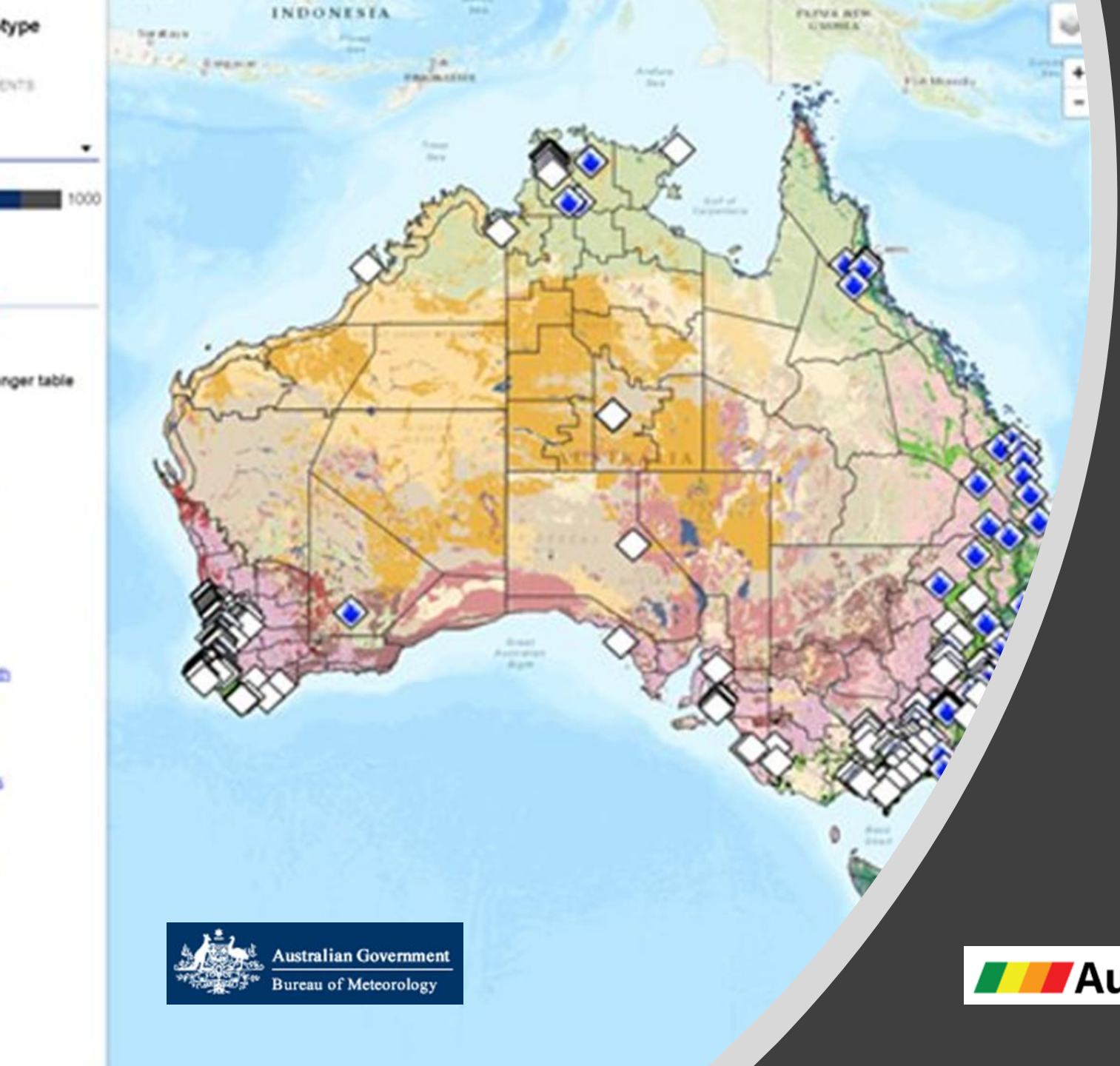

The Australian Fire Danger Rating System: Achievements and Challenges

Australian Fire Danger Rating System

Acknowledgements:

BoM AFDRS team:

Howard Jacobs (PM), Sam Sauvage (Development), Evan Morgan (Sponsor), Ann Farrell (rtd.), Steven McGibbony, Simon Louis, Hannah Colhoun, Paul Bierman

Climate: Paul Gregory, Naomi Benger, David Jones, Andrew Dowdy

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ACCESS-S team esp. Debbie Hudson, Morwenna Griffiths,…

