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**HAZARDS**CRC

# THE AUSTRALIAN FLAMMABILITY MONITORING SYSTEM

Web site prototype version 1.0

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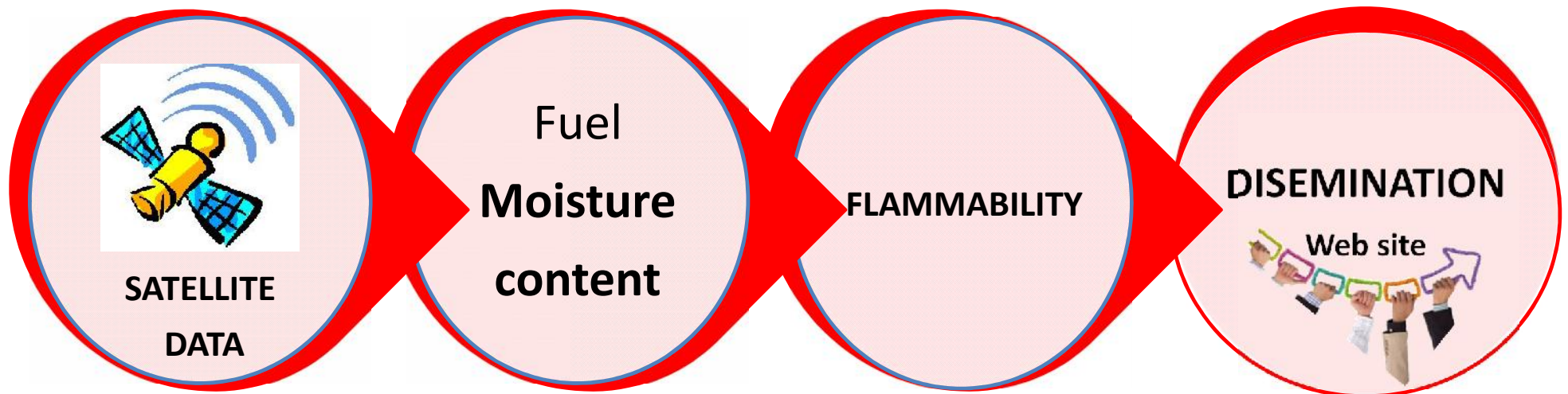


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# THE AUSTRALIAN FLAMMABILITY MONITORING SYSTEM (AFMS) WEB SITE

First **continental-scale** prototype web site providing spatial information on **fuel moisture content** and landscape-scale **fuel flammability** derived from **satellite observations**



## AFMS WEB SITE: WHY?

- 1) Working with satellite-derived large data sets is not easy
- 2) You often need a GIS specialist to visualize, summarise or interpret the data for you

### Our Objective:

- To make spatial information on FMC and flammability **easier and faster to access**

Automated, Systematic, Near-real time, Nation-wide

## AFMS WEB SITE: WHY?

The overarching objective is to **assist users** in better resources allocation in fire protection and response and improved awareness of fire hazards to people and property.



## AFMS WEB SITE

### **Data currently displayed** (2001-to date, 500 m, 4 days)

- Live Fuel Moisture Content (FMC) physical model based on the inversion of Radiative Transfer Models.
- Uncertainty in the FMC estimates
- *Flammability index (FI, 0-1) by comparison of satellite-based FMC with mapping of actual fire events (MODIS).*
- Fuel class mask (grassland, shrubland, forest)

### **Basic input data**

- MODIS reflectance (4 days\*)
- MODIS land cover type (yearly)
- Look up tables of simulate spectra for different FMC

# AFMS WEB SITE: DATASETS PRE-COMPUTED USING THE NATIONAL COMPUTATIONAL INFRASTRUCTURE (NCI)



- >12,000 MODIS images (2001-2017)
- **Freely available** archive at the NCI thanks to the USGS
- Raijin: massively parallel technology for high-performance processing of geospatial data

