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FIRE HISTORY AND LANDSCAPE LEVEL FOREST DYNAMICS IN THE NORTHERN ONTARIO/QUEBEC CLAYBELT

INTRODUCTION

A current view in ecosystem management assumes that if we maintain forest mosaic diversity in managed landscapes at a level similar to the one resulting from natural disturbances, we will retain a large portion of biological diversity at lower levels (species and/or genetic).

In the boreal forest, fire is the main natural disturbance type that initiates succession and creates a mosaic of forest stands of different ages and compositions, in conjunction with the physical characteristics of landscapes. Among the forest types that occur in natural forest mosaics, the proportions of old-growth and mature forests are likely to be less in managed forests (under the current rotation) than in naturally disturbed forest landscapes.

This project is aimed at defining the fire regime that prevailed in the area of the Lake Abitibi Model Forest (LAMF) over the last 300 years. Knowledge gained will help to define the historical age-class distribution of stands in the model forest, together with the spatial extent, organization and composition of forest types. This information is a first step towards establishing management guidelines for sustainable forestry in the Clay Belt of Ontario and Quebec.

LOCATION

This research, which complements research underway in Quebec's boreal region, is being undertaken in the Lake Abitibi Model Forest(LAMF) in northeastern Ontario.

RESULTS

Time since fire map

The fire history reconstruction of the LAMF allowed us to make a time since fire map that shows the area originating from different fire decades. This map indicates that large portions of the forest have not burned for long time periods. It suggests that fires are large in the LAMF region, whereas the intervals between successive fires at the same place are relatively long. This will be important in the development of management strategies for this region.

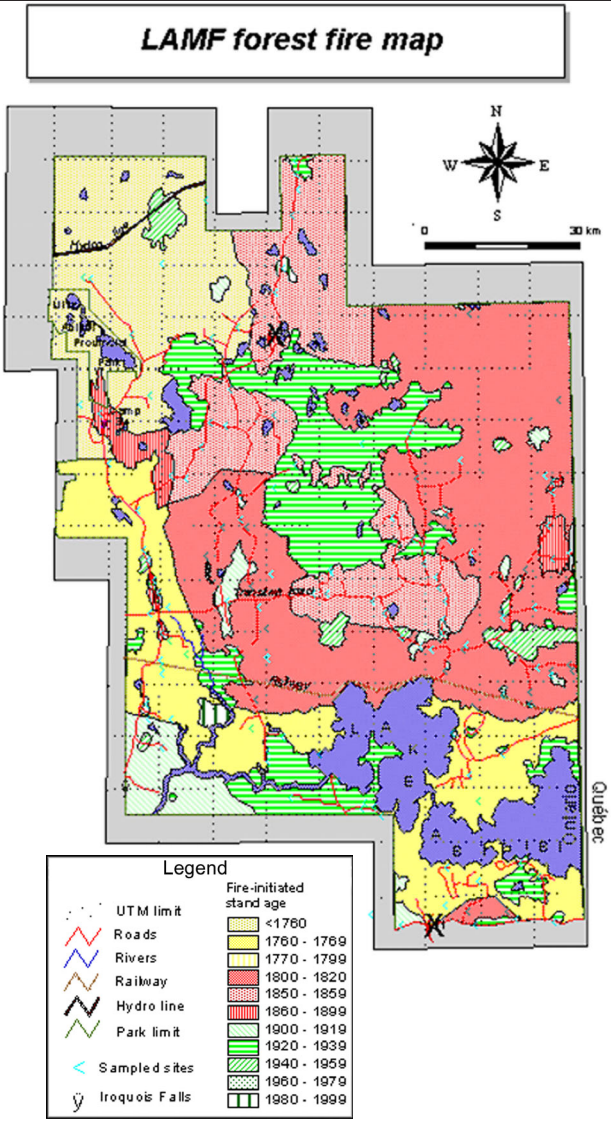

***Figure 1**. Time since fire map of the Lake Abitibi Model Forest.*

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Age-class distribution

Nineteen percent of the land base of the LAMF originated from fires that occurred between 1910 and 1930. Since then, there has been a general decrease in the area burned. It is worth noting that almost 78% of the forest has not burned for more than 100 years, 31% for more than 200 years and 13% for more than 250 years. The average age of the forest stands is 172 years. This average age is equivalent to the general fire cycle of the study area for the entire period under study, which is longer than what is generally expected for the boreal forest.

Forest composition

As expected, the jack pine, white birch, and poplar working groups (WG) are most dominant in the stands that have burned within the last 100 years. The black spruce WG occupies an increasingly larger area in older stands that have not burned at least since 1860. There is also a trend towards increasing occurrence of the balsam fir WG with the time since fire, and it is very rare in stands that have burned within the last 100 years. Finally, the white cedar WG is more abundant in the older stands. These results confirm that the dominance of various species changes over time.

Exploratory analysis of tree species trends as a function of fire and surface geology revealed that till and sand are more favourable to jack pine than clay or organic deposits, with 44% of jack pine stands located on sand. Only 2% of stands with jack pine are older than 200 years. Balsam fir was found to have a preference for sandy deposits, and analysis confirmed that this species is rare in stands that have burned recently.

CONCLUSIONS

With a mean time since fire of 172 years for the LAMF region, a large portion of the forested area exceeds the usual rotation age. Most of the older stands would be eliminated in an even-aged management strategy with a rotation of 100 years. The difference between natural age-class distribution and the one under the current management system is fundamental because it implies, under fully regulated, even-aged management, the loss of over-aged forests, which are often judged essential to biodiversity maintenance, or a decrease in allowable cut due to longer forest rotations if the natural disturbance cycle is strictly adhered to. We suggest that this apparent incompatibility between these two aspects of sustainable forestry can be mitigated by the use of silvicultural practices designed to maintain specific structural characteristics of over-mature stands in forests under management. This approach may provide a means of maintaining species and ecosystem diversity while only slightly modifying allowable cut.

MANAGEMENT IMPLICATIONS

It would be possible to treat some stands by clear-cutting followed by planting or seeding, representing a treatment considered similar to fire; other stands would be treated by partial cutting or careful logging, which simulates the natural evolution of over-mature stands; and still other stands would be harvested by selection cutting, as a means of emulating gap dynamics in old growth. We suggest that the average forest stand age, 172 years in the LAMF, could be used as a baseline in strategic planning of harvesting activities in order to estimate the desired proportion of the three cohorts under different silvicultural treatments. With a maximum harvesting age of 100 years, 43% of the stands would be treated as cohort I, 25% as cohort II and 32% as cohort III.

SOURCES OF RELEVANT INFORMATION

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