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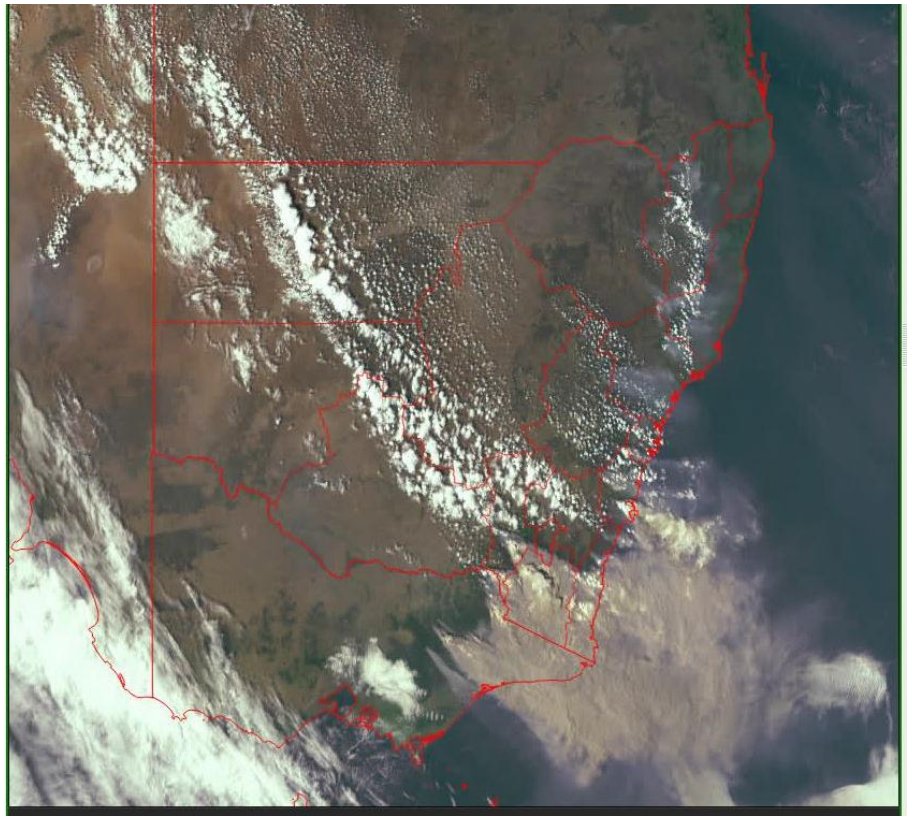
RFS, now BoM:
Simon Heemstra

AFAC:
Greg Esnouf, John Bally, Rob Webb

Australian Fire Danger Rating System

Overview:

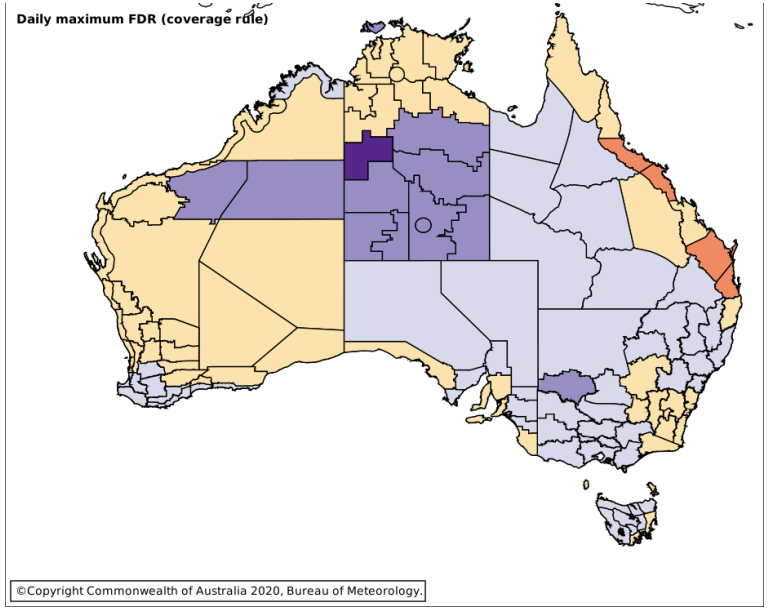
- What is the AFDRS, and why implement it?
- Structure of new system
- Achievements - Where are we now?
- Challenges/opportunities for future



