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Predicting Stem Windthrow Probability in a Northern Hardwood Forest Using a Wind Intensity Bio-Indicator Approach

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ABSTRACT

Unlike fire or insect outbreaks, for which a suppression program can be implemented, it is impossible to prevent a windstorm event or stop it while it is occurring. Reducing stand susceptibility to windstorms requires a good understanding of the factors affecting this susceptibility. Distinct species- and size-related differences in stem windthrow susceptibility are difficult to obtain because it is impossible to distinguish their relative effects from those of wind intensity. Using a damage assessment database (60 20-metre radius plots) acquired after an exceptional wind storm in Western Quebec in 2007, we developed an approach in which proportions of windthrown sugar maple poles were used as bio-indicators of wind intensities affecting the plots. We distinguished between single and interactive effects of wind intensity, species, stem size, and local basal area on stem windthrow susceptibility. The best logistic regression model predicting stem windthrow included the wind intensity bio-indicator, species, basal area, and the species by diameter at breast height (DBH, 1.3 m) interaction. Stem windthrow probability generally increased with DBH and decreased with basal area. Species wind-firmness was ordered as: yellow birch > sugar maple = eastern hemlock = American beech > ironwood > basswood = other hardwoods = other softwoods. Our method remained an indirect method of measuring wind intensity and its real test would require a comparison with anemometer measurements during a windstorm. Despite its indirect nature, the method is both simple and ecologically sound. Hence, it opens the door to conducting similar windthrow studies in other ecosystems.

KEYWORDS

Windthrow Prediction; Species Wind-Firmness; Tolerant Hardwood Forests; Silviculture Guidelines

Cite this paper

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