Lessons from Black Summer

Natural Hazards Research Australia

Fire Australia 2024, 9 May 2024, Surfers Paradise

Dr Rowena Morris, NSW/ACT Node Research Manager, Natural Hazards Research Australia

Lessons from Black Summer

28 organisations

23 projects, Multi-discipline

→ fire predictive services
→ cultural land management
→ community-centred disaster risk reduction
→ bushfire data and reconstruction.

- Why was this fire season so devastating?
- What new capabilities can be implemented?
- How can Australia learn from its worst season?

Natural Hazards Research Australia

Understanding Black Summer

When

- August 2019 to March 2020

Consequences

- 33 lives lost
- 1000's affected by smoke inhalation and other impacts

Government response

- Several states and territories held post-fire inquiries and reviews, and the Australian Government conducted the Royal Commission into National Natural Disaster Arrangements.

Natural Hazards Research Australia

Research Program

Bushfire and Natural Hazards CRC

23 projects, 28 organisations
Multi-discipline

→ fire predictive services
→ cultural land management
→ community-centred disaster risk reduction
→ bushfire data and reconstruction.

Fire predictive services

To boost situational awareness before and during bushfires, and to enhance the sharing of risk information and warnings with communities.


PLANNING

Natural Hazards Research Australia

Modelling fire weather interactions

Researchers

Dr Mika Peace at the Bureau of Meteorology

With emergency services in Queensland, New South Wales, Victoria, South Australia and Western Australia. **ACCESS-Fire model**

Fire generated vortex near Karumba (Victoria, Corryong fire) at 7.30pm 30 December 2019.
Photo credit: Ms Janice Newnham

Source: COUPLED FIRE-ATMOSPHERE SIMULATIONS OF FIVE BLACK SUMMER FIRES USING THE ACCESS-FIRE MODEL | REPORT NO. 705.2021

Natural Hazards Research Australia

Understanding moisture in the landscape

Researchers

Dr Paul Fox-Hughes (Bureau of Meteorology) and A/Prof Marta Yebra (Australian National University

With emergency services in Queensland, New South Wales, Victoria, South Australia, Western Australia and the Australian Capital Territory.

Photo credit: Bureau of Meteorology, Australian National University

Source: SOCIAL AND FUEL MOISTURE PRECURSORS OF FIRE ACTIVITY DURING THE 2019-20 FIRE SEASON | REPORT NO. 686.2021

Natural Hazards Research Australia

Established and emerging uses of predictive services in Victoria

Researchers

Dr Chloe Begg (Country Fire Authority), Dr Graham Dwyer (Swinburne University of Technology), and Dr Timothy Neale and Dr Ian Pollock (Deakin University).

FBANs and users interact in the Victorian State Control Centre, January 2020. Photo credit: Timothy Neale

Source: ESTABLISHED AND EMERGING USES OF PREDICTIVE SERVICES IN VICTORIA | REPORT NO. 697.2021

Natural Hazards Research Australia

Identifying water sources using satellite imagery

Researchers

Leo Lymburner at Geoscience Australia, with support from the National Aerial Firefighting Centre. **Digital Earth Australia (DEA) data Sentinel-2**

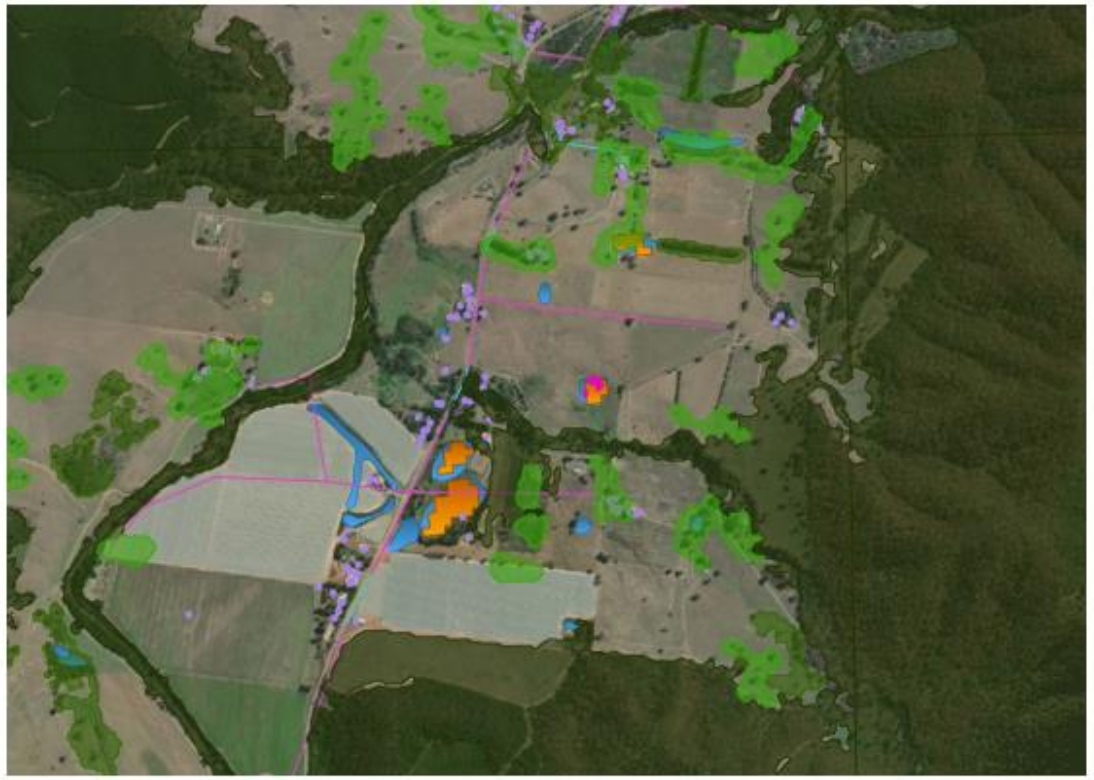


FIGURE 11 LOCATION NOW WITH THE INCLUSION OF TREE COVER (SHOWN IN GREEN BUFFERS)

Trees close to the top dam render it unsuitable for access.

