

# The Southern Superb Lyrebird: an ecosystem engineer and impacts of the 2019/20 megafires on its habitat



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# Overview

Part 1

- Introduction to 'ecosystem engineering'

Part 2

- A dose of lyrebird ecology

Part 3

- Lyrebirds as ecosystem engineers... what's the evidence?

Part 4

- The big picture in a landscape changed by fire

Part 5

- Implications for future lyrebird conservation



# Ecosystem engineers

- What is an ecosystem engineer?

“Organisms that physically modify, maintain, create or destruct habitats” – Jones *et al.* 1994

Three criteria (Cuddington *et al.* 2011):

- a) Cause structural change to environment (larger than background variation)
- b) Other biota must be sensitive to the type and degree of change
- c) Biotic response must be greater than that caused by background variation



# Australian context: Digging ecosystem engineers impact litter and soils



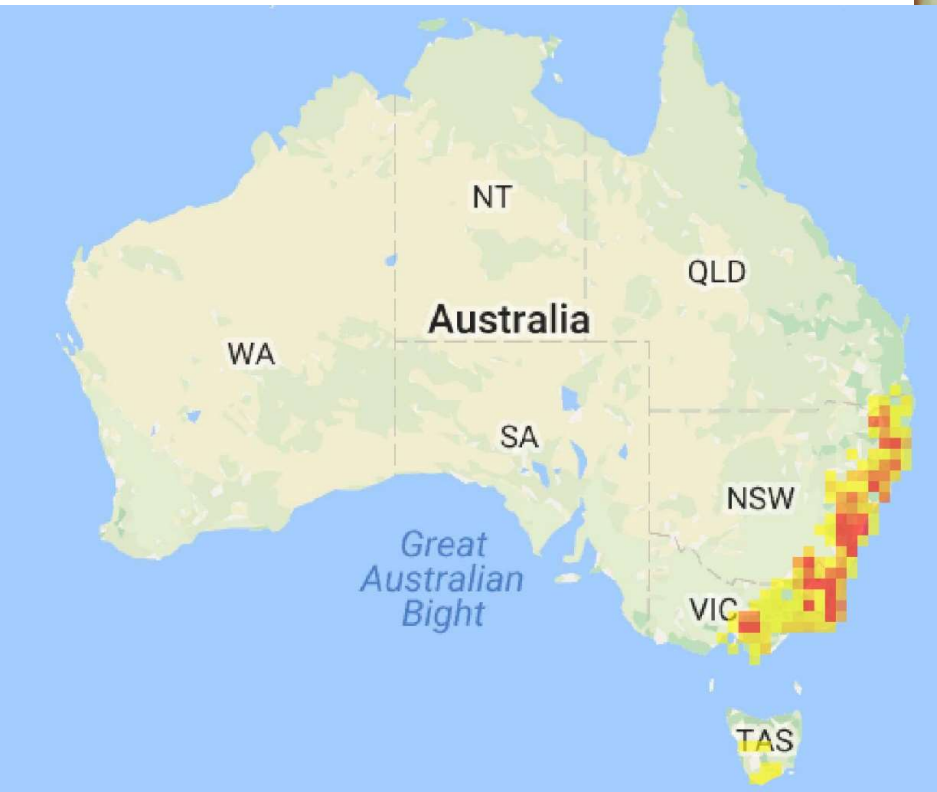
# Lyrebird ecology



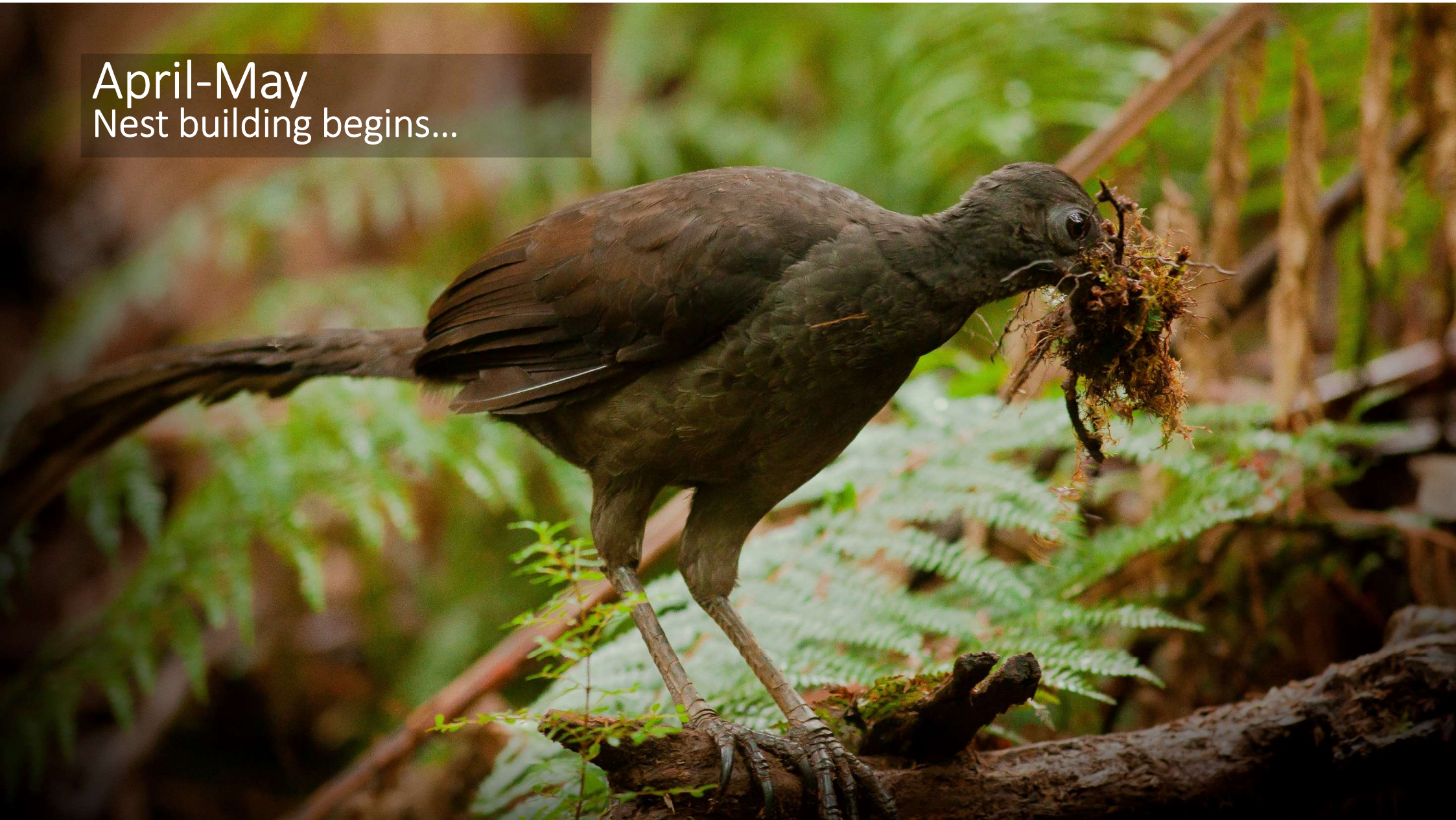
# The Superb Lyrebird (*Menura novaehollandiae*)

