

**Extreme
wildfire:** Our new
reality – are
we ready?

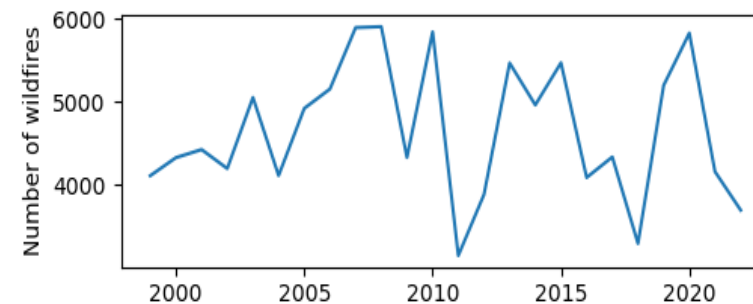
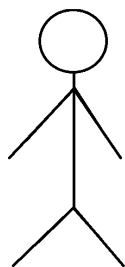
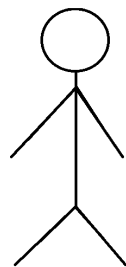


Developing foundational wildfire datasets for New Zealand

Laura Kiely
September 2024



Wildfire in New Zealand



1200

1800

Present

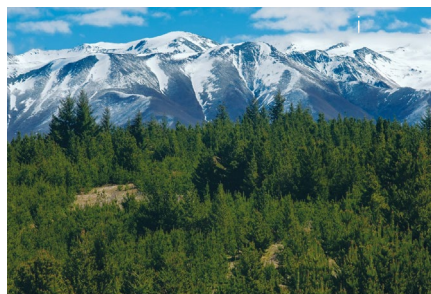
Pre Human Settlement
(c. 800 years ago)



Vegetation
loss

Fire

Young
forest,
scrub and
grassland



Post European Settlement
(c. 1990)

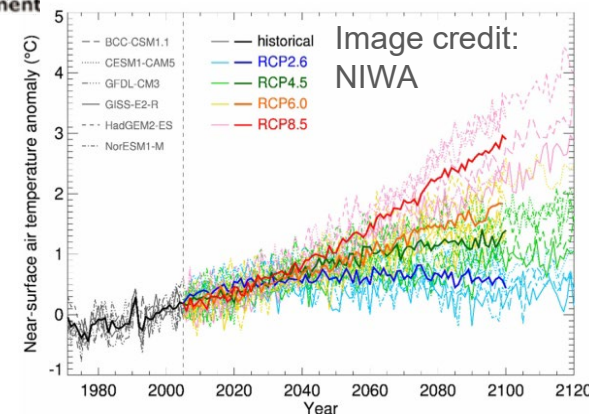


Figure adapted from Weeks et al. (2012)

Forest Grassland and Scrub Alpine Pasture Cropland Urban Lakes and Rivers

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SCION

Wildfire in New Zealand



Image: Stuff.co.nz



Image: NZ Herald

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Wildfire in New Zealand

Scion Fire and Atmospheric Science team



Tool Development



Fire Behaviour



Modelling



Ecology

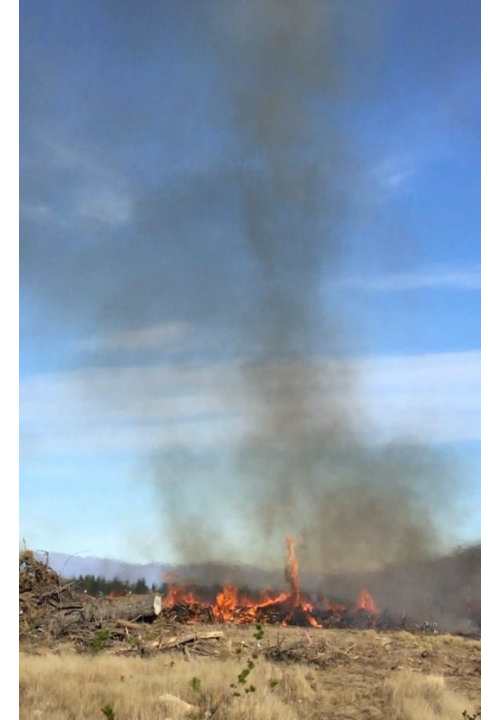
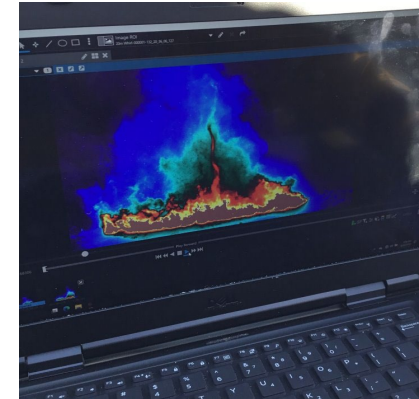


Risk Reduction



Partner Inquiries

- Wildfire Occurrence Database
- New Zealand Wildfire Risk Map
- Near real-time fuel moisture



