

### SPARK OPERATIONAL

The Australian national bushfire simulator

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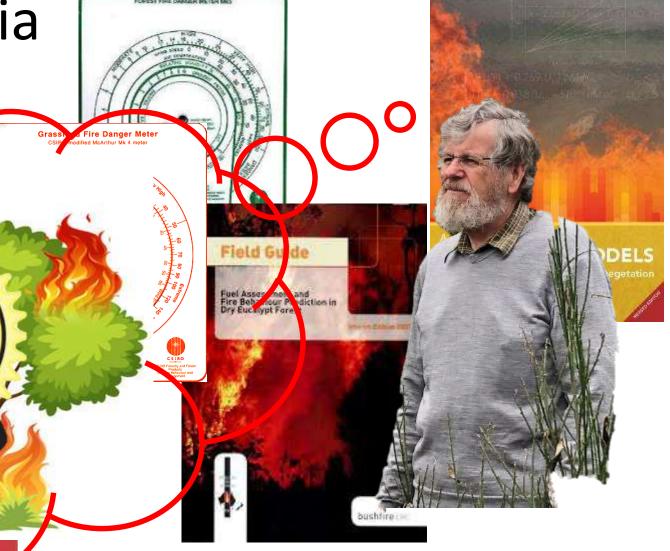


