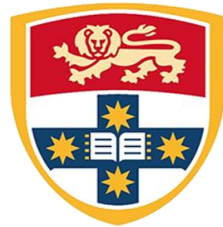


Bad things happen: impacts of wildfires on wildlife

Chris Dickman



THE UNIVERSITY OF
SYDNEY

Bad things are happening with climate change

- Global warming will affect everything – local, regional, continental and global climate, sea levels
- Increased frequency and severity of extreme events, such as:
 - Floods, droughts, heatwaves, cyclones, storm surges and **wildfires**
- Focus here on the ‘Black Summer’ fires of 2019-2020 in Australia
 - What are the impacts on wildlife, and what can we do?

The background - 1

“Recent projections of fire weather ... suggest that fire seasons will start earlier, end slightly later, and generally be more intense. This effect increases over time, but should be directly observable by 2020” (Garnaut Climate Change Review 2008)

Images: ABC

Grass fires



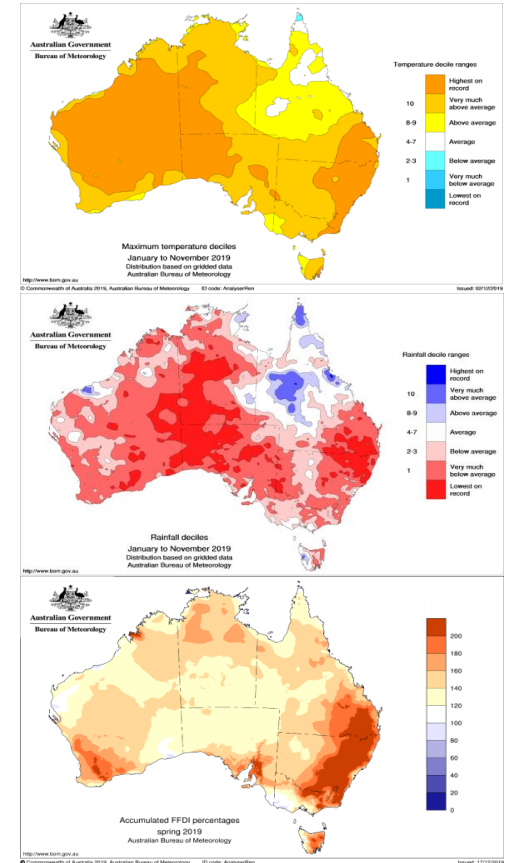
Forest fires



The background - 2

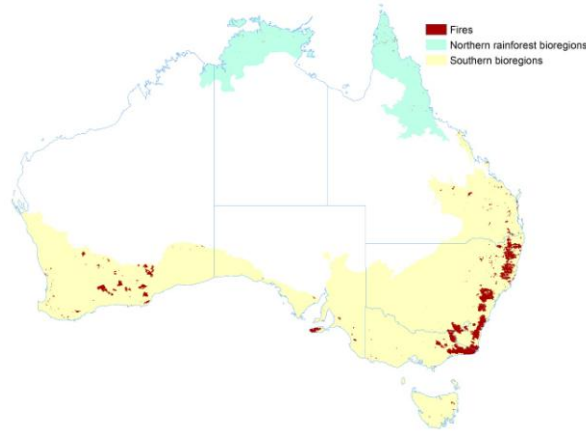
- 2019 – very hot, very dry → Extreme forest fire danger index
- Spot fires began August 2019; main fire season Nov 2019 – Feb 2020
- Fires out by early March 2020, later in WA

