

Prescribed Fire in an Eastern White Pine Stand in Pukaskwa National Park*

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Abstract

One role of protected areas is to act as an ecological baseline. Parks Canada is legislated to maintain protected ecosystems in as natural a state as possible. Prescribed fire is a key vegetation management "tool" available to park managers. Since its establishment in 1978, Pukaskwa National Park has operated under a fire suppression regime. Given the fire dependant nature of the forest communities in the park, the suppression of fire may be characterized as a regressive management intervention. The Park Ecosystem Conservation Plan and Vegetation Management Plan emphasize the requirement for fire on the park landscape. Prescribed fire is a proactive management intervention. This paper documents the use of fire in an old growth white pine stand in Pukaskwa National Park and the preliminary vegetation responses. The forecast and actual fire behaviour and fire effects will be described as will the planning process and the logistical challenges related to implementing the parks first fire use project.

Introduction

One role of protected areas is to act as an ecological baseline. Parks Canada is legislated to maintain protected ecosystems in as natural a state as possible. Prescribed fire is a key vegetation management "tool" available to park managers. Since its establishment in 1978, Pukaskwa National Park has operated under a fire suppression regime. Given the fire dependant nature of the forest communities in the park, the suppression of fire may be characterized as a regressive management intervention. The park Ecosystem Conservation Plan (Geomatics, 1997) and Vegetation Management Plan (Lopoukhine, 1989) emphasize the requirement for fire on the park landscape. Prescribed fire is a proactive management intervention. This poster documents the use of fire in an eastern white pine stand and preliminary observations of vegetation response.

Site Description

The 23 hectare study site is located in Pukaskwa National Park, 82 kilometres west of Wawa, Ontario. This area is in the transition between the Great Lakes-St. Lawrence forest region and the Boreal forest region (Rowe, 1972). Eastern white pine (*Pinus strobus*) occur as scattered individuals throughout the southern two-thirds of the park. White pine are uncommon in the northern one-third of the park. The stand is dominated by a supercanopy (26 metres, 60 to 90 cm d.b.h.) of white pine and three red pine (*Pinus resinosa*). The red pine date to approximately 1790. The stand may have been perpetuated by human caused fire. The site is just inland from a natural campsite on the shore of Lake Superior, an important historical

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travel route. The stand can be described as Ecosite 15 (Racey, 1997), vegetation type V-12 (white pine mixedwood), and soil type S-2 (fresh, fine sandy mineral soil) as per the Northwestern Ontario Forest Ecosystem Classification (Sims, 1997). The subcanopy is composed of white birch (*Betula papyrifera*), white spruce (*Picea glauca*), black spruce (*Picea mariana*), trembling aspen (*Populus tremuloides*) and several jack pine (*Pinus banksiana*). The understorey was dominated by balsam fir (*Abies balsamea*), white birch and mountain ash (*Sorbus decora*). Balsam fir was present throughout the stand, but formed dense thickets in approximately one half of the area.

An assessment of pine species regeneration was completed in 1996. No pine seedlings were found in regeneration survey plots however some were noted incidentally. Fire may have burned areas immediately adjacent to the stand in the 1920s as evidenced by fire charred white pine stumps and some even aged pole size white pine.

Reasons for the lack of regeneration may include: blister rust, insufficient light exposure, the deep duff layer or lack of seed. Blister rust does occur in the park but was not observed in this stand. The deep duff layer is not likely the limiting factor but these conditions may be desirable for the larval stage of cone insects. We have not noted any unusual number of aborted cones. On the basis of open cones in the canopy and on the ground, the trees seem to be light to moderate, but consistent seeders.

Vegetation Management Objectives

An essential step in the management of park ecosystems is to quantify the objectives of any management intervention. The specific objectives for this fire use project were:

- to encourage natural pine species regeneration in the treatment area;
- to reduce forest fuels by approximately 2 kg/m²;
- to reduce balsam fir regeneration by more than 60%;
- to encourage the perpetuation of jack pine and red pine as scattered individuals;
- to expand the stand area by 10% (2 hectares); and,
- to assess potential cone crop for 1998, and evaluate potential for a repeated treatment.

Fire Use Prescription

The prescription was a compromise between managing fire behaviour and managing potential competing vegetation. The prescription was developed in part using the Understorey White Pine Prescribed Burning Expert System (Kourtz, 1996). The project was a cooperative venture involving: Parks Canada personnel from Pukaskwa National Park and other national parks; Pic River First Nation; Ontario Ministry of Natural Resources, Wawa District; and, the Canadian Forest Service.

Results and Discussion

The prescribed burn was completed April 27 and 28, 1998, eleven days after a late spring snow fall had melted. The soil was still frozen in most locations. Fire weather indices for these two days are shown in Table 1. The strip back fire pattern was

Date	Temperature (°C)	Relative Humidity	Wind Speed (km/h)	Wind Direction	Fine Fuel Moisture Code (FFMC)	Duff Moisture Code (DMC)	Initial Spread Index (ISI)	Build-Up Index (BUI)
April 27	7.5	36%	2.2	194°	89.5	22.9	4.6	22.9
April 28	9.3	23%	2.9	216°	90.4	27.2	5.3	27.1

Table 1: Fire Weather Indices for April 27 (Unit A) and April 28 (Unit B), 1998

ignited by hand drip torches, proceeding cross slope. The strips were laid from five to 15 metres apart. The ignition strategy is critical to managing fire intensity and behaviour and, by extension, to achieving vegetation management objectives. No control problems were encountered and there were no escapes across the fire line. Light touch tactics were used wherever possible. The perimeter consisted of a narrow trail. The trail and outside perimeter was surface wetted prior to ignition. The fire was permitted to smoulder for 24 hours after ignition.

The prescribed burn met most of the vegetation management objectives. The leaf litter was reduced by an average of one centimetre. Most of the fuels consumed (1.2 kg/m²) were fine and medium fuels on the forest floor, and the balsam fir. Ninety percent of the stand was blackened resulting in 80% mortality of balsam fir. An additional 10% of the balsam fir were scorched to a point where mortality is likely. Six of the white pine were killed directly by fire (torching). Fire burned out the heartwood of an additional ten white pine, five of which have since toppled. The direct white pine mortality at the time of fire use was about 5%. An accurate determination of pine mortality will be made in 1999.

An assessment of the white pine conelets suggests that 1998 was an above average seed year. The heat caused some of the jack pine cones to open. Jack pine seed was observed on the ground two days after fire use.

Photos and videotape were taken at permanent photo points in 1997, prior to, during and immediately after the burn. Three 10x10 metre Forest Ecosystem Classification permanent sample plots were established in 1996. Each plot will be monitored at least every second year to assess fire effects generally and regeneration of pine species specifically.

Summary

Despite significant logistical challenges, this prescribed burn was considered a great success in terms of interagency cooperation, fire line organization, holding and suppression. Initial results suggest that immediate vegetation management objectives including balsam fir reduction were achieved. Monitoring will reveal the extent to which other objectives such as pine species regeneration were achieved.

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