

Wildfire effects on plants and soils in Aotearoa

Nicola Day

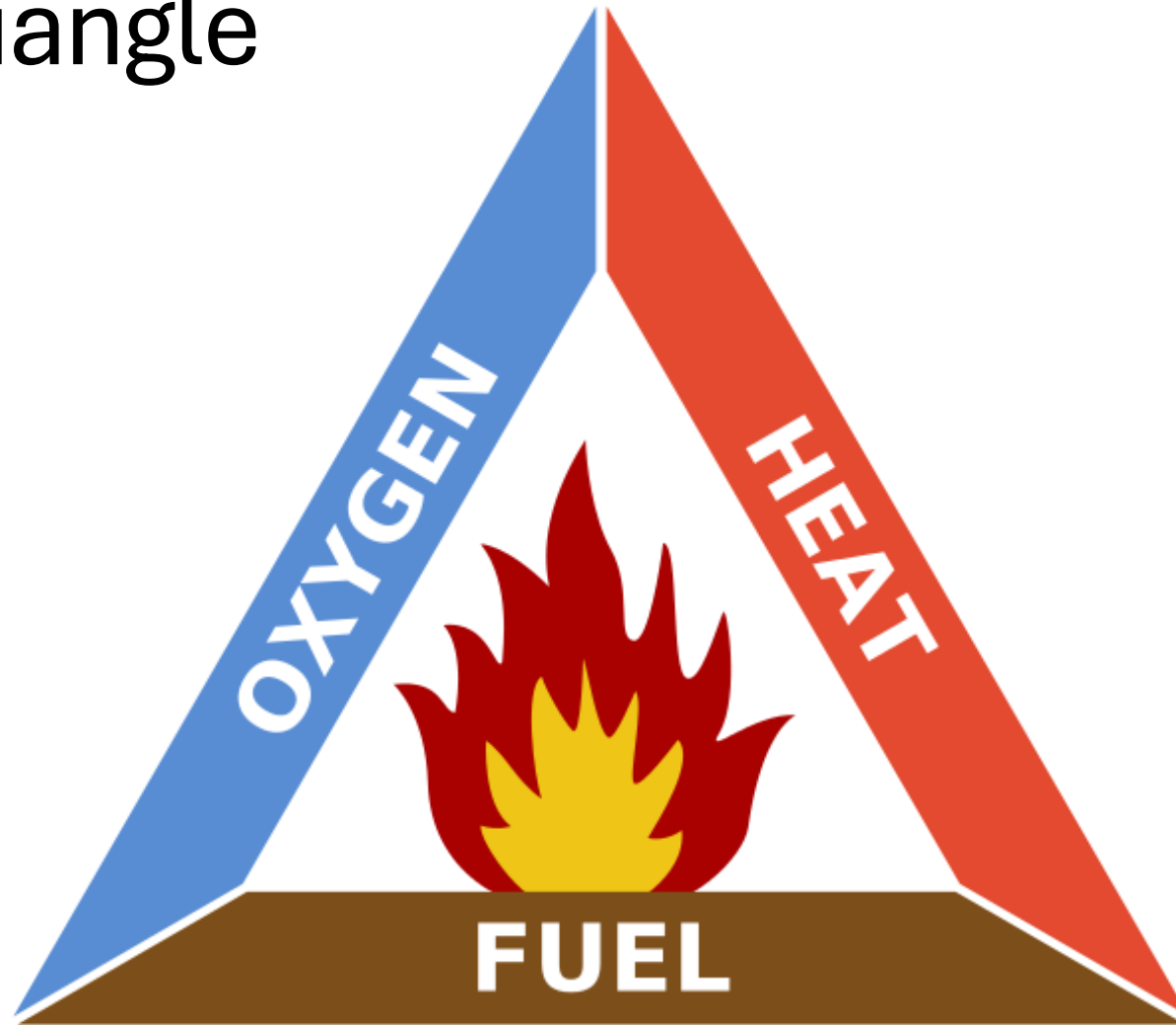


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VICTORIA UNIVERSITY OF
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TE HERENGA WAKA
NEW ZEALAND

Fire triangle



Some species are less flammable than others



Vegetation as Fuel

- Biomass
- Fuel connectivity
- Species differ in flammability:
 - moisture content
 - plant chemistry
 - fuel structure (e.g., fine fuels)

Low flammability plants:

<https://www.fireandemergency.nz/fire-safety-campaign-resources/low-flammability-plants/>



A/Prof. Tim Curran's Plant Barbecue (Lincoln Uni)