- Complex courtship displays – famous mimicry
- Long-lived passerine
- Slow reproduction
- Forages for invertebrates in litter and soil





April-May  
Nest building begins...





# Nest

- Domed structure
- Ground level to 15m



## Male courtship

- Winter breeding
- Male constructs earth mounds for display
- Sings loudly to tell other lyrebirds he has a territory





Single egg clutch  
Prolonged incubation

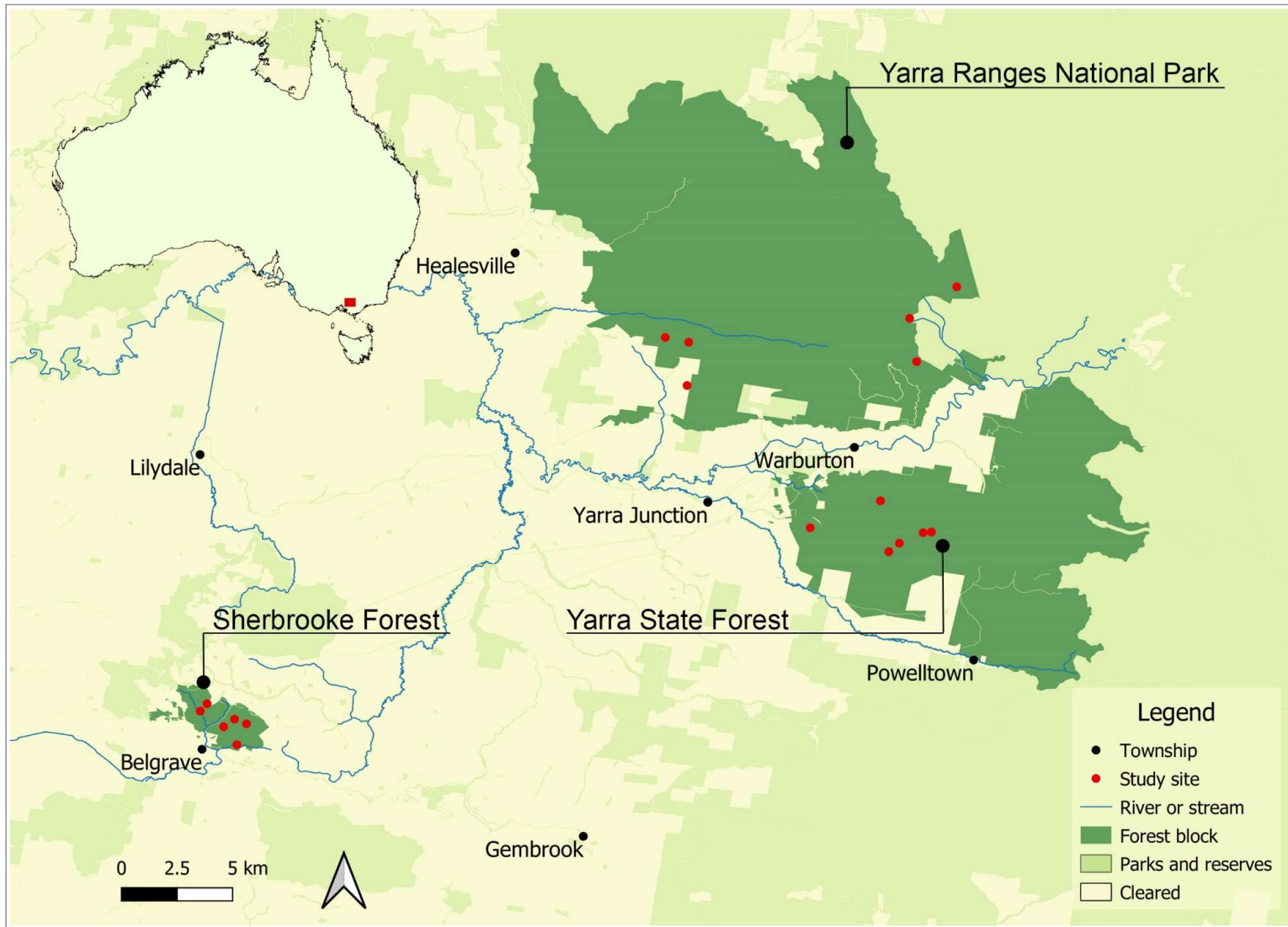


# PhD first questions

- How much soil do lyrebirds displace when foraging?
- Does this activity affect litter depth?



# Study location



# Experimental treatments



Vegetation structure  
Soil compaction  
Soil movement

Litter depth

Seedlings  
Floristic composition  
Invertebrates

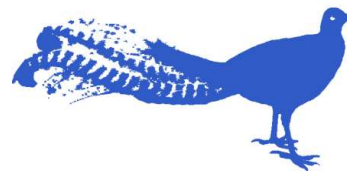
Lyrebirds move LOTS of litter and soil!







