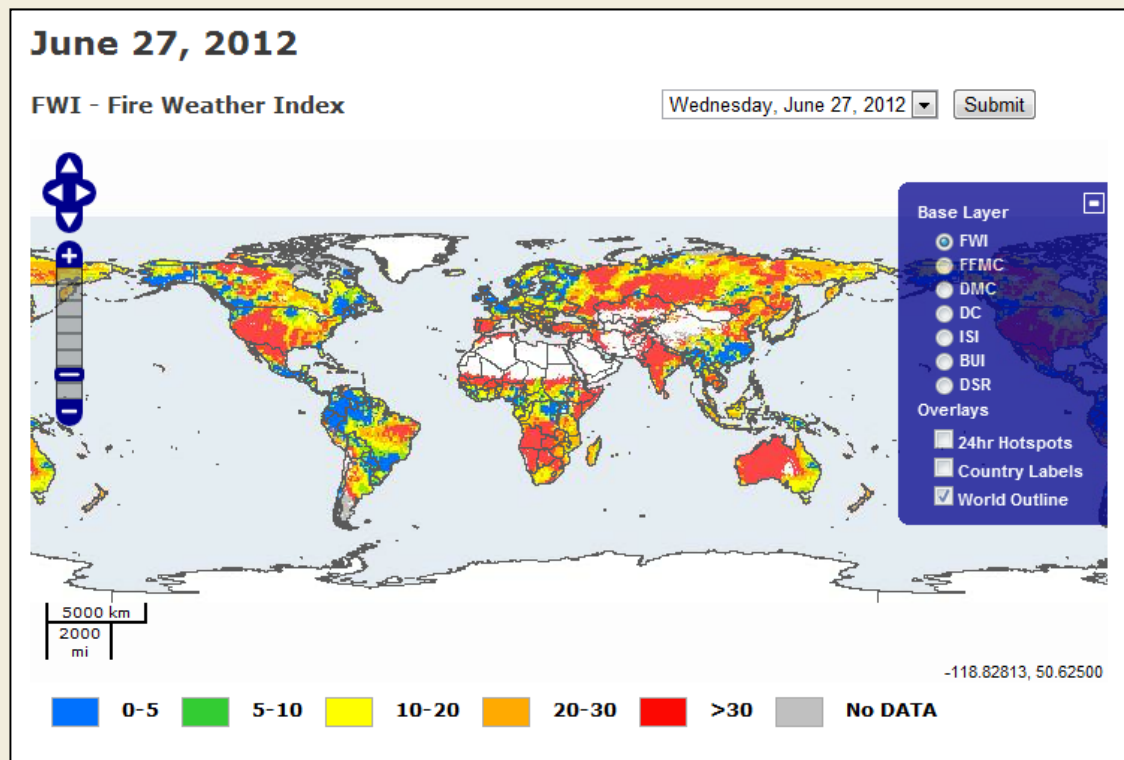




The Global Fire Early Warning System



WJ (Bill) de Groot

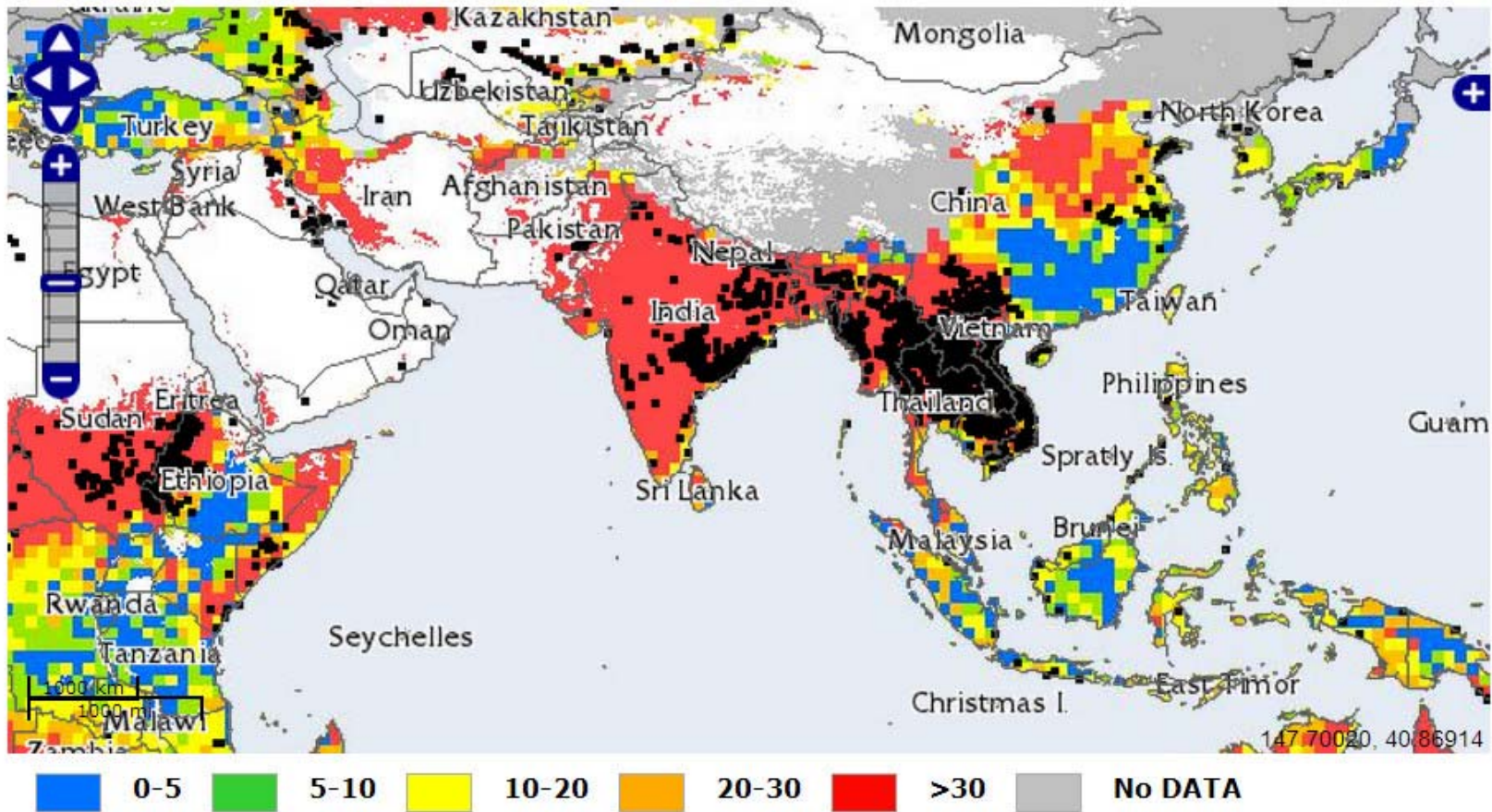




April 5, 2013

FWI - Fire Weather Index

Friday, April 5, 2013



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GOFC-GOLD GLOBAL OBSERVATION OF FOREST AND LAND COVER DYNAMICS



ISDR

International Strategy for Disaster Reduction

GlobalEWS

A GLOBAL EARLY WARNING SYSTEM FOR WILDLAND FIRES

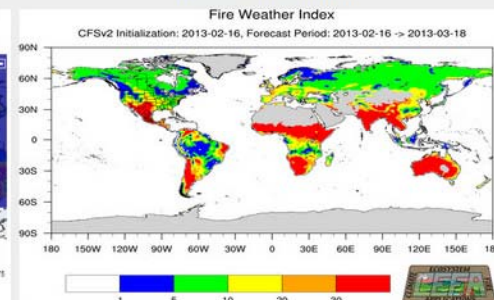
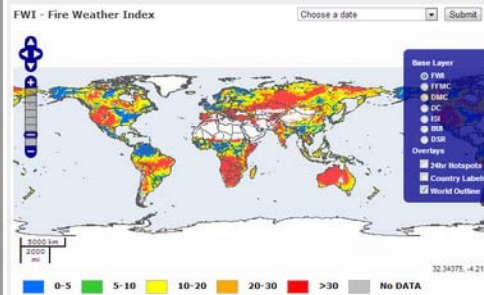
[Home](#) [7-Day Forecasts](#) [Monthly Forecasts](#) [Overview](#) [GFMC EW Portal](#) [Demos](#) [Further Info & Contacts](#)

Global Fire and Early Warning

Mapping Products

[Global Early Warning System 7-day Interactive Forecast](#)
(for access click on map)

[Global FWI Monthly Forecast](#)
(for access click on map)



Outline of Fire Danger Products in the Global Early Warning System for Wildland Fire

The fire danger indicators currently presented on the Global Early Warning System for Wildland Fire (Global EWS) are components of the Canadian Forest Fire Weather Index (FWI) System. The Global EWS provides 1-7 day forecasted FWI System data based on the NCEP Global Forecast System. The FWI System components are currently calibrated to commonly used threshold values that identify low to extreme conditions. As such, the Global EWS provides a means of comparing relative