How soil microbes drive and respond to plant invasions in Mediterranean ecosystems: insights from Australian acacias

Cal-IPC 30-Year Anniversary Symposium

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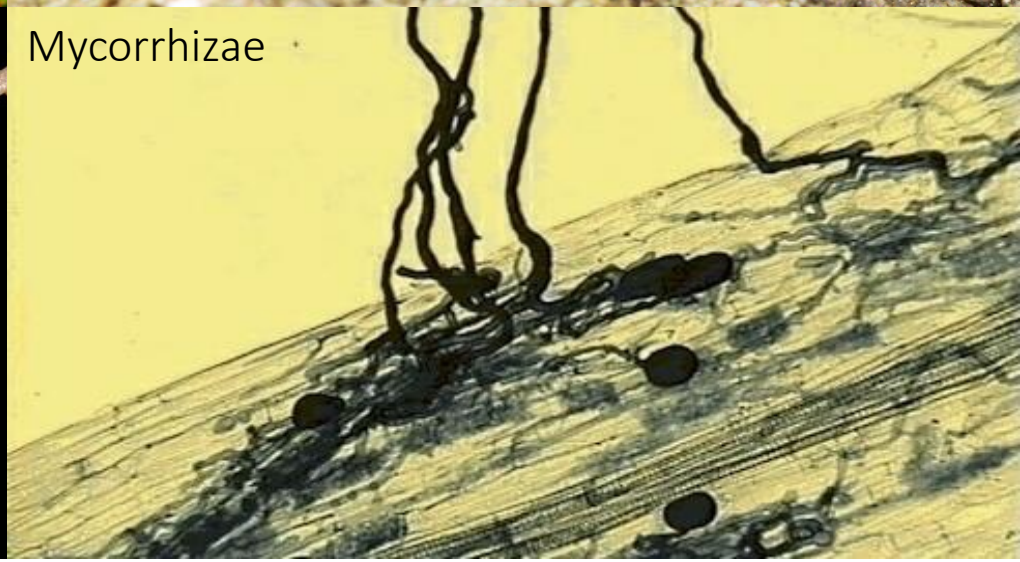
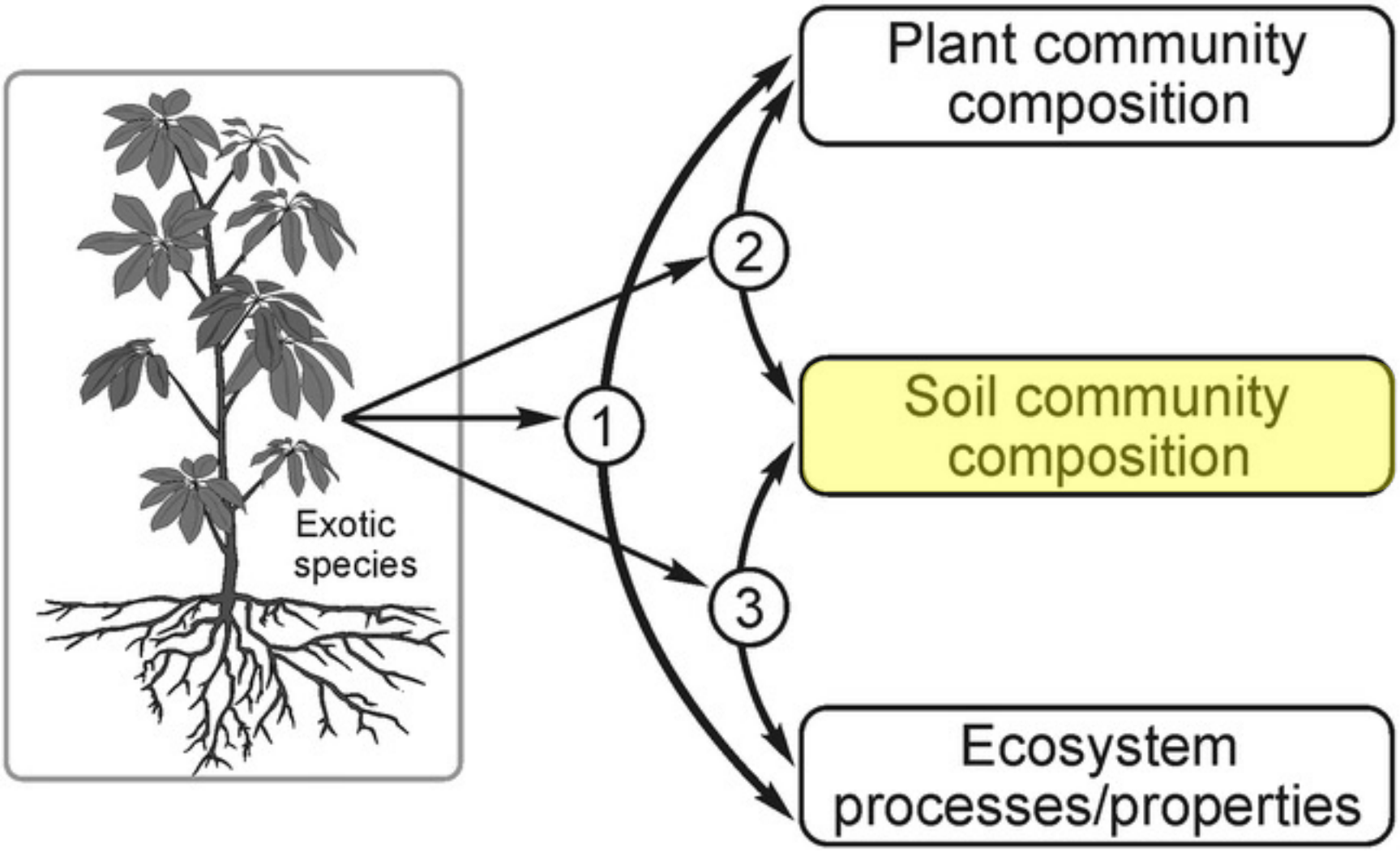
MACQUARIE University

Microbial mutualists and invasion success



Mutualists and invasion success - Australian acacias and rhizobia

Microbiomes and invasion success



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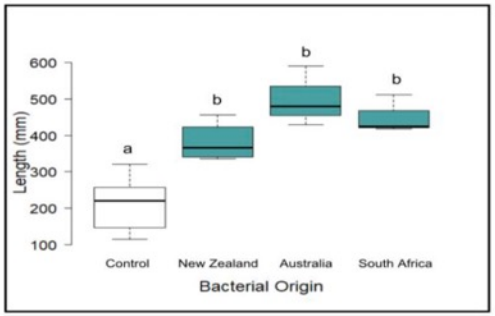
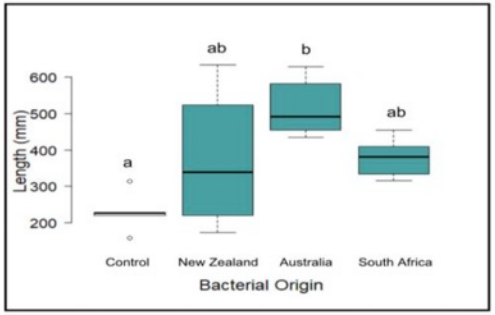
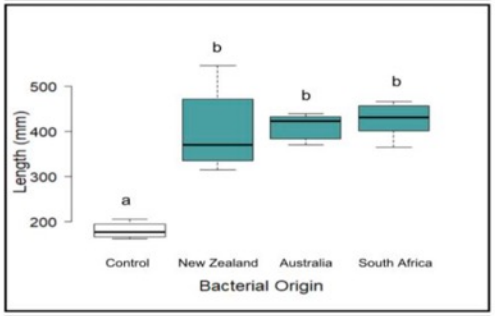


