

Extended-range  
Fire Weather Products  
within the  
Canadian Wildland Fire  
Information System

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***Canadian Forest Service***

# Introduction

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The **Canadian Forest Fire Danger Rating System (CFFDRS)** has been an important part of forest protection operations in Canada since 1970. The ability to forecast fire-weather conditions associated with the CFFDRS is critical to operational decisions and thus is a routine part of fire management planning.

This presentation outlines the current efforts of the **Canadian Forest Service (CFS)** to provide extended forecasts through the **Canadian Wildland Fire Information System (CWFIS)**. Using a suite of forecasting products, the CFS is developing longer-range applications including fire growth and fire occurrence predictions.

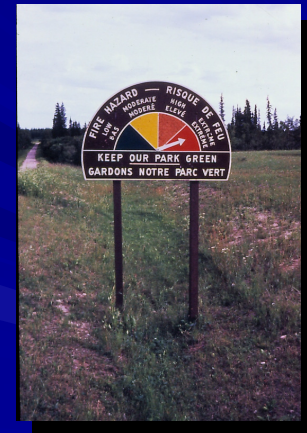
# Introduction

## Canadian Forest Fire Danger Rating System

The fire-weather forecasts are based on the forecasted conditions as calculated by the **CFFDRS**.



The two principal models within the CFFDRS are the Canadian Forest **Fire Weather Index (FWI)** System and the Canadian Forest **Fire Behaviour Prediction (FBP)** System. This presentation focuses on components of the FWI system.

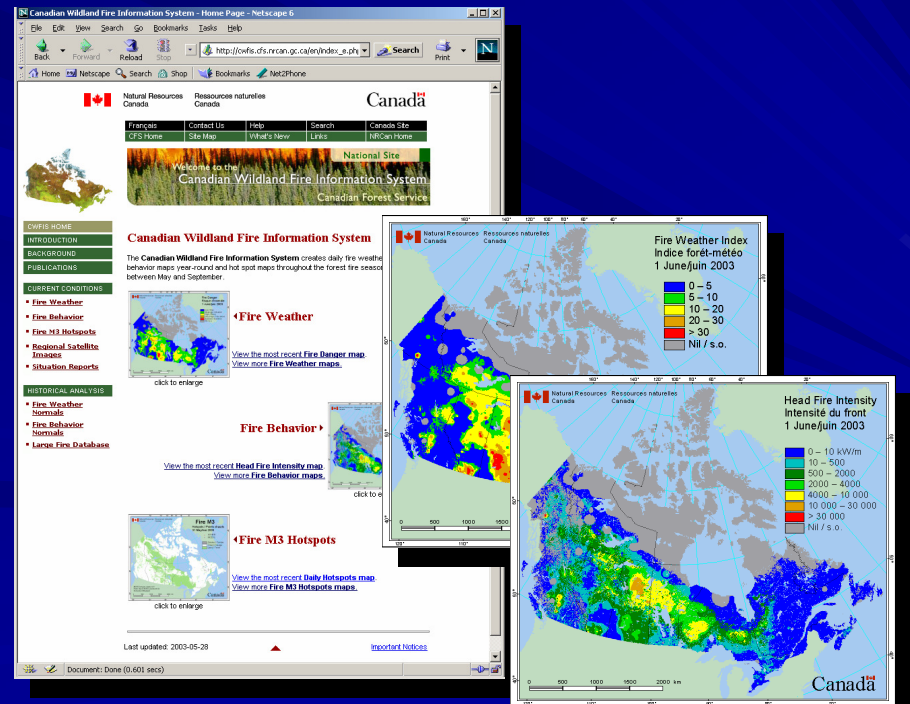


# Introduction

## Canadian Wildland Fire Information System

The **Canadian Wildland Fire Information System (CWFIS)** is a computer-based fire management information system that monitors fire danger conditions across Canada.