Source: USING DEA WATERBODIES TO SUPPORT AERIAL FIREFIGHTING | REPORT NO. 722.2022

Natural Hazards Research Australia

Mapping surface fine fuel moisture content

Researchers

Li Zhao, with A/Prof Marta Yebra and Prof Geoff Cary at the Australian National University. **Australian Flammability Monitoring System**

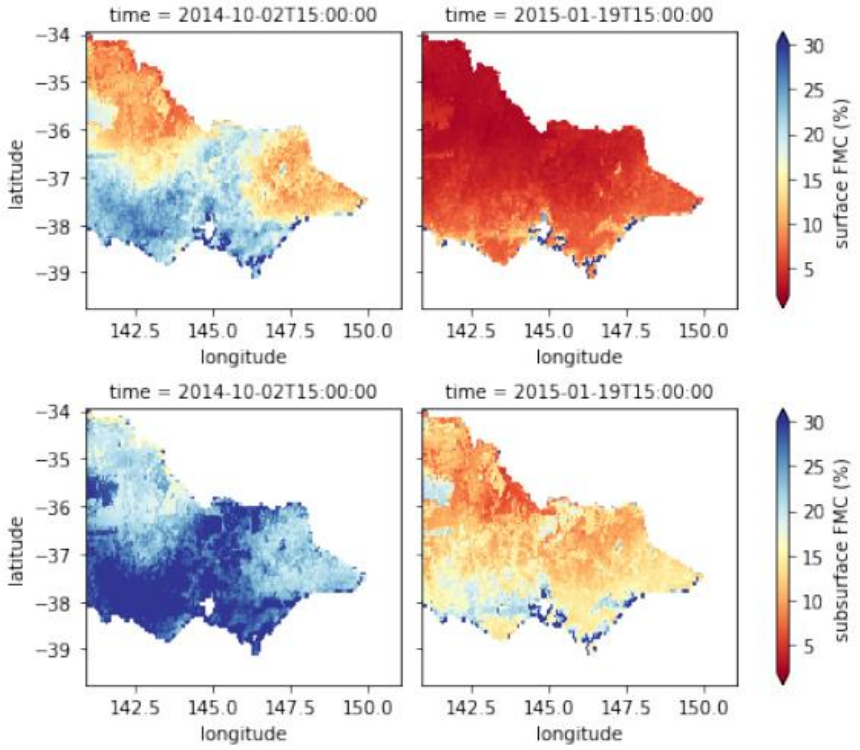


Figure 9 Estimates of surface (left) and subsurface (right) FMC from the coupled model in Victoria on the 2nd of October 2014 (top) and the 19th of January 2015 (bottom).

Source: [MAPPING SURFACE FINE FUEL MOISTURE CONTENT| REPORT NO. 733.2022]

Cultural land management

To learn from Traditional Owners on how to reduce landscape risk through better integrated cultural land management knowledge and practices


Dharawal National Park
Jingga Track
Grade hard
200m to track head
(Track - 2.4 km return)
O'Hares Creek Lookout
Grade easy
2.4 km return
Minerva Pool Lookout
Grade medium
2.4 km return to lookout
10B Management Trail
Grade medium
2.4 km return to weir
Wedderburn
Dharawal
National Park
Minerva Pool
Minerva Pool is culturally significant to the Dharawal traditional owners.
Minerva Pool is a place for only women and children to enter the waters.
We invite you to visit the lookout, explore the natural scenery and respect the cultural significance.

Natural Hazards Research Australia

Cultural land management in southeast Australia

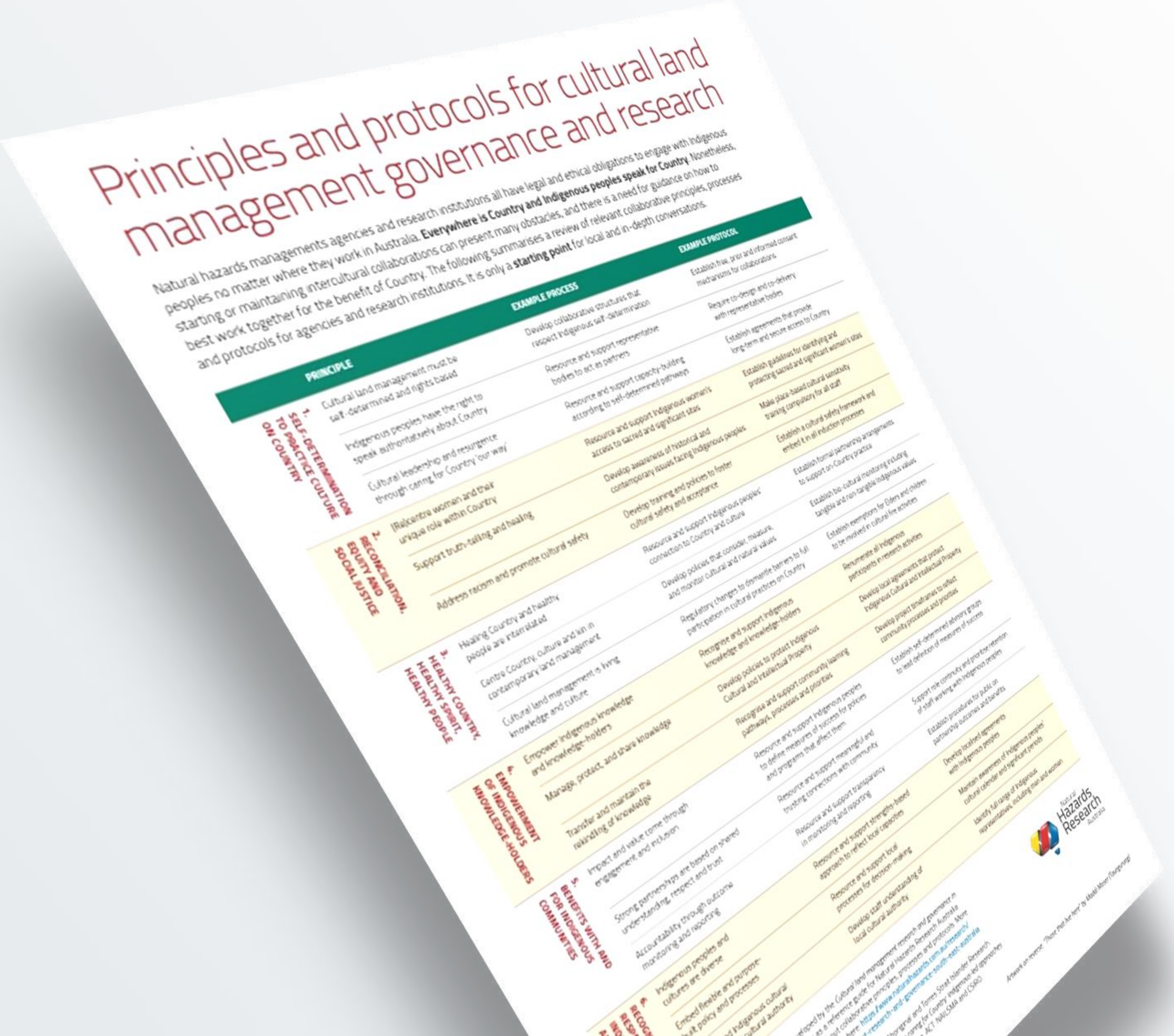
Researchers

Oliver Costello (Jagun Alliance Aboriginal Corporation), Tasmin Dilworth and Dr Katharine Haynes (University of Wollongong), Tony Jansen (One Point Five Degrees) and Dr Timothy Neale (Deakin University).

