Landcare Research
Manaaki Whenua

Ecosystem services assessment in New Zealand

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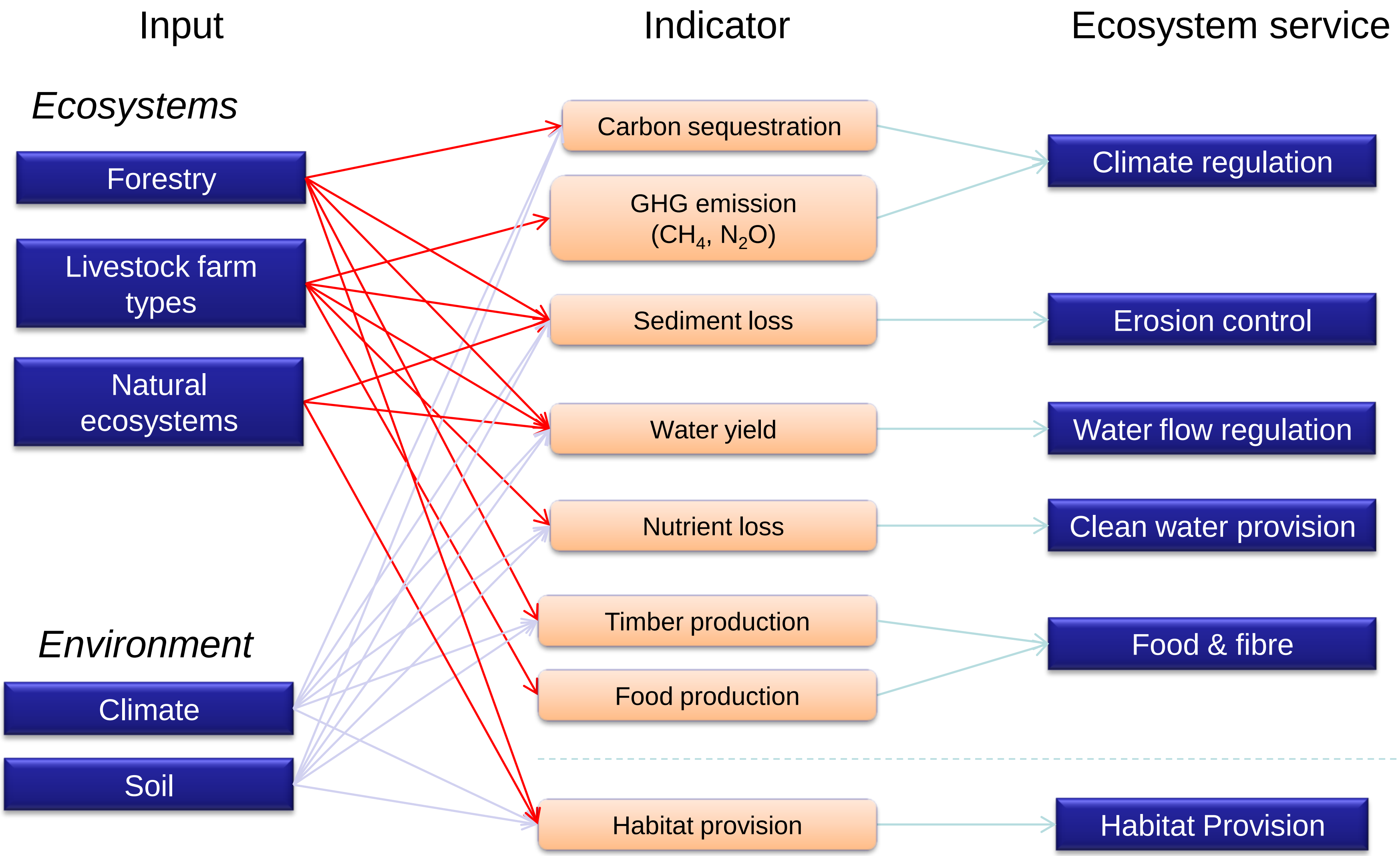
Ecosystem services research

- Spatially explicit models of ES indicators
- Decision-making tools for better matching of land use with soil capability
- Build biodiversity into an ecosystem service-based approach for resource management

