To remove or not to remove? That is the question facing fire mangers in windthrown affected landscapes.

Shannon Devenish – Director, Planning and Authorisations
Forest and Fire Operations Division

Energy,
Environment
and Climate Action

CFA

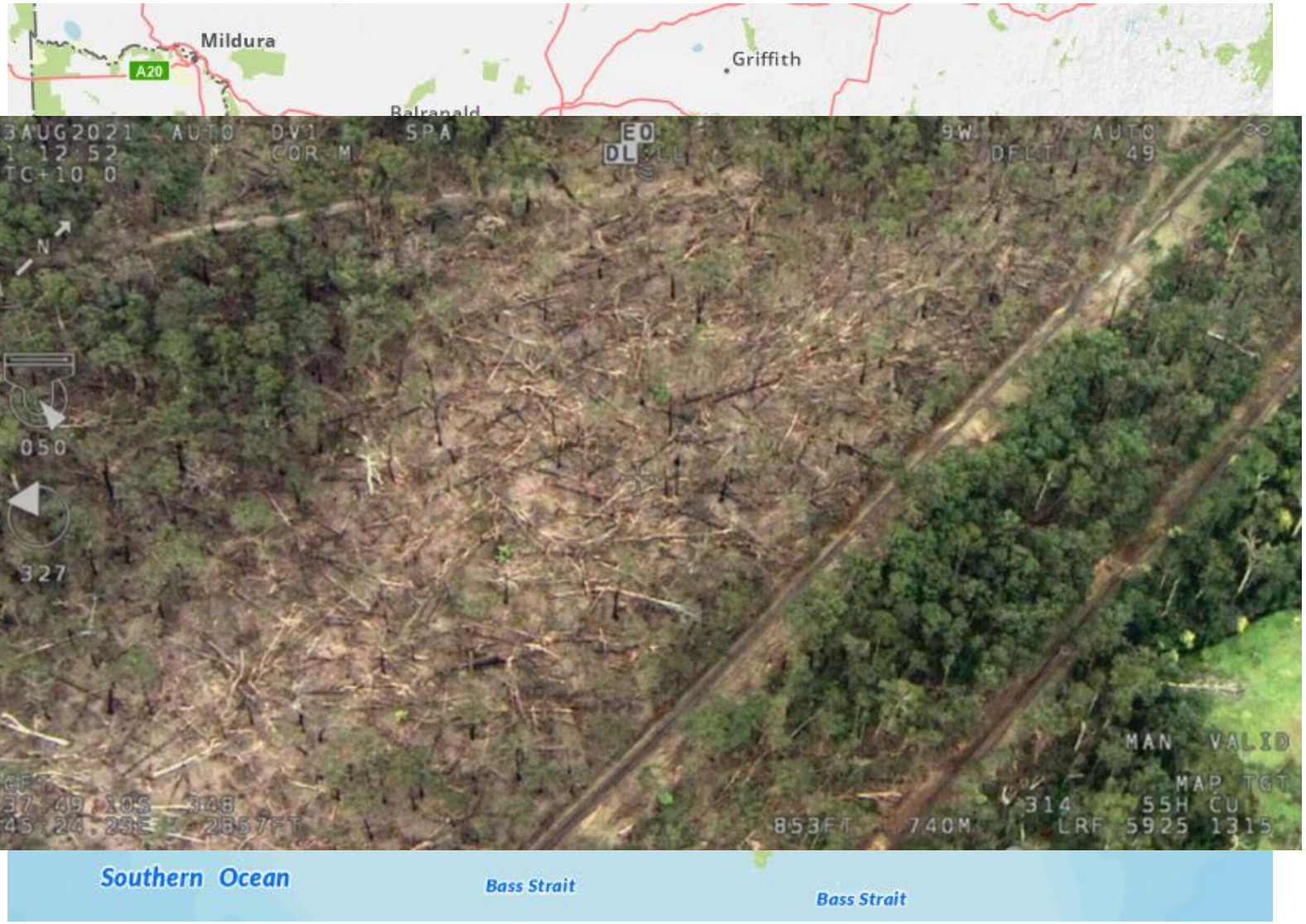
FOREST FIRE MANAGEMENT VICTORIA

We acknowledge and respect Victorian Traditional Owners as the original custodians of Victoria's land and waters, their unique ability to care for Country and deep spiritual connection to it.

