The right tree in the right place

New Zealand Wilding Conifer Management Strategy 2015–2030

Contributing factors to the wilding conifer problem

- Legacy source plantings – dating from early 1900s
- Private and crown land – multiple land owners
- Lack of clear roles and responsibilities
- Lack of a coordinated effort
- Problem is often unrecognised until trees have cones and are creating further spread – with increased costs of control

Strategy Vision

"The right tree

in

the right place"

Strategy Goal

Prevent the spread of wilding conifers

and

contain or eradicate established stands by 2030

What the strategy covers

- Prevent continuing spread
- Eradicate or contain priority sites
- Funding framework to address legacy plantings
- Improving and aligning policy (e.g. RMA, BSA)
- Awareness raising and behaviour change
- Roles for Central government, Local government, land occupiers, and communities
- Research and practice improvement

- The strategy will be available on www.wildingconifers.org.nz

- Contact MPI by email:

wildingconifer@mpi.govt.nz

ntorta, Kaweka Forest Park

Setting the scene

How BIG an issue are wilding conifers?

Why are they a problem?

What is being done to solve the problem?

What could be done from here?

Setting the scene

How BIG an issue are wilding conifers?

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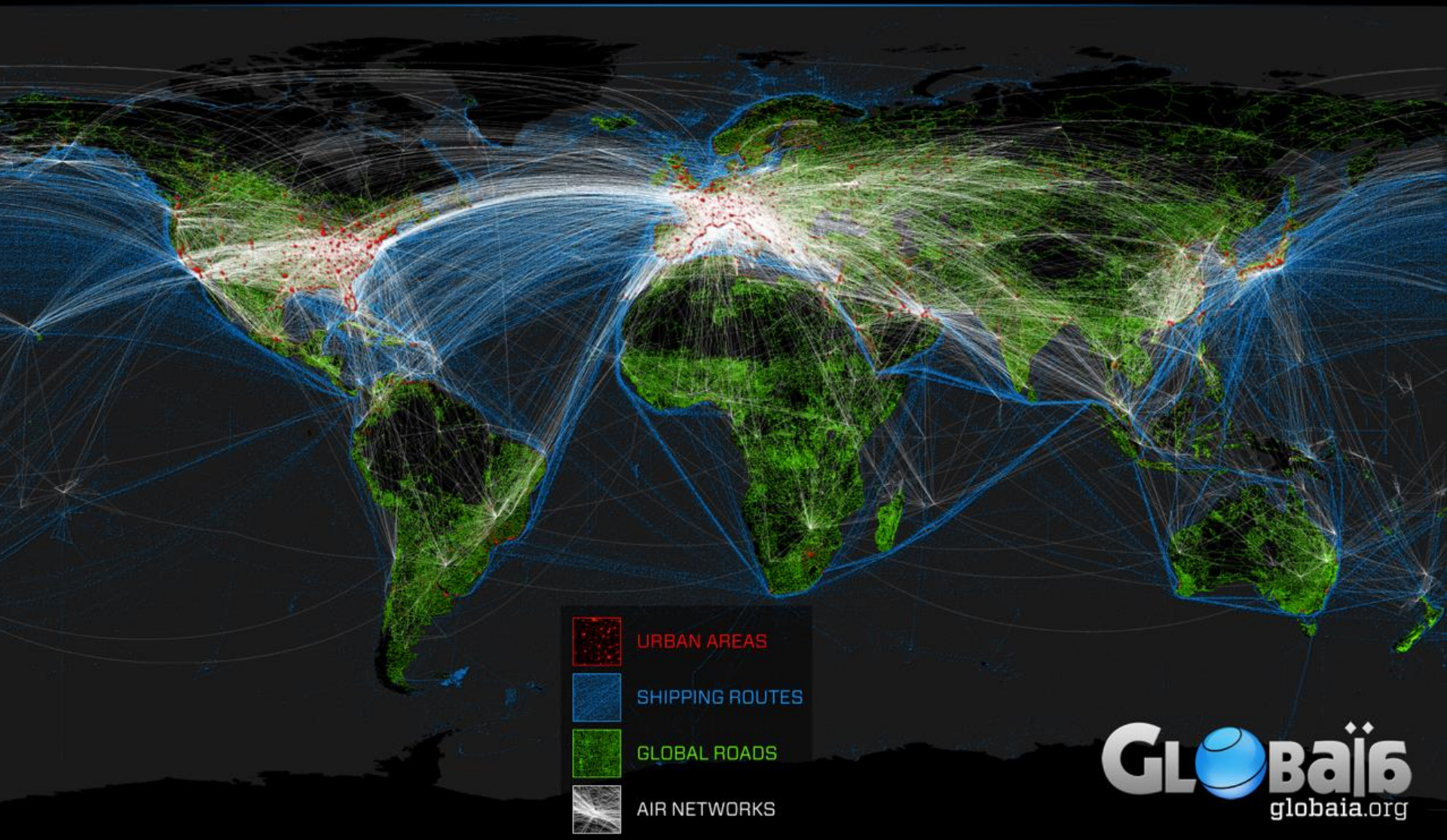
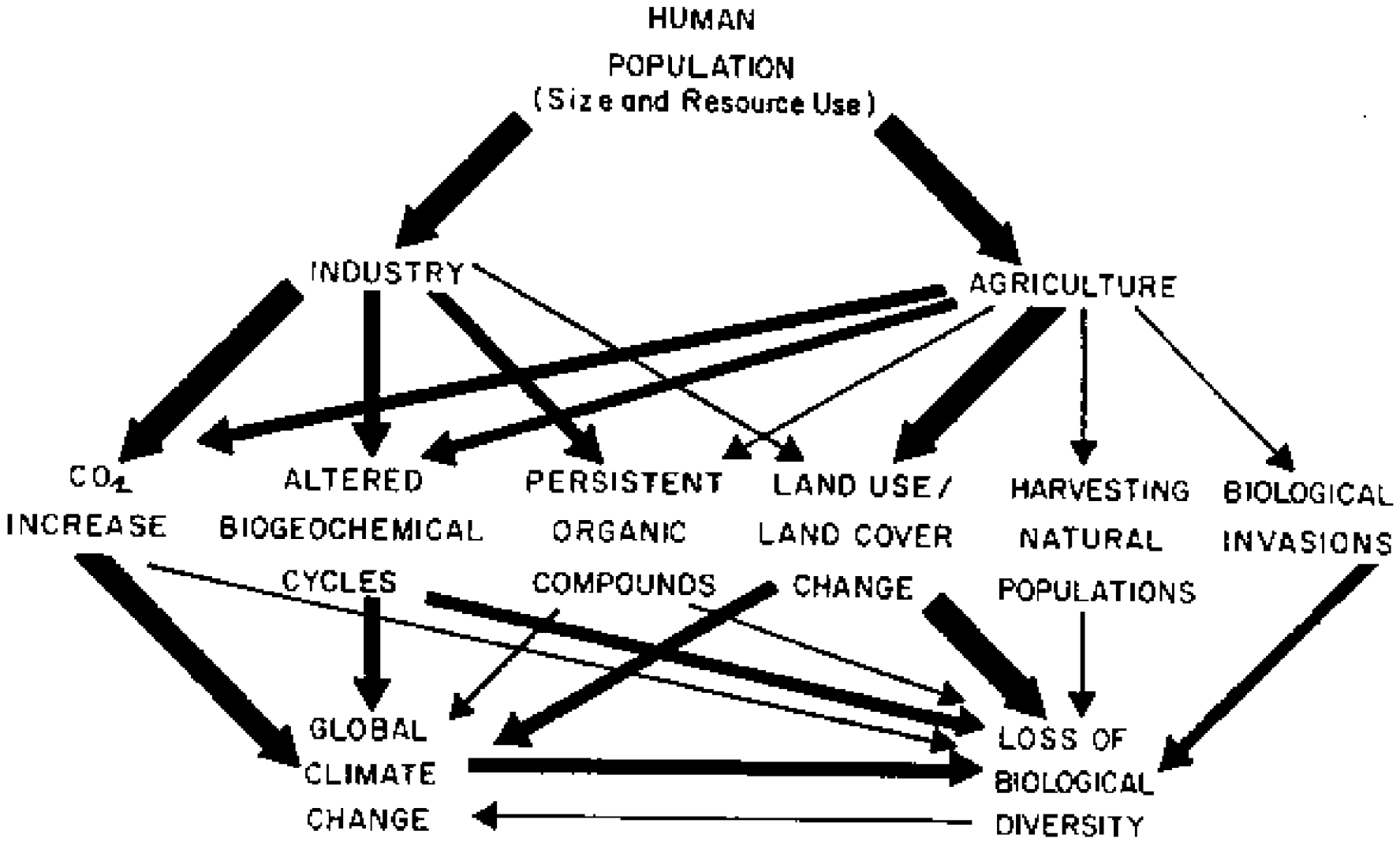
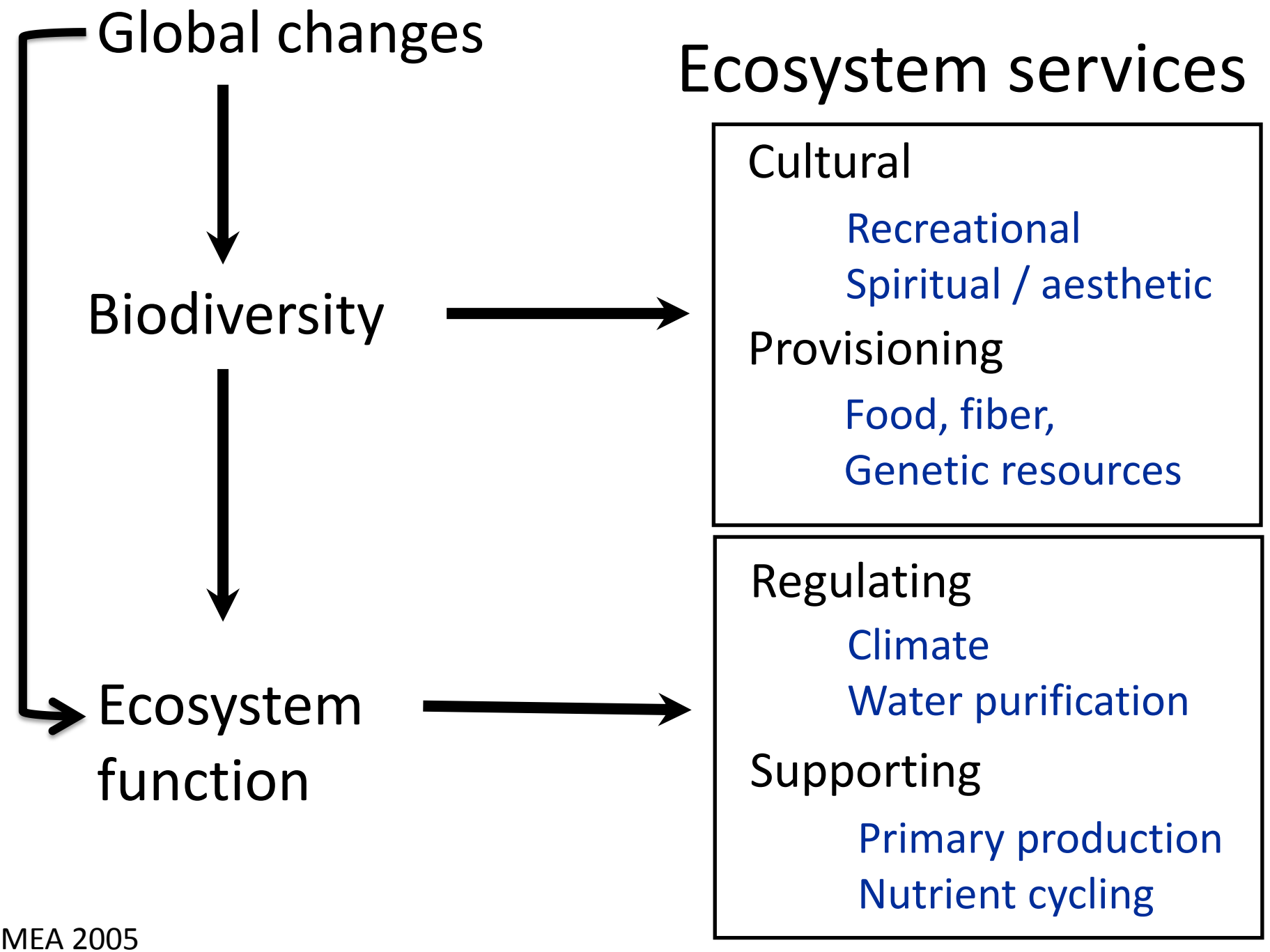
THE ANTHROPOGENIC PLANET