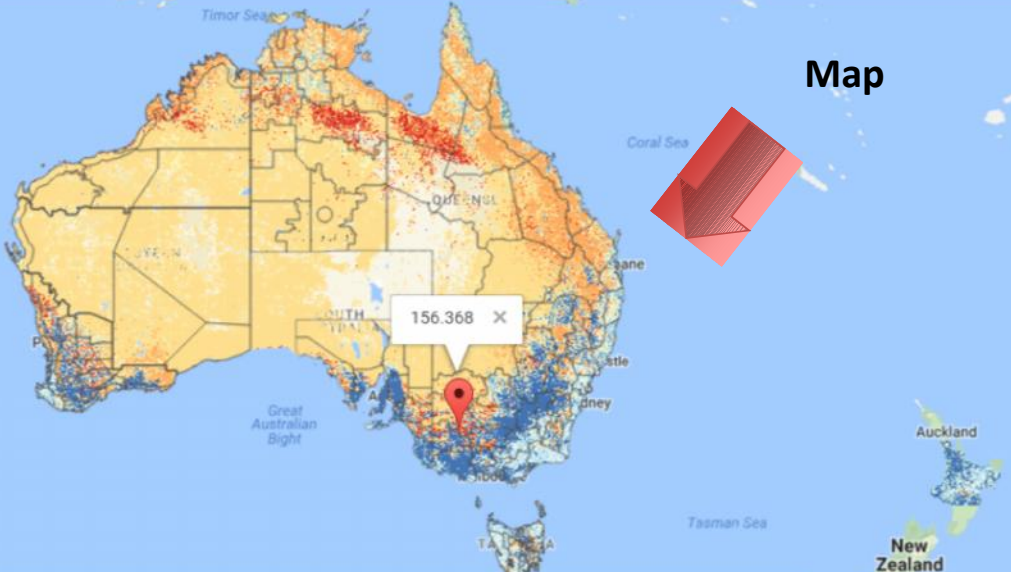
What would have taken a **single computer >2 years** to perform was completed in a matter of **days** using NCI's Raijin

2015-09-30  
Search lat/lon or address

Search options

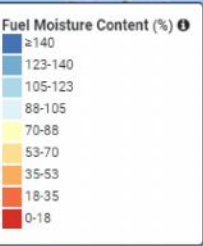
- Fuel Moisture Content
- Fire Weather Areas
- Road Map
- Opaque