Minyumai Indigenous protected area, North Coast Cultural Land Management Workshop, 17-18 May 2021. Photo credit: Tony Jansen

Source: CULTURAL LAND MANAGEMENT IN SOUTHEAST AUSTRALIA | REPORT NO. 704.2021

Cultural land management resources



Natural Hazards Research Australia

Indigenous fire and land management in northern Australia

Researchers

Glenn James and Danny Burton (North Australian Indigenous Land and Sea Management Alliance; NAILSMA) and supported by Otto Campion (Aboriginal Research Practitioners' Network; ARPNet), Barry Hunter (Djabugay Aboriginal Corporation), and Jimmy Morrison, Ted Gondarra and James Bayung (Dalkarra and Djirrikay Authority)

Final project workshop, Kuranda. Qld. Hosted by Djabugay. 10 May 2021.

Source: INDIGENOUS FIRE AND LAND MANAGEMENT – IMPACT AND SUSTAINABILITY | REPORT NO. 680.2021

Community-centred disaster risk reduction

To understand and assist communities and governments in enabling effective and efficient community participation and leadership in disaster preparation, relief and recovery

Natural Hazards Research Australia

Community attitudes and experiences of the 2019-20 NSW bushfire season

Researchers

Commissioned by the NSW Rural Fire Service and completed by Dr Josh Whittaker, Dr Katharine Haynes, Carrie Wilkinson and Stephanie Samson at the University of Wollongong, and Dr Matalena Tofa, Dr Tamsin Dilworth, Jessica Collins and Lillian Tait at Macquarie University.

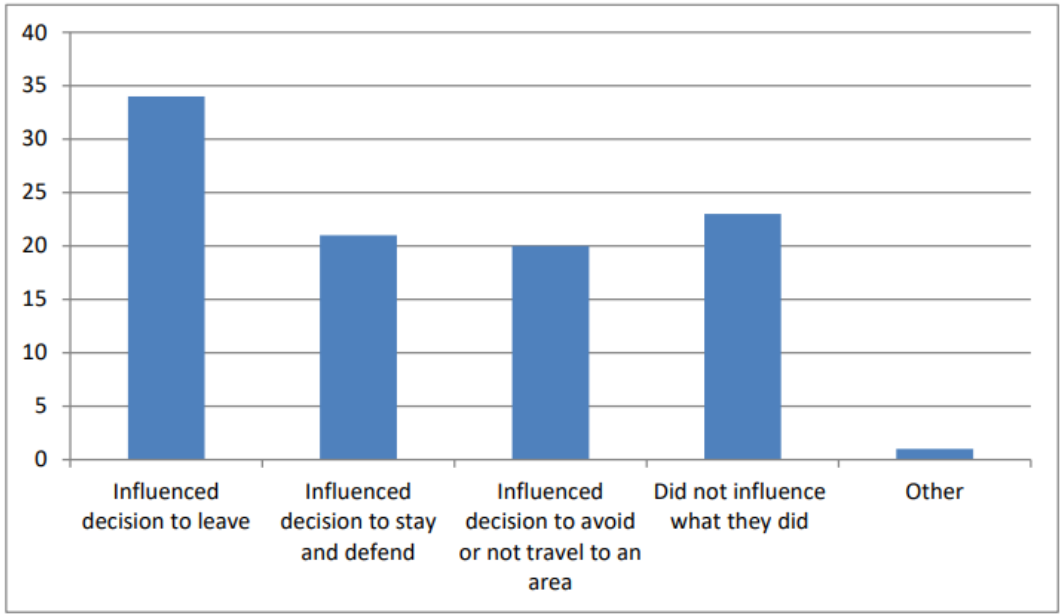


FIGURE 12: INFLUENCE OF FIRE SPREAD PREDICTION MAPS ON DECISIONS (%)

Source: BLACK SUMMER – HOW THE NSW COMMUNITY RESPONDED TO THE 2019-20 BUSHFIRE SEASON | REPORT NO. 651.2021

Natural Hazards Research Australia

Community-led recovery

Researchers

This project was completed by Prof Lisa Gibbs, Dr Colin Gallagher, Dr Kate Brady, Dr Claire Leppold and Greg Ireton from the University of Melbourne, Andrew Haywood, Yvette Clarke and Stewart Davies at Bushfire Recovery Victoria, and Fyowna Norton and Vaughn Brandenburg at Emergency Management Victoria

Source: COMMUNITY-LED RECOVERY – BLACK SUMMER FINAL REPORT | REPORT NO. 702.2021

Natural Hazards Research Australia

Understanding experiences and recovery capabilities of diverse communities in Gippsland

Researchers

Commissioned by Victoria University's Institute for Sustainable Industries and Liveable Cities and delivered in partnership with Gippsland community members and the Victorian Council of Social Service

East Gippsland and Wellington Shires

Photo credit: Shutterstock

Source: Young, C., Jones, R N., and Cormick, C. (2021). Growing the seeds: recovery, strength and capability in Gippsland communities, Victoria University, Melbourne.

Bushfire data and reconstruction

To analyse data and reconstructions of specific fires for intelligence on how best to better understand how to manage fires and to reduce the risk of fires in future.

Natural Hazards Research Australia

QLD
Wind speed reduction factors

Researchers

Prof Hamish McGowan and Katherine Rosenthal from the University of Queensland, and Raymond Bott and John Myles from Queensland Fire and Emergency Services.