Some plants survive fires to promote self-replacement: Seeders



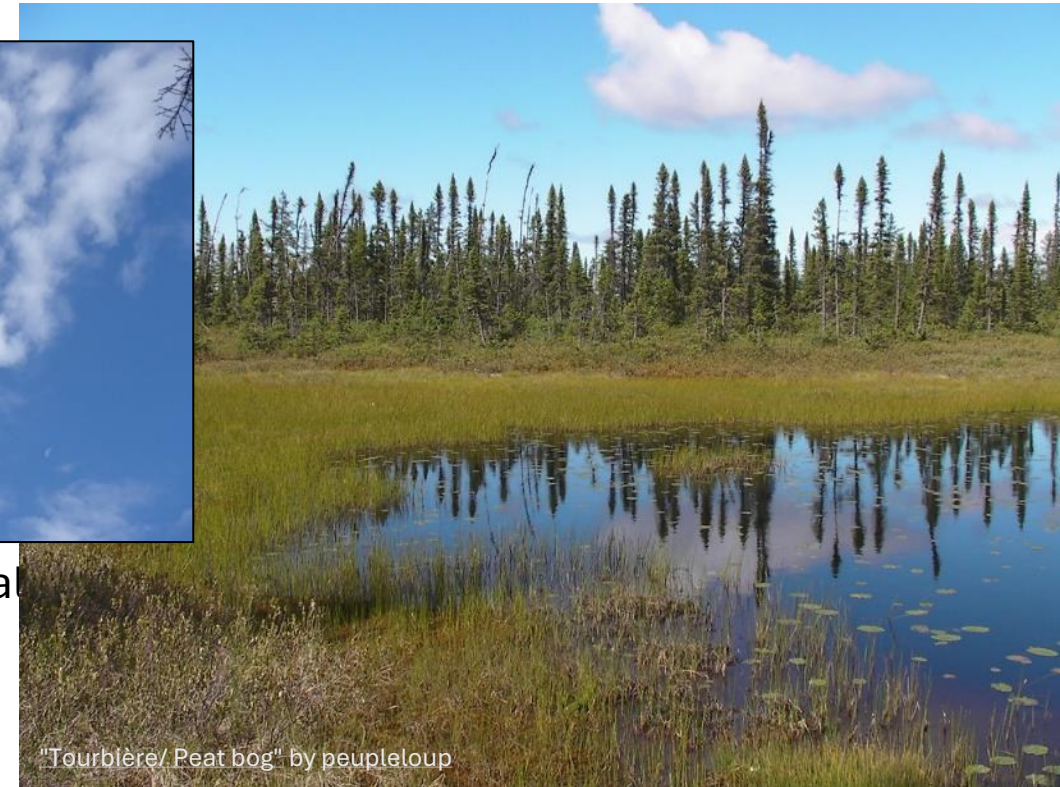
Jac
Pin

Pulse of regeneration of

- Serotiny <https://www.youtube.com/watch?v=ab-WSXX7lRw>
- Many seeds disperse in from nearby unburned areas as well



