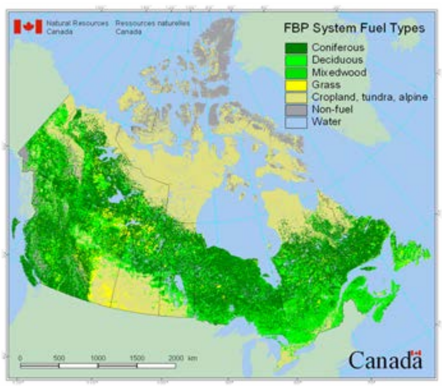
Monitoring Vegetation Changes to Help Predict Fire Behavior

The Canadian Forest Fire Behavior Prediction (FBP) System uses weather, topography, and vegetation to estimate potential rate of fire spread, fuel consumption, and fire intensity. These estimates support applications such as fire management preparedness and decision-making, prescribed burn planning, fire growth modeling, and smoke forecasting.



The Canadian Wildland Fire Information System (CWFIS) uses the FBP system to produce daily national maps of fire behavior components, which are presented on the CWFIS web site (www.cwfis.cfs.nrcan.gc.ca).

FBP System Fuel Type Map (Natural Resources Canada)

Peter Englefield, a Physical Sciences Officer with the Canadian Forest Service (CFS) explains, “One of the inputs to this process is a fuel type map, which is updated annually. But grass and deciduous fuel types change during the course of the year. Ease of ignition, fire spread rate, and fire intensity are significantly greater in grasslands when the grass is dry (cured) and in deciduous forests when the trees are leafless.”

The Normalized Difference Vegetation Index (NDVI) is a measure of the relative density and health of vegetation. In 2014 the CWFIS began using current NDVI data downloaded from the US Geological Survey, combined with a weather-based model, to produce daily maps of grass curing and deciduous leaf-out across Canada. “These maps are used as inputs to the CWFIS in order to improve the accuracy of the FBP output maps,” says Englefield. “The hope is that this data will improve the ability of organizations, such as the CFS and provincial and territorial fire management agencies, to better predict fire behavior, and so contribute to a more timely and effective response to wildland fires across Canada.”

Researcher: Peter Englefield (peter.englefield@canada.ca)

Fragmentation and Edge Effects of Seismic Lines on Plant Communities

Linear disturbances such as seismic lines, pipelines, and roads can cause forest fragmentation – isolated patches of forest that disrupt the movement of plants, animals, and insects. These smaller patches have a proportionately high amount of edge habitat, an outer band along the perimeter of the linear disturbance, which may significantly differ in environmental conditions from the interior, undisturbed habitat.

Limited information is available on the fragmentation and edge effects of seismic lines on forest ecosystems in western Canada’s oil patch. Anna Dabros, a Forest Ecologist with the Canadian Forest Service, is researching ways to improve forest regeneration and restoration efforts related to linear disturbances.

“Forests fragmented by linear disturbances may be so affected by edge effects that they may not support the same plant biodiversity and abundance as intact forests, thus reducing the potential for natural regeneration.”

Linear disturbance in Northwest Alberta (photo: Anna Dabros, 2016)

Dabros explains, “The objective of this study is to assess the impact of seismic lines and the edge effects associated with them on plant species composition, abundance, richness and diversity in Swan Hills, northwest Alberta.”

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Sampling vegetation to assess edge effects (Photo: Anna Dabros, 2016)

With an estimated area almost three times the size of PEI, or 1.5 million hectares, linear disturbances in Alberta are an increasing challenge and concern – and current guidelines and requirements for resource extraction companies to reclaim and restore seismic lines may require further scientific guidance.

Says Dabros, "If certain plant species are unable to recover from these disturbances, the boreal forest itself may not be as healthy and resilient as it once was. The baseline information from this research is necessary to develop the right decision-making tools for resource sector managers to anticipate and reduce the potential impacts of industrial operations in the boreal forest."

Researcher: Dr. Anna Dabros (anna.dabros@canada.ca)

Canada's Greenhouse Gas Emissions from Wildland Fires

Forest fires are highly variable disturbances on the Canadian landscape that are responsible for a large amount of the greenhouse gases (GHGs) emitted each year, and are predicted to increase in size and frequency due to a warming climate.

To gain a better grasp of the impact that forest fires have on Canada's GHG emissions, researchers at the Canadian Forest Service (CFS) use the National Fire Database (NFDB), a collection of forest fire data from almost 370,000 wildland fires in Canada (http://cwfis.cfs.nrcan.gc.ca/ha/nfdb), to reconstruct fire activity in Canada.

CFS researchers also rely on the National Forest Carbon Monitoring and Reporting System (NFCMARS; http://www.nrcan.gc.ca/forests/climate-change/carbon-accounting/13087). The NFCMARS is used to calculate GHG emissions rates (in tonnes of CO2 equivalent per hectare) for each ecozone in Canada. Those emission rates are then used to derive total emissions for each fire in the NFDB. The result is an estimate of GHG emissions from every recorded wildfire in Canada.

"What we found," says Brian Simpson, a Forest Analyst and Modeller with the CFS, "is that for the period from 1946 to 2013, GHG emissions peaked in 1989 at 922 mega tonnes (Mt), mostly driven by extreme fires that year in Manitoba and Quebec (Figure 1). From 1980 onwards, the lowest value occurs in 1997, at only 61 Mt in GHG emissions from fires for the whole country. By comparison, Canada's total annual GHG emissions from sources other than forest fires in 2013 were 726 Mt of CO2 equivalent.

Simpson explains further, "first, historically, Canada has not included forest fires in its targets for GHG emissions reductions; second, emissions from forest fires can exceed the rest of Canada's emissions combined; and third, forest fires in Canada are forecast to increase in the future under a warming climate. Therefore," concludes Simpson, "it is important to understand how much forest fires in Canada have contributed to global GHG emissions in the past, and how much they may contribute in the future."

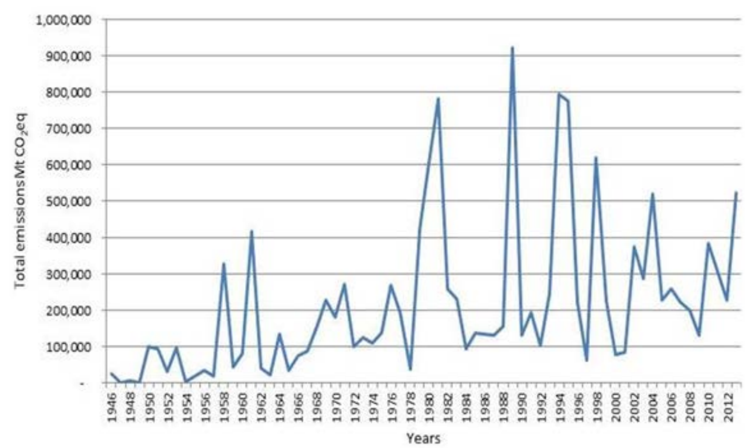

Figure 1. Emissions of greenhouse gases in mega tonnes (Mt) of CO2 equivalent from mapped Canadian fires since 1946. (B. Simpson)

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Aussi en française

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Cite as: Darwent, R., Ed. 2016. Northern Notes. Nat. Resour. Can., Can. For. Serv., North. For. Cent., Edmonton, AB. Northern Notes. No. 3.
ISSN 2369-0208