WRF PHOENIX RapidFire and SPARK

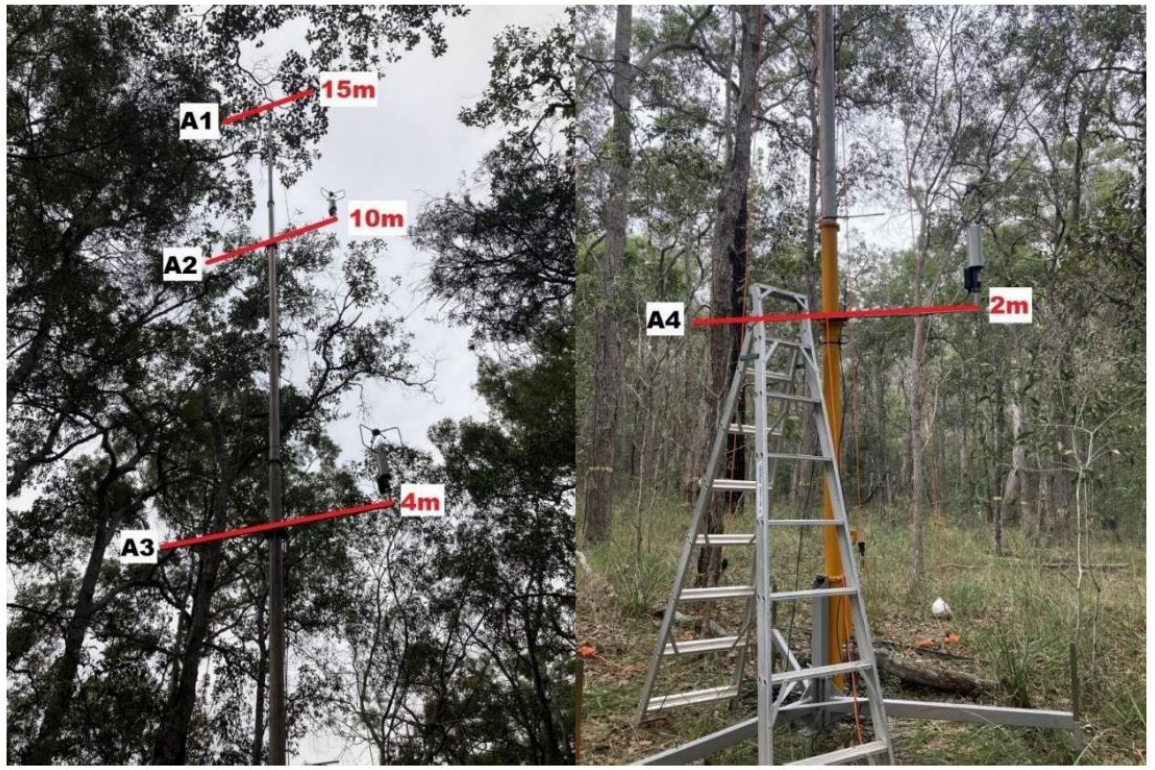


FIGURE 4: (LEFT) THE INSTALLATION HEIGHTS OF THE TOP THREE ANEMOMETERS (A1, A2, A3) AND (RIGHT) THE INSTALLATION HEIGHTS OF THE BOTTOM ANEMOMETER (A4). ADD 0.5M TO EACH FOR THE FINAL MEASUREMENT HEIGHTS.

Source: WIND SPEED REDUCTION FACTORS (WRFS): UTILITIES FOR WRF ASSESSMENT AND COMMUNICATION | REPORT NO. 688.2021

Natural Hazards Research Australia

NSW
Effects of prescribed burning in NSW

Researchers

Dr Owen Price, James Barker, Simin Rahmani and Carrie Wilkinson from the University of Wollongong, and Donald MacDonald from the NSW National Parks and Wildlife Service

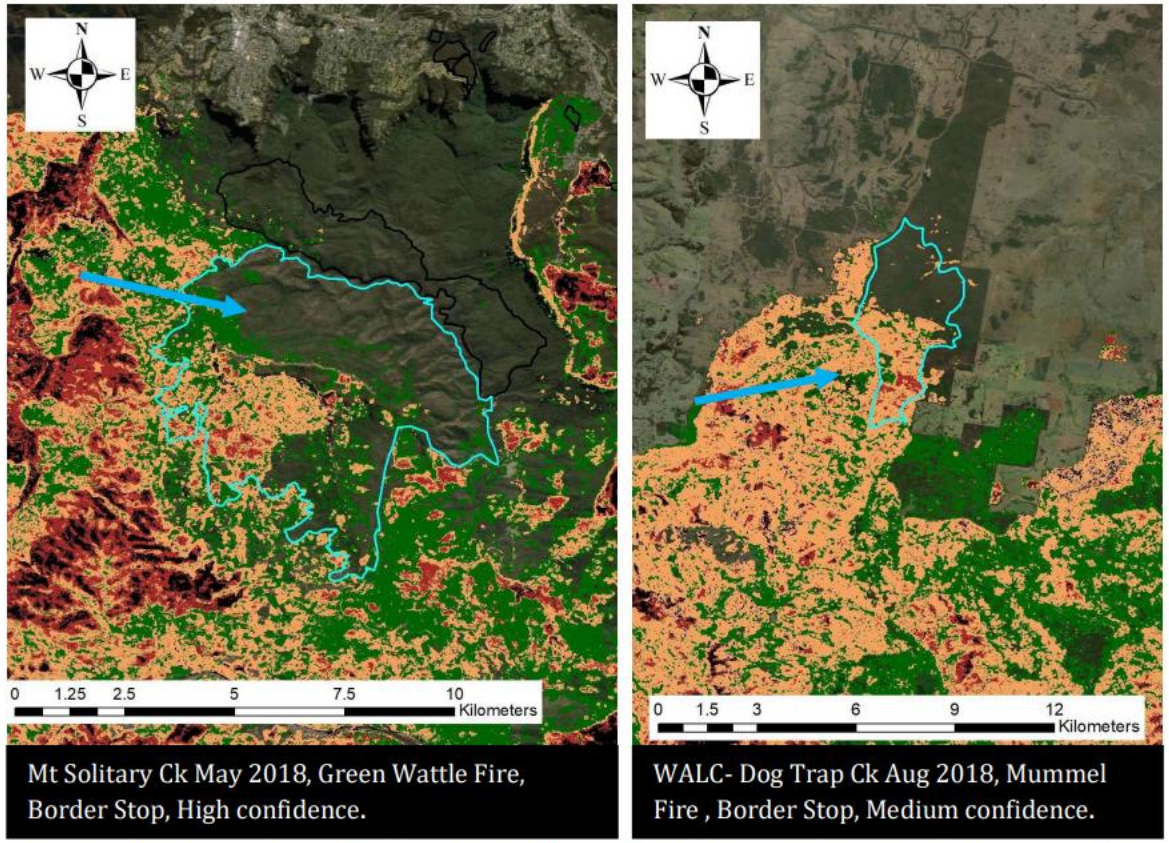


FIGURE 5.2. TWO EXAMPLES HR BURNS IN WHICH THE SUBSEQUENT BUSHFIRES BOUNDARY ALIGNED WITH THE HR. THE ARROW INDICATES THE WIND DIRECTION.

