Fire Prediction Services

— Centre of Excellence —
PRESCRIBED BURNING

emps
Emergency Management Professionalisation Scheme

Greg Esnouf

AFAC

RURAL AND LAND MANAGEMENT GROUP

DOCTRINE

Approved
- Managing Trees Hazards
- Bushfire Operations and Windfarms

In development
- Aerial Ignition Operations

Under review
- Management of Remotely Piloted Aircraft at Emergencies and Prescribed Burns
- Class A Recycled Water for Firefighting

Joint meetings with Forest Fire Management Group planned

Research directions being discussed

PREDICTIVE SERVICES GROUP

- Established by AFAC in 2015, with an initial focus on bushfire.
- Undertaking high level scoping of investment in systems, research and capability
- Key end user group for fire & land management agencies with BNHCRC, BoM Hazard Services Forum, NFDRS, Fire Prediction Services
- Currently considering how to best support predictive services capability development in other hazard areas

Predictive Services Group

We are the **strategic advisory group** to the AFAC Council on **Predictive Services.**
We are **nationally focused** and **advocate** the **future direction** of Predictive Services through collaboration and coordination.
Our initial **focus** will be on **bushfire.**

Vision: Taking the surprise out of bushfires for safer communities

Strategic outcomes 2018– 2021

- Enhance capability and enable timely and informed decisions based on predictive services.
- Provide confidence through scientifically rigorous, reliable and specific predictive services.
- Develop predictive services through a well communicated, adaptive, innovative and collaborative approach.
- Facilitate national interoperability and consistency in predictive services.

Strategic drivers and priority actions

1. Improving interoperability and sharing resources
1. Agree minimum training and accreditation standards
2. Establish operational protocols
3. Establish resource sharing arrangements

2. Leading innovation in science and technology
1. Identify/evaluate supporting systems & products
2. Improve Seasonal Outlook process
3. Develop R&D priorities
4. Development of new/improved decision support tools
5. Support research & implementation

3. Enhance predictive services capability in sector
1. Develop systems, products/info for both tactical and strategic decision making
2. Develop training for predictive services practitioners and end users
3. Establish collaboration network for practitioners

4. Enhance community understanding of risk and mitigation strategies
1. Develop stakeholder engagement plan
2. Develop comms plan
3. Strengthen collaboration with community stakeholders
4. Identify key community needs

5. Develop national best practice principles and standards
1. Standards for systems, processes and data
2. Develop evaluation frameworks
3. Develop a transition to operations process

6. Harnessing projects and funding at a national level
1. Identify new strategic partners and funding sources.
2. Develop investment strategy
3. Support NFDRS
4. Support BoM Hazard Services Forum
5. Support Prescribed Burning Centre of Excellence
6. Support BNHCRC
7. Support Warnings Group

Version 2
October 2018

Smoke and Air Quality Forecasting (AQFX)

- Developed by BoM, CSIRO, DELWP and several universities
- Designed to help planned burn managers make decisions to manage smoke exposure and to issue targeted health warnings when needed.
- Currently operational in Victoria and is soon to be operational in NSW.
- Endorsed at AFAC Council in April 2018
- Proposed phased rollout over next three years.
- Finalising funding arrangements with jurisdictions

PREDICTIVE SERVICES GROUP

Research systems: current projects

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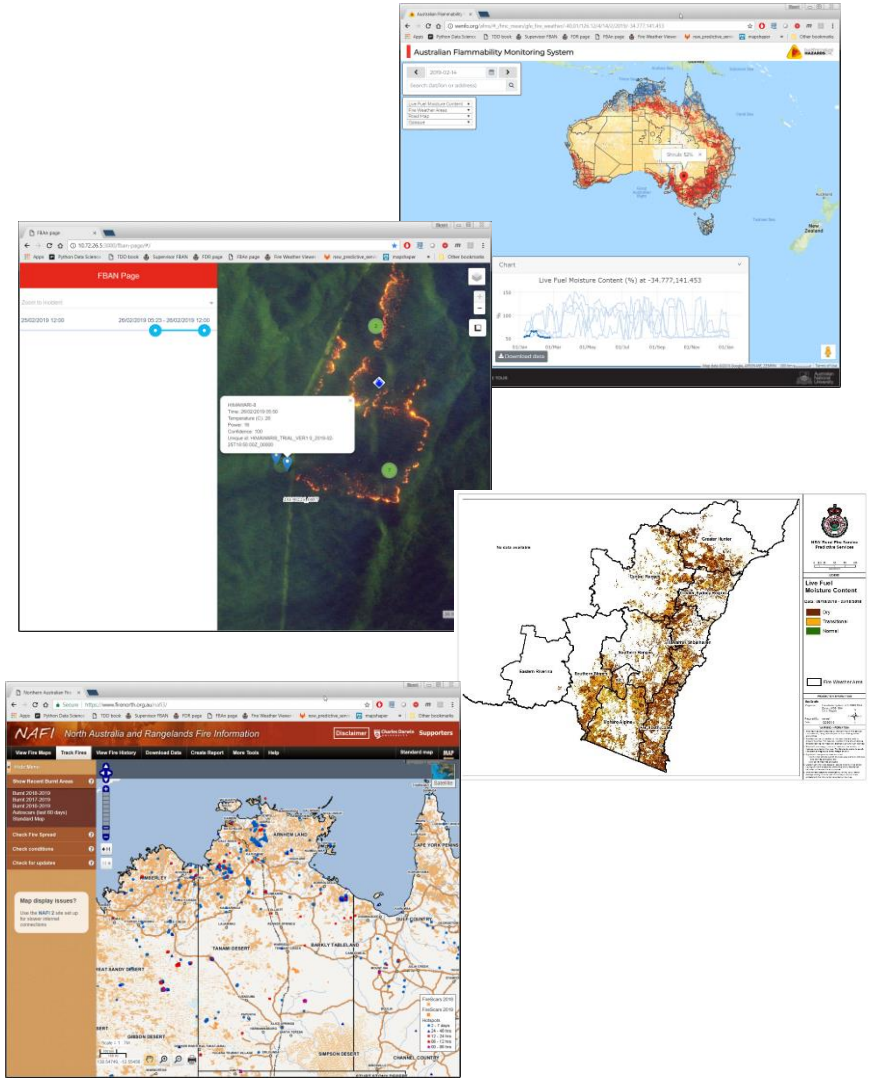
Project	University	Contact
Fuel Moisture	ANU	Marta Yebra
JASMIN	Bom	Vinod Kumar
PyroCb Firepower Threshold (PFT)	BOM	Jeff Kepert
Himawari fire detection	RMIT	Karen Reinke
Crown Fire Potential	UOM	Trent Penman
Wind Reduction Factor	VICU	Khalid Moinuddin
VLS	UNSW	Jason Sharples
Fire Severity	RFS	Warwick Hehir
NAFI	Darwin University	Andrew Edwards
PB Atlas	UOW	Hamish Clarke
PB Windows and Optimisation	UOW	Hamish Clarke
Canopy Moisture	UOW and UWS	Rachael Nolan



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Canopy Moisture	UOW and UWS	Rachael Nolan

- Many websites developed or under development
- Hosted on a variety of platforms
- Becoming increasingly important for operational decision making
- Need operational reliability 24/7
- Current funding platforms may not continue for ever

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FBAN network

Webinars

- Effect of grass fuel load
- Mallee –heath fire behaviour model
- Predicting fire behaviour in spinifex fuels
- Australian Flammability Monitoring System
- Development of a pyrocumulonimbus prediction tool
- Bushfire prediction with SPARK
- AQFX smoke and air quality forecasting system

Go to You Tube - search for AFAC Predictive Services

Fire Behaviour Analysts

- Developing interstate deployment standards and process in conjunction with National Resource Sharing Centre

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CLIMATE CHANGE GROUP

- Established in April 2018

- Developed a revised national position on climate change, and nationally consistent talking points to support AFAC members when discussing issues post incident related to climate change.

- Developed 6 priorities for 2019-2021:

    1. **Research and development** –a research and implementation gap analysis

    2. **Championing adaptation and integration of climate change into sector governance planning and policy** – includes a knowledge base of case studies and good practice, templates and decision support tools.

    3. **Effective communication, stakeholder engagement and influence** –develop a communications and stakeholder engagement plan and key information and communication products

4. **Workforce** – Links to impacts on health and wellbeing, volunteering models, staffing.

5. **Resourcing** –resource implication of climate change for emergency services, and incentivising transition to renewables and ethical procurement decision making processes.

6. **Integration into the AFAC Collaboration model** – embed into AFAC core business

Planning an expert panel at AFAC19 to discuss the risks, opportunities and potential for the EM sector to influence positive action on climate change. The panel will highlight the increasing impacts of climate change on human health

Fire Prediction Services

- Established to manage and develop fire spread prediction capability
- Licence Phoenix to jurisdictions
- Released version 4.1 with improvements
- Provide user support
- Considering further enhancements to Phoenix (short – medium term), including cloud based operation
- Preparing longer term business development strategy
- Engaging with CSIRO re SPARK, including operational audit

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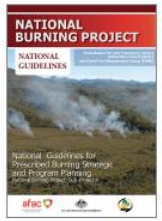
PRESCRIBED BURNING

A HOLISTIC AND CONSISTENT APPROACH TO PRESCRIBED BURNING

BEST PRACTICE GUIDELINES



Strategic

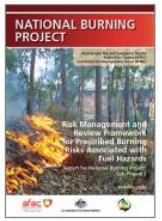
Operations

The frameworks and principles identified in these documents will be valuable to practitioners, planners and land managers with an interest in planning or undertaking prescribed burning in the best possible way.

RISK FRAMEWORKS

Operations and safety

Smoke and GHG

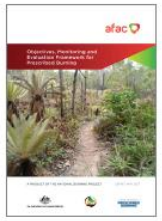


Fuel hazard

Ecological

These reports build and present frameworks that can be adopted by practitioners and agencies to facilitate improved approaches and greater appreciation of risks associated with undertaking prescribed burning.

