

Monitoring Forest Fires in Alberta & British Columbia

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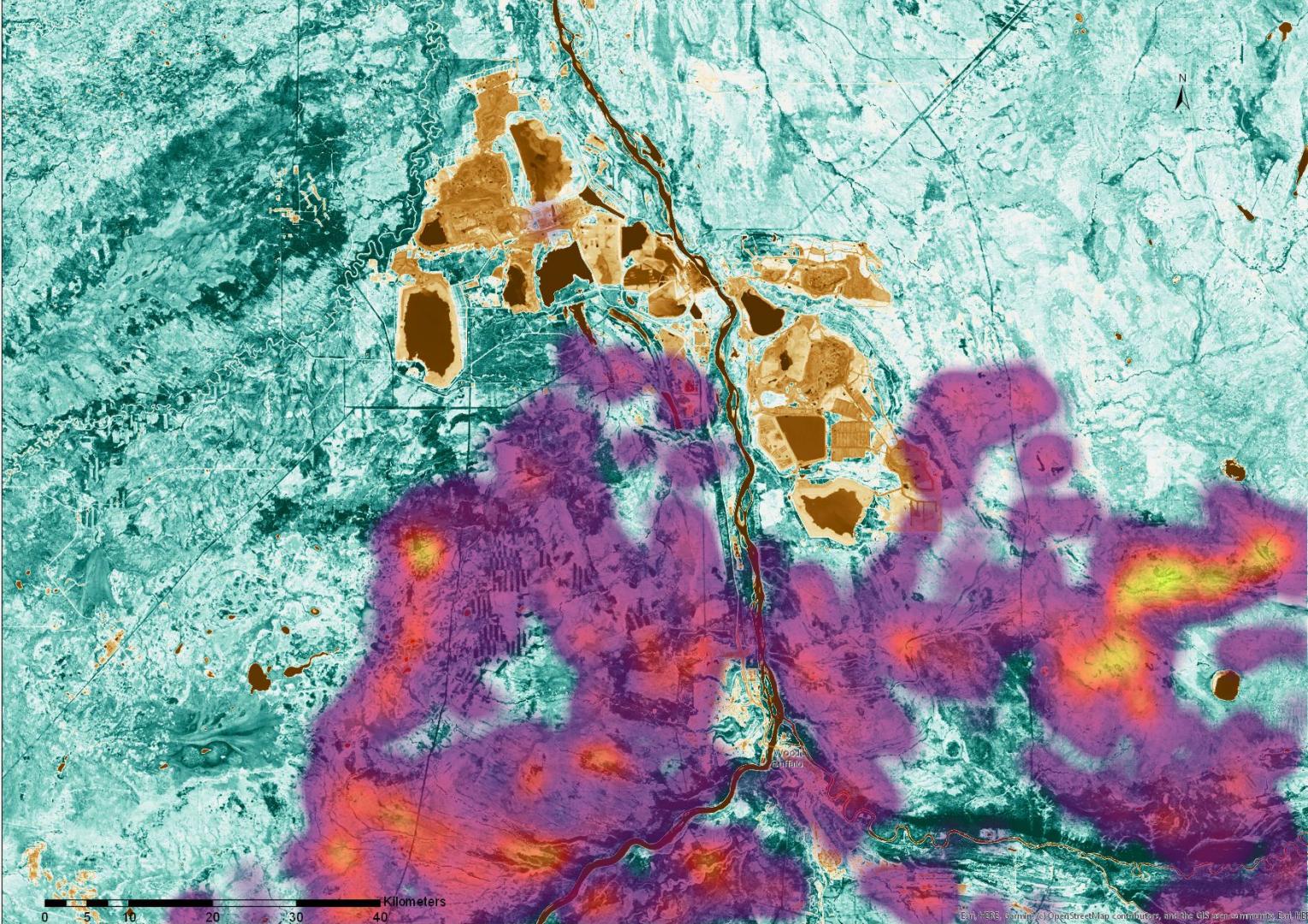
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Fort McMurray fire 2016



0 5 10 20 30 40 Kilometers

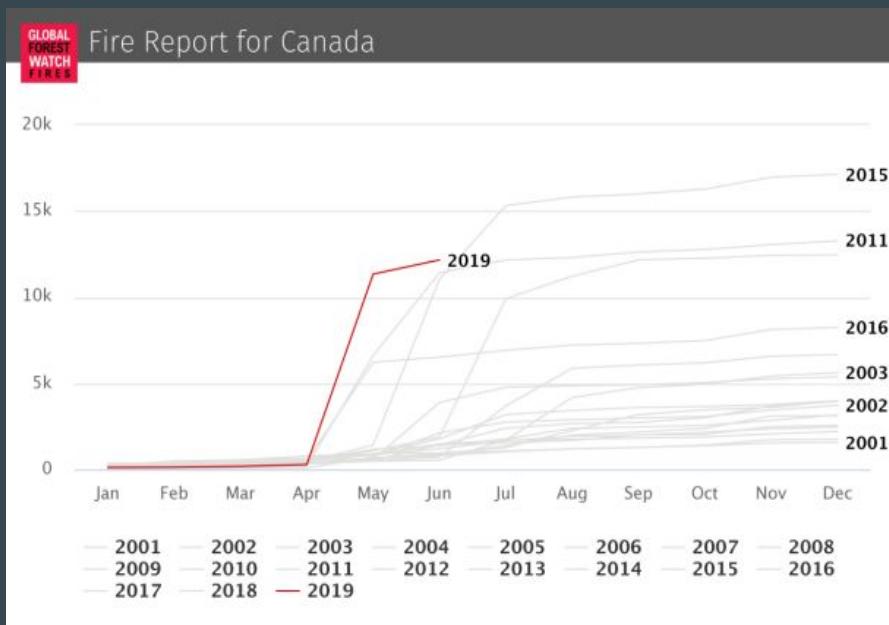
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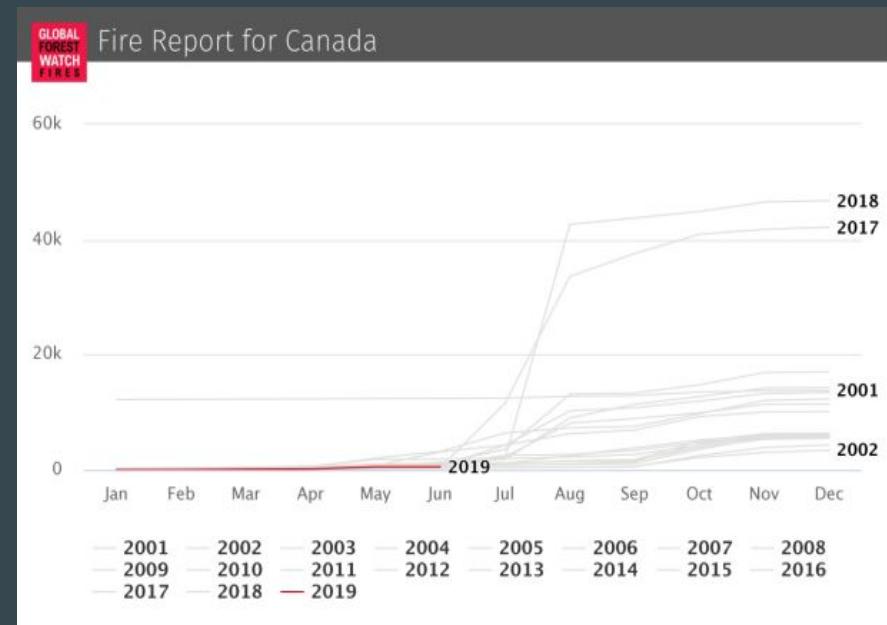
In a forest where fires rarely happen, fuel builds up: There's **surface fuel** (grass, logs, woody debris, brush); **ladder fuel** (shrubs, small trees, snags); and **tree crowns**.

- 1 Surface fires spread quickly through brush and woody debris.
- 2 Ladder fuels allow the fire to move up toward the forest canopy.
- 3 Tree crown fires are so intense, they're difficult to control.

Fire statistics in Alberta and British Columbia



Alberta



British Columbia

What's behind the rise of Megafire?

Wildfires are dramatically increasing in size and number, magnifying risk for people and wildlife. Why are these megafires occurring more frequently, with such devastating effects? Several factors attribute to increasing Megafires including global climate changes, invasive species and increasing human settlement.