Source: ANALYSIS AND CHARACTERISATION OF BUSHFIRE-MEETS-PRESCRIBED BURNS EVENTS FROM THE 2019-20 FIRE SEASON | REPORT NO. 683.2022

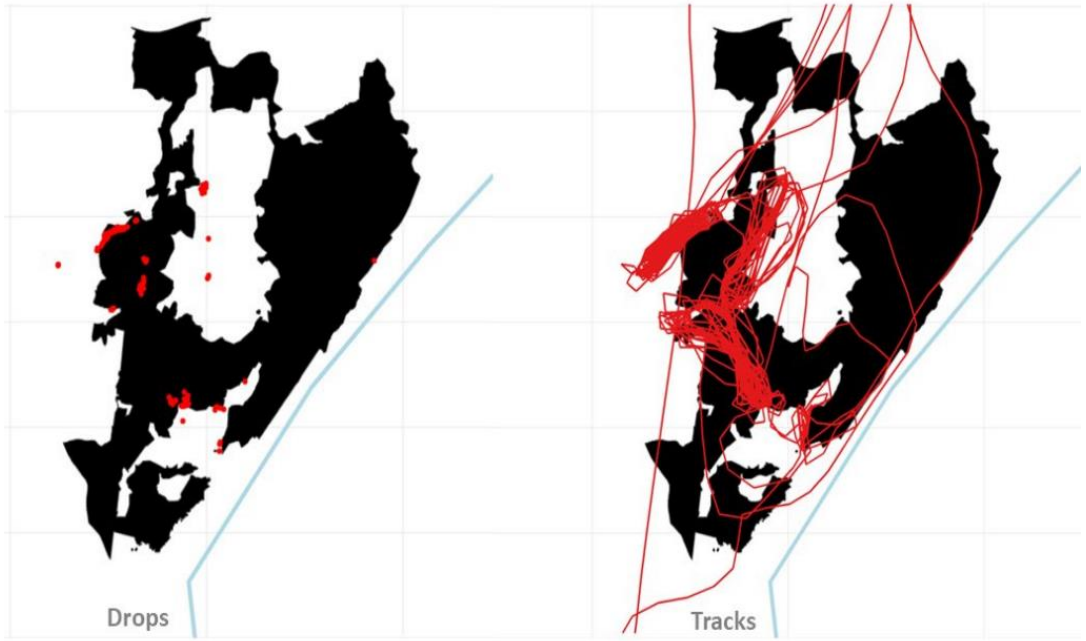
Natural Hazards Research Australia

Researchers

Heather Simpson, Michael Storey and Dr Owen Price from the University of Wollongong, and Matt Plucinski from CSIRO.

NSW

Suitability of aviation tracking data for use in bushfire suppression



Source: INVESTIGATING THE SUITABILITY OF AVIATION TRACKING DATA FOR USE IN BUSHFIRE SUPPRESSION EFFECTIVENESS RESEARCH | REPORT NO. 725.2022

Natural Hazards Research Australia

NSW
Extreme fire development on NSW south coast

Researchers

Prof Jason Sharples from the University of New South Wales.

A fire-generated thunderstorm formed over the Badja Forest Rd and Tuross Falls Rd fires, northwest of Cobargo. Photo credit: RFS

Source: Understanding the Black Summer bushfires through research

Natural Hazards Research Australia

NSW

Property damage and resilience on NSW south coast in January 2020

Researchers

Steven George, James O'Brien, Salomé Hussein and Jonathan Van Leeuwen at Risk Frontiers

Post 2019 Banyabba bushfires. Photo Credit: Lukas Gibb

Source: JANUARY 2020 NSW BUSHFIRES STUDY | REPORT NO. 582.2020

Natural Hazards Research Australia

NSW

Informing post-fire recovery planning of northern NSW rainforests

Researchers

Dr Ross Peacock (Macquarie University) and Prof Patrick Baker (University of Melbourne).

Burnt and collapsed veteran *Nothofagus moorei* tree Photo Credit: Ross Peacock

Source: INFORMING POST-FIRE RECOVERY PLANNING OF NORTHERN NSW RAINFORESTS | REPORT NO. 721.2022

Natural Hazards Research Australia

VIC

Spread and behaviour of the eastern Victorian fires

Researchers

Owen Salkin from Natural Systems Analytics.

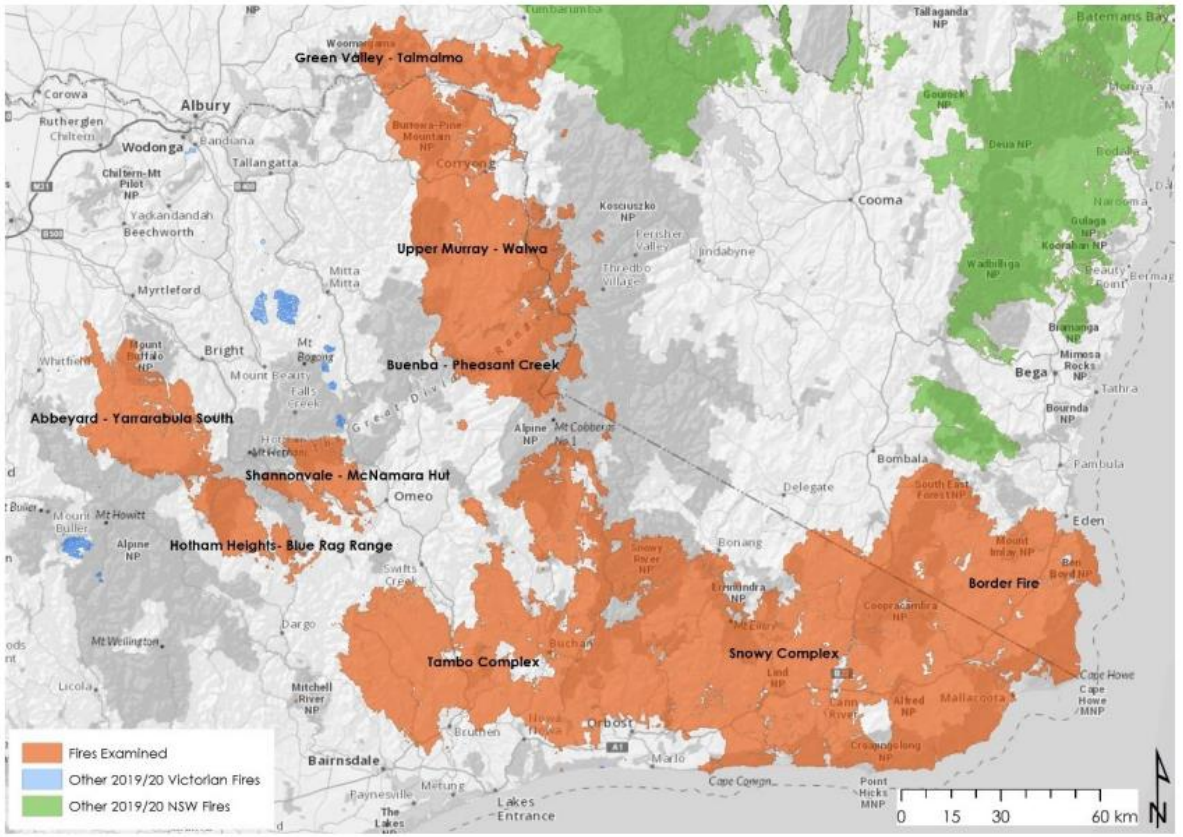


FIGURE 1: 2019/20 BUSHFIRES SHOWING FIRES EXAMINED IN THIS REPORT

Source: VICTORIAN BUSHFIRE CASE STUDIES – BLACK SUMMER FINAL REPORT | REPORT NO. 734.2022

Natural Hazards Research Australia

SA

Mitigating risk using prescribed burning in Kangaroo Island and Mount Lofty Ranges