Visualization Options



Map

Legend/Info

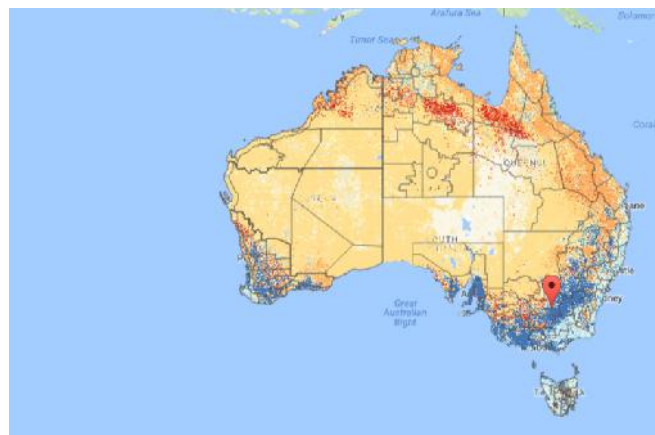


Chart

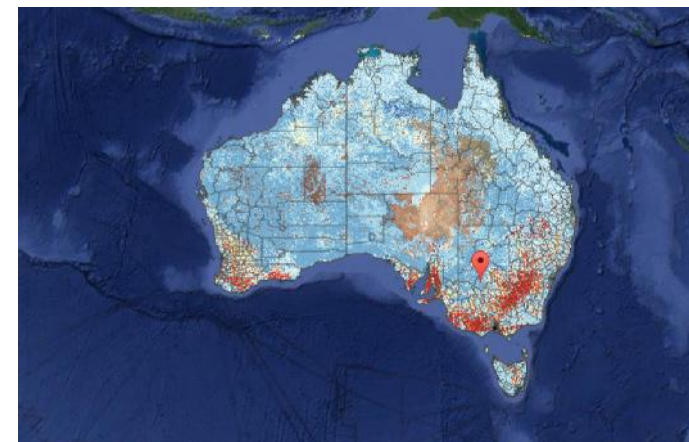
# AFMS WEB SITE: VISUALIZATION OPTIONS

1. Layers
  1. Live FMC
  2. Uncertainty
  3. Flammability
  4. Fuel Class
2. Vectors
  1. States Territories
  2. Local Government Areas
  3. Fire Weather Areas
  4. Defence Training areas
  5. National Parks
  6. NRM Regions
3. Road Map/Satellite
4. Opaque/Transparent