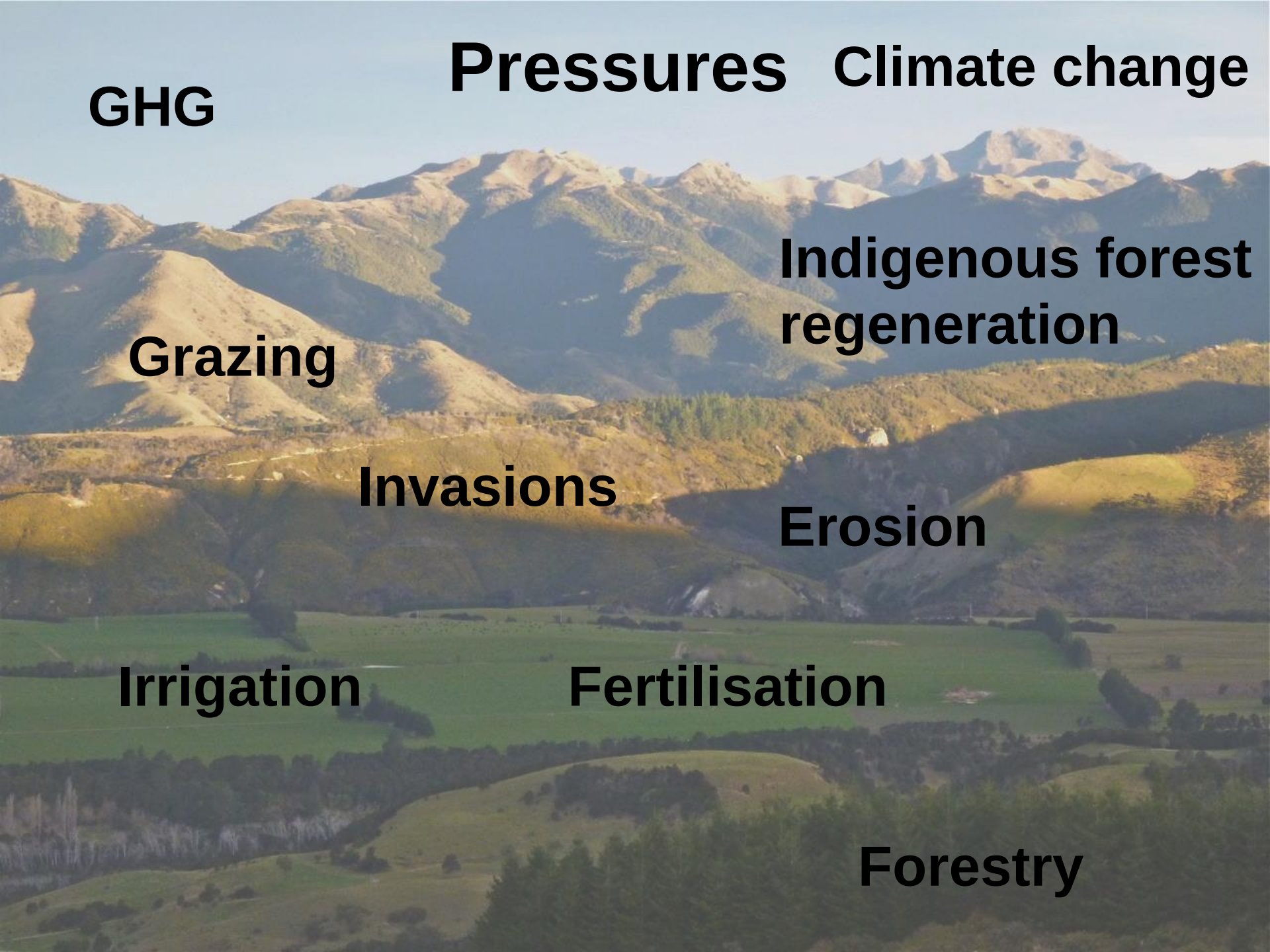


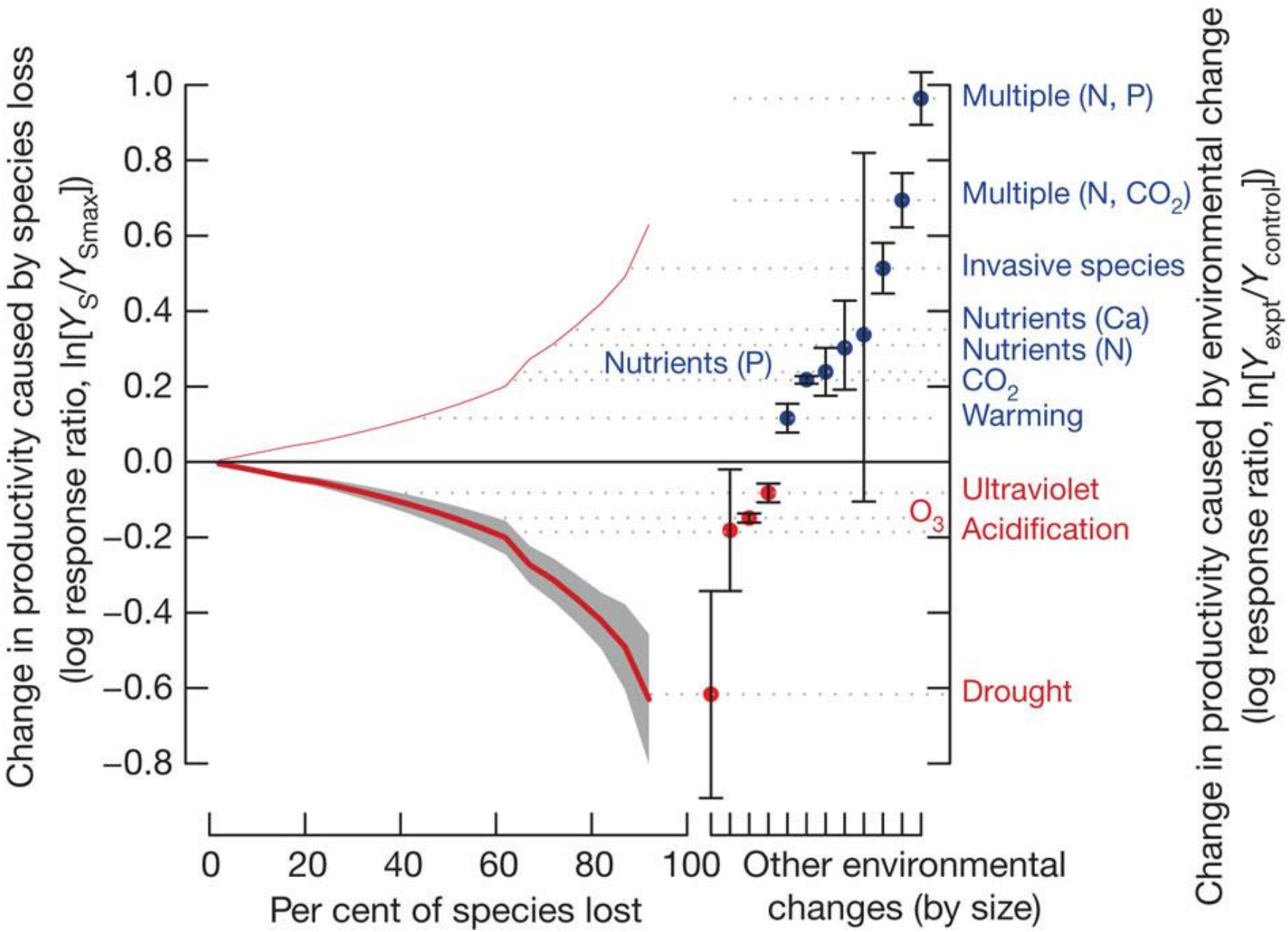
Vitousek et al 1996 Amer. Sci. 84:468


Global changes
Biodiversity
Ecosystem function
Ecosystem services
Cultural
Recreational
Spiritual / aesthetic
Provisioning
Food, fiber,
Genetic resources
Regulating
Climate
Water purification
Supporting
Primary production
Nutrient cycling