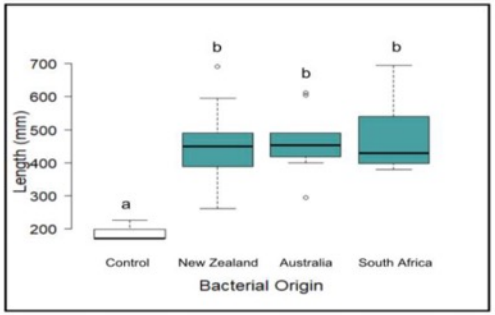
A. dealbata



A. decurrens

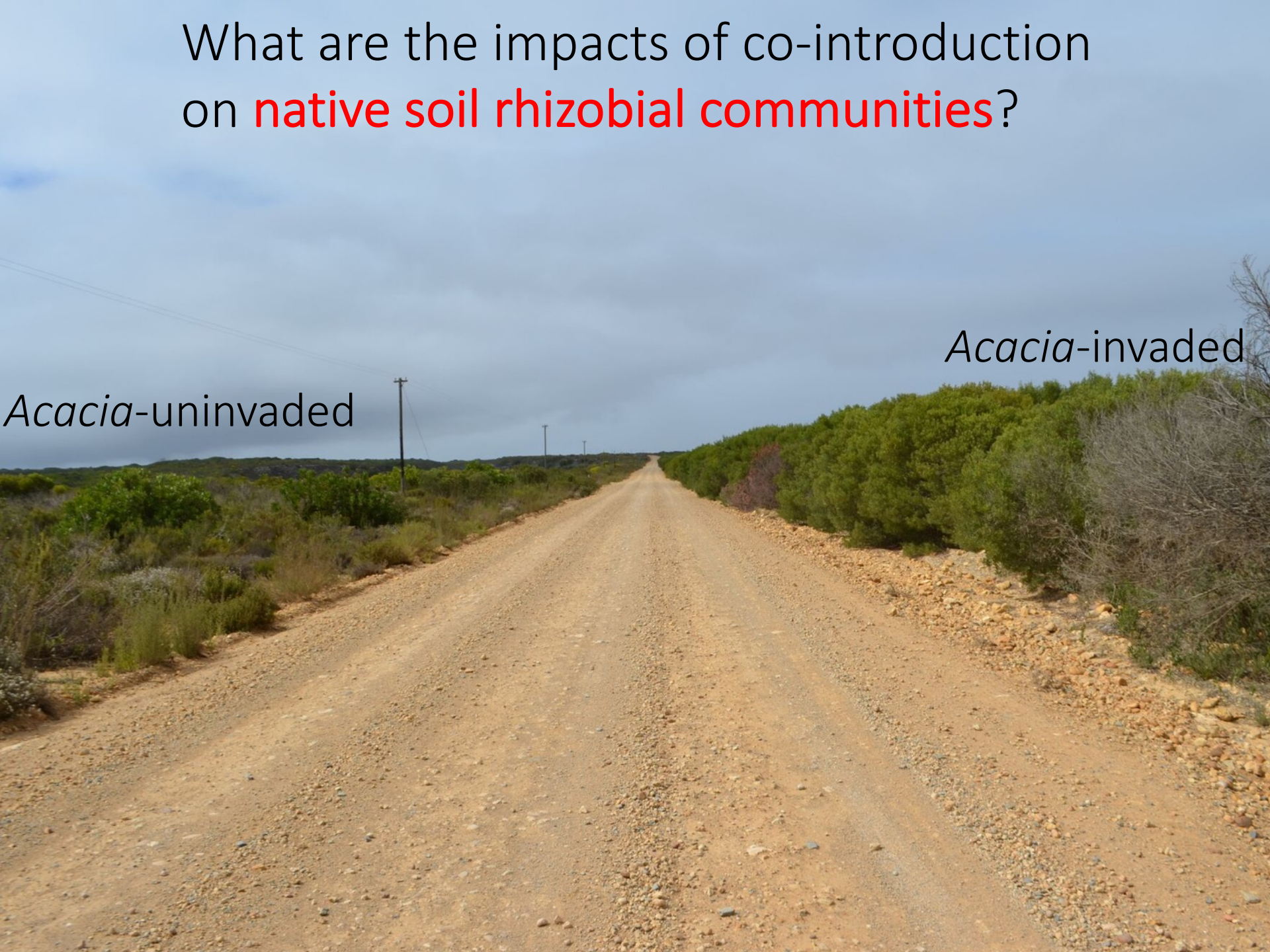


A. melanoxylon



Warrington et al. 2019 Journal of Biogeography

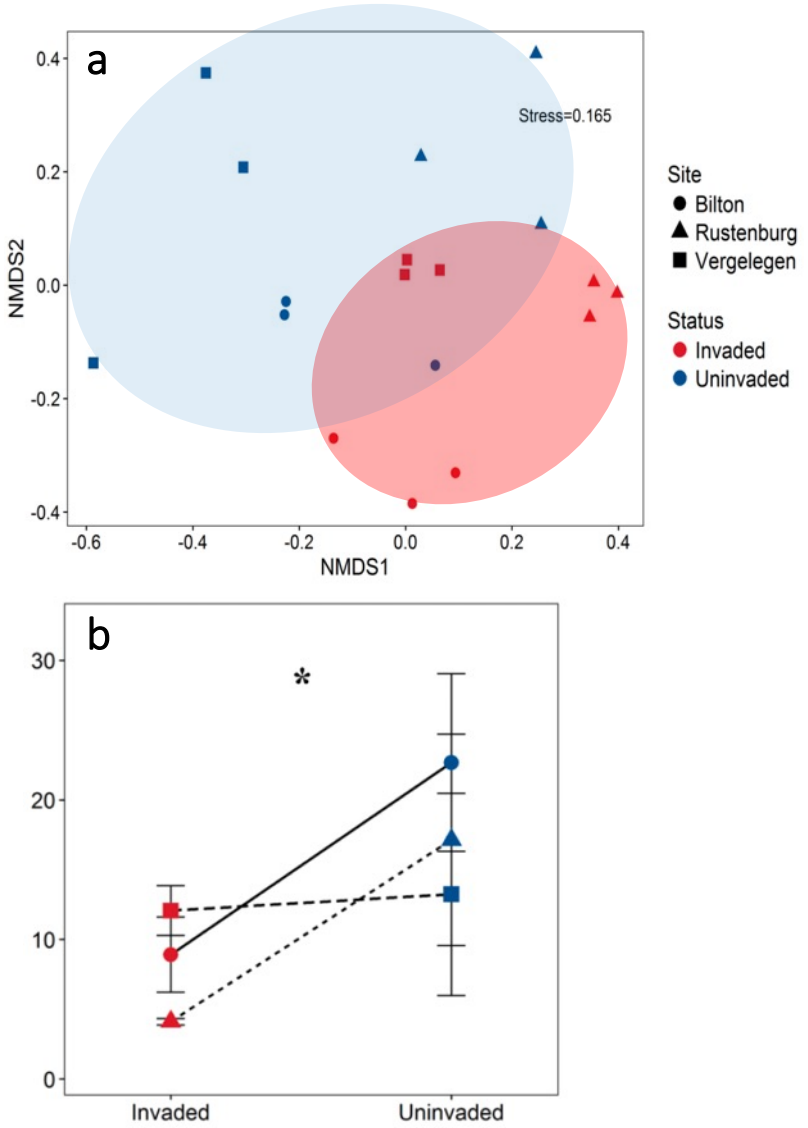
What are the impacts of co-introduction on native soil rhizobial communities?