FMC/Fire weather areas/Road Map/Opaque



Uncertainty/Local Government areas/Satellite/Opaque



FMC/Fire weather areas/Road map/Transparent



Uncertainty/Local Government/Satellite/Transparent





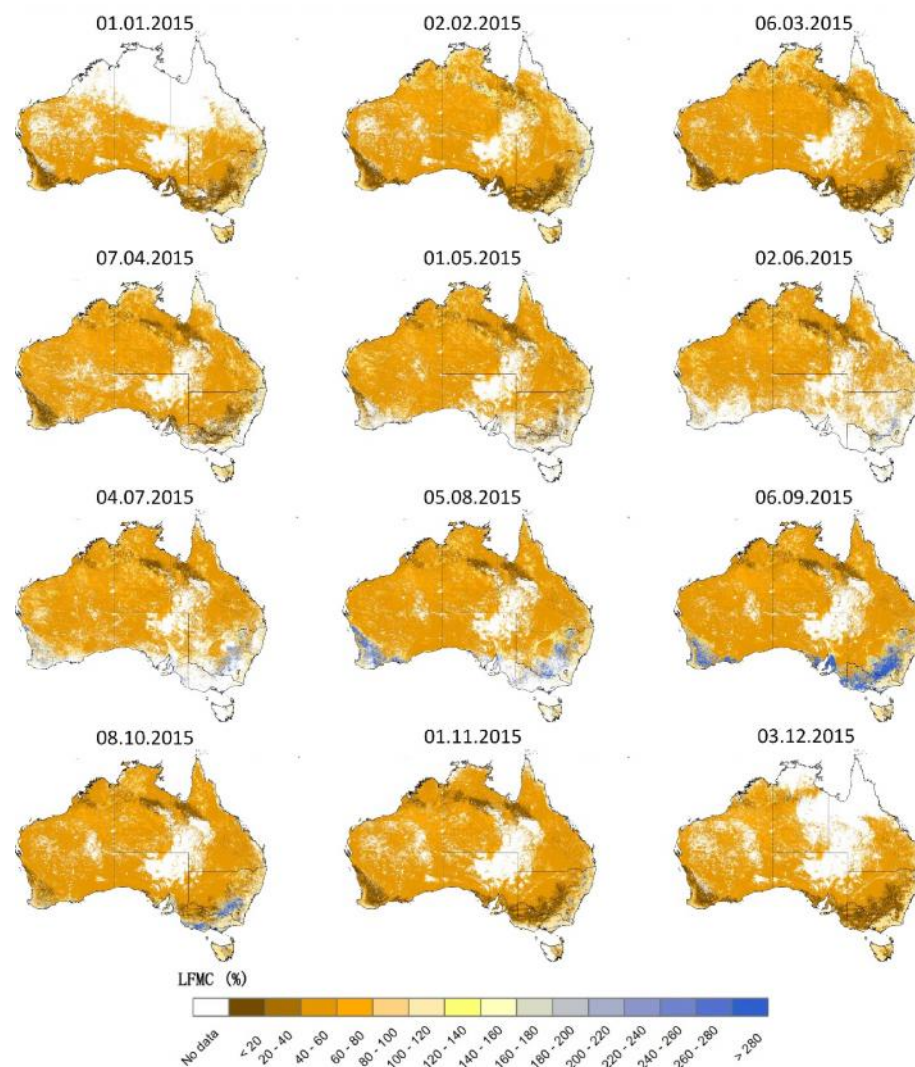
## AFMS WEB SITE: FEATURES

Allows users to **visualise and