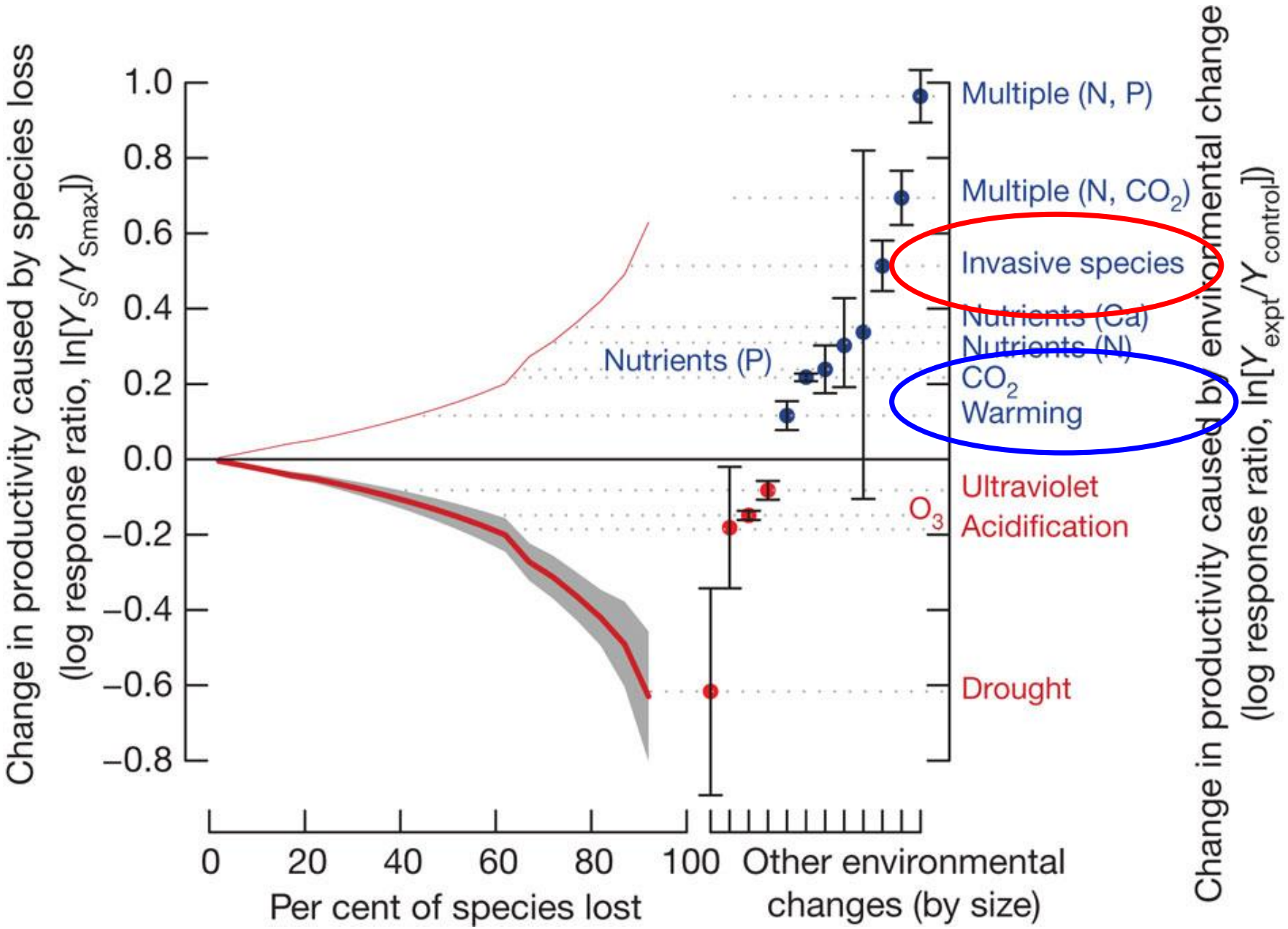
MEA 2005

Pressures

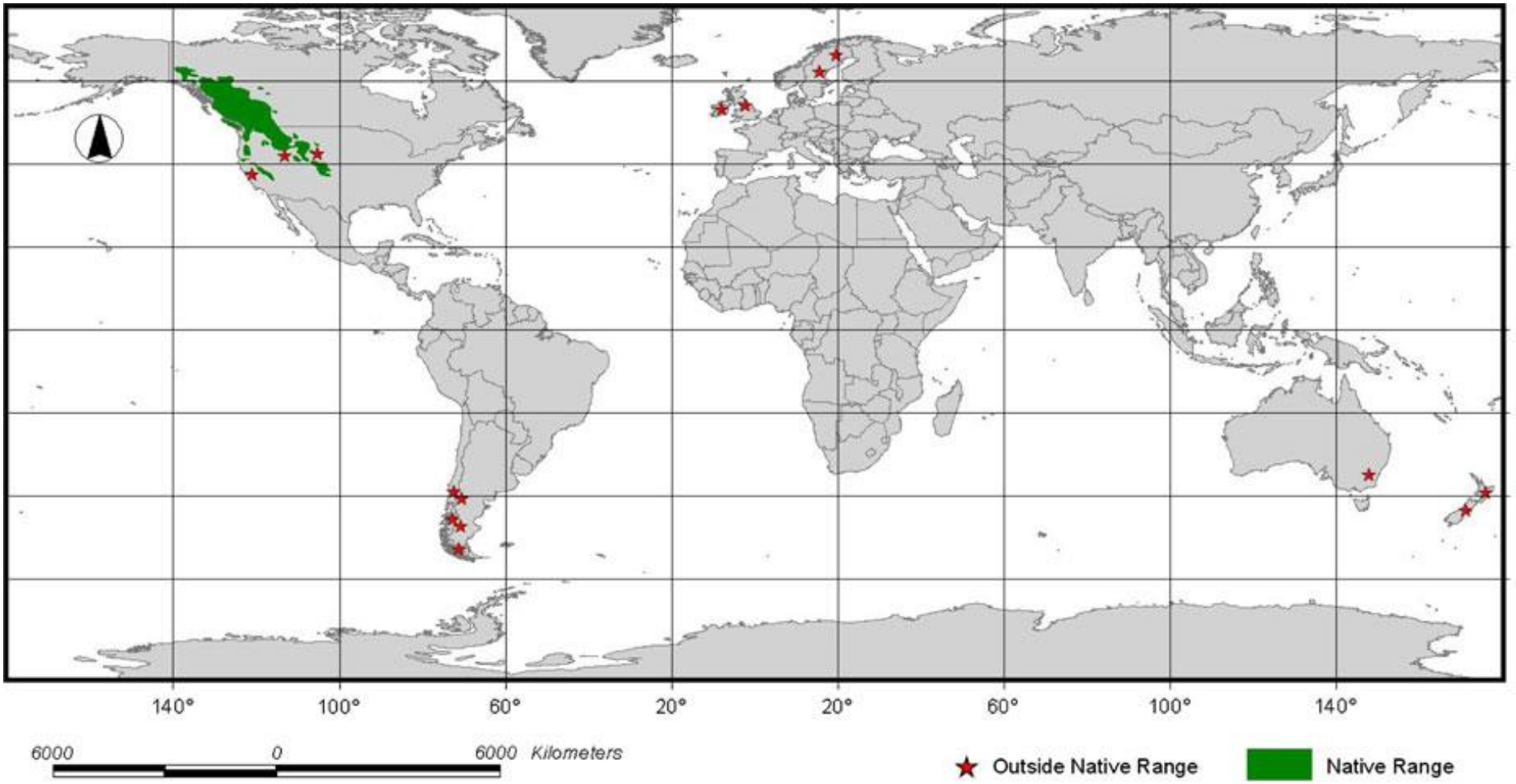

Pressures
Climate change
GHG
Indigenous forest regeneration
Grazing
Invasions
Erosion
Irrigation
Fertilisation
Forestry