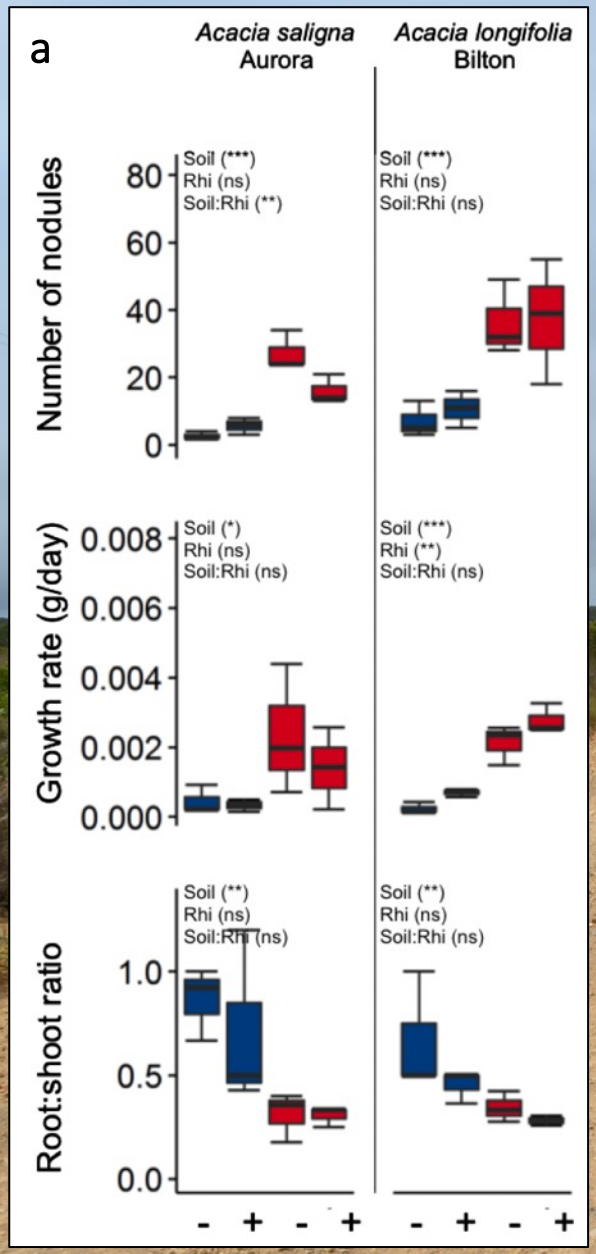
What are the impacts of co-introduction on native soil rhizobial communities?

Acacia-uninvaded

Acacia-invaded

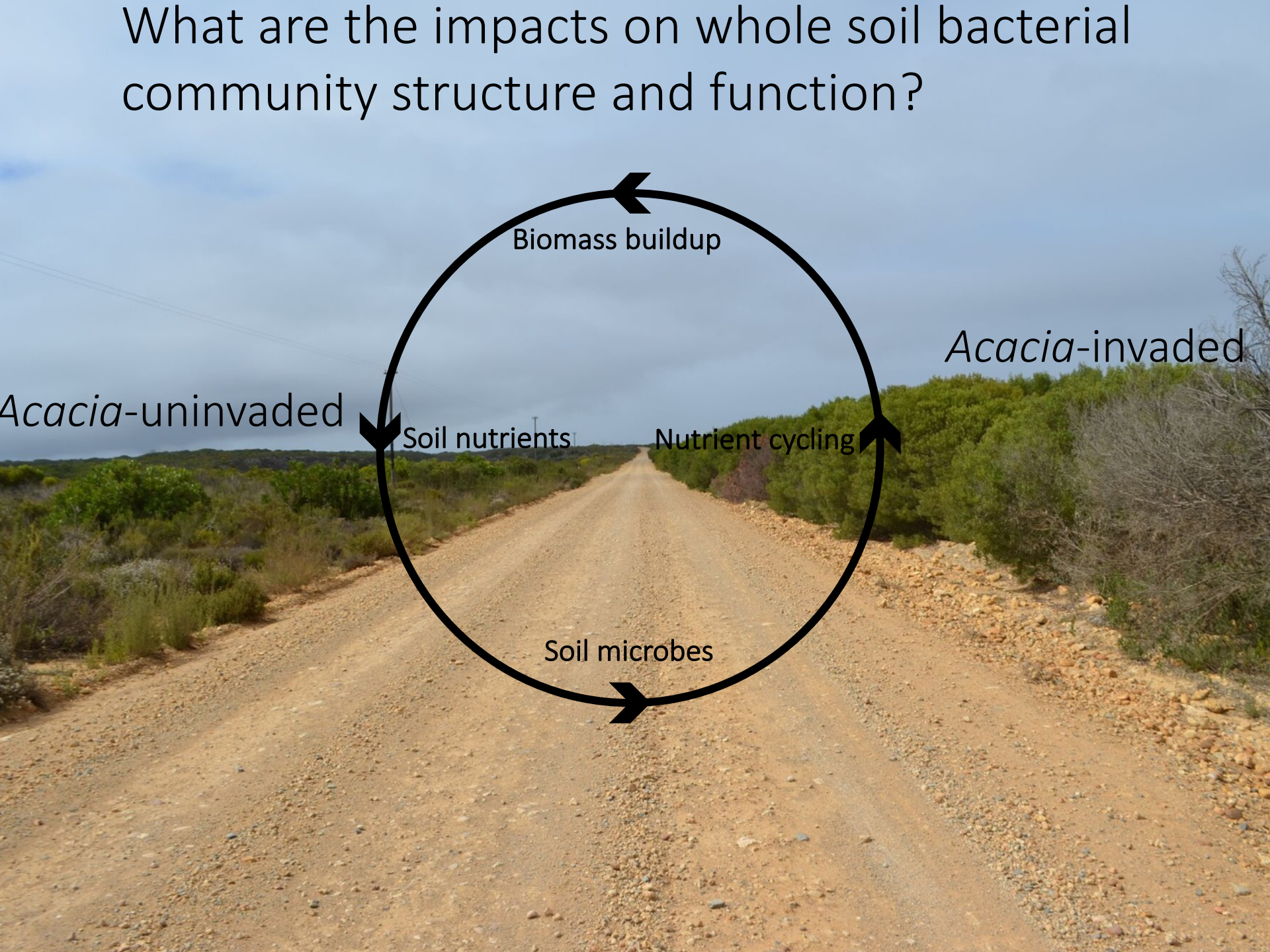


Le Roux et al. 2018 Journal of Ecology

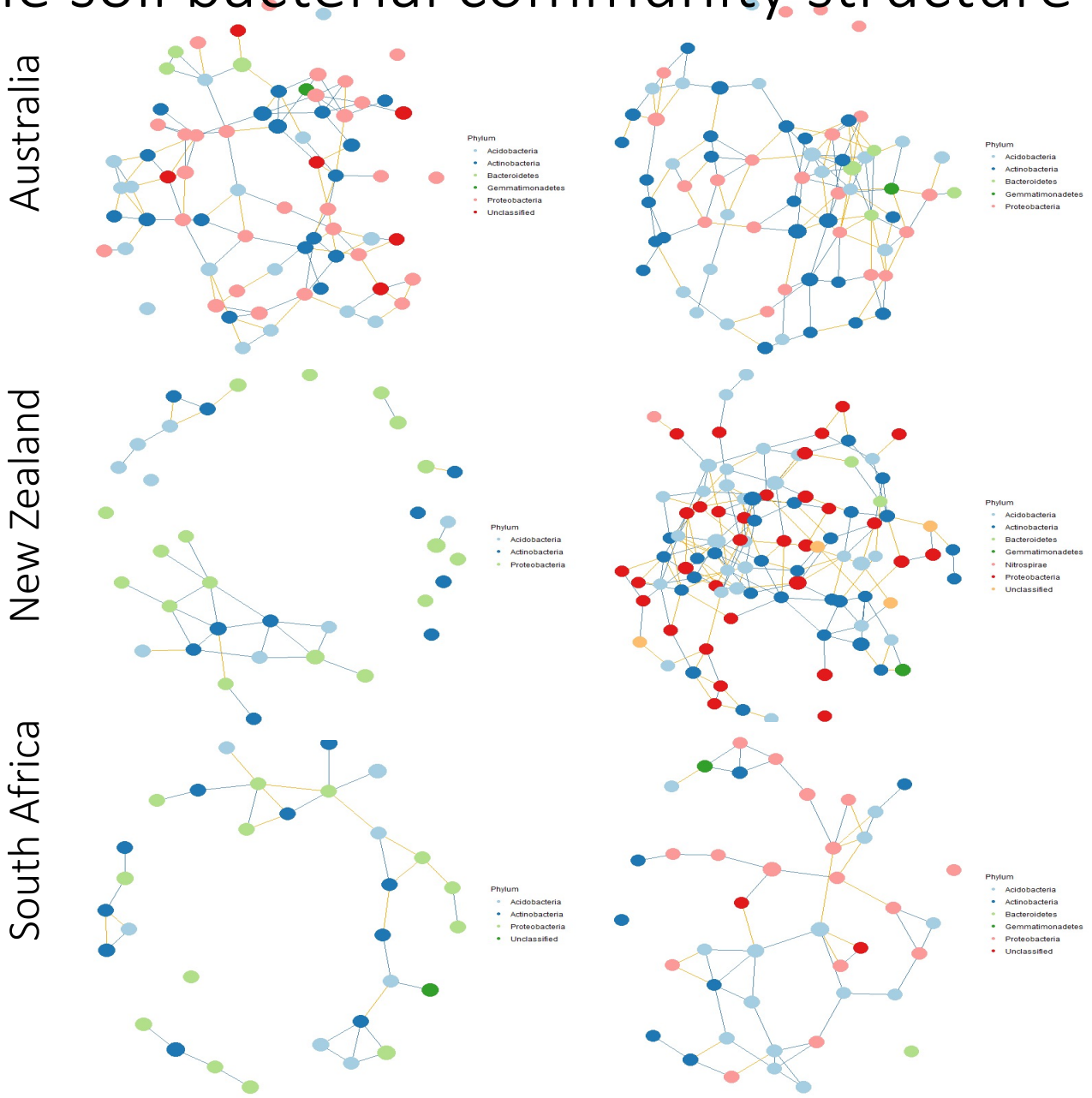


Le Roux et al. 2018 Journal of Ecology

What are the impacts on whole soil bacterial community structure and function?