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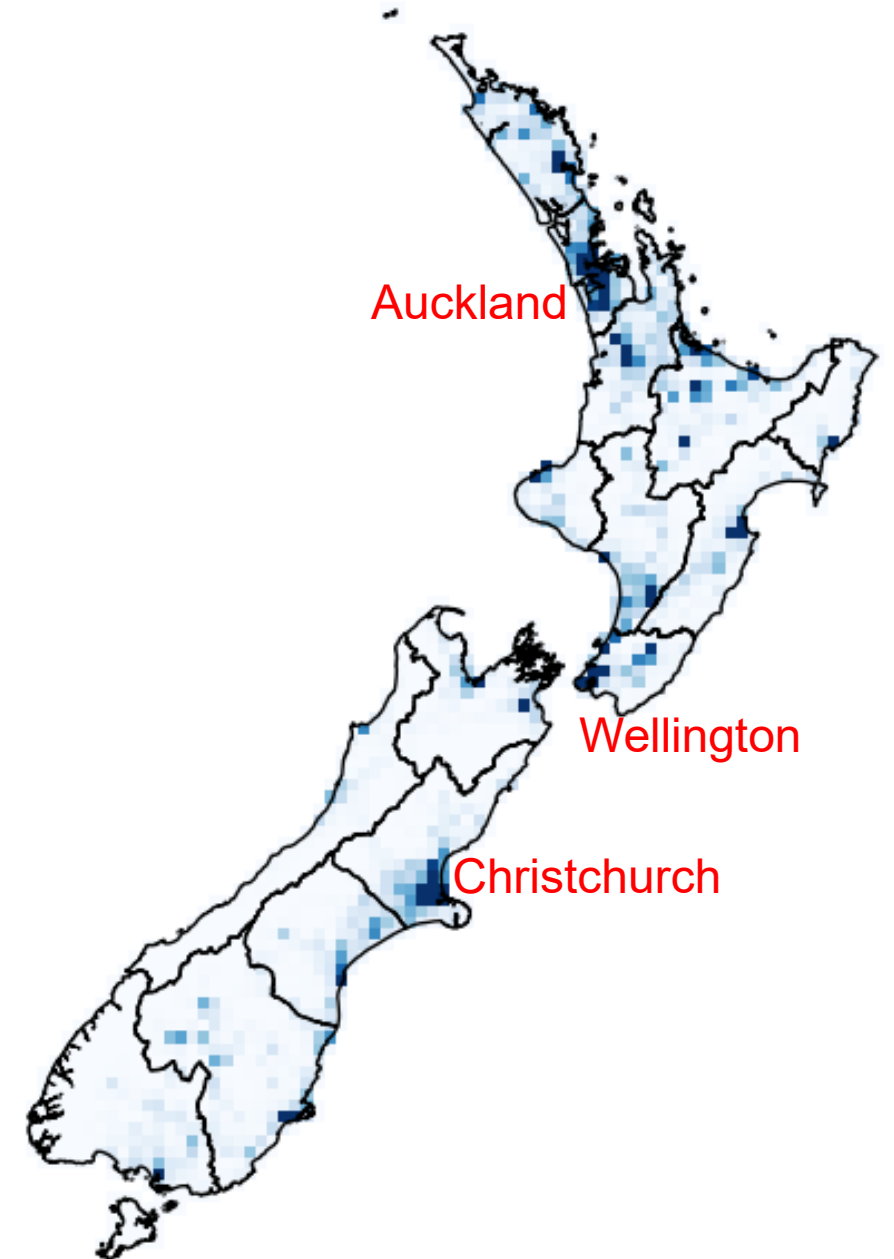
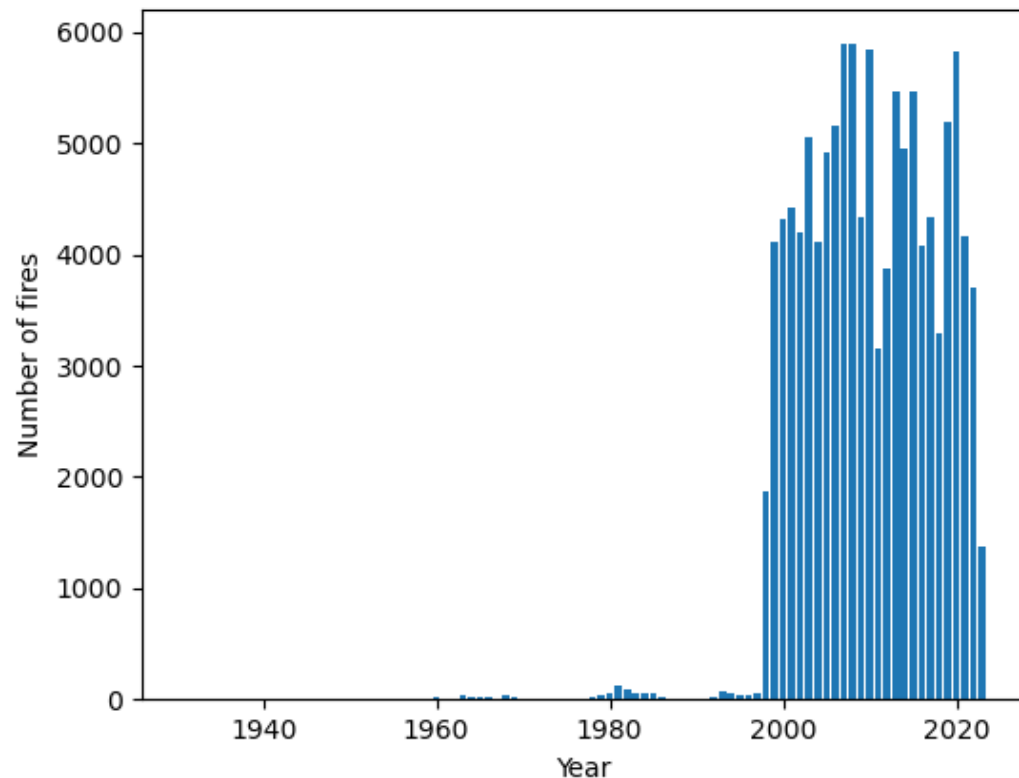