fire danger conditions between countries, continents, and biomes; and the 1-7 day forecast identifies the expected future fire danger trend. This type of information is often useful for large-scale fire management decision-making such as planning cross-border suppression resource exchanges.

Although these indicators can be used to compare fire danger across the globe, the indicators are not calibrated to the local fire regime, which includes the influences of fuel, ignition sources, climate, fire management/suppression policy, etc. For that reason, the next stage in development of this system is regional calibration to adjust the fire danger scales using historical fire data (primarily remotely sensed) and weather data. This will calibrate the fire danger indicators to provide operational-level information such as potential for fire starts and difficulty of control. Regional calibration will be an on-going collaborative effort with regional and national agencies.

The FWI System has 6 components that represent fuel dryness and potential fire behaviour at the landscape level. All components are presented in the Global EWS:

- Fire Weather Index (FWI) is a general indicator of fire danger and fire intensity



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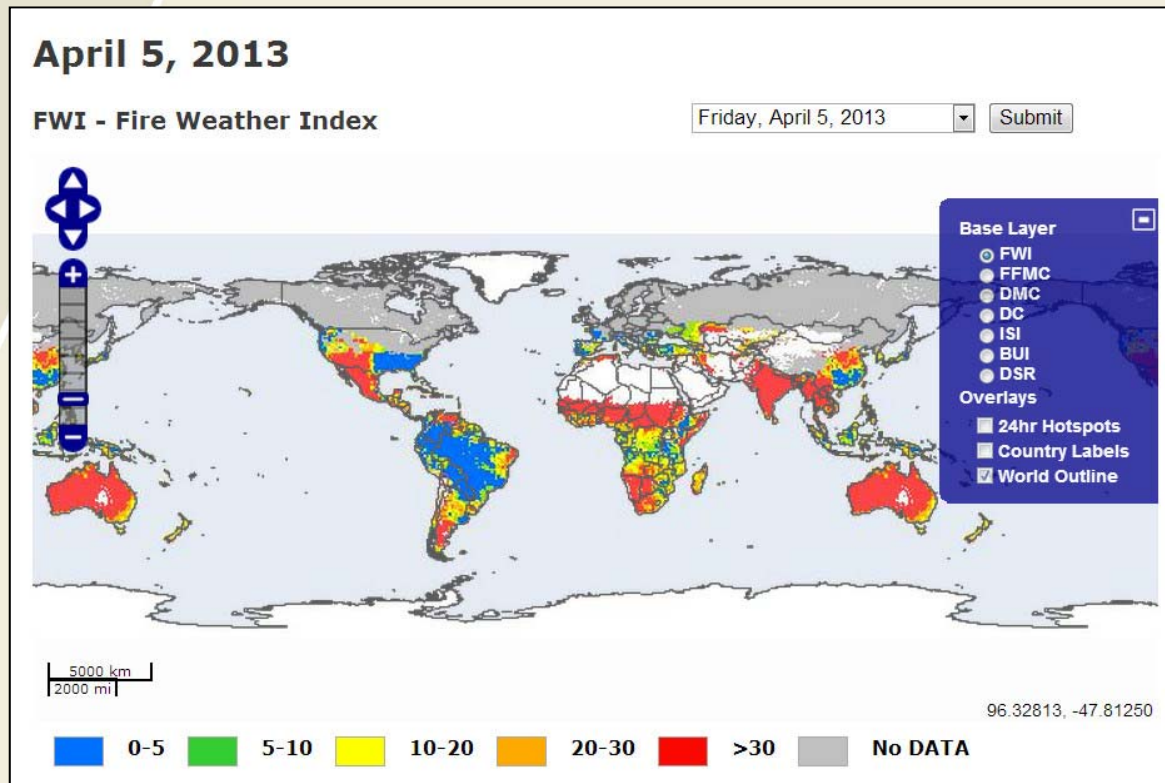
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Next Steps - Regional Calibration