# FBAN tools in Australia

Simulations by hand

Empirical mo

Kevin Tolhur lifting to nex





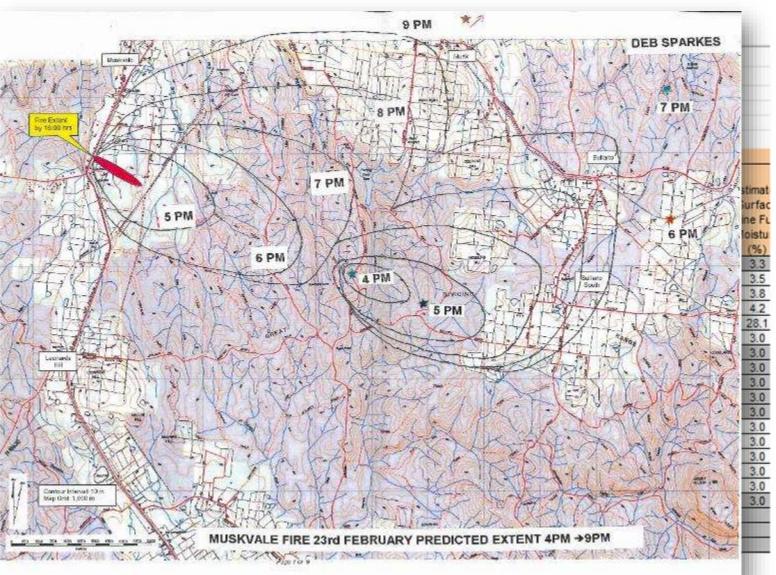


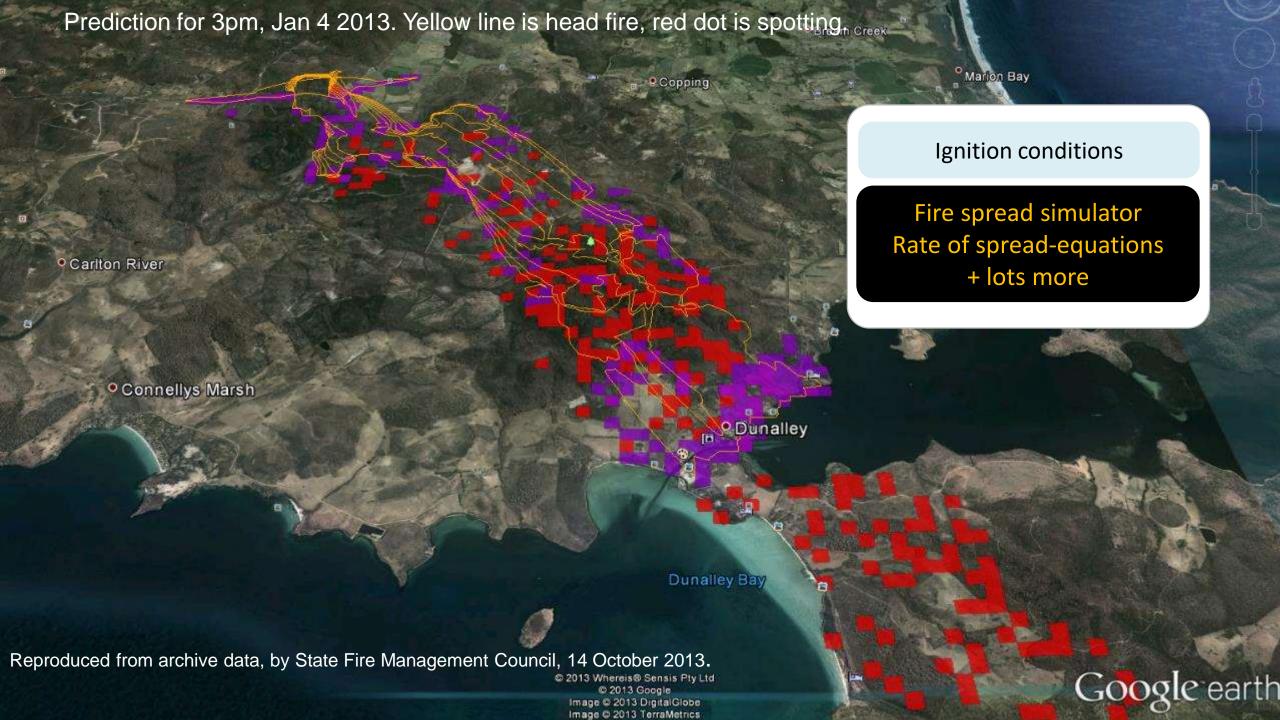
#### Forest Fire Behaviour based on McArthur Mk5 fire behaviour meter

Locality: Nicholson Street Melbourne

Fine Fuel Load (t/ha)	24	Reset Fuel Loads	Wind Reduction F
Slope (deg)	0	Reset Slope	Use BoM Drought

Day (optional)	Date (dd/mm/yyyy)	Time (24h)	Air Temp	Relative Humidity (%)	Wind Dir	Wind Speed @ 10m (km/h)	Gene Direct of Fi Spre (deg,
Tue	15/12/2020	15:00	45	8	350	60	176
Wed	16/12/2020	15:00	38	10	350	45	170
Thu	17/12/2020	15:00	35	15	210	35	30
Fri	18/12/2020	15:00	30	20	210	30	30
Fri	19/06/2020	4:00	5	90	350	10	170
Sat	00/01/1900	0:00	0	0	0	0	180
Sat	00/01/1900	0:00	0	0	0	0	180
Sat	00/01/1900	0:00	0	0	0	0	180
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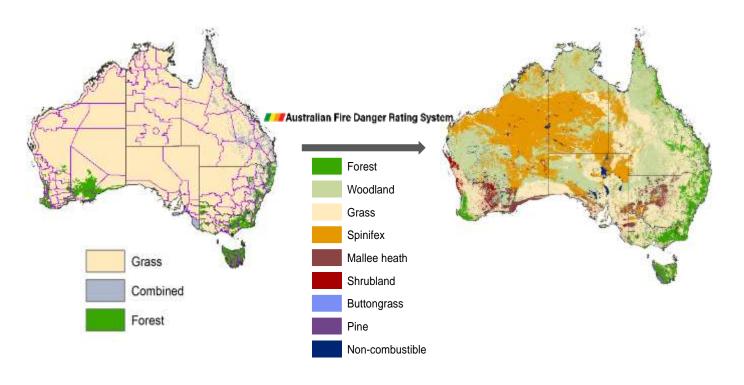






### Simulator Evaluation for Australia

- What is the best simulator overall?
- Tested 4 simulators against the same case studies
- Cost-benefit analysis



 http://www.bom.gov.au/research/publications/otherreports/FPS\_Final\_R eport\_v1.81\_Evaluation\_Of\_Simulators\_Release.pdf





#### Separation of software from models

- Models can be developed and tested by users
- Common platform for bushfire modelling
- Independent expert contributions to overall system

#### **Parallel development**

- Spark team develop core capability
- Researchers/users develop models
- End users deploy and configure system