Images: Bureau of Meteorology

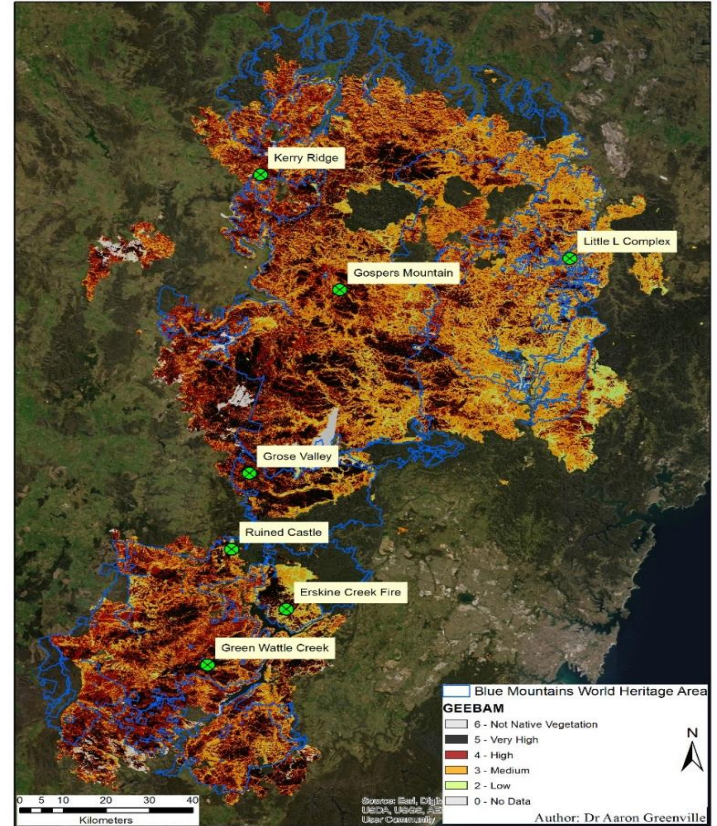


Magnitude of the fires

- Fires burned ~18.6 m ha, 11.5 m ha in forest & woodland*
- Largest fires in SE and SW, smaller fires across Top End
- Variable intensity/severity
- Season described as 'season from hell', 'unprecedented'
- Largest forest fires recorded (*cf.* California, Siberia, Brazil, Indonesia etc), World Heritage sites, rainforests affected



*Possibly less according to recent studies



GEEBAM mapping – courtesy A. Greenville

Impacts of the fires

- 33 human fatalities, ~400 **smoke-related** deaths, >3,000 homes destroyed
- Massive infrastructure loss and damage
- Smoke hazard effects from 'PM2.5' particles felt by many people in towns and cities; smoke carried to South America
- Overall cost* to Australia: >\$10 billion (Royal Commissions), \$100 billion (J. Quiggin, UQ)
- *Costs to wildlife *not* included



Kangaroo Island, before & after

Impacts of the fires on wildlife - 1

- **Individuals:**
 - 2.46 billion reptiles
 - 181 million birds
 - 144 million mammals, inc. 4.96 million kangaroos & wallabies, and 38.93 million possums & gliders
 - 61,000 koalas
 - 51 million frogs
 - Up to 240 trillion inverts (C. Reid)
- Estimates based on extrapolations of densities across bioregions + modelling

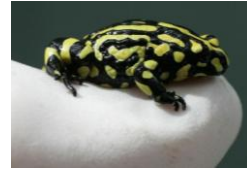


PHOTO: A kangaroo races to escape a grass fire in outer Lithgow. (ABC News: James Carmody)



Image: *The Australian*

Impacts of the fires on wildlife - 2

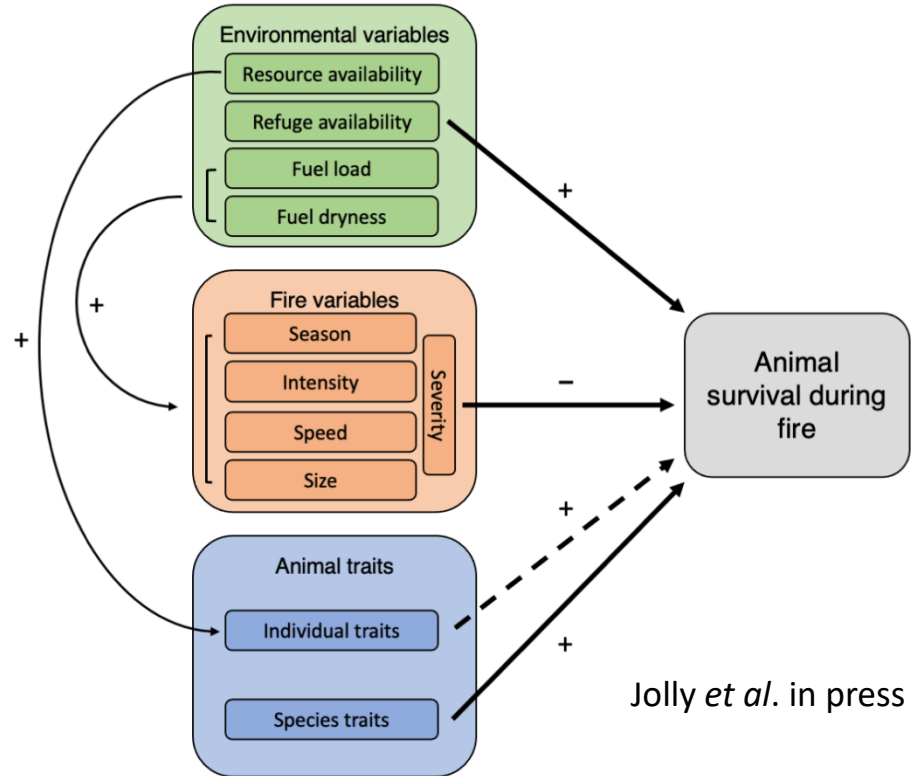
- **Species and communities:**
 - 832 native vertebrate species had ranges in the path of the fire (Ward *et al.* 2020)
- **Species*** needing urgent attention:
 - 119 species of vertebrates (+ crayfish included in this tally)
 - 191 species of invertebrates
 - 471 species of plants
 - many more prioritised for assessment
- **Ecological communities*** needing urgent attention:
 - 37 (of 84 EPBC Act-listed communities)
- *Assessments made by the Wildlife and Threatened Species Bushfire Recovery Expert Panel & collaborators