Two Methods:

- I. Use frequency distributions of fire weather indices
- II. Use fire occurrence and area burned distributions



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Global Regions for Emission Modeling



- | | |
|---------------------------|-----------------------------------|
| Australia and New Zealand | Middle East |
| Boreal Asia | Northern Hemisphere Africa |
| Boreal North America | Northern Hemisphere South America |
| Central America | Southeast Asia |
| Central Asia | Southern Hemisphere Africa |
| Equatorial Asia | Southern Hemisphere South America |
| Europe | Temperate North America |





Future Fire EWS Data Needs

Items to include in future that influence fire behaviour and EWS Products:

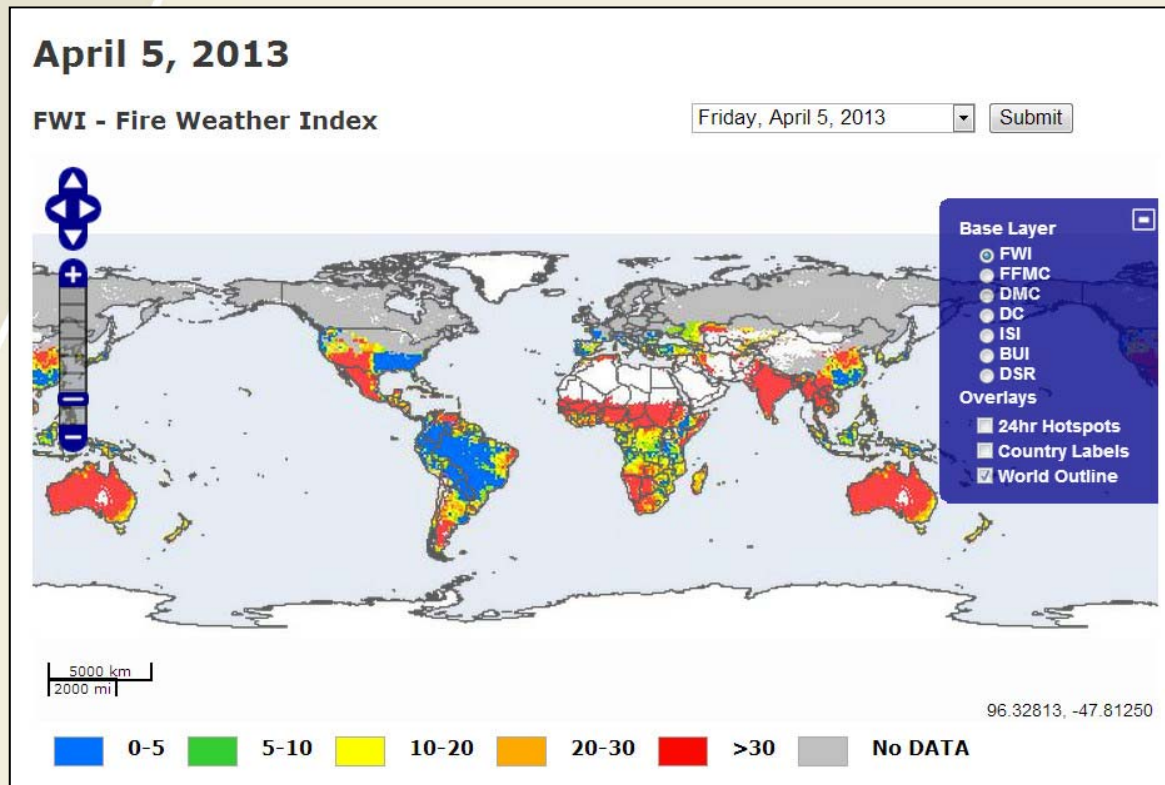
- Spatial rainfall (esp. at low amounts)
- Fire behaviour:
 - fire radiative energy, indicating fuel consumption and emissions;
 - Fire intensity - from fuel consumption and rate of fire spread
- Biomass (fuel load), affecting emissions as well as fire behaviour





Additional Fire Danger Criteria

- incorporate snowfree and snowcover to start and end fire season (necessary for correcting spring Drought Code)
- live fuel moisture information needed to simulate seasonal greenup/curing (grasslands, mixedwood and hardwood forests)







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Next Step: Regional Applications

		Detection		
Potential Ignition Level		Prevention Activity	Activity	Period
Low		None	None	None
Moderate		Post local warning signs	towers	mid-day
High		Local media warnings	towers	all day
		Prescribed fire restrictions	vehicle patrol	mid-day
Extreme		TV and radio warnings	towers	all day
		Prescribed fire exclusion	vehicle patrol	all day
		Local community meetings	aircraft patrol	mid-day





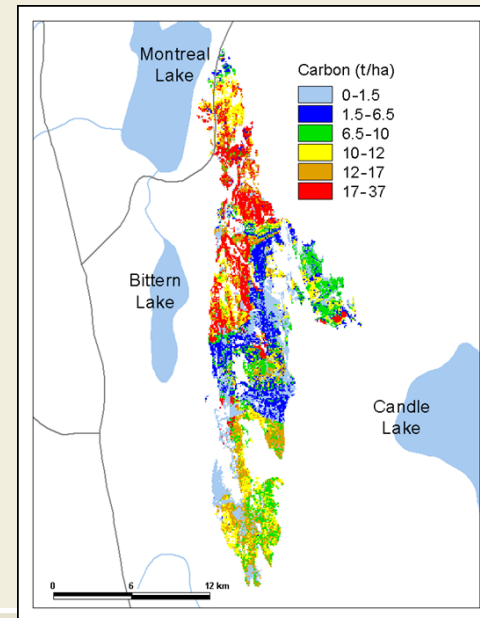
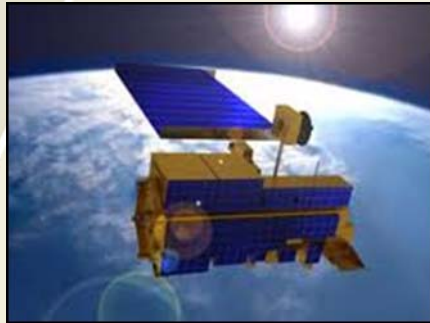
Regional (and National) Applications