Hooper et al. 2012 Nature 486: 105



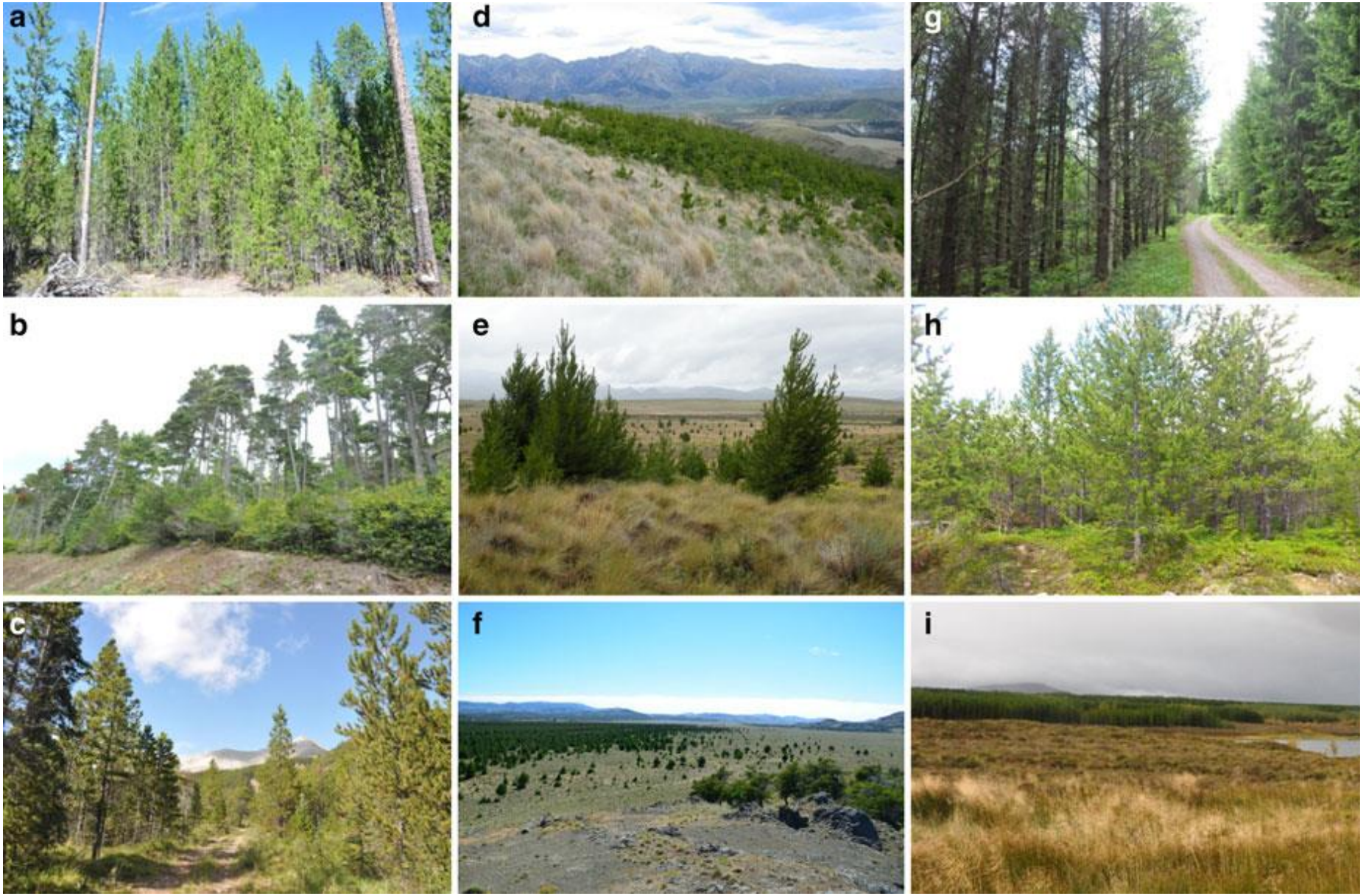
Hooper et al. 2012 Nature 486: 105



Langdon et al. 2010 Biol. Invasions 12:3961; Gundale et al. 2014 Biological Invasions *in press*