Black spruce “cone ba
Picea mariana



Some plants survive fires to promote self-replacement: Resprouters/survivors



Resprouting *Eucalyptus* tree

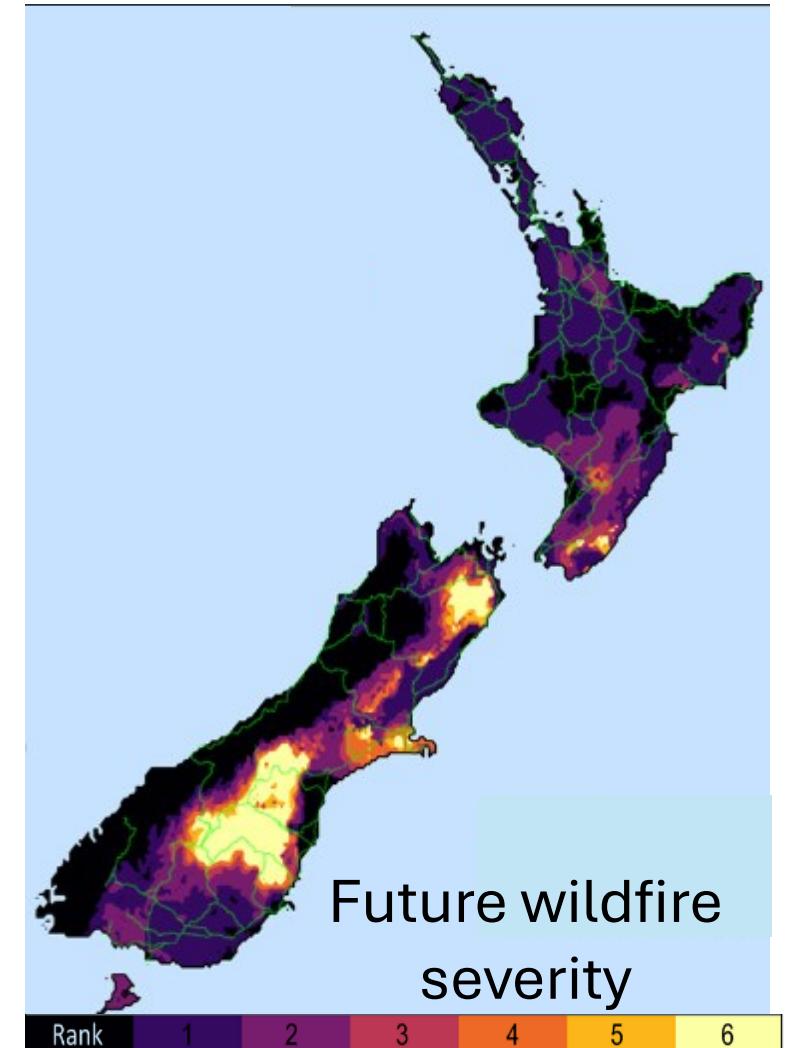
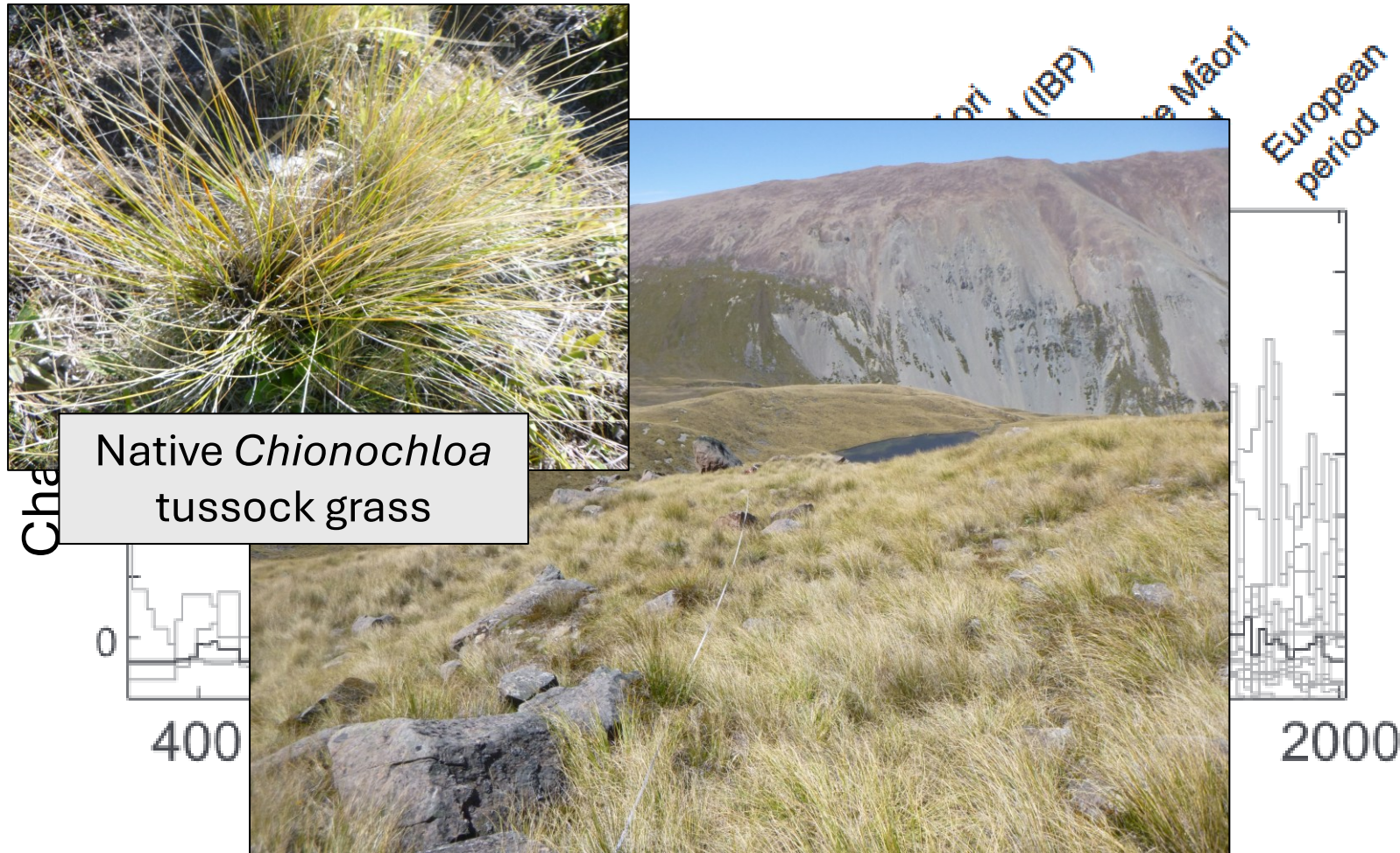