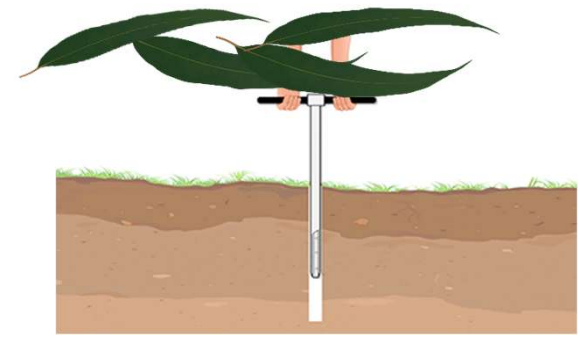
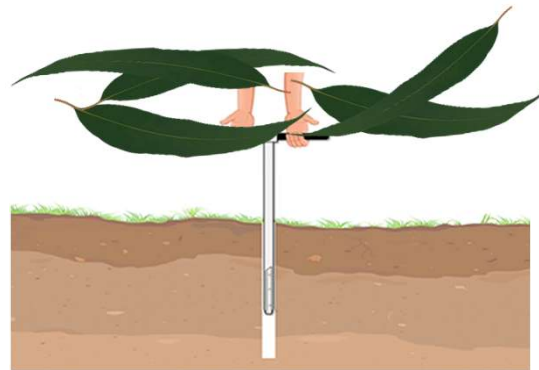
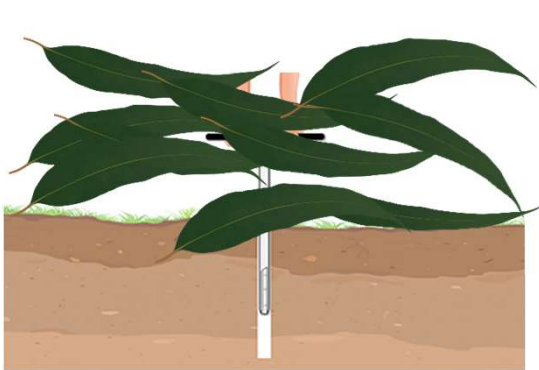
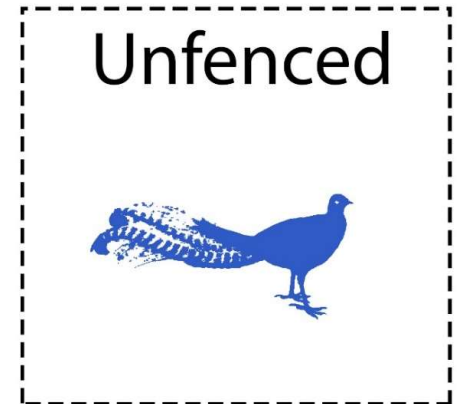
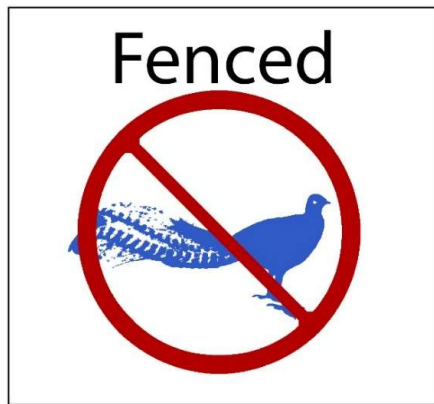
Standard Superb Lyrebird  
(weighs in at ~900g)



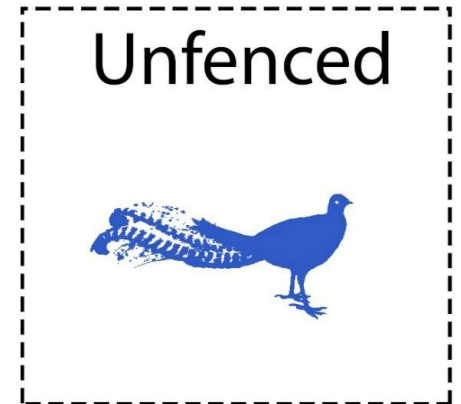
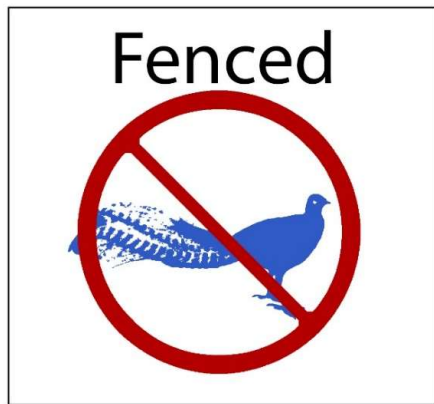
Standard dump truck  
(hauls 32 tonne)