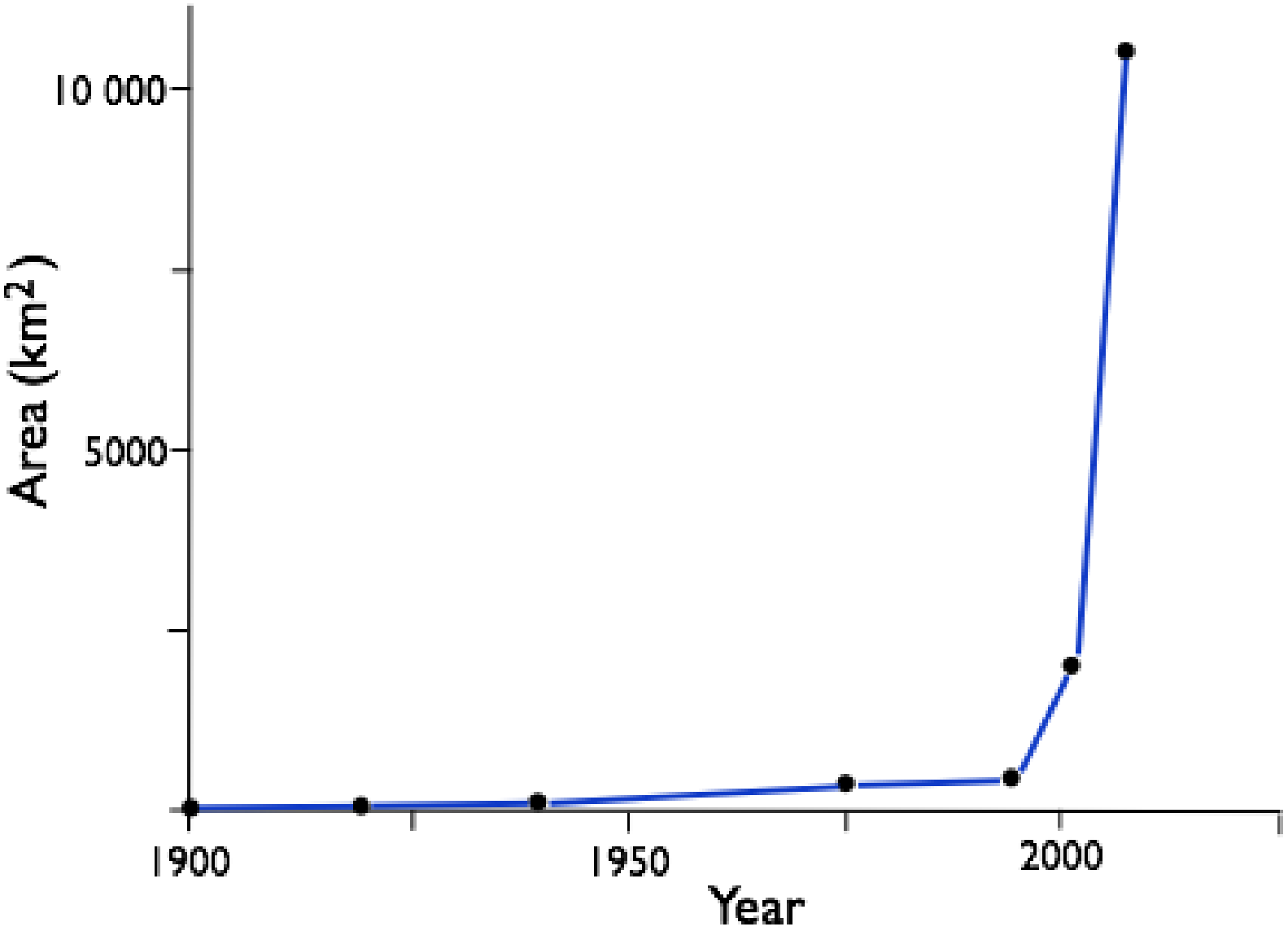
Native range

Introduced range



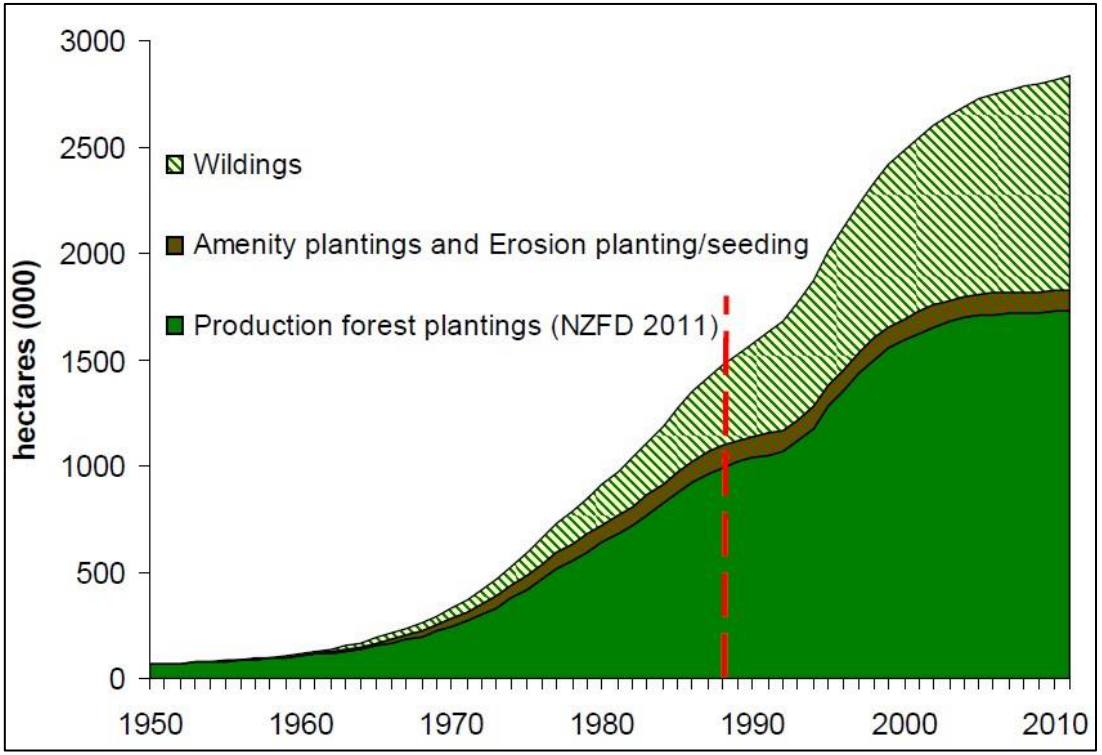
The horse has bolted…

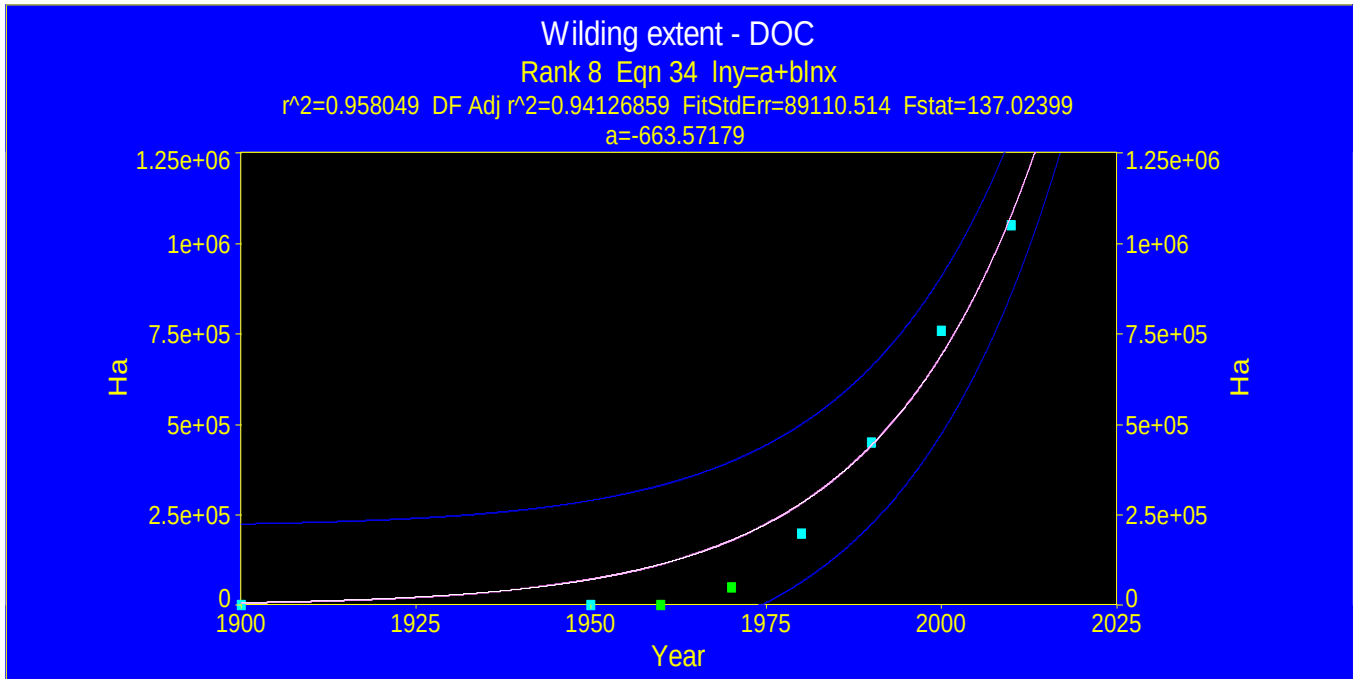
Extent of wilding conifers in NZ



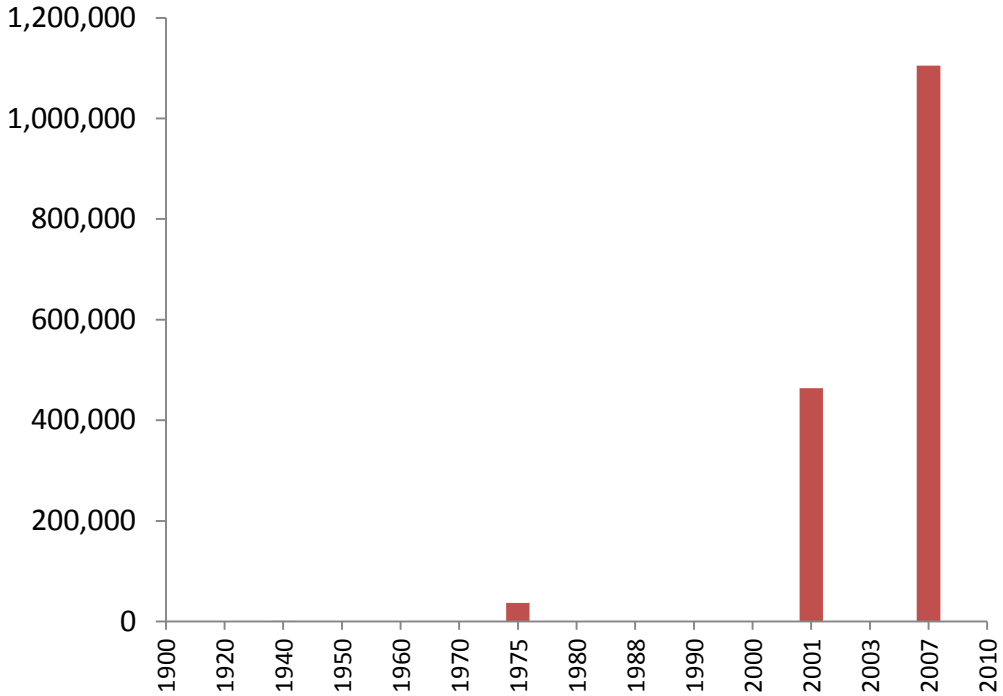