- REDD+
- Fire and Ecosystem Services
- Community Based Fire Management





Comparison of Wildland Fire Carbon Emissions Estimation Methods





Next Step: Boreal Fire Regimes (1979-2009)



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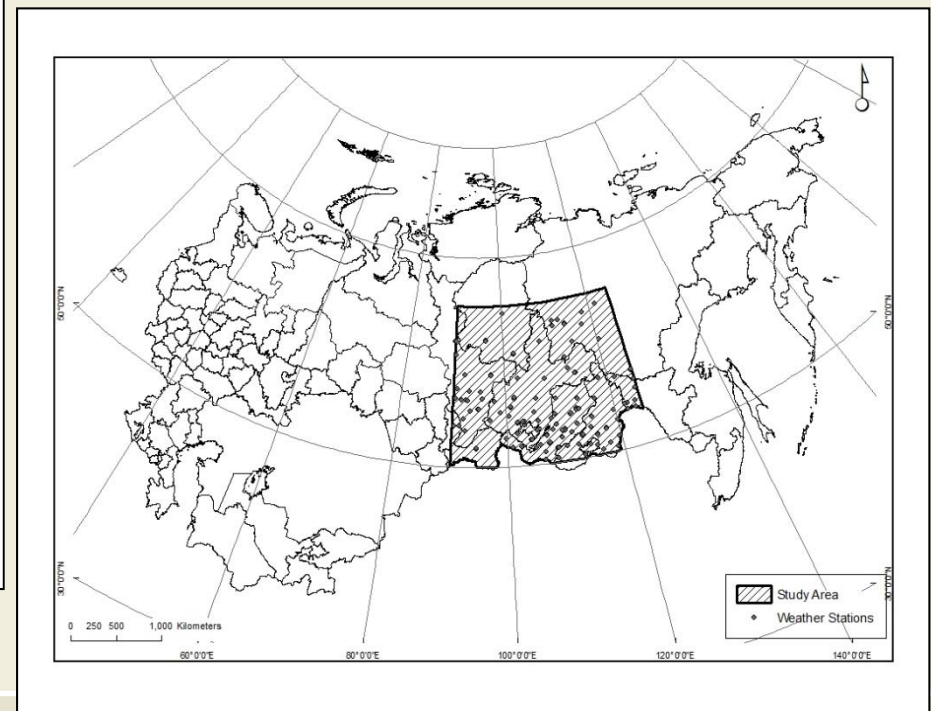
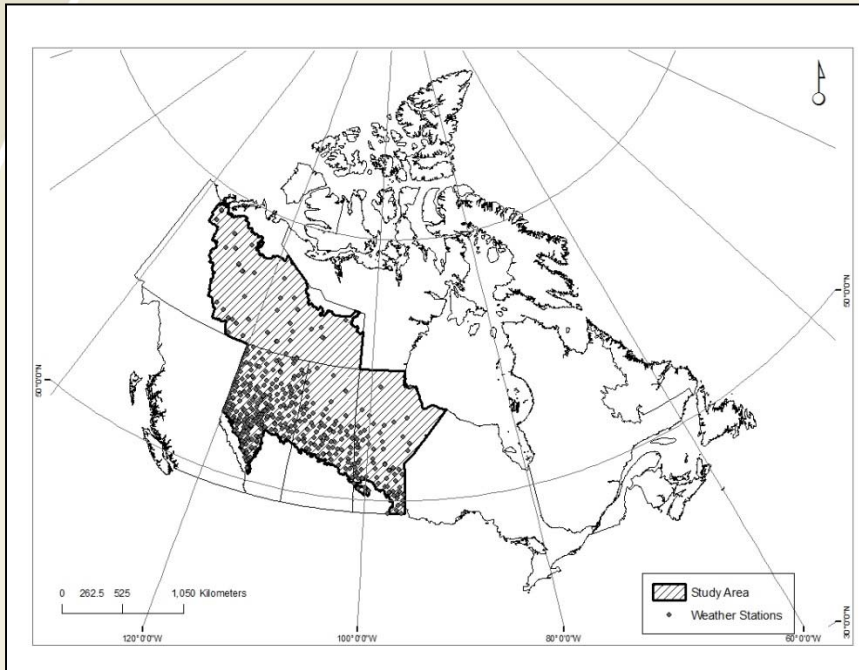
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Boreal Fire Regimes

(2001-2007)

>200ha fires



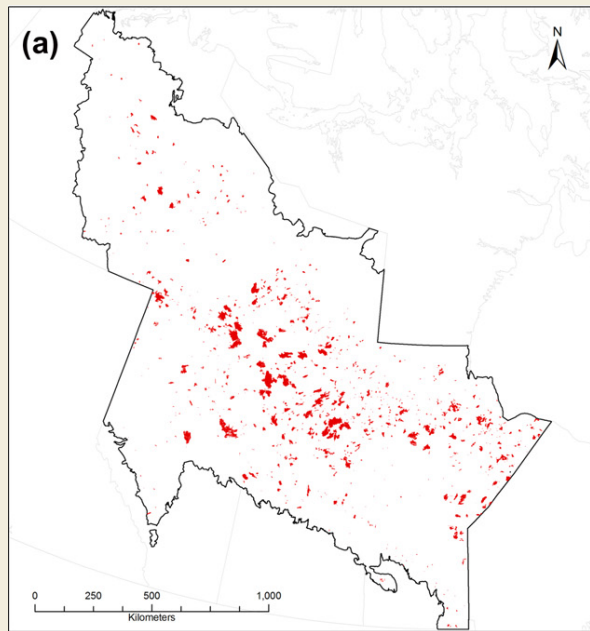
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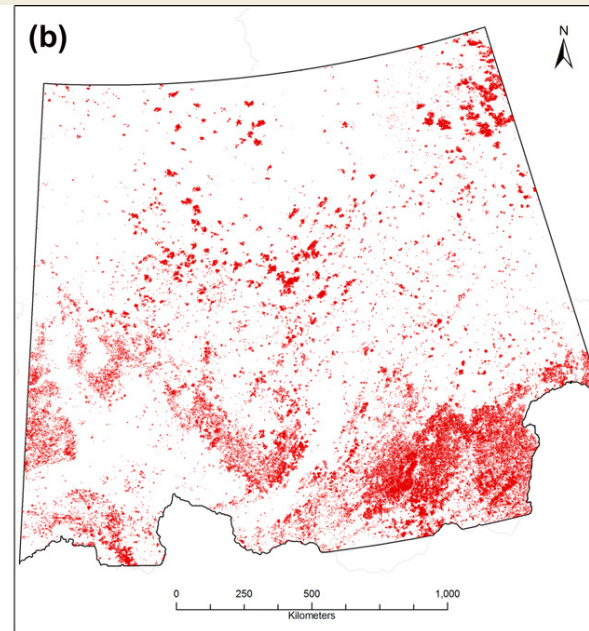
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Boreal Fire Regimes



