



BEST

Building biodiversity into an ecosystem service-based approach for resource management

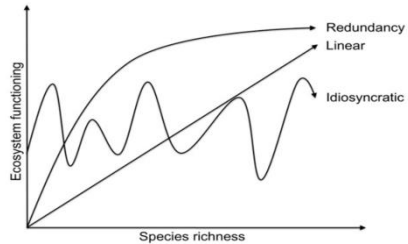
Research partnership with



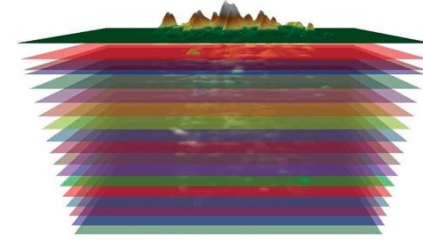
New Zealand's Natural Capital

Māori & governance

Building biodiversity – land cover – ecosystem service relationships



Modelling ecosystem services & human behaviour



Natural resource management decisions



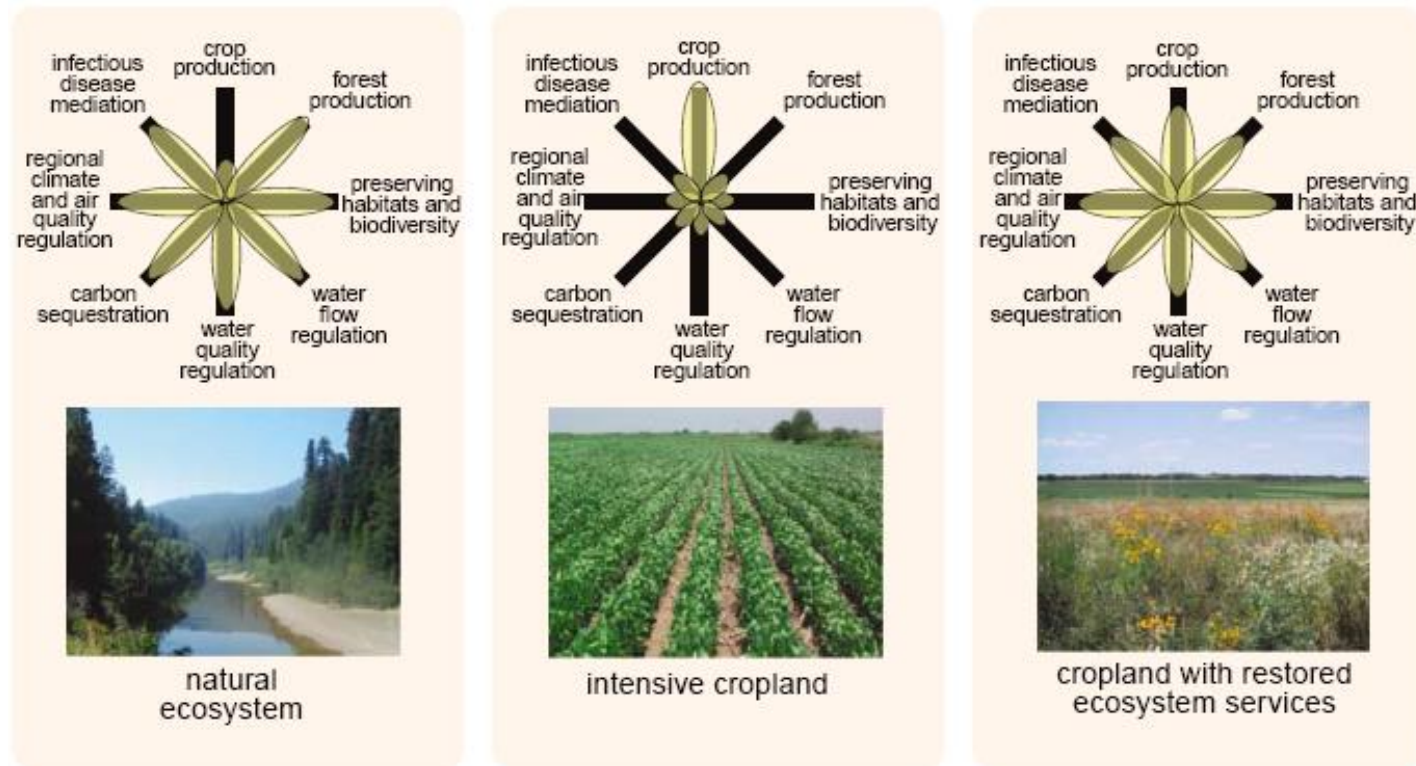
Land managers routinely assess biodiversity and ecosystem services & systematically factor these into natural resource management planning

Focal questions

- How does service provisioning correlate across land covers (bundles, tradeoffs)?

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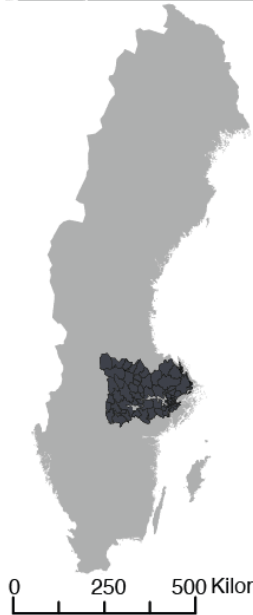
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- Are ES with local benefits traded off against global ones (implications for who pays)?

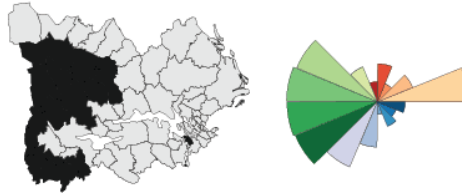
Focal questions

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- Do broad land cover categories like native vs. production determine service provisioning?
- Are ES with local benefits traded off against global ones (implications for who pays)?
- How do you maximise flows of all services and their resilience at large (e.g. catchment) scales?

Mapping & assessing ES



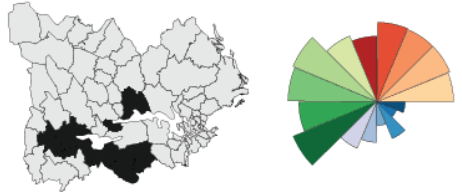
Forest and towns



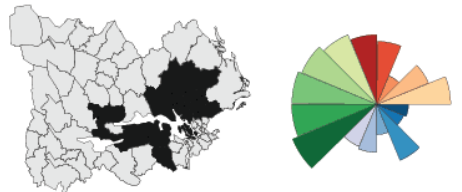
Remote Forest



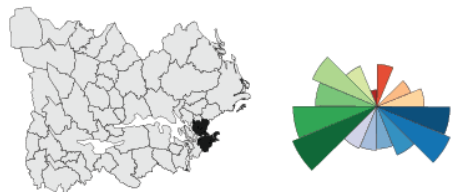
Mosaic cropland livestock



Mosaic cropland horse



Urban



Measuring biodiversity and services is difficult

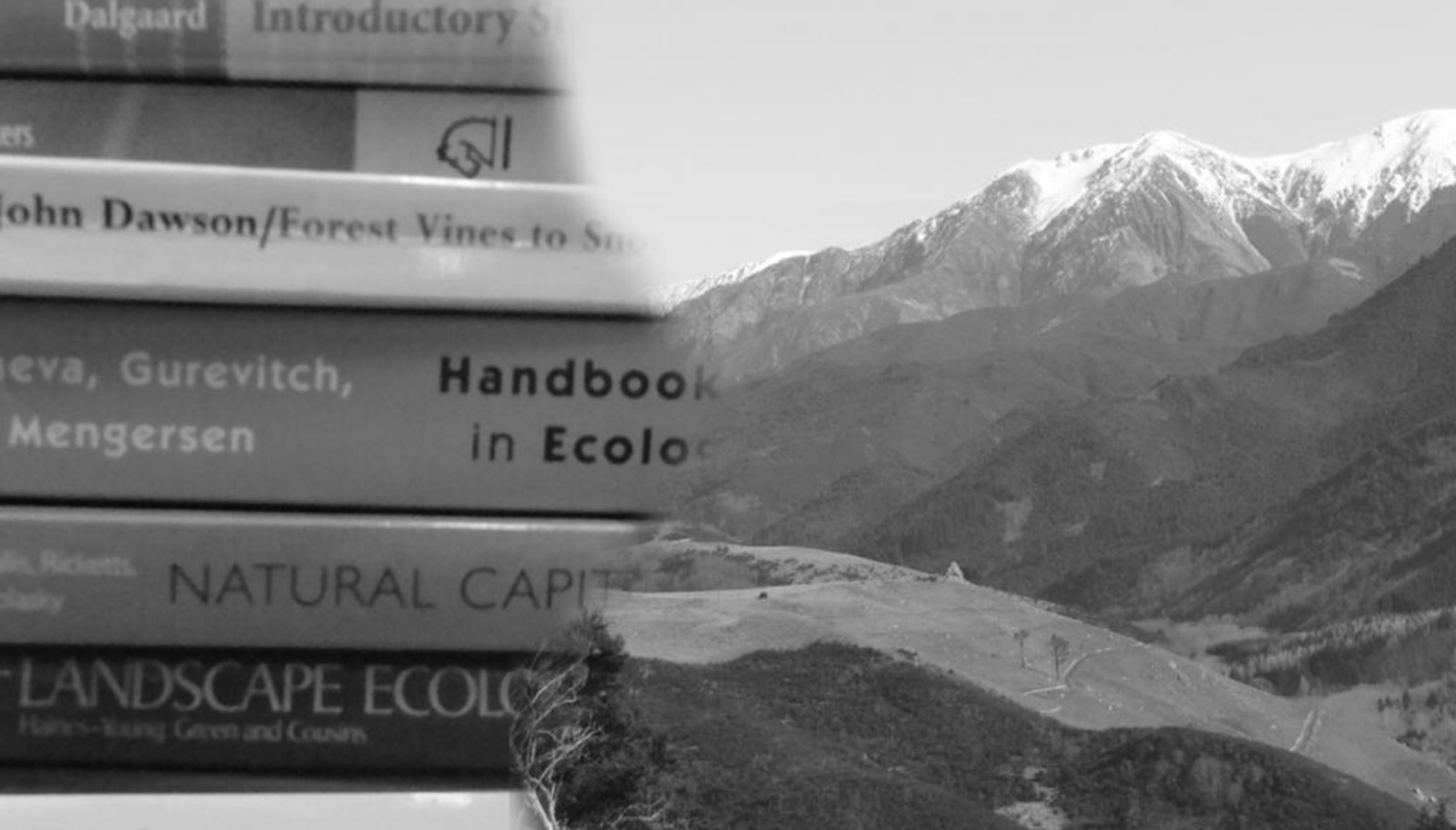
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- Cost of measuring BD and ES (need fine information across large scales)
- Which measure of ES to use (more measures= more cost)?
- Which measure of BD to use?
- Does biodiversity tell us anything about services that land cover doesn't?