interpret national-scale** information on FMC and flammability as **maps**

(Bushfire outlook  $\approx$  timing of the drying of the fuel)

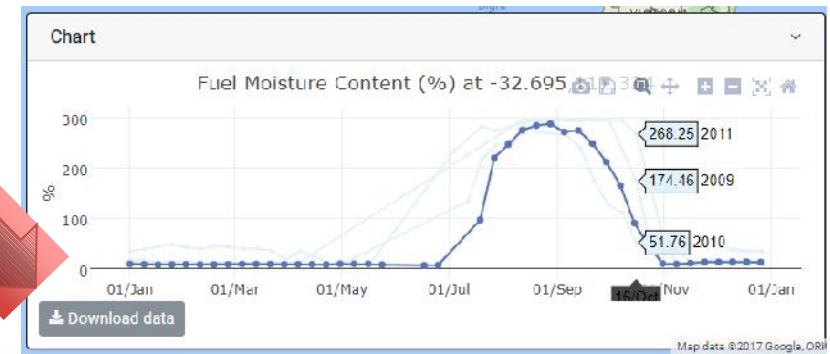
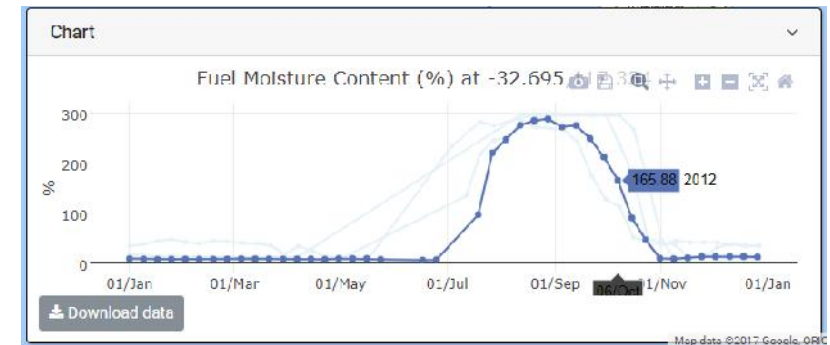
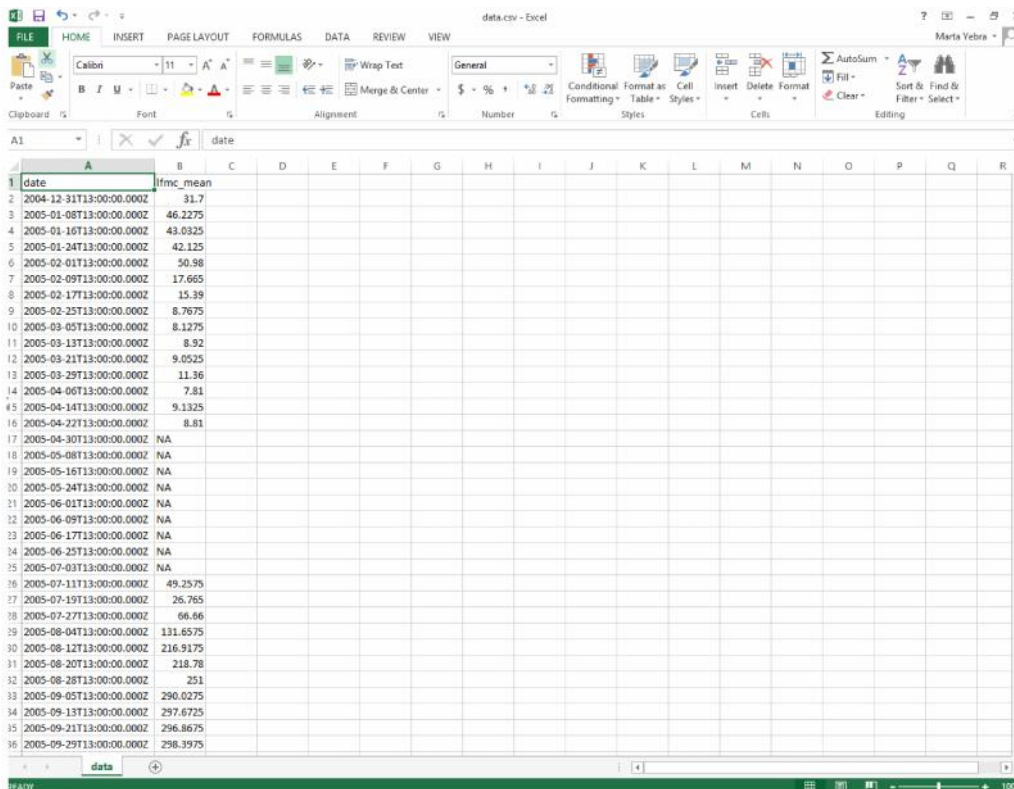
### Example: Overview of FMC in 2015