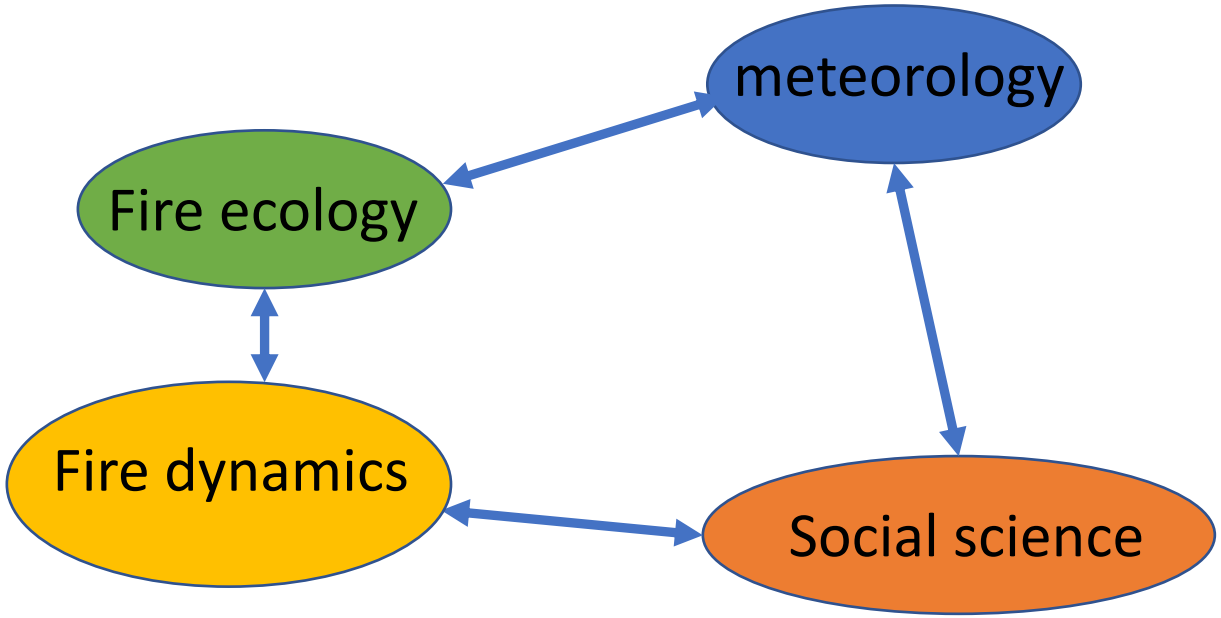
Australian Fire Danger Rating System

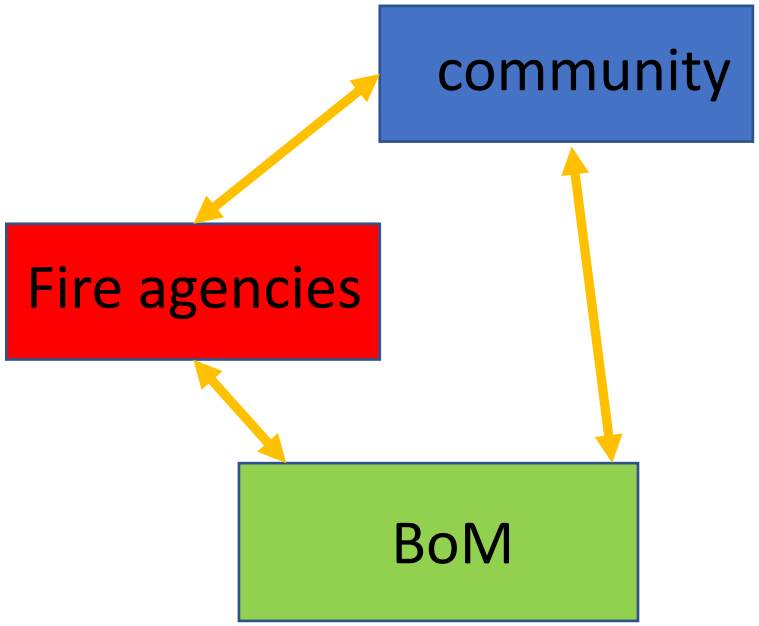
- Currently McArthur Forest and Grass fire danger ratings
- Developed in 1950-60's
- Not amenable to incremental improvement – so 1950's science
- McArthur intended system as a first step