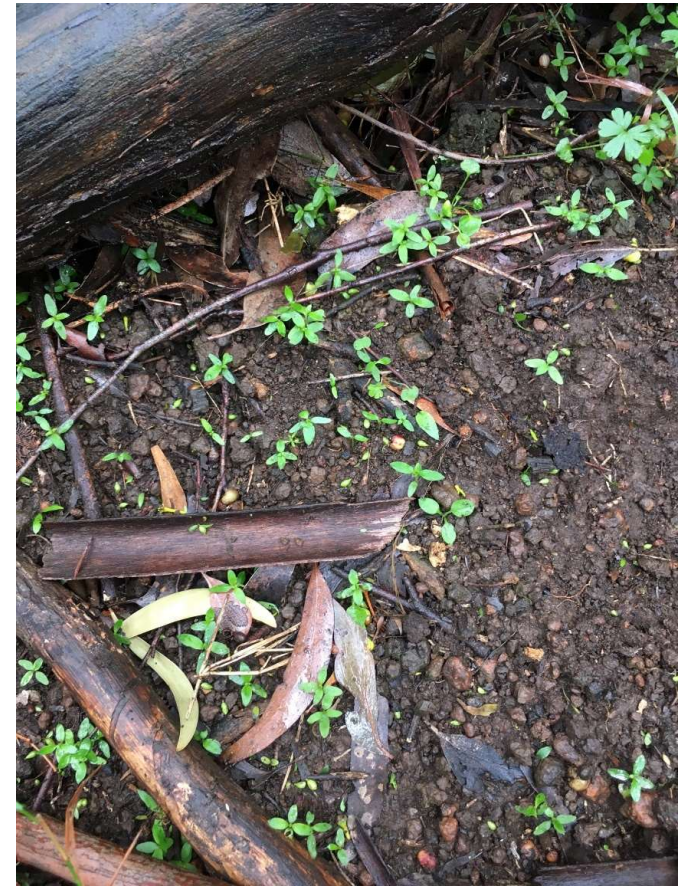
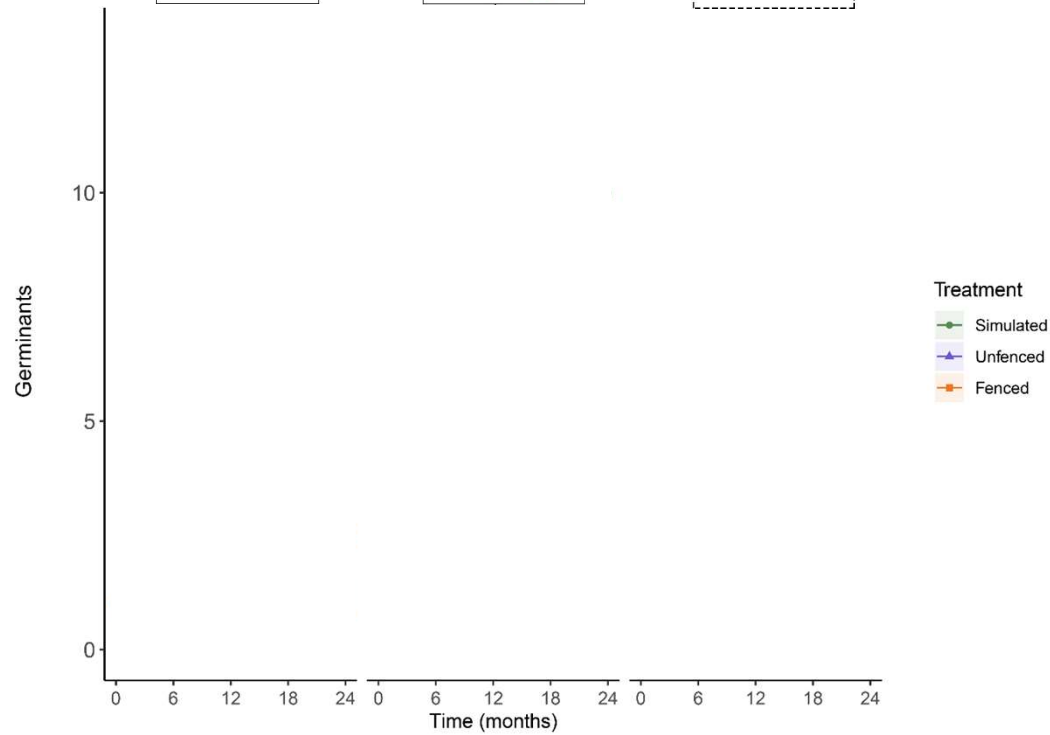
# Litter and compaction is altered