Wildfire Occurrence Database



Wildfire Occurrence Database

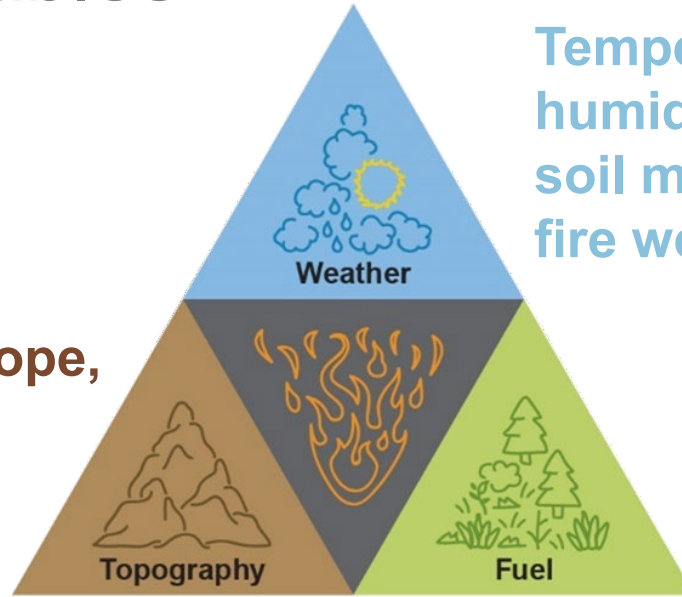
- Spatial database of wildfire occurrence
- Sourced from fire records
- Updated annually



Additional variables



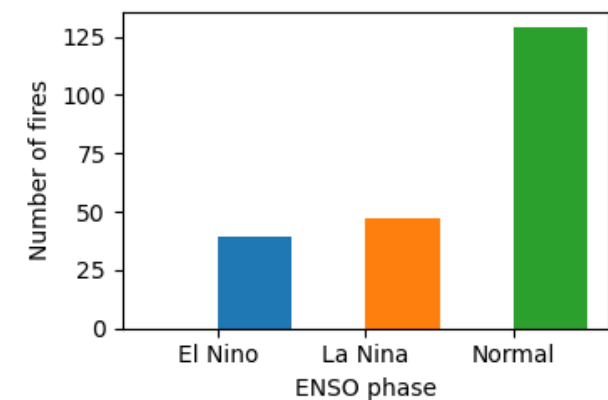
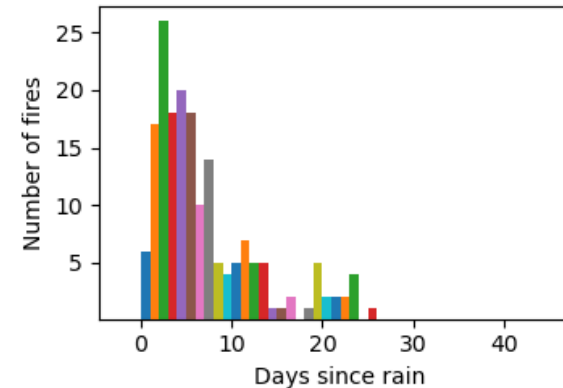
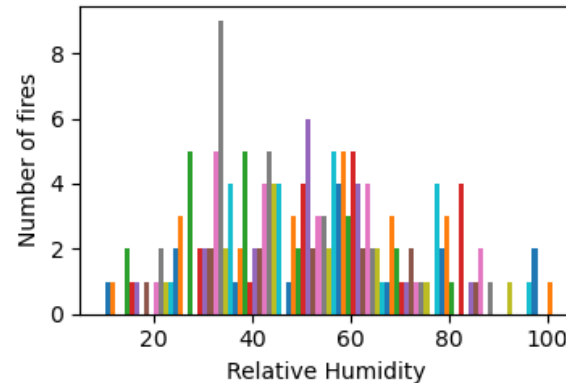
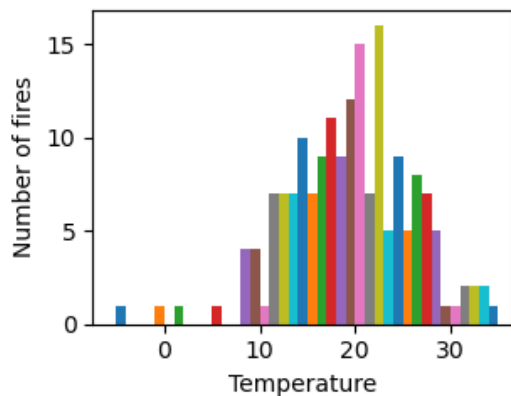
**Elevation, Slope,
Aspect,
Landform**