MEASURING PERFORMANCE



Objectives & monitoring

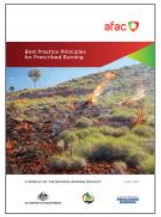
Performance measures

A framework and set of performance measures for evaluating prescribed burning against desired objectives.

BEST PRACTICE SYNOPSES

Process map

Step-by-step best practice guide for prescribed burning, from strategic planning through to burning implementation.



Best practice principles

Best practice principles for prescribed burning summarised into a ready-to-use synopsis for the benefit of prescribed burning professionals.

RISK MANAGEMENT SYNOPSIS

The risk management framework for prescribed burning summarised into a ready-to-use synopsis for the benefit of prescribed burning professionals.

PROGRAM LOGIC

Diagrammatic summary of the rationale behind prescribed burning.

OVERVIEW

This report is a very useful introduction and overview of prescribed burning in Australasia and the evidence base that underpins the use of planned fire.

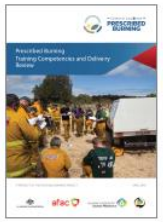
BEST PRACTICE REVIEW

This report provides a detailed account of the prescribed burning practices that are considered to be examples of best practice.

SCIENCE REVIEW

Reviewing science, practical and Traditional Owner knowledge around the use of prescribed burning as a land management tool.

CAPABILITY REVIEWS



Training

Resources

A review of prescribed burn training and resource capability to aid in improving training and resource sharing outcomes.

NATIONAL POSITION

The National Position articulates a nationally agreed position on prescribed burning and establishes principles for the development and implementation of prescribed burning policies and programs.

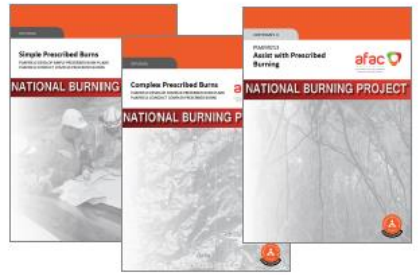
AN APPROACH TO OBJECTIVES SETTING

A tool for clearer identification of costs and benefits when analysing competing objectives in planning for prescribed burning.

TRAINING MANUALS

These learner resources provide instruction and theory that can be used by students or by instructors for lesson planning.

- Assist with prescribed burning
- Simple prescribed burns
- Complex prescribed burns



TOOLBOX

The National Tool Box is a repository of existing decision support tools that can aid in prescribed burning.

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PRESCRIBED BURNING

Centre of Excellence for Prescribed Burning

Prescribed burning encompasses a spectrum of activities, from risk management to community engagement. This collection assists practitioners to access current best practice and research for informed planning and implementation of prescribed burning.

The Centre of Excellence for Prescribed Burning communicates guiding frameworks and principles developed under the National Burning Project, to promote a holistic and consistent approach to prescribed burning practices, and supports the implementation of those practices by agencies.

The Centre also facilitates ongoing engagement across the industry, building agency capability to deliver prescribed burning informed by research and good practice. Get involved

Upcoming

Webinar - The return of Cultural Burning - 24th April - Details to come

Fire and Fuels Conference- Research Workshop - 29th April

KNOWLEDGE HUB

National prescribed burning guidelines and frameworks

Frameworks, guidelines and principles for prescribed burn planning, produced by the National Burning Project

Traditional Owners and cultural burning

Resources regarding involvement of Traditional Owners and cultural burning in prescribed burning programs

Prescribed burning tools

Useful tools for agencies undertaking strategic and operational prescribed burning planning

CONTENT CAN BE UPLOADED THROUGH THE KNOWLEDGE HUB OR EMAILED TO DEB SPARKES

— Centre of Excellence — PRESCRIBED BURNING

PRESENTERS WANTED

CONTACT DEB SPARKES

Centre of Excellence for Prescribed Burning

22 subscribers

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Uploads PLAY ALL

Conflicting evidence of the efficacy of prescribed...

501 views • 1 month ago

AFAC18 Prescribed Burning Panel Session

92 views • 2 months ago

Windows for prescribed burning under climate...

44 views • 4 months ago

Objectives Analysis Cost:Benefit Tool

22 views • 8 months ago

Quality Assurance in prescribed burn programs

36 views • 9 months ago

PRACTITIONER NETWORK WEBINARS


SPINIFEX CLINIC PLANNED FOR JULY
ALICE SPRINGS
REGISTER YOUR INTEREST WITH DEB SPARKES
https://www.flickr.com/photos/christangey/29280710338

CLINICS

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PRESCRIBED BURNING

deb.sparkes@afac.com.au

CONNECT WITH US

KNOWLEDGE HUB

https://knowledge.aidr.org.au/prescribed-burning

WEBINARS

YouTube – Centre of Excellence for Prescribed Burning

@prescribedburning

https://www.facebook.com/groups/549994425355507/

EMERGENCY MANAGEMENT PROFESSIONALISATION SCHEME

www.emps.org.au

CERTIFIED ROLES CURRENTLY AVAILABLE

- Incident Controller
- Planning Officer
- Operations Officer
- Public Information Officer
- Logistics Officer
- Fire Behaviour Analyst
- Burn Controller
- Fire Investigator

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EMERGENCY MANAGEMENT PROFESSIONALISATION SCHEME

REGISTERED ROLES CURRENTLY AVAILABLE

Incident Management Team
Registered Level 2 Incident Controller
Registered Planning Officer
Registered Intelligence Officer
Registered Public Information Officer
Registered Level 2 Operations Officer
Registered Logistics Officer
Registered Finance Officer

Prescribed Burning roles
Registered Complex Burn Planner
Registered Complex Burn Operations Officer

Other roles
Registered Divisional Commander
Registered Fire Investigator
Registered Fire Behaviour Analyst
Registered Arduous Bushfire Firefighter

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EMERGENCY MANAGEMENT PROFESSIONALISATION SCHEME

EMPS now free at the point of application for personnel of AFAC member agencies

EMPS will work with agencies and individuals to facilitate the process as much as possible.

For registration, agencies can make block applications for all their qualified personnel

CCOSC has indicated that for overseas deployment, a relevant EMPS credential (if one exists) will be required from 2020 onwards

Current activity:

- finalising a credential for our strategic commanders working at regional/state level
- planned credentials for aviation support roles,

EMPS strategic vision over the next five years includes:

- Common practice standards for fire management across Australasian fire, land and emergency services
- Extending the scope beyond AFAC member agencies to emergency managers in other organisations and areas (e.g. recovery)
- Looking more closely at what 'professionalism' means for our sector in terms of how others (government, the community) see us and the development pathways (e.g. higher education) that we use

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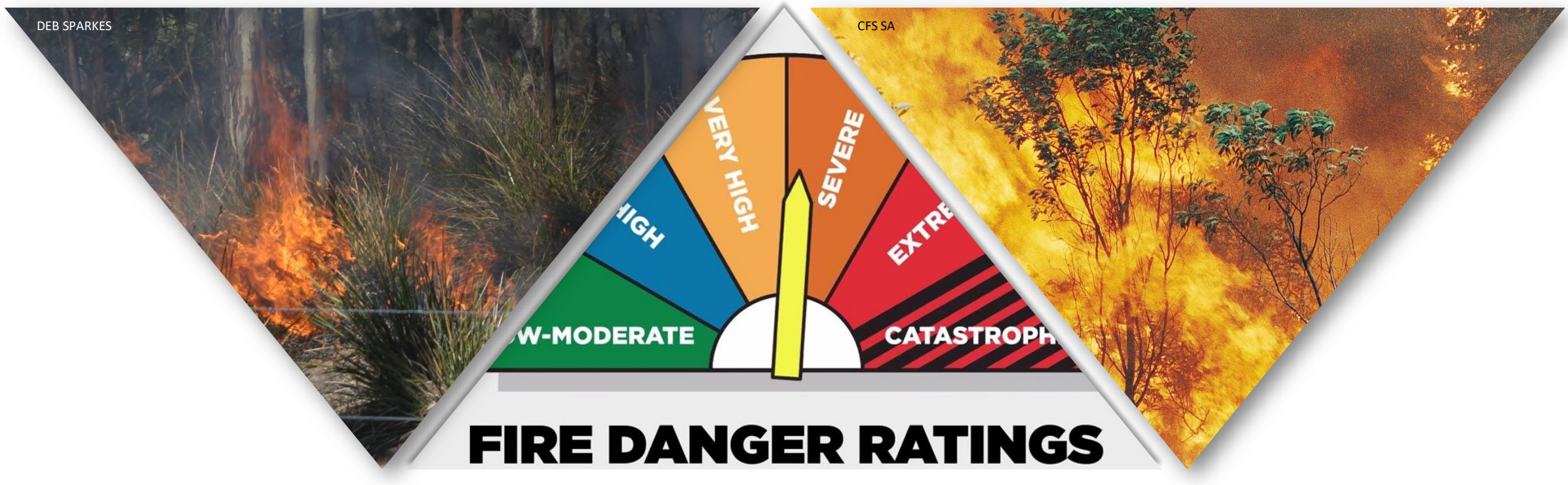
Questions?

greg.esnouf@afac.com.au

National Fire Danger Rating System



Understanding Fire and Risk for Better Community Safety

Greg Esnouf AFAC & John Runcie NSW RFS

NFDRS Key components

FACTORS	COMPUTATION	INDICES	DECISION-MAKING
Fire Weather	Spatially and temporally based systems that use scientifically supported formulae and processes to calculate indicators	Fire Behaviour Index	Community warnings (determined ratings)
Fuel Condition		Ignition Likelihood Index	Total Fire Ban and other restrictions
Fire Behaviour		Fire Suppression Index	Targeted community warnings
Ignition Likelihood		Fire Impact Index	Community, Government and ESO readiness
Fire Suppression			Strategic Risk Mitigation
Fire Impact			

Fire Behaviour Index | Other Indices | FDR Improved Decisions

Adapted from Program Management Plan 2015

2014-15

2017-18

2018-19

PHASE 1

PHASE 2

Fire Behavior Index

Research Prototype

Calibration Refinement Publication

Other Indices

Scope other Indices

Improved Decisions

Social Research

PMO

Manage NFDRS Program.