(Refs: Smith 1903, Cheeseman 1925, Beauchamp 1962, Wardrop 1964, Hunter & Douglas 1984, Ledgard 1988, Harding 1990, Ledgard 2001, North etal 2007, Paul & Ledgard 2011)

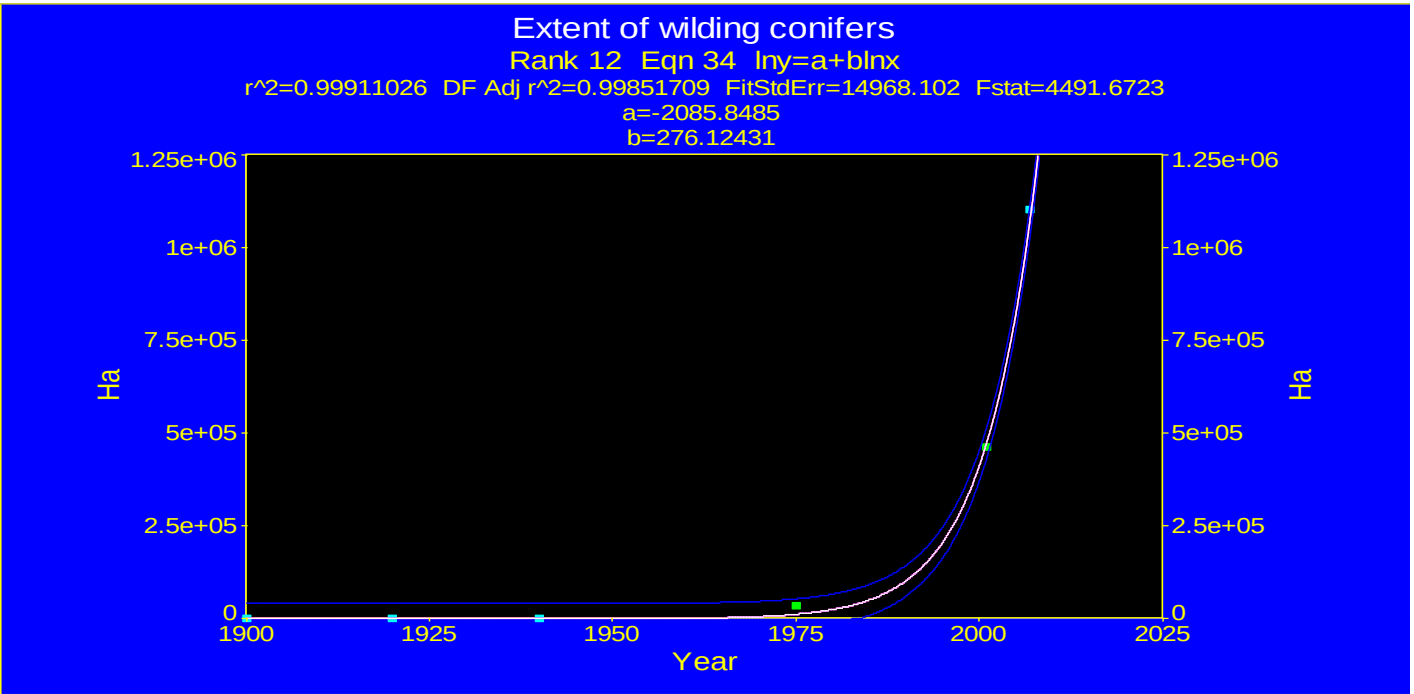
Wilding extent – DOC (Briden & Howell 2012)