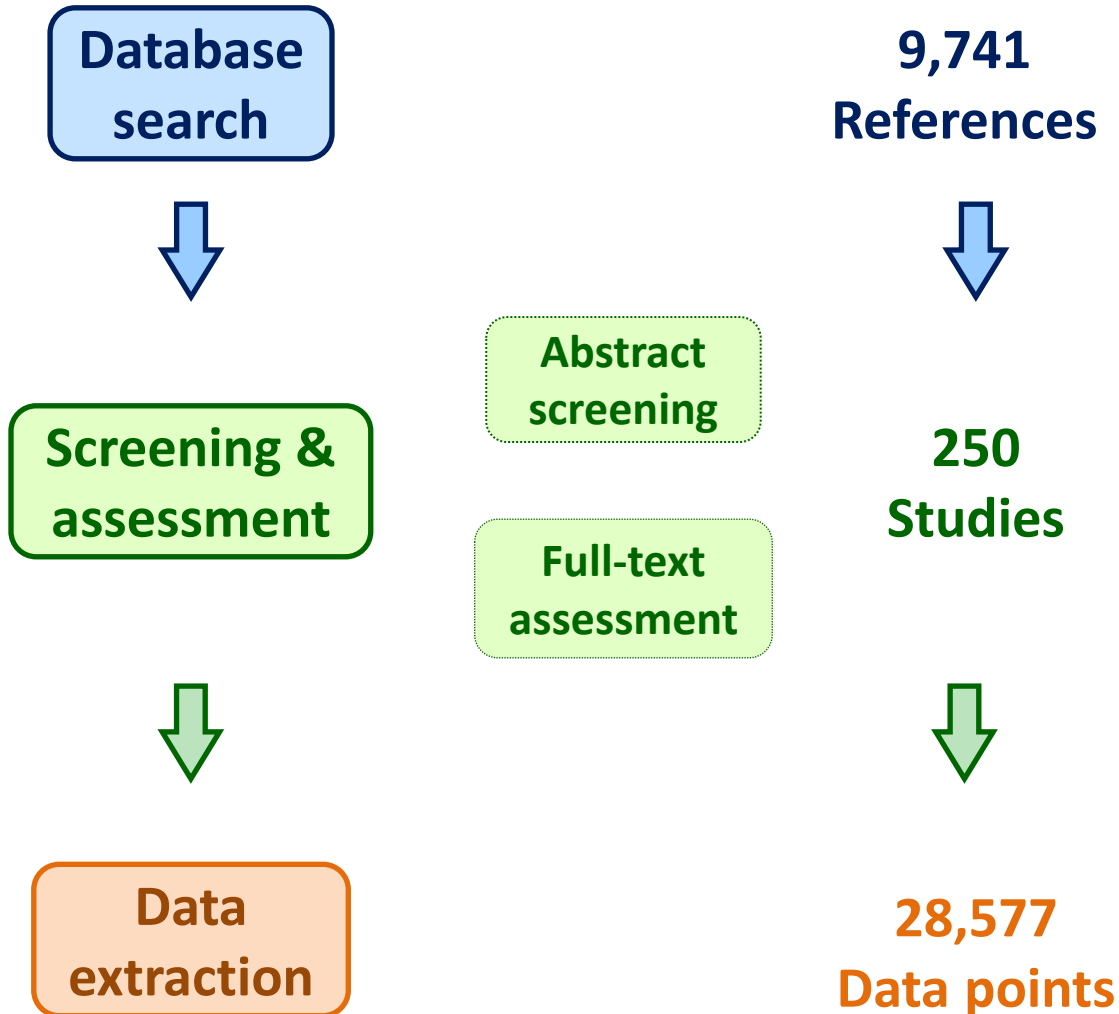


A meta-analysis on:

**Land use effects on ecosystem
service provision
New Zealand (1970 – 2015)**



Data collection

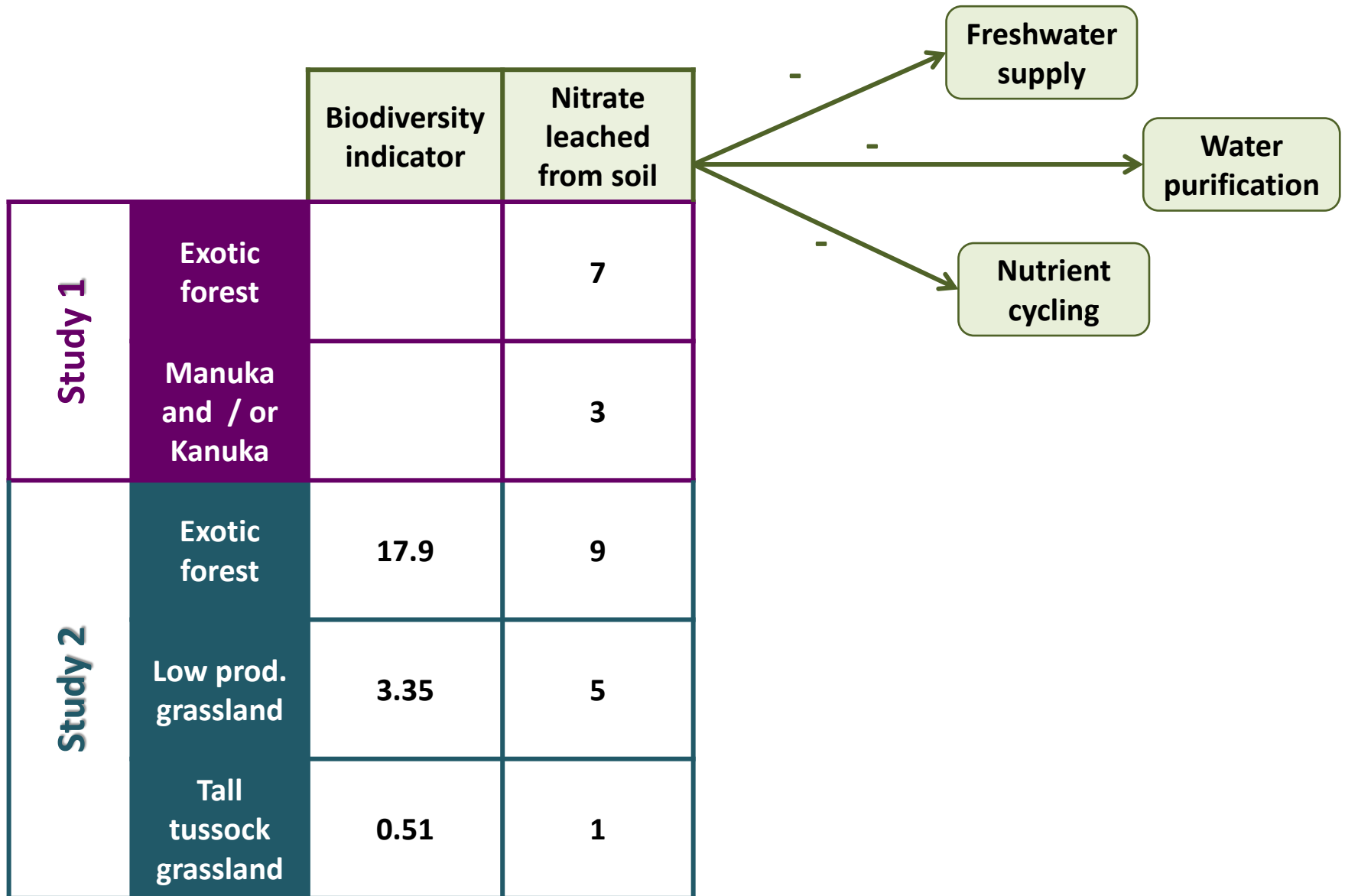


What is a data point?