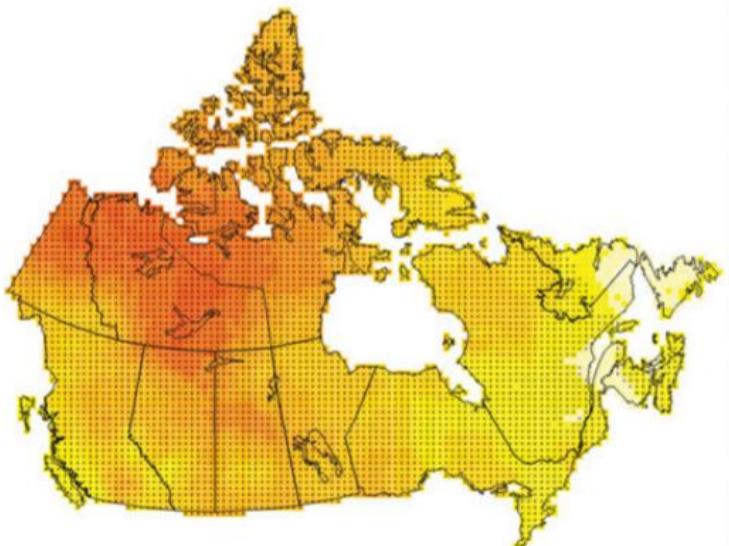
Climate changes

Invasive species

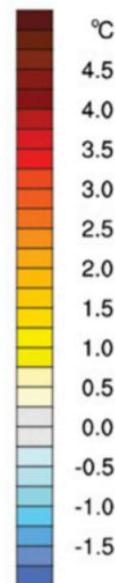
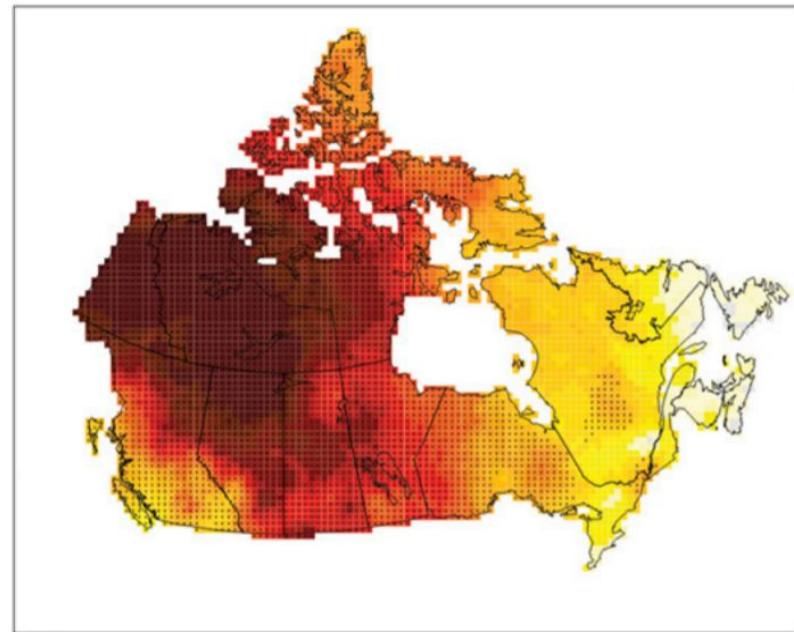
Increasing human settlement

Canada temperature trends

a) 1948-2012



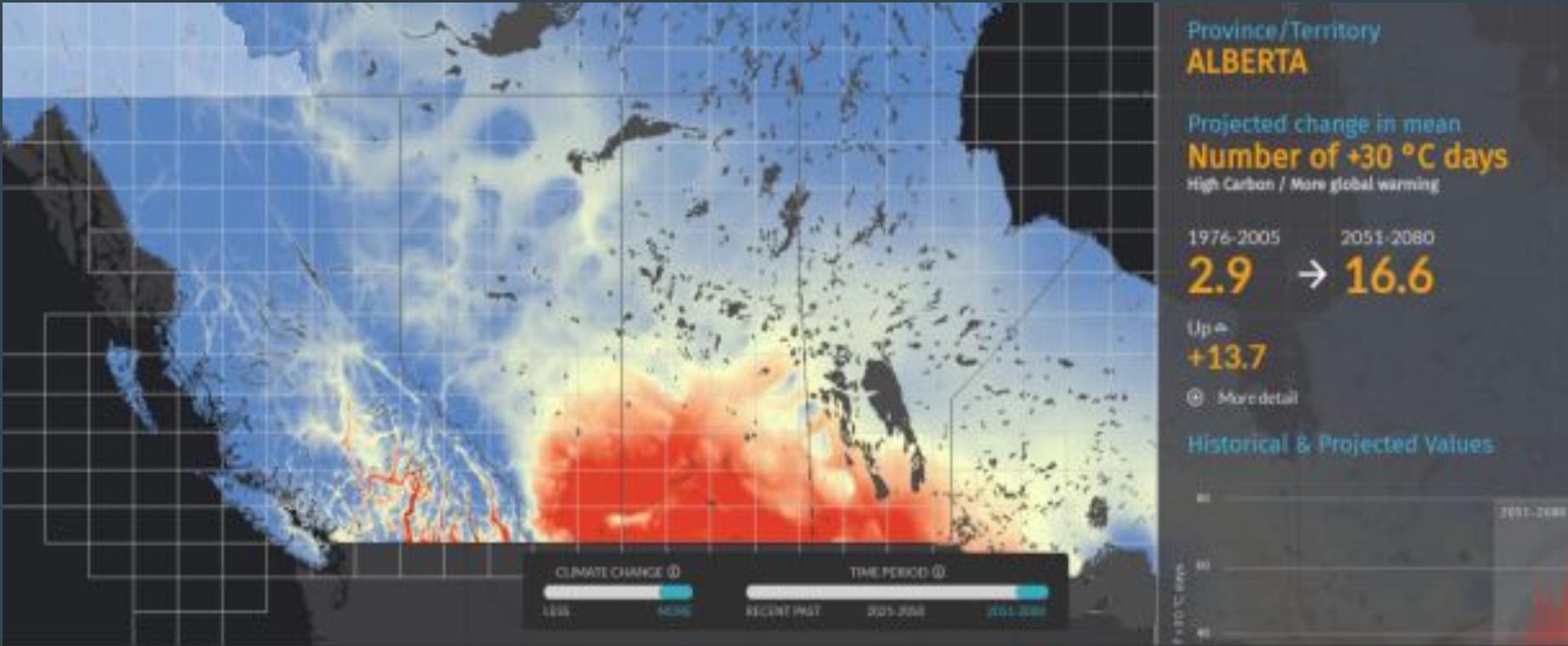
a) Winter



Trends in annual mean temperature for (a) 1948–2012

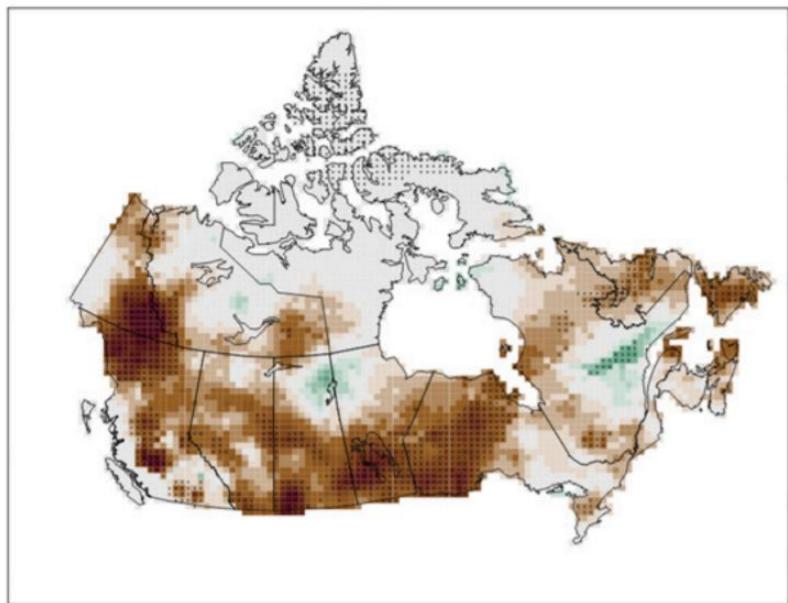
Trends in mean winter temperature for 1948–2012

Extreme weather: Very hot days (+30°C)



Warming winter/spring and early snow melt

a) Spring



Trends in snowfall ratio for 1948–2012 for spring

b) Snow cover duration (Feb. to Jul.)