Phase 2 Research Prototype

- FDR currently not measurable
- Research Prototype addresses:
  - *Fire Management* - x 4
  - *Categories* - x 6
  - *Vegetation Types* - x 8

Vegetation Types

Fuel Type	Live trial	Case studies	Total
Forest	141	47	188
Grassland	63	14	77
Woodland/ Savanna	18	0	18
Mallee-heath	15	0	15
Shrubland	14	4	14
Spinifex	9	0	9
Buttongrass	0	6	6
Pine	5	0	5

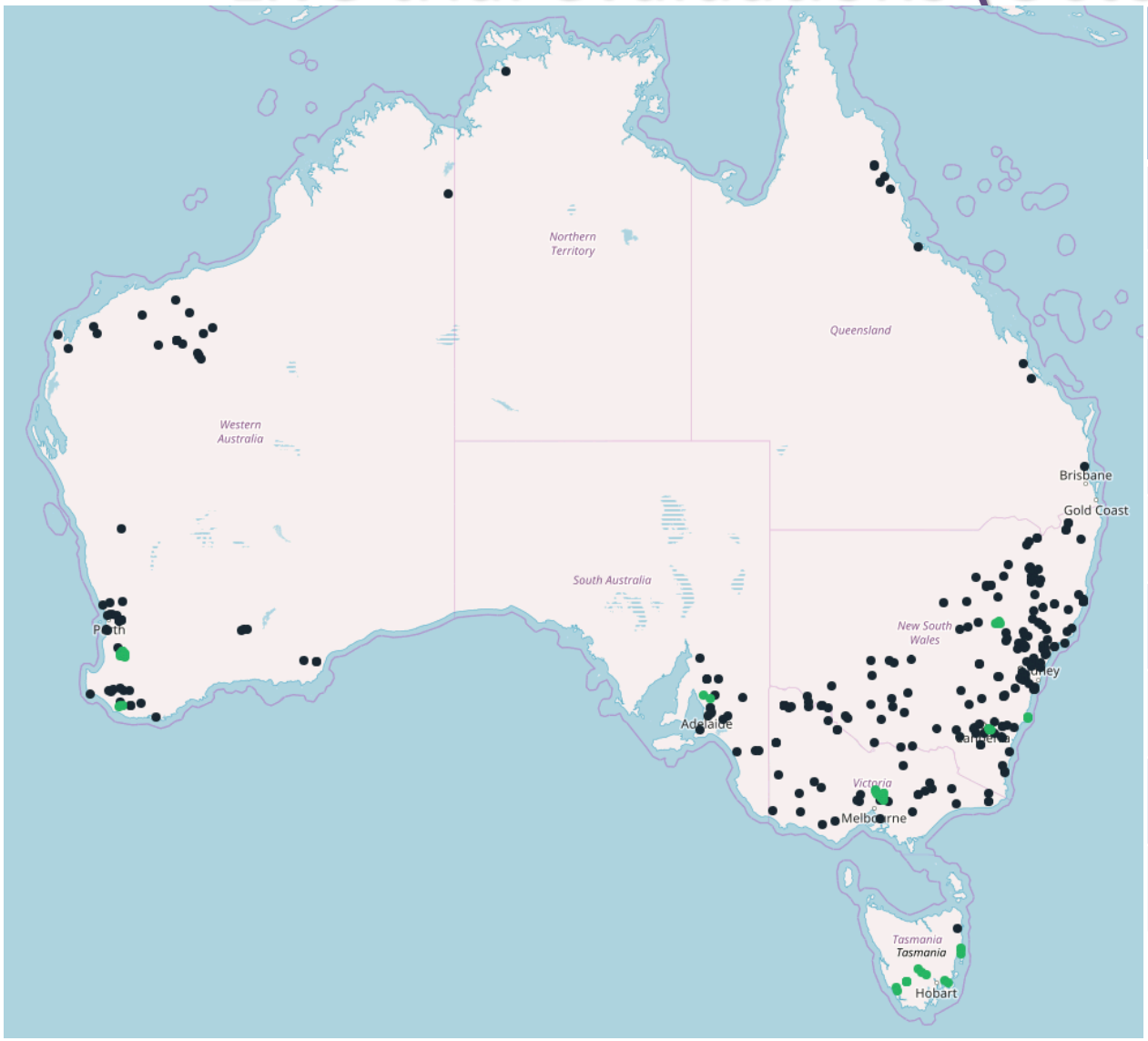
Categories

1. Mostly self-extinguishing, trouble-free fires
2. Typical prescribed burning conditions, fires generally easy to suppress.
3. Most wildfires in this category. Fires typically suppressed with direct, parallel or indirect attack.
4. Initial attack success critical to prevent large fire development. Defensive suppression strategies.
5. Defensive suppression strategies. High levels of threat to life/property. Safety of fire fighters and community paramount.
6. Unsafe for fire fighters and community. Without initial attack success, likelihood of very large fire development is very high. High probability of loss of life and property.

Fire Management

Fire Management
Fire behaviour
Prescribed burning
Suppression
Consequences

Live trial evaluations (October 2018 – March 2019)



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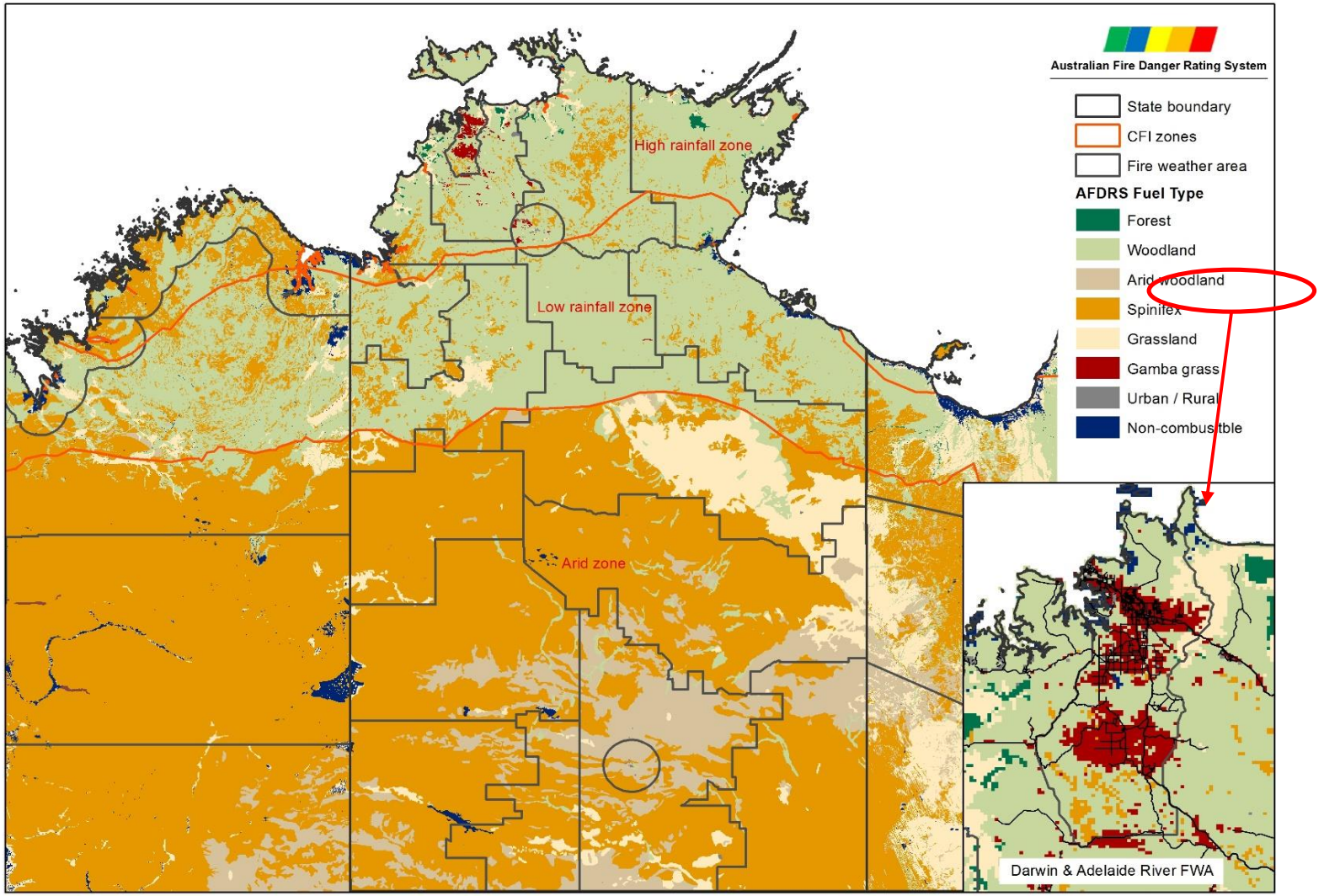
Pine	5	0	5