We honour Elders past and present whose knowledge and wisdom has ensured the continuation of culture and traditional practices.

DEECA is committed to genuinely partnering with Victorian Traditional Owners and Victoria's Aboriginal community to progress their aspirations.

2021 Storm Event



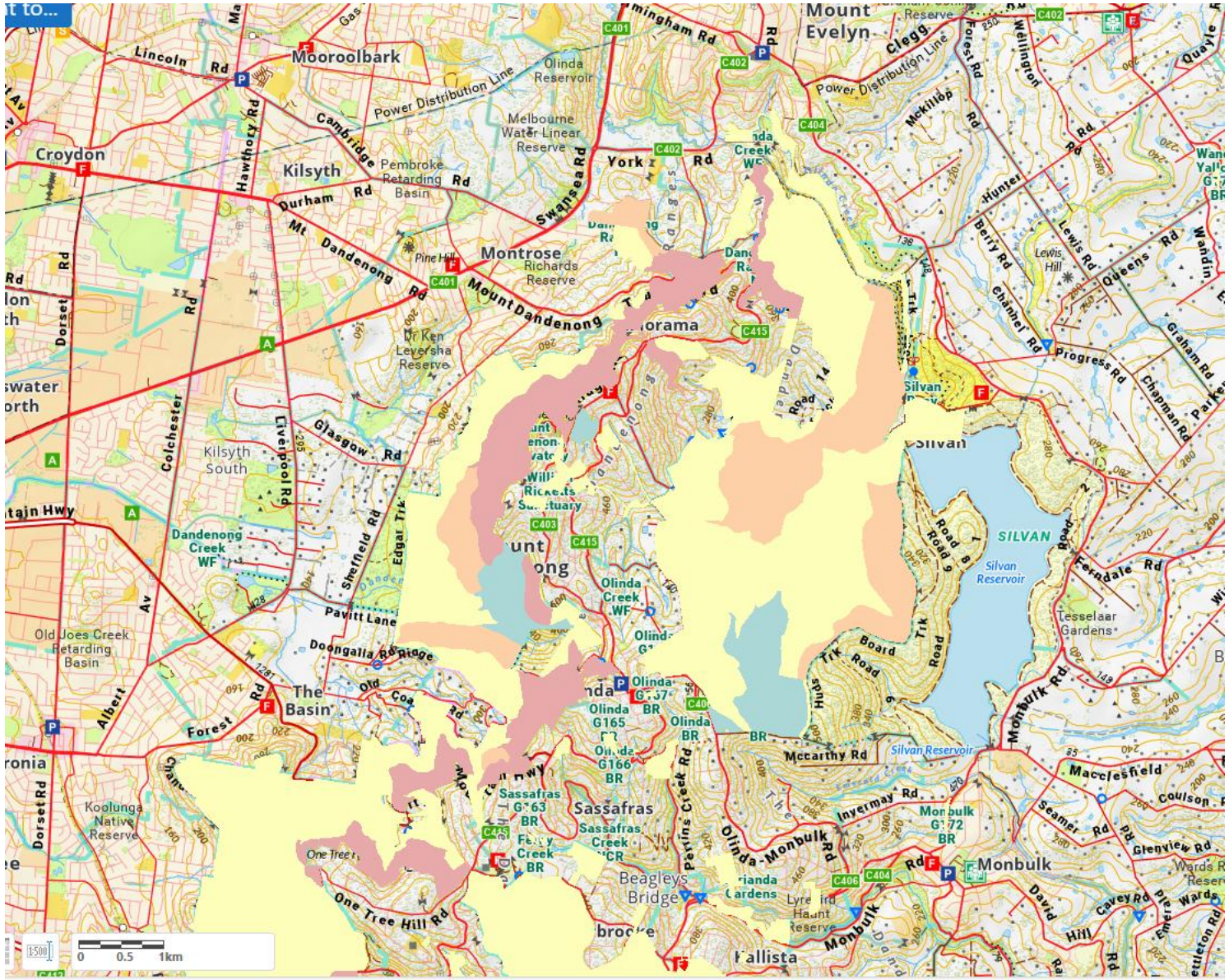
- Destructive winds over 140km/h
- Significant amount of fallen and hazardous trees and debris
- High severity event - >50% decrease in canopy (Fairman et al. 2023)
- Wind-thrown tree stems changed forest structure
  - Increased fuel on forest floor
  - Increased fuel continuity
  - Increased exposure (faster drying)
  - Vertical to horizontal
  - Soil moisture – runoff patterns impacted
- After emergency response major cleanup remained.