**Temperature, relative
humidity, wind speed,
soil moisture, rainfall,
fire weather index**



**Land cover,
Fuel type**



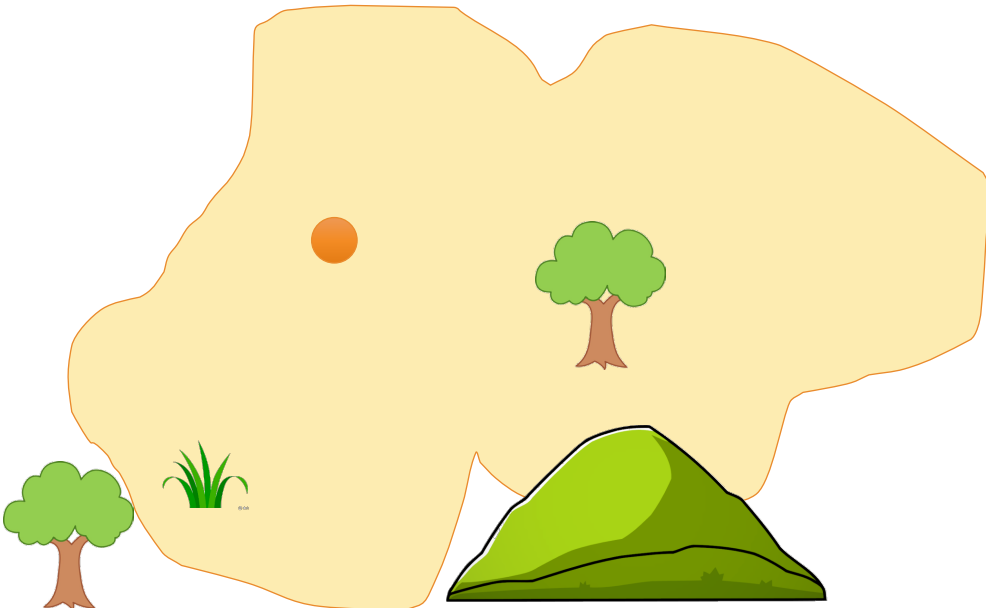
Improving spatial data

Point location

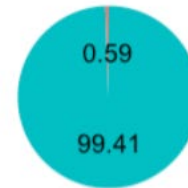


Could burned area datasets give us fire perimeter data?

Point location and polygon area



Total



Group

% of fires detected by satellites
% of fires not detected by satellites

MODIS



Group

% of fires detected by satellites
% of fires not detected by satellites

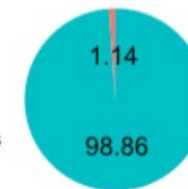
VIIR S-NPP



Group

% of fires detected by satellites
% of fires not detected by satellites

VIIR NOAA-20



Group

% of fires detected by satellites
% of fires not detected by satellites

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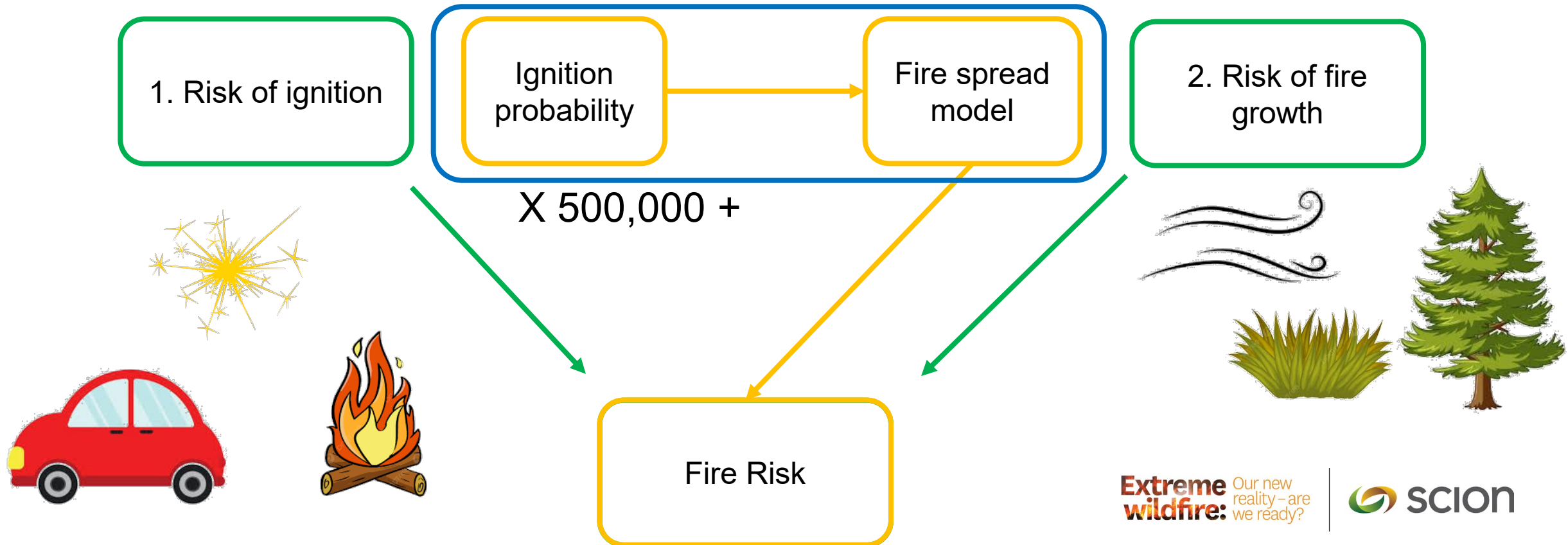