Spinifex zones

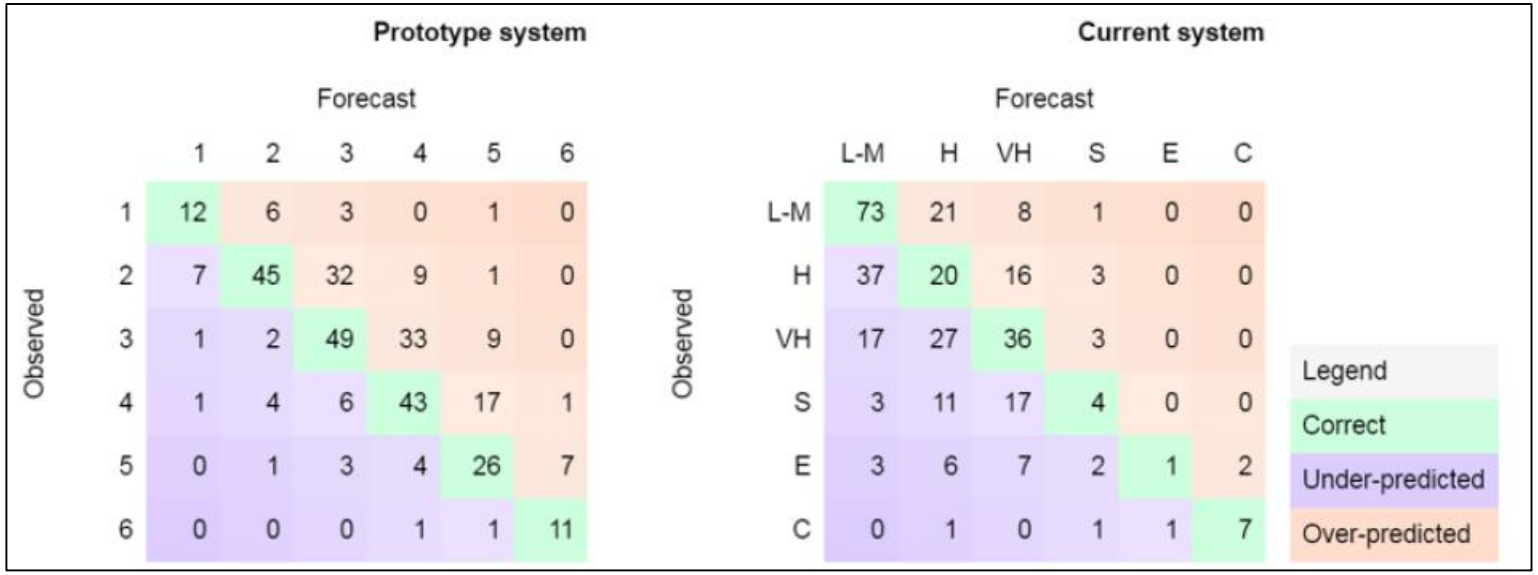
- Currently use arid zone model
- Separate out according to CFI zones (high, low, arid) to better represent faster growing spinifex

Gamba grass

- 1.5 km grid
- overrides underlying fuel type
- over 6 t/ha



Results (all fuel types)



	NFDRS Prototype	Current system	Comment
Fraction over-predicted	0.35	0.16	0 to 1. Lower is better
Fraction correct	0.55	0.43	0 to 1. Higher is better
Fraction under-predicted	0.09	0.41	0 to 1. Lower is better
Peirce skill score	0.44	0.22	-1 to 1. Higher is better
Gerrity skill score	0.65	0.42	-1 to 1. Higher is better

Predictions

- Current system over-represents low intensity fires
- Prototype better represents wider range of fire categories
- Prototype:
  - more correct predictions
  - higher skill

Phase 2 Social Research
Three Stages

Stage 1

National Benchmark Survey

Conducted from 14 to 27 September 2018

Stage 2

Qualitative Research

Conducted from 1 October to 22 November 2018.

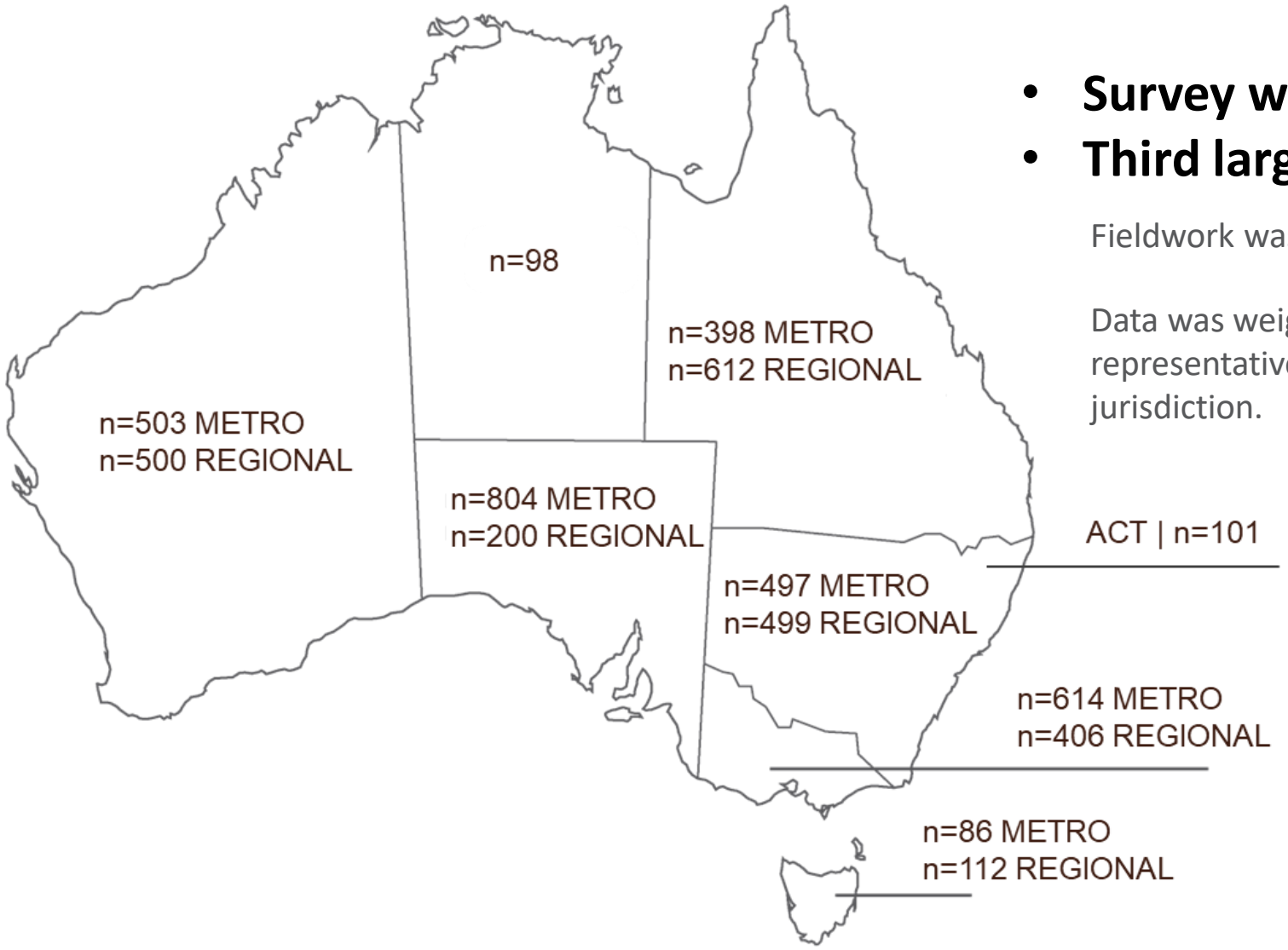
Stage 3

Quantification of Optimised Models

Planned for April 2019

National Fire Danger Rating System

Stage 1 Quantitative Samplings per Jurisdiction



- **Survey was conducted with 5,430 individuals**
- **Third largest survey ever undertaken**

Fieldwork was between 14 and 27 September 2018

Data was weighted by age and gender to ensure representativeness at a national level, and within each jurisdiction.

National Fire Danger Rating System

Fire Danger Ratings - Key Insights

Though prompted recognition of Fire Danger Rating signage is high, people show limited understanding of its purpose and desired actions.

Less than four in ten currently use the system to plan days in summer, and only a third have taken action due to the Fire Danger Rating in the past.

Prompted awareness	93%
Incorrect understanding of purpose	61%
Feel the National Fire Danger Rating System is **relevant**	61%
Currently **use** the National Fire Danger Rating System	37%
Have taken **action** in past due to the Fire Danger Rating	34%