“The Dandenong's”

Silvan Reservoir and Water Treatment Plant


Greater
Melbourne
Greenvale
Yan Yean
Sugarloaf
Maroondah
O'Shannassy
Upper Yarra
Thomson
Silvan
Tarago
Cardinia

Silvan Reservoir Case Study



Fire Management Zones

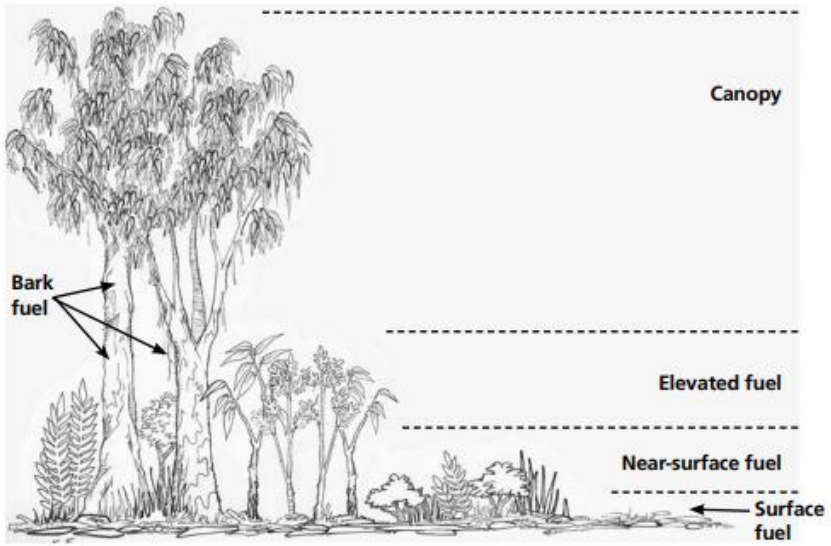
- 1 - Asset Protection Zone
- 2 - Bushfire Moderation Zone
- 3 - Landscape Management Zone
- 4 - Planned Burn Exclusion Zone

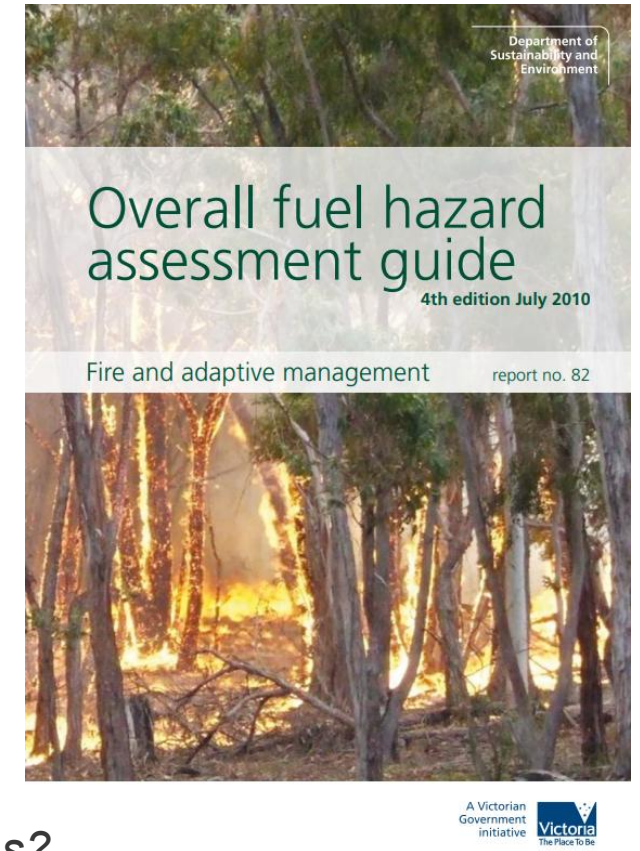
Balancing competing interests

Fuel classification

Fine Fuels:

- dead plant material <6mm diameter, live material <3mm diameter
- High surface-area-to-volume ratio – dry out quickly and ignite easily
- Contribute to fire initiation and rapid spread
- Main focus for fire managers to assess direct attack effectiveness and FROS





How do coarse fuels (fallen trees, branches and stumps) contribute to bushfires?