- 1) Temperate zones of Australia
  - a) Low FMC values in January.
  - b) FMC reach their maximum at the end of winter or beginning of spring (August/September).
  - c) FMC started to decrease until the end of the summer when values reach their minimums.
- 2) Tropical regions in the north of the country, the tendency was the opposite.
- 3) Desert zones FMC values constantly low



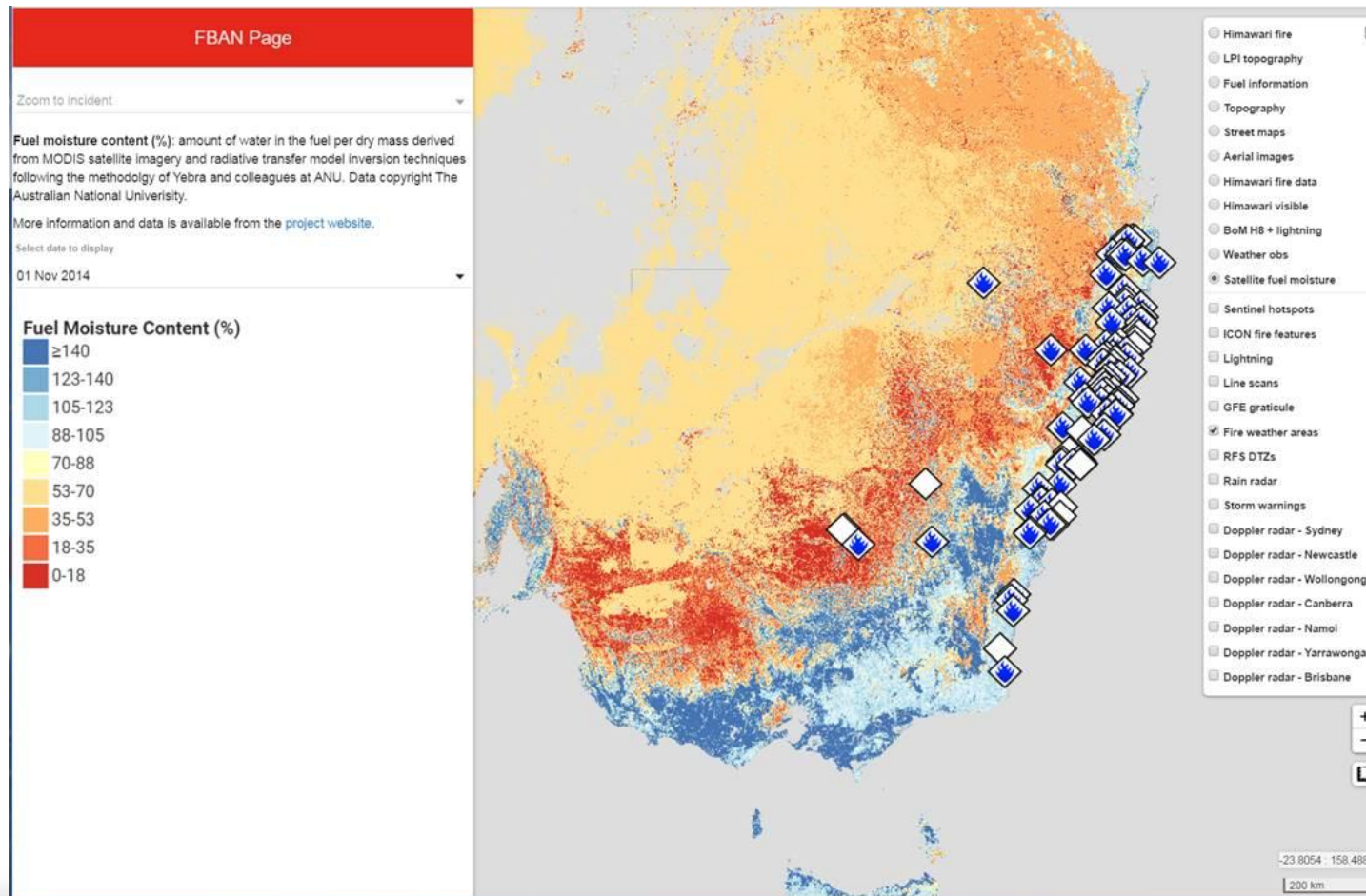
# AFMS WEB SITE: FEATURES

Allows users to visualise and interpret national-scale information on FMC and flammability as **graphs**.



# AFMS WEB SITE: CURRENT USERS

## NSW-RFS



## AFMS WEB SITE: CURRENT USERS

### New National Fire Danger Ratings working group

- 1) To obtain FMC for the **Spinifex fuels** since the rate of spread model for this fuel type requires FMC but doesn't provide a way to calculate it
- 2) We have received FMC data for Spinifex from Neil Burrows (WABSI) to validate the estimates.

### Guy Carpenter & Company Pty Ltd

- 1) Reinsurance broker
- 2) To price the policies in relation to fire risk
- 3) Comparing the FMC and Flammability values with locations where **bushfire claims** have occurred historically
- 4) Feedback: higher resolution needed for the Wildland Urban Interface

# AFMS WEB SITE: YOUR FEEDBACK IS ESSENTIAL FOR FUTURE DEVELOPMENTS!!

**Revised prototype web site (1.1)** to be presented at the BNHCRC Research Advisory Forum (25-26 Oct)

## 1) **Data** that could be displayed;

- a) Information on past fires (occurrence, intensity and burn extent from MODIS)
- b) Fire weather, Grassland curing
- c) Near surface fuel moisture content (Matthews et al. 2006)