National Fire Danger Rating System

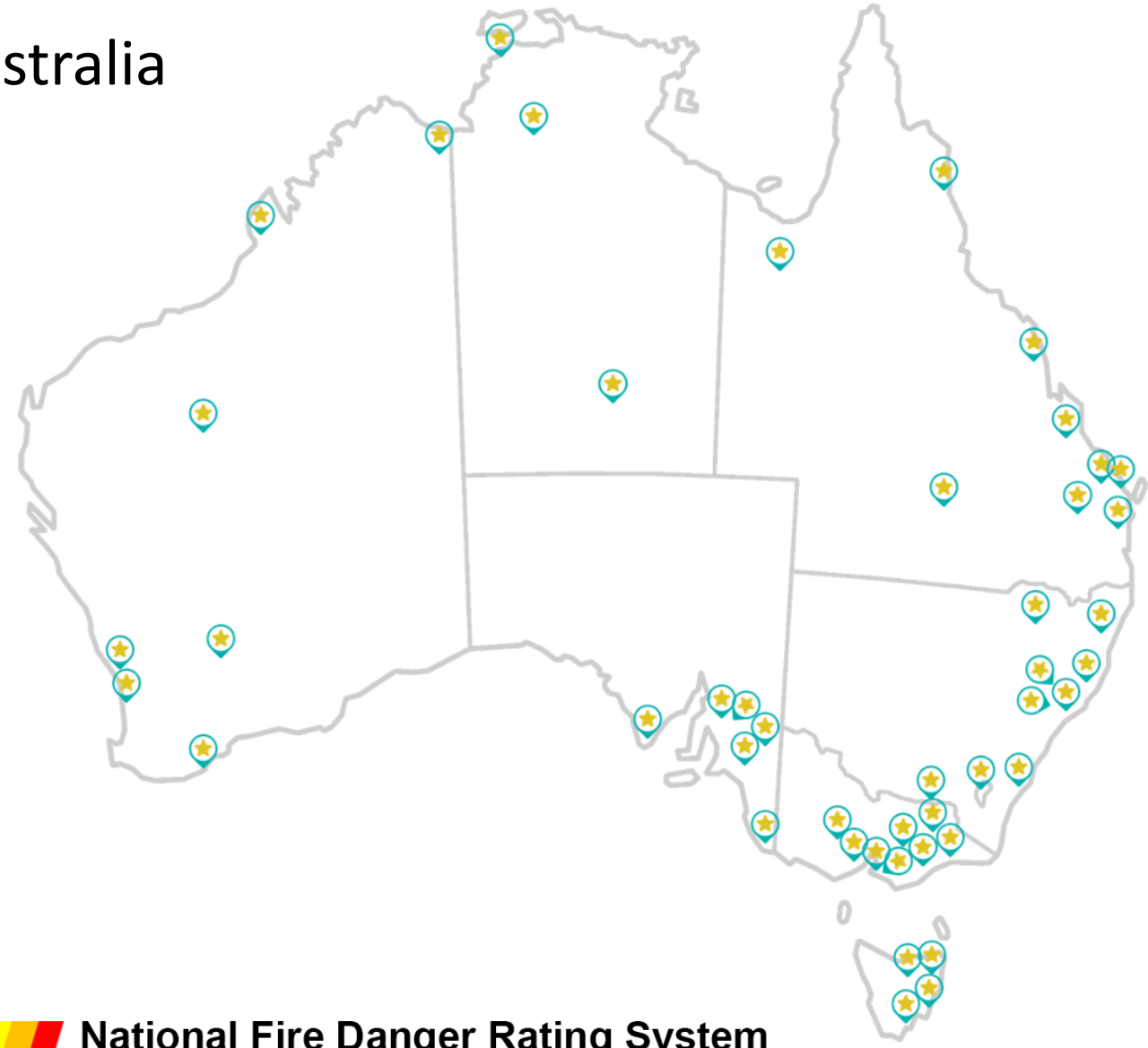
Key insights

- “Total Fire Ban” is well known and higher in regional locations
- When prompted, few would take action below a severe rating
- Fire Danger Rating signage is recognised as relevant by the majority, but few are using it
- The majority have never taken action due to the Fire Danger Rating before

Stage 2 Qualitative research

conducted in 48 locations across Australia

- Focus groups and workshops were conducted with communities throughout Australia in October and November 2018.
- Locations were determined in collaboration with the project steering group:
- **Medium-High Risk areas, where minor or major incidents have occurred in the past five years**
- **Medium-High Risk areas, where no incidents have occurred in the past five years**
- **Low-Risk areas**



See appendix 2 on page 115 for further breakdown of groups

National Fire Danger Rating System

Themes – Fire Danger Ratings

- Six tiers is seen as too many
- Action words associated with each level
- Will need to work through many mediums – signage, audio, visual and spatial
- High level of Total Fire Ban understanding
- Physical shape of meter (current or new)

Challenges to Address

- System must be simple and easy to understand and use
- Individuals need to have a greater awareness of their personal risk
- Current mistrust in forecasts and warning systems
- Must consider minority users (tourists and non-English speakers)
- Warnings and forecasts have to be absorbed by individuals in a complex environment with competing messaging

2014-15

PHASE 1

2017-18

2018-19

PHASE 2

2019-20

2020-21

2021-22

PHASE 3

Fire Behavior Index

Research Prototype

Calibration Refinement Publication

System Build

Transition to Operational

Other Indices

Scope other Indices

National datasets

Build/run prototype

Evaluation Calibration

Improved Decisions

Social Research

Design FDR Framework

Change Management
Legislation, Training, Engagement, Signage, Decision Processes

PMO

Manage NFDRS Program. Transition to future governance.

Phase 3 Operational Build

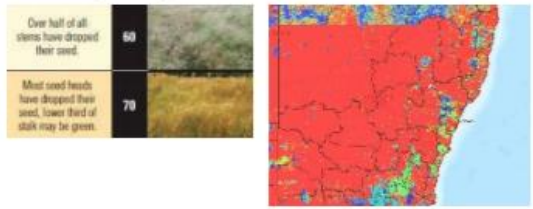
- Four systems
- Business requirements being finalised soon
- Tender and build over next two years

System overview - daily

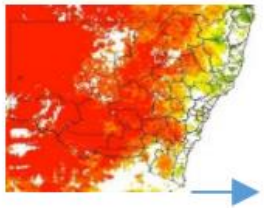
1. Fuel state editor

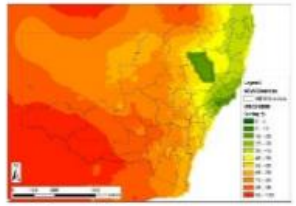
Fire agencies

Agency data
Fire history, fuel types, fuel models, fuel state observations



Agency editing





NFDRS, host TBD

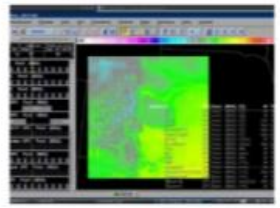
Fuel state editor

Current state of the world (v2):
Model output (e.g. DF)
Remote sensing (e.g. curing)

Bureau of Meteorology

Current state of the world (v1):
Model output (e.g. DF)
Remote sensing (e.g. curing)

Weather forecast (forecaster edits)



NFDRS calculations
(forecaster edits with agency input)

NFDRS products

netCDF

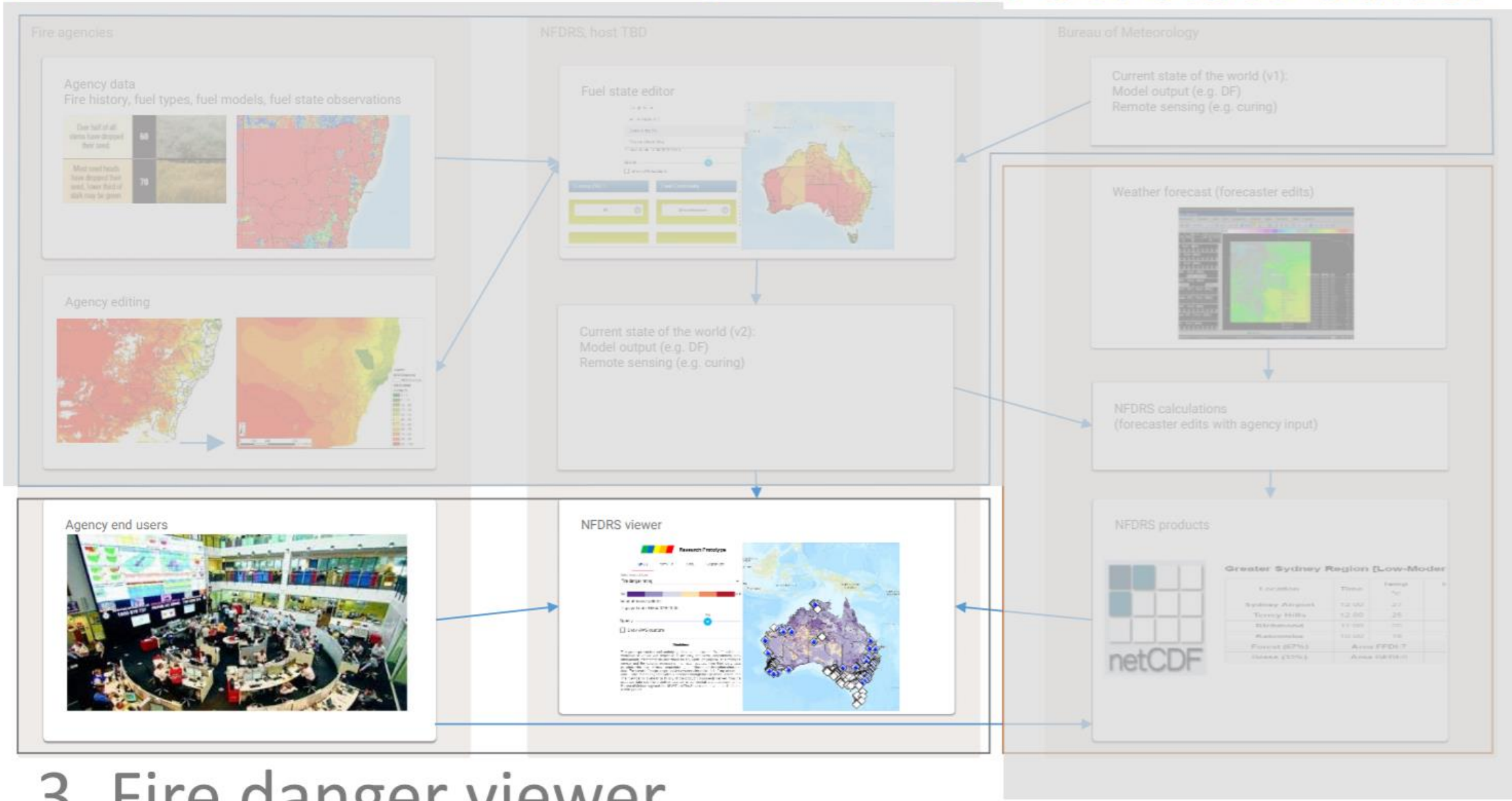
Greater Sydney Region [Low-Moder

Location	Time	Temp °C	
Sydney Airport	12:00	27	
Terrey Hills	12:00	25	
Richmond	11:00	20	
Katoomba	10:00	18	
Forest (67%)	Area FFDI:7		
Grass (33%)	Area GFDI:0		