- Limited peer-reviewed research in Australian literature
- Not part of documented fuel classification system
- Contribution to bushfire risk not well understood by community and stakeholders

BUT

- Operational experience tells us high volumes of coarse fuels = increased bushfire risk

Addressing the knowledge gap

- Aim:

To synthesize current operational knowledge and practices and peer reviewed literature to provide a comprehensive understanding of the risks associated with coarse fuels from storm events as they relate to fire behaviour, bushfire suppression effectiveness and planned burning.

Coarse fuels – evidence and experience

Darcy Prior, Andy Ackland, Mike Ryan, Glenn Rudolph, John van de Paverd, Shane Vandenborn, Angus Williamson

Literature

- ↑ Fire intensity
- ↑ Residence time
- ↑ Convection column development
- ↓ Overnight RH recovery
- ↑ Spotting production and distance
- ↑ Chance of reignition
- ↑ Smoke
- 😉 Fire behaviour

Operational Experience

- ↓ Access
- ↓ Extinguishment
- 😉 Fire behaviour
- ↓ Safety

Tim Gazzard,
Trevor Dess

Access – Travel time and first attack success

- Modelled using real time travel and control line construction data
- Response times of D4's (FAD) most heavily impacted with average response times increases by >2 hours
- D6 delayed by average of 30mins
- Used to model probability of first attack success in storm affected versus non storm affected areas
  - Reduced probability of first attack success
  - 10-fold decrease that fire would be contained in the first 2 hours (21% down to 2%)
  - Increased number of buildings and agricultural land impacted
  - Driven by delay in plant access and control line construction, in turn delaying ground crews
  - Fire grows bigger and has greater impact

More difficult extinguishment – Learmonth Creek Road Fire 2014

- *A parallel can be drawn between bushfires in logging coupes and what would be expected when supressing bushfires in areas with coarse fuels.*

- The Learmonth Creek Road fire:
  - Started in an active logging coupe at **18:00** on **27th January 2014**
  - Fire **contained** by **03:00 on 28th February** to **22ha**
  - Bark stack **re-ignited** 12 days later on the **9th February -** "spike day" with strong NW winds.
  - Fire was **contained** on **12th February** at **720ha**.

