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Canadian Forest Service – Great Lakes Forestry Centre

Prescribed Burning in the Tallgrass Prairie Ecosystem

INTRODUCTION

The tallgrass prairie ecosystem is one of the most endangered ecosystems in Canada. It is characterized by grasses up to three metres tall and by a variety of wildflowers and fauna, including numerous species at risk. It once covered close to 1000 km^2 throughout southern Ontario and now only 3% of that area remains as small, fragmented pockets. These areas, between the Trent River and Windsor, represent the most easterly extent of the ecosystem in Canada. A major cause of the decline of this ecosystem was the practice of fire exclusion in the last century; frequent fires are needed to encourage seed production and prevent the encroachment of woody plants. Restoration efforts over the last 20 years have included an increasingly active prescribed burning program, delivered by a growing range of stakeholders. Fire scientists with the Canadian Forest Service (CFS), recognized worldwide for their expertise in developing fire behaviour prediction systems, have been involved in creating new prediction models for fire behaviour in grasses. These new models are intended to more accurately predict rate of spread for the tallgrass prairie ecosystem fuel type than the current model. The recently published "Field Guide to Predicting Fire Behaviour in Ontario's Tallgrass Prairie" will provide burn practitioners with the best available science and tools to assist them in preparing burn plans and making decisions about expected fire behaviour on any potential burn day, thus minimizing risk to the public and to property in the area.

GREAT LAKES FORESTRY CENTRE (GLFC) RESEARCH

The CFS developed the Canadian Forest Fire Behaviour Prediction (FBP) System, which is currently used operationally throughout Canada. While it already contained rate of spread estimates for grass fires, designed for use when planning prescribed burns, observations from experienced prescribed burners confirmed that fire behaviour was not being predicted well by the FBP System under many circumstances. Furthermore, the act of burning these fuels and restoring tallgrass species to the sites leads to an increase in fuel loads and a subsequent increase in fire intensity on further burns. CFS fire researchers recently joined with the Ontario Ministry of Natural Resources (OMNR) and the Elgin County Stewardship Council to carry out a research program aimed at developing a better practical understanding of fuels and fire behaviour in the tallgrass prairie ecosystem. As a major part of this initiative, a Masters student at the University of Toronto carried out field documentation of fuel loads and fire behaviour under the guidance of GLFC scientist Mike Wotton as part of a partnership agreement with the Faculty of Forestry.

Fuel load assessment

Despite its importance in estimating potential fire intensity, there has been no simple and efficient method in place for objectively assessing fuel loads on tallgrass prairie sites during prescribed burn planning. New techniques for the rapid assessment of fuel load in tallgrass prairie were developed to assist in prescribed burn planning. Methods described in the field guide use either a Robel pole (a standardized method of estimating visual obstruction from fuel) or a photo series. Both methods are to be used during the fall before the planned burn, while the grass is still standing; this timing also corresponds to the period when spring burn plans must be developed. Observed fuel loads on tallgrass sites across southern Ontario were 2-3 times higher than the standard fuel loading used in the Canadian FBP System.

Spread rate prediction

Fire behaviour observations collected from approximately 15 prescribed burns in the spring of 2008 and 2009 were used to test several existing models for predicting grass fire spread rate for the tallgrass prairie type. Weather, fuel consumption and fire spread rate observations were collected on each fire and compared to existing models of fire spread rates. Despite burns being carried out under a range of typical fire weather conditions, the current operationally used grassland model in Canada did not predict spread rates well. An existing model from Australia was adopted as the most accurate.

Moisture model for grass drying time

The Australian grassfire spread rate model proposed for use in tallgrass prairie relies upon a direct estimate of grass moisture content; this was provided by a new model for cured grass moisture in unshaded conditions. GLFC scientists developed the new moisture model based on field sampling of grass drying throughout the day. The new weather-based moisture model incorporates the effect of solar radiation and allows users to track the moisture content in exposed grass layers matted down by winter snowpack. The new model helps explain how grasslands can go from soaking wet to dry and ready to burn within a few hours.

Field demonstration

CFS and Ontario Parks field staff tested the predictions from the new field guide in the spring of 2010 at Rondeau Provincial Park by conducting prescribed burns on a series of grass-covered plots. Seven plots, created by using existing borders within the park, were burned over a full day. In the days prior to the burns, the weather was extremely cold and wet; over 25 mm of rain fell during the two days previous and light snow was in the air on the evening before the burns. The grass spread model in the currently used Canadian FBP System predicted that fire would not be able to sustain itself and spread at any point during the day. However, burns ignited every hour from 10:30 a.m. onwards began as very slow-moving fires and increased to very high intensity grass fires with spread rates of around 40 metres/minute by early afternoon (a value predicted by the new spread rate model). This day of controlled burning provided an excellent demonstration of the effectiveness of these new models.

Future Work

Further work to test the applicability of the new grass moisture and spread model in grass fuels other than tallgrass prairie will be carried out in addition to the continued collection of fire behaviour observations in tallgrass. The majority of fire weather stations operated by fire management agencies across Canada do not currently report solar radiation with their observations, so methods will be developed to estimate diurnal solar radiation from latitude, longitude and date in combination with a standard estimate of sky cover. This will be of use not only for grass moisture estimation but also eventually for the new forest litter moisture models under development within the CFS, which will also depend partly on estimates of solar radiation.

CONCLUSION

CFS scientists and other members of the tallgrass fire behaviour project team are working with the OMNR to bring this new guide into operational use. Workshops have been held in southern Ontario with practitioners directly involved in planning and executing prescribed burns. A successful prescribed burning program will be an important tool in the restoration of the tallgrass prairie ecosystem.

ADDITIONAL INFORMATION

Field Guide for Predicting Fire Behaviour in Ontario's Tallgrass Prairie

http://firelab.forestry.utoronto.ca/publications/grass_field_guide.html

PRINCIPAL COLLABORATORS

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- Ontario Ministry of Natural Resources
- SMK Consulting
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