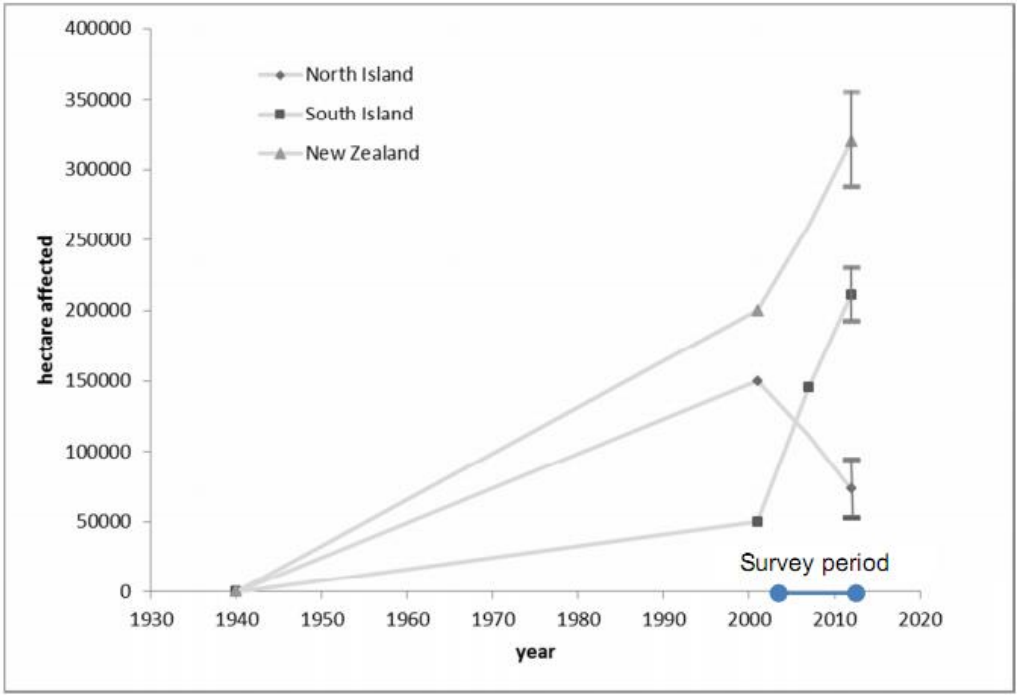


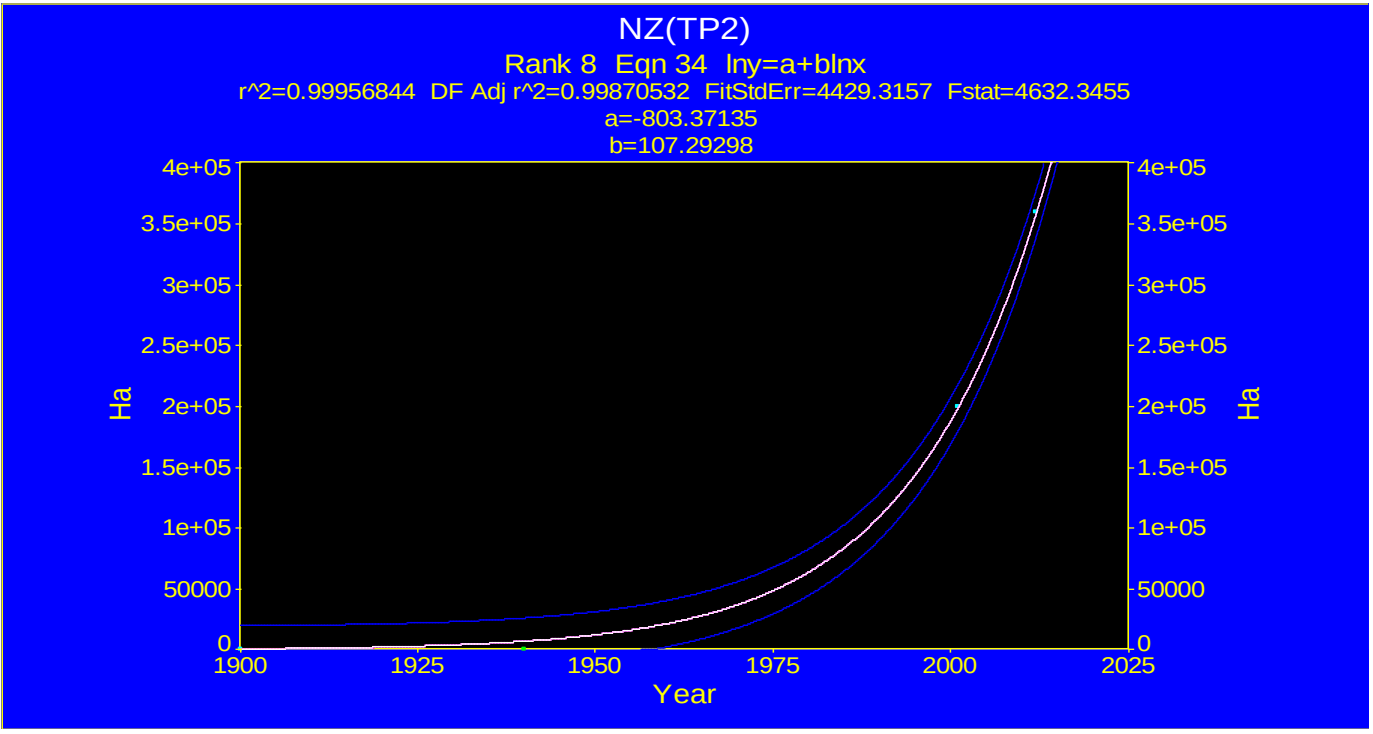
Wilding extent – LCR
(Peltzer & Burrows 2012)



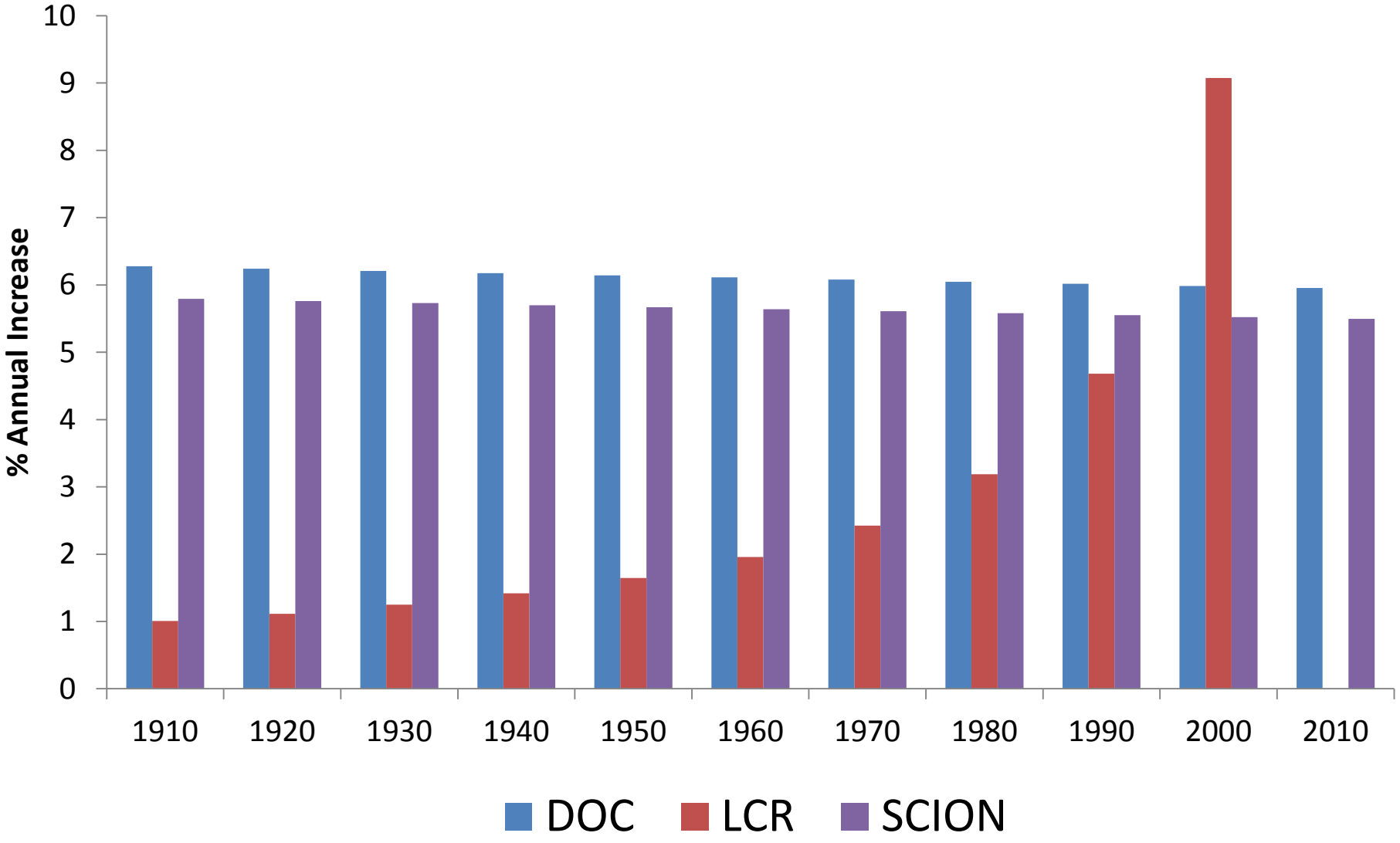


Wilding extent – SCION (Paul 2013)

