

Understanding complex interactions in forest ecosystems: climate and insect outbreaks

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Introduction

- Natural disturbances are major drivers in forest ecosystems, affecting the structure and function.
- Climate change affect the vulnerability of host species to defoliation
- Spruce budworm (SBW) (*Choristoneura fumiferana*), is the main defoliator in the Eastern Canadian forest



Photo by: Lavoie & Montoro Girona

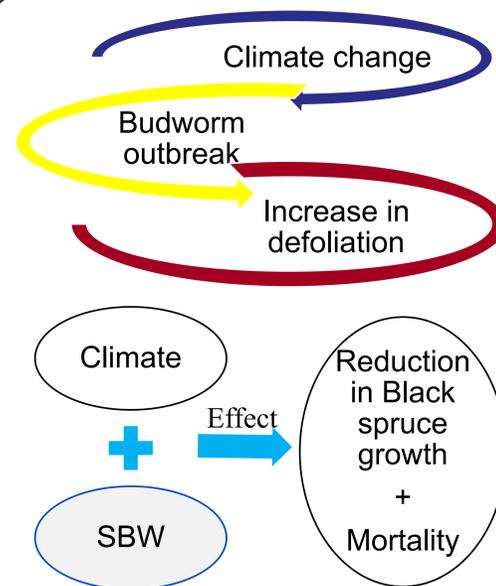
Effect of budworm attack on black spruce

- Increase in the severity (% of affected trees) of SBW during the last century



- Expansion, to the north, and increase of frequency and severity
- Changing climate scenarios

Hypothesis



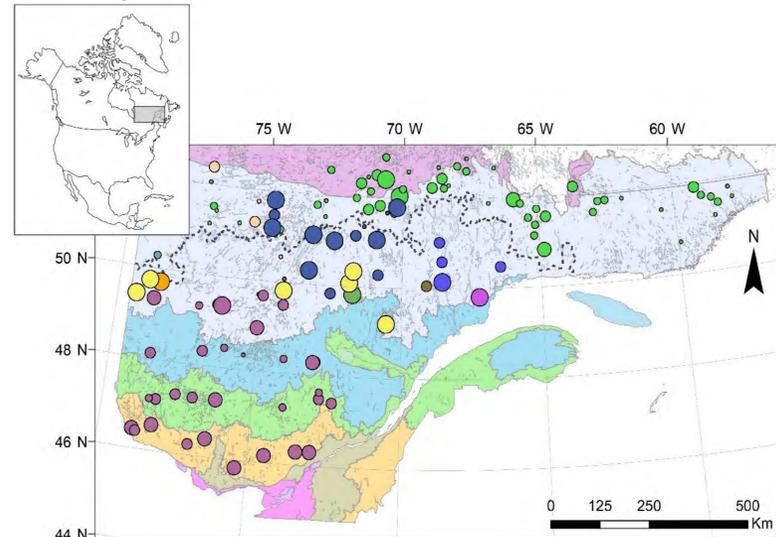
- Climate change affects the severity of black spruce epidemics due to the better synchronization of bud / budworm emergence

Objectives

- Identify the influence of different climate scenarios on the dynamics of spread and severity of epidemics
- Evaluate the trend and the impact of climate on SBW outbreaks during the last century
- Calibrate & redo the spatiotemporal patterns

Methods

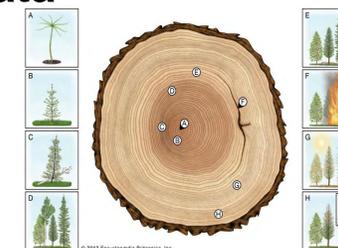
Study area



Location of study sites in Quebec. The different colors correspond to the various original datasets

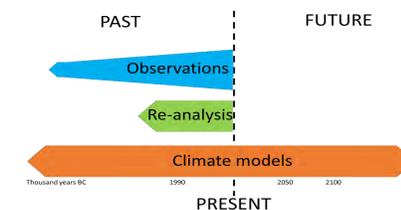
Dendroecological data

- Dendrochronological time series data integrating more than 10 different projects from the Ministry
- Complementary field works



Climatic data

- Climate datasets of the last century (WorldClim data)



Modeling

- Climate normalized growth during absence/presence of SBW (presence recorded by MFFP through aerial surveys)
- Evaluate the effect of budworm outbreak of growth as a function of climate parameters
- “Compare the predicted climate effect on the reduction of growth during an epidemic”

Contributions

- Evaluate the effect of climate during the outbreak period on the growth of the boreal stands over the years
- Extract the rate and the extent of impact of the defoliating insect, and its interaction with climate, on the boreal stands
- Help understand ecological shifts at a spatiotemporal scale
- The results of this project will help on future climate to predict a general trend in the range and severity of future outbreaks

References

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