New Zealand Wildfire Risk Map



New Zealand Wildfire Risk Map

- Spatial wildfire risk under extreme fire conditions
- Working with natural hazard planning groups and local councils on what they need



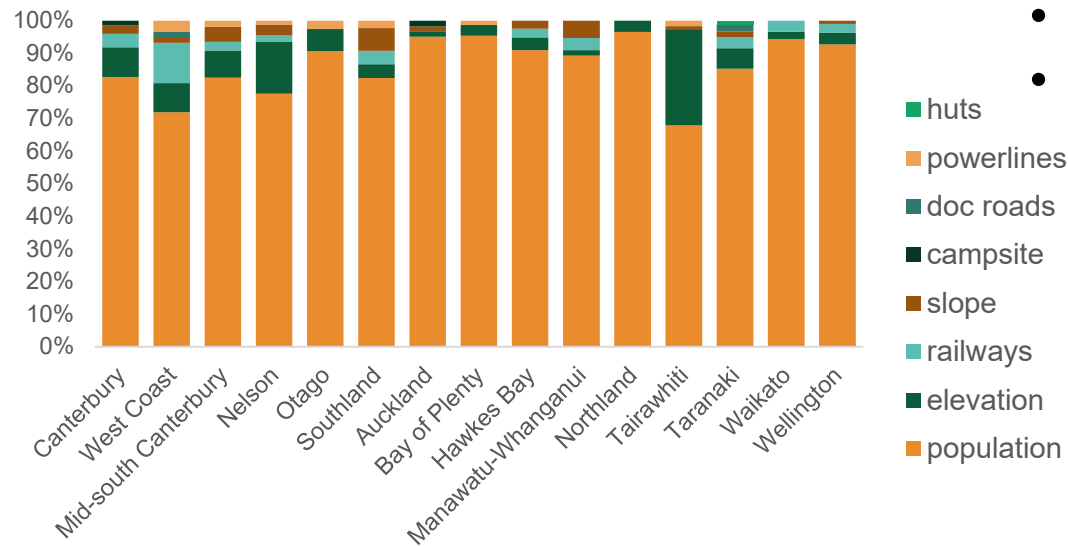
Ignition probability

Historic ignition data

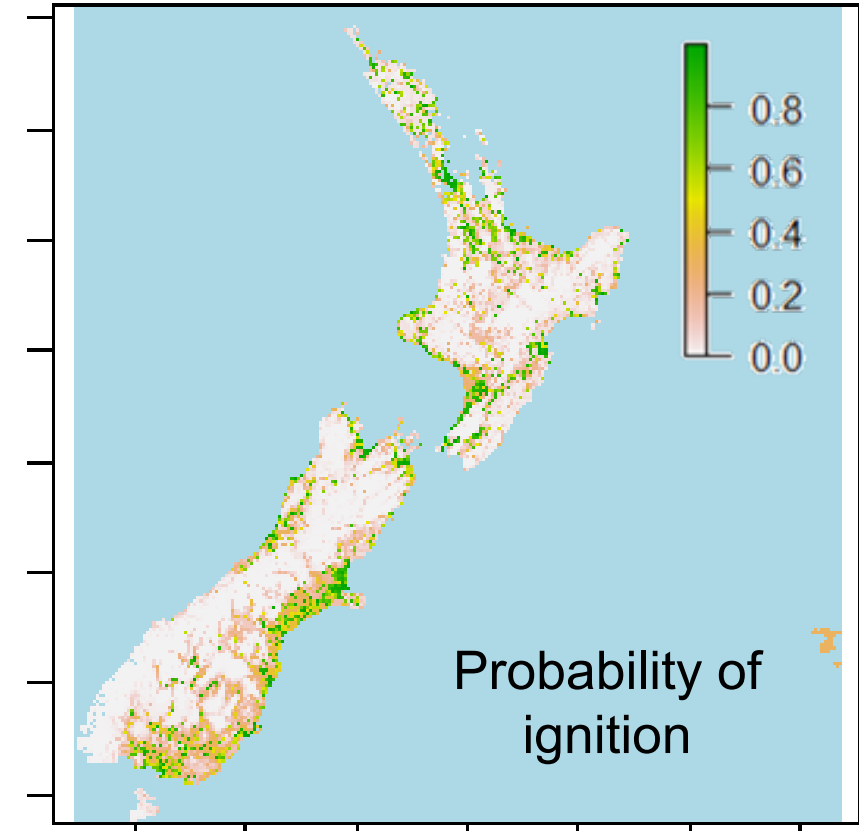
Suspected ignition drivers

Machine Learning
*Brett Moore, NRCAN

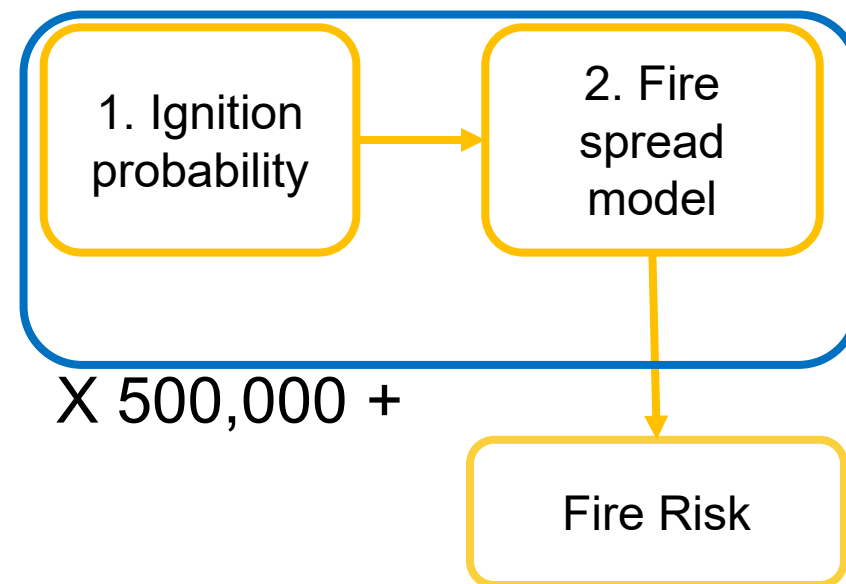
- Population
- Powerlines
- Railways
- Rivers
- Campsites
- Camp huts
- Walking tracks
- Access roads
- Aspect
- Slope
- Elevation



