THE INFLUENCE OF FIRE INTERVAL ON THE REGENERATION OF BLACK SPRUCE AND JACK PINE IN THE NORTHERN BOREAL FOREST OF QUEBEC

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ABSTRACT

Black spruce (*Picea mariana*) and jack pine (*Pinus banksiana*) are two major species of the North American boreal forest, east of James Bay, Quebec. These tree species are the main components of the forest cover in the area, where a 100-year fire rotation period prevails. Largely because of catastrophic fires in 1989, the local fire cycle decreased from 100 to 50 years. Previous studies carried out in this area suggest that the current fire regime favors jack pine expansion at the expense of black spruce. To test this hypothesis, we calculated the probabilities of post-fire transition from one species to another for two fire intervals (47 and 67 years) in well-drained sites and for longer intervals (from 92 to 270 years) in poorly drained sites. The transition probabilities were used in a simulation model of the post-fire forest regeneration. This model takes into account 1) the proportion of spruce and pine in the initial stand, 2) the evolution of these two tree species densities during the fire-free interval, 3) the variability in the duration of successive fire intervals, and 4) the regeneration potential (number of viable seed per unit area) as influenced by the forest dynamics between two fire events. Field data show that despite the absence of mature jack pine in the poorly drained sites, it represents 11% to 40% of the regeneration observed 11 years after fire. Jack pine regenerated in poorly drained sites from adjacent well-drained sites following the 1989 fire. The probability that a jack pine will replace a black spruce after fire averaged 0.76 (n = 366) for a 47-year fire interval in the well-drained sites and decreased to 0.16 (n = 49) for a 211- to 270-year fire interval in the poorly drained sites. This model is a tool for studying the long-term consequences of present and anticipated future fire regimes on the composition of the regenerating stands.

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