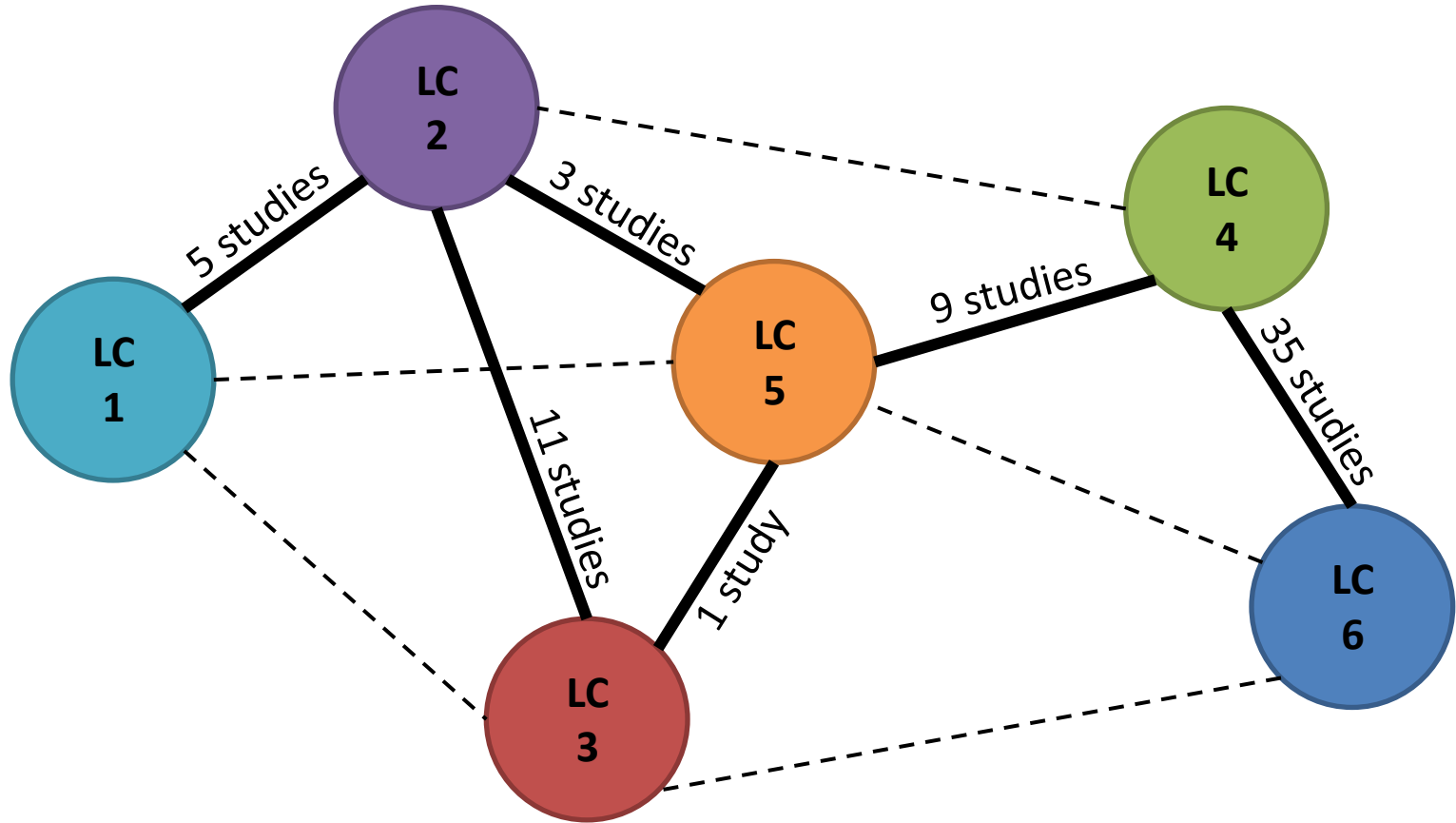
		Biodiversity indicator	Ecosystem service indicator
Study 1	Land Cover A		7
	Land Cover B		3
Study 2	Land Cover A	17.9	9
	Land Cover C	3.35	5
	Land Cover D	0.51	1

Per study: at least **one** indicator of service provision and **two** land covers

Data aggregation



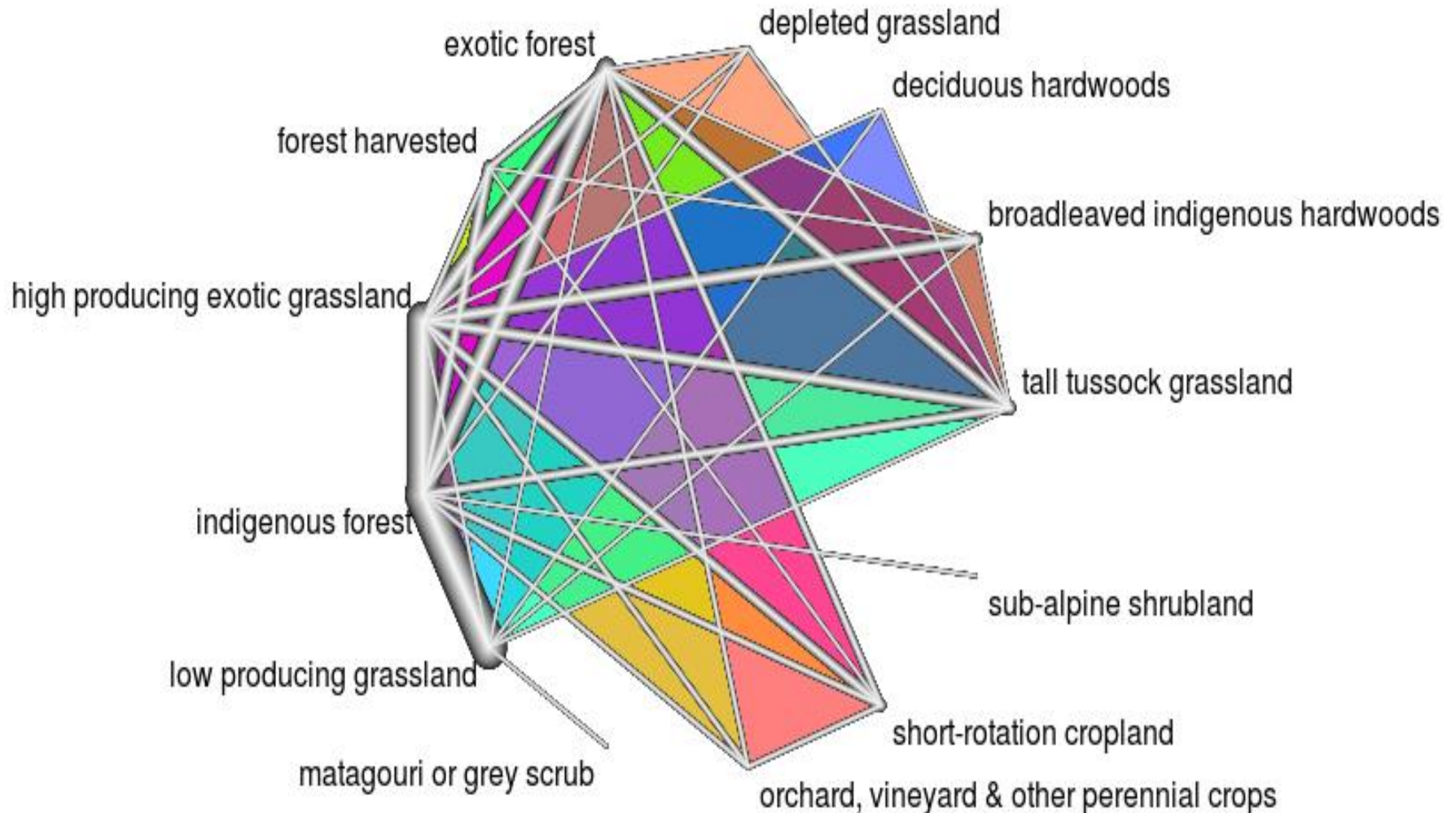
Network meta - analysis



For each of 17 services

— Direct evidence
- - - Indirect evidence

Evidence network for habitat provision



Some caveats before we begin

- Excluded “single - land cover” provisioning services (e.g. meat, dairy, wool, crops)
- For individual ES – Land cover comparisons:
 - Competing evidence from different indicators
 - Comparisons may not hold for land cover changes
 - Differing strength of direct & indirect evidence