Snow-cover duration change for 1950–2012

Bark Beetle infestation



Early warning fire prediction and mitigation strategies

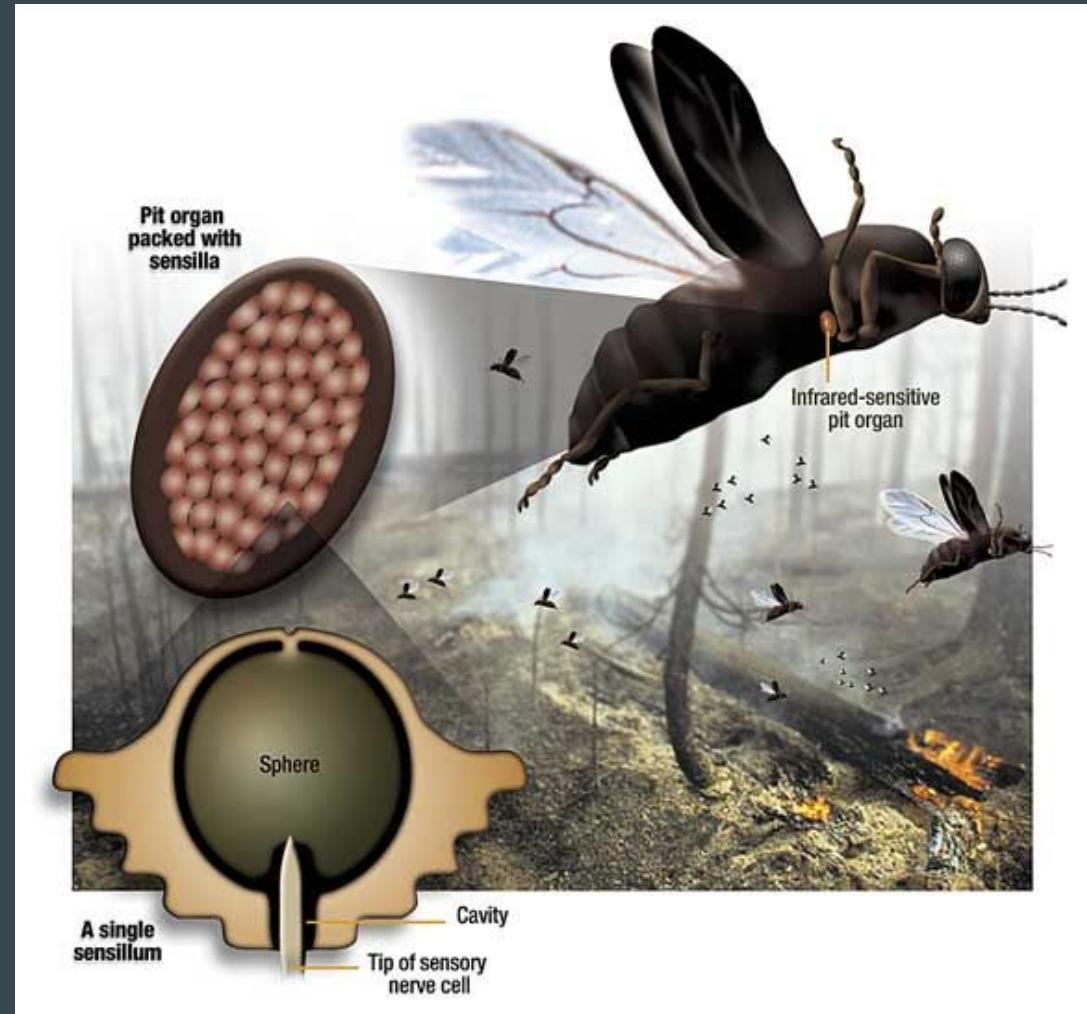
Highly sensitive detector- learning from Beetle