Researchers

Dr Hamish Clarke, Dr Owen Price and Prof Ross Bradstock from the University of Wollongong; Brett Cirulis, Anthony Rawlins and A/Prof Trent Penman from the University of Melbourne; and Dr Matthias Boer from Western Sydney University.

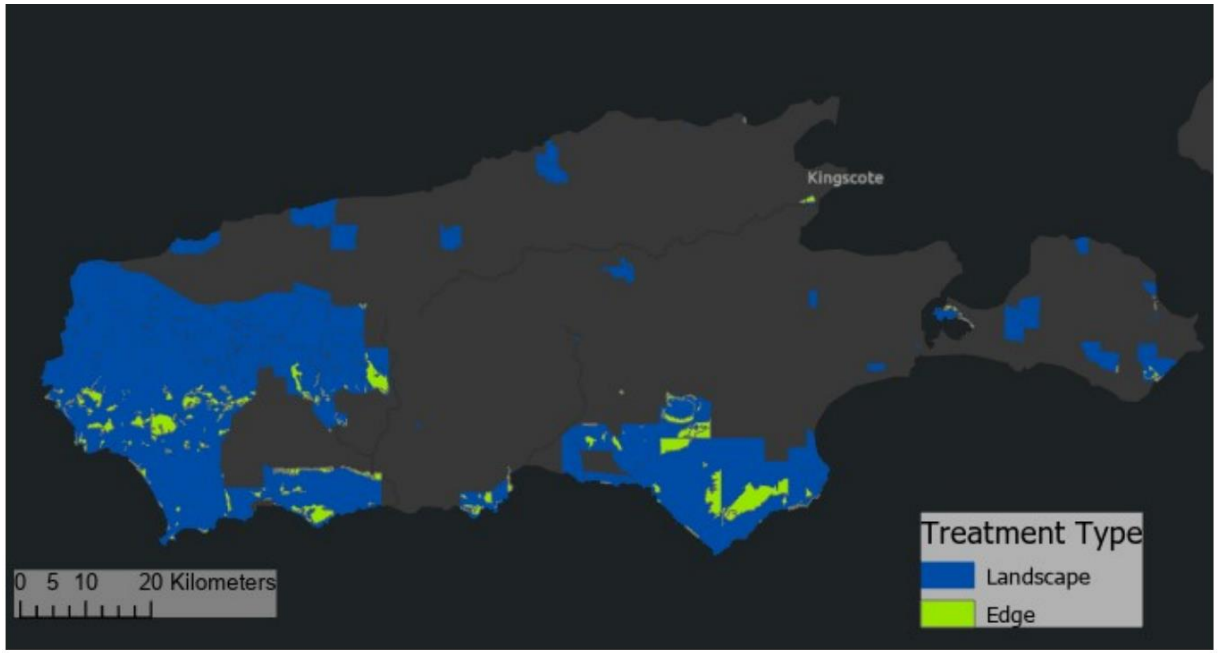


FIGURE 3 LOCATION OF EDGE AND LANDSCAPE BURN BLOCKS, KANGAROO ISLAND CASE STUDY LANDSCAPE

Source: RISK MITIGATION FROM PRESCRIBED BURNING IN KANGAROO ISLAND AND MOUNT LOFTY RANGES | REPORT NO. 690.2021

Natural Hazards Research Australia

SA

Kangaroo Island Black Summer fire reconstruction

Researchers

Simon Ramsey, A/Prof Karin Reinke, Nur Trihantoro, Prof Simon Jones and Chermelle Engel at RMIT University. Researchers investigated how geostationary satellite earth observations can be used to reconstruct fire activity. **geostationary satellites like Himiwari-8**

Kangaroo Island fire. Photo Credit: Rob Hartill, South Australian Country Fire Service Promotions Unit

Source: KANGAROO ISLAND BLACK SUMMER 2019-20 FIRE RECONSTRUCTION | REPORT NO. 685.2021

Natural Hazards Research Australia

SA

Fire risk modelling for Kangaroo Island

Researchers

Erica Marshall, Denis Kultaev, Sarah McColl-Gausden, Dr Alexander Filkov and A/Prof Trent Penman from the University of Melbourne

Fire Regime and Operations Simulation Tool .