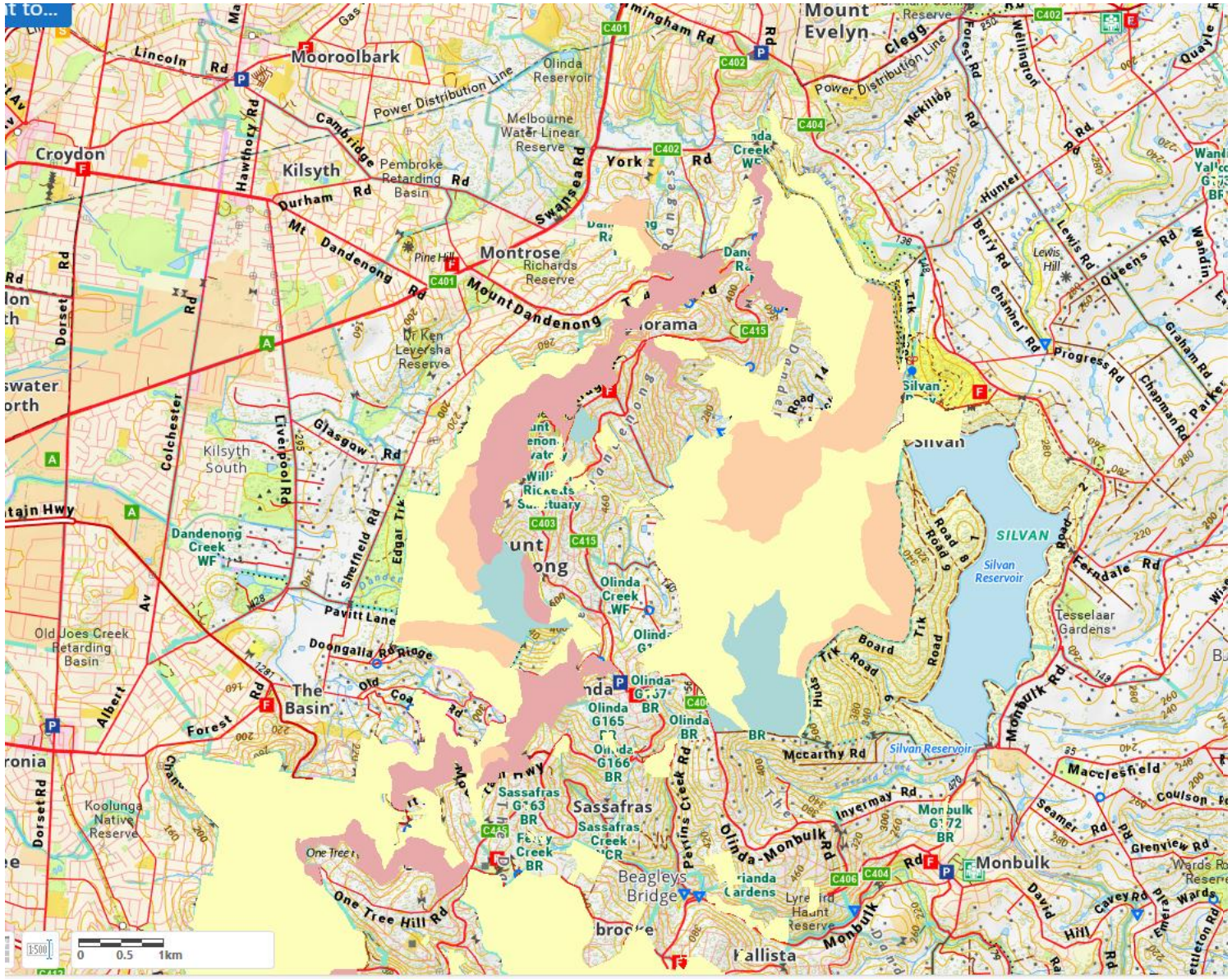
- Lessons learnt
  - The combination of **heavy** and fine fuels **increased fire intensity, spread, spotting** and **radiant heat** making it **unsafe** for **direct attack** from ground crews
  - The fire **spread quickly** as the material was **fully available**, having dried out due to **lack of canopy**.
  - **Debris piles** burnt over the top appeared fully **blacked out** but **re-ignited** under hot windy conditions
  - The **heavy debris** made **control line construction difficult** and **time consuming**.
  - D4 and D6 **dozers** were **critical** to **contain** the fire **safely** using parallel attack

To remove or not to remove – context is important

- Decision support framework:
  - Step 1 – Determine objectives
  - Step 2 – Risk assessment – decision support model (SOP 3.5.9 Post wind event debris management)
  - Step 3 – Define control strategy
    - Mulching/chipping
    - Pile burning
    - Planned burning
    - Mechanical removal
    - Thinning and regeneration
    - Combinations and staging
    - No intervention
  - Step 4 – Plan and implement strategy
  - Step 5 – Monitor and review

- Approach can be applied either immediately following event (preferred) or to historic events

Step 1 – Determine Objectives



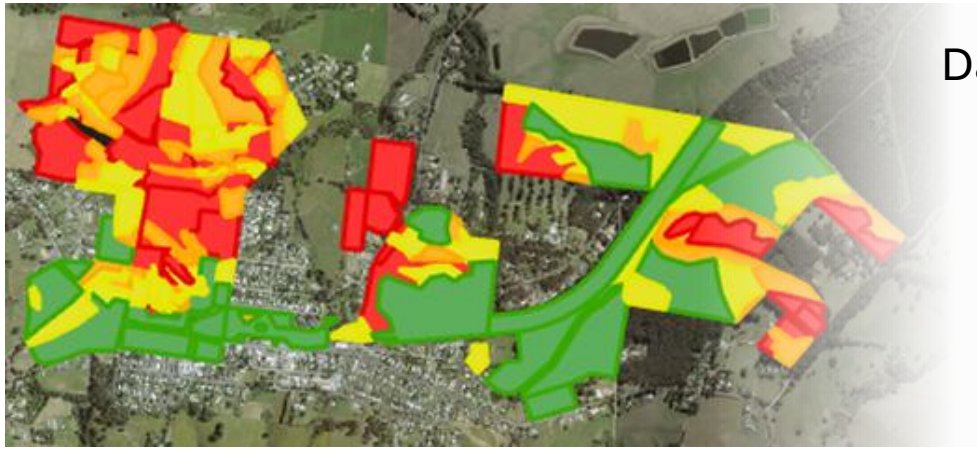
Red - *to provide the highest level of protection to human life and property by reducing radiant heat and ember attack during the event of bushfires*

Orange - to reduce the speed and intensity of bushfires by complimenting the APZ in protecting assets, particularly from ember spotting.