Fundamental mechanism of fire spreading

Fire risk active monitor and prediction

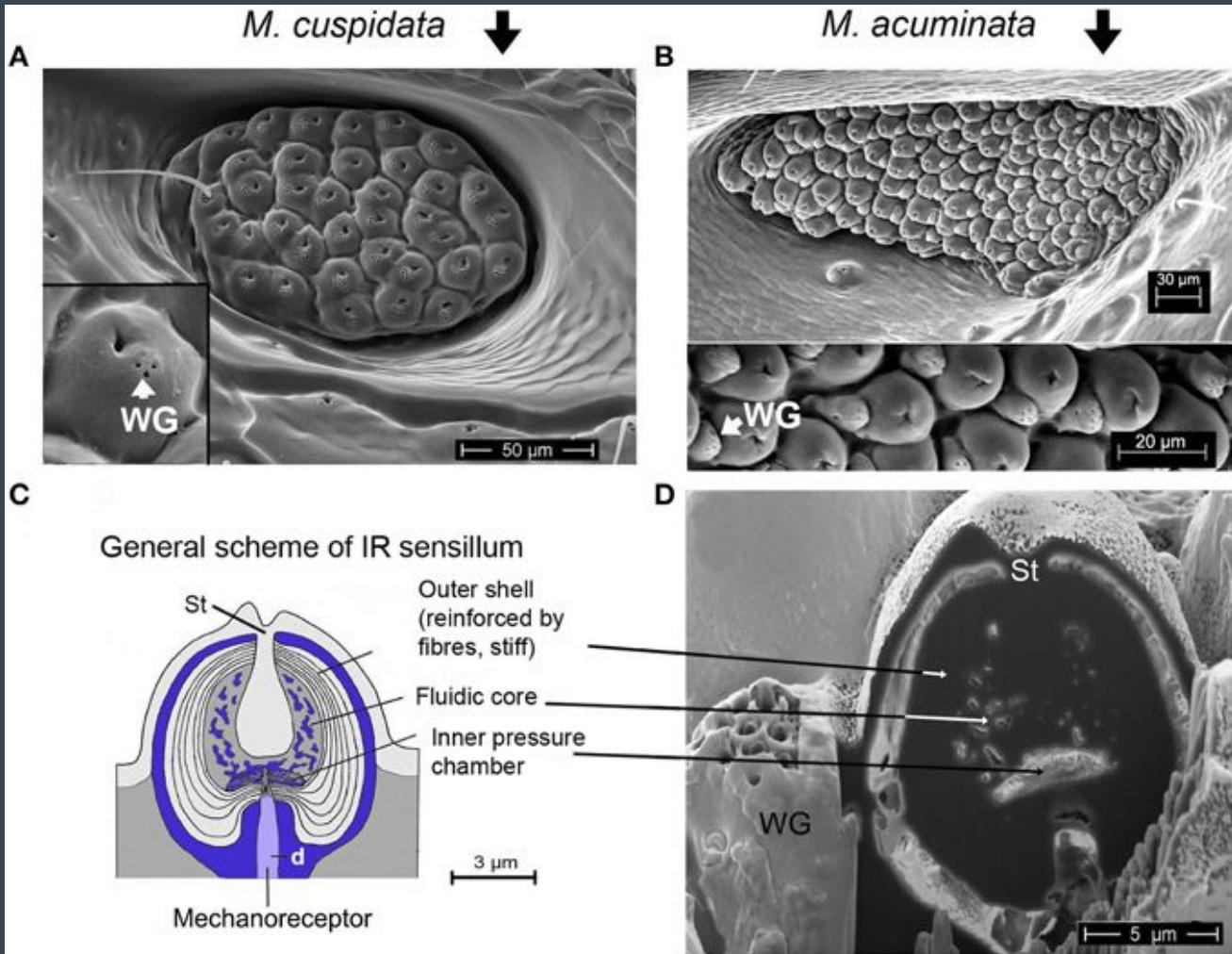
Firefighting robotics

Jewel beetles of the genus Melanophila

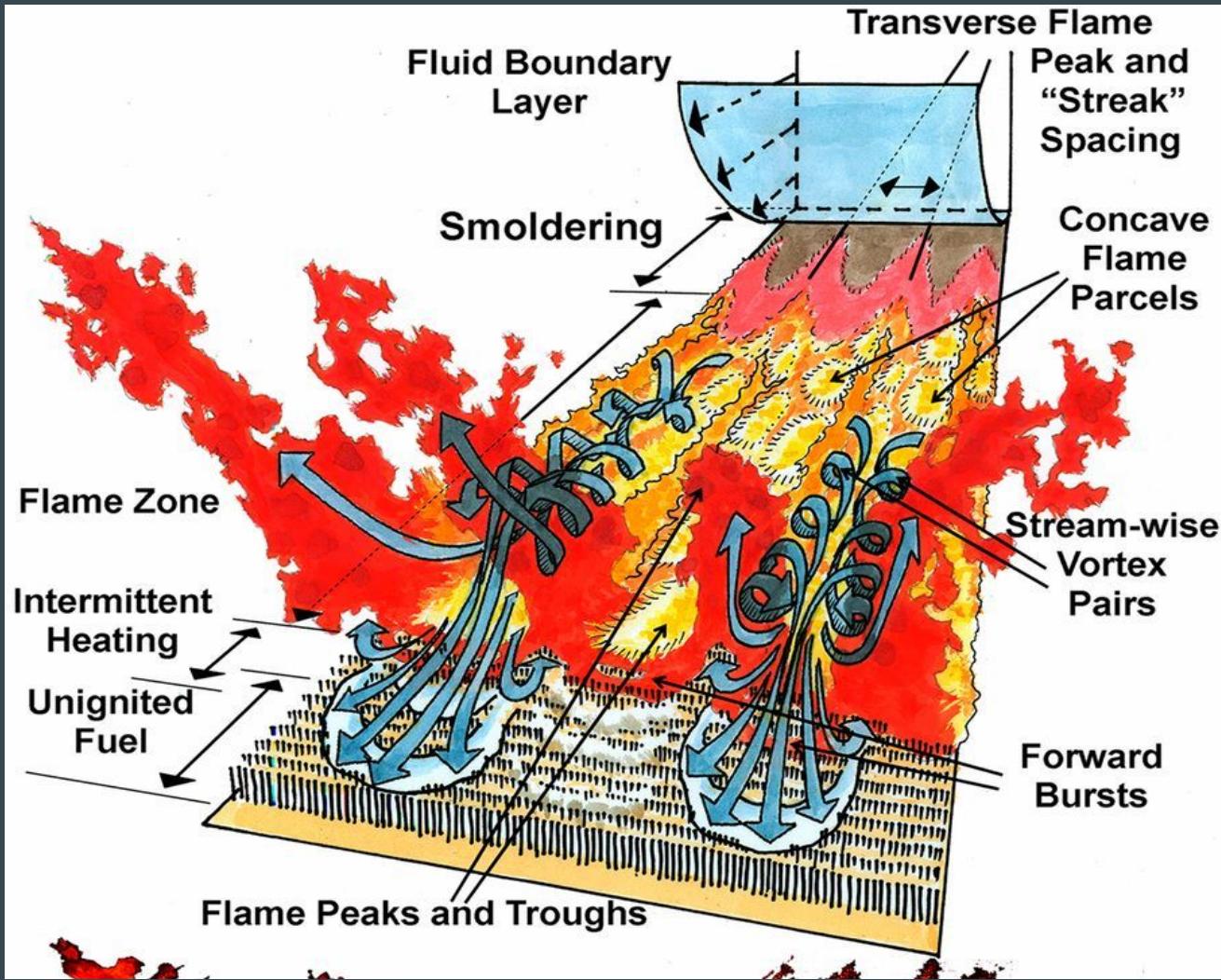
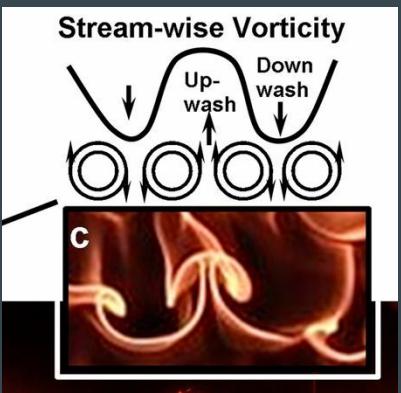


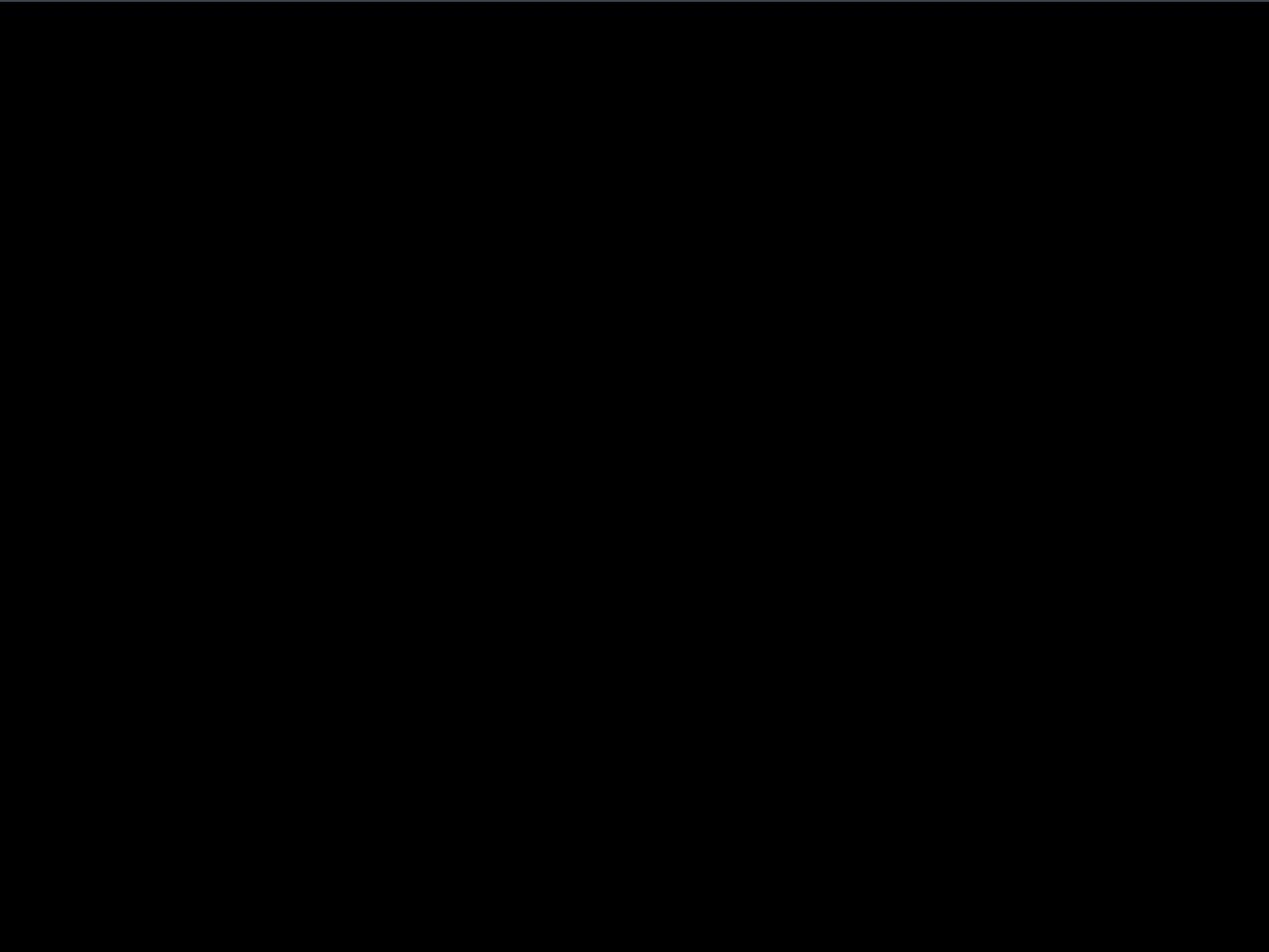
Metathoracic infrared (IR) organs could be used for forest fire detection

Designers could use Jewel beetle as source of inspiration to create highly sensible IR sensor for early fire detection.