Resprouting willow shrub (*Salix*)

Plants that have evolved with fire commonly have these adaptations



Aotearoa New Zealand: Fire activity increased when people arrived ~700 years ago



Historical vegetation change in Aotearoa



<http://www.teara.govt.nz/en/interactive/11674/deforestation-of-new-zealand>

Are our grassland plants fire-adapted?

Known species that can survive to resprout post-fire

- Very little is known about how our native plants respond to fire



Lots of wind-dispersed weeds that might recover well from fire



September 2020 (Spring):

- 300 ha burned at Pukaki Downs



Huge burning glow in the sky at uncontrolled fire near Aoraki/Mt Cook

11:09 am on 1 September 2020

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Firefighters are still battling to slow a huge scrub fire burning since Sunday in Mackenzie Country, but bad weather overnight has helped their efforts.



The fire seen over Lake Pukaki, on Monday night. Photo: RNZ / Nate McKinnon



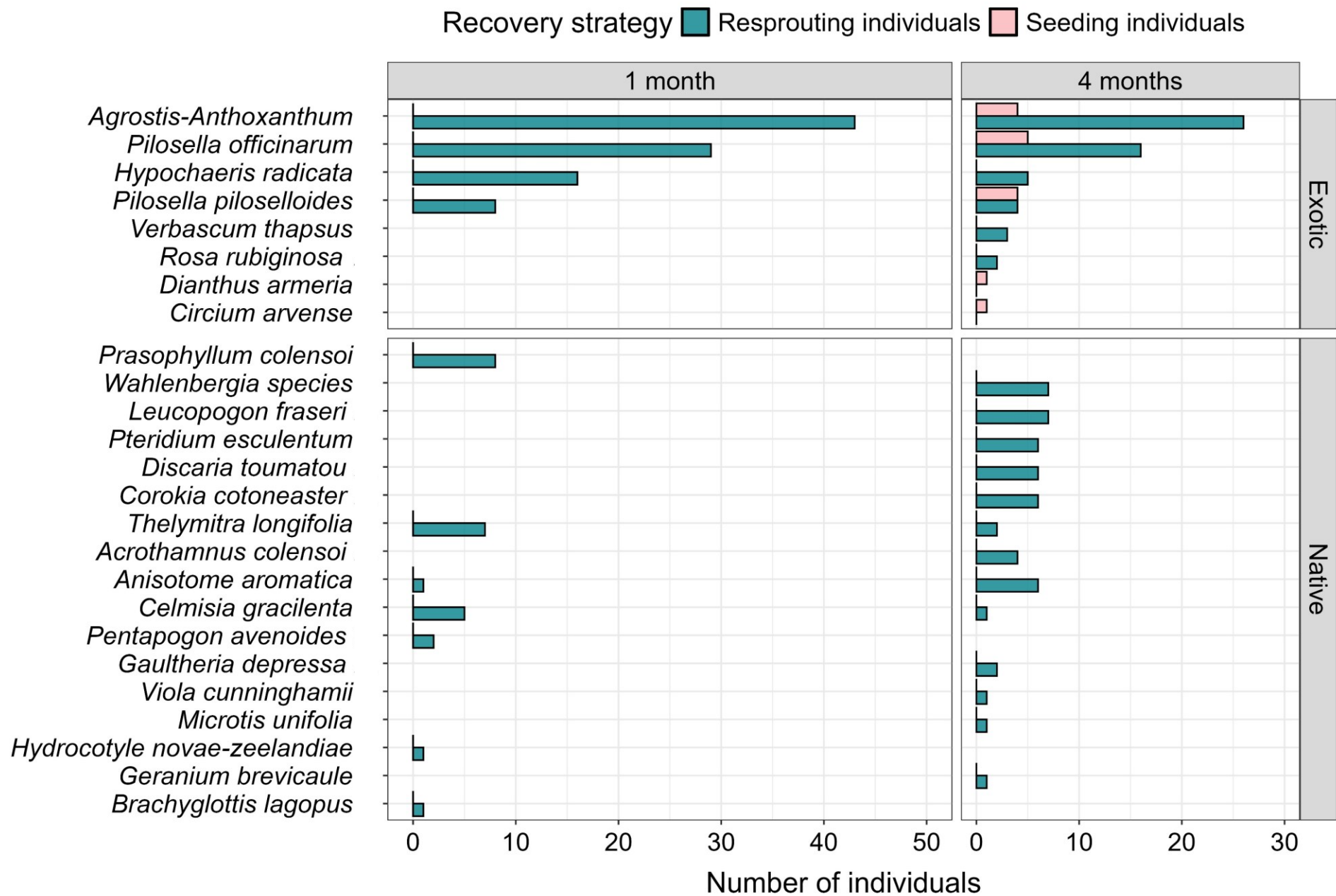
Dr. Shanta Budha-Magar

- Plant surveys 1, 4, and 16 months after fire
- Assessing regeneration strategy 1 and 4 months after fire

