bushfire&natural HAZARDSCRC

MAPPING BUSHFIRE HAZARD AND IMPACT

Developing spatial information on fire hazard for planners, land managers and emergency services

Marta Yebra, Albert Van Dijk and Geoff Cary

Fenner School of Environment and Society, ANU College of Medicine, Biology and Environment, ACT.

An Australian Government Initiative

CRC AUSTRALIA

Australian National University

PROJECT END-USERS

1. Simon Heemstra, NSW Rural Fire Service (lead-end-user)
2. John Bally, Bureau of Meteorology
3. Adam Leavesley and Neil Cooper, ACT Parks and Conservation Service
4. Stuart Matthews, NSW Rural Fire Service
5. Robert Preston, Public Safety Business Agency, QLD
6. Andrew Sturgess and Bruno Greimel, QLD Fire and Emergency
7. Andrew Grace, Attorney-General's Dept, ACT
8. Simeon Telfer, Department of Environment, Water and Natural Resources, SA
9. Belinda Kenny, Office of Environment & Heritage, NSW
10. David Taylor, Tasmania Parks and Wildlife Service
11. Frank Crisci and Ali Walsh, SA Power Networks
12. David Hudson and Maggie Tran, Geoscience Australia.

New end-users: Frederick Ford, Department of Defence

PROJECT EXTERNAL COLLABORATORS

- David Riano (UC-Davis, USA)- Visiting research fellow Sept 2016 (funds from the ANUCES and UC-Davis professional development award.
- Emilio Chuvieco (University of Alcala, Spain)
- Alex Held, Arancha Cabello and Michael Schaefer (CSIRO / TERN-AUSCOVER)
- Jim Gould and Tom Jovanovic (CSIRO)
- Philip Zylstra (UOW)
- Samsung Lim (UNSW)
- Darius Culvenor (Sensing Systems)

PROJECT STUDENTS

PhD students:

- **Yang Chen** (University of Monash-APA + BNHCRC top-up). "Mapping forest fuel load and structure from LiDAR". Royal Society of Victoria Young Scientist Research Prize!
- **Andrea Massetti** (University of Monash-APA + BNHCRC Associate student). "Enhancement of fire spread modelling using high-resolution remotely sensed data".
- **Narsimha Garlapati** (ANU-APA+BNHCRC top-up) has decided to end his PhD studies.

Academic study visitors

- **Xingwen Quan** (University of Electronic Science of China) (Oct 2015-2016)

Undergraduate students

- **Lois Padgham** (ANU, ACT Parks). "Measuring live FMC in complex forest stands"
- **Nicola McPherson** (ANU) "Grassland curing and moisture content monitoring with passive microwave remote sensing"

GOAL

- Produce reliable and operationally useful **spatial information on critical aspects of bushfire hazard** (fuel structure, load and flammability)

- Determine the **impact of unplanned and prescribed burning** on fuel accumulation as well as landscape values (habitat, water resources and carbon storage) over time, in support of fire management.