Canada: 1028 fires
Area burned:
6.1 M ha



Russia: 30,243 fires
Area burned:
39.7 M ha



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Boreal Fire Regime Comparison

	Canadian Study Area	Russian Study Area
Number of fires (per 100 M ha forest)	93.7	1441.9
Area burned (M ha/100 M ha forest)	0.56	1.89
Mean fire return interval (yrs)	179.9	52.9
Large fire size (ha)	5930	1312
Crown fire (%)	57.1	6.5
Head fire intensity (kW/m)	6017	4858
Fuel consumption (kg/m ²)	5.68	3.73
C emissions rate (t/ha)	28.4	18.5
Total C emissions rate (Mt/100 M ha forest)	15.8	35.0

de Groot et al. 2013

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15-18 November 2010

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de Groot et al. 2013

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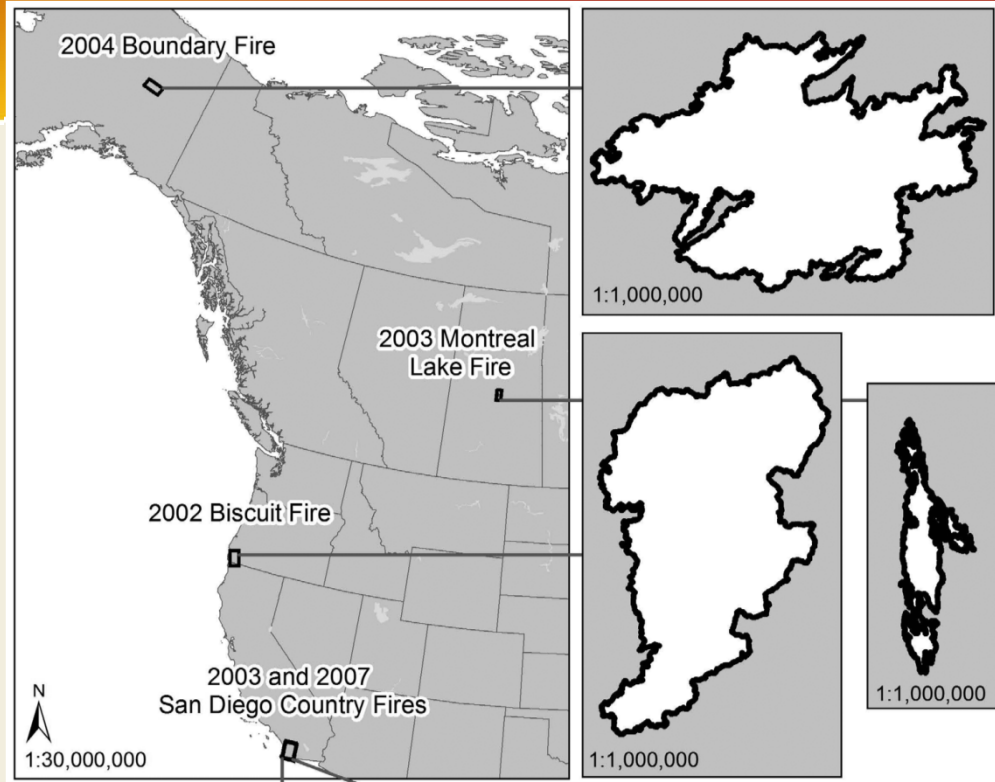


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Comparison of C emission Methods and Fuels Databases