## 2) Ideas for **additional data**?

**Automated, Systematic, Near-real time, Nation-wide**

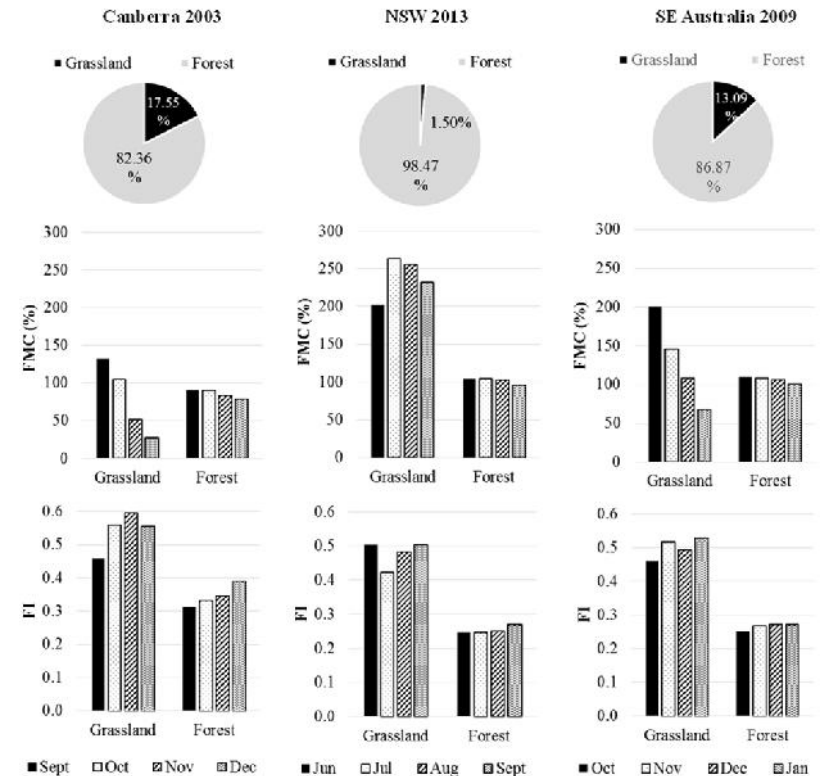
# AFMS WEB SITE: YOUR FEEDBACK IS ESSENTIAL FOR FUTURE DEVELOPMENTS!!

## 2) Additional **web features** that could be added

### a) e.g. Regional summaries?

- States Territories
- Local Government Areas
- Fire Weather Areas
- Defence Training areas
- National Parks
- NRM Regions

## 3) Ideas for **additional features**?



## AFMS WEB SITE: PATHFORWARD

- 1) AFMS understanding and reliability
- 2) AFMS long-term continuity
  - a) Expected lifetime of the Terra and Aqua satellites (MODIS sensor) has already been exceeded
  - b) Evaluate geostationary Japanese Himawari-8 satellite, the European Sentinel-2 and the Landsat and VIIRS satellites.
- 3) Higher spatial/temporal resolution
- 4) Towards a comprehensive characterization of flammability.



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# THANK YOU!! WE ARE LOOKING FORWARD TO YOUR FEEDBACK

## Acknowledgments

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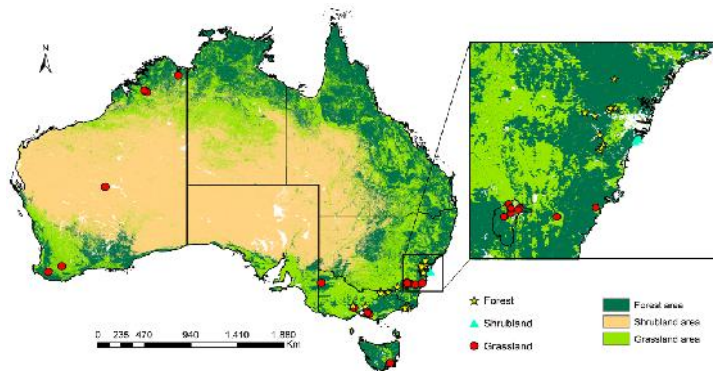
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# VALIDATION WITH FIELD OBSERVATIONS

- at 2 new sites established in the ACT in collaboration with ACT Parks and Conservation Service (grassland (Coppins Crossing) and forest (Namadgi) (2014-2016))
- at 32 sites located in NSW, ACT, VIC, QLD, WA, TAS (2006-2015)



**379 observations**