Habitat provision across land covers

Land cover

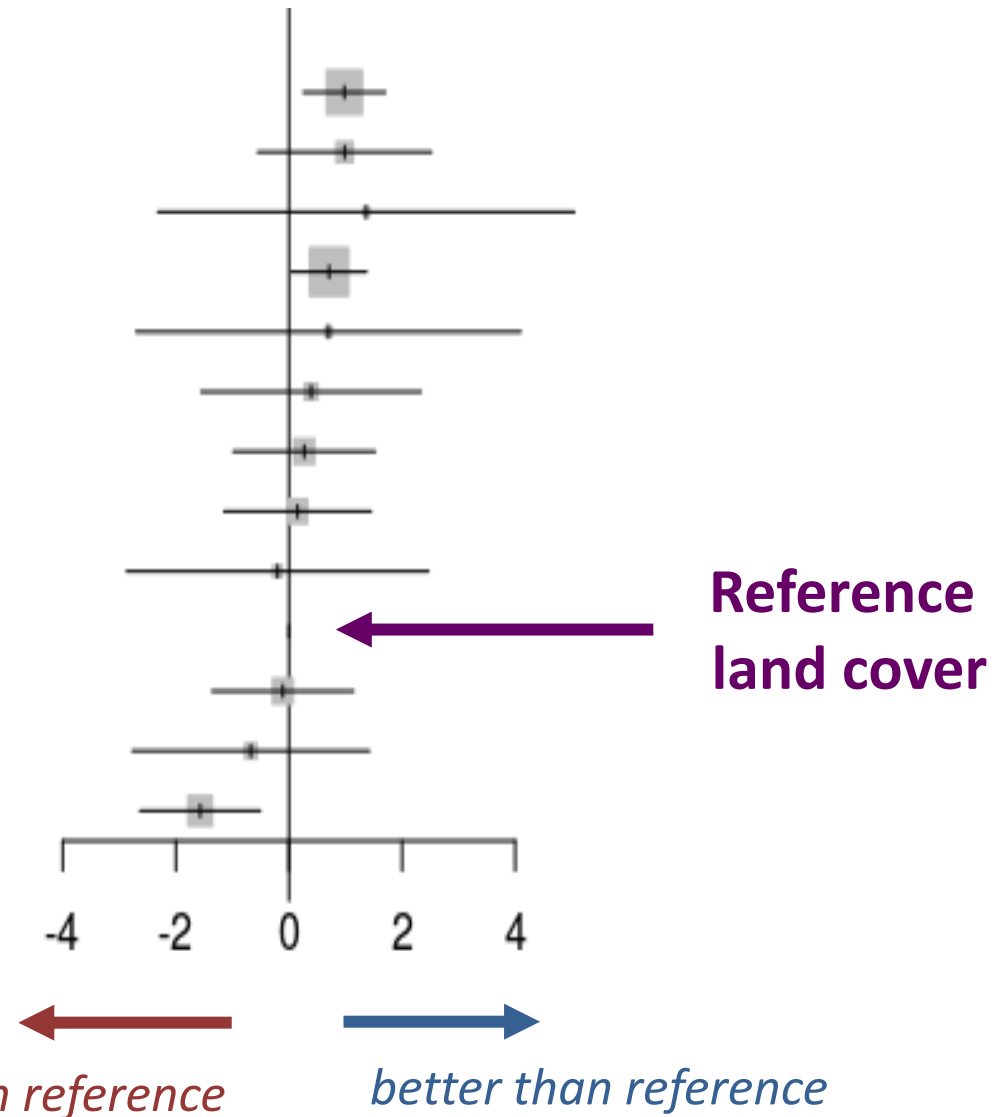
exotic forest
broadleaved indigenous hardwoods
matagouri or grey scrub
indigenous forest
sub-alpine shrubland
orchard, vineyard & other perennial crops
forest harvested
low producing grassland
depleted grassland
high producing exotic grassland
short-rotation cropland
deciduous hardwoods
tall tussock grassland



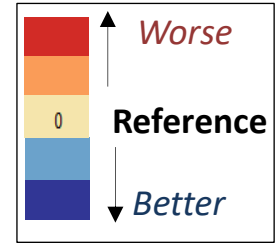
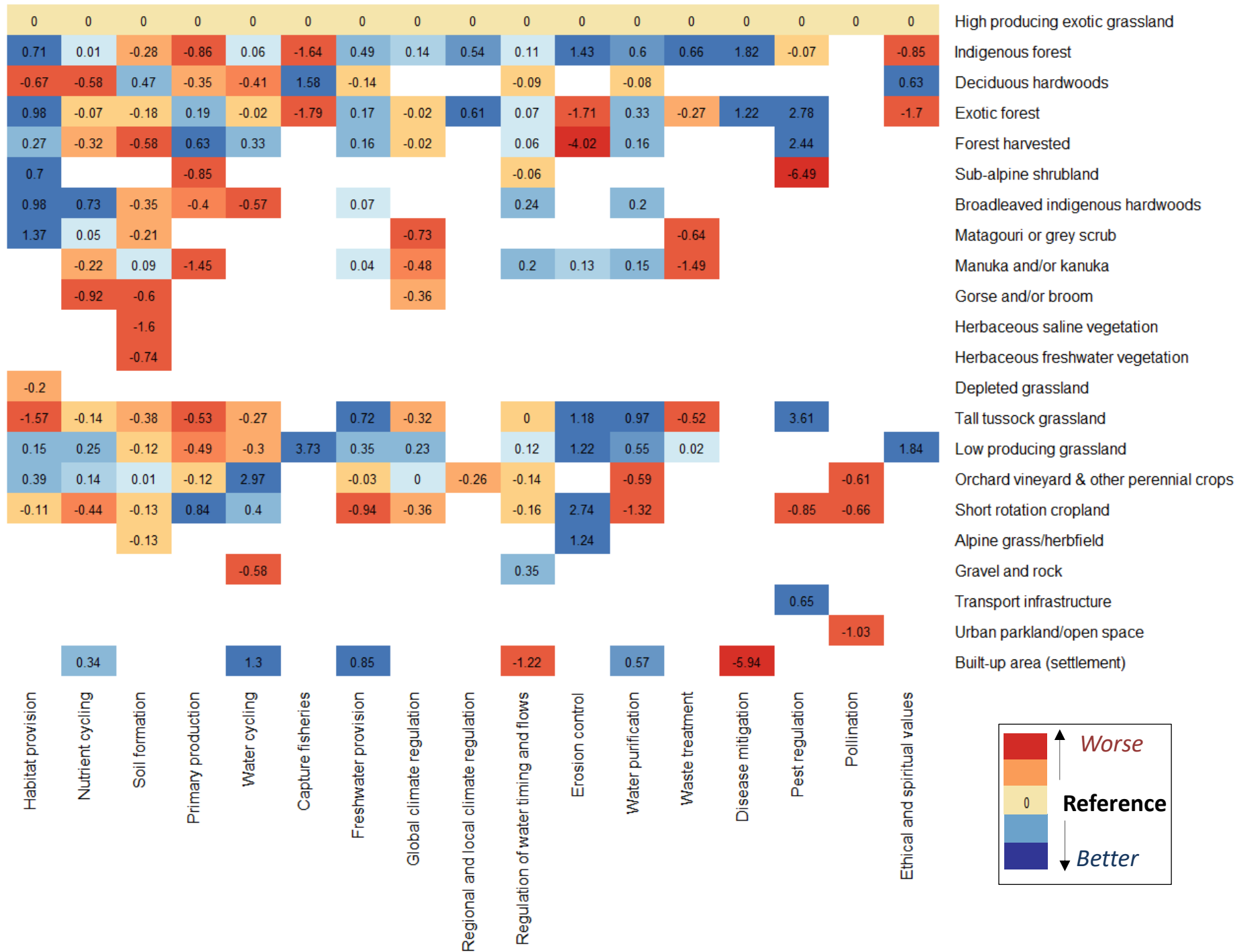
Habitat provision across land covers