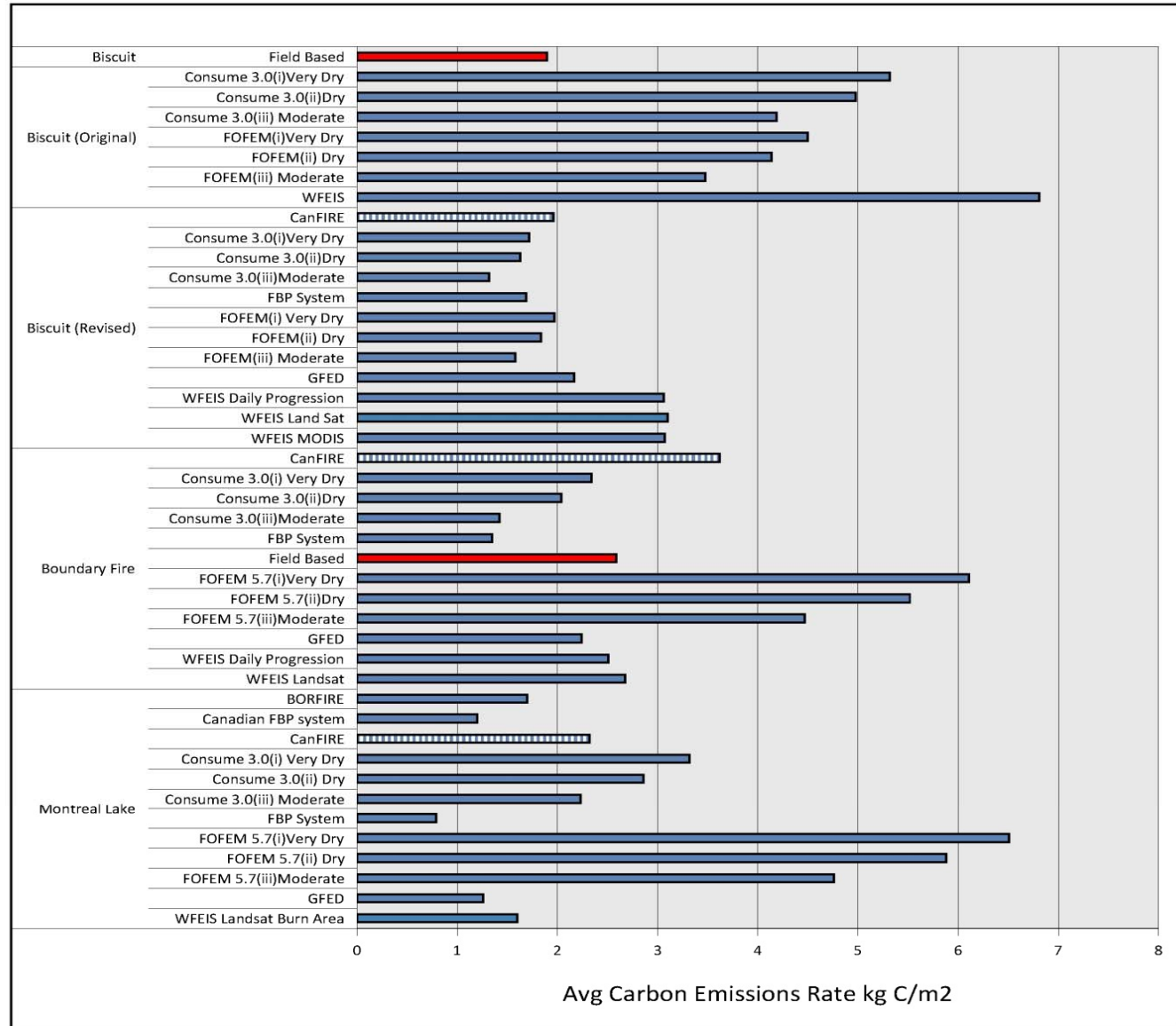
French et al. 2011

16



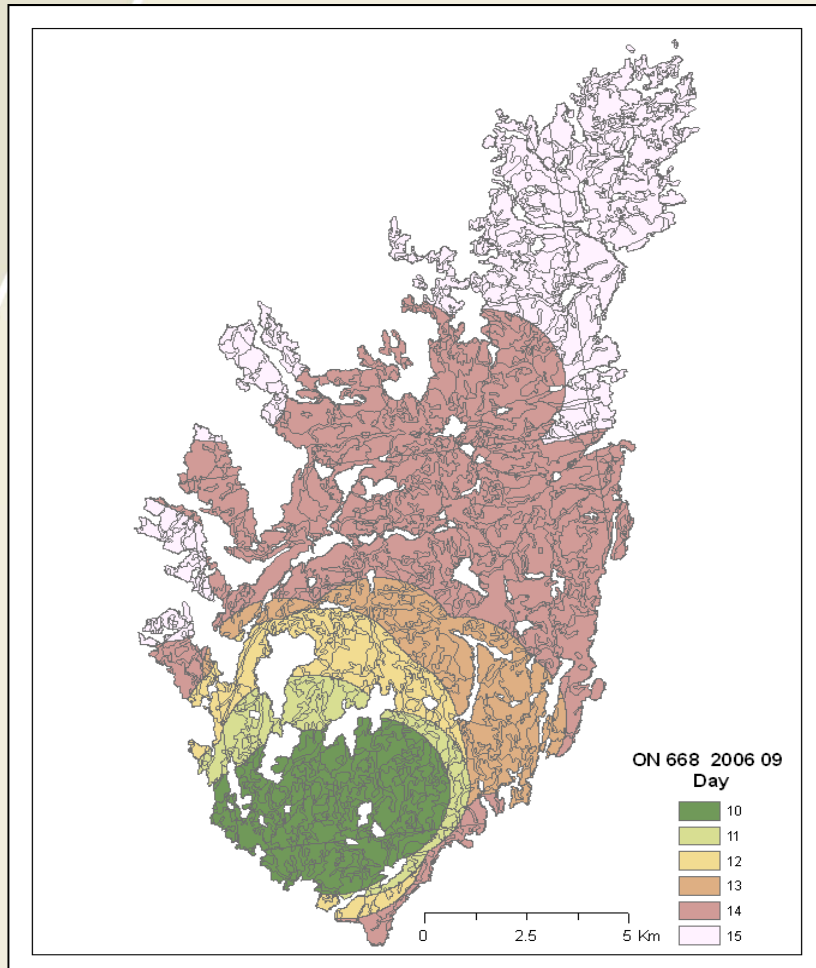
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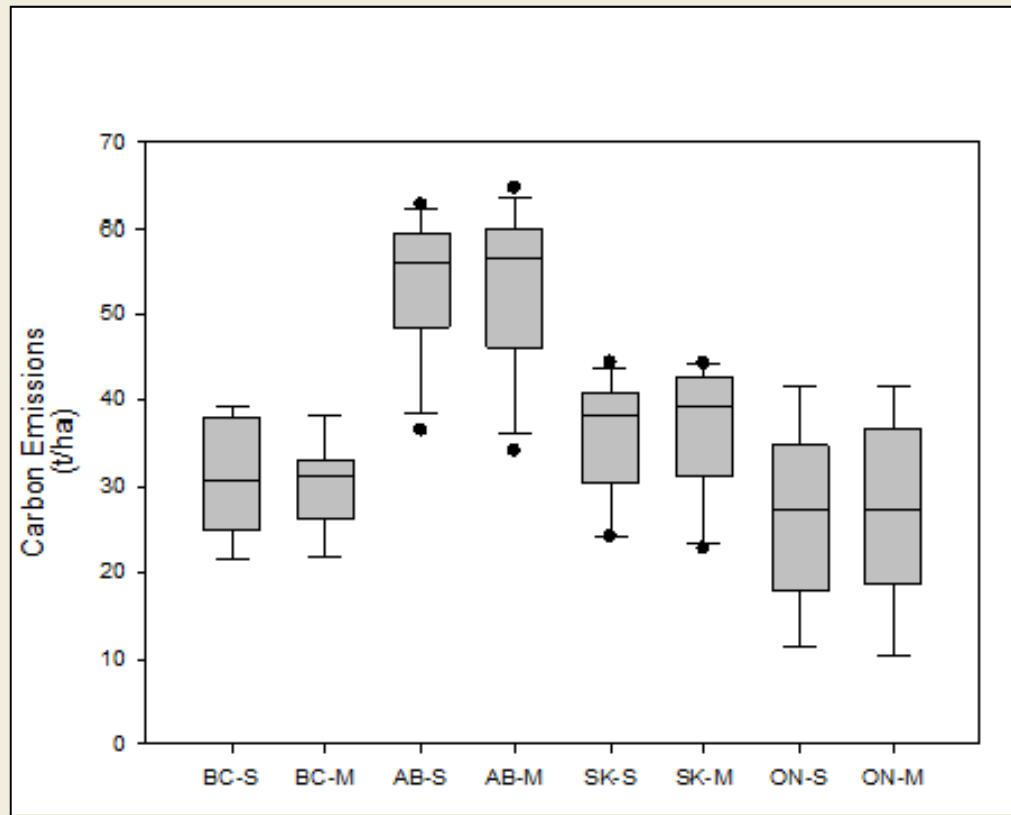


