# Data and Decision Support Tools in the Wildland Fire Information System

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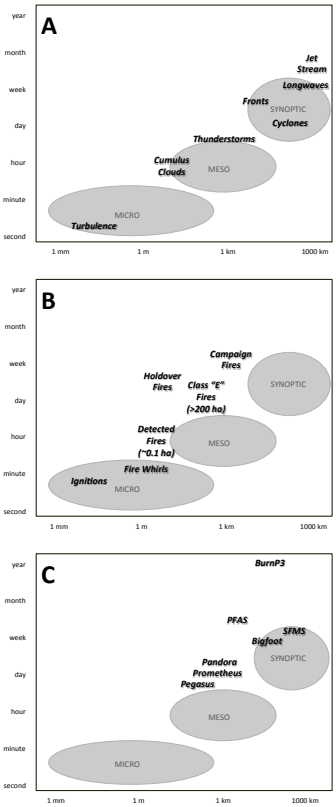
## Decision Support Tools




**A**) The three meteorological scales – micro, meso, and synoptic – are shown on this general representation of meteorological events, organized by the duration and size of the event.

**B**) In addition to fuels and topography, wildland fire is a weather driven process that operates at scales similar to meteorological events. The largest fires can last for weeks or even months and create their own weather systems.

**C**) The Canadian Forest Service uses a variety of models to aid in fire management and planning. Most of the models operate at scales meaningful for large fires (i.e., 200+ ha) because those fires require the greatest efforts to control them.

**Prometheus** – a deterministic fire modelling application that produces fire perimeter predictions; various scenarios can be tested with the model; designed to allow integration with other models

**Pandora** – an application that allows the user to run Prometheus simulations in a batch process

**Pegasus** – an easy-to-use online version of Prometheus (data management and processing are done by the server)

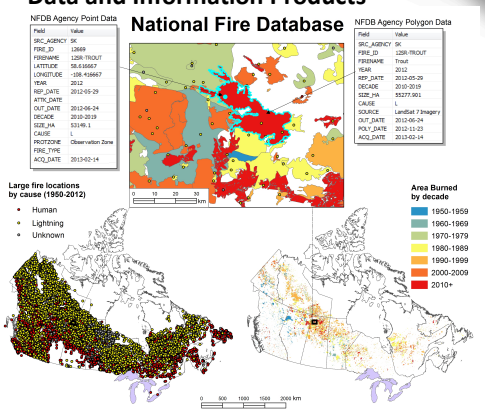
**Bigfoot** – an operational fire growth model available through the CWFIS that produces 24 and 48 hour predictions for dozens of fires every day across Canada

**Probabilistic Fire Analysis System (PFAS)** – a suite of fire growth models that operate at multiple time scales; can use hourly weather data, forecast weather data, or climatological data depending on the length of the analysis

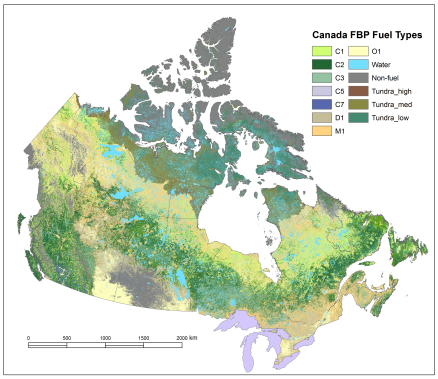
**Burn-P3 (Probability, Prediction, and Planning)** – a fire simulation model that models the ignition and growth of a large number of fires to predict the burn probability; uses Prometheus as a fire growth engine

**Spatial Fire Management System (SFMS)** – a tool to produce raster maps of weather and fire weather components, fire behavior, even fire climatology; used to produce the maps on the CWFIS website (http://cwfis.cfs.nrcan.gc.ca/)

## Data and Information Products




The Canadian National Fire Database (CNFDB) is a collection of wildland fire polygon and point data from all of Canada's fire management agencies (provinces, territories, and Parks Canada. The data are highly referenced and useful for a wide range of national scale mapping, analysis and research.




The Canadian Wildland Fire Information System (CWFIS) uses fuel types derived from the Canadian Forest Fire Danger Rating System (CFFDRS) Fire Behavior Prediction (FBP) System. However, updates to the CFFDRS will require a more flexible method to map fuels to match the new system. For example, where the existing FBP fuel types would primarily be mapped according to species (i.e., jack pine would be C3 or C4), the new system could use a combination of structural elements to derive a fuel type. In that case, a C4 fuel type might be defined as a predominantly conifer stand with high crown closure and a top height of less than 10m. The above map is an illustration of that method where all of the FBP fuel types are defined by their structure rather than their predominant forest cover type.

These methods are leading to a new framework for modelling fire (Cruz *et al* 2004) and fuels, using crown bulk density (CBD) and canopy base height (CBH), with the addition of a surface fuel model, as the new method for mapping fuels. Below is an example of how CBD and CBH can used to define the overstory portion of forest fuel types, based on an analysis of National Forest Inventory ground plot data.

Also, as the Canadian Arctic continues to warm, tundra fires have become more common (a fire near Ferguson Lake, NU that grew to over 5,000 ha this year). Therefore, the fuels map also shows a preliminary fuels layer for tundra fuel types.

### Modelling crown base height with Regression Trees.

In the next generation Canadian Forest Fire Danger Rating System (CFFDRS), fire behavior may be modelled using parameters such as canopy bulk density (CBD) and crown base height (CBH). CBH is an easy parameter to conceptualize, but it is more difficult to measure and map. Using ground plot data from the National Forest Inventory (NFI) and recent fieldwork, a regression tree was used to build models of crown base height in Wood Buffalo National Park (WBNP). By using a national map of forest attributes (Beaudoin et al, 2014) and the results of the model, a map of crown base height as a fraction of total height was created for WBNP. The regression tree is shown at right, on the bottom, along with a map of crown base height and the resulting change in predicted critical surface fire intensity compared to standard FBP fuel type models.

CBD – the mass of fuel per unit canopy volume, measured in kg/m3 – can also be derived from the same plot and forest attribute data. When combined, these two variables become the basis for a new method of describing, modelling and mapping fuels in the next generation CFFDRS (see graph at far right).