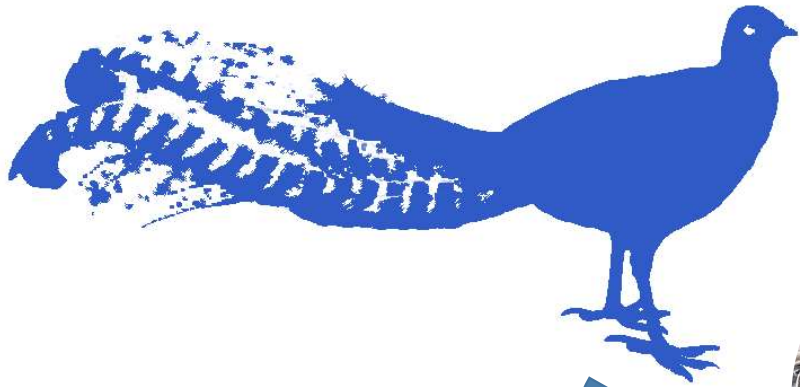
# Hypothesis: Germinant plants



# Lyrebirds and germination



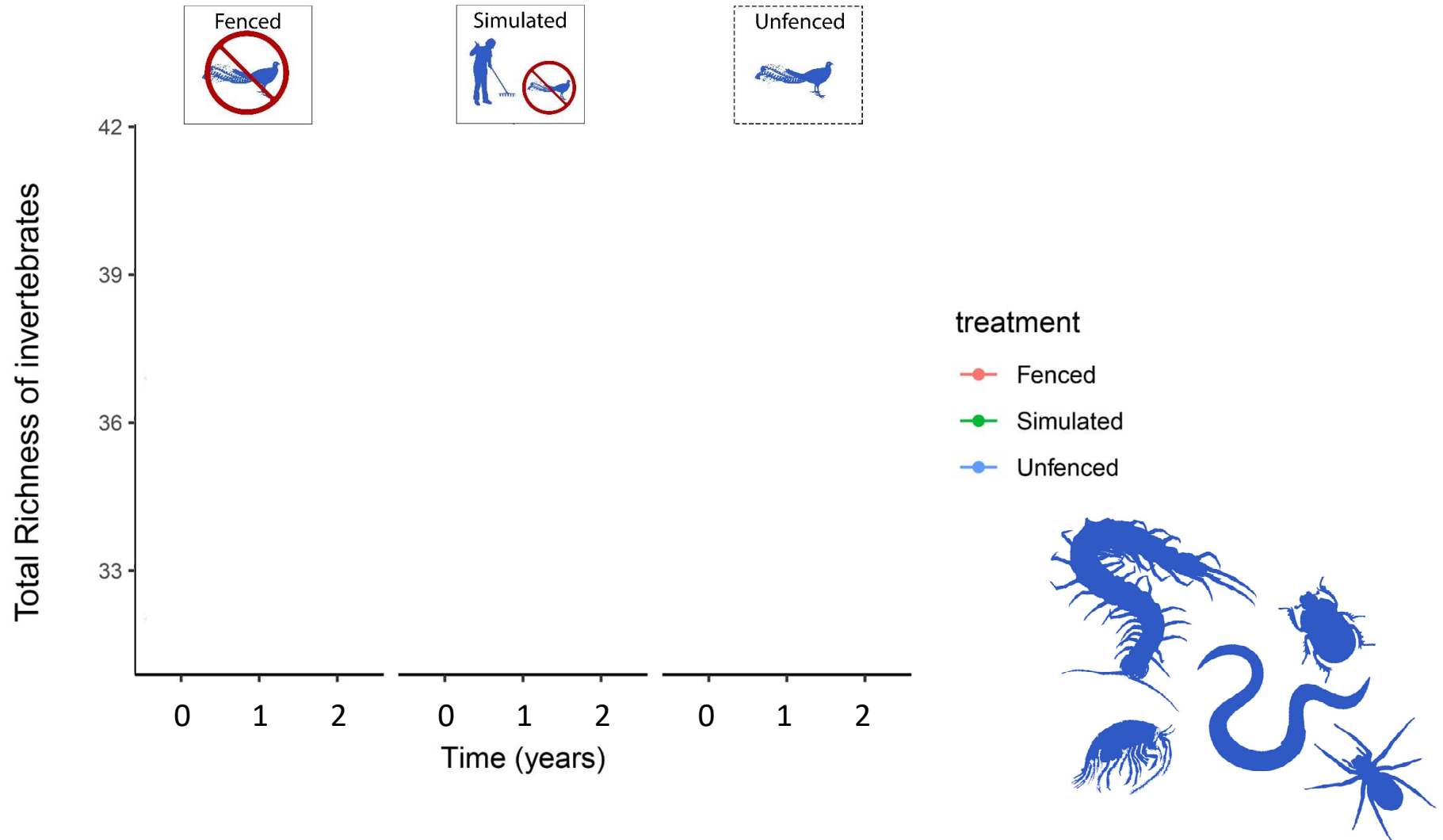
# Hypothesis: invertebrates



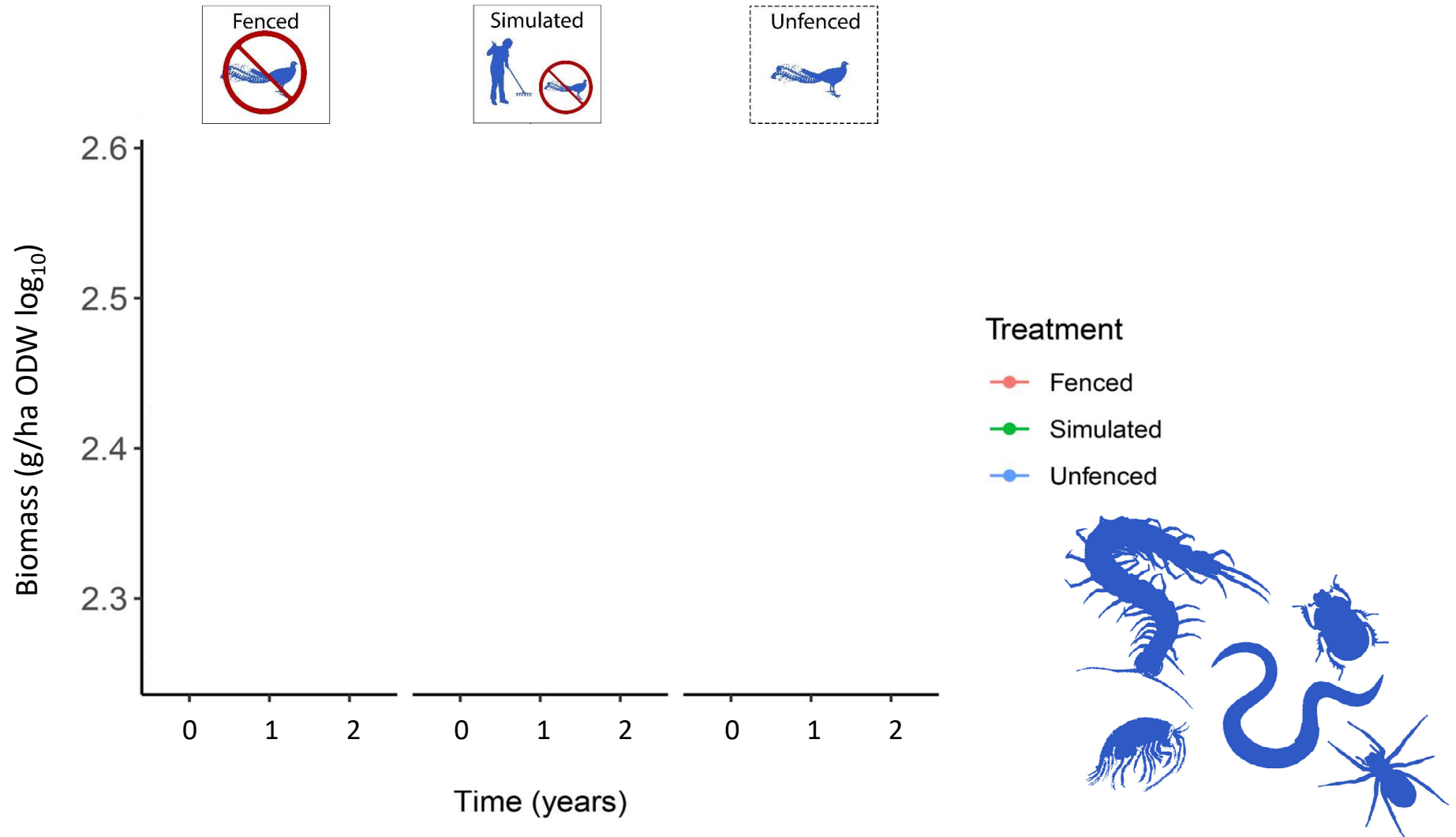
“Farming” feedback on engineer

Engineering effects (soil movement, litter burial = increased habitat heterogeneity and resources)