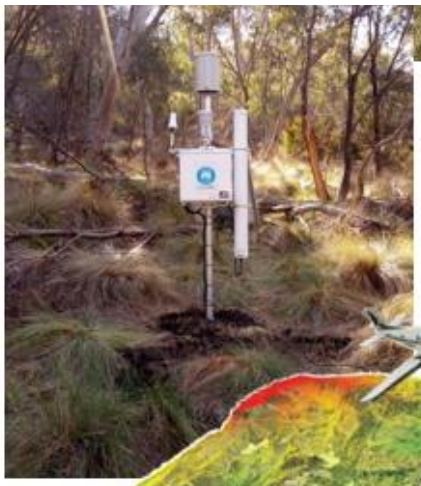
TWO MONITORING APPROACHES

In-Field

Ground LiDAR fuel classification

Curing/FMC sensors

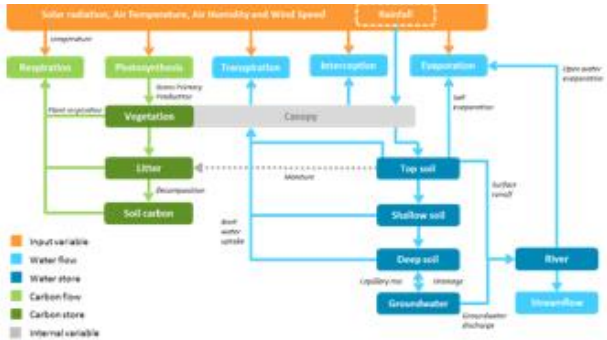
Cosmic ray probe



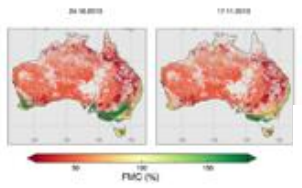
Airborne LiDAR fuel classification

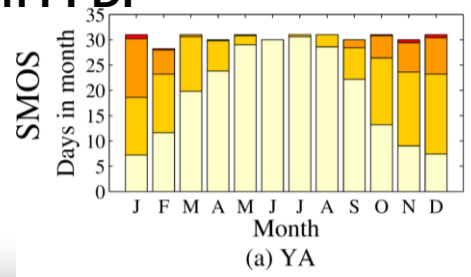
National-Scale

HiFRI model-data fusion



Improved soil moisture in FFDI





AFMS

2002.11.25
Flammability Index

RESEARCH IMPLEMENTATION SURVEY

[*Name of project output*]

Indicate with a tick (✓) if you agree with the following statements;

Indicate with a cross (×) if you disagree with the following statements;

Leave any box blank if you neither agree nor disagree with the following statements.

- □ I understand the general objectives of this research from an operational perspective

Thinking about the type of organisation you work in, do you agree or disagree that the organisation would:

- □ Benefit from using these research findings in the next 5 years
- □ Benefit from using these research findings in 5 to 10 years
- □ currently have the capacity to use these research findings
- □ Use these research findings if they were provided operationally, by a third party

The following issues would need addressing for this research to be useful to my organisation: …

SUMMARY ASSESSMENT OF PROJECT OUTPUTS

METHOD	PRODUCT	COVERAGE	SPATIAL RESOLUTION	COST*	OPPORTUNITIES	READINESS	POTENTIAL IMPACT ON DECISIONS	UTILIZATION POTENTIAL
National-scale	AFMS	national	25-250 m[1]	**Free**	Integration in the new NFDRS	**High**	**High**	**High**
	Improved soil moisture in FFDI	national	5-43 km[2]	**Free**	Integration in the current NFDRS	**High**	**Low**	**High**
	HiFRI	potentially national	25-250 m	**Free**	Integration of several outputs from this project	**Medium**	**High**	**Medium**
In-Field	Ground LiDAR-based fuel classification	plot	<1 m	**High** $23k[3])	Technology will become cheaper	**High**	**High**	**Medium**
	Airborne LiDAR-based fuel classification	as acquired	~1 m	**High** $3.5-8 p/ha[3]	End user experience will increase and technology will become cheaper	**High**	**High**	**Medium**
	Cosmic Ray probe	ca. 3ha	n/a	**High** $17k[3]	Can be combined with fire weather monitoring and technology may become cheaper	**Low**	**High**	**Medium**
	Curing/FMC sensors	site	n/a	**Medium** $5k[3]		**High**	**Low**	**Low**

RESEARCH PLAN FOR 2017-2020
GENERAL AIM

1. Increasing the understanding, reliability and long-term continuity of the **Australian Flammability Monitoring System (AFMS)**, and through this, its acceptance and adoption.

2. Investigating a small number of promising, low-cost **in-field methods to** improve their cost/benefit ratio and utility.

RESEARCH PLAN FOR 2017-2020
SPECIFIC OBJECTIVES

1. To collect field observations of FMC and spectra from a variety of relevant fuel types and **further tune and verify the FMC retrieval method**, and to quantify its uncertainty and reliability in the context of fire risk assessment.

2. To investigate the use of reflectance data from alternative satellite instruments in AFMS to **achieve long-term continuity** as well as improved **temporal and spatial** quality.

3. To integrate other factors such as fire weather, dead FMC and total biomass into AFMS for a **comprehensive characterization of fire hazard conditions**.

RESEARCH PLAN FOR 2017-2020
SPECIFIC OBJECTIVES

4. To further **evaluate alternative low-cost in-field methods** to develop innovative ways to monitor key fuel properties determining fire hazard (e.g. FMC, fuel structure and fuel load)

5. To assess the **real and ongoing cost of providing fuel-related fire hazard information** using and combining some of the previously mentioned observation techniques against the suitability of the data for its intended audience, and its potential common good value.