Carbon Emissions Modeling



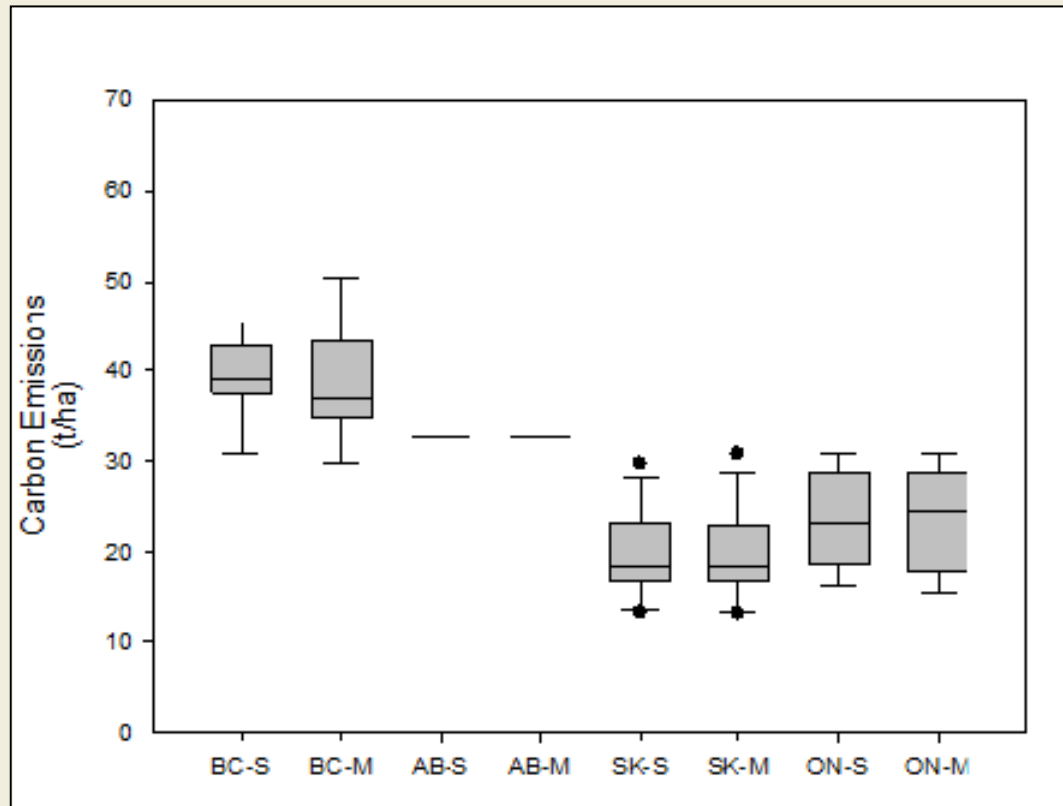
- 43 large fires in Canada 2006-2010
- Landsat area burned
- daily fire spread by MODIS hotspots
- daily fire weather
- bottom-up calculation of C emissions using fuels, weather data and fire behaviour modeling (fuel consumption) by CanFIRE
- Fuels – prov. forest inventory, national FBP database
- 1-day and daily fire spread simulations





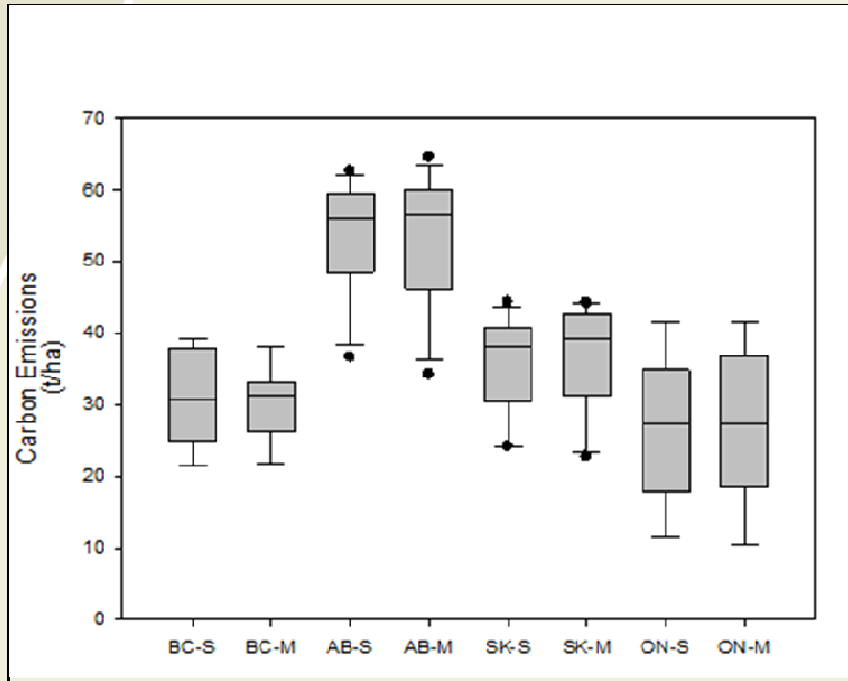
British Columbia (BC) (n=9), Alberta (AB) (n=12), Saskatchewan (SK) (n=13), and Ontario (ON) (n=9);
Fuels: Nadeau et al. 2005 [2004 VGT landcover, ecozone classes, national forest inventory; 16 discrete fuel types]