Ecosystem Services Classification

Tier 1	Tier 2	Tier 3
Qualitative measure (narrative statement)	Quantitative measure per ecosystem	Spatial variation within ecosystem
Food: capture fisheries, aquaculture, Wild food, honey Genetic resources, biochemicals Minerals Disease\pest regulation Pollination Cultural: Aesthetic values, recreation, tourism, sense of belonging	Food: crops Water purification Natural hazard regulation Nutrient cycling Soil formation and maintenance Primary production	Food: livestocks, crops Fibre: timber, sheep wool Freshwater: quality (nutrient) Physical support for dwellings Climate regulation Water-flow regulation Erosion control Water cycling Natural habitat provision

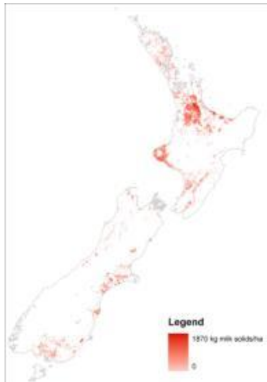
GIS framework



Ausseil et al (2013)

Mapping ecosystem services

Meat production

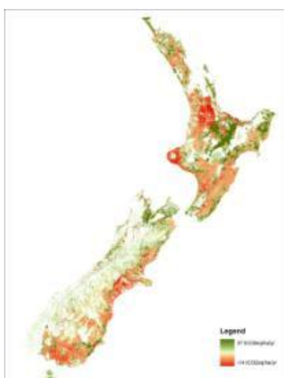


Milk solids production

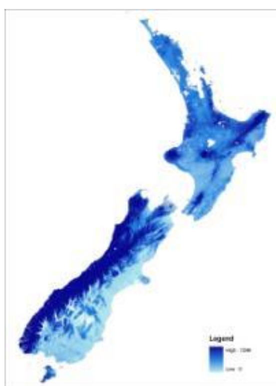
Wood production

Wool production

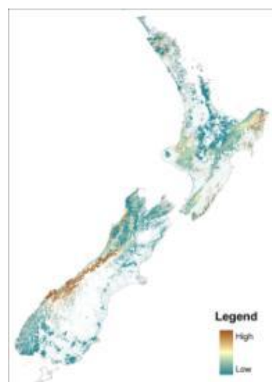
Provisioning services



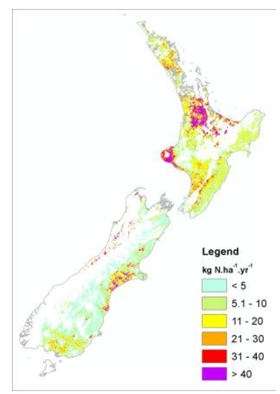
Greenhouse gas fluxes



Water yield



Soil retained



Nutrient loss

Regulating services

Ausseil et al (2013)