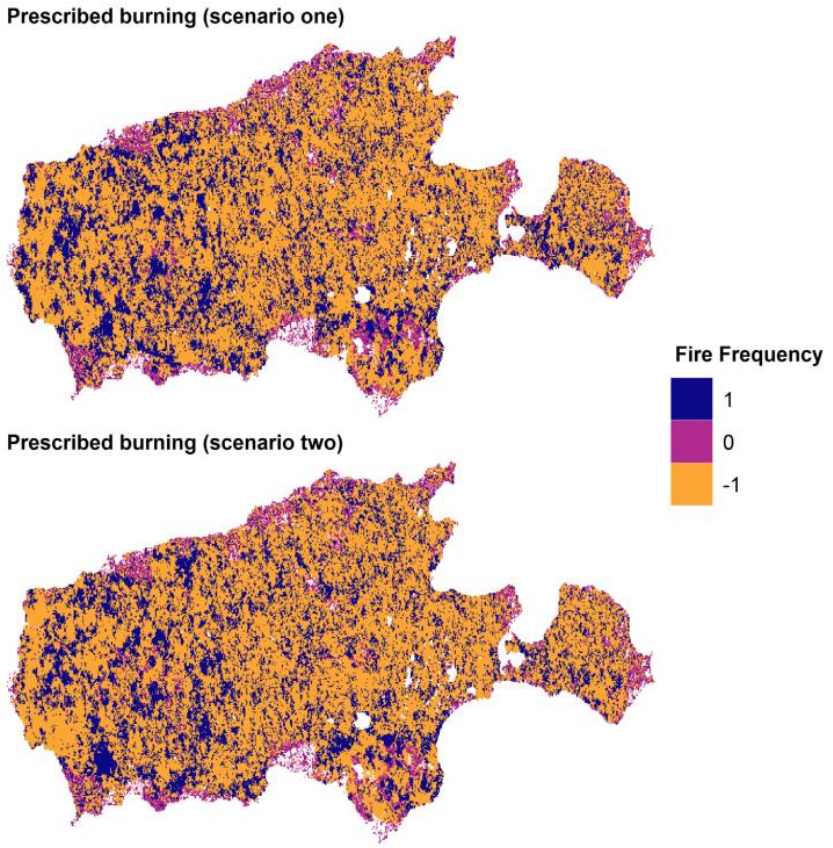


FIGURE 5: LOCATIONS ON KANGAROO ISLAND WHERE WILDFIRE FREQUENCY DIFFERED BETWEEN THE WILDFIRE ONLY AND THE PRESCRIBED BURNING BURNING SCENARIOS. POSITIVE VALUES SHOW WHERE THE FREQUENCY OF WILDFIRES WAS HIGHER IN THE PRESCRIBED BURNING SCENARIO COMPARED TO THE WILDFIRE ONLY SCENARIO. NEGATIVE VALUES SHOW WHERE THE WILDFIRE ONLY SCENARIO HAD A HIGHER FREUQNECY THAN THE PRESCRIBED BURNING SCENARIO AND ZERO INDICATES NO CHANGE IN THE FREQUENCY OF WILDFIRES.

Source: RISK MODELLING FOR KANGAROO ISLAND – BLACK SUMMER FIRES SOUTH AUSTRALIA | REPORT NO. 684.202

Natural Hazards Research Australia

WA
Yanchep bushfire analysis

Researchers

Dr Joe Fontaine at Murdoch University

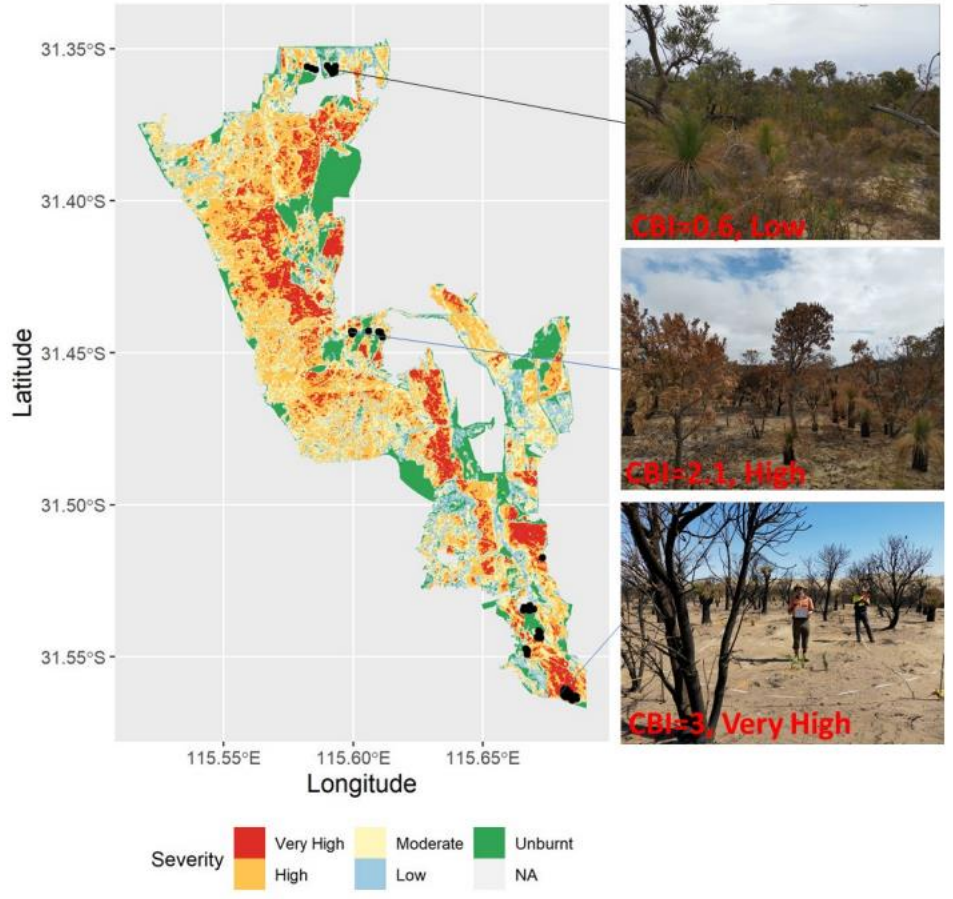


FIG 3. FIRE SEVERITY CLASSES WITHIN THE YANCHEP BUSHFIRE USING RBR THRESHOLDS AND BLACK POINTS REFLECTING CBI PLOTS WITHIN THE BUSHFIRE PERIMETER. PHOTOS AT RIGHT DEPICT A RANGE OF SEVERITY CONDITIONS, MEASURED JANUARY 2020.

Source: YANCHEP BUSHFIRE ANALYSIS – BLACK SUMMER FINAL REPORT | REPORT NO. 726.2022

Natural Hazards Research Australia

WA
Validating fuel moisture estimates in Yanchep

Researchers

A/Prof Marta Yebra and Shukhrat Shokirov at the Australian National University. **Sentinel 2**