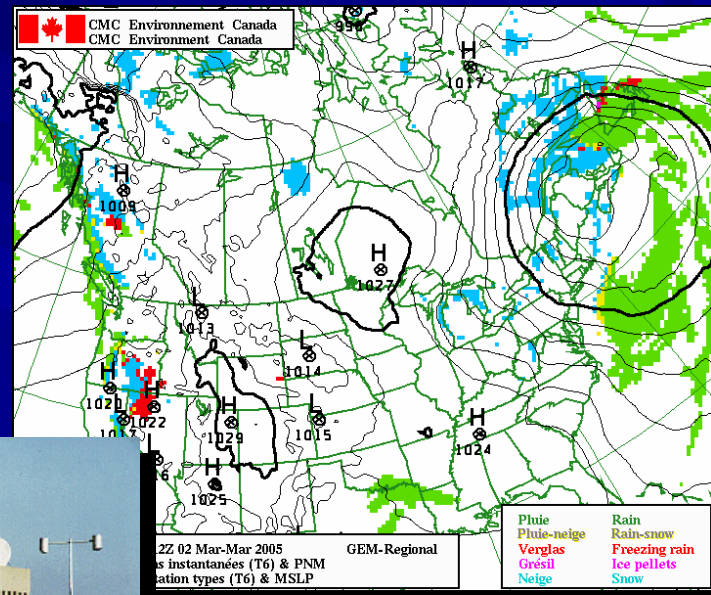
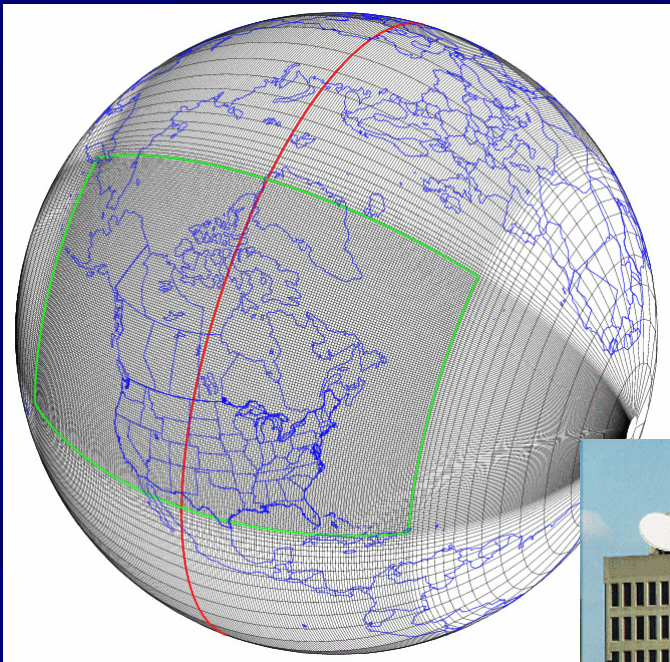
Daily weather conditions are collected from across Canada and used to produce fire weather and fire behaviour maps based on the **Canadian Forest Fire Danger Rating System (CFFDRS)**.



# Introduction

## Canadian Meteorological Centre

The **Canadian Meteorological Centre (CMC)** provides a number of forecasting products that can be applied to fire danger.



# Introduction

## Extended Forecast

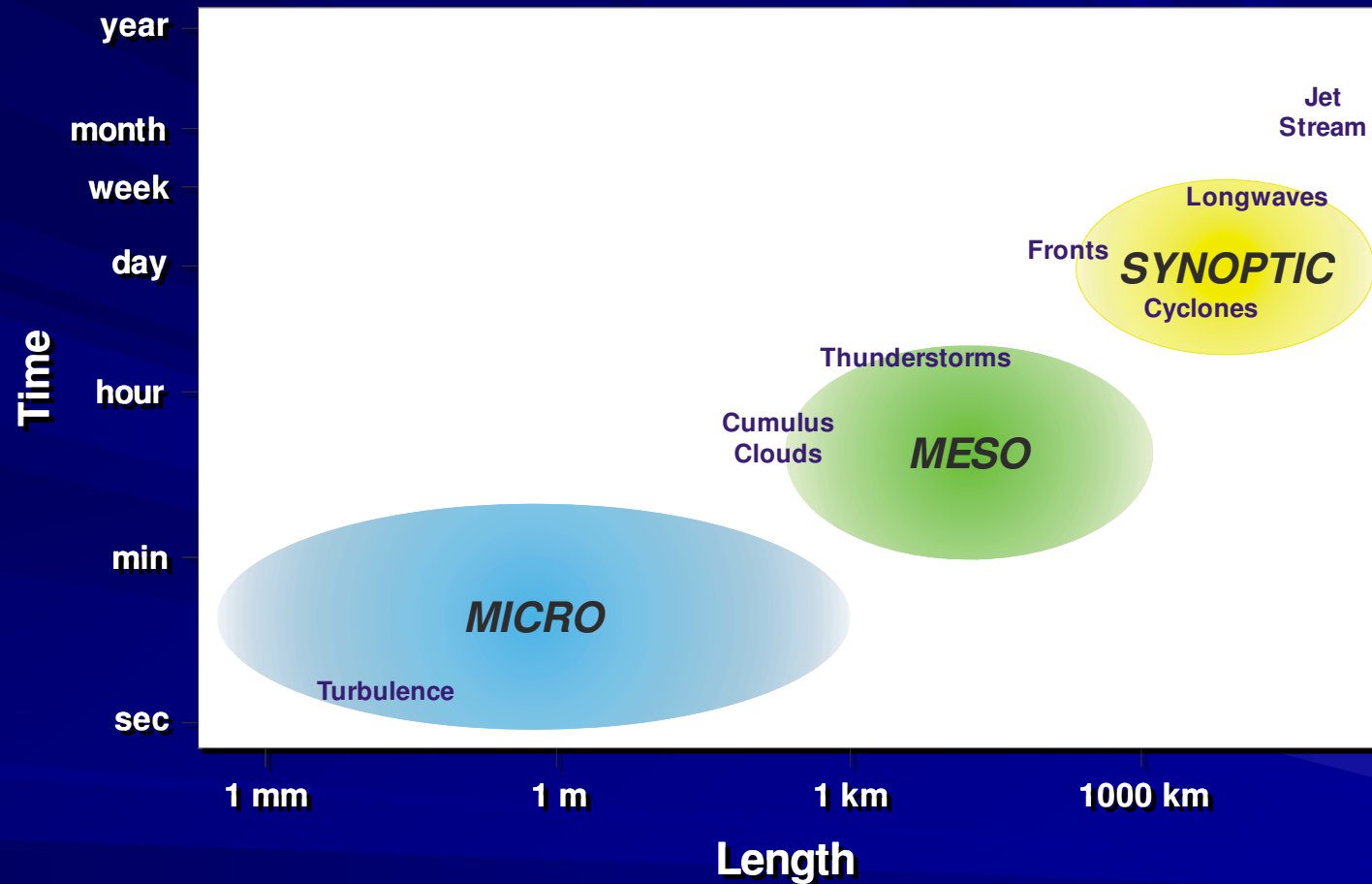
Through cooperation with CMC, the CWFIS is now providing extended-range forecasts of the fire conditions across Canada.