Impacts of the fires on wildlife – 3(i)

Were animals *killed* or *affected*?

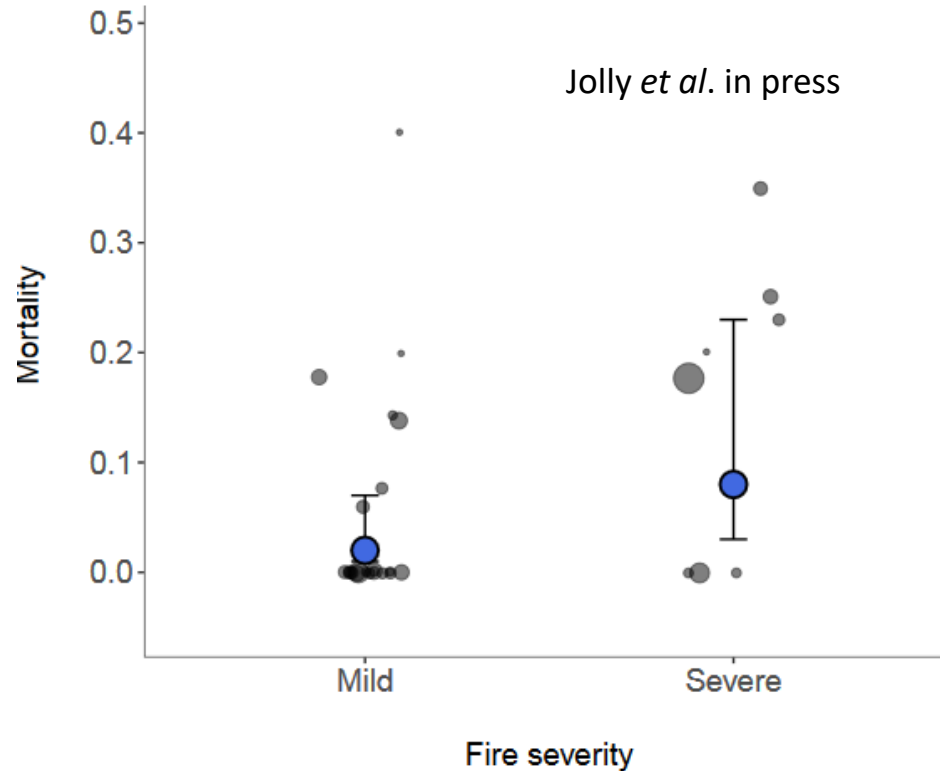
- Effects of fire vary with environmental variables, fire variables and animal traits
- Death by burning / smoke inhalation *not* inevitable



Impacts of the fires on wildlife – 3(ii)

Were animals *killed or affected*? – *lit review*

- Global meta-analysis of radio-collared wildlife ($n = 43$ studies) shows that direct fire mortality is **low**: 2 – 7%
- Most animals survive!