2. Fire danger editor

System overview - daily

1. Fuel state editor

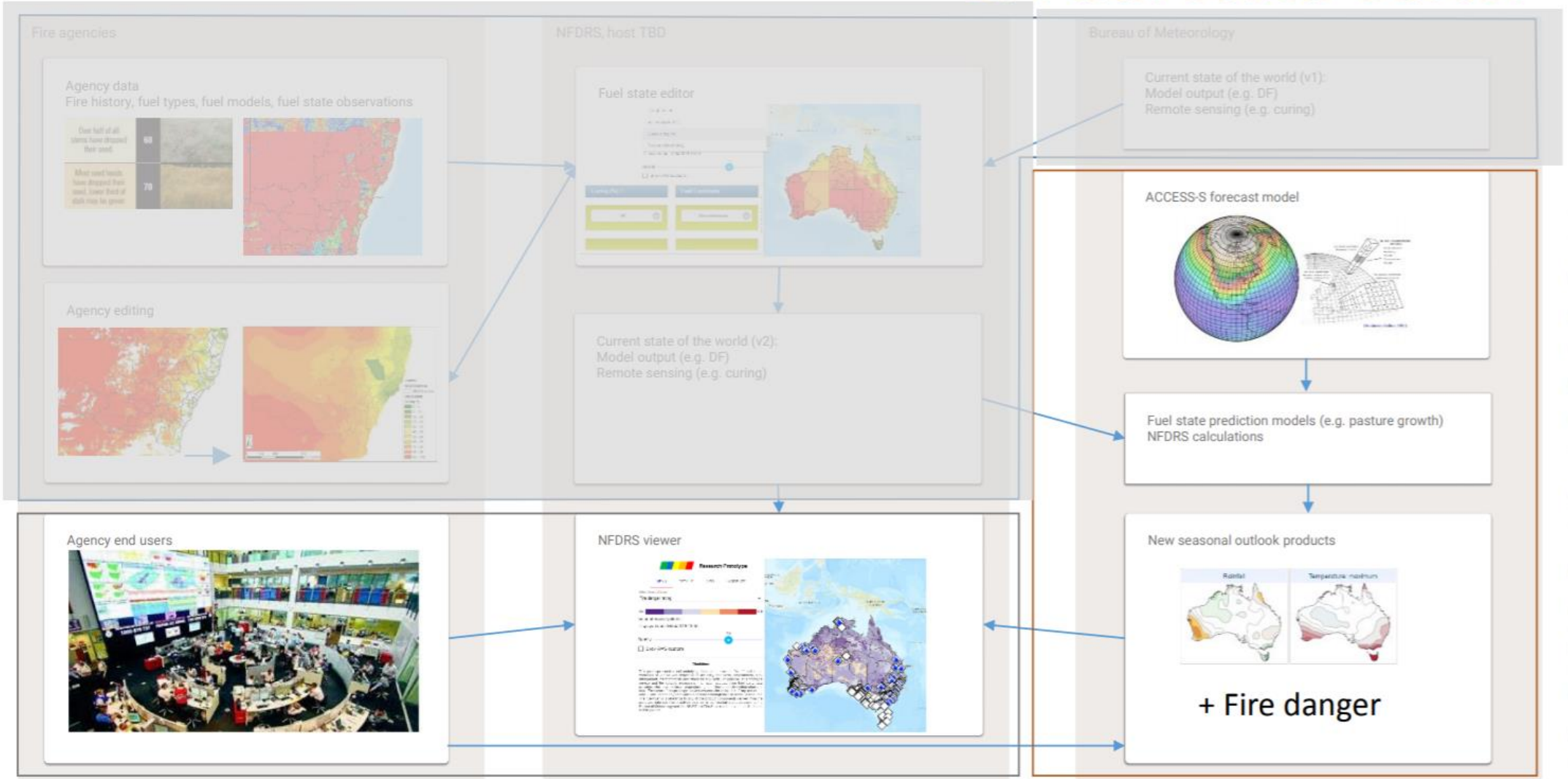


2. Fire danger editor

3. Fire danger viewer

System overview - seasonal

1. Fuel state editor



4. Seasonal outlook

3. Fire danger viewer

Phase 3: Other Indices Research prototype

ABC News

- *Ignition index*:
  - natural and human ignitions
  - ease and probability of ignition
- *Suppression index*:
  - resources capacity
  - probability of success or failure
- *Impact index*:
  - loss of life, property
  - impact on built and natural environment
  - economic and social impact

Pooncarie, NSW -33.796, 142.450

Few models available

Phase 3 – Improved decision making framework

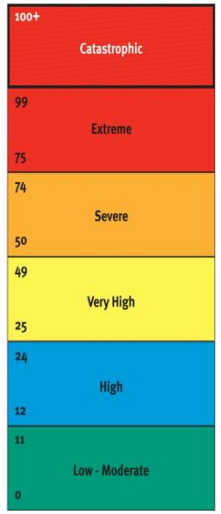
Opportunities

– Reconsider how we describe and communicate “fire danger”
– What do ratings mean, how are they used?
– How do we calculate the rating?
– What counts as correct for the decisions you make?
– Area ratings or a different approach?
– How do you deal with spatial variations within an area?
– How do you deal with temporal variations?

Current Decision Making

Fire behaviour index
- McArthur Forest & Grass
- "0-100"

Rating



Decision Making

- Agency readiness
- Management activities e.g. burning
- Regulation of activities
- Communicating fire danger to the public

Improved Decision Making Phase 3

Fire behaviour index
- 8 fire behaviour models
- New rating framework under development

Social research

New Rating Framework

Improved Decision Making

Agency readiness

Regulating use of fire e.g. TFB

Regulating other activities e.g harvesting, school closures

Communicating fire danger to the public

Some challenges
Area ratings or a different approach?

- Currently describe fire danger by fire weather area
- These were calculated from point forecasts ‘representative’ of broader areas using daily maximum FFDI or GFDI
- Introduction of GFE from 2009 onward required calculation from grids
- ‘10% rule’ adopted from coastal wind warning. Linear→ Area

Some challenges
Area ratings or a different approach?

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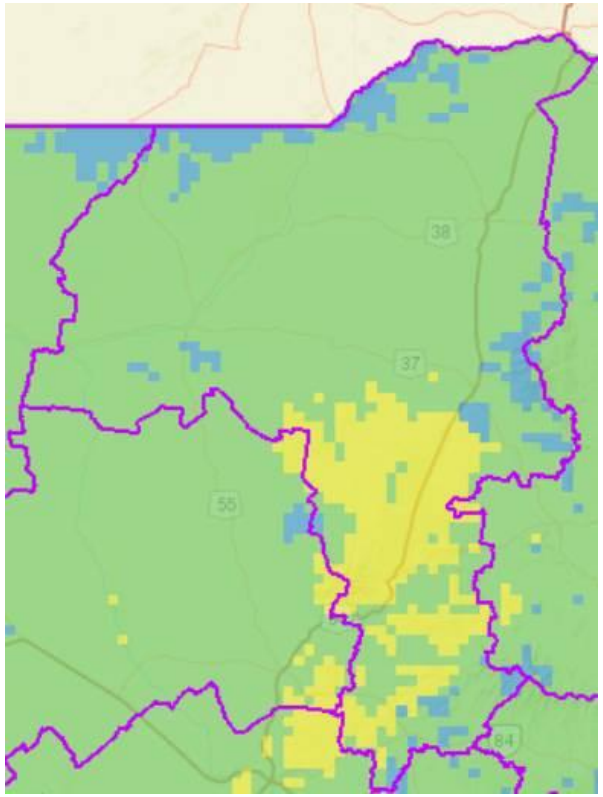
- These were calculated from point forecasts ‘representative’ of broader areas using daily maximum FFDI or GFDI
- Introduction of GFE from 2009 onward required calculation from grids
- ‘10% rule’ adopted from coastal wind warning. Linear→ Area
- Why use such a broad area?

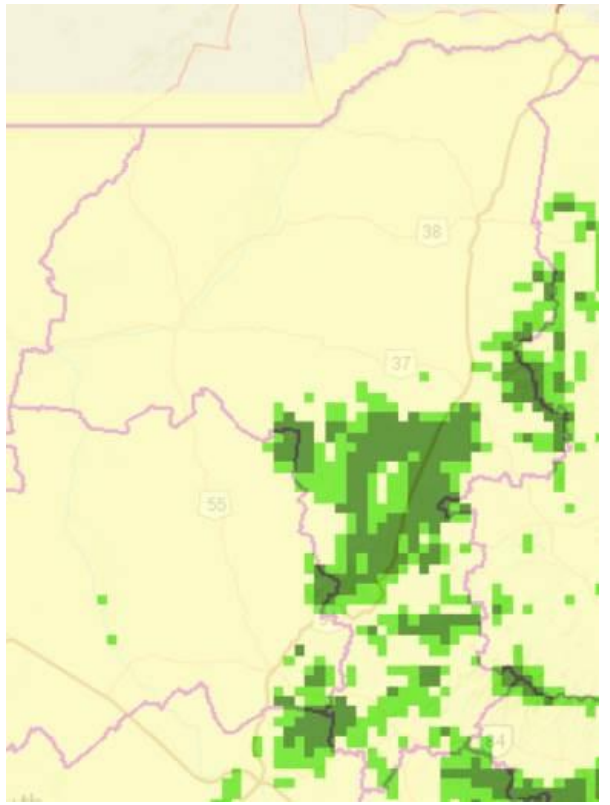
National Fire Danger Rating System

Spatial challenges with current system

Variation within area can be significant



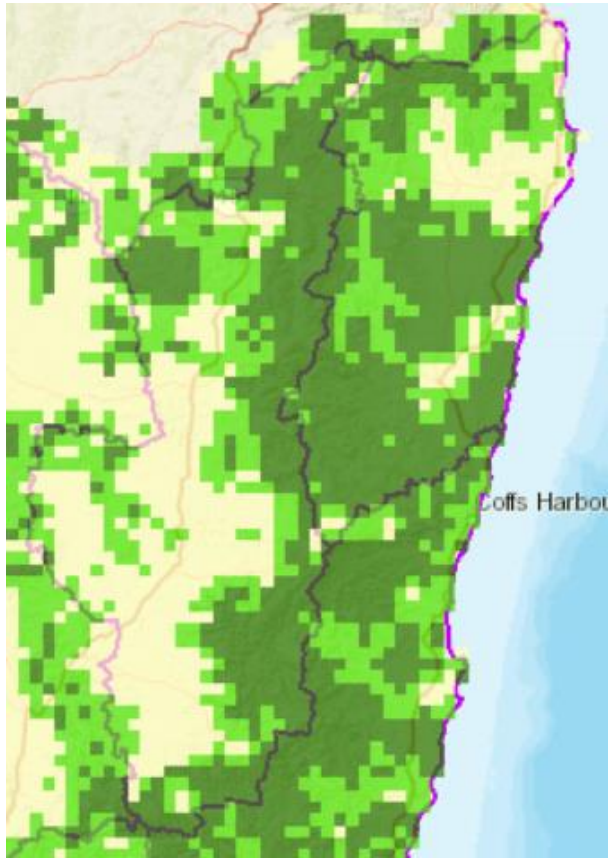
FDR map



Fuel type map
(yellow = grass, dark green = forest, bright-green = combined)

This could become more of an issue with 8 fuel types

- Previously:
  - Grass, forest, or both
- NFDRS:
  - More complex for some fire weather areas
  - Effect of minor fuel types that respond differently, e.g. heath.