Spatial optimisation of ES

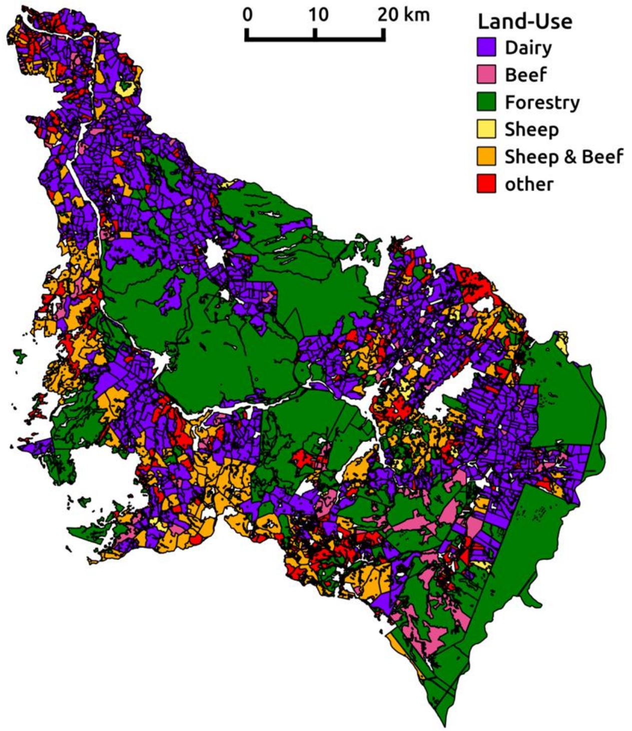
Objective: **min soil erosion**

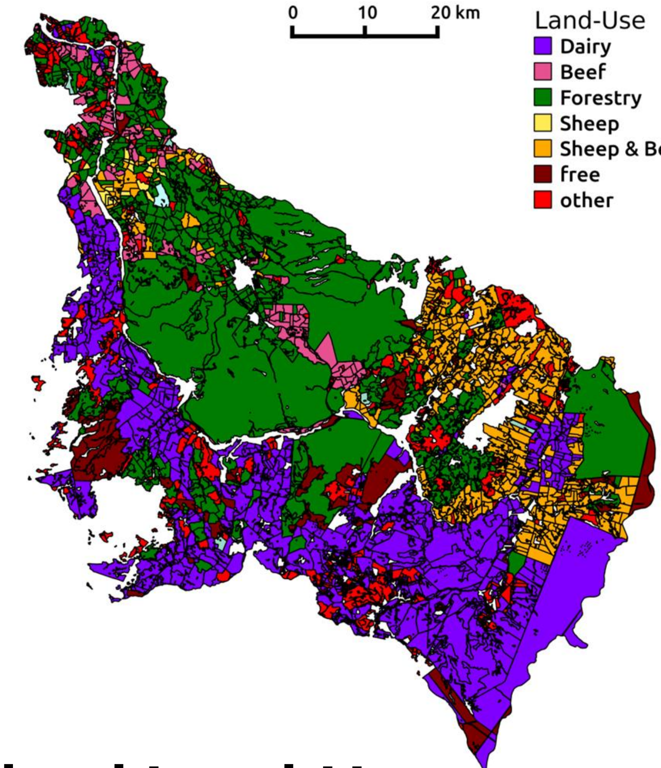
min nitrate leaching

Constraints: **$$ = $$ (2008)**

n. l.<= 6573809 [kg/a]

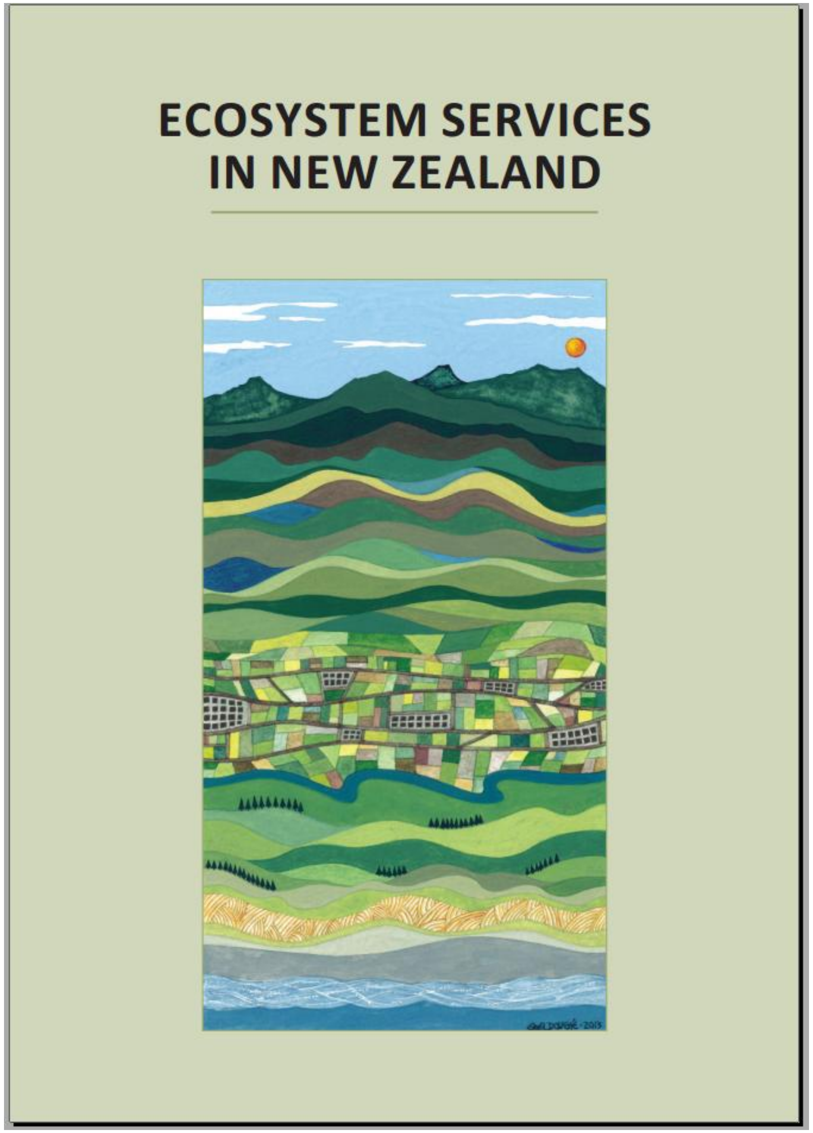
Land-Use	Area	Nitrate Leaching	Erosion	Milk Solids	Wood	Meat	Wool
Total	-7	-8	-14	0	0	0	0