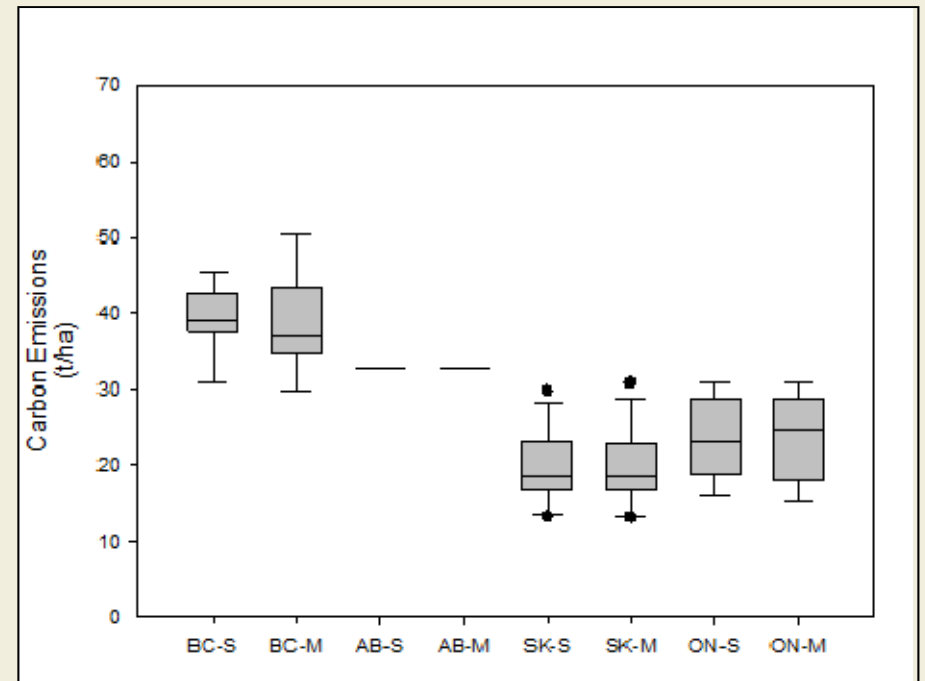


British Columbia (BC) (n=9), Alberta (AB) (n=2), Saskatchewan (SK) (n=13), and Ontario (ON) (n=9);
Fuels: Provincial forest inventory, ~200 tree species-based fuel types, adjustable fuel load





National fuel database
1 km, 16 fuel types, standard fuel loads



Provincial forest inventory
Stand-level, ~200 fuel types, variable fuel load



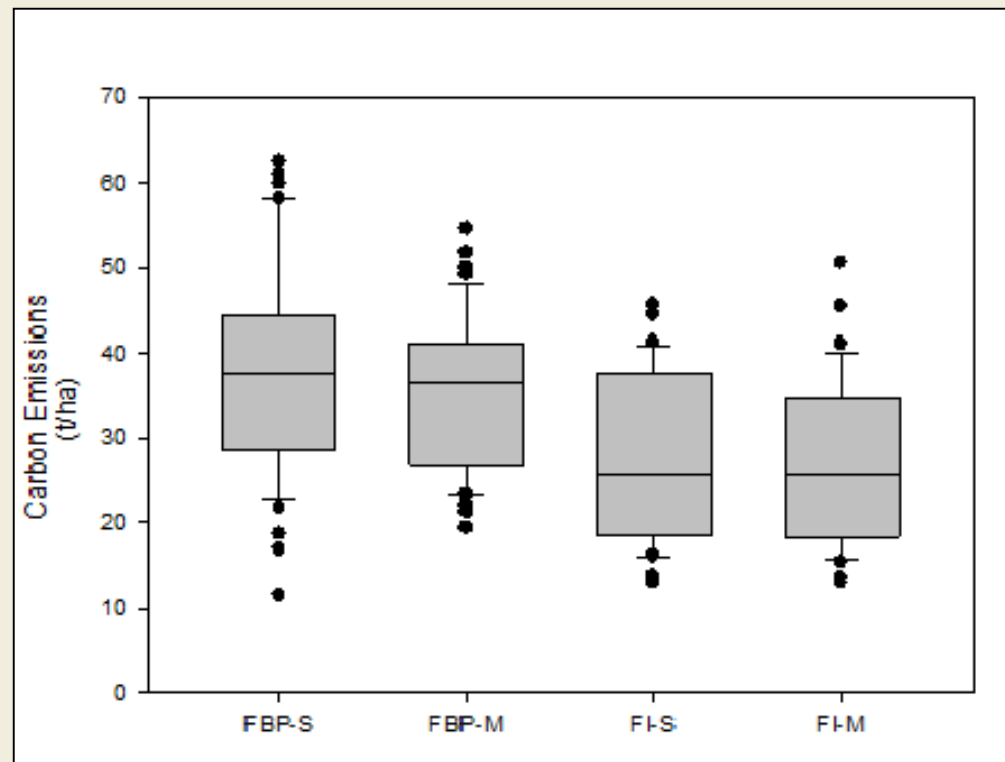


Fig. 3. Summary of carbon emissions using the national fuel map (FBP System fuel types) and provincial forest inventory (FI) with single-day and multiple-day simulations with CanFIRE.





Thank You

GOFC-GOLD Global Fire EWS Project Team

WJ de Groot	Canadian Forest Service
JG Goldammer	Global Fire Monitoring Centre
J San-Miguel-Ayanz	Joint Research Centre, European Commission
T Brown	Desert Research Institute
CO Justice	University of Maryland/FIRMS
TJ Lynham	Canadian Forest Service
IA Csiszar	NOAA/NESDIS
E Chuvieco	University of Alcalá



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