National Fire Danger Rating System

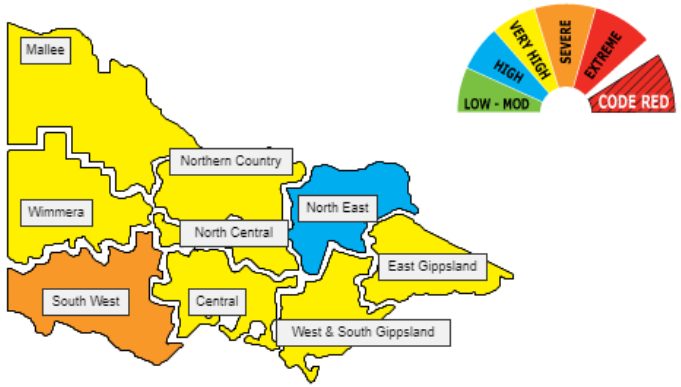
Temporal challenges – how we describe FDR over time

Current

Sat, 2 Mar 2019 is not currently a day of Total Fire Ban.

Total Fire Ban & Fire Danger Ratings map

Select a district to see a list of municipalities:



Displays when Total Fire Ban in force - Check what you can and can't do on days of Total Fire Ban

Bureau of Meteorology forecast issued at:
Thu, 28 Feb 2019 05:30 AM

Total Fire Ban & Fire Danger Ratings listing

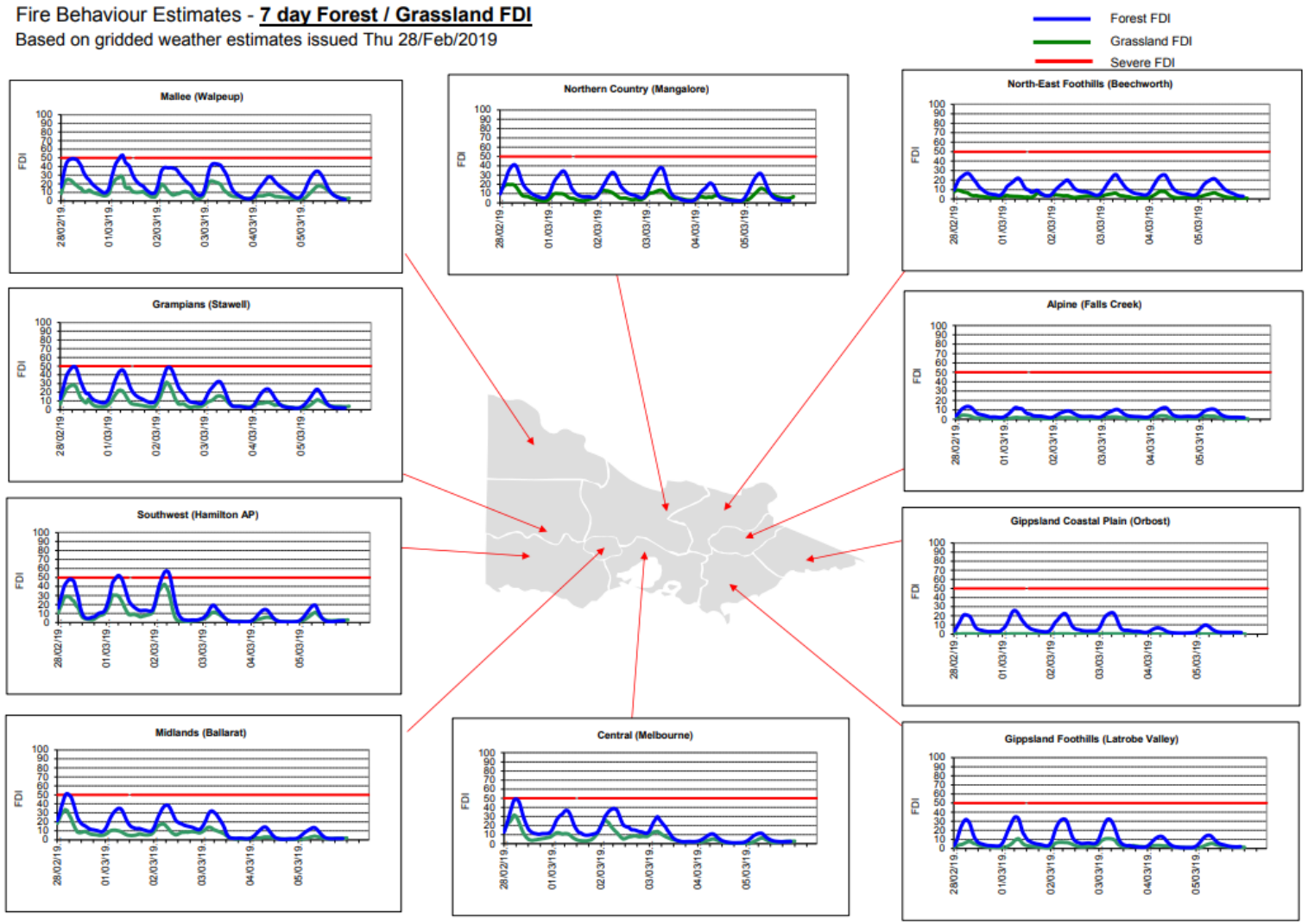
Select a district to see a list of municipalities

District	Total Fire Ban declared?	Rating
Mallee	No - restrictions may apply	Very high
Wimmera	No - restrictions may apply	Very high
South West	No - restrictions may apply	Severe
Northern Country	No - restrictions may apply	Very high
North Central	No - restrictions may apply	Very high
Central	No - restrictions may apply	Very high
North East	No - restrictions may apply	High
West and South Gippsland	No - restrictions may apply	Very high
East Gippsland	No - restrictions may apply	Very high

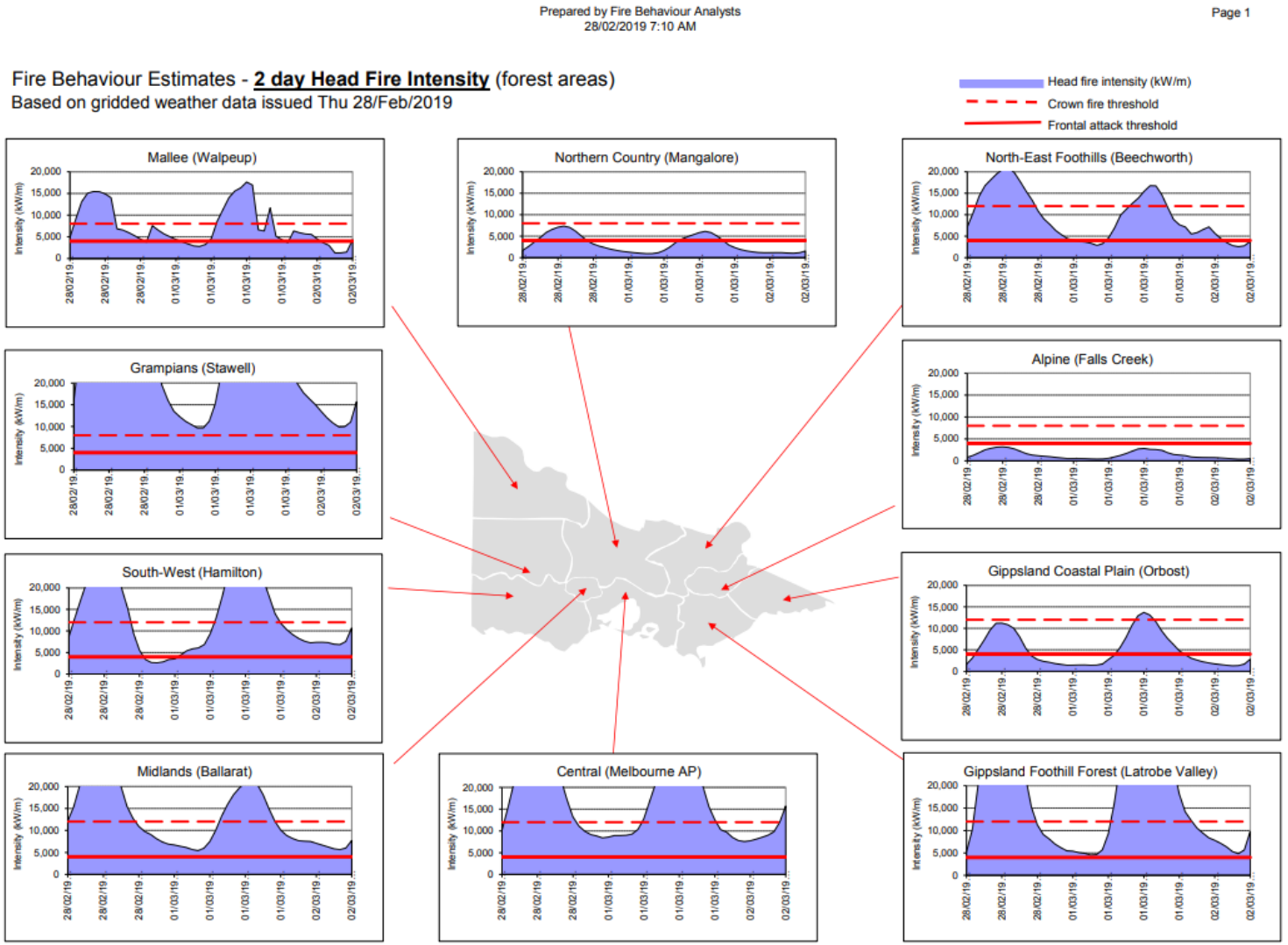
Which district am I in? | RSS RSS version