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Looking across ES

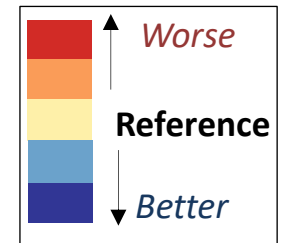
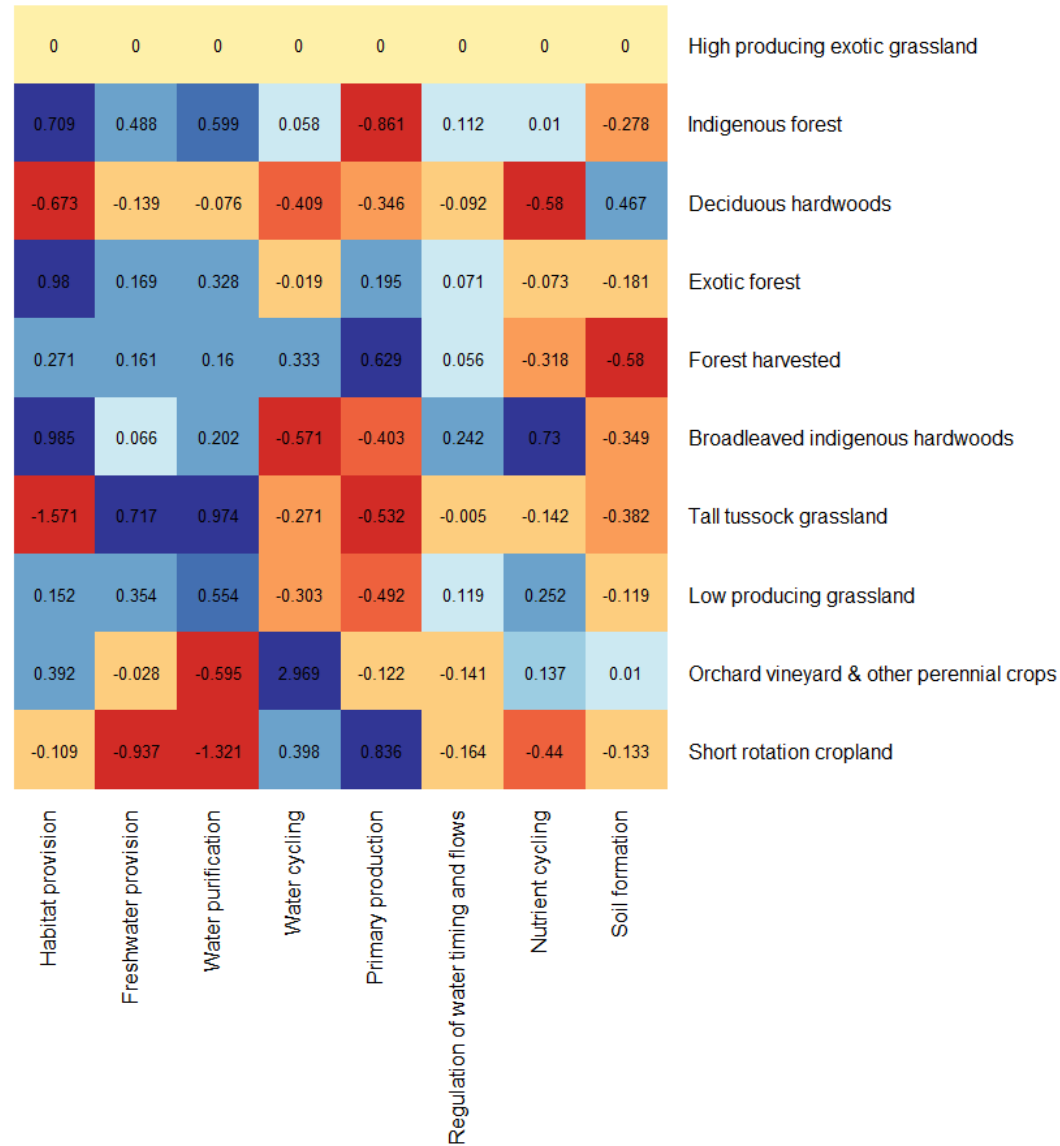


First take-home messages

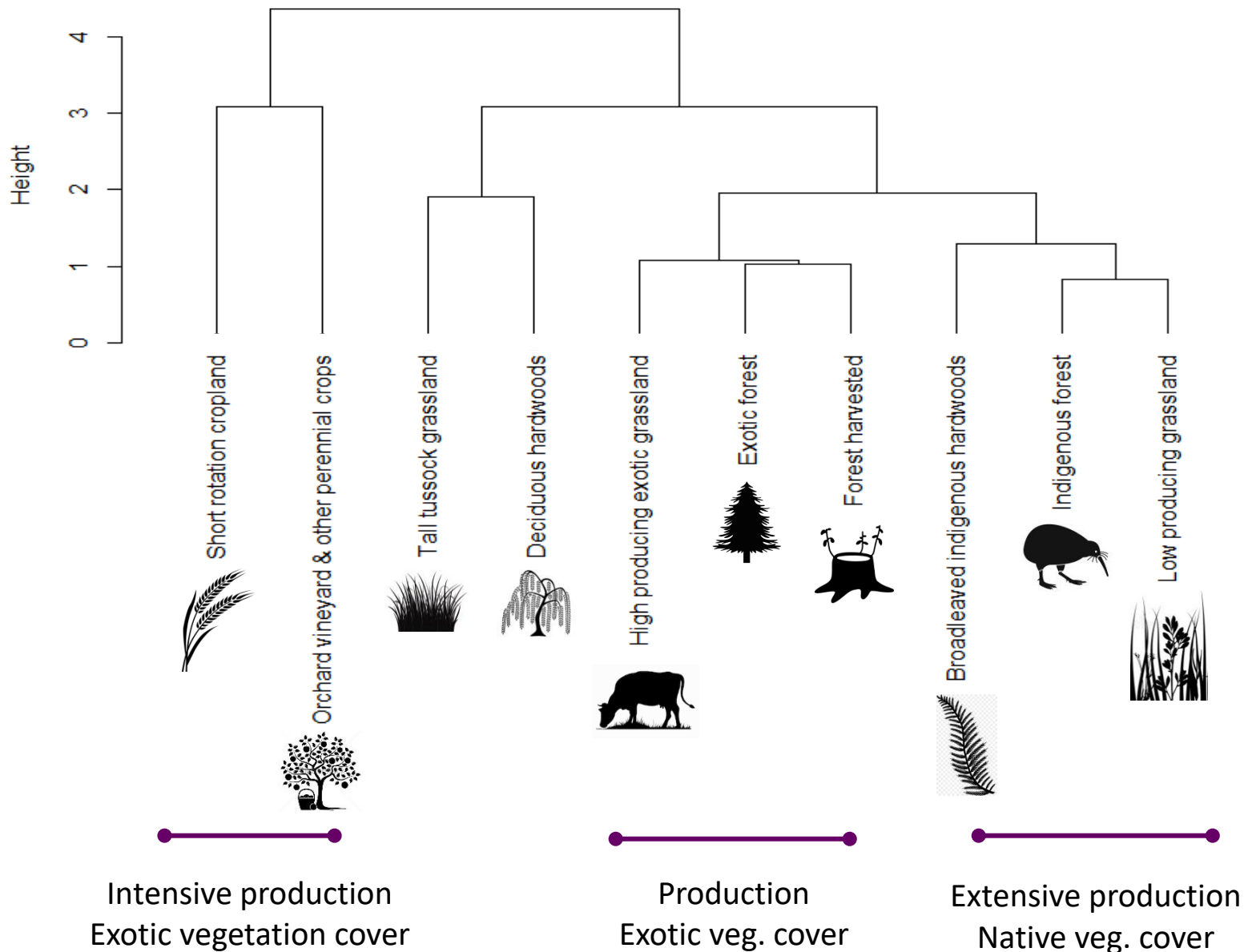
- No “silver bullet” land cover to provide all ecosystem services
- Trade-offs are always present
- Provisioning of multiple services requires a mosaic of land uses in the landscape