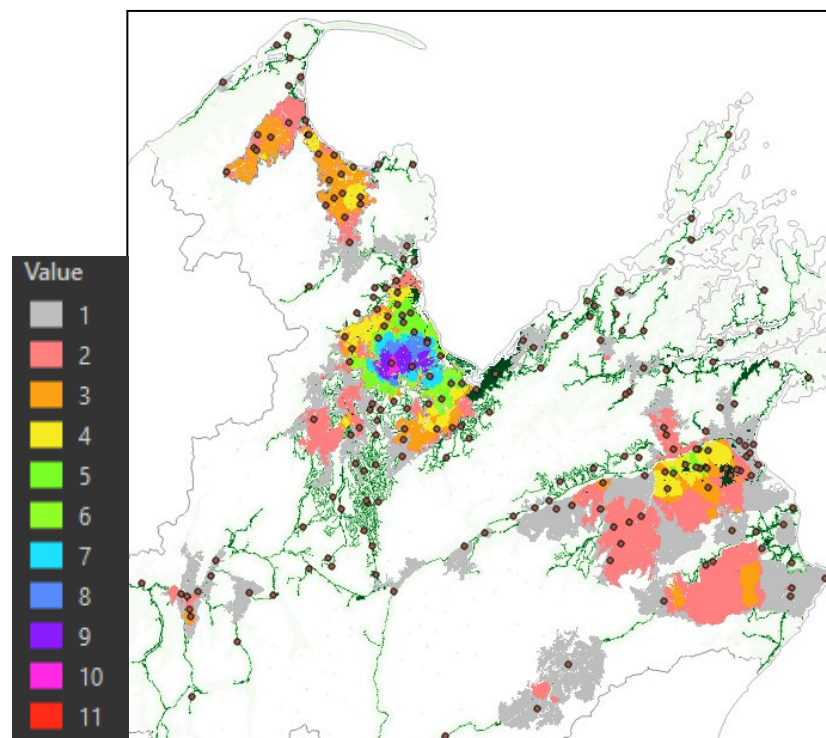
1. Ignition probability



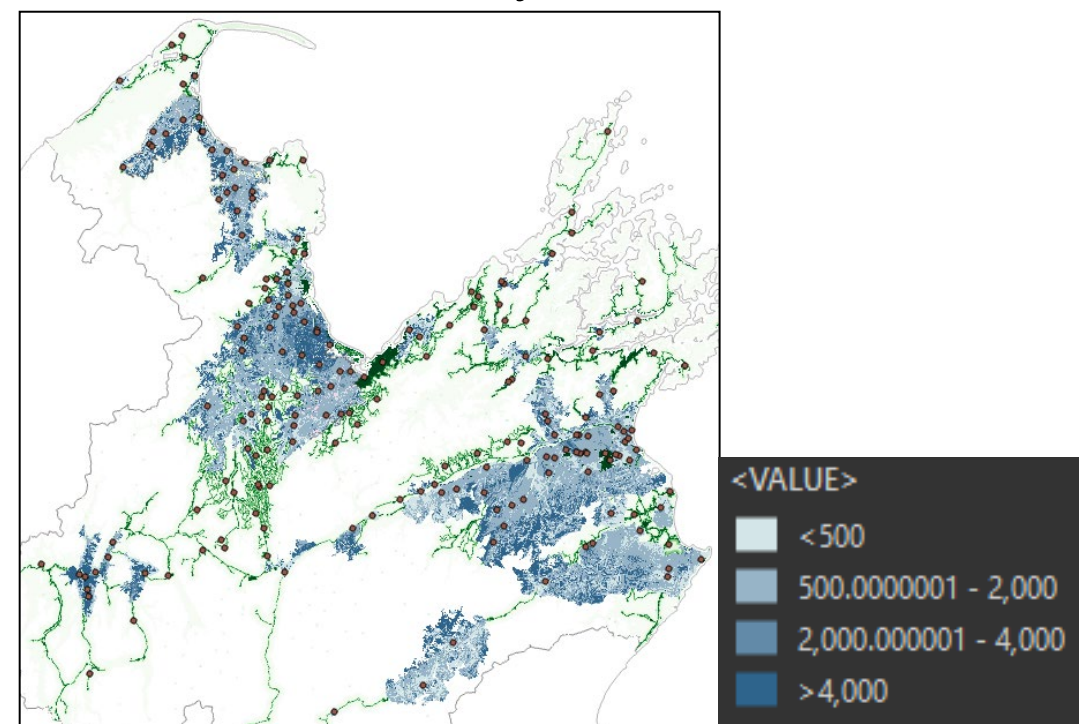
Fire risk



Number of burns



Maximum fire intensity



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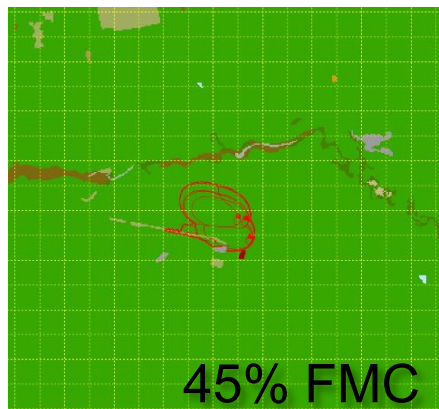
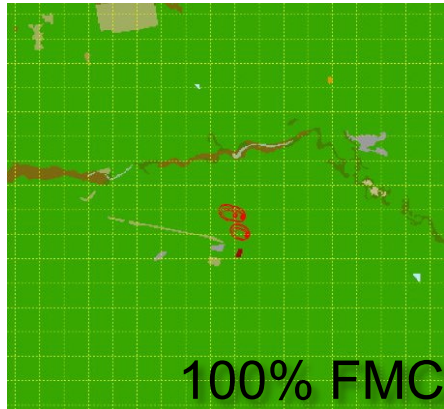


