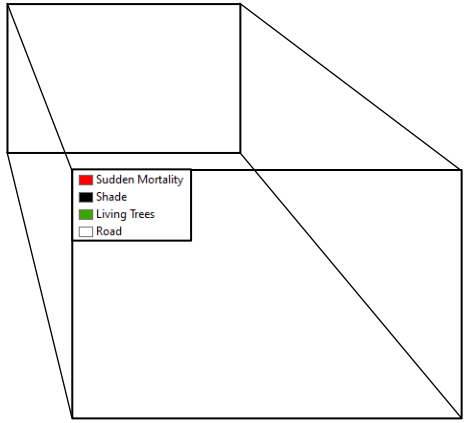
The best performing BRT model will be used to examine historic mortality events across balsam firs native range, to highlight common threads of climatic stress linking mortality events.



Chapter 2 – Stand and Site Drivers

The frequency of balsam fir mortality will be derived from pixel classification of high-resolution aerial imagery.

Forest stand and site factors associated with higher levels of mortality will be determined.



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