# Invertebrate Richness



# Invertebrate biomass



# Summary

- Good evidence that lyrebirds act as ecosystem engineers
- Lyrebirds cause significant change to litter and soil structure
- Foraging is spatially and temporally widespread
- Lyrebirds facilitate seed germination but have no negative effect on floristic richness





# Summary

- Lyrebirds facilitate greater invertebrate richness
- Foraging is a mechanism for farming invertebrate prey



# A catastrophic event: Black summer fires

- 2019/20 'megafires' burnt through ~12 million hectares of eastern Australia
- Billions of animals estimated to have been killed in the fires
- Initial analysis by BirdLife estimated that ~40% of lyrebird range was impacted
- Partnership between BirdLife and La Trobe University, funded by WWF (1 year after the event)

Photo: Dan Himbrechts



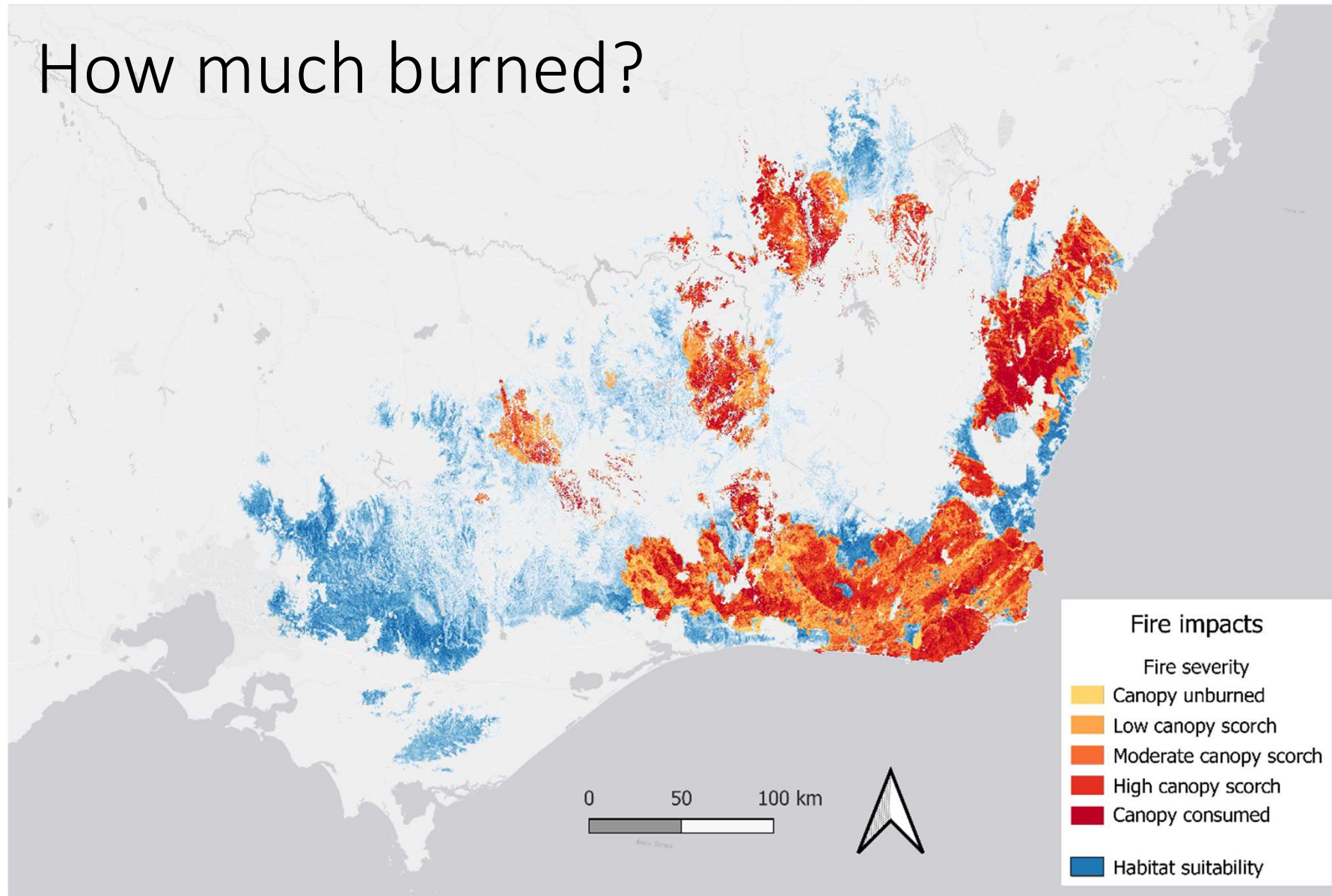




## Key Questions

- How much area of lyrebird habitat was burned at varying levels of fire severity?
- How much of different forest types inhabited by lyrebirds was burned?
- How well do lyrebirds perform as an “umbrella species” and with whom do they associate?
- What constitutes a refuge and where are these?

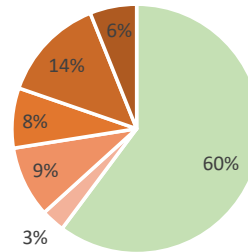
# How much burned?



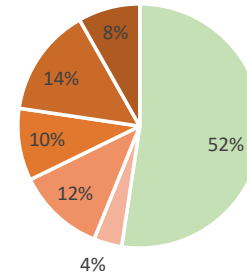
# How much burned?