UTILIZATION PLAN
OBJECTIVE

To provide a pre-operational **near-real time flammability data service** (The Australian Flammability Monitoring System, **AFMS**) to support fire risk management and response activities and, in the long term, the new National Fire Danger Rating System.

http://wenfo.org/aus-env/#/ wenfo.org

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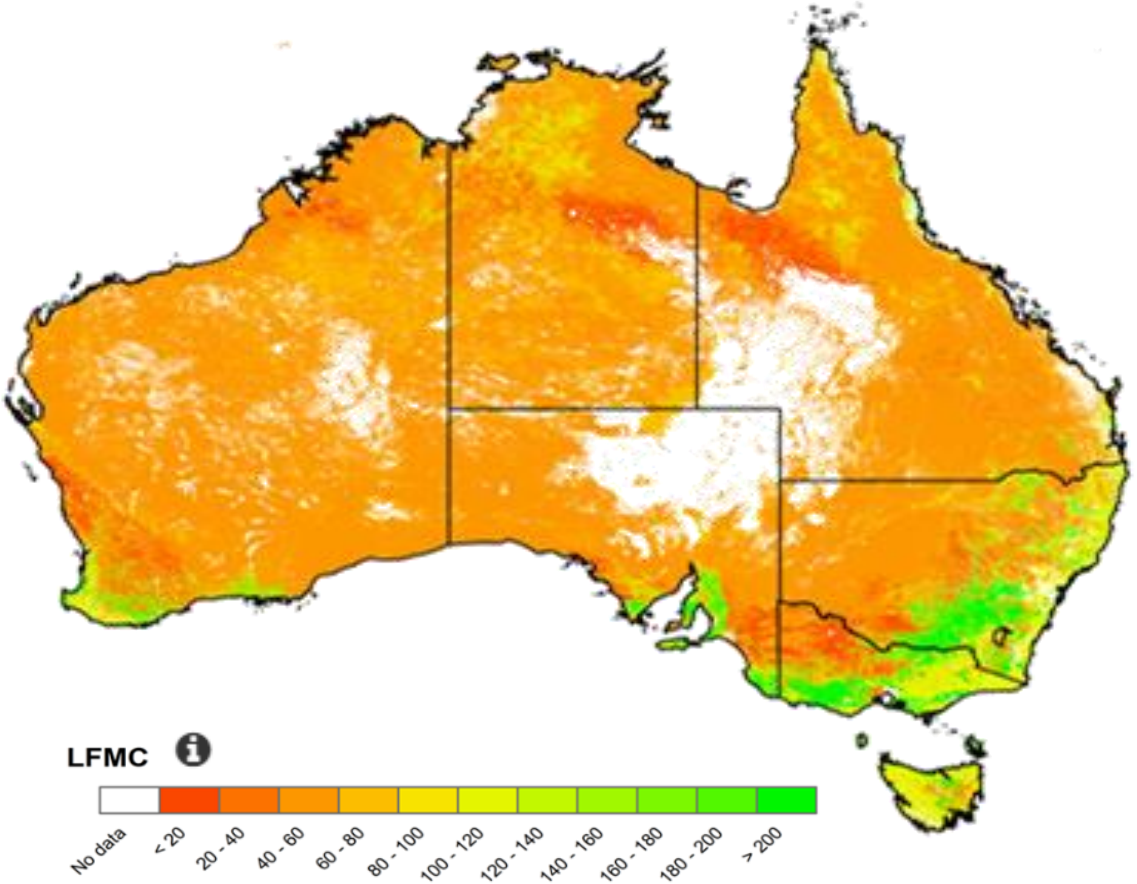
Australian Flammability Monitoring System