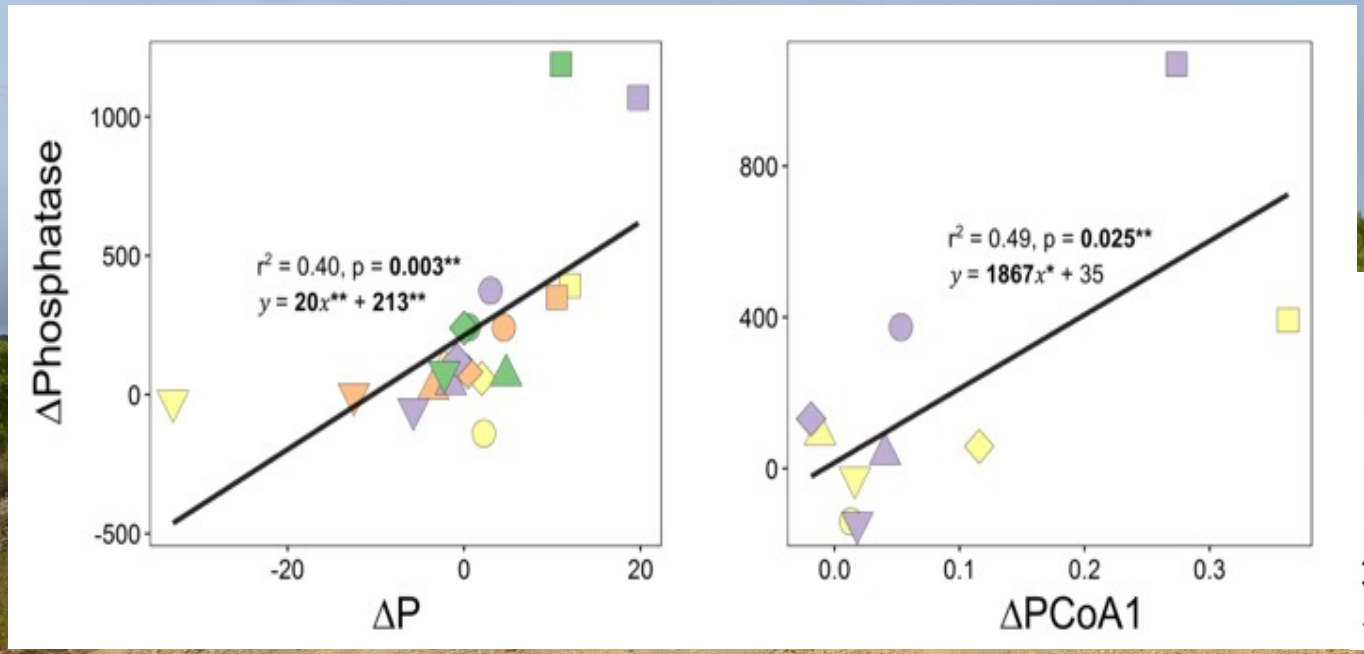


Whole soil bacterial community structure



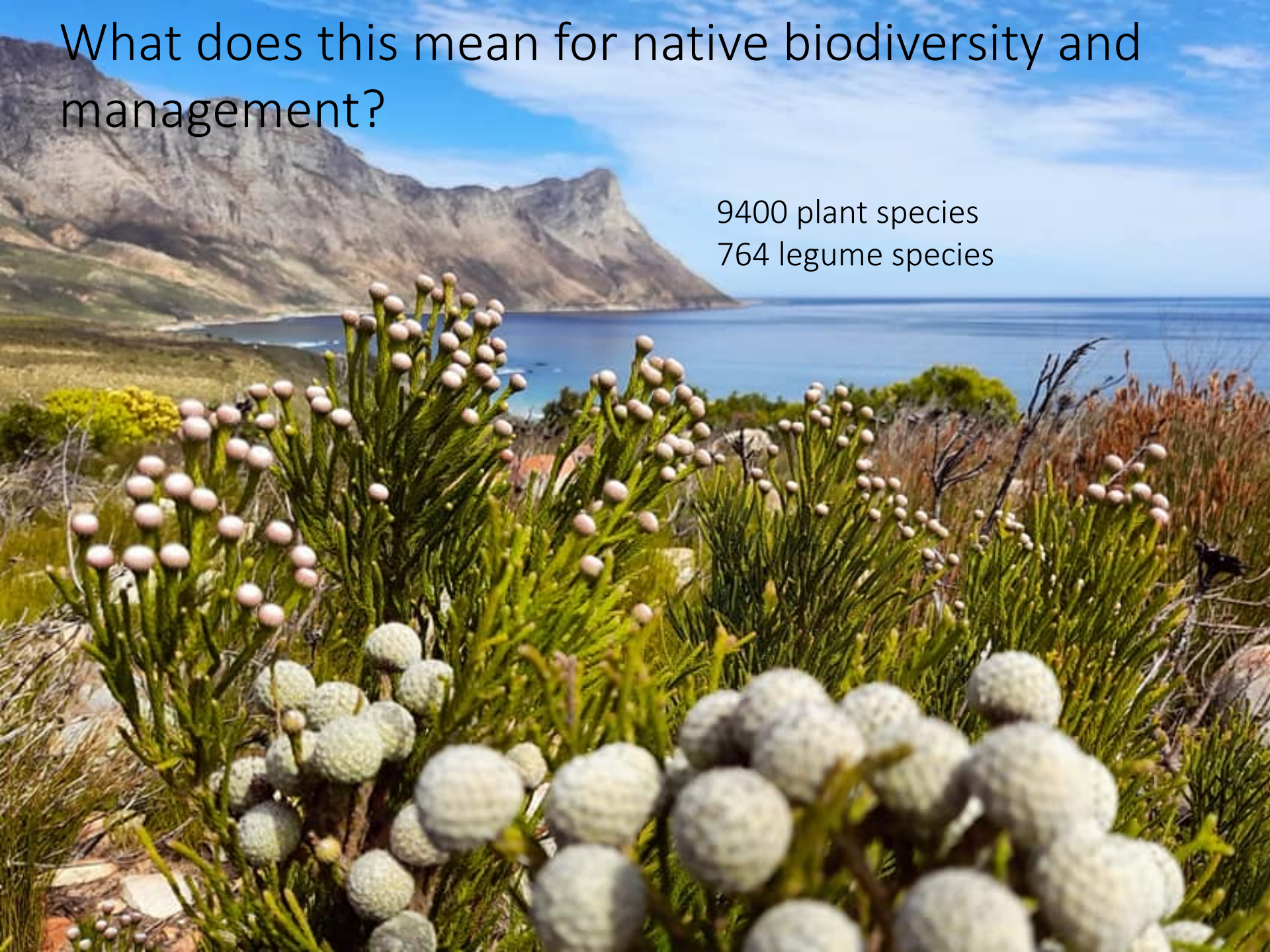
Rodriquez et al. unpublished data

Whole soil bacterial community structure

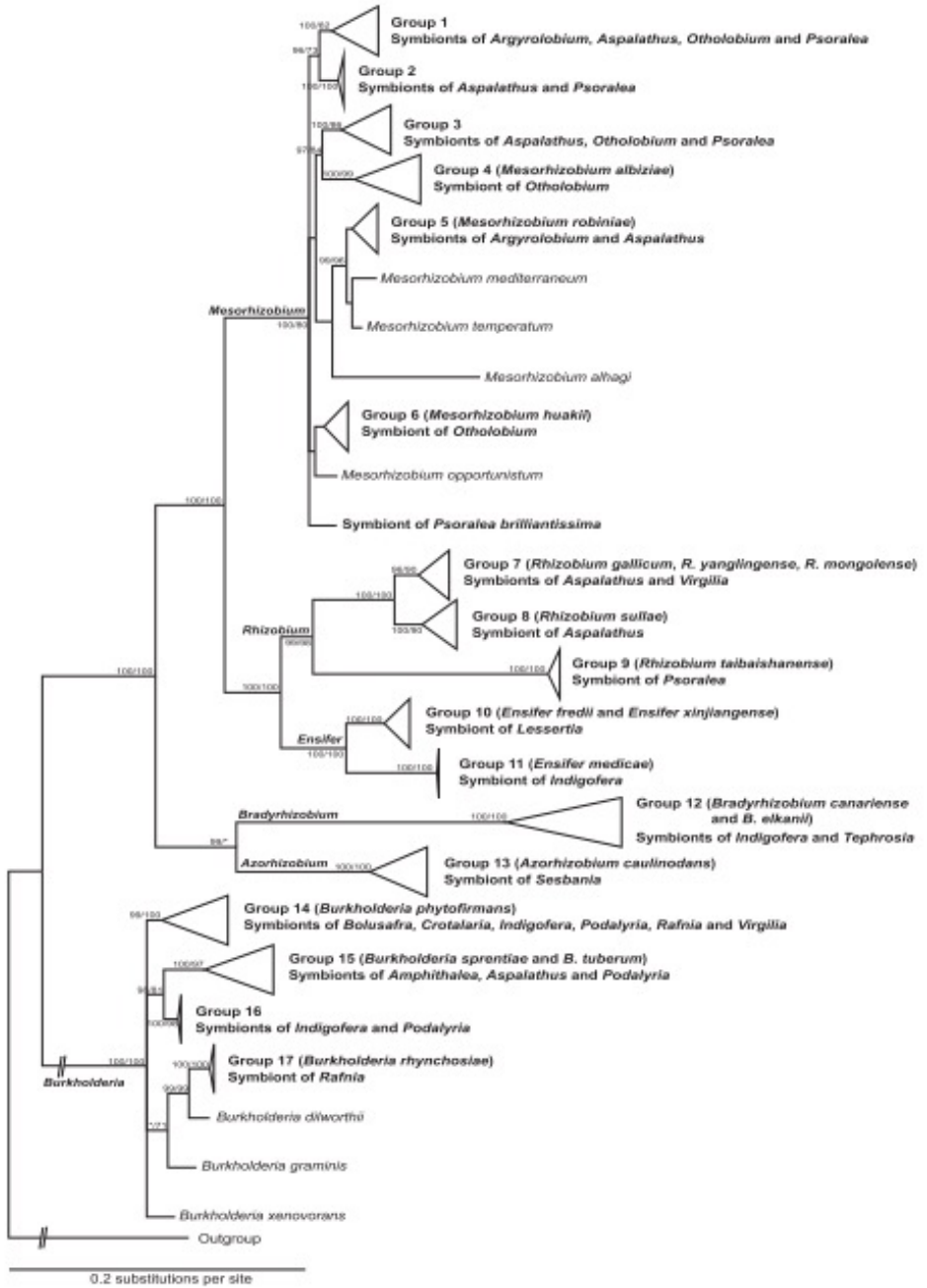


Keet et al. (2021) Microbial Ecology

What does this mean for native biodiversity and management?



Management insights – the rhizobial perspective

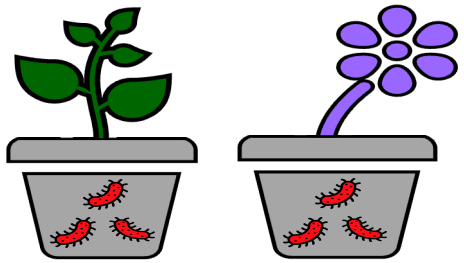
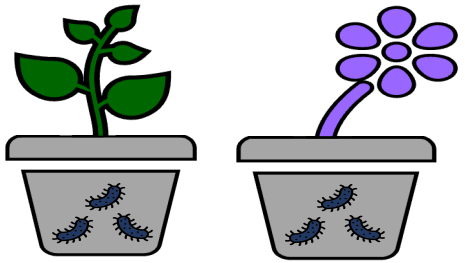