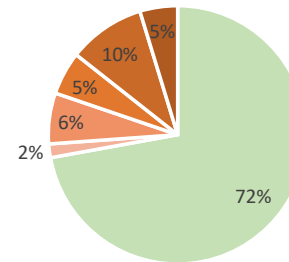
a. Open forests



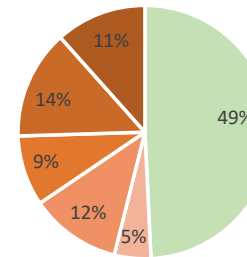
b. Damp forests



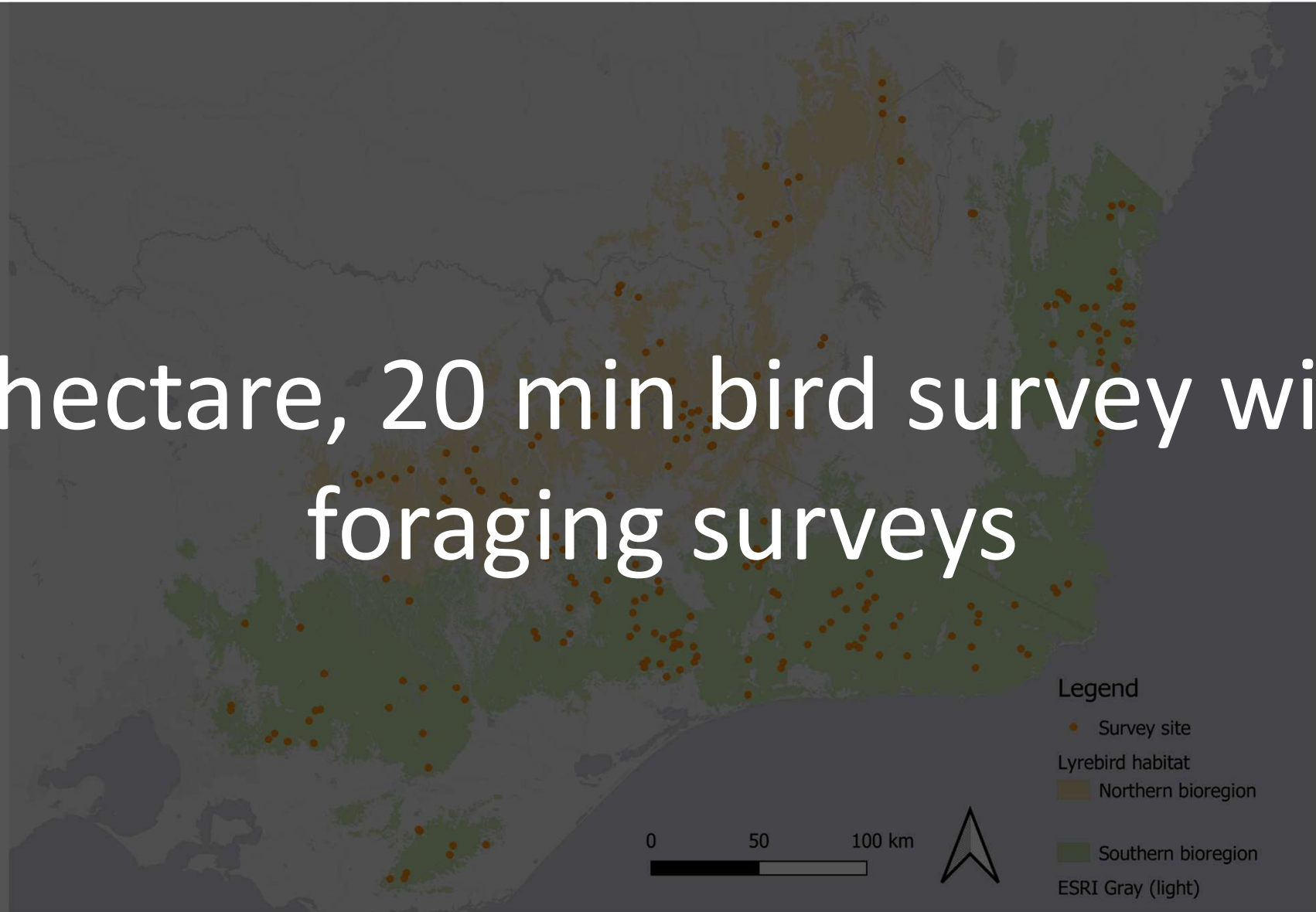
c. Wet forests



d. Rainforests



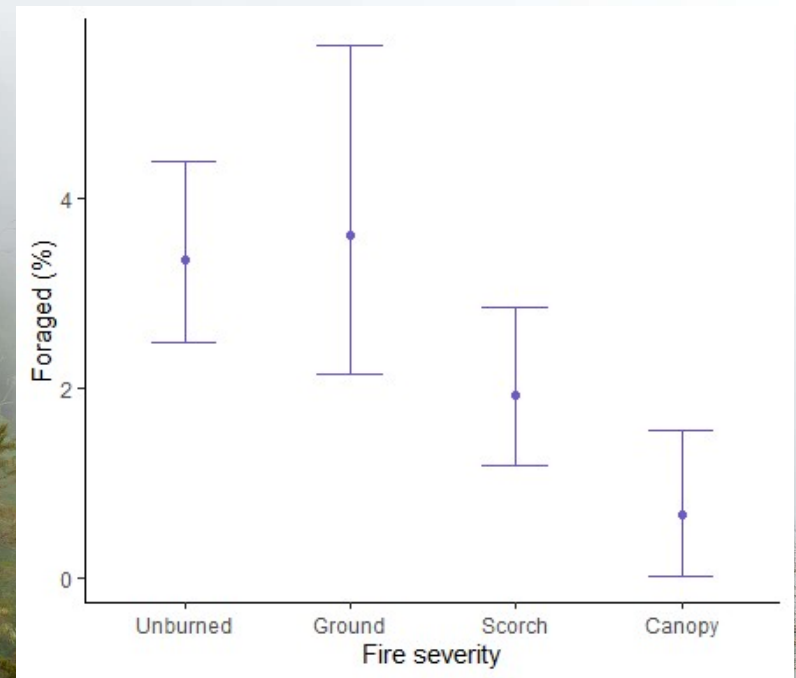
# 2 hectare, 20 min bird survey with foraging surveys