Near real-time fuel moisture and fuel type integration into fire assessments

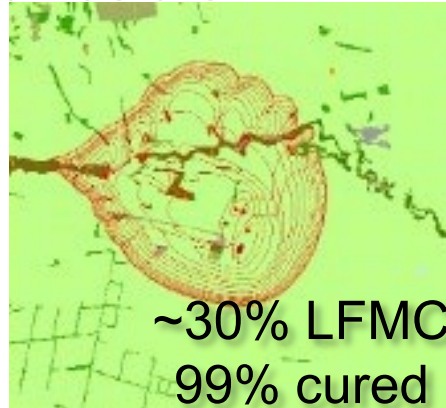
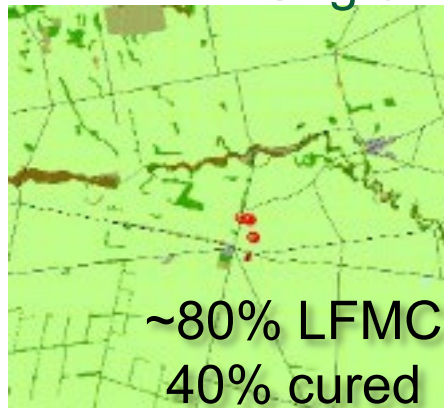


Fuels and fuel moisture

Mature Pine Plantation



Ungrazed Pasture



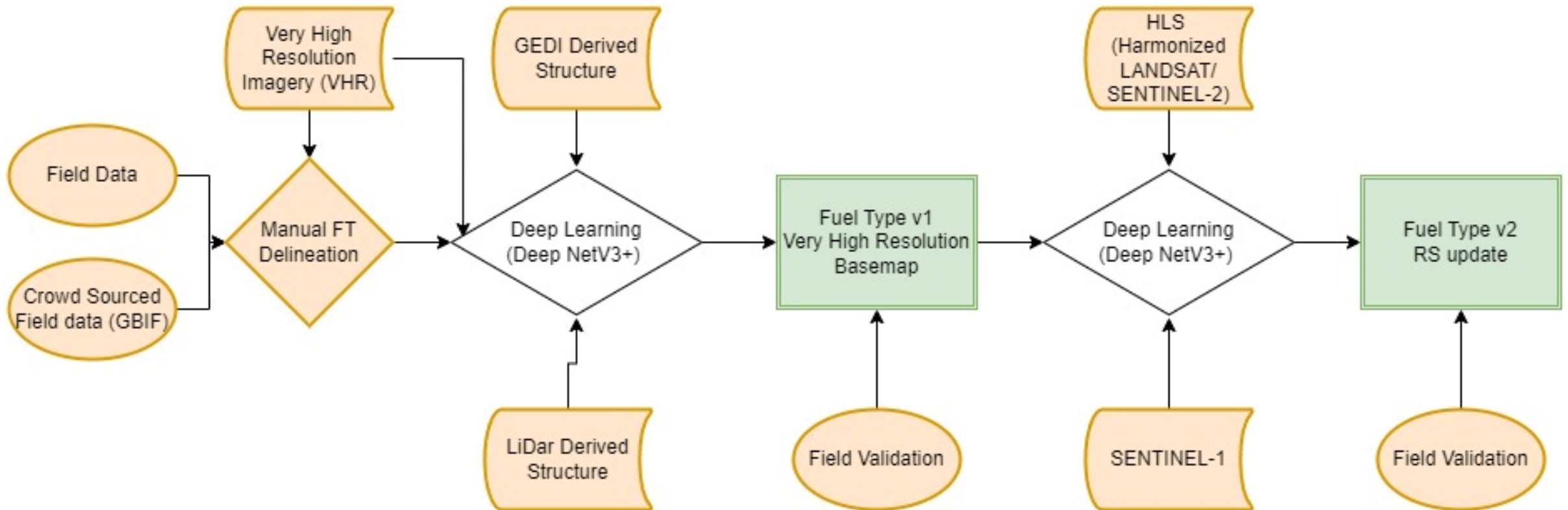
- Current data:
- Fuel type: LCDB
- Fuel moisture: weather surrogates or static values