Management insights – the rhizobial perspective

Psoralea pinnata

Acacia saligna

Management insights – the rhizobial perspective

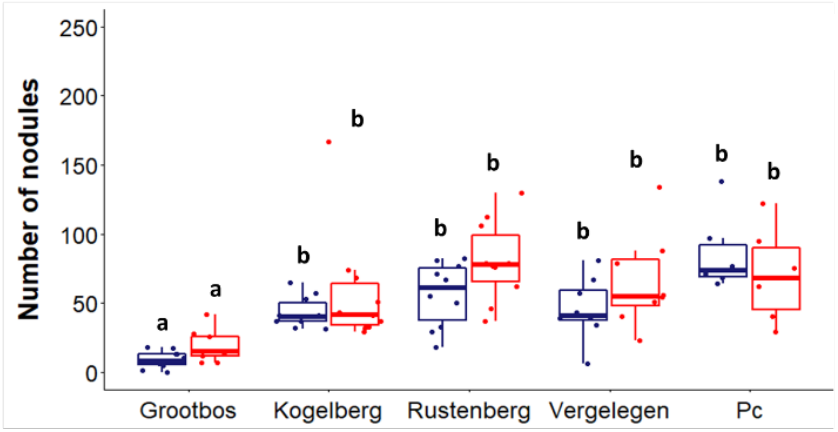
Repeated for each soil type	Five different soil types
Australian *Bradyrhizobium* added	
No inoculum added	

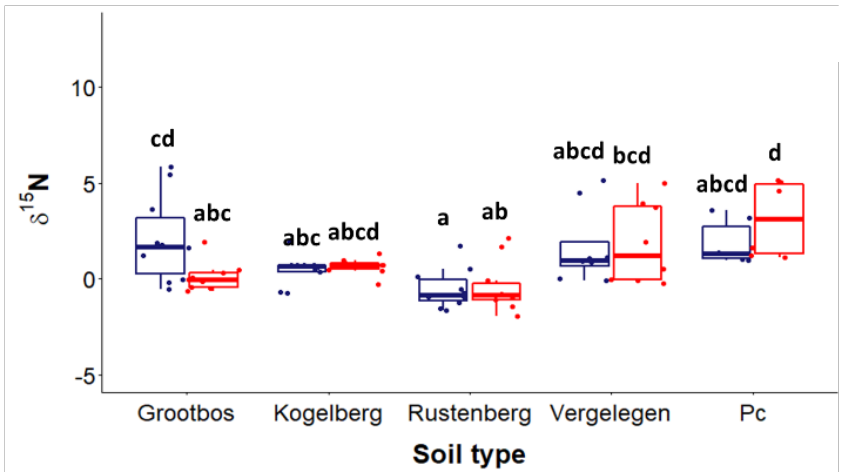
Acacia saligna *Psoralea pinnata*

Warrington et al. unpublished data

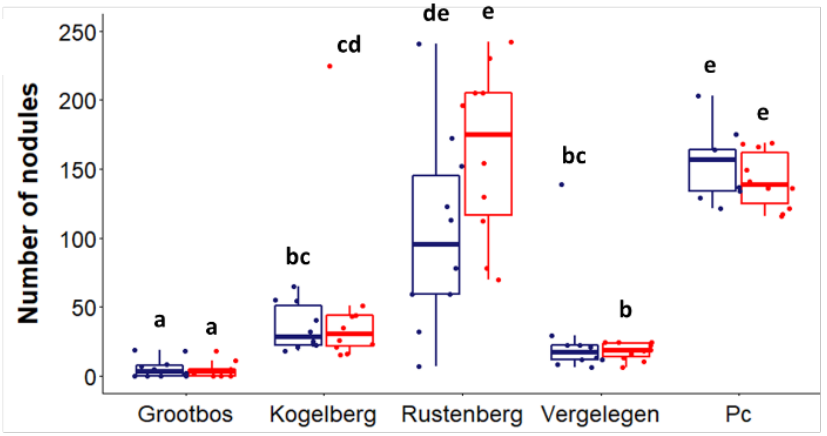
Management insights – the rhizobial perspective