Yellow – to *reduce landscape fuel and bushfire hazard, support ecological resilience through appropriate fire regimes, and land management for particular values (e.g. forest regeneration and water catchments) at a landscape level*.

Blue – *exclude the use of planned burns*

Step 2 – Risk Assessment

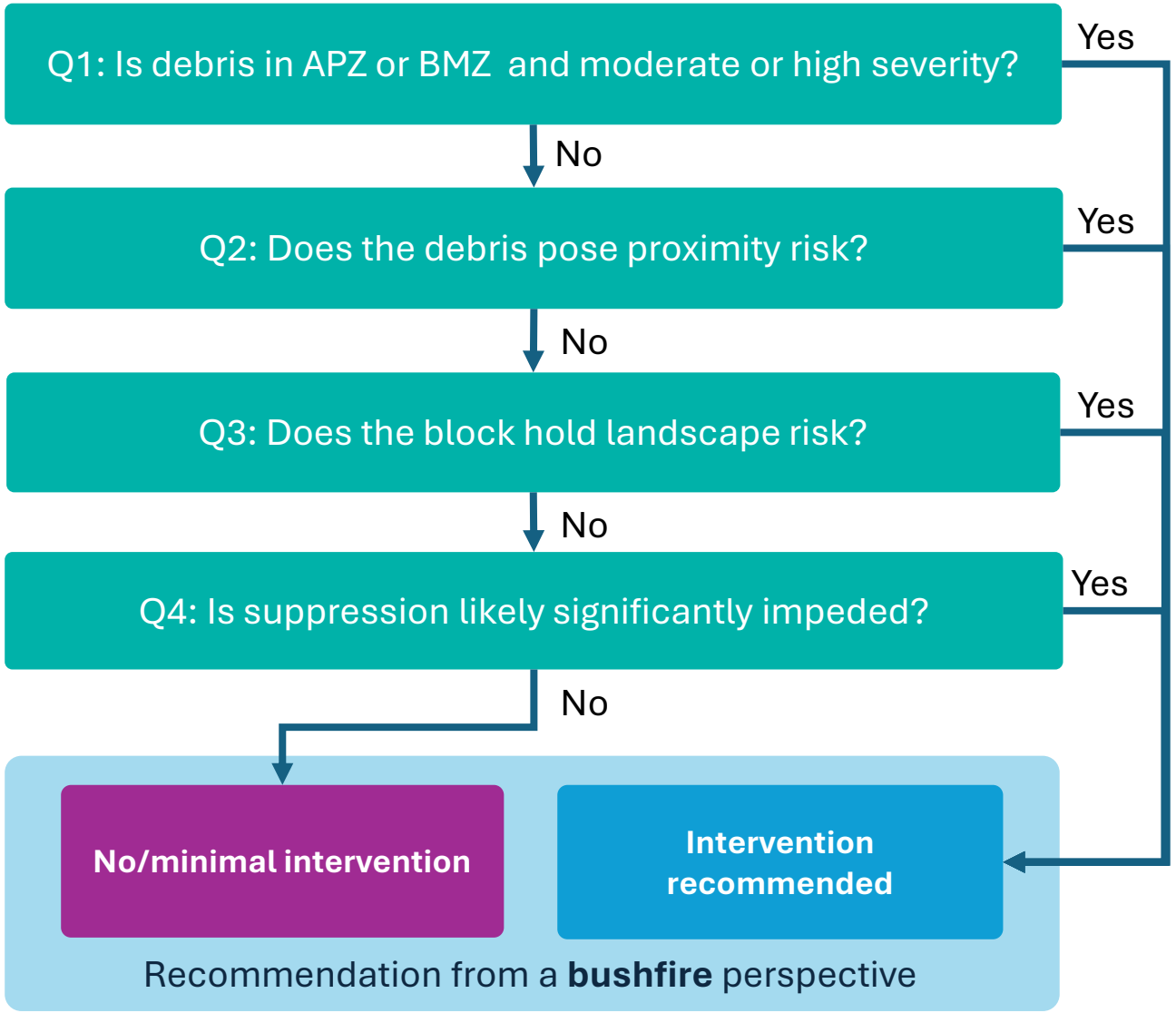


Damage mapped and classified from aerial / drone imagery

- High impact: majority canopy loss and extensive tree fall (> 50%)
- Moderate impact: patchy canopy loss with moderate tree fall (30% - 50%)
- Lower impact: retained canopy with some tree fall (< 30%)
- Minor or no remotely-visible canopy damage