- *For the first **48 hours**, the CWFIS uses CMC's SCRIBE weather products to predict fire weather conditions;*
- *The North American Ensemble Forecast System (NAEFS) is used to produce fire weather forecasts for the next **14 days**;*
- *CMC's Global Seasonal Forecast maps are used to produce monthly forecasts for the next **4 months**.*

# Scales

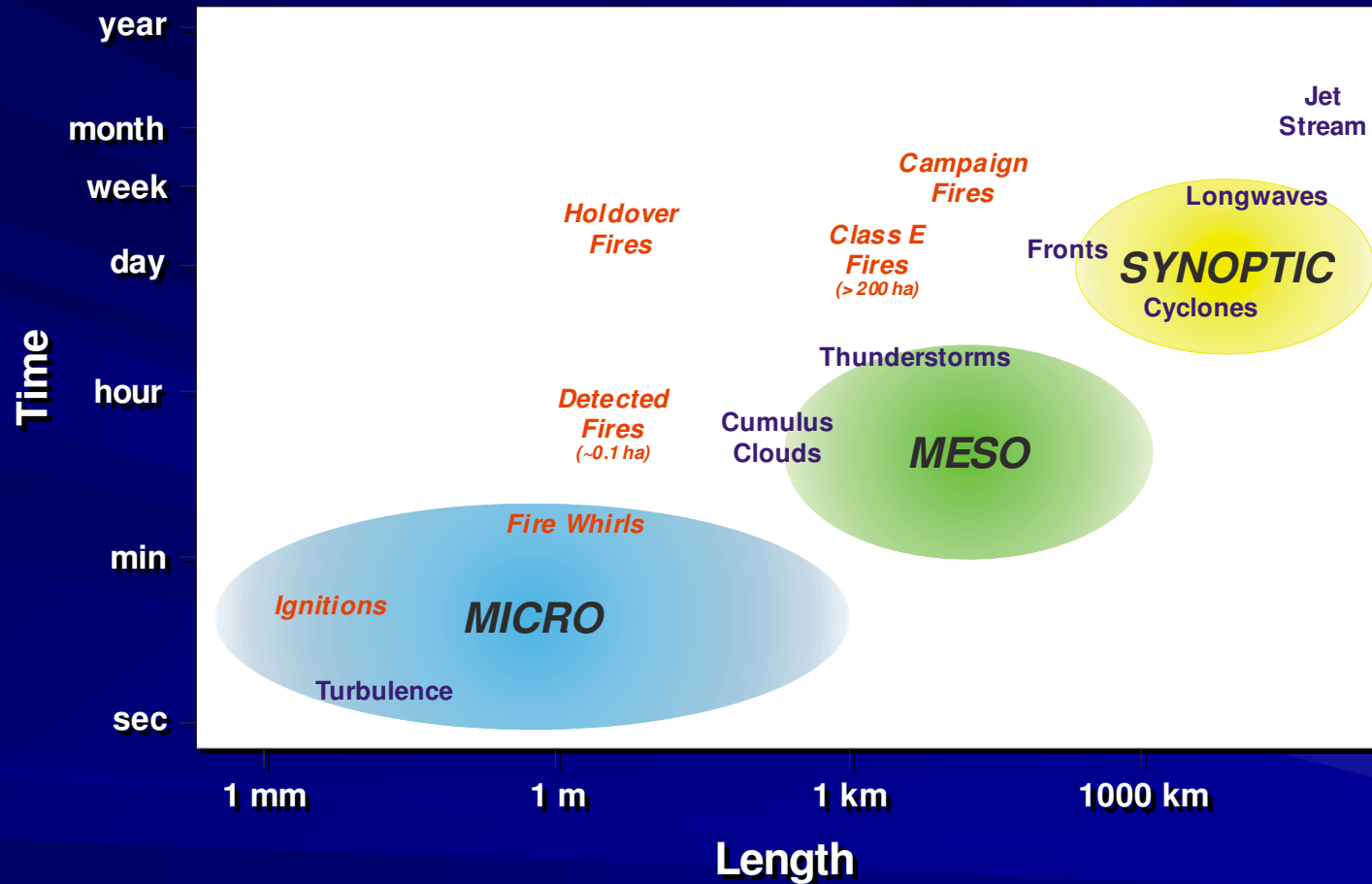


# Scales



Meteorologists have traditionally classified weather events into three scales: **micro**, **meso** and **synoptic**

# Scales



This approach to scales can also be applied to wildland fire and fire danger rating.