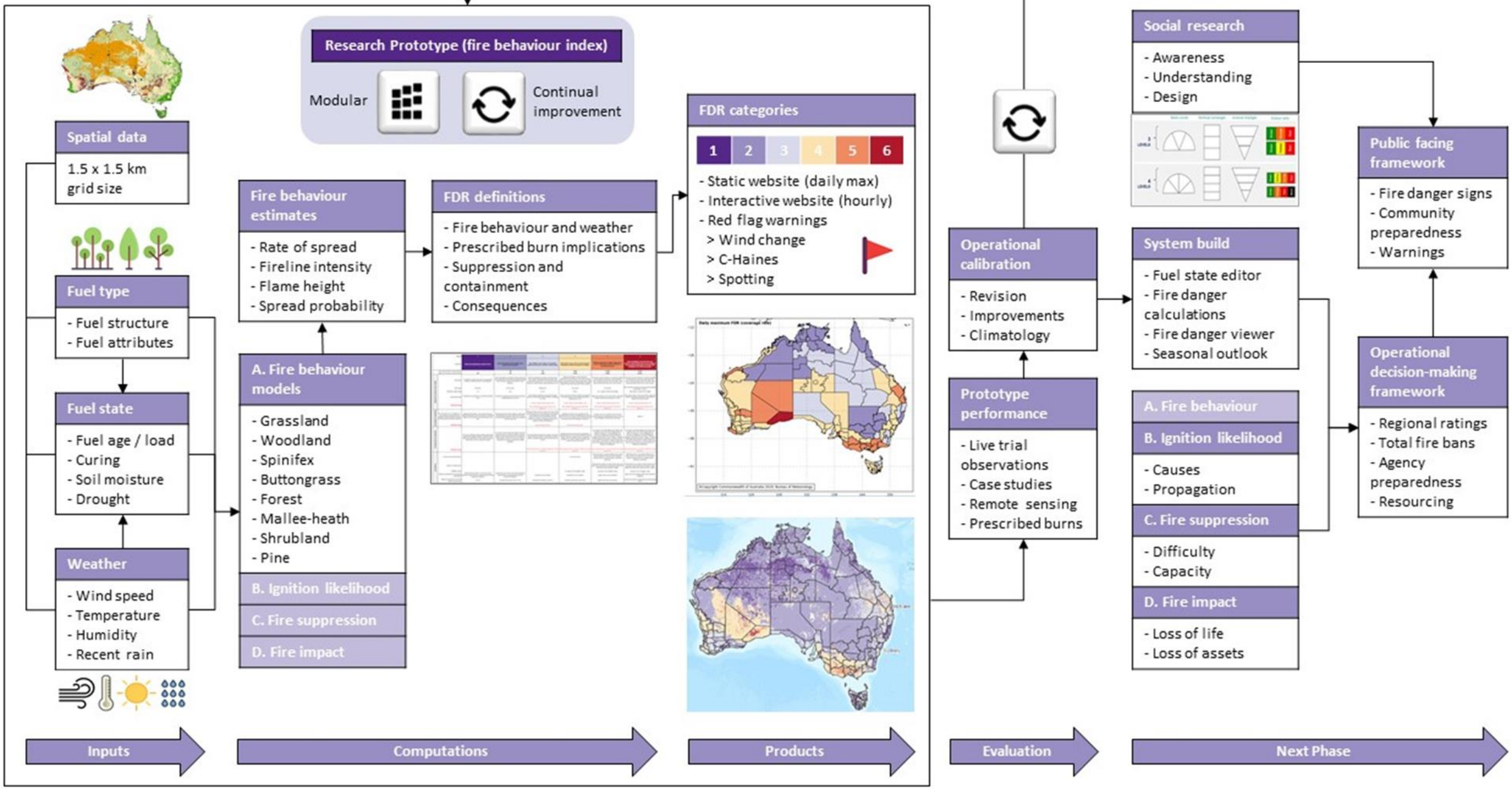
- AFDRS incorporates new science – fire behaviour models for all Australian vegetation types/is modular
- Indices for ignition, suppression, impact
- Social science for maximum uptake