Impacts of the fires on wildlife – 3(iii)

Were animals *killed* or *affected*? – field surveys

- **Mammals:**

- Blue Mountains: *all* greater gliders and yellow-bellied gliders lost in severe fires (Smith & Smith 2021)
- Victoria: glider losses of 43-92%
- Alpine areas: losses of >75% for populations of broad-toothed rats, spotted-tailed quolls (van Eeden & Dickman in press)

- **Huge losses!**



Dave
Nelson



Aust.
Geog

Impacts of the fires on wildlife – 3(iii)

Were animals *killed* or *affected*? – field surveys

- **Birds:**

- NSW: eastern bristle bird habitat burnt, large pop reduction
- East Gippsland: sooty owls detected at 3/37 burnt sites, powerful owls at 2/37 and masked owls at 0/37 burnt sites
- Glossy black cockatoos reduced from 36% of survey sites to 6.5% (van Eeden & Dickman in press)

- **Huge losses!**



Birdlife Action Network



Peter Menkhorst

Impacts of the fires on wildlife – 3(iii)

Were animals *killed* or *affected*? – field surveys

- **Frogs, fish, crayfish:**

- Blue Mountains: Blue Mtns tree frogs and leaf-green tree frogs detected at 57% and 73% of sites post-fire
- Victoria: Spotted tree frogs, Booroolong frogs, green-and-golden bellfrogs, Keferstein's tree frogs, Martin's toadlets detected at 36 - 65% of sites post-fire
- Crayfish, some galaxiid nos down 70% (van Eeden & Dickman in press)



NSW NPWS &
Environment Vic



- **Huge losses!**

Impacts of the fires on wildlife – 4

Were animals *killed* or *affected*? Summary

- Direct impacts of fires on wildlife – even severe ones – can be small
- True for Black Summer fires? Perhaps, but these fires were unprecedented; many species also in bad shape due to drought and heatwaves pre-fire (e.g., koalas, flying-foxes)
- **Post-fire impacts** likely to have been especially severe: loss of habitat, food, predation



Kerryn Parry-Jones

But there was some good news ...

- Post-fire rains stimulated regrowth (but leaf litter, logs, hollows will take longer)
- Post-fire surveys indicate good survival of some species and ecological communities (e.g. dunnarts, pink slugs)
- Fox and feral cat activity not as pervasive in burnt forest as feared
- Community galvanised: huge interest and concern
- Government non-government and management agencies responded



Community responses

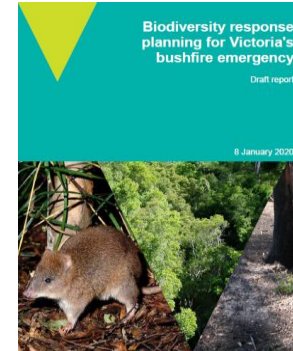
- Pro-active management (e.g., added food, water, shelter), huge carer response + surveys
- Targeted asset protection (e.g., Wollemi pines)
- Erection of predator-proof fencing – Kangaroo Island
- Translocation of animals near fire front, drones, heat-sensors
- \$\$ commitments at state and federal levels, donations to NGOs
- Emergency response at all levels
- **But:** how prepared will we be for the next mega-fire season?



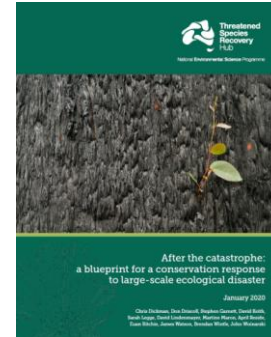
Department of Planning, Industry and Environment
**Wildlife and Conservation
Bushfire Recovery**
Immediate Response January 2020



environment.nsw.gov.au



VICTORIA
Department of Environment, Land, Water and Planning



Some welfare implications - 1

- Huge nos of animals brought into care
- Carer organisations, facilities, resources, volunteers, vets overwhelmed; burn-out and stress
- The care conundrum: what next for animals in care?