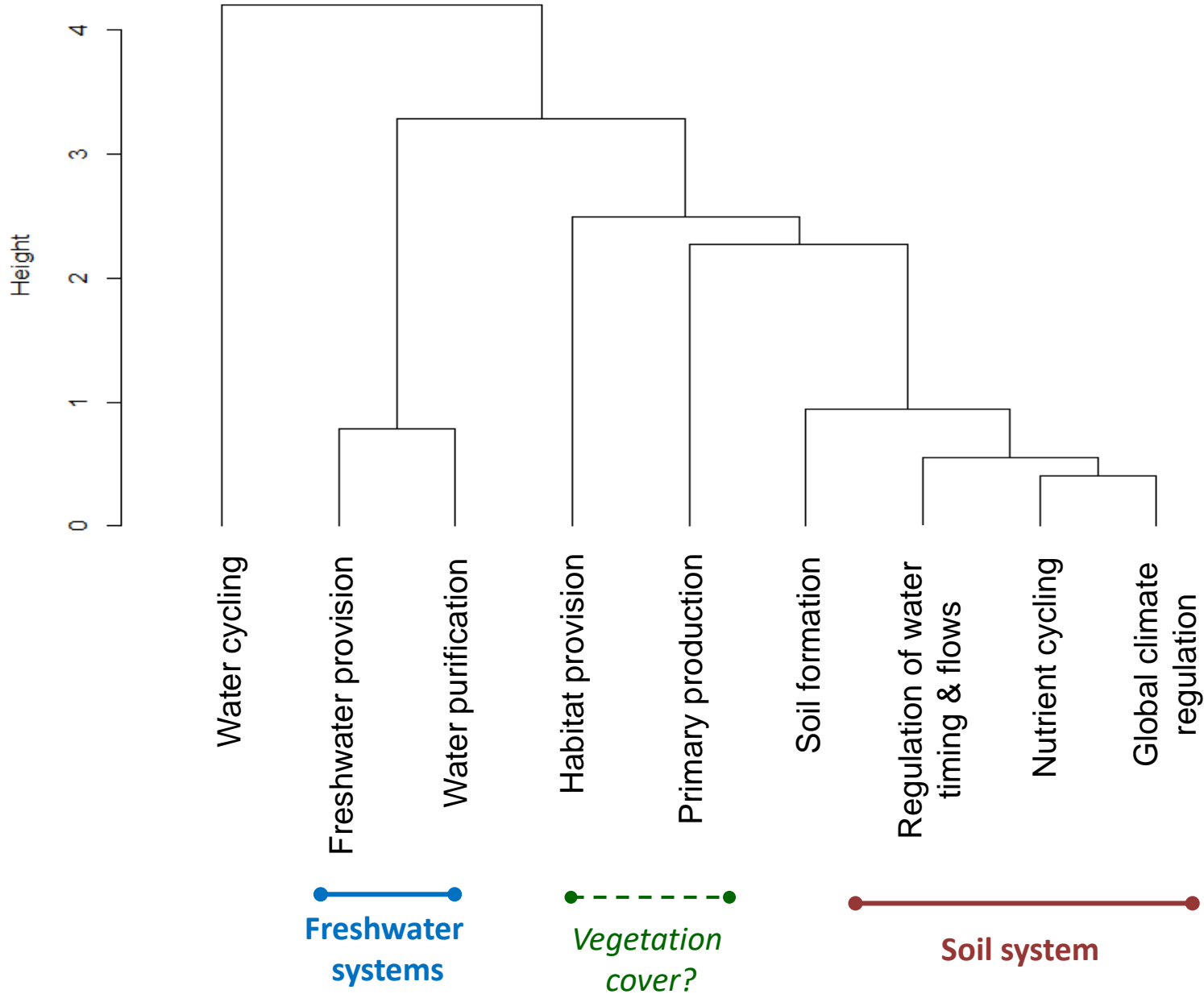
Data subset to explore tradeoffs



Land covers in ecosystem service space



Ecosystem services in land cover space

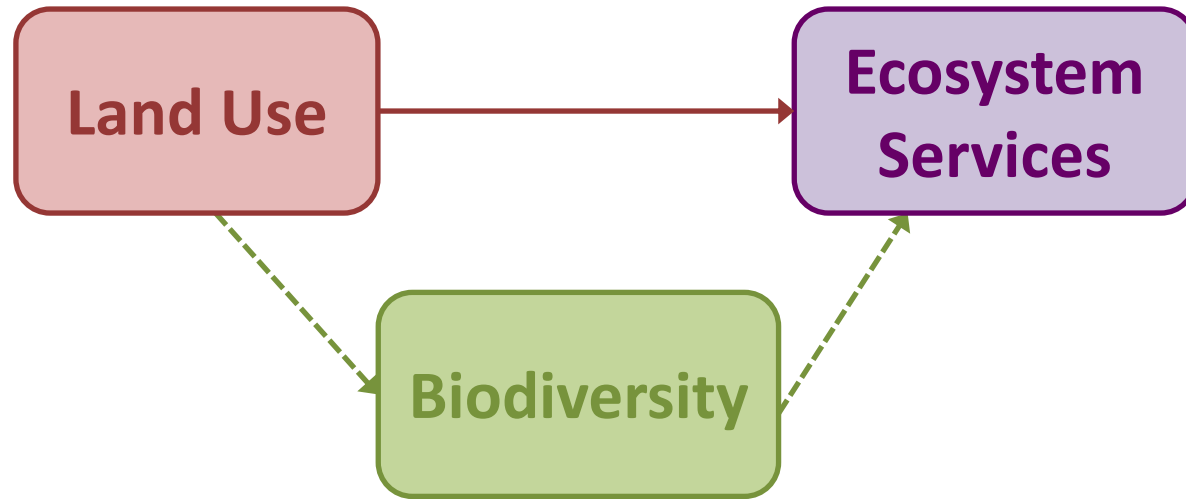


Second take-home messages

- Land covers will provide similar services depending on:
 - Production intensity ✓
 - Presence of native vegetation cover ✓
 - Forest cover ✗
- Services with different scale of benefits are not traded-off across land covers



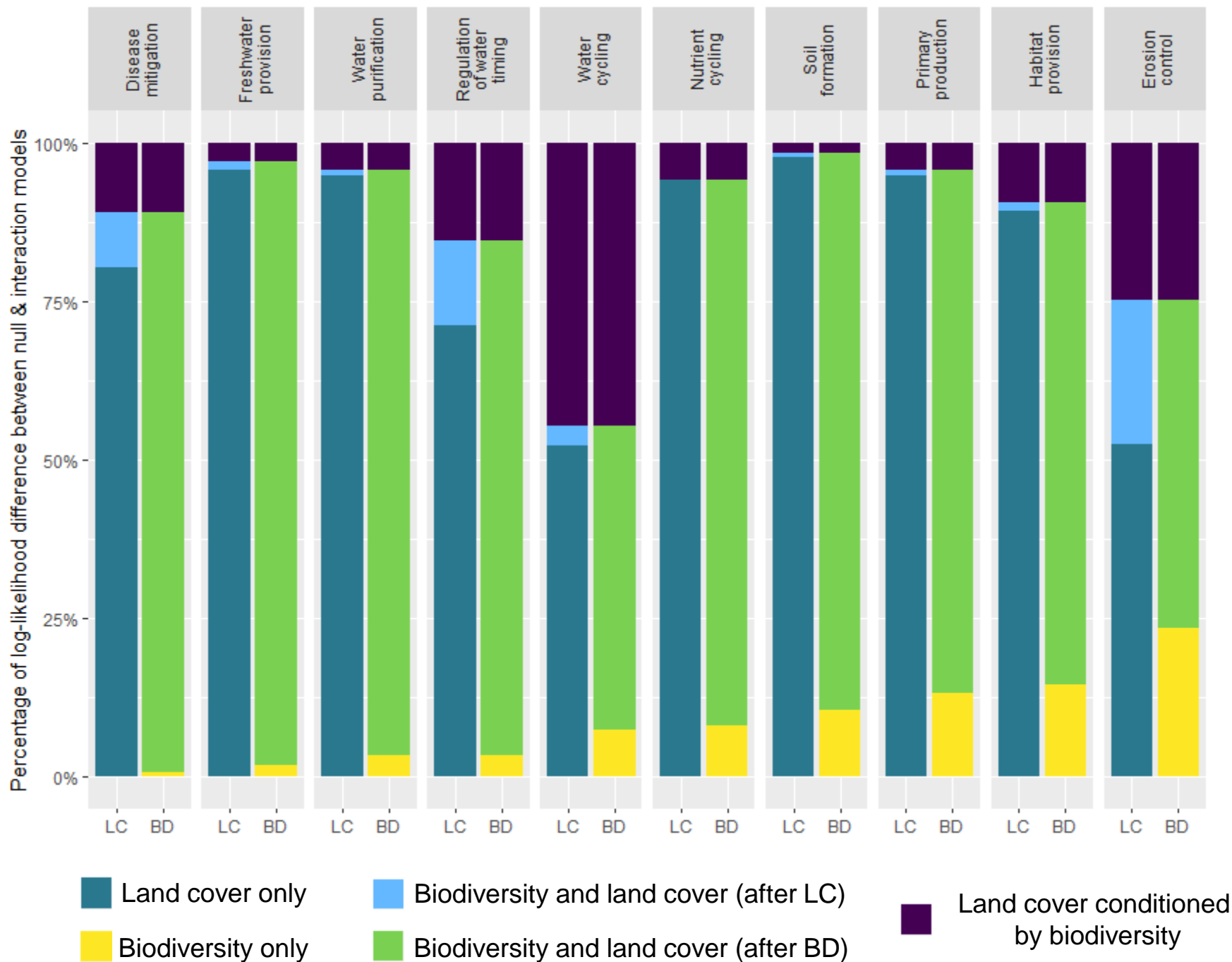
Does biodiversity tell us anything that land cover doesn't?