Land-Use 2008 **Optimised Land-Use**

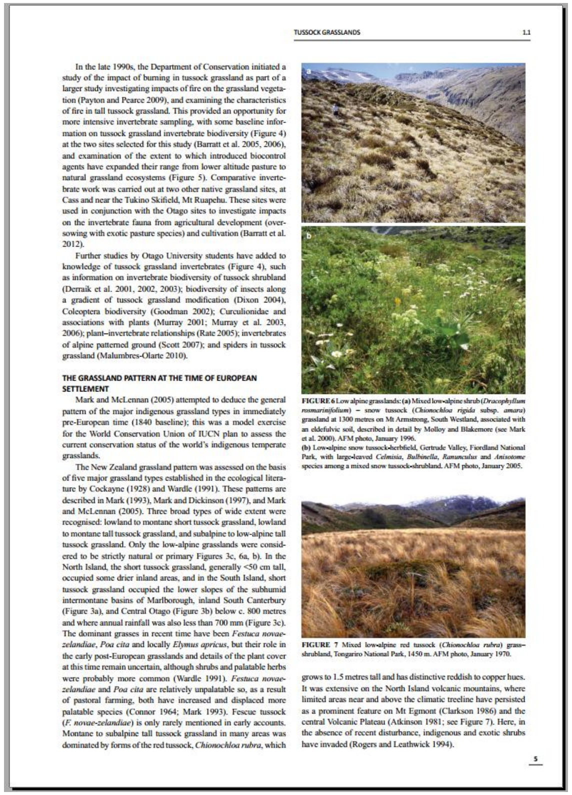
Herzig et al (2013)

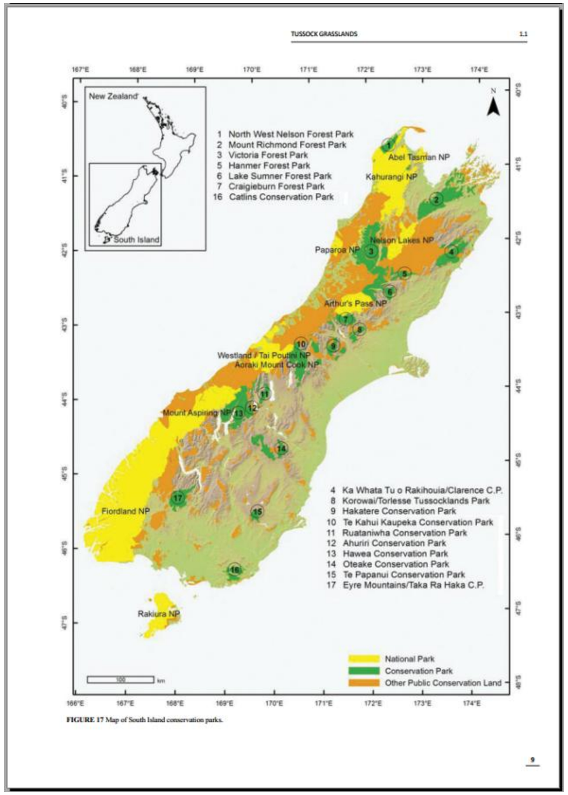


www.nationwidebooks.co.nz (book order)
http://www.landcareresearch.co.nz/publications/books/ecosystem-services-in-new-zealand (pdfs)