# Scales

Forecasting fire danger rating can be divided into three scales depending on weather forecasting ability.

As the run time increases, the model becomes less deterministic and more probabilistic.

Short-range

Medium-range

Long-range

hours

days

weeks

months



*deterministic*  
*weather-based*  
*detailed*

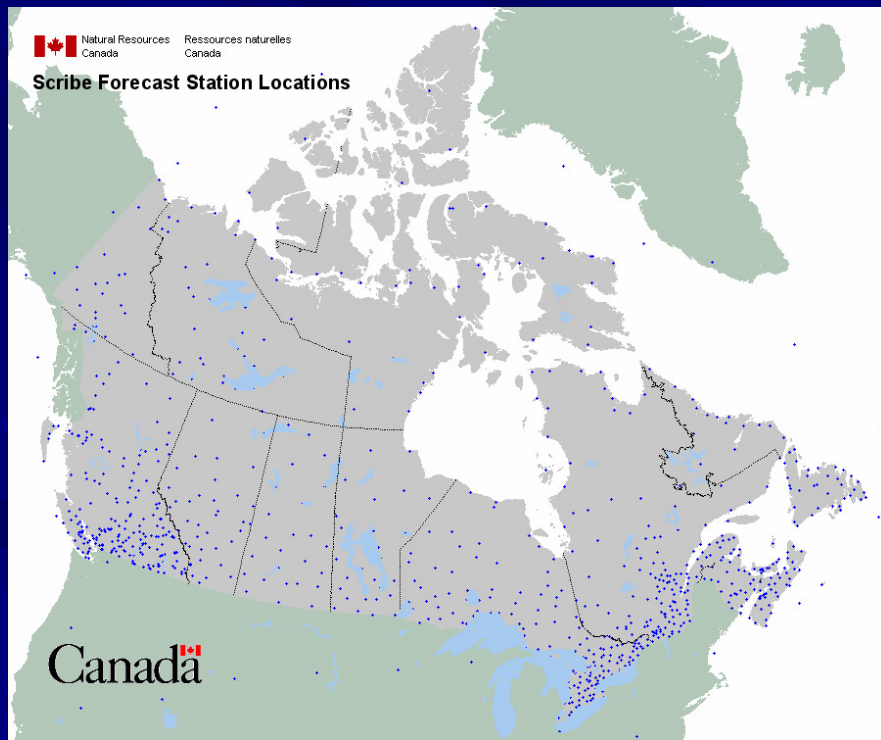
*probabilistic*  
*climate-based*  
*generalized*

# Fire Weather

# Fire Weather

## Short-range Forecasts

CMC's **SCRIBE** forecasts provide 72-hour spot forecasts at 3 hour intervals for 845 stations within Canada.



SCRIBE forecasts are based on the **Global Environmental Multiscale (GEM)** model predictions.

Conditions at SCRIBE stations are interpolated from GEM grids and adjusted using **model output statistics (MOS)**.