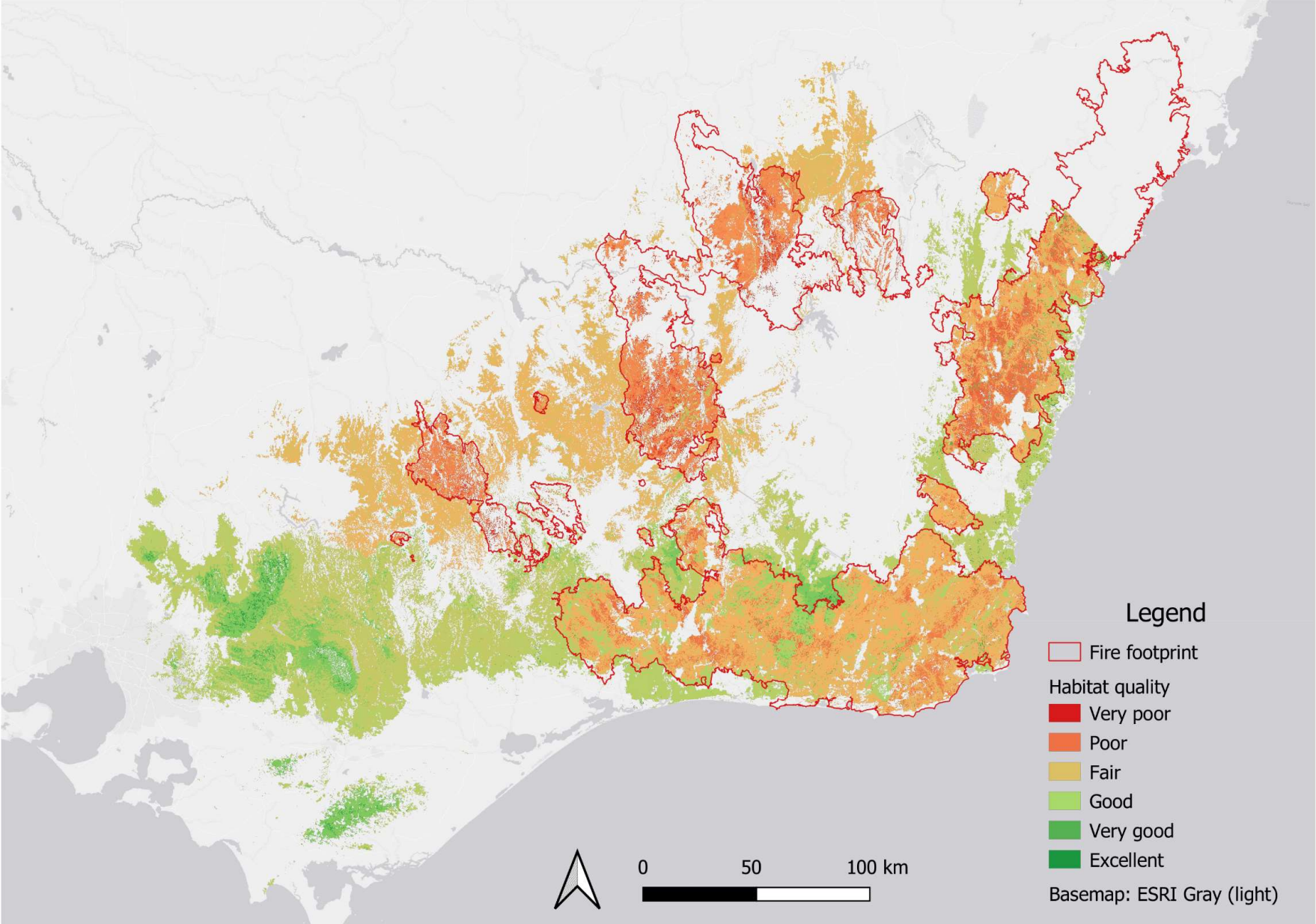






# Model predictions







Mount Buffalo, northern Victoria



Clifton Creek, East Gippsland, Victoria



Blue Mountains, Central NSW



Mackenzie River, E Victoria



Genoa Peak, east Gippsland Victoria



Bemm River, East Gippsland Victoria



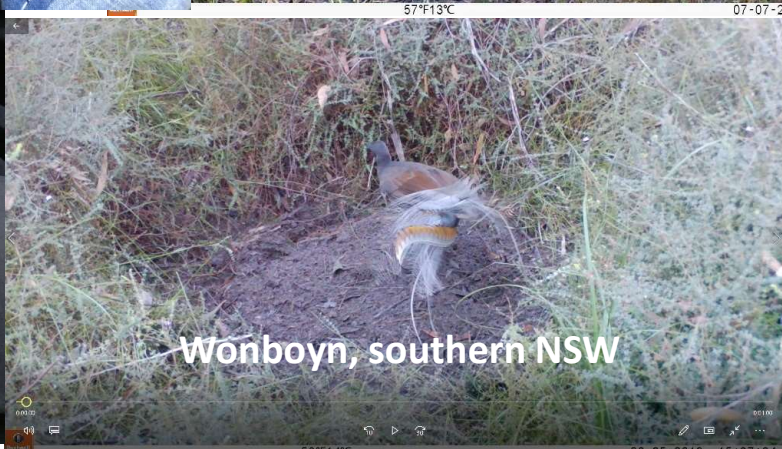
Girraween National Park, QLD



Mallacoota, east Gippsland Victoria



Gibraltar Range, northern NSW



Wonboyn, southern NSW



Wonboyn, southern NSW

Future prospects for lyrebird conservation...











@alexcmaisey



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- Entomologist: Dr. Annette Anderson



# Acknowledgments - Organisations



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Equity Trustees Charitable Foundation



## Share the stories...

- Lyrebirds mimicking humans