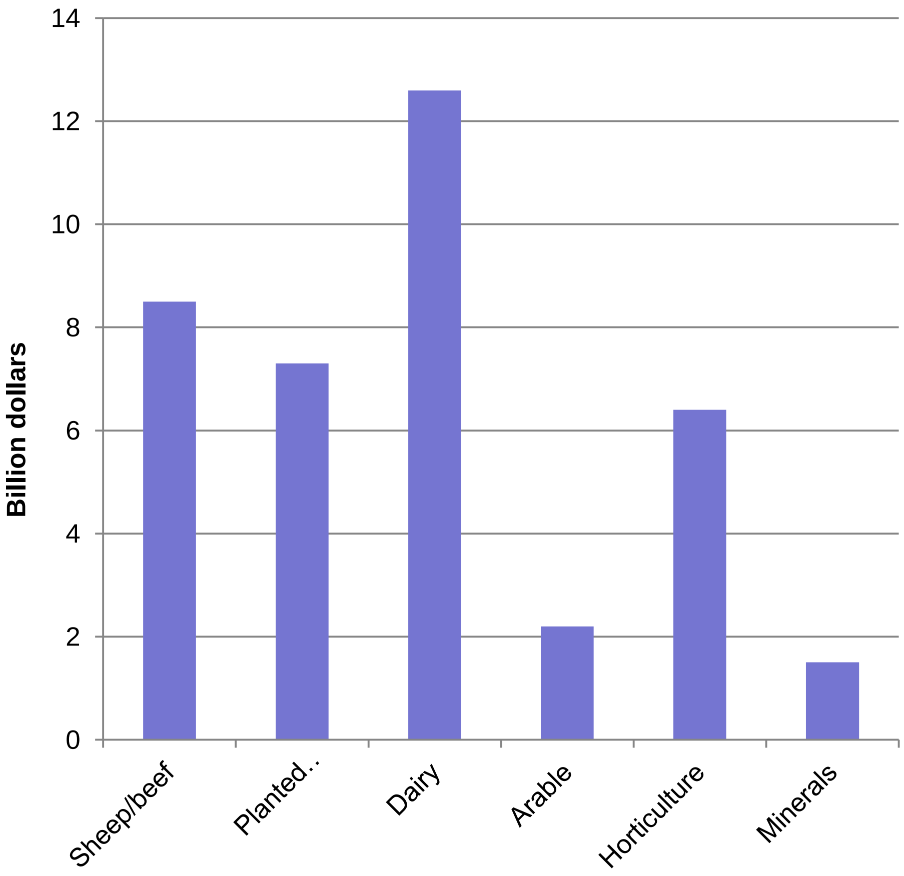
What’s in the book

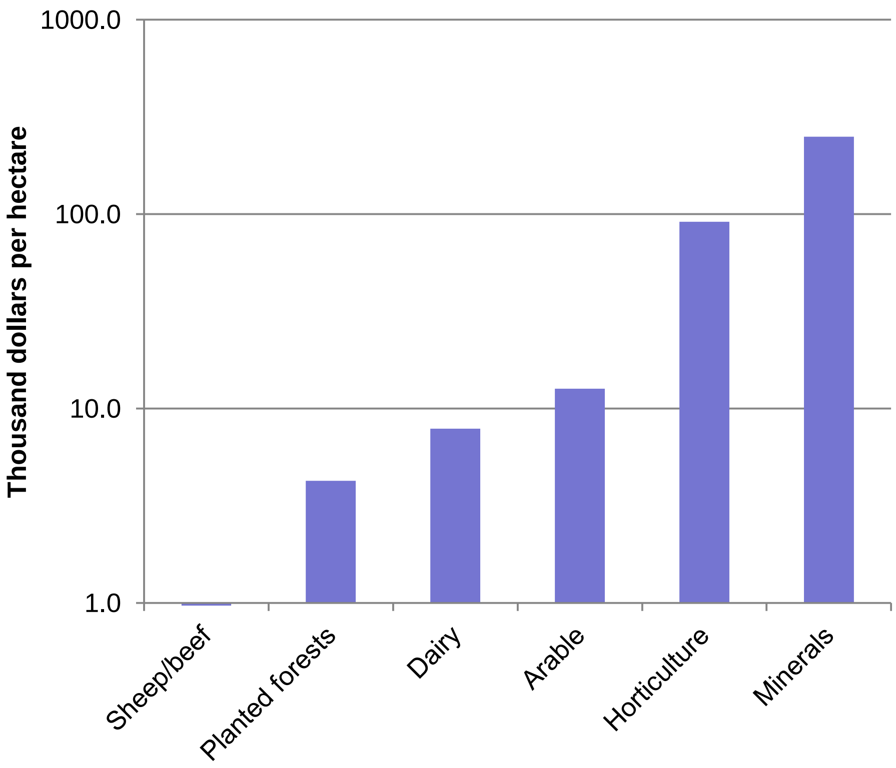
- Part 1: Natural and managed ecosystems
- Part 2: Ecosystem services
- Part 3: Analysis