National Fire Danger Rating System

Temporal challenges

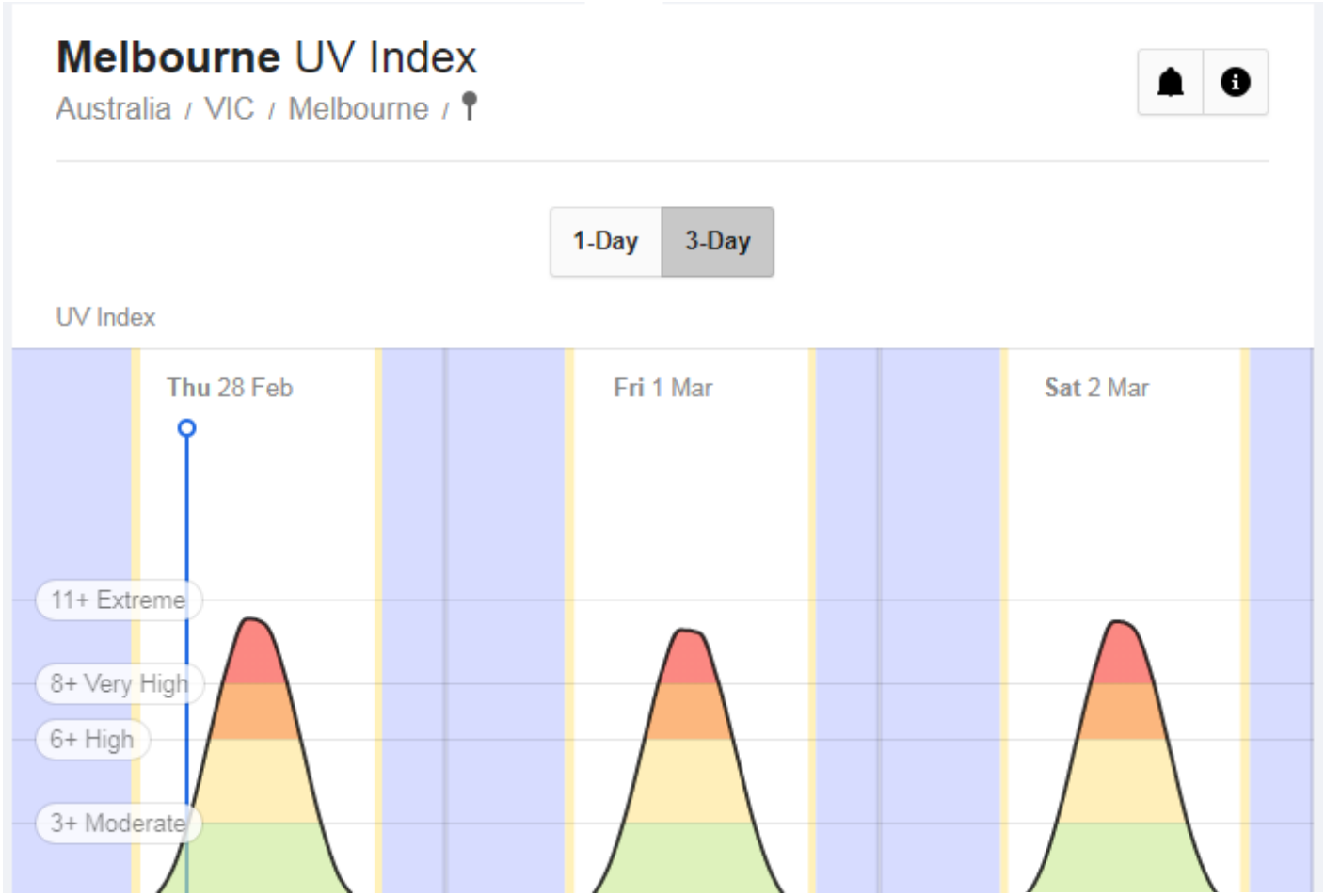


Temporal challenges



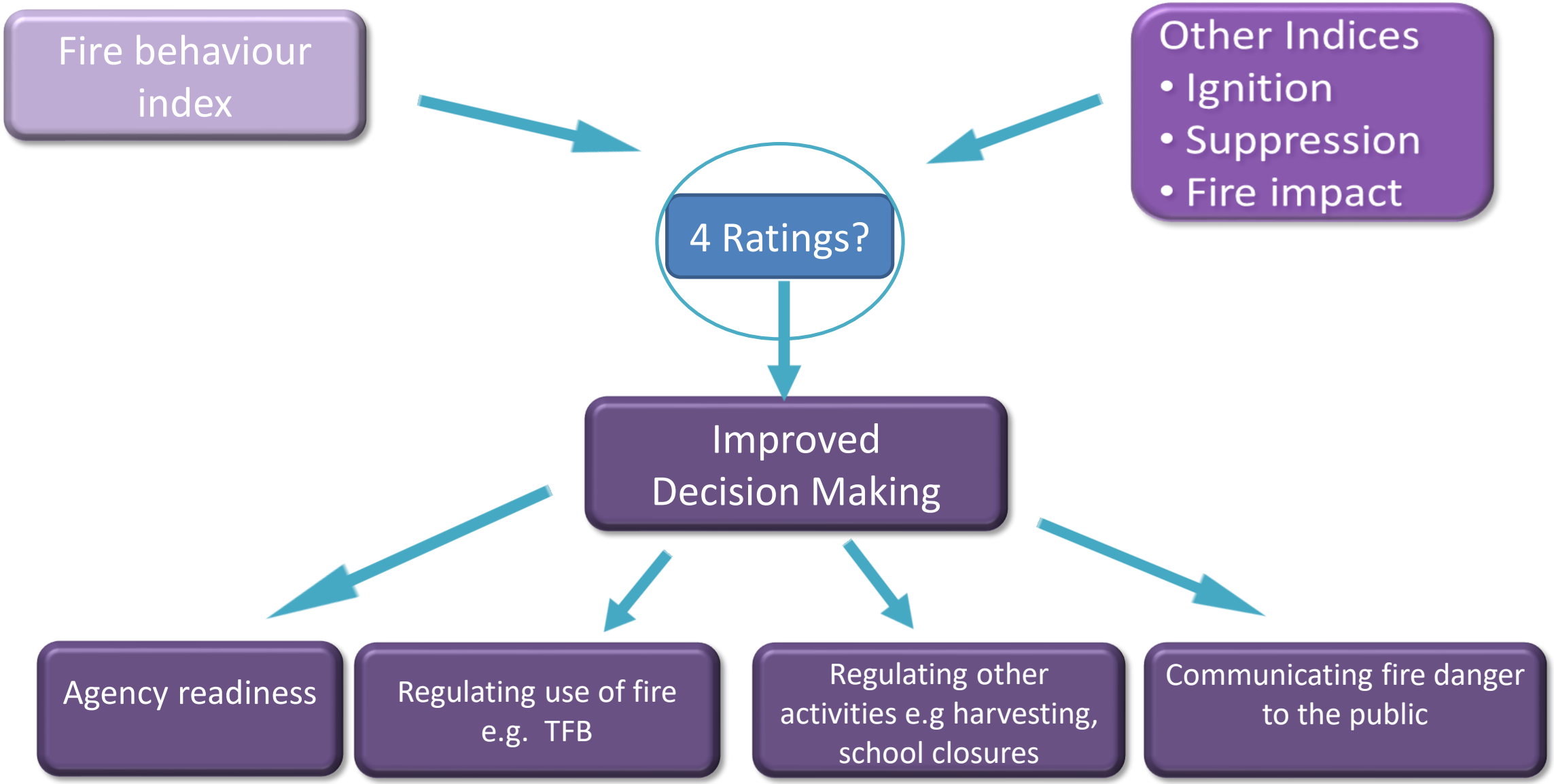
National Fire Danger Rating System

Temporal challenges



National Fire Danger Rating System

Improved Decision Making - Phase 4?



Improved Decision Making

A new way of thinking about risk and communicating it

From one Fire Danger Index to potentially four different indices?

Which do you use when, and how do you communicate them?

Decision	Fire Behaviour Index	Ignition Index	Suppression Index	Fire Impact Index
Conduct prescribed burn	?		?	
Cease harvest	?		?	
Agency readiness (IMT, aircraft, f/fighter)	?	?	?	?
Total Fire Ban	?	?	?	?
School closure				?

Improved decision making - Summary

Each component will potentially result in significant change:

Improved Fire Behaviour Index –

- changed thresholds for FDR?
- More fuels to consider and understand the implications
- new ways of expressing FDR e.g. spatially, temporally

New indices (Ignition, Suppression, Fire Impact) –

- new thinking around decision making inputs for different issues?

Improved FDR decision making framework –

- how do we use & communicate the new indices & ratings to user and public,
- what are triggers,
- how do we tailor to risk etc

Improved decision making - Summary

Changes may be needed in :

- Legislation, regulation e.g. TFBs, permits, cropping, forest harvesting
- Policy and procedures (fire agencies preparedness , other agencies e.g. school closures, utilities preparedness etc)
- Community Education
- Infrastructure e.g. signs
- Land use planning, building construction standards
- Data collection and storage
- etc

- All changes will require significant consultation with jurisdictions and other stakeholders (e.g. agricultural, industry and utilities groups) to develop national standards
- All will require significant lead times to develop and implement new policies, infrastructure and training
- Many of these activities will be jurisdictional responsibilities and will need to be included in budget forecasts now

A major opportunity to change the way we describe and express fire danger