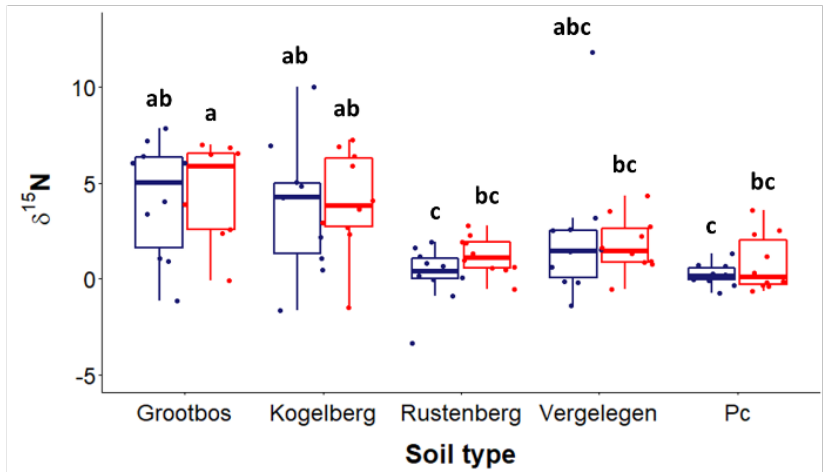
Acacia saligna





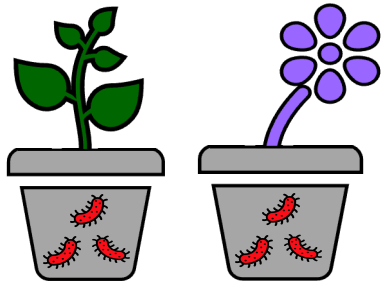
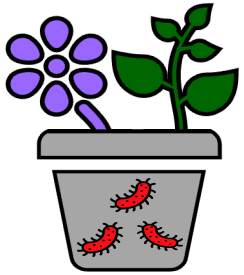
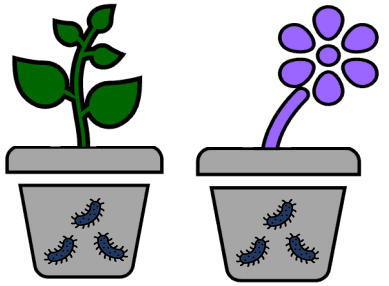
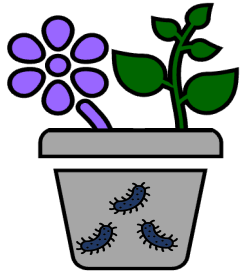
Psoralea pinnata





Warrington et al. unpublished data

Management insights – the rhizobial perspective

One soil type only	Grown alone	Grown together
Australian *Bradyrhizobium* added		
No inoculum added		

Acacia saligna *Psoralea pinnata*

Warrington et al. unpublished data

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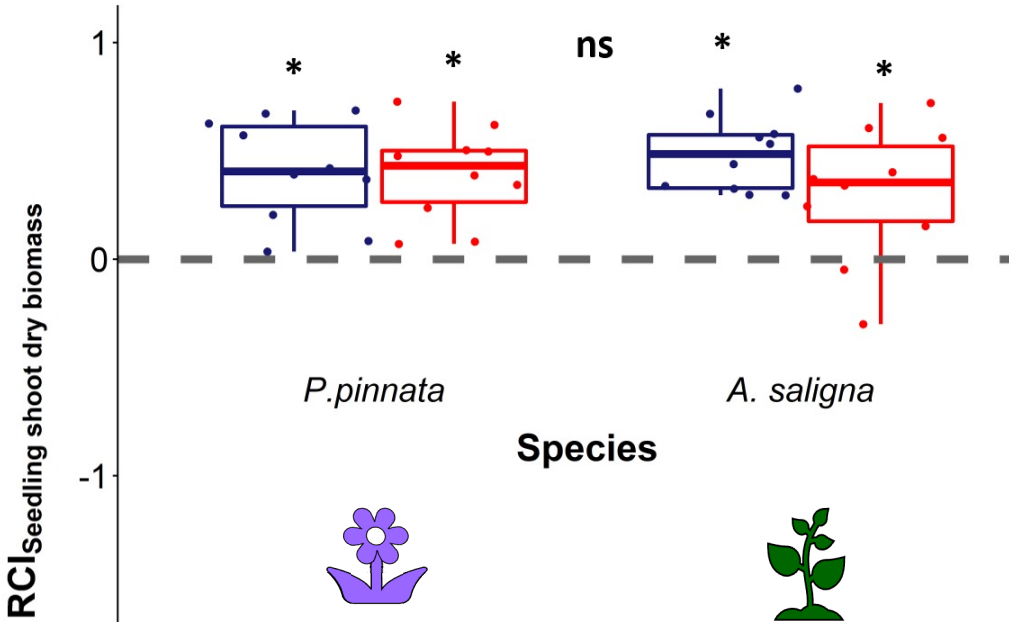

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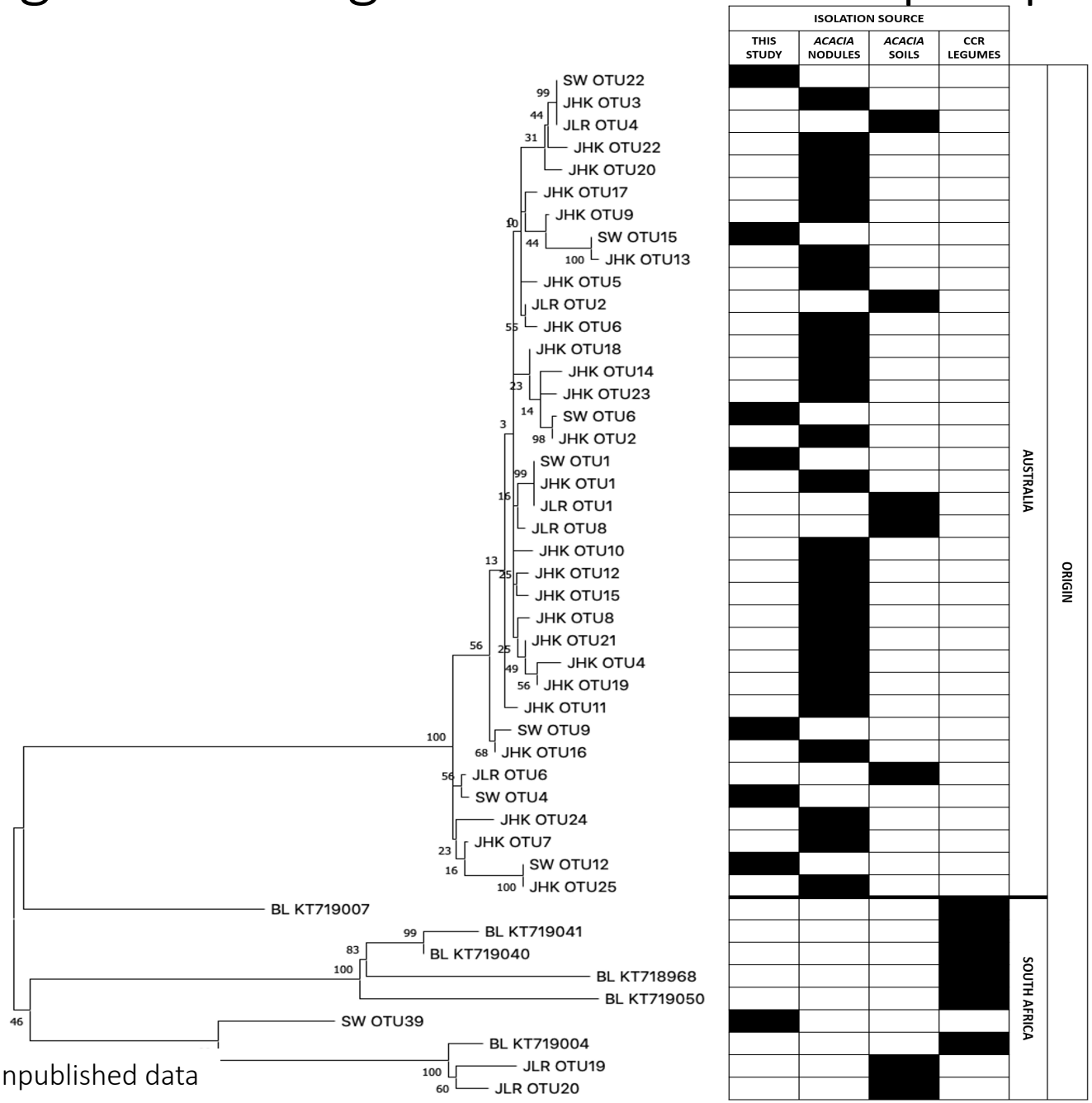