#### Modular design

- Python-based, open CL C, Javascript (UI)
- Client/server architecture

Ignition conditions

Fire spread simulator
Rate of spread-equations
+ lots more

**Previous simulators** 

Ignition conditions

Rate of spread-equations

Lots of user defined functions

Fire spread simulator

Spark

User defined

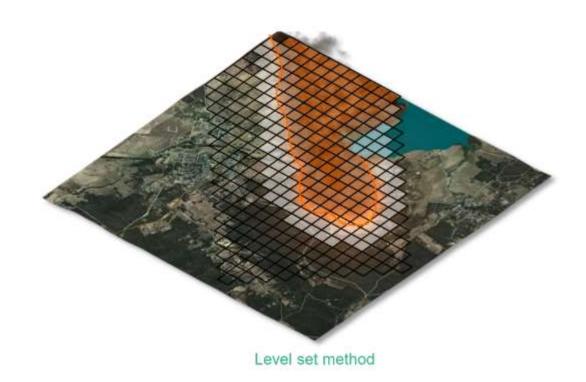
Software





## What is Spark

- Spark is a bushfire prediction framework developed by CSIRO
- Rate of spread based on input data – wind, fuel, terrain
- Spark Operational







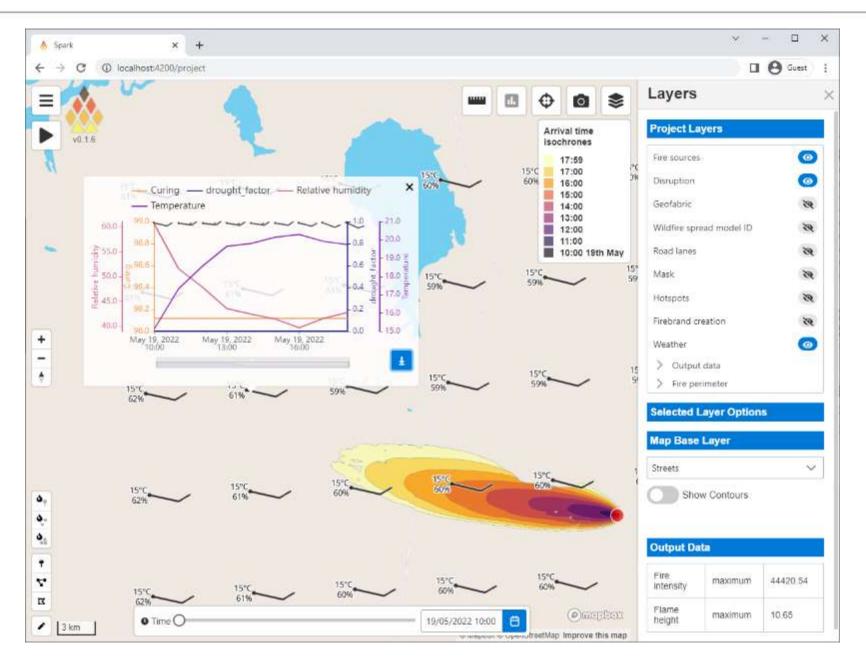
### Spark design principles

- Codebase is *Modern, Modular, Maintainable*
- **UI** is clean, simple and **Optional**.
- All inputs visible (ignitions, weather, fuel, land attributes)
- Interactively edit ignitions, fuels, disruptions, weather
- Runs wide range of fire behaviour models and sub-models
- Easily connect to data sources (eg hotspots, lightning, curing etc etc)
- Flexible output generation
- Ensemble capable