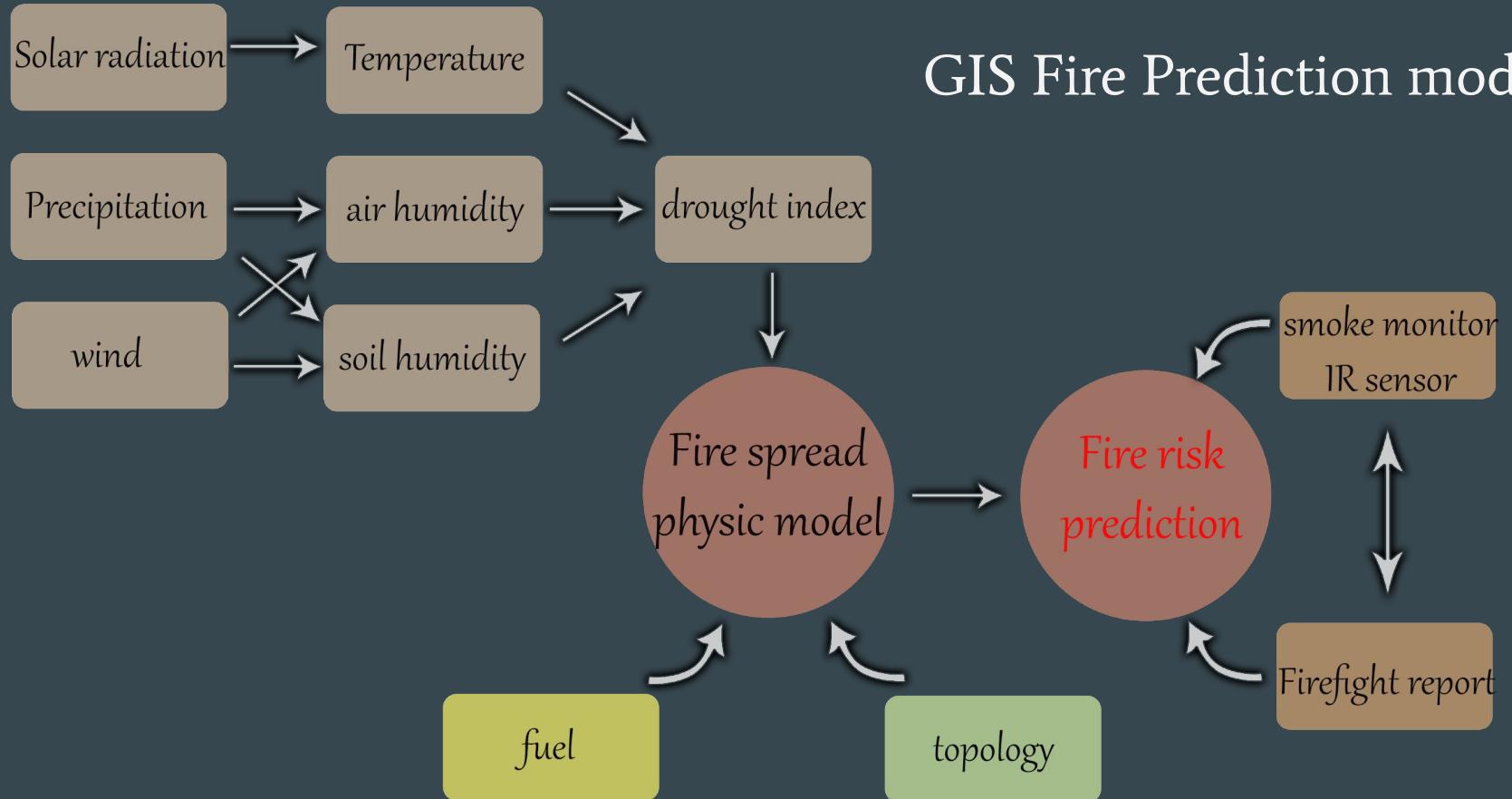


Wildfire spreads mechanism

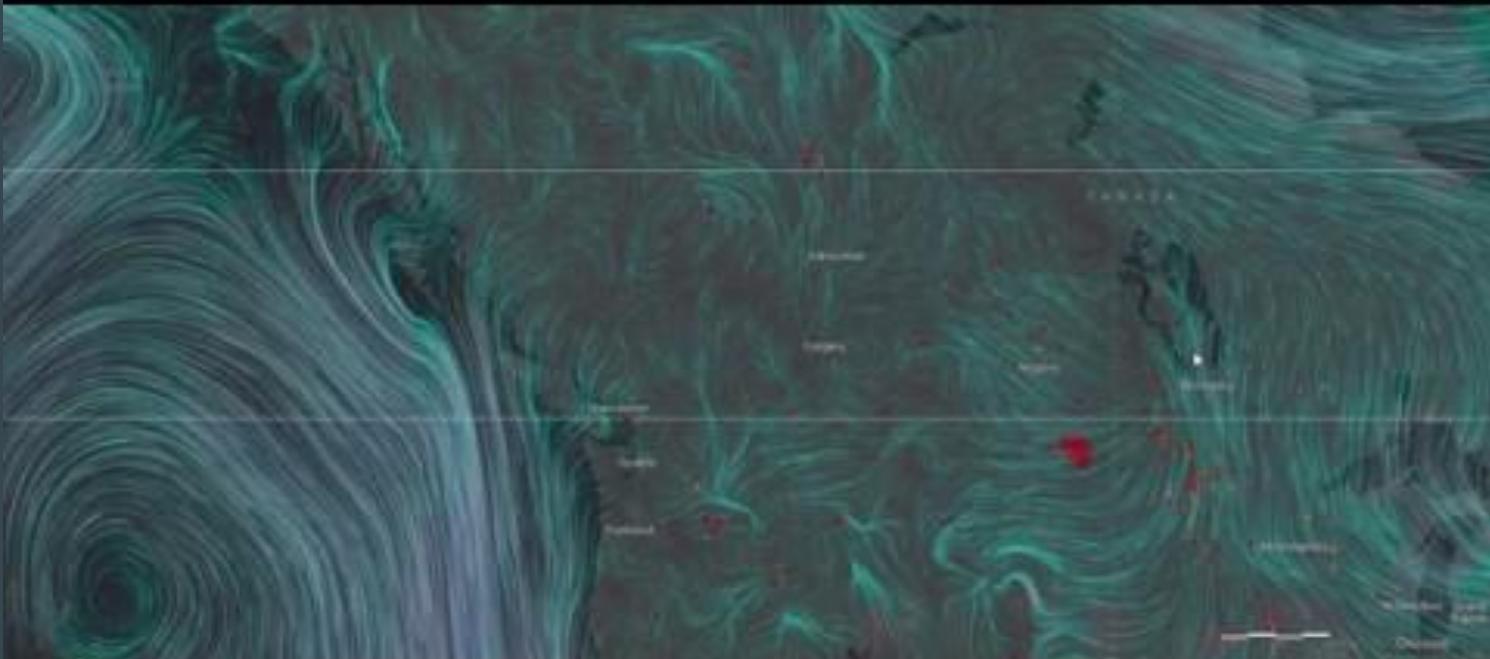


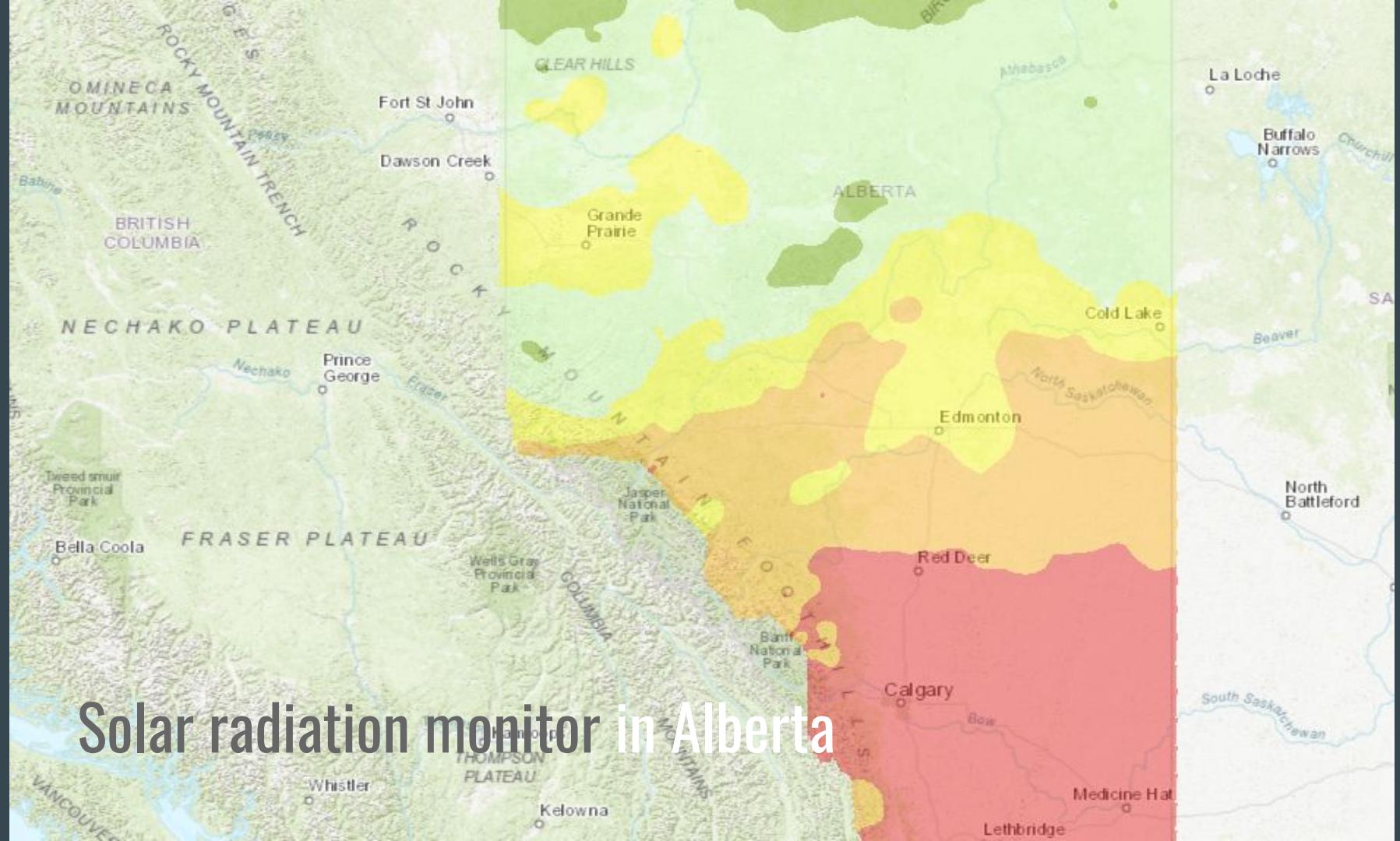


GIS Fire Prediction model

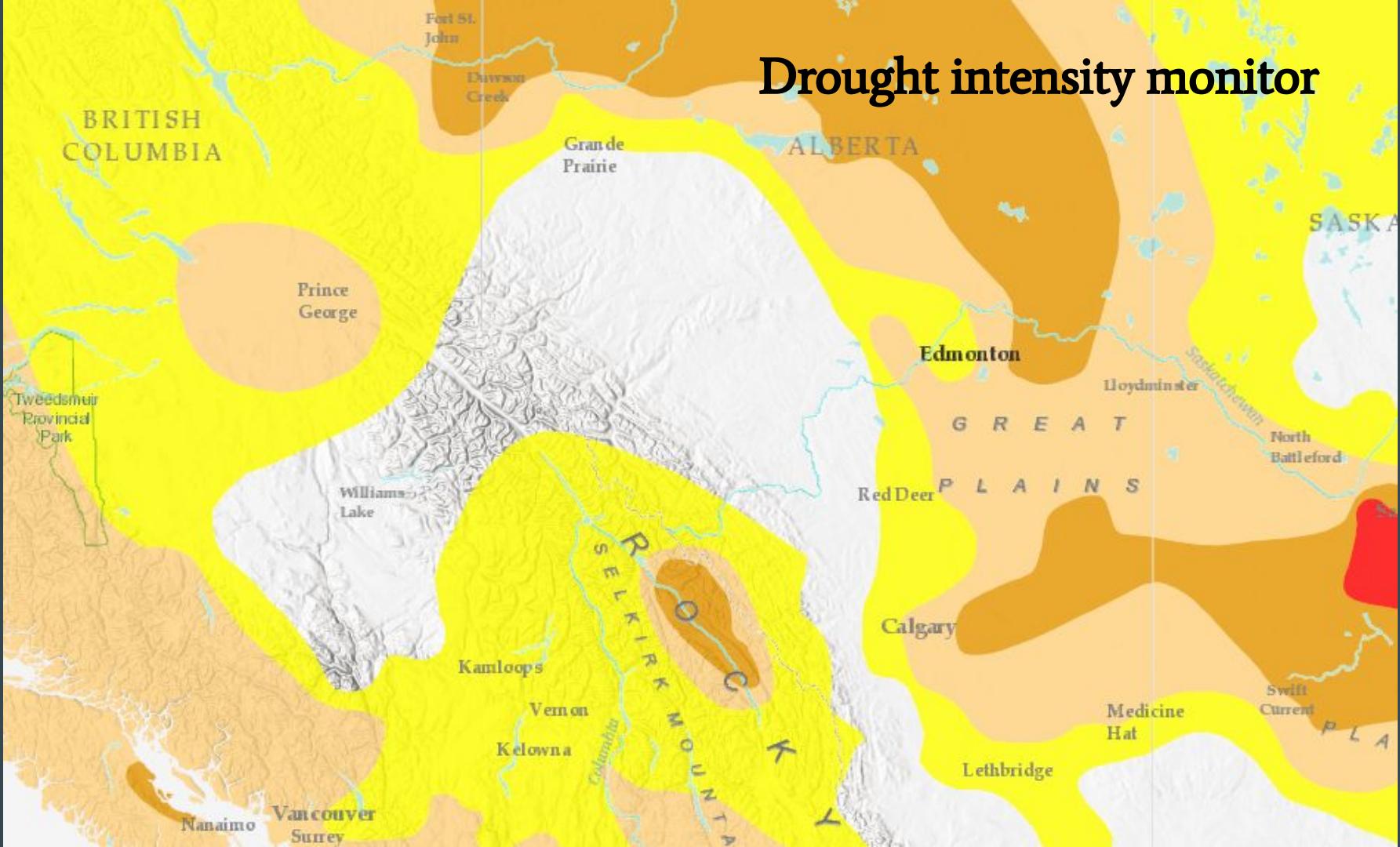


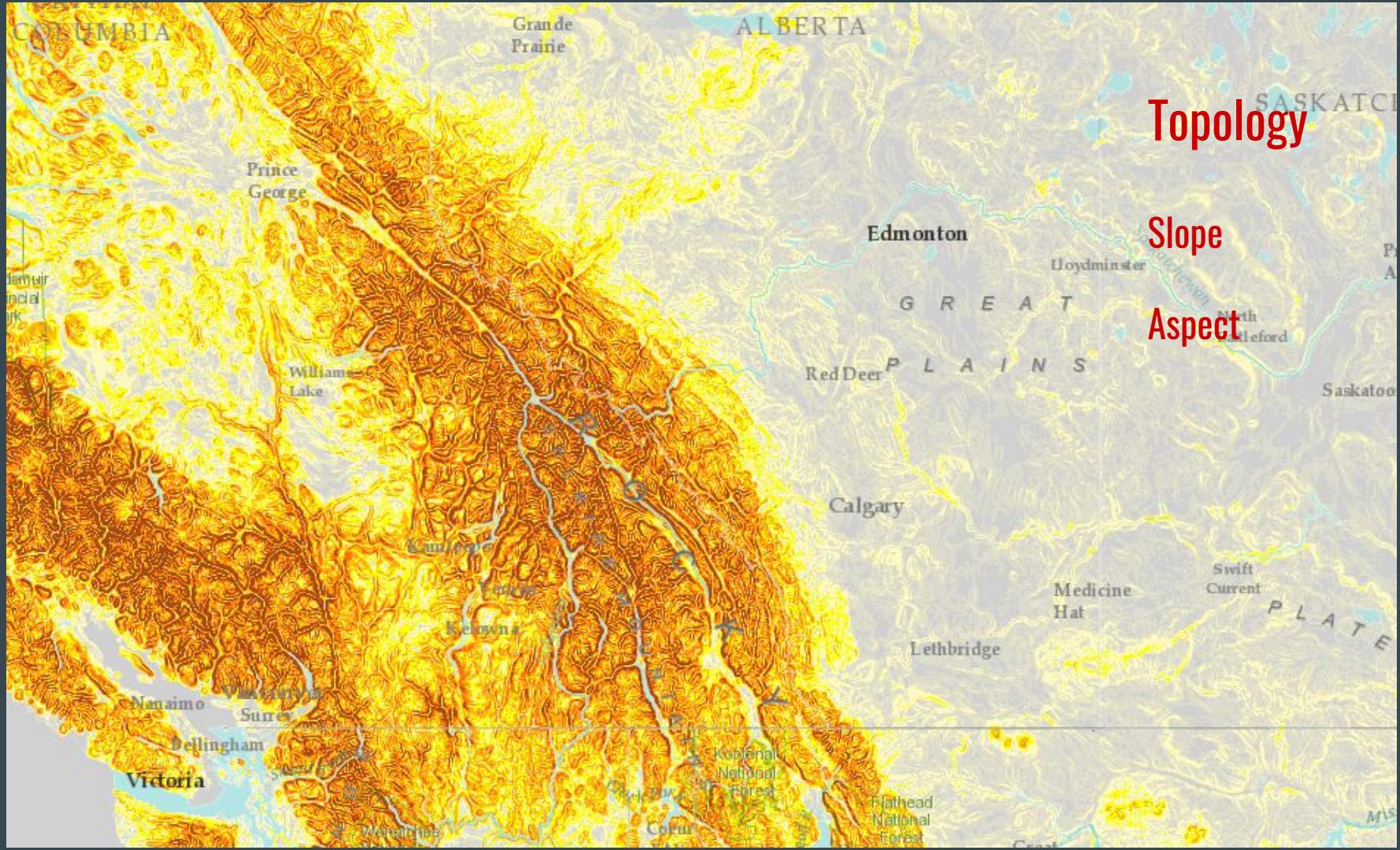
Wind direction monitor



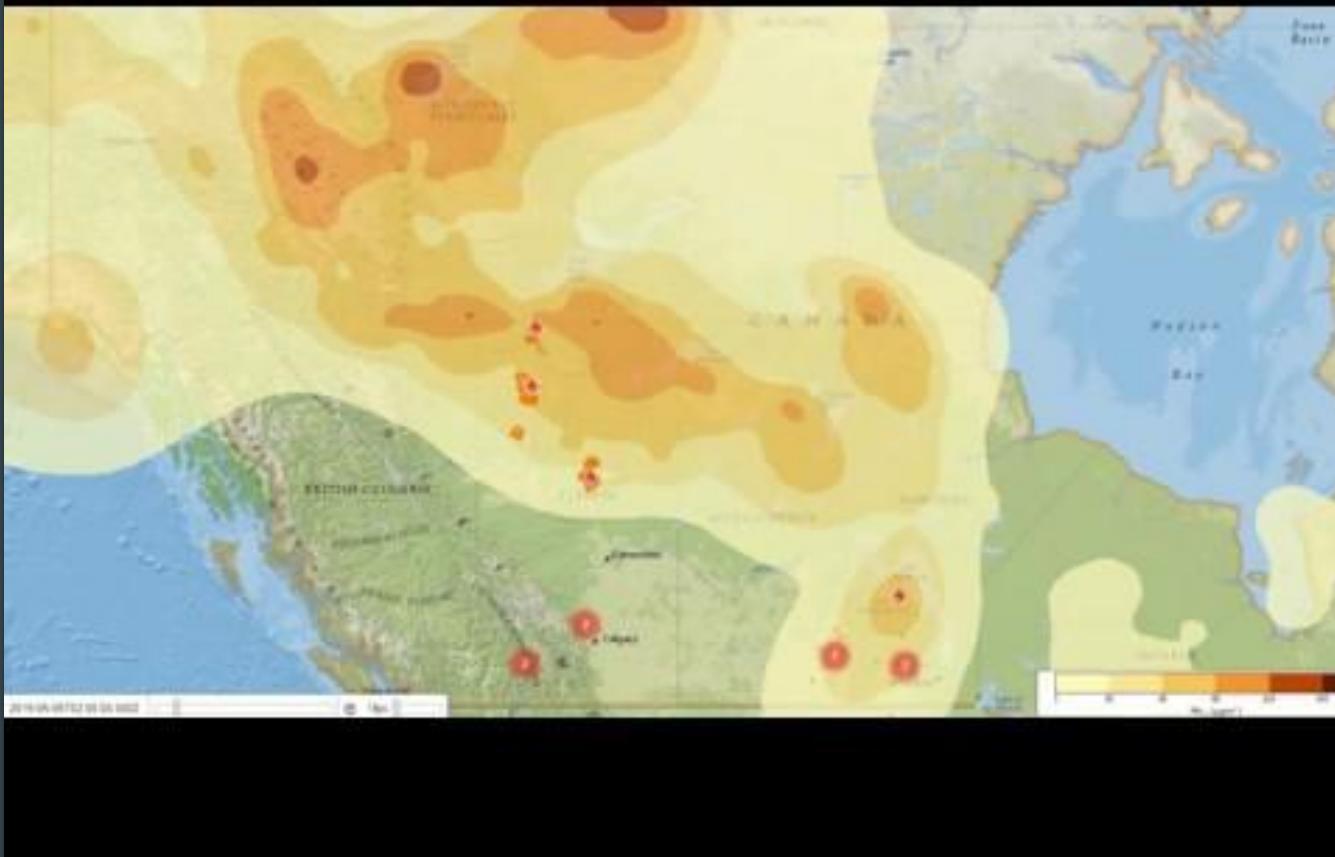


Drought intensity monitor





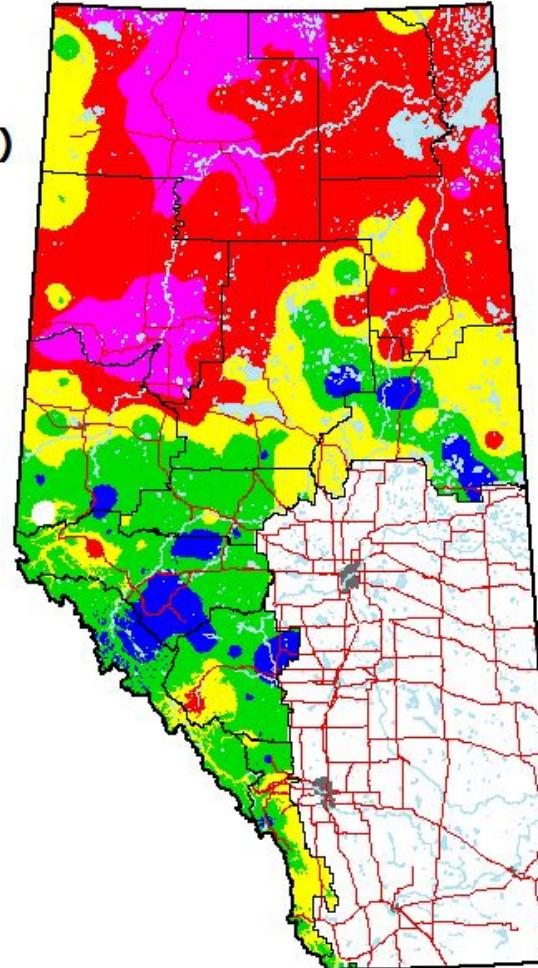
Fire Smoke(PM2.5) monitor



Alberta

Fire Danger (Fire Weather Index)
for June 12, 2019

- Low
- Moderate
- High
- Very High
- Extreme
- No Data



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Map created on Jun-12 at 14:06

Disadvantages of firefighting aircraft

Dangerous

Difficult

Expensive



TOP
SOCIETY





Like



Rate

Prescribed Fire Burn

- Large wildfires that burn more than hundred thousands of acres are increasing in the western Canada and U.S over the last three decades. Homes and communities are also getting destroyed from these wildfires. Poor fire-management practice is bringing destruction to the forest.
- Paul Hessburg (TED Talk 2017) suggest to put the right kind of fire back into the forest system to recover lost trees from the fire.
- One of the tools he used is prescribed burning to intentionally thin out trees. It's going to create already burned patches on the landscape that will resist the flow of future fires.
- Prescribed burning creates less smoke than wildfire does. Public support for using this tool is poor. This is a social problem and needs human to solve it by working together, increase awareness to lawmakers.

Paul Hessburg at TEDxBend

Why wildfires have gotten worse – and what we can do about it

How is prescribed burning done?