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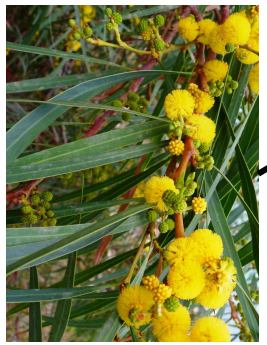
Management insights – the rhizobial perspective



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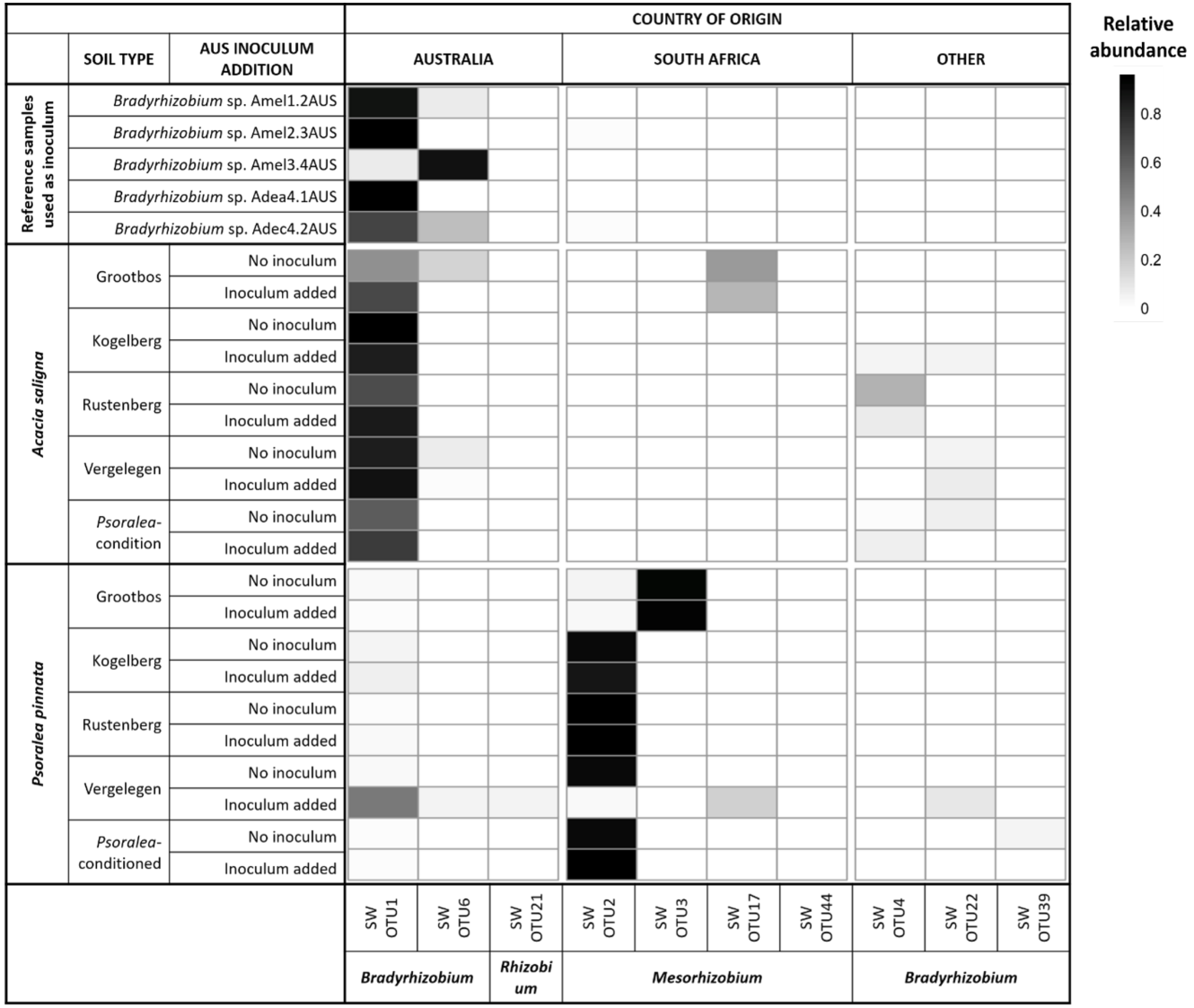
Management insights – the rhizobial perspective



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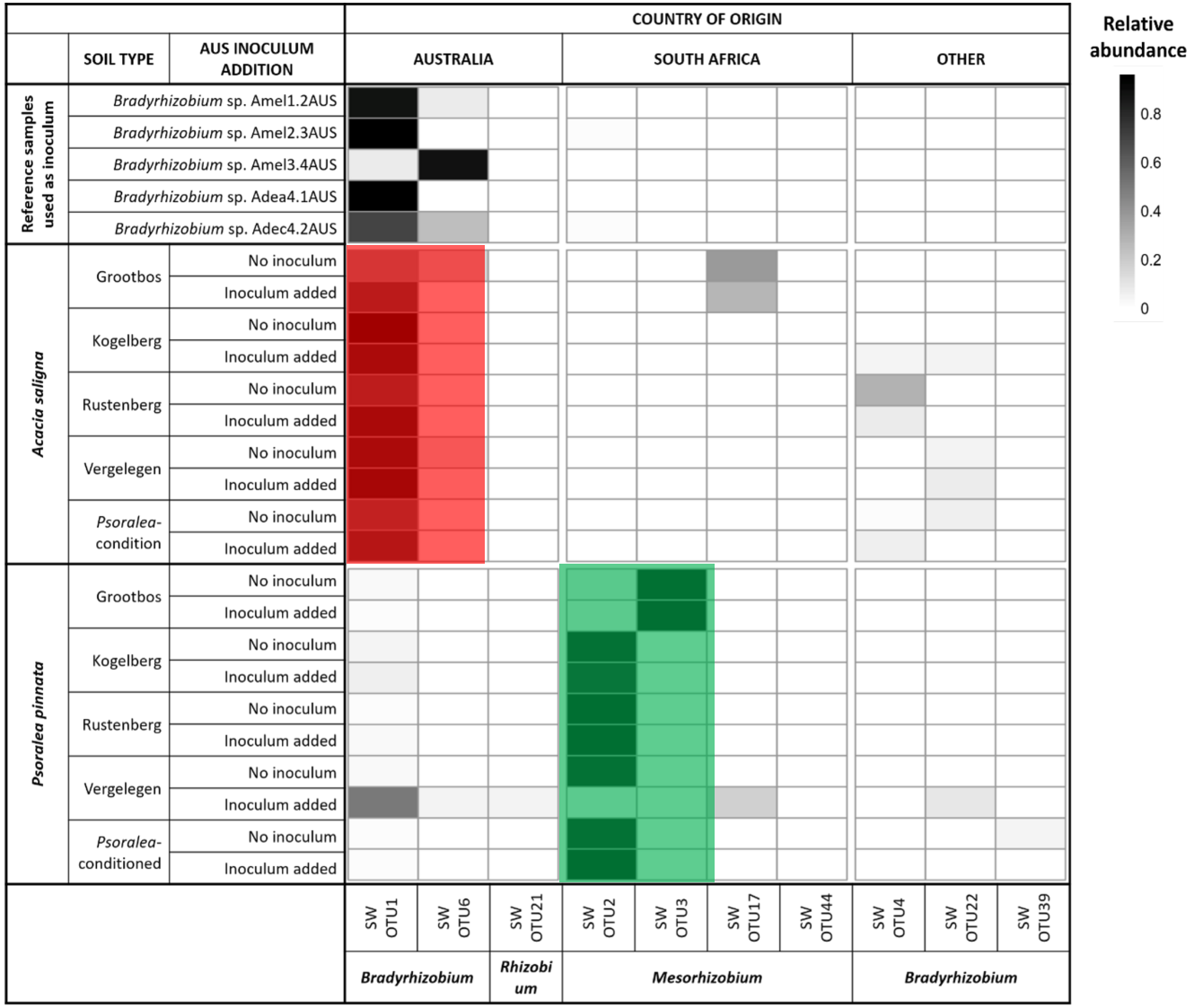
Management insights – the rhizobial perspective