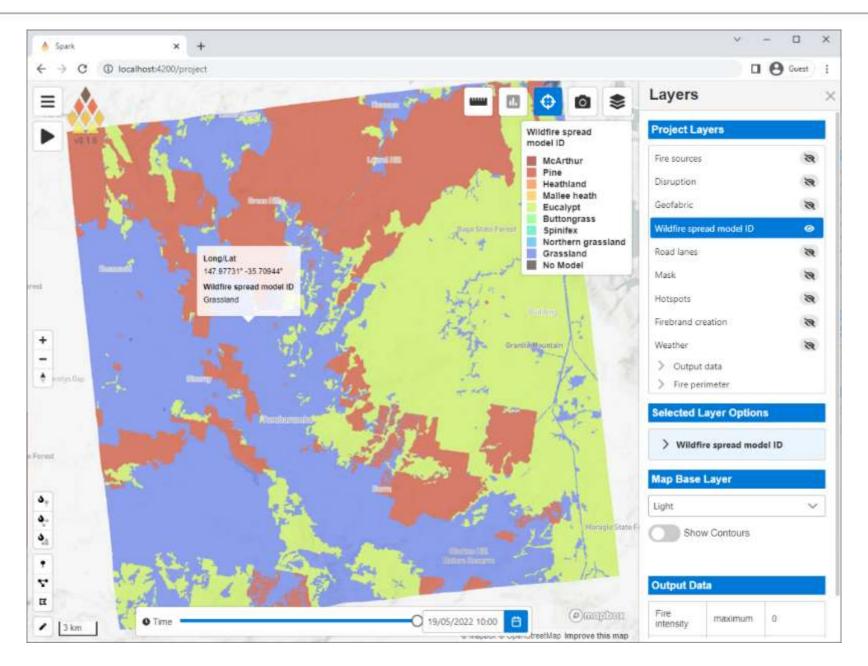
# Visualisation of weather data







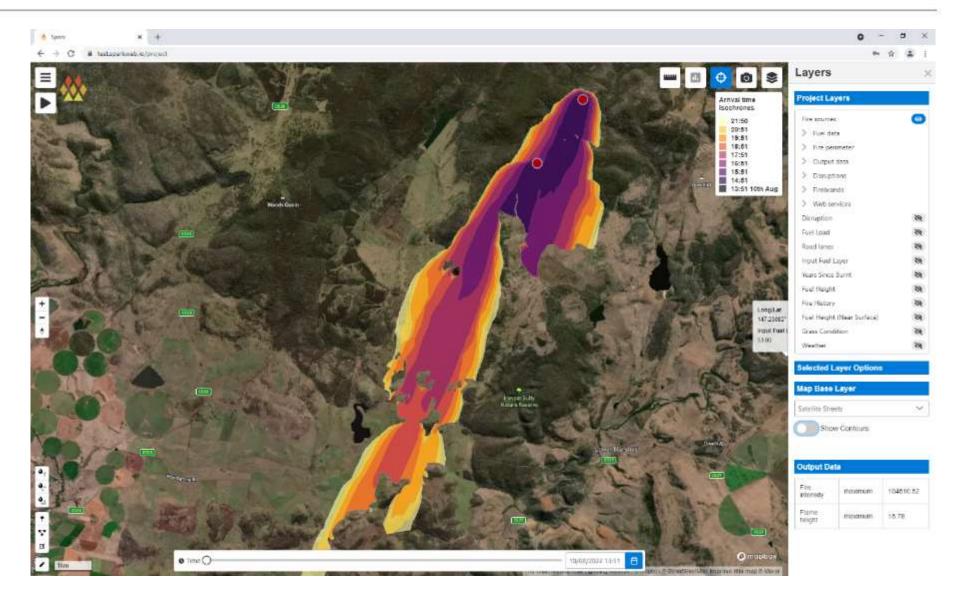
# Visualisation of fuel type







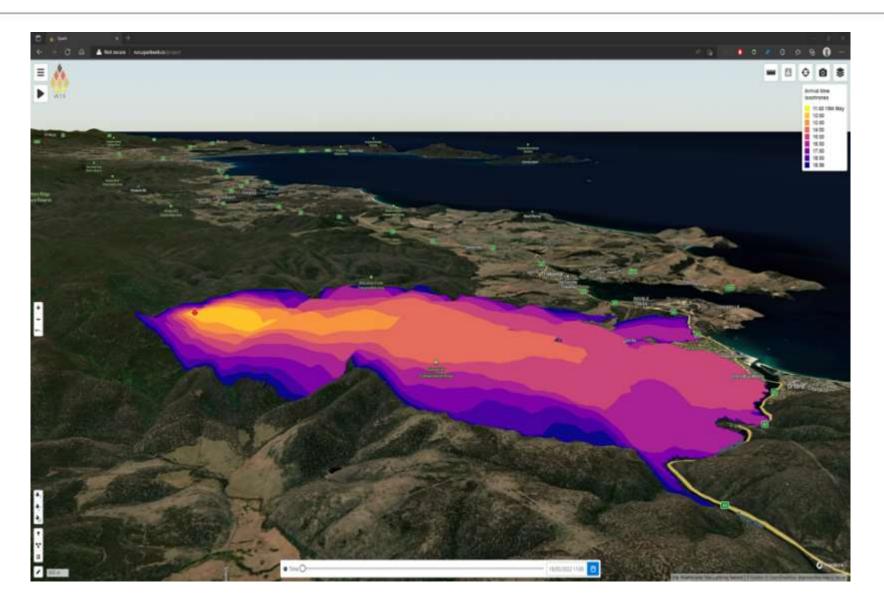
# 3D landscape view





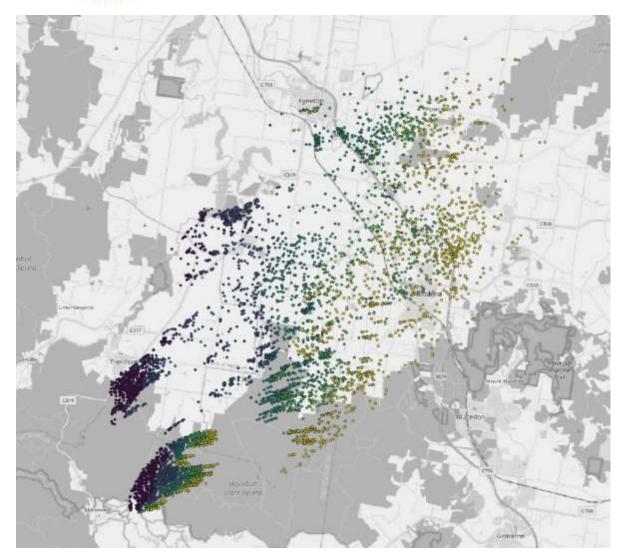


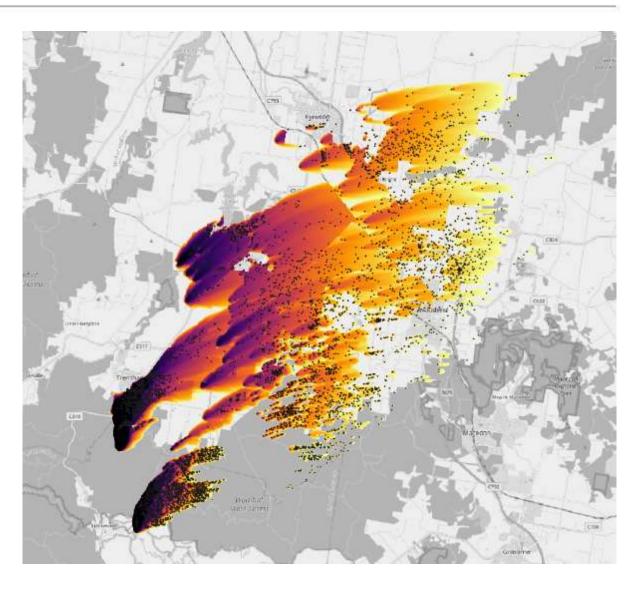
# 3D landscape view







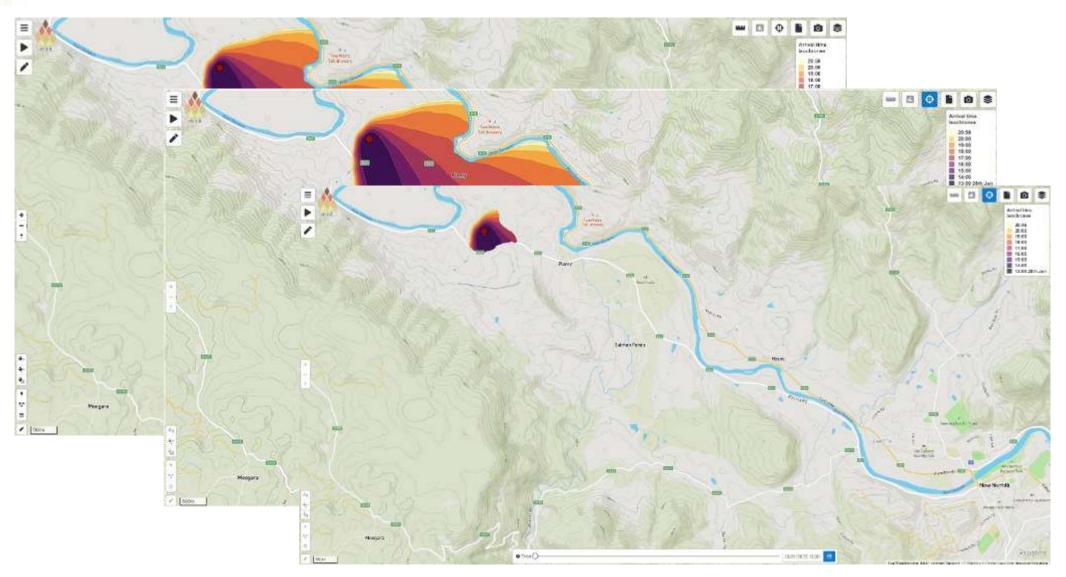




**Ember Transport Model** 





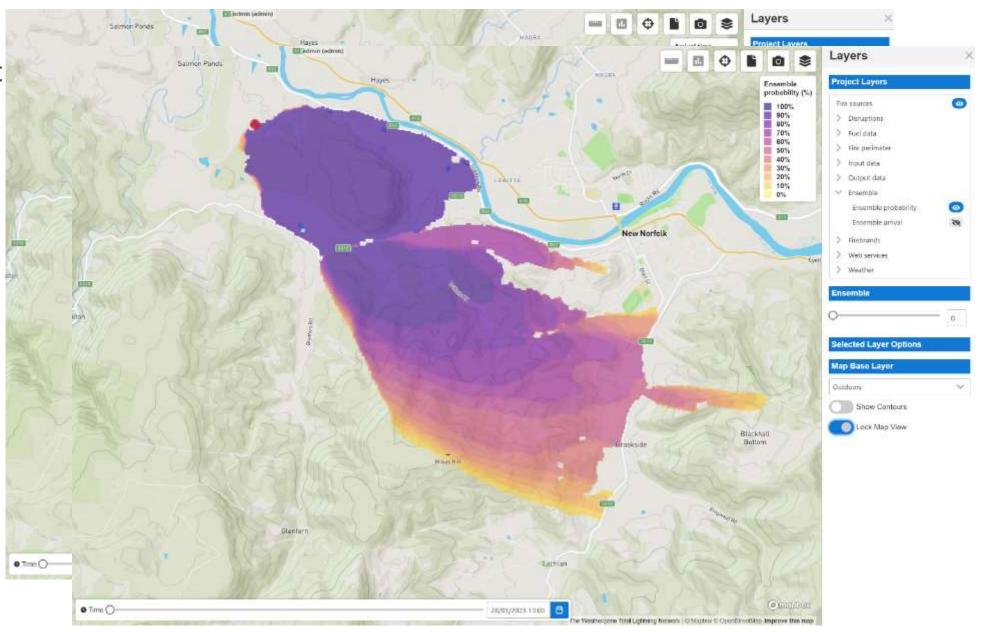