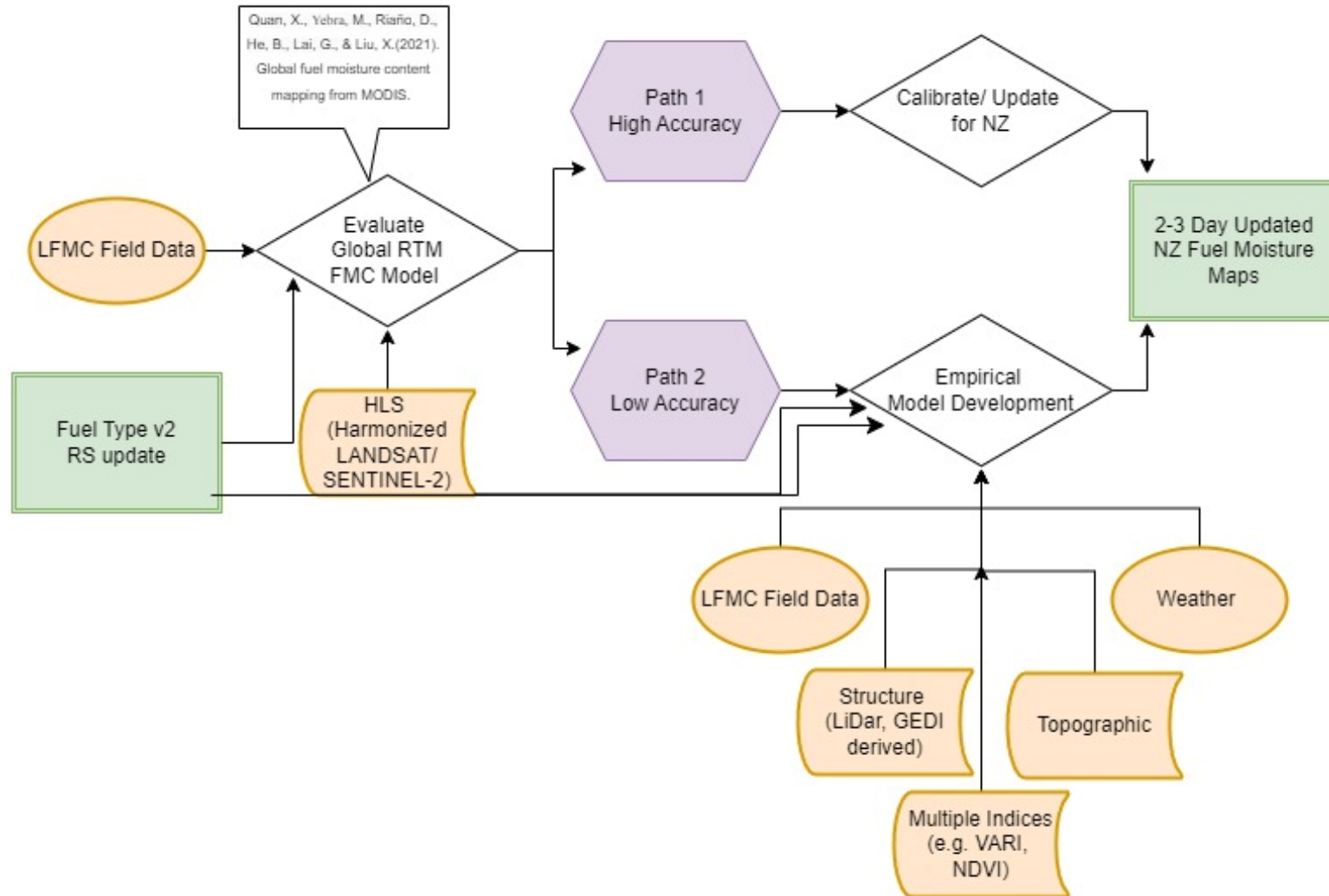
How do we create near-real time fuel moisture and fuel type systems?

Fuel Type Process

- Compared satellite sensors, data inputs, and modelling
- Identified a best path for creating fuel type data



Fuel Moisture Process



Fuel Models

Fire
Simulation
Tools

Fire Danger
Ratings

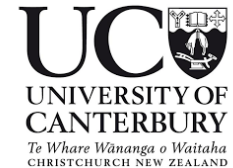
Seasonal
and long-
term trend
tracking

Acknowledgements

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- **Team and collaborators:** Shana Gross, Wayne Schou, Veronica Clifford, Jiawei Zhang, Katerina Pihera-Ridge, Michael Watt (Scion); Eric Lee, John Keithley “Kit” Difuntorum, Feng Guo, Yamika Gandhi (University of Canterbury); Grant Pearce, Rory Renwick, Darrin Woods (Fire and Emergency New Zealand); Jessica McCarty, Jacquelyn Shuman (NASA Ames); Marta Yerba (Australia National University); Michèle Slaton (United States Forest Service)



Australian
National
University



- **Feedback:**
 - Rural Fire Research Advisory Group End-users



www.scionresearch.com



Prosperity from trees *Mai i te ngahere oranga*

Scion is the trading name of the New Zealand Forest Research Institute Limited