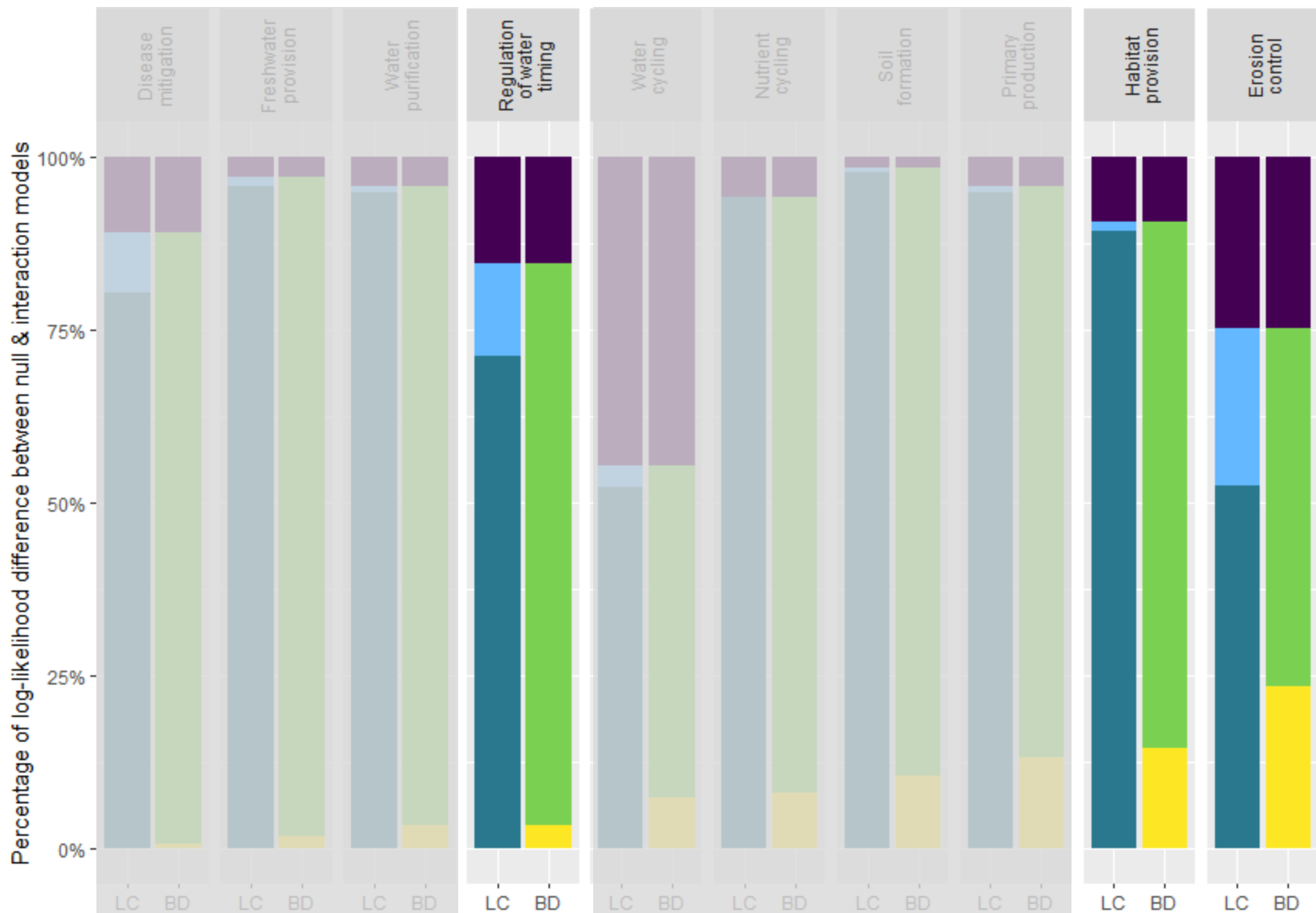


Biodiversity data subset

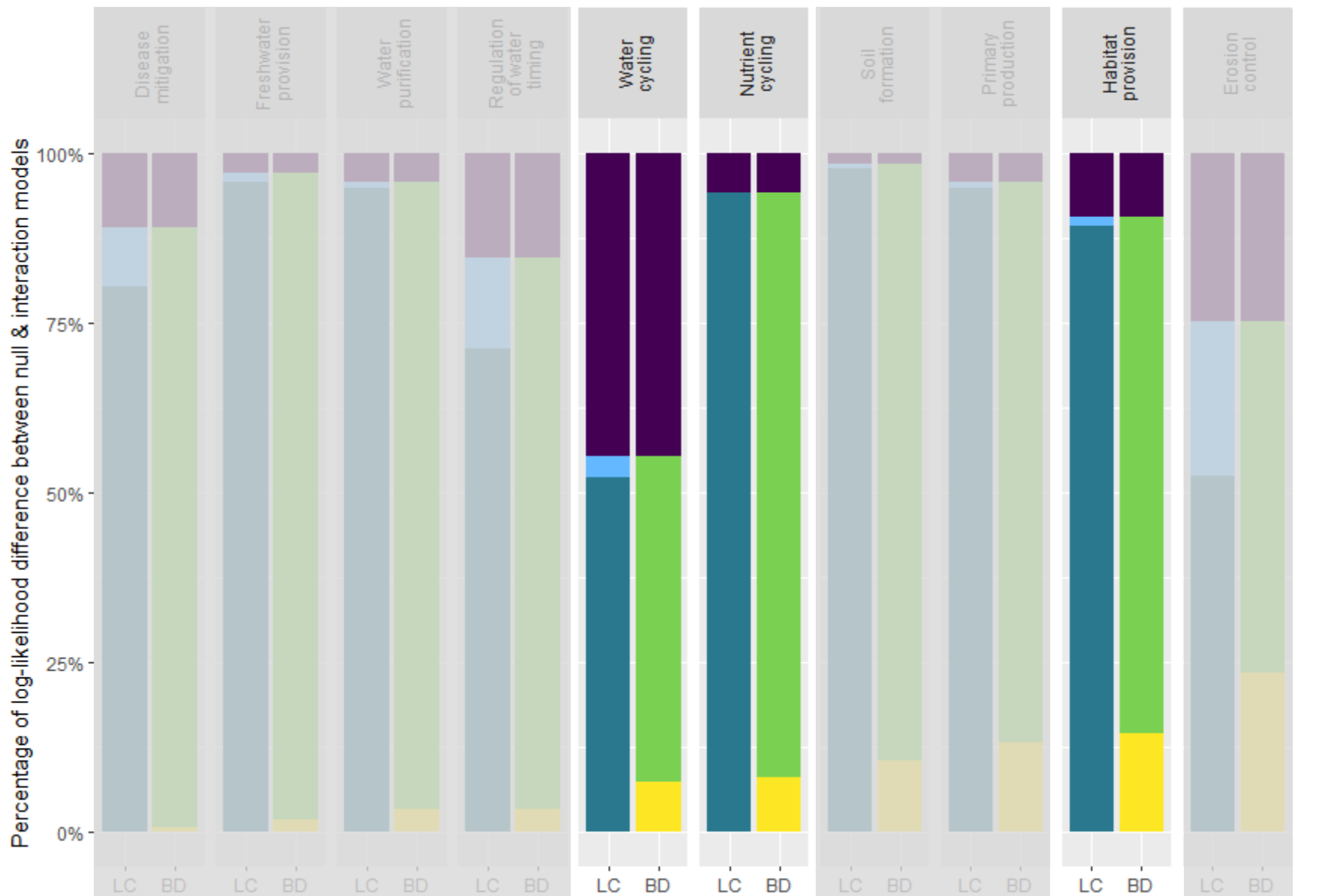
- 11 studies with matched biodiversity and ecosystem service data
 - 10 ecosystem services
 - 6 land covers
 - 86 sites
- Species richness as biodiversity indicator







LC - Null
 BD - Null
 BDLC - LC
 BDLC - BD
 Inter - BDLC



Land cover only

Biodiversity and land cover (after LC)

Land cover conditioned by biodiversity

Biodiversity only

Biodiversity and land cover (after BD)

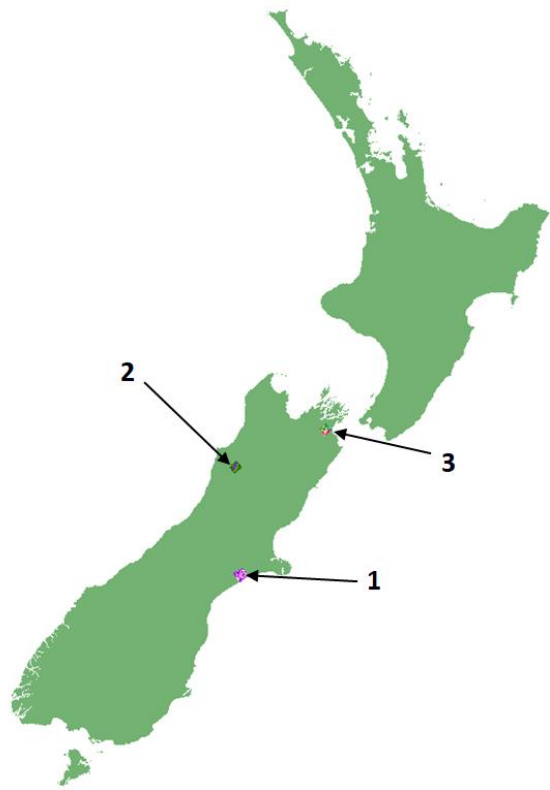
Third take-home messages

- Land cover often provides a **good surrogate** measure for the effect of biodiversity on ecosystem service provision
- **Exceptions** to this are:
 - Habitat provision
 - Regulation of water timing & flows
 - Erosion control
- Improving biodiversity could **alleviate** land-use impacts on:
 - Habitat provision
 - Water cycling
 - Nutrient cycling