Fuel Management	Proximity	Landscape Risk	Suppression
Fire Management Zone	Distance from: - Nearest dwelling - Nearest township	Modelled fire spread from all Risk 2.0 ignitions impacting on surrounding localities	Size of largest discrete patch for each damage class

Step 2 – Risk Assessment – Decision Support Tool



Q1 guidance		Fire Management Zone		
		APZ	BMZ	Other
Severity	Low	No*	No*	No
	Moderate	Yes	Yes	No
	High	Yes	Yes	No

*Yes if planned burn delivery impeded by debris

Q2 guidance		Distance to building	Distance to township boundary		
		0-100m	0-100 m	100-1,000 m	> 1,000 m
Severity	Low	No	No	No	No
	Moderate	No	Yes	No	No
	High	Yes	Yes	Yes	No

Q3 guidance		Fire catchment potential		
		Low	Moderate	High
Severity	Low	No	No	Yes
	Moderate	No	Yes	Yes
	High	No	Yes	Yes

Q4 guidance		Patch size		
		0-5 ha	5-10 ha	> 10 ha
Severity	Low	No	No	No
	Moderate	No	No	Yes
	High	No	Yes	Yes

Step 3 – Define the control strategy

- Once the risk assessment is complete, the control strategy must be developed which will consist of one or more management actions:
  - *Mulching / chipping*
  - *Pile burning*
  - *Planned burning*
  - *Mechanical removal*
  - *Regeneration and thinning*
  - *Combinations and staging*
  - *No intervention*

Stage 1 - Removal of logs along track edges and internal fuel breaks – Winter 2024 – delayed to Spring 2024
Stage 2 – removal of coarse fuel within two burn units to enable planned burning in future – Summer 24/25
Stage 3 – investigate need to re-seed and thin to support forest structure development

Step 4 – Plan and Implement the strategy

- The management actions identified in the control strategy have been planned through DEECA's operational and tactical planning processes.
- Considers the
  - specific requirements of each site and how to minimise impacts to other values during the works.
  - Includes specific mitigations for any threatened species or cultural values identified in the work site.
  - Mitigations are endorsed by biodiversity experts and Traditional Owners.
  - The works are also approved by Parks Victoria as the land manager.

Step 5 – Monitor and Review

- Forest structure monitoring program
  - increasing understanding about regeneration following disturbance events.
  - inform decision making about the need to plan and implement a thinning or re-seeding management action in the future.

- Biodiversity surveys
  - Increased understanding about impact of disturbance events to threatened species
  - Within and outside intervention areas, and storm impacted and non-impacted areas

- Using an adaptive management framework to test, learn and refine the management actions through practice.

Report Recommendations

1. Define treatment targets for coarse fuel based on bushfire risk and forest health outcomes
2. Targeted mapping and treatment of coarse fuels where they present a significant bushfire risk using one or more control strategies
3. Embed tactical considerations in doctrine and training for both bushfire and planned burning
   - e.g. key message in all pre-season briefings
4. Prioritise and develop plan to address key knowledge gaps
5. Increase community engagement and education