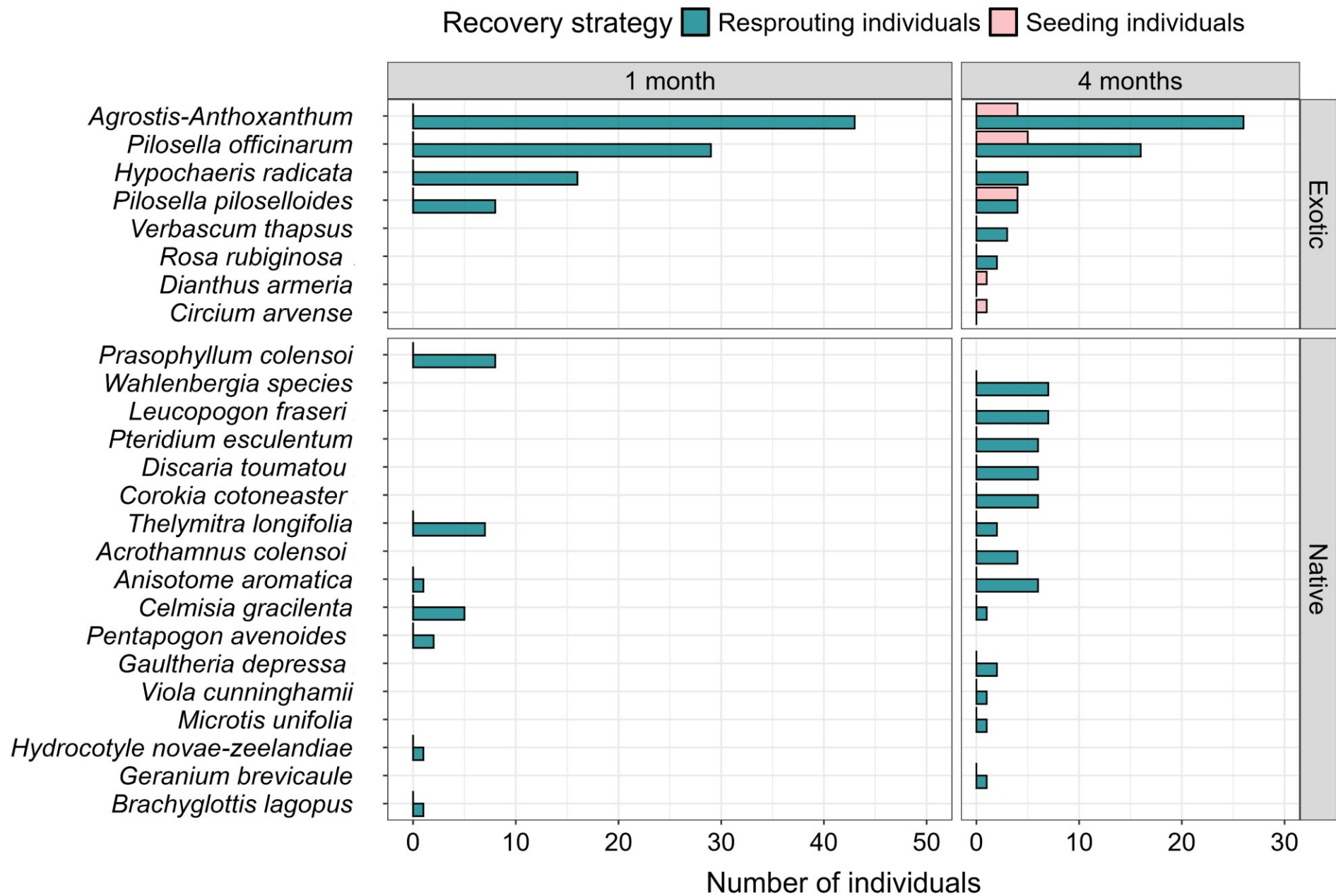


S. Budha Magar

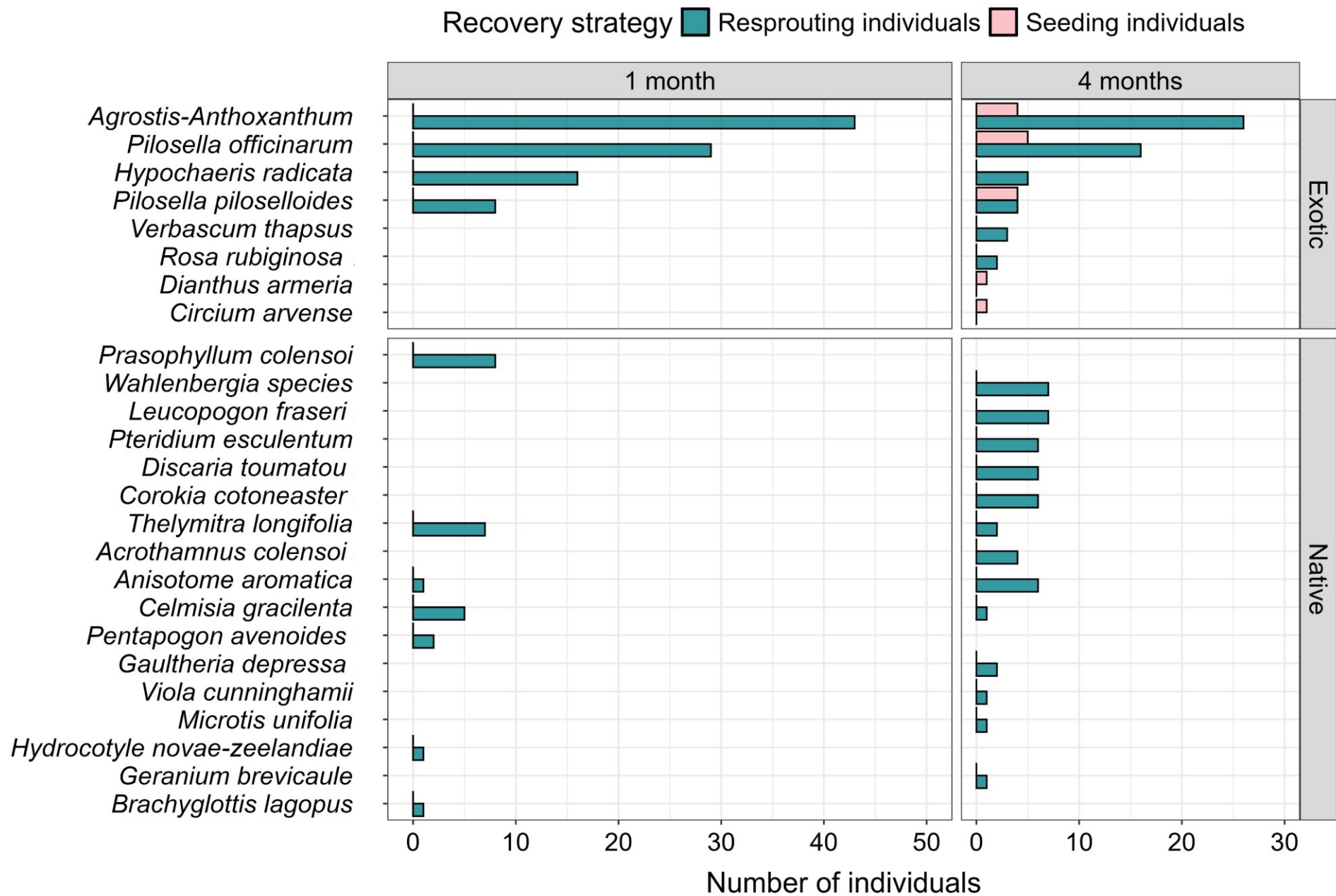




Most plant individuals regenerated by **surviving** the fires and **resprouting**, as opposed to from seed.



All individuals that regenerated from seed did so 4 months after fire; none did at 1 month after fire.



Only exotic species regenerated from seed; no native species regenerated from seed.

Many native plants survived fire

- Woody species take a too long to recover
- There is dramatic change in vegetation and a lot of recovery of natives 1-16 months after fire
- Nearby seed sources are relevant (especially exotic species)
- Whether active restoration is needed may not be evident immediately following fire