Value of some provisioning ecosystem services





Dymond et al, accepted

Synopsis of the book

Service Group Service	Urban	Production				Natural									
Provisioning	Urban	Pasture	Cropland	Orchard	Exotic forest	Forest	Shrubland	Grassland	Alpine	Rare	Wetland	Estuary	Lake	River	Marine
Crops	↗	↗	↗	↗											
Livestock		±						↔							
Capture fisheries											↘	↔	↔	↔	↔
Aquaculture														↗	↗
Wild foods		↔			↔	↔	↔	↔	↔		±	±	±	±	
Timber					↑	↘									
Fiber		↘				↗		↔			↘				
Biomass fuel		↔					↔								
Thermal energy															
Freshwater		±	↔	↔	↔	↔	↔	↔	↔		↔		↔	±	
Genetic resources		↔	↗	↗	↔	↔	↔	±	±	↘	↘	↔	↔	↘	↔
Biochemicals, natural medications, and pharmaceuticals							↗								
Minerals						↗	↗	↗	↗						↗
Physical support for dwellings	↑	↔	↔	↔				↔							
Regulating	Urban	Pasture	Cropland	Orchard	Exotic forest	Forest	Shrubland	Grassland	Alpine	Rare	Wetland	Estuary	Lake	River	Marine
Air quality regulation	↗														
Climate regulation	↘	↘	↔	↔	↑	↔	↑	↔	↔		↔	↔	↔	↔	↘
Water regulation		↔			±	↔	↔	↔	↔		↔			↘	
Erosion regulation		↗	↔		↗	↔	↗	↘	↔						
Water purification and waste treatment	↗	↗									↘			↘	
Disease regulation	↗														
Pest regulation	↗	↔	↘	↘	↔	↗	↔	↘	↘		↘	↔	↘	↘	↔
Pollination	↓	↓	↓	↓		↔	↔	↔	↔						
Natural hazard mitigation					↔	↔	↔				↔				
Cultural	Urban	Pasture	Cropland	Orchard	Exotic forest	Forest	Shrubland	Grassland	Alpine	Rare	Wetland	Estuary	Lake	River	Marine
Amenity value	↘	↔	↔	↗	↔	↔	↔	↔	↔	↔	↘	↘	↘	±	↔
Recreation	↔	↔			↔	↔	↔	↔	↔		↔	↔	↘	↔	↔
Tourism	↔	↔		↗	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Sense of belonging	↔	↘	↘	↔	↔	↔		↔	↔			↔	↔	↔	↔
Supporting	Urban	Pasture	Cropland	Orchard	Exotic forest	Forest	Shrubland	Grassland	Alpine	Rare	Wetland	Estuary	Lake	River	Marine
Soil formation and maintenance	↘	↘	↔	↗	↔	↔	↔	↘	↘						
Provision of natural habitat free of weeds and pests	↗	↔	↔	↔	↔	±	↔	↘	↔	↘	↘	↘	↔	↘	↘