Nine News Network

Some welfare implications - 2

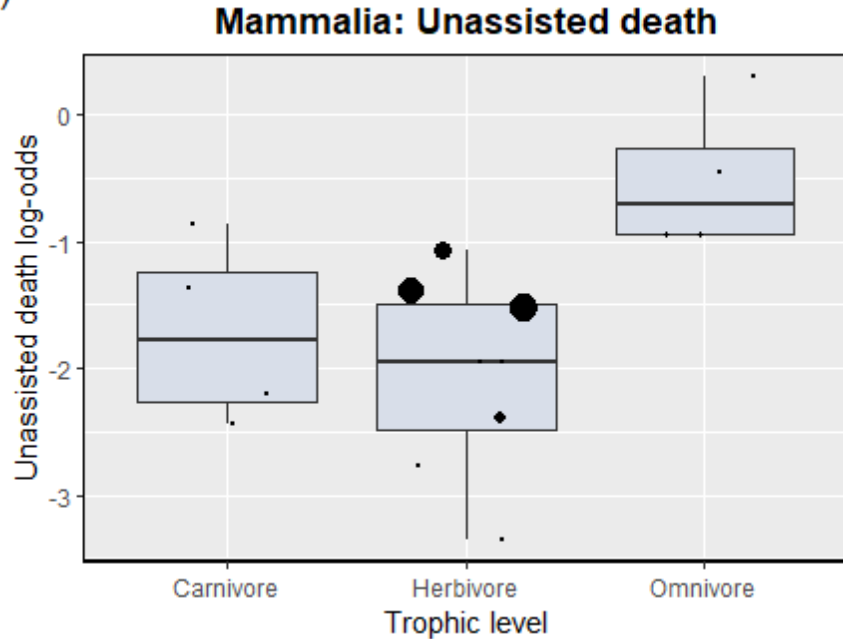
- The care conundrum:
 - triage?
 - euthanasia?
 - resources needed for care and rehabilitation?
 - can animals be released and, if so, where?
 - survival prospects?
 - monitoring
- What do we know?



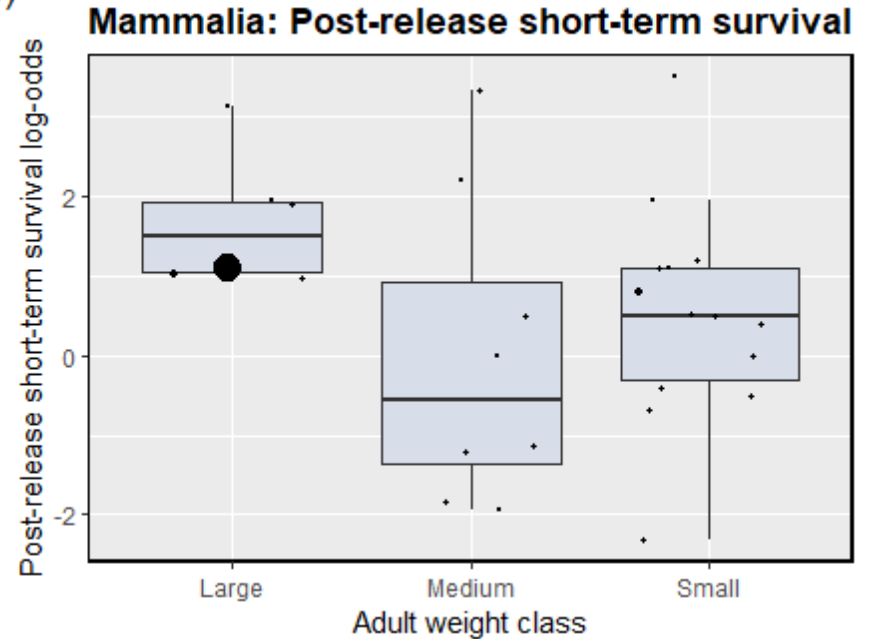
Nine News Network

Some welfare implications - mammals

a)