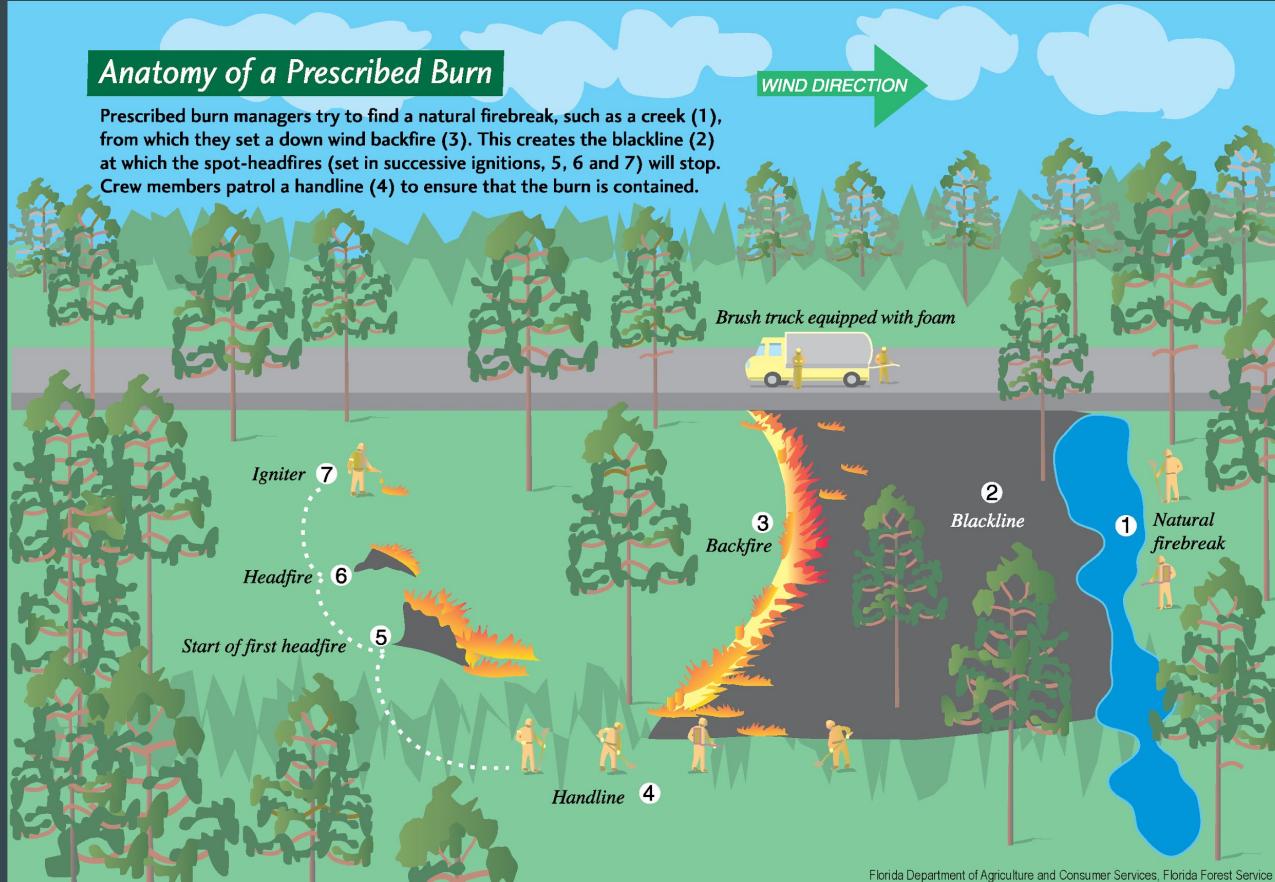
- training involved learning fire behaviour (ignition, growth, full development and decay)
- methods of ignition and suppression
- proper use of equipment
- install fire control lines prior to day of the burn and monitor
- burn season spans from mid-October to mid-April when most vegetation and many animals are sleeping/inactive



Sawback prescribed fire in Banff National Park.

Credit: Chris Siddall

How is prescribed burning done? (contd.)





Subalpine and Montane Forests: Canadian Rockies



Insurance Policy

Insurance tips in Fort McMurray, Alberta:

- Home and all contents covered with home/homeowners insurance in the case of a forest fire
- Car damage covered by auto insurance policy, but possessions in car must be claimed via home/condo insurance policy

Insurance tips in British Columbia:

- Forest fire damage covered under home and car insurance. Includes smoke damage.
- BCAA

Economy & Post-Fire Renovation

Post incident economy damage



- Fort McMurray is a Municipality in Alberta. The production of fossil energy with an estimated **1.4 billion** cubic metres of unconventional oil source leads Canada as oil producer.
- Provincial and federal governments have spent approximately **\$5.3 billion** will be re-invested in Alberta's economy over the next 3 year
- Economic impact of the fires: expect the aftermath of the wildfires to cause **456 million or 0.1 percent off real GDP in Alberta 2016**
- Most significant cost to local industrial industry is oil production: Oil production losses totalled 47 million barrels and cost producers **\$1.4 billion** in revenues in 2016

Economic impact analysis

Assumptions Used for Economic Impact Analysis (\$ millions)

	2016	2017	2018	2019	Total
Residential investment (new housing and renovations)	208	460	348	149	1,165
Business non-residential investment in structures	158	457	122	82	819
Business investment in inventories	151	164	18	18	351
Exports of oil	-1,388	-	-	-	-1,388
Transfers to households from government, Red Cross, and businesses	200	-	-	-	200

Source: The Conference Board of Canada.

Table 2
Key Economic Indicators

(difference between baseline scenario and Fort McMurray wildfires scenario)

	2016	2017	2018	2019	Total
GDP at market prices (\$ millions)	-1,601	1,696	867	521	1,483
Real GDP at basic prices (2007 \$ millions)	-456	1,062	455	218	1,279
Real GDP (percentage difference)	-0.1	0.4	0.2	0.1	
GDP deflator (percentage difference)	-0.33	0.10	0.07	0.06	
Average weekly wages industrial composite (percentage difference)	0.04	0.12	0.05	0.03	
Household income (\$ millions)	236	1,121	457	220	2,034
Employment (number)	2,135	8,968	3,264	1,588	15,955
Retail sales (\$ millions)	69	345	172	70	656
Housing starts (number)	225	889	882	577	2,574
Net operating surplus of corporations (\$ millions)	-4,716	130	190	128	-4,268

Source: The Conference Board of Canada.

GDP measurement:

Measured through economic activity that generates income through wages, profit, loss from oil production and economic boost from the sheer size of firefighting, emergency services, and clean-up efforts have generated economic activity.

Mental Health Issues Linger from Fort McMurray Fire

"It's not just help in the moment, It's also help that's going

to protect their mental health down the line" -Vincent Agypong

- Through Agyapong's extensive survey included question about age,

employment, people before fire, Exposure to the fire and media follow up.

- Over 486 responses have shown +12.8 percent of probable post-traumatic stress disorder patients.
- 15 percent fulfil the criteria for an alcohol use disorder and nine per cent fulfil the criteria for a substance abuse disorder.



Overview: Short Term Effect?

Economy and Home Renovation:

- Fort McMurray wildfires swallowed nearly 590,000 hectares and destroyed nearly 2,000 residential and commercial structures.
- A total of \$5.3 billion will be injected into Alberta's economy for the rebuilding effort; this will have been Canada's costliest natural disaster.
- Temporary shutdowns of oil sands production created losses of around 47 million barrels and cost producers \$1.4 billion in revenues in 2016.
- While rebuilding and replacing lost assets will generate economic activity, this doesn't suggest that Canadians in general or Albertans in particular will be better off economically.

(Information Achieved from the Conference Board of Canada 2016)

Overview: Long Term Effect?

Environmental and Health Concerns:

- PM2.5 particles that are flowing in the air due to toxic emissions and ashes that formed from the forest fire.
- Large scale affection due to wind direction (affecting the neighbouring countries).
- Long Term Health Effect due to air quality as declination in lung function and cardiac arrest

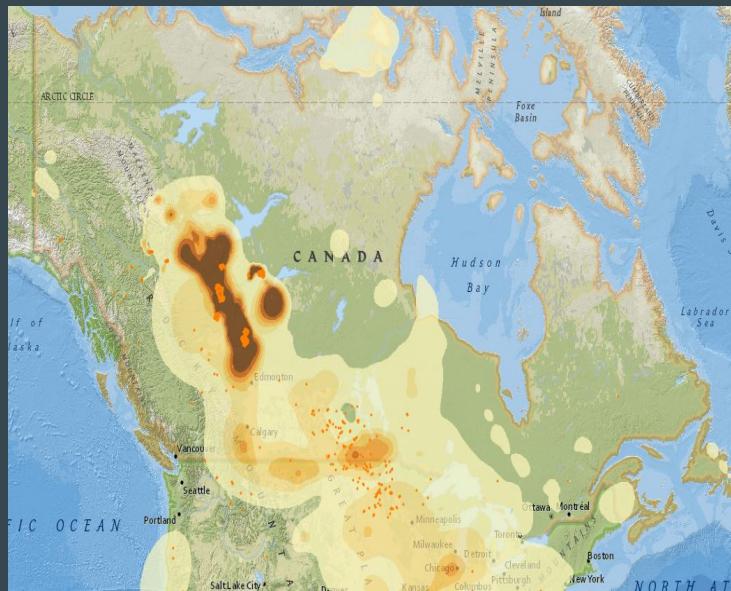


Photo Achieved from:
<https://globalnews.ca/news/5336828/health-effects-of-wildfire-smoke-research/>

Thank you! : Q & A