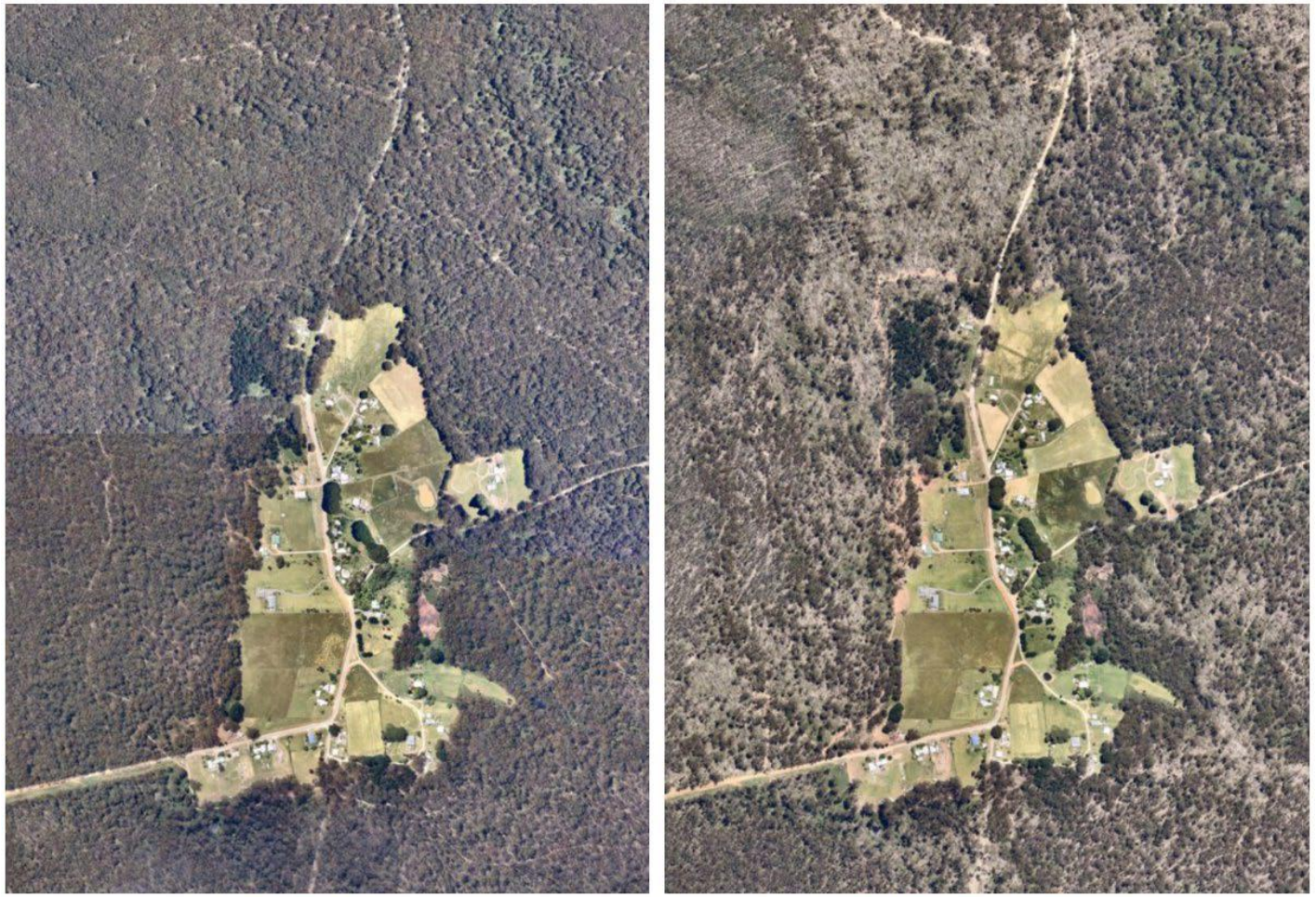
The Crack team of experts

- **Project Sponsors:** Chris Hardman Alen Slijepcevic
- **Project Lead** – Shannon Devenish
- **Project Coordination** – Angus Williamson
- **Fire Behavior Team** - Darcy Prior, Andy Ackland, Mike Ryan, Michael May, Mitch Stevens, Tim Gazzard
- **Operational Team** - Glenn Rudolph, John van de Paverd, Shane Vandenborn,
- **Reviewers** – Tom Fairman, Jane Cawson

Questions

References

2021 Storm Event



December 2020 December 2021

Aerial imagery showing the change to the Wombat SF, adjacent to Barkstead community following the June 2021 storm (Nearmap Imagery)

- Destructive winds over 140km/h
- Significant amount of fallen and hazardous trees and debris
- Wind-thrown tree stems changed forest structure
- Initial clean up delivered as “emergency response” under the Emergency Management Act
- Remaining works left to land and/or fire managers.

Forest structure following windthrow events

- High severity event - >50% decrease in canopy (Fairman et al. 2023)

- Windthrow events change forest structure:
  - Increased fuel on forest floor
  - Increased fuel continuity
  - Increased exposure (faster drying)
  - Vertical to horizontal
  - Soil moisture – runoff patterns impacted

WHY IS MELBOURNE'S DRINKING WATER SO GOOD?

Melbourne Water