EXPERIMENTAL REBURNS 1–4 YEARS AFTER A HIGH-INTENSITY CROWN FIRE

Nathalie Lavoie
Department of Renewable Resources, University of Alberta, 751 General Services Building, Edmonton, AB T6G 2H1, Canada

Martin E. Alexander
Canadian Forest Service, Northern Forestry Centre, 5320 - 122 Street, Edmonton, AB T6H 3S5, Canada

ABSTRACT

Taking advantage of the opportunity provided by the International Crown Fire Modelling Experiment (ICFME) in Fort Providence, Northwest Territories, Canada, we investigated into the flammability of recent burns (up to 4 years since fire) following a high-intensity crown fire was performed. Before the ICFME experimental fires, the burned areas were sections of a mature (71-year-old) jack pine (*Pinus banksiana*) stand with an understory of black spruce (*Picea mariana*).

In June 2000, a 30 × 30-m subplot was located in plots 6 (burned in 1997), 8 (burned in 1998), and 9 (burned in 1999) at the ICFME site, and the fuels were inventoried. On 28 June, a day when the fuel moisture and current weather conditions were conducive to crowning (a successful crown fire was carried out in Plot 3), the three subplots were ignited (reburn) after sampling the fuel moisture. The Canadian Forest Fire Weather Index (FWI) System components for 28 June 2000 were Fine Fuel Moisture Code (FFMC) = 93.2, Duff Moisture Code (DMC) = 65, Drought Code (DC) = 404, Initial Spread Index (ISI) = 10.8, Buildup Index (BUI) = 93, and Fire Weather Index (FWI) = 32. The line ignitions, performed during the peak burning period, were completed a few minutes apart (the time for the "terra-torch" to travel from one plot to the other). These quasi-simultaneous ignitions allowed for the observation of the three fires under the same weather conditions (temperature 28.3 °C, relative humidity 32%, and 10-m open wind 23.1 km/h). Only Plot 6 (3-year-old burn) continued to burn after the line of fuel from the ignition had been consumed. However, the fire was only burning in certain types of material (i.e., punky wood, logs, stumps, and the remaining duff surrounding them) and several sections of the line went "out" just a few moments after ignition. The vegetation present in the subplot did not contribute significantly to the fire. After 30 minutes no visible flame was observed, although some small areas within the perimeter of the fire kept smouldering for approximately 24 hours, with no appreciable spread, before the fire was declared "out." A few raindrops (0.4 mm) were recorded on site on the evening of 28 June, which may have contributed to the extinction of the fire in Plot 6.

In June 2001, in light of the observations made the previous year and considering the general patchy pattern of regeneration in recently burned stands, we decided to downscale experimental observations to microplots (2 × 2 m). As the reburn in Plot 6 was the only one which showed any signs of sustained fire activity in 2000, the microplots were located only in the three ICFME plots burned in 1997 (i.e., plots A, 5, and 6). The location of the microplots was selected according to the pattern of vegetation development in each stand. Seven microplots were established in these recently burned areas, and four microplots were set up in an adjacent unburned section of the mature stand. The microplots for the reburns were located in areas mainly covered by low shrubs (n = 1), carpets of twin-flower (*Linnaea borealis*) (n = 1), or grass (approximately 50% cured) (n = 1). Four (n = 4) microplots were also located in areas covered by a mix of herbs, shrubs, grass, seedlings, and duff that were reproducing at a smaller scale the conditions in the 30 × 30-m subplot burned the previous year in Plot 6. For each test fire event, one microplot located in the mature stand was burned simultaneously with one or two microplot(s) located in a recently burned area afforded by the ICFME burns. The line ignitions were performed using hand-held drip torches. The range in the FWI components under which these microplots were burned (14–16 June and 19 June) were FFMC = 89.9–92.6, DMC = 49–65, DC = 175–210, ISI = 7.8–14.5, BUI = 58–73, and FWI = 21–35. The 10-m open wind speed recorded during the fires was between 10 and 13 km/h. For every paired ignition, the fire burning in the microplots located in the mature stand spread across the entire length of the microplot and had to be subsequently extinguished. In the reburned microplot(s), there was no noticeable fire spread and the fire went "out" as soon as the line of fuel from the drip torch had been consumed.

These observations indicate that under similar (or milder) weather and fuel moisture conditions, stands that show the same fuel–vegetation development after fire as the ICFME site are unlikely to reburn during at least the first 4 years following a high-intensity crown fire. It would, however, be useful to know whether similar experimental fires could be performed on the other plots of the ICFME (or of other sites providing a similar opportunity) during a longer time period (i.e., 15–25 years). Very little is known about the variation in flammability with time in most of these fuel types and long-term opportunities to study this aspect of fire behavior are quite rare.

Citation: Lavoie, N., and M.E. Alexander. 2004. Experimental reburns 1–4 years after a high-intensity crown fire [abstract]. Page 229 *in* R.T. Engstrom, K.E.M. Galley, and W.J. de Groot (eds.). Proceedings of the 22nd Tall Timbers Fire Ecology Conference: Fire in Temperate, Boreal, and Montane Ecosystems. Tall Timbers Research Station, Tallahassee, FL.