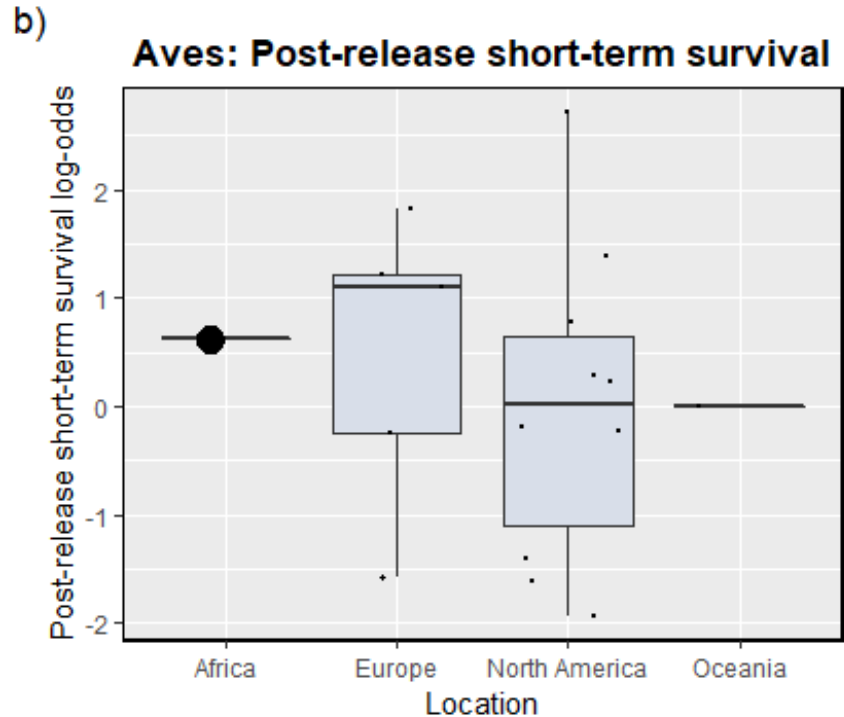
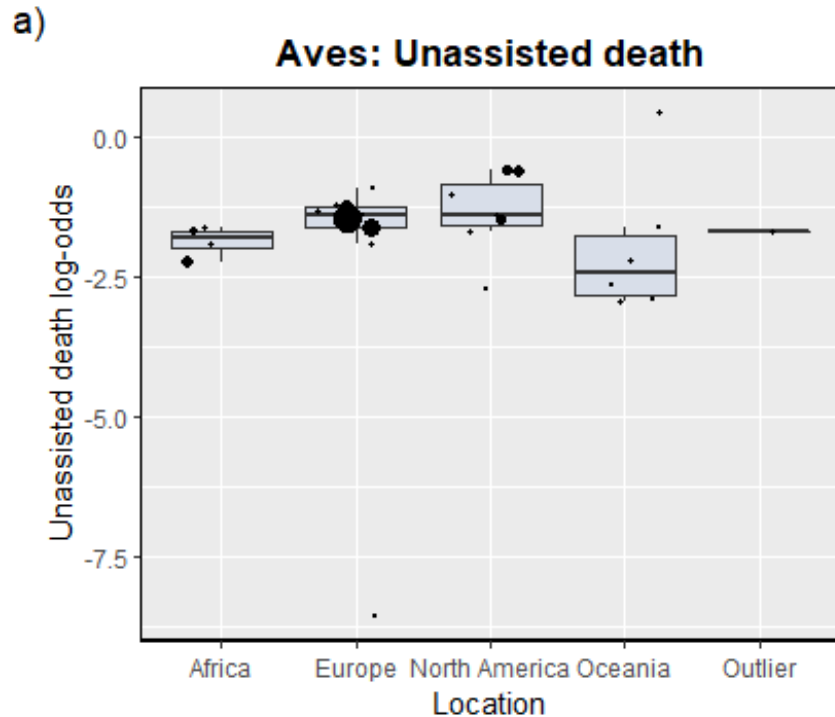


b)



Literature review ($n = 125$ studies) by Cope *et al.* in review indicates survival differences between mammals of different size and diet in care and post-release: **context is crucial**