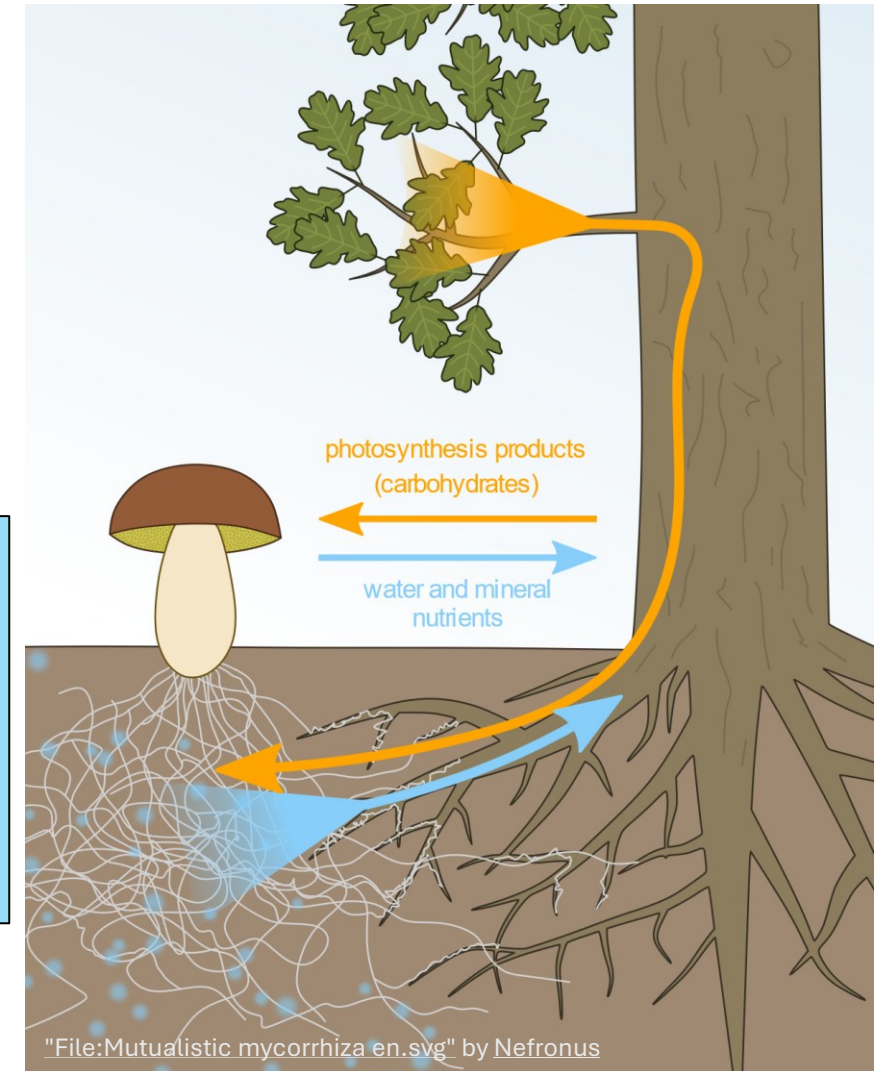
Mycorrhizal fungi

- Most plants on earth form intimate relationships with fungi
- The fungus obtains carbon from the plant
- The plant obtains nutrients from the soil
- This relationship is known as a mycorrhiza



Mycorrhizas are mutualisms:

The plant and the fungus both benefit from the relationship



Fire and fungi

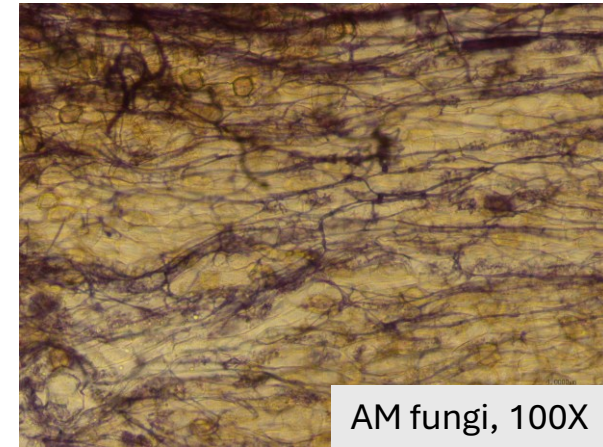


Morel mushrooms rely
on disturbance to
reproduce

- Fire tends to:
 - ↑ decomposer fungi (nutrient cyclers)
 - ↓ plant mutualistic fungi (mycorrhizas)