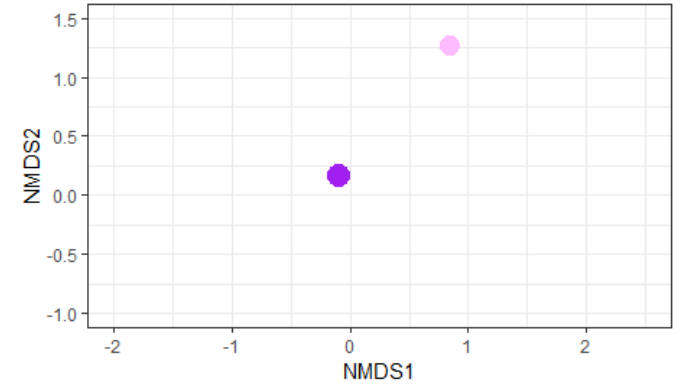
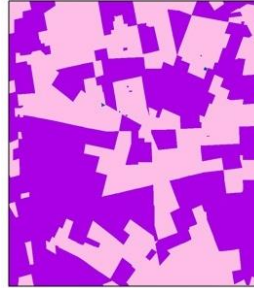


Moving forward....

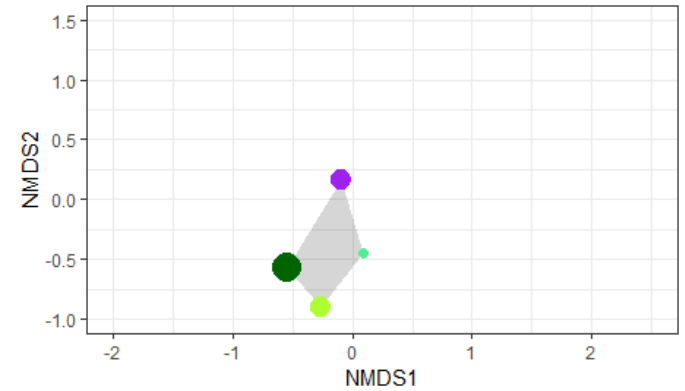
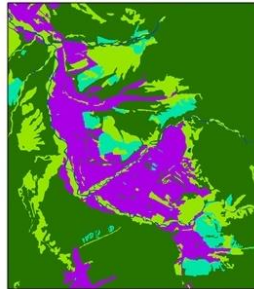
How can we maximize delivery and resilience of ecosystem services in actual landscapes?



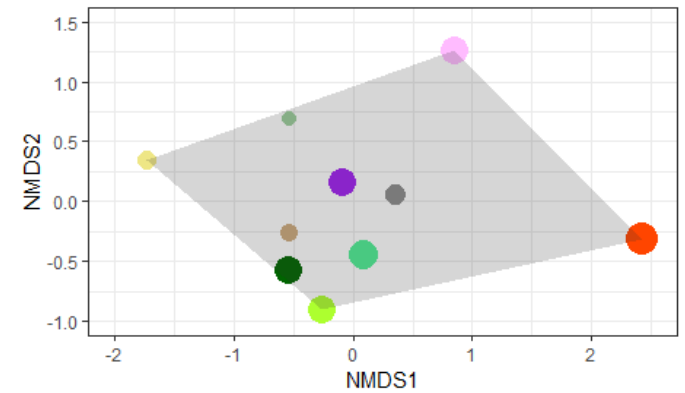
Case 1



Case 2



Case 3



Land covers

- Broadleaved indigenous hardwoods
- Deciduous hardwoods
- Exotic forest
- Forest harvested
- High producing exotic grassland
- Indigenous forest
- Low producing grassland
- Orchard, vineyard & other perennial crops
- Short - rotation cropland
- Tall tussock grassland

Point area is proportional to land cover extent in each case

Special thanks to:

MBIE - BEST project
team

Shinichi Nakagawa
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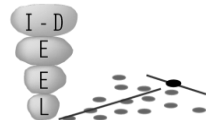
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INTER-DISCIPLINARY
ECOLOGY AND
EVOLUTION
LAB



**the
Stouffer
Lab**

**complexity
in ecology**

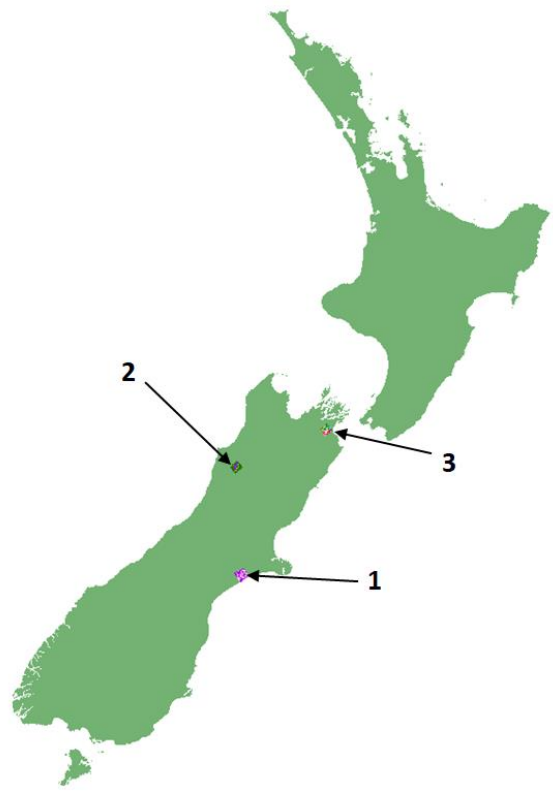


TYLIANAKIS LAB GROUP

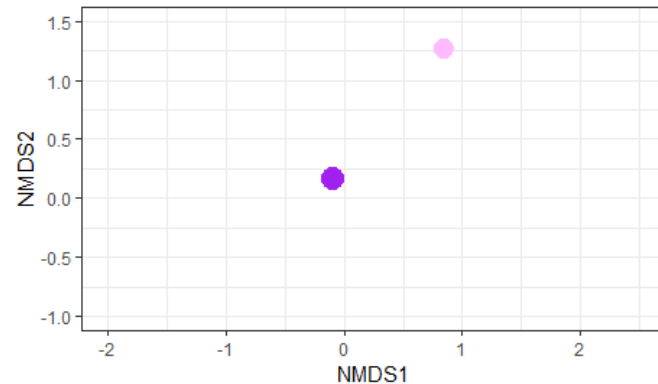
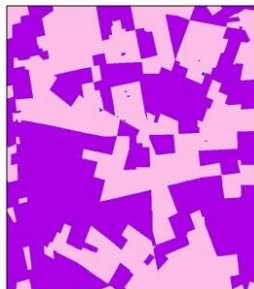
& many thanks to you...



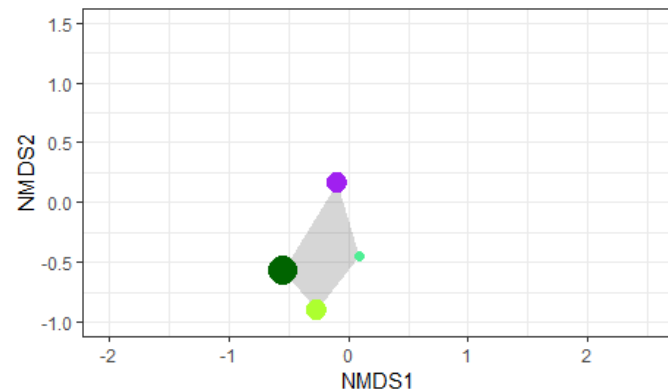
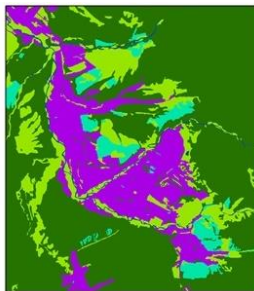
cgomezcre@gmail.com



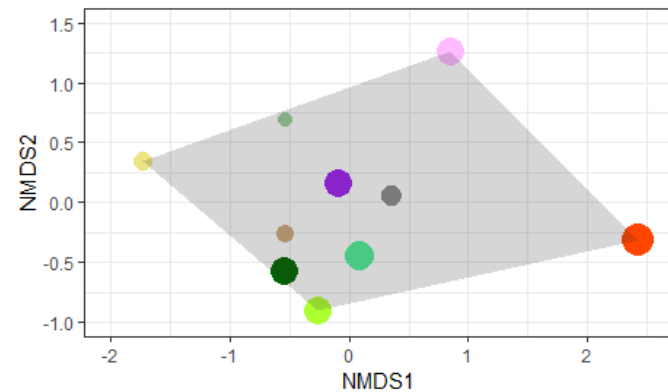
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