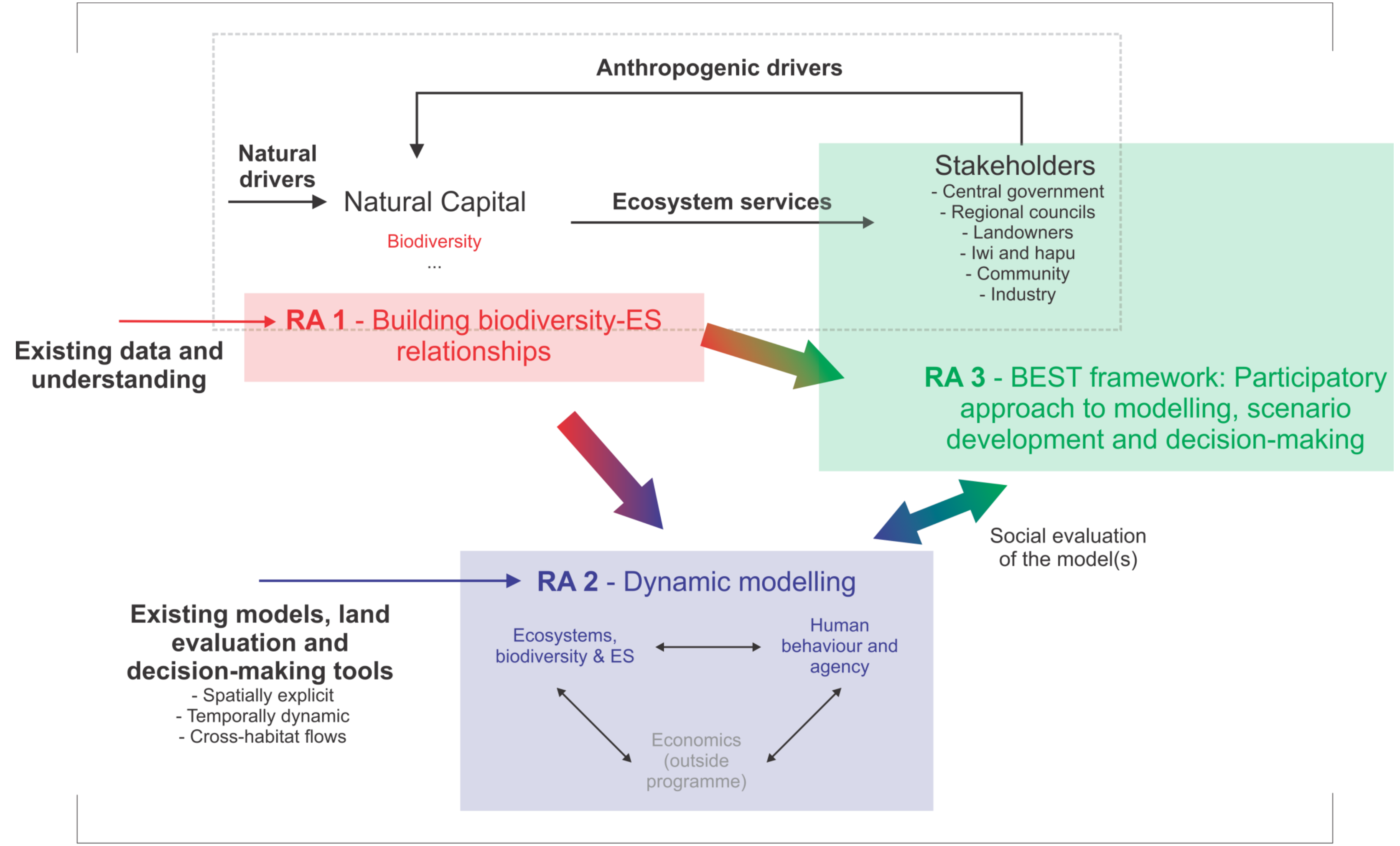
Importance for delivering service High / Medium-high / Medium-low / Low **Trend over last 20 years** ↑ Improving ↗ Some improvement ↔ No net change ↘ Some deterioration ↓ Deterioration ± Improvement and/or deterioration in different locations

Dymond et al, accepted

What have we learned?

- Improve riparian management
- Match land use with soil capacity
- Evaluate trade-offs between invasive species and native biodiversity

BEST: Biodiversity and ecosystem services assessment



Biodiversity-Ecosystem Services Decision Making Assessment (BEST) Framework

Linkages with decision-makers

- Piloted ES approach with regional councils
- Piloted ES review with 5 NZ companies
- Science advice to the New Zealand Natural Capital Assessment
- Involvement at international level to IPBES and ITPS

Innovative data analysis

– improve harmonisation of spatial databases (soil, land use, biodiversity) for reporting

– Model indicators of biodiversity and ecosystem services

– Support environmental reporting and future ES assessment

Thank you