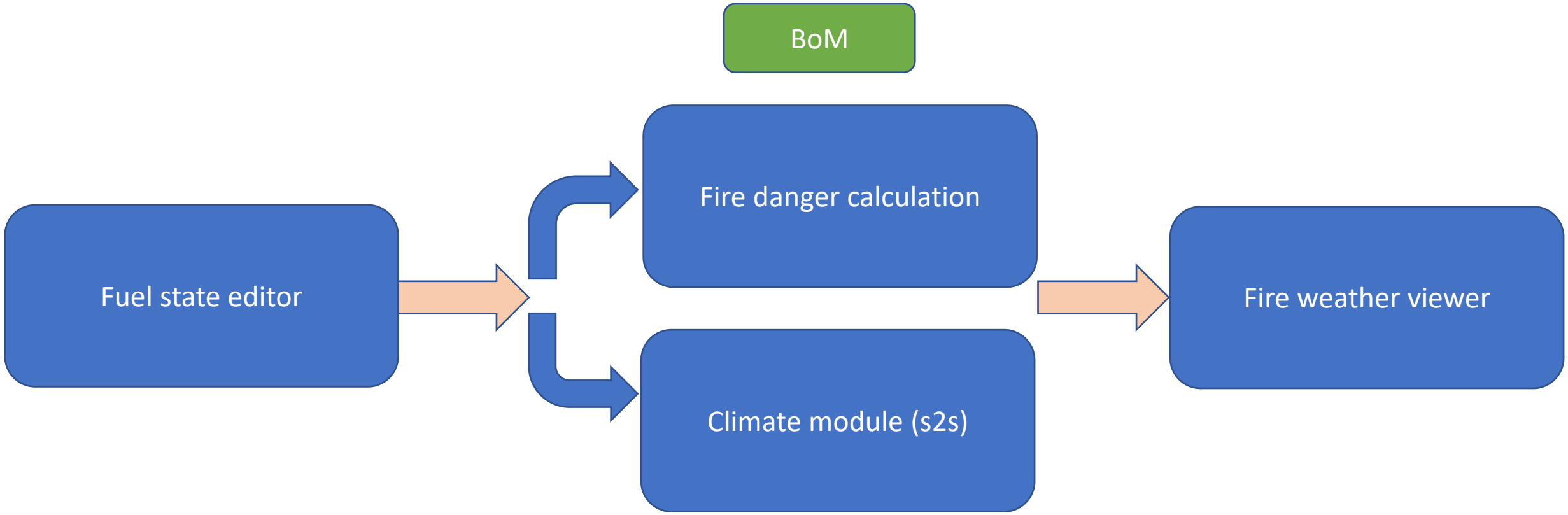
Necessarily multidisciplinary:





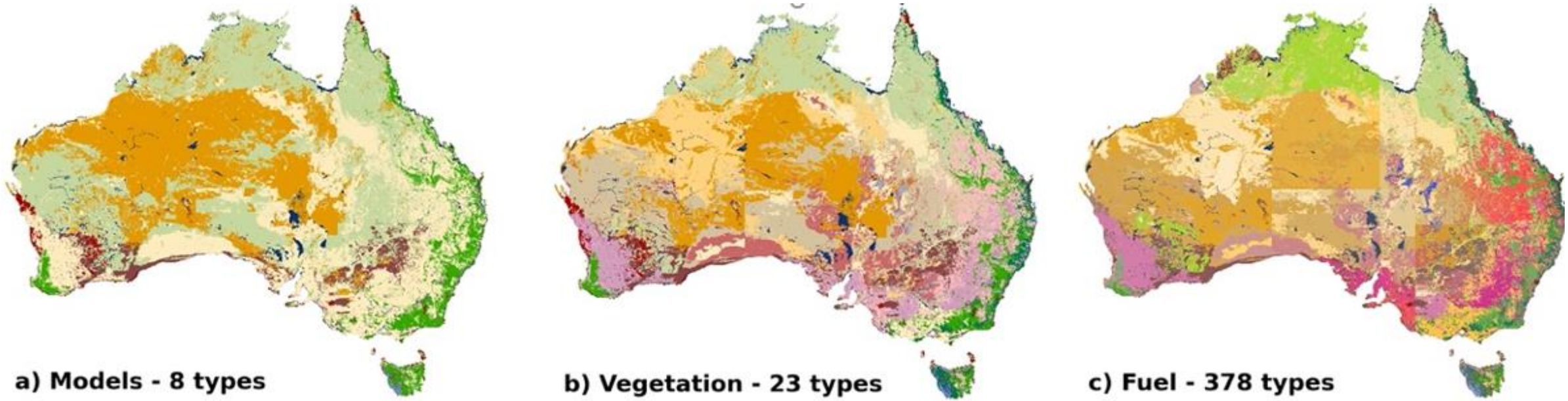

Research Prototype (fire behaviour index)
Modular
Continual improvement
Spatial data
1.5 x 1.5 km grid size
Fuel type
- Fuel structure
- Fuel attributes
Fuel state
- Fuel age / load
- Curing
- Soil moisture
- Drought
Weather
- Wind speed
- Temperature
- Humidity
- Recent rain
Fire behaviour estimates
- Rate of spread
- Fireline intensity
- Flame height
- Spread probability
A. Fire behaviour models
- Grassland
- Woodland
- Spinifex
- Buttongrass
- Forest
- Mallee-heath
- Shrubland
- Pine
B. Ignition likelihood
C. Fire suppression
D. Fire impact
FDR definitions
- Fire behaviour and weather
- Prescribed burn implications
- Suppression and containment
- Consequences
FDR categories
1 2 3 4 5 6
- Static website (daily max)
- Interactive website (hourly)
- Red flag warnings
> Wind change
> C-Haines
> Spotting
Operational calibration
- Revision
- Improvements
- Climatology
Prototype performance
- Live trial observations
- Case studies
- Remote sensing
- Prescribed burns
Social research
- Awareness
- Understanding
- Design
System build
- Fuel state editor
- Fire danger calculations
- Fire danger viewer
- Seasonal outlook
A. Fire behaviour
B. Ignition likelihood
- Causes
- Propagation
C. Fire suppression
- Difficulty
- Capacity
D. Fire impact
- Loss of life
- Loss of assets
Public facing framework
- Fire danger signs
- Community preparedness
- Warnings
Operational decision-making framework
- Regional ratings
- Total fire bans
- Agency preparedness
- Resourcing
Inputs
Computations
Products
Evaluation
Next Phase