Configurable disruptions





# Chance of Impact from Ensembles



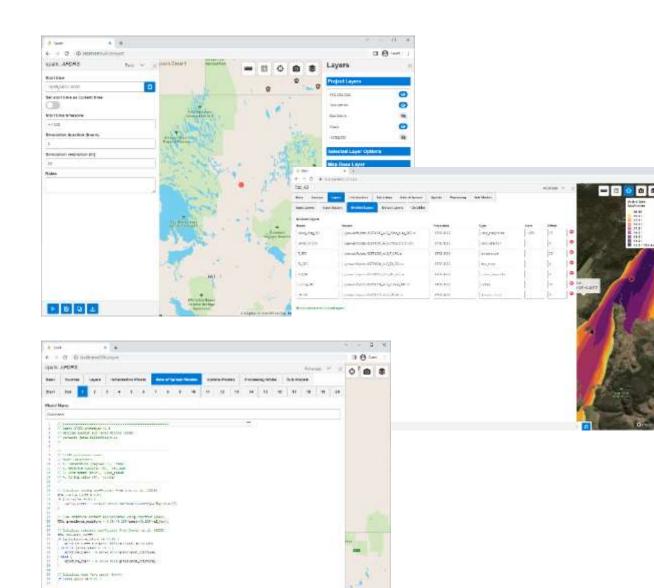




### **Spark Operational**

#### Model configuration

- Basic use
  - Set start time, duration
  - Input start locations, lines, polygons
  - Input suppression lines
- Advanced use
  - Upload weather data
  - Edit all model scripts
  - Add new input and output layers
  - Modify attributes within lookup tables (eg fuels, disruption)







### Important!

- A tool not a solution
- Decision support tool, NOT a decision making tool
- Need to have policies for how data is managed in, curated and managed out
- Coupled fire behaviour models much too slow but part of an evolving model ecosystem
- Very clever people have built this and made it look fabulous which is dangerous
- Still need to train people in fire behaviour analysis
- Still need to have outputs linked to a good communications framework