08/10/2014 | Longitude | Latitude

States and T | Live FMC | *GO TO*



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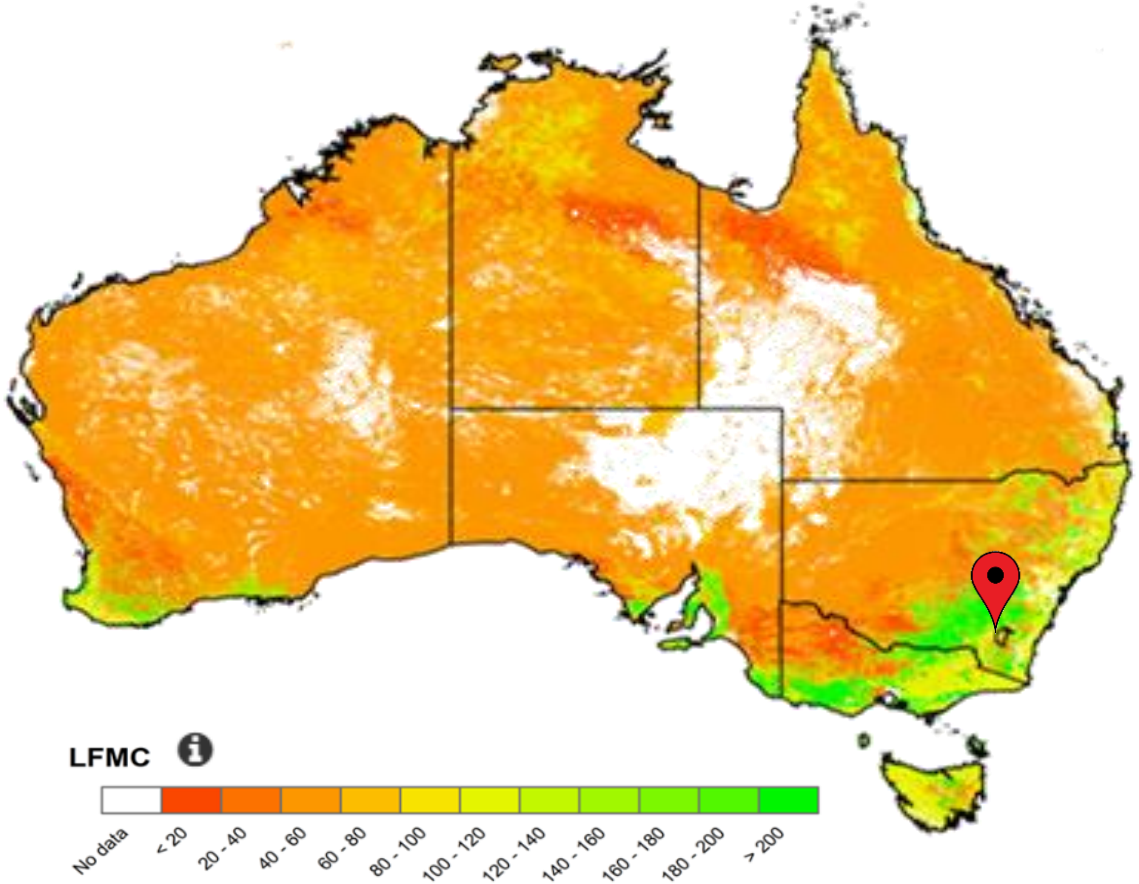
Australian Flammability Monitoring System

08/10/2014 | -35.9139 | 148.950

States and T | Live FMC | GO TO



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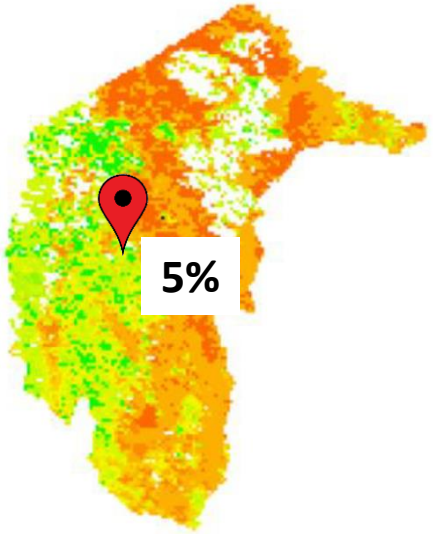
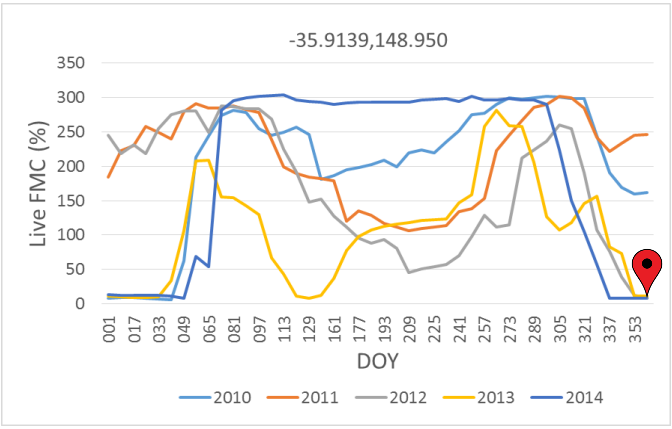


LFMC

No data | < 20 | 20 - 40 | 40 - 60 | 60 - 80 | 80 - 100 | 100 - 120 | 120 - 140 | 140 - 160 | 160 - 180 | 180 - 200 | > 200



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UTILIZATION ACTIVITIES AND TIMELINE

Activity	Timeline
1. End-user engagement	All project life
2. Data processing chain development and testing	Nov-16
3. Develop documentation and interpretation guidelines	Mar-17
4. Demonstration Workshop	Oct-17
5. Trialling by selected agencies	Nov 17 to Mar-18
6. Workshop to evaluate trial utilisation	Jun-18
7. Further improvement based on feedback and research outcomes	Jan-19
8. Transition to agency as pre-operational product	Jul-20

END-USER STATEMENT

Stuart Matthew, NSW Rural Fire Service

BREAKOUT SESSION

Tomorrow after the morning tea break

11:30am-12:30pm

Room 3-Torrace room

Tomorrow after Lunch

1:30-2:30pm

Stanner room

THANK YOU