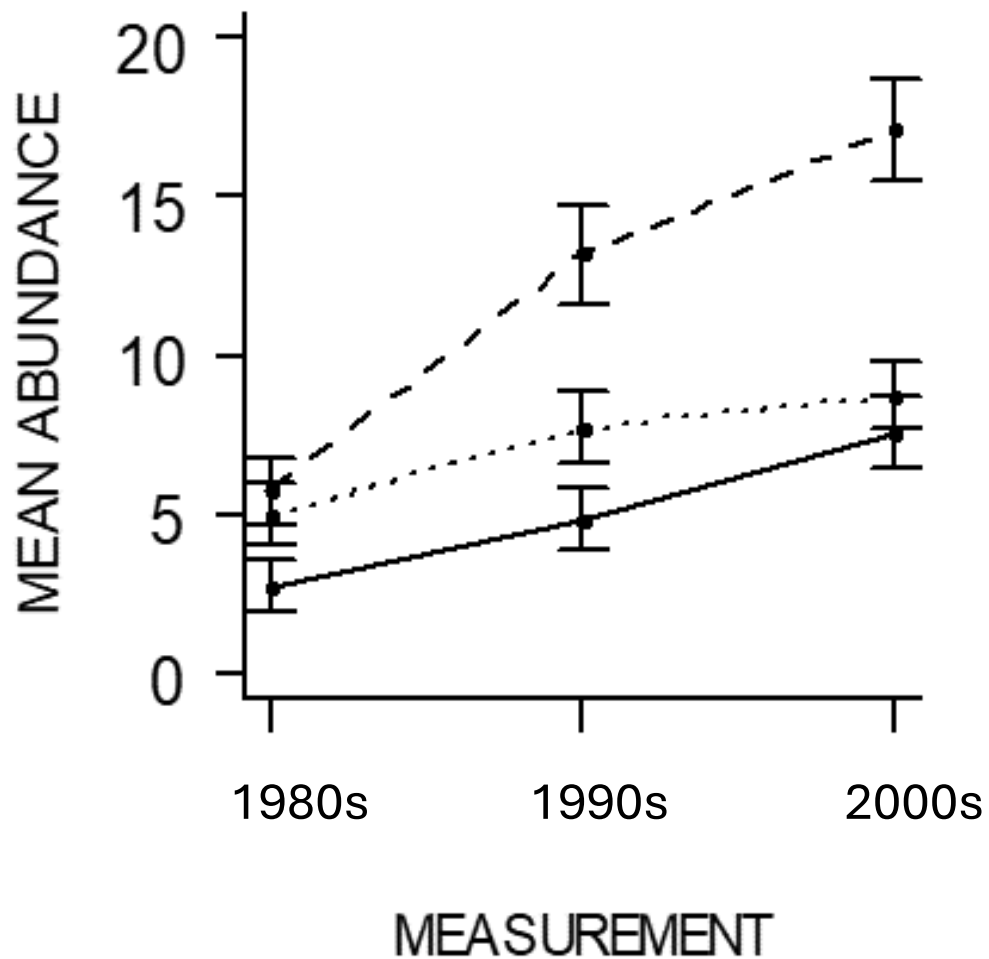


Ectomycorrhiza



AM fungi, 100X

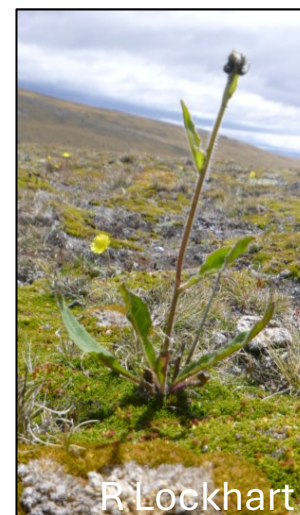
Invasions by exotic hawkweeds



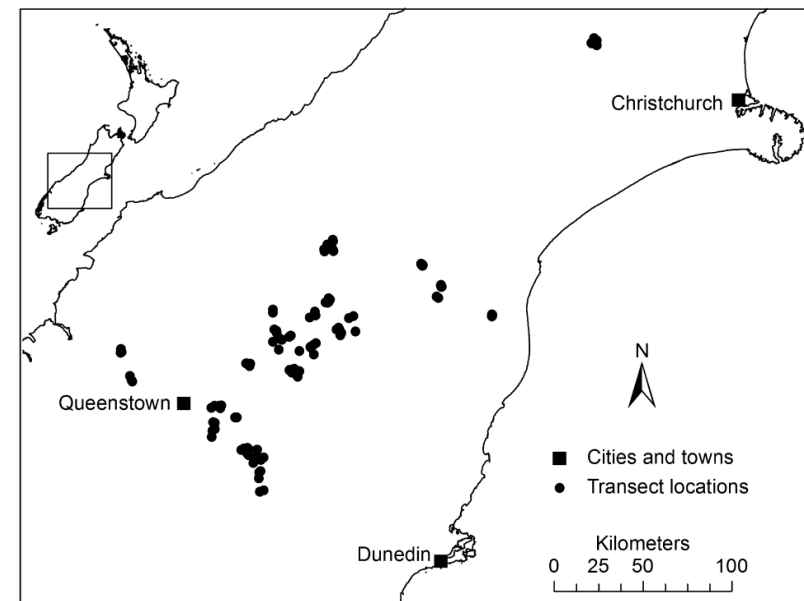
--- *Pilosella officinarum*



..... *Pilosella piloselloides*



— *Hieracium lepidulum*



Does fire change arbuscular mycorrhizal fungal communities and promote invasion?



