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Summary: The declining status of Eastern white pine (*Pinus strobus* L.) is a major concern for the Kitcisakik Algonquin community, who has been calling for restoration of the species on its ancestral territory. Thus, the proposed study will generate important information from the field and the laboratory, coupled with traditional ecological knowledge documented by interviews, in order to understand the dynamics of white pine at its northern distribution limit and propose culturally adapted management and restoration strategies for the return of this valuable species on Kitcisakik's ancestral lands.

Background

Eastern white pine (*Pinus strobus* L.) is an economically valuable timber species in northeastern North America (see distribution map in figure 1). This culturally and ecologically valued species was overharvested over the last few centuries. Extensive logging and slash fire eliminated white pine seed sources and allowed early successional hardwoods to replace white pine forests (Weyenberg *et al.*, 2004). Natural regeneration was also problematic because of specific site requirements, slow initial growth rate, susceptibility to damage from blister rust and weevil, heavy browsing by herbivores, etc. Therefore white pine management is quite challenging.

Problem Statements and Justification

Ongoing interest for white pine management and restoration in a variety of ecosystems has been prompted by the species' recognized economic, ecological, social and cultural value (Pitt *et al.*, 2009). White pine decline in Quebec is a major concern for the Kitcisakik Algonquin community, who has been calling for restoration of the species on its ancestral territory. Though 'western scientific knowledge' provides a basis for understanding the ecosystem characteristics, the importance of 'traditional ecological knowledge' (TEK) has been overlooked.

No research has yet been done on Kitcisakik's ancestral land concerning white pine ecology, management, and restoration. Although studies were realized in other areas of the species' distribution (Engelmark *et al.*, 2000; Burgess *et al.*, 2005), their applicability to Kitcisakik's territory is uncertain. Therefore, important questions need to be asked before implementing restoration and sustainable management strategies for white pine on Kitcisakik's ancestral territory:

- **WHERE** white pine stands used to be found?
- **WHAT** were the characteristics of those stands?
- **WHY** is white pine so important for the Algonquins?
- **HOW** could white pine populations be restored and managed on Kitcisakik's ancestral grounds?



Figure 1: Distribution map of White pine



Plate 1: White pine (Source: wikimedia.org)

Objectives of the Study

1. To reconstruct the long-term dynamics of white pine on Kitcisakik's ancestral territory.
2. To study the reproductive biology, population dynamics and community ecology in selected white pine stands representative of the species' northern distribution limit.

Objectives of the Study contd...

3. To determine what characteristics of white pine – from tree to landscape scale – make it a culturally important species for First Nations in general and Algonquins in particular.
4. To develop innovative strategies to restore and sustainably manage white pine stands on Kitcisakik's ancestral territory.

Study Area

The study area is Kitcisakik's ancestral territory, in the Abitibi-Témiscamingue region of western Quebec, within the boundaries of the Réserve Faunique La Vérendrye (Figure 2). The Kitcisakik territory is located in the western balsam fir – yellow birch (*Betula alleghaniensis* Britton.) bioclimatic sub-domain (south) and the western balsam fir – paper birch (*Betula papyrifera* Marsh.) sub-domain

(north) (Saucier *et al.*, 1998). Since 1970, some 60% of productive forest land within traditional hunting grounds has been harvested by timber companies at an annual rate of 300,000 to 400,000 m³ (Saint-Arnaud *et al.*, 2009).

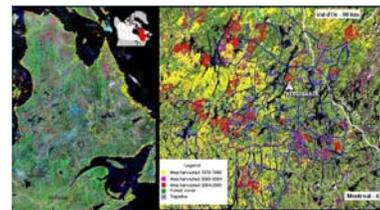


Figure 2: Location of the study area with logging history

Methodology

1. Present white pine distribution will be assessed through studies of aerial photographs and forest maps, and past distribution will be assessed by reviewing existing pollen databases and by macroremains analysis (identification of fresh and charred vegetation fossils found in soils). The characteristics of the forest stands where white pine used to be found will be compared to those of remnant white pine stands in order to target the best sites for restoration efforts.
2. The ecology and reproductive biology of white pine at the species' northern distribution limit (corresponding with Kitcisakik's ancestral territory) will allow to better document the link between the species' regeneration dynamics and natural disturbances e.g. forest fires, white pine weevil, white pine blister rust and herbivory. White pine autoecology will be compared to site types available on Kitcisakik's ancestral territory in order to elaborate restoration and management options.
3. Semi-directive interviews will be conducted with people from Kitcisakik in order to investigate indigenous ecological knowledge about white pine. This knowledge will be useful to determine the cultural and ecological importance of white pine and its use in indigenous systems, as well as to elaborate management scenarios and select restoration sites. Semi-directive interviews will also be conducted with other stakeholders (forest companies, Ministry of Natural Resources and Wildlife, etc.) to suggest viable scenarios and realistic targets for white pine management and restoration.

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Plate 2: Damaged terminal shoot of an open-grown white pine seedling (Photo by D. Pitt)



Plate 3: Blister-like spore fruiting bodies emerging from stem canker on a white pine sapling infected with blister rust (Photo by S. Greifenhagen)

Expected Results

1. Past white pine dynamics are mostly known from studies conducted in the southern part of the species range. Our study will allow us to document the species' dynamics at its northern distribution limit, placing emphasis on the roles of disturbances on shaping this dynamics (fire, logging, blister rust, and weevil).
2. A better knowledge of reproductive biology of white pine in the northern part of its range will allow us to better document the link between the species' regeneration dynamics, site type, and natural disturbances (fire, weevil, blister rust, and herbivory). This will help identify the most suitable sites on which to focus restoration and management efforts.
3. Members of the Kitcisakik community possess substantial knowledge about white pine ecology and they use the species for a variety of purposes. Therefore, documenting this knowledge will allow for management and restoration initiatives to be rooted in their livelihood and focused on their needs. As it is known that various stakeholders play different and equally important roles in natural resources management, stakeholder analysis will explore the management practices and efforts made at present and discuss the potential modifications for the future. An integrated management approach will assure that all perspectives are taken into account.

Contribution to the Advancement of Knowledge

1. Our study will fulfil the gap as there are no such studies in this distribution limit and will suggest management and restoration strategies in Kitcisakik's territory.
2. Our study is amongst the first exploring TEK of the Aboriginal people. The TEK has been neglected in this region even though it has been considered important in forest resources management.
3. The long term contribution of the study is embodied in the sustainable forest management notion: to maintain and increase forest ecosystem health over the long term while ensuring environmental, social, economic and cultural values for current and future generations.

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