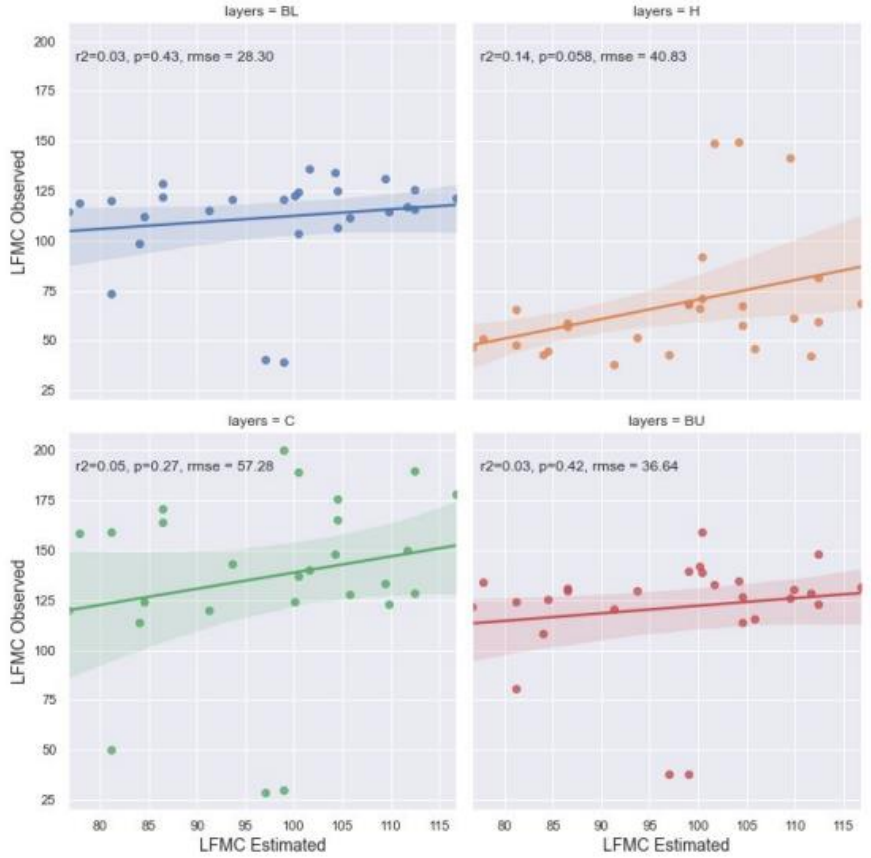


Figure 8. Relationship between observed and estimated LFMC by different vegetation layers (BL - Banksias Lower, BU - Banksias Upper, H - Hibbertias, C - Calothamnus).

Source: VALIDATION OF FUEL MOISTURE CONTENT ESTIMATES FROM THE AUSTRALIAN FLAMMABILITY MONITORING SYSTEMS| REPORT NO. 732.2022

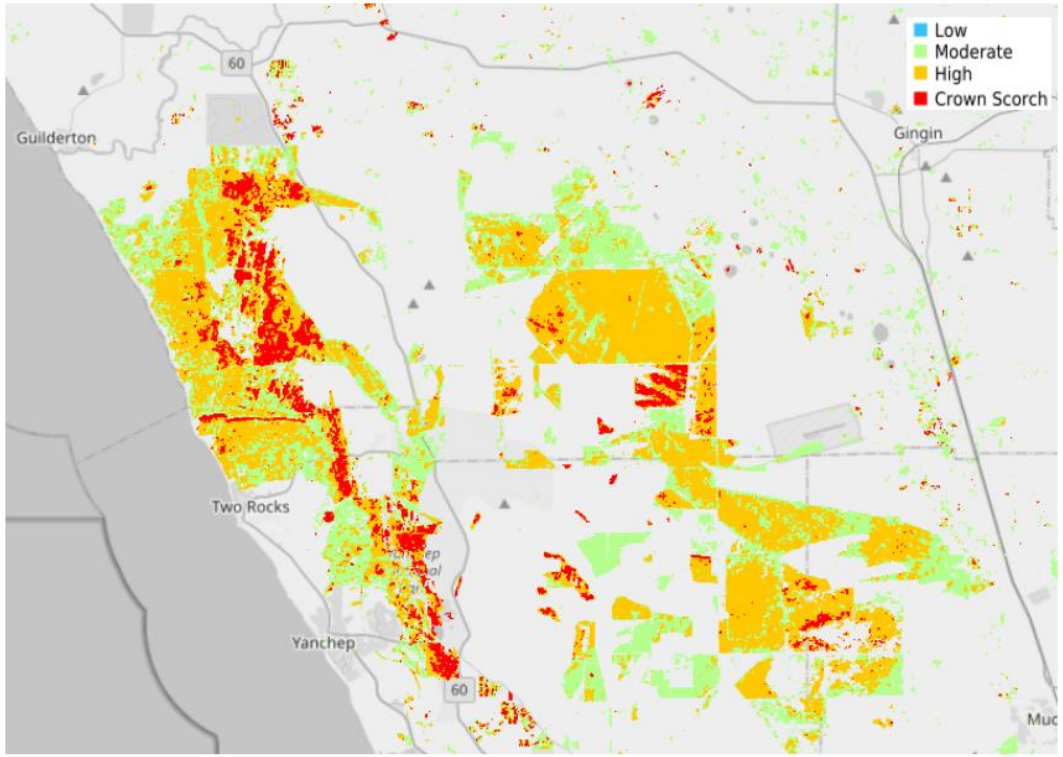
Natural Hazards Research Australia

WA

Fuel moisture and fire history of south-west WA from Sentinel-2 satellite imagery

Researchers

Adrian Allen, Norman Santich and Passang Dorji at Landgate (Western Australia's land information authority), and Agnes Kristina and Jackson Parker at the Department of Fire and Emergency Services (DFES), as part of a larger project with DFES, the Department of Biodiversity, Conservation and Attractions (DBCA), Australian National University (ANU) and Murdoch University.



FIRE SEVERITY HISTORY DEVELOPED FROM 2016 TO 30 JUNE 2021 FROM SENTINEL 2 IMAGERY

Source: ESTIMATING FUEL MOISTURE AND FIRE HISTORY FROM SENTINEL 2 SATELLITE IMAGERY | REPORT NO. 727.2022

Priorities moving forward

The findings of this research were used to inform the national Research Priorities, published by Natural Hazards Research Australia to guide research into disaster risk reduction and natural hazard resilience.

→ Translation of observed and modelled extreme bushfire behaviours to improve fire prediction and fireground safety

→ Understanding the design, communication and dissemination of predictive maps to the public

→ Cultural land management (northern): connecting Indigenous people and the emergency management sector – effective partnerships

→ Cultural land management (southern): cultural land stewardship research in south east Australia

→ Community-led recovery: evidence, dimensions, and supports for Community Recovery Committees

→ Identifying water sources for aerial firefighting

Natural Hazards Research Australia

Research and Implementation

Progress

- 52 active research projects
- 61 postgraduate scholar and associate students
- Data management framework and catalogue to share hazards data being established
- Research informed findings presented at conferences, workshops, seminars and more

More in 2024

- More rounds of research investment
- Commencement of work placement progress
- Thought leadership
- First Nations Scholarship
- Measuring performance

Natural Hazards Research Australia

Be part of the journey

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@hazardsresearch

www.naturalhazards.com.au

NATURAL HAZARDS RESEARCH FORUM

ADELAIDE, 14–16 MAY 2024

rowena.morris@naturalhazards.com.au

Natural Hazards Research Australia

Conclusion

Program

Lesson-management perspective

Moving forward

Research program has been extended by Natural Hazards Research Australia

→ dynamic situational awareness

→ natural hazard focused risk management and risk reduction

→ incident management and decision-making in a dynamic and uncertain environment

→ responsive recovery

→ understanding the needs and values of communities through a natural hazard lens

→ collecting and managing natural hazards research data

Thank-you

Find more information about the Black Summer research program at naturalhazards.com.au/black-summer