Chionochloa

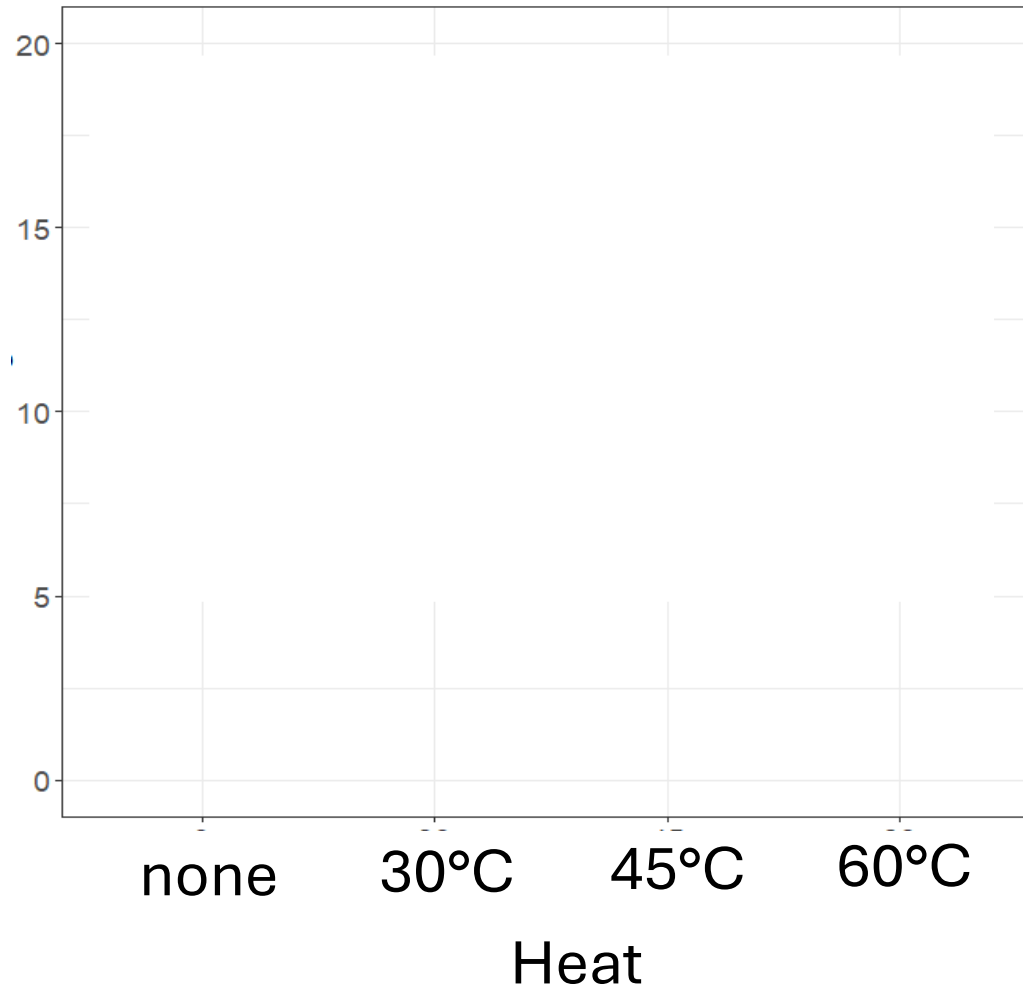


Hieracium



Pilosella

Predicted AM
fungal richness



Kendall Morman
(Ngāti Kuri)

Invasive species had more impact on arbuscular mycorrhizal fungi than heat



Chionochloa



Hieracium

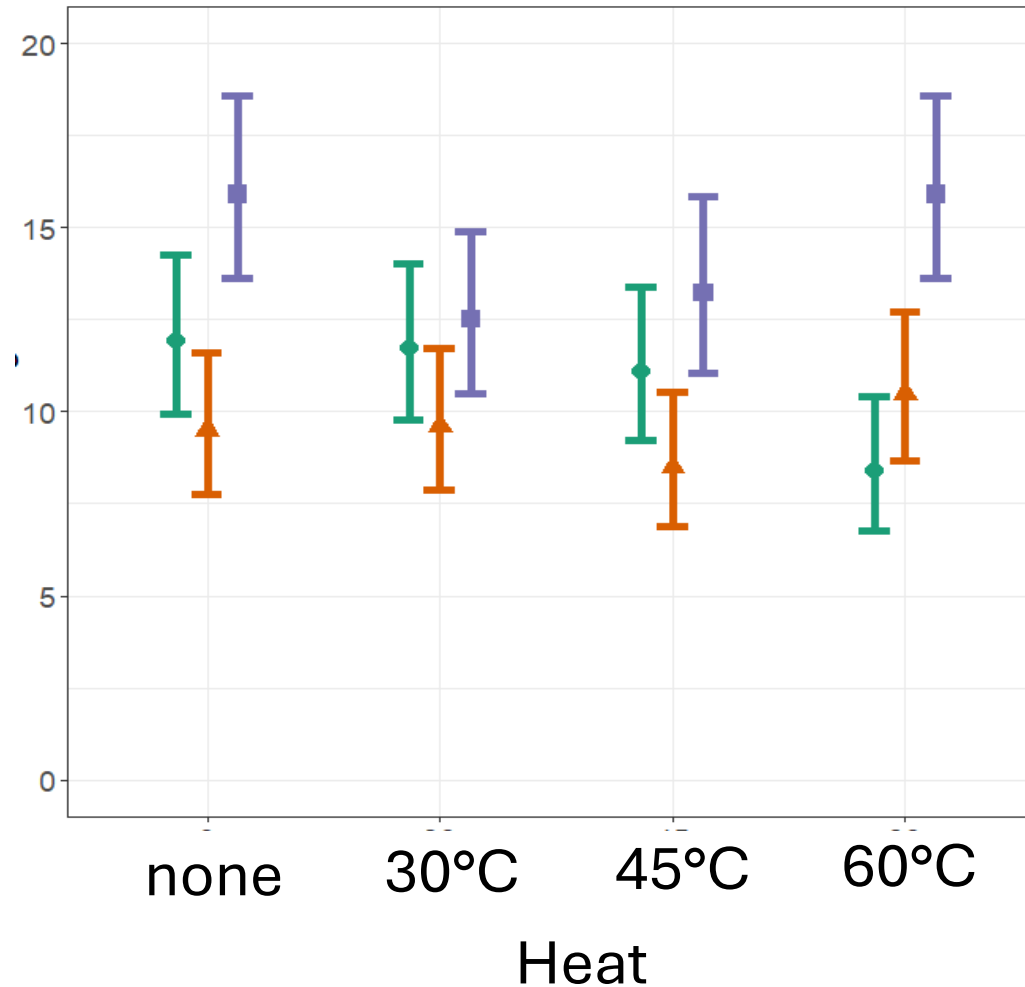


Pilosella

species

- Chionochloa
- Hieracium
- Pilosella

Predicted AM
fungal richness



Kendall Morman
(Ngāti Kuri)

Implications of increased wildfire activity in sanctuaries

- Aspects to consider
 - Proximity to seed sources
 - Flammable and non-flammable plant species, e.g., green fire breaks
 - Local landscape conditions, e.g., wetter areas will have less severe and less frequent fires
- When is active restoration needed?
 - many natives can resprout

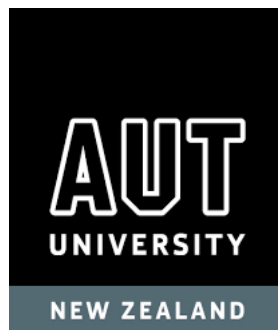


Paul Daly, NZ Geographic

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- Hannah Buckley



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