High level project structure



A few key steps

1. Fuel specification



a) Models - 8 types

b) Vegetation - 23 types

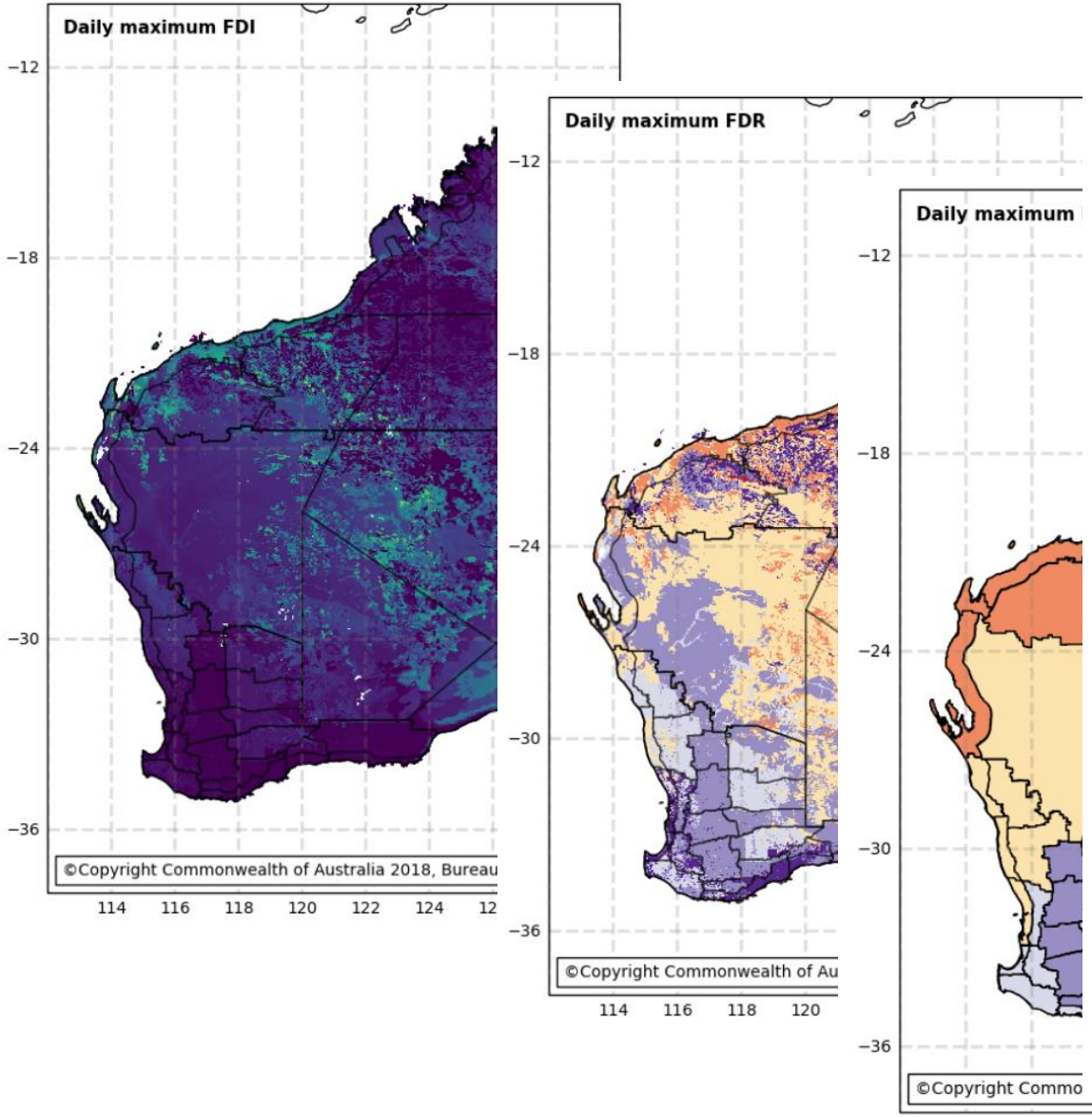
c) Fuel - 378 types

Sequence courtesy Sam Sauvage

2. Rating scale

1	2	3	4	5	6
Mostly self-extinguishing, trouble-free fires.	Typical prescribed burning conditions. Fires generally easy to suppress and contain.	Most bushfires in this category. Fires typically suppressed with direct, parrallel or indirect attack.	Initial attack success critical to prevent large fire development. Increasing focus on defensive suppression strategies.	Conditions limit strategic suppression options. High levels of threat to life/property. Elevated risk to firefigter safety. Initial attack success critical to prevent large fire development.	Elevated risk to firefighter safety. High probability of loss of life and property. Initial attack success critical to prevent large fire development. Conditions limit strategic suppression options. Wind speed and limited visibility may ground some aviation resources.

3. Constructing the forecast



Region	AAC	Rating	CHaines	Spotting dist (m)	WCDI
Central and Eastern	WA_FW039	Category 5	Yes		Yes
Northern	WA_FW038	Category 4	Yes	312	Yes
North Kimberley Coast	WA_FW001	Category 4	No	312	No
West Kimberley Coast	WA_FW002	Category 4	Yes		Yes
Kimberley Inland	WA_FW003	Category 4	Yes	312	Yes
East Pilbara Coast	WA_FW004	Category 5	No		Yes
West Pilbara Coast	WA_FW005	Category 5	No		No
Ashburton Inland	WA_FW007	Category 5	No		Yes
East Pilbara Inland	WA_FW006	Category 5	Yes		Yes
Exmouth Gulf Coast	WA_FW008	Category 5	No		No
North Interior	WA_FW013	Category 4	Yes		Yes
Gascoyne Coast	WA_FW009	Category 5	No		No
Gascoyne Inland	WA_FW010	Category 4	No		No
Goldfields	WA_FW011	Category 4	Yes		Yes
South Interior	WA_FW014	Category 5	Yes		Yes
Eucla	WA_FW012	Category 5	No		Yes
South West Land Division	WA_FW040	Category 3	No	345	No
Jilbadgie	WA_FW037	Category 3	No	50	No
Avon	WA_FW036	Category 2	No	310	No
Coastal Central West - North	WA_FW015	Category 4	No		Yes
Inland Central West - North	WA_FW016	Category 4	No	262	No
Coastal Central West - South	WA_FW017	Category 4	No	50	No

Where we are now:

Prototype

Ongoing refinement:

- New system, built from scratch, performs better (esp. at high end) than current
- Series of publications in preparation e.g. climatology + tech report (led by Sam Sauvage)
- Refinements following 2019-20 fire season
- Development of prototype "other" indices:
  ignition/suppression/impact

Implementation

Trial mode 2021-22, operational 2022-23

Challenges and opportunities

- Fuel availability – JASMIN/AWRA/AFMS?
- Red flags – pyroCb/PFT/ember transport
- Further development of S2S service
- Ensemble forecasting with AFDRS

Review:

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