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Abstract

A review of mechanistic modelling of wind damage risk to forests

Barry Gardiner, Ken Byrne, Sophie Hale, Kana Kamimura, Stephen J. Mitchell, Heli Peltola and Jean-Claude Ruel

2008

Summary:

This paper reviews the current status of mechanistic models for wind damage risk assessment, describing model structure, applicability, validation and current limitations. We focus particularly on the hybrid mechanistic/empirical models GALES and HWIND, which have been designed for calculating wind damage risk at the stand level within uniform forests and which are the most widely adopted models within the research community. These models have been integrated with different methods for predicting the local wind climate in order to calculate the probability of wind damage in a number of different countries. We also discuss ongoing modelling work and proposals for future development in order to deal with complex forest structures and predict the wind damage risk of individual trees within stands through the integration of mechanistic risk models with forest growth and yield models within a geographical information system framework. This kind of model integration will enable spatial representation of tree lists and damage propagation and allow managers to evaluate the effect of different harvesting and thinning scenarios on the risk of windthrow of both stands and individual trees within a stand.

forest dynamic, gap dynamic, succession
methodology: modelling

ecosystem: disturbance, pollution

Notes

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Introduction

Mechanistic wind damage risk modelling

Outline of mechanistic modelling

Prediction of CWS

Prediction of wind climate

Current status and applications of mechanistic models GALES and HWIND

Validation of mechanistic modelling approach

Current limitations of mechanistic modelling of wind damage risk

Assumptions and empiricisms

Validity of risk predictions in structured stands

Damage propagation and tree-to-tree variability

Impacts of semi-spatial and non-directional wind climate on risk predictions

Discussion

New developments required of mechanistic modelling of wind damage risk

Examples of recent and ongoing modelling

Validation of improved mechanistic models

Incorporating mechanistic models into forest management systems

Conclusions

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References

Címszavazva - GE

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