Warrington et al. unpublished data

Management insights – the soil bacterial community perspective

3 sites and 4 plots per sites

Clearing done ~5 years ago
Passive restoration

Soil chemistry | Plant communities | Soil bacterial communities

Invaded

Cleared

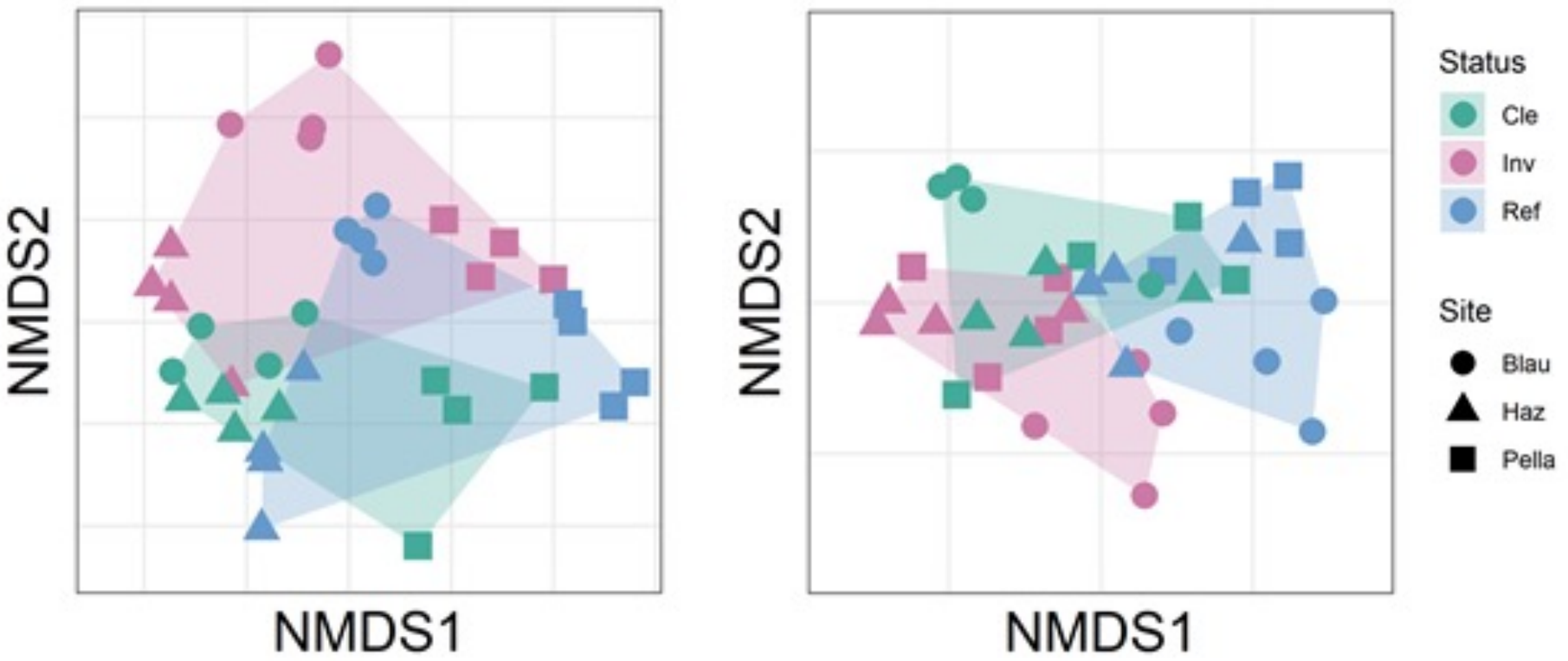
Uninvaded

Yannelli et al. unpublished data

Management insights – the soil bacterial community perspective

Plants

Soil bacteria



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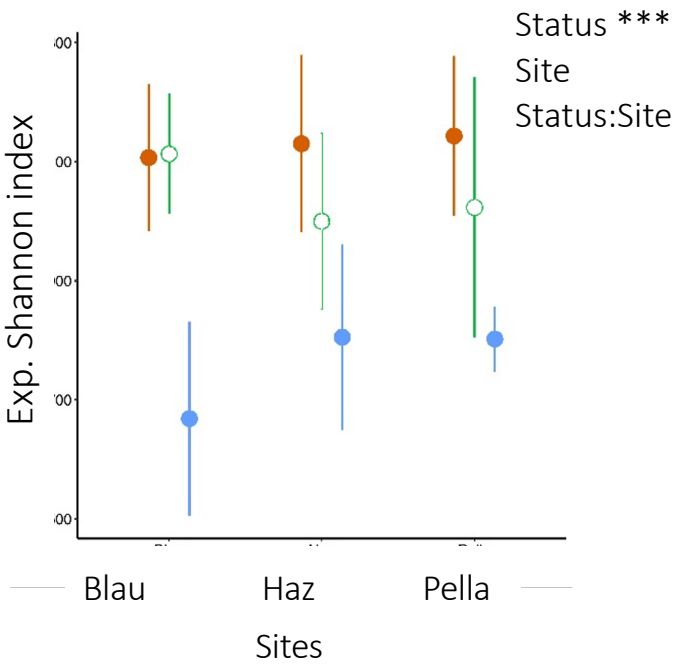
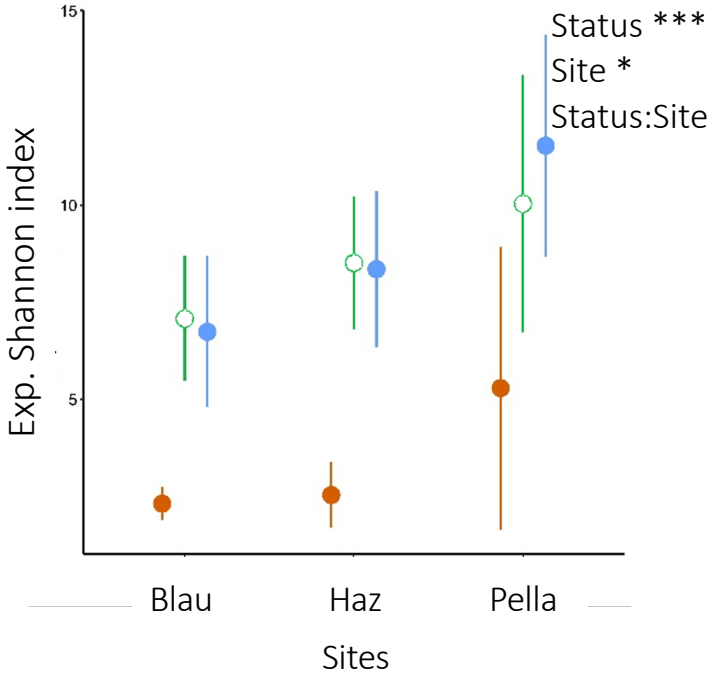
Management insights – the soil bacterial community perspective

Bacterial communities



Plant communities



Cleared
Invaded
Uninvaded

Yannelli et al. unpublished data

Taken together

Cointroduction of plants & mutualists commonplace

Invasive legumes can homogenize soil rhizobial communities

Generates positive PSFs and legacy effects

Consequences for restoration

Acknowledgements

Lise-Mari van Zyl

Florencia Yannelli

Jan-Hendrik Keet

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Allan Ellis

Ana Novoa

Megan Mathese

Thank you

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