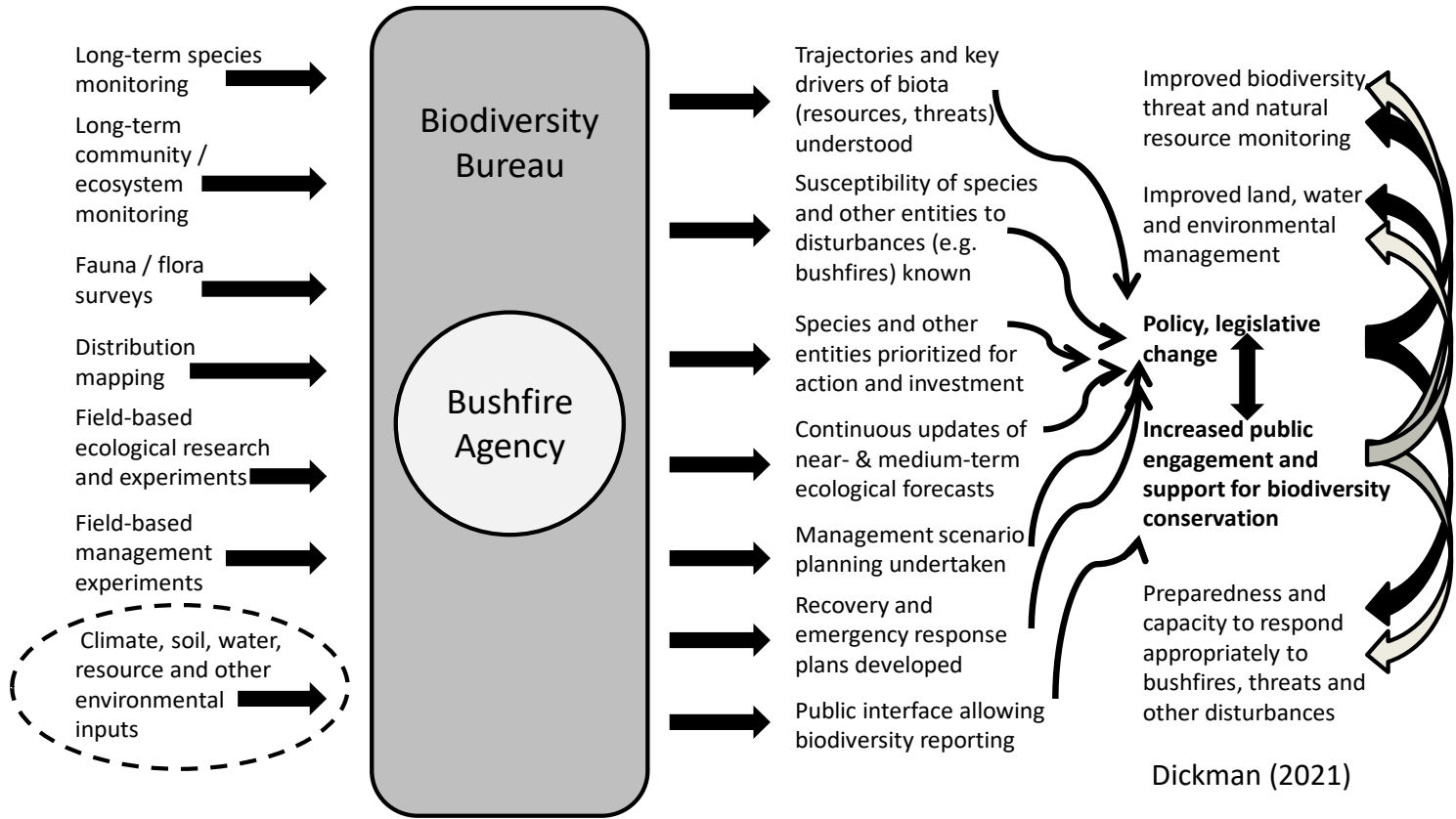
Some welfare implications - birds



Literature review ($n = 125$ studies) by Cope *et al.* in review indicates survival differences between birds in different geographical locations: **context is crucial**

The future ...

- **Some suggestions:**
 - **Increase monitoring**, adaptive management, and \$\$ to fund it; citizen science
 - Improve fire prevention and management / Traditional Knowledge
 - Identify species / communities of most concern and reduce risk of high intensity fires / protect during fires
 - Identify key resources needed by wildlife post-fire and plans to deliver them post-fire *in situ* (e.g., food, water supplements) and *ex situ* (e.g., care and rehab); mitigate threats
 - Improve habitat connectivity + protect unburnt vegetation
 - Establish rapid response teams to act swiftly post-fire; include actions in recovery plans
 - Move **rapidly** to decarbonise
- Policy changes ..? Government round tables, state bushfire inquiries, Senate Inquiries (EPBC Act, Fauna Extinction Crisis) – Royal Commission: 80 recommendations about what to do ...
- Establish a **Biodiversity Bureau**



Conclusions

- Bad things happen, like the Black Summer fires
- Effects on animals, plants and ecological communities can be severe, and will worsen with climate change
- Better management /resources needed for individual animals that are affected, and their carers, as well as populations in the post-fire environment
- Many recommendations have been made to prepare us for the next 'bad things'; continued public support and political courage will be essential for these preparations to be effective
- Scope / value for a Biodiversity Bureau?

Thank you!

Any questions?