# Fire Weather

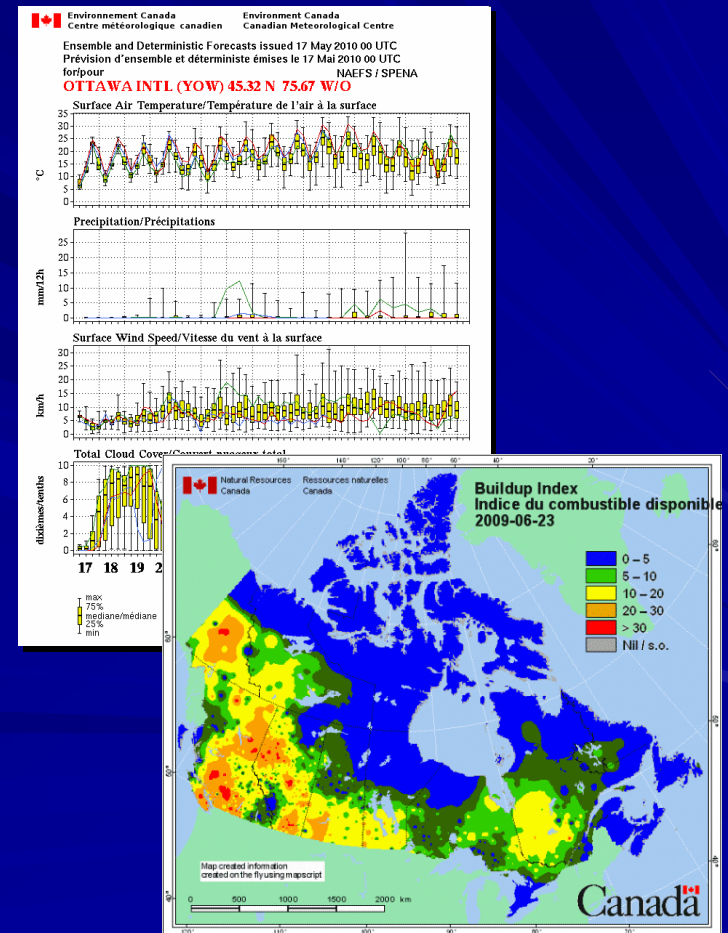
## Medium-range Forecasts

The North American Ensemble Forecast System (**NAEFS**) is a joint project involving

- Meteorological Service of Canada (MSC)
- United States National Weather Service (NWS)
- National Meteorological Service of Mexico (NMSM)

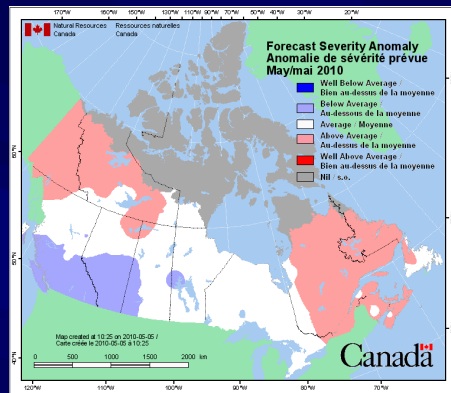


The combined 40-member ensemble provides weather forecast guidance for the 1-14 day period.

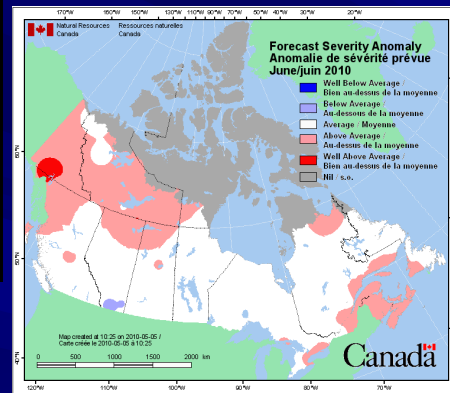


# Fire Weather

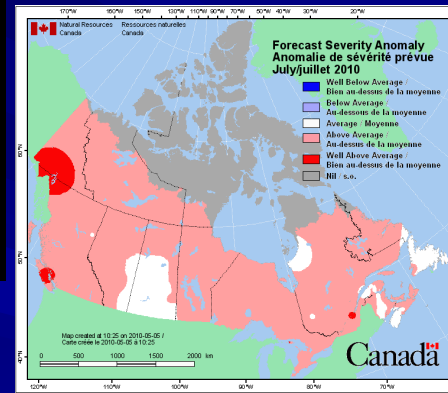
## Long-range Forecasts



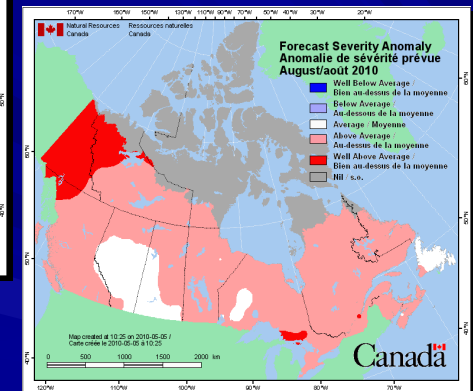
May



June



July



August

CMC's **Global Seasonal Forecasts**

and overwinter conditions as recorded in the **CWFIS**

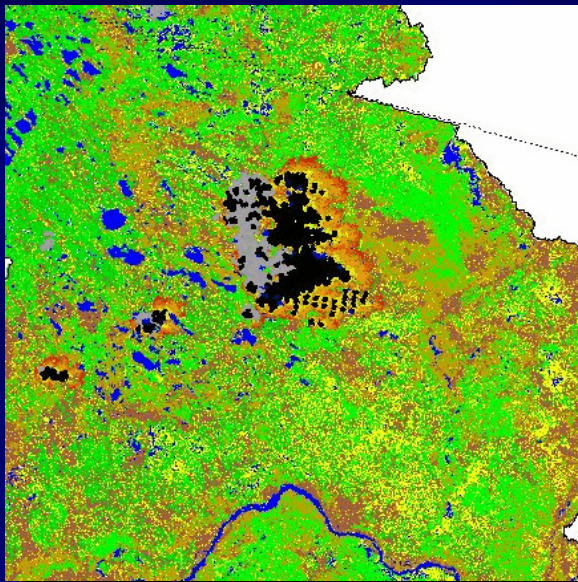
are used to create monthly fire weather outlooks for the next four months.

# Fire Growth Modelling



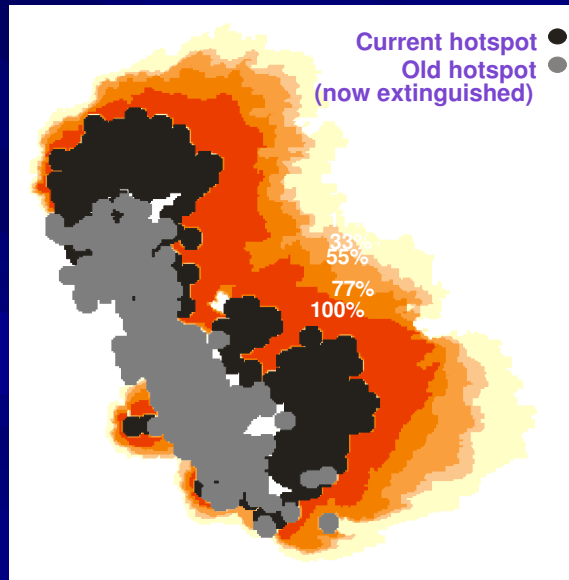
# Fire Growth Modelling

## Prescribed Fire Analysis System



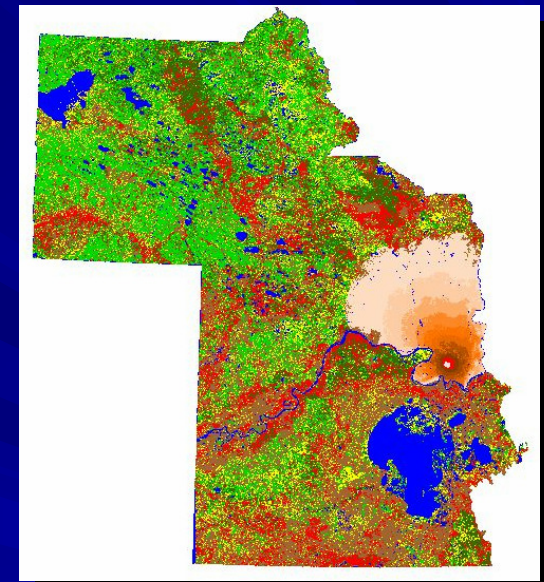
### Short-range

- *hourly*
- *deterministic*



### Medium-range

- *daily*
- *ensemble*



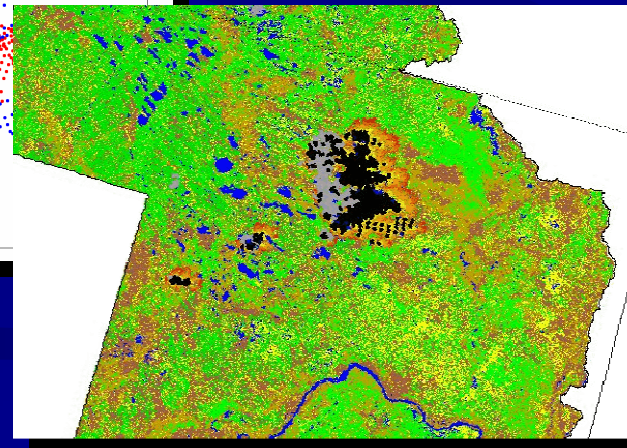
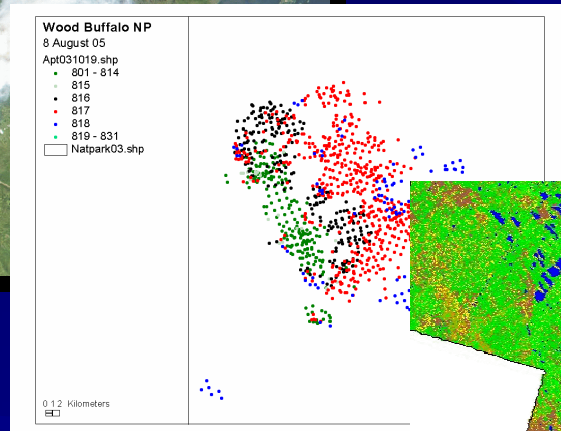
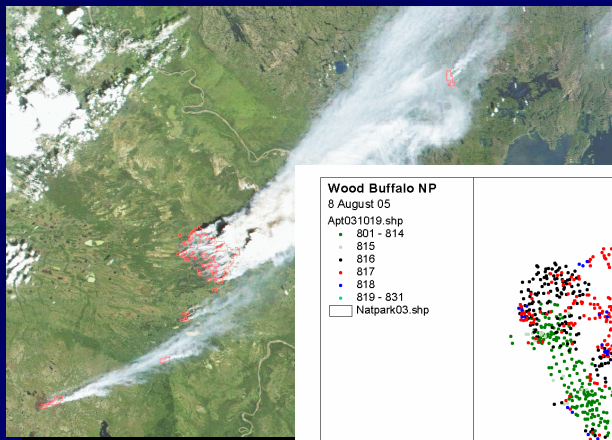
### Long-range

- *weekly*
- *probabilistic*

# Fire Growth Modelling

## Short-range Predictions

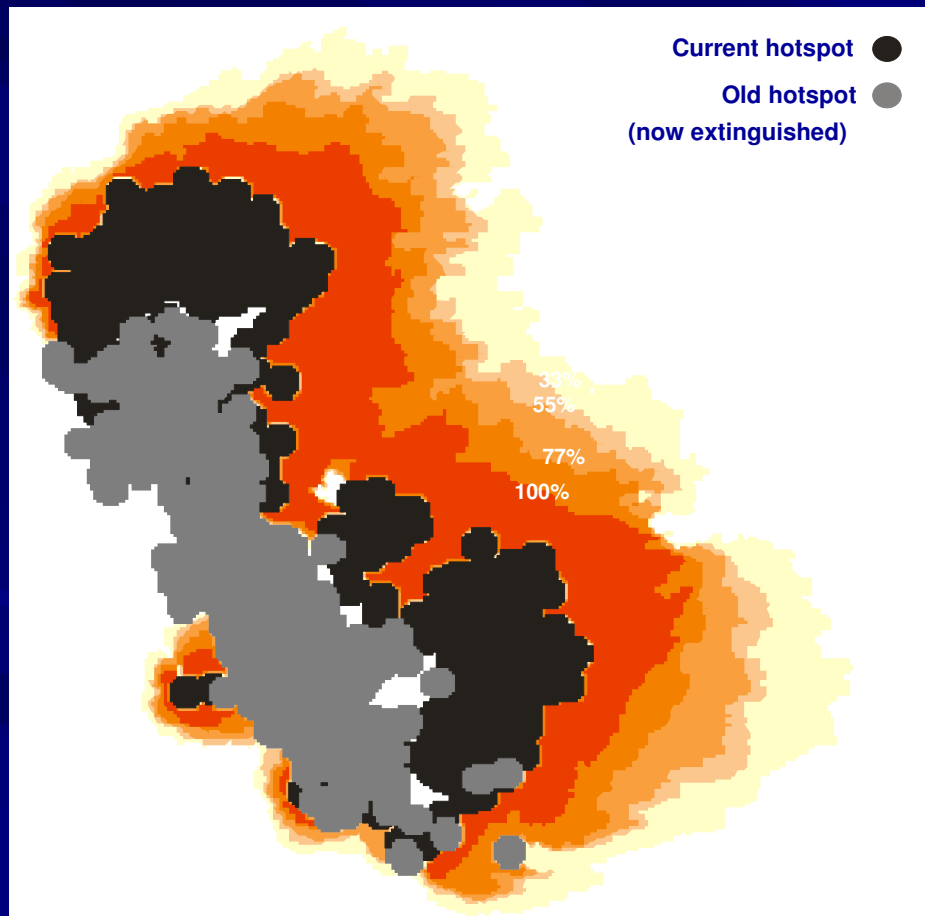
Using **NOAA/AVHRR** and **MODIS** hot spot data and **SCRIBE** forecasts, short-range predictions of fire growth can be produced.



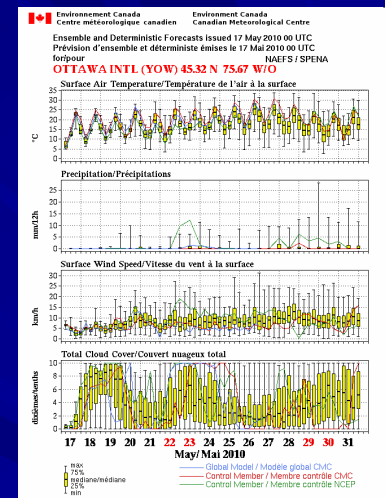
These predictions are available through the CWFIS

# Fire Growth Modelling

## Medium-range Predictions



**NAEFS** products can be used to produce medium-range predictions of fire growth.



These predictions will provide probabilistic fire boundaries useful for estimating probability of containment and threat assessment.

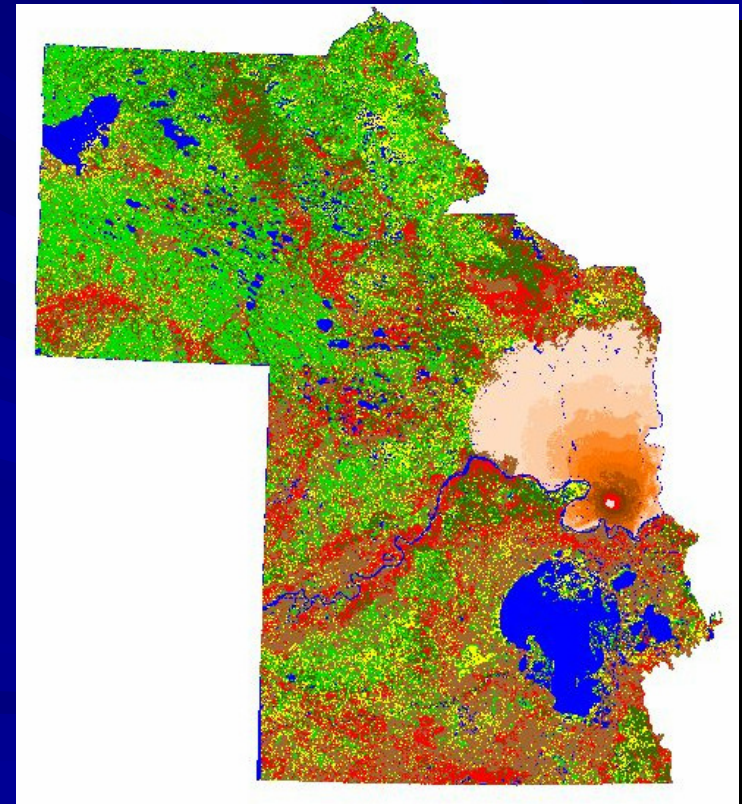
# Fire Growth Modelling

## Long-range Predictions

Long-range predictions based on the probability of spread and of fire-stopping events

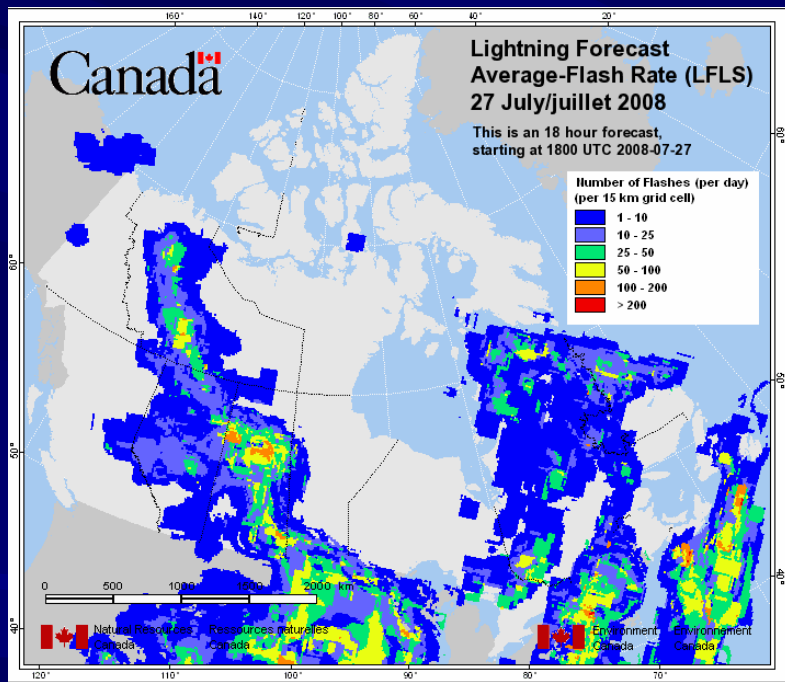
$$p_{fire}(t) = p_{spread}(t) \times P_{survival}(t)$$

These predictions are helpful in modified suppression response decisions, such as those conducted in BC during the 2009 and 2010 fire seasons.

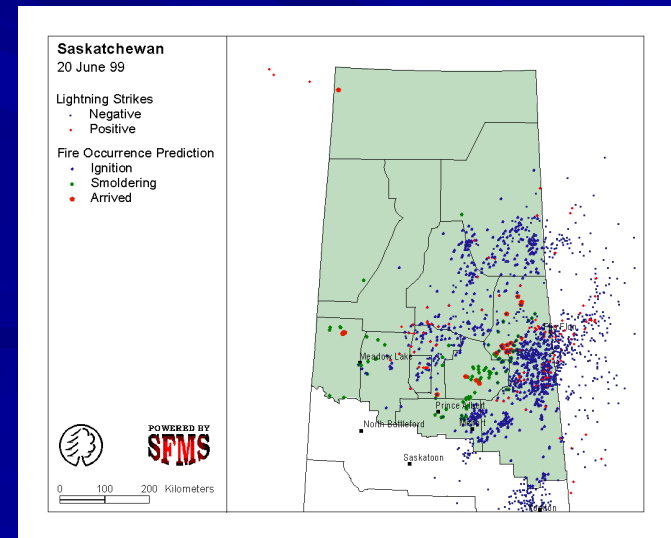


# Fire Occurrence Prediction

# Fire Occurrence Prediction



Lightning predictions provided by the **Canadian Lightning Detection Network (CLDN)** and **Environment Canada** will be combined with fire occurrence prediction models to predict fire numbers and locations as part of the CIFFC Resource demand project.



# Summary

# Summary

Current efforts of the **Canadian Forest Service (CFS)** are aimed at providing extended forecasts through the **Canadian Wildland Fire Information System (CWFIS)**.

Through cooperation with the **Canadian Meteorological Centre (CMC)**, a suite of forecasting products are being developed to provide longer-range applications including fire growth and fire occurrence predictions.

Through these extended forecast products, fire management agencies can extend their time-frame for preparedness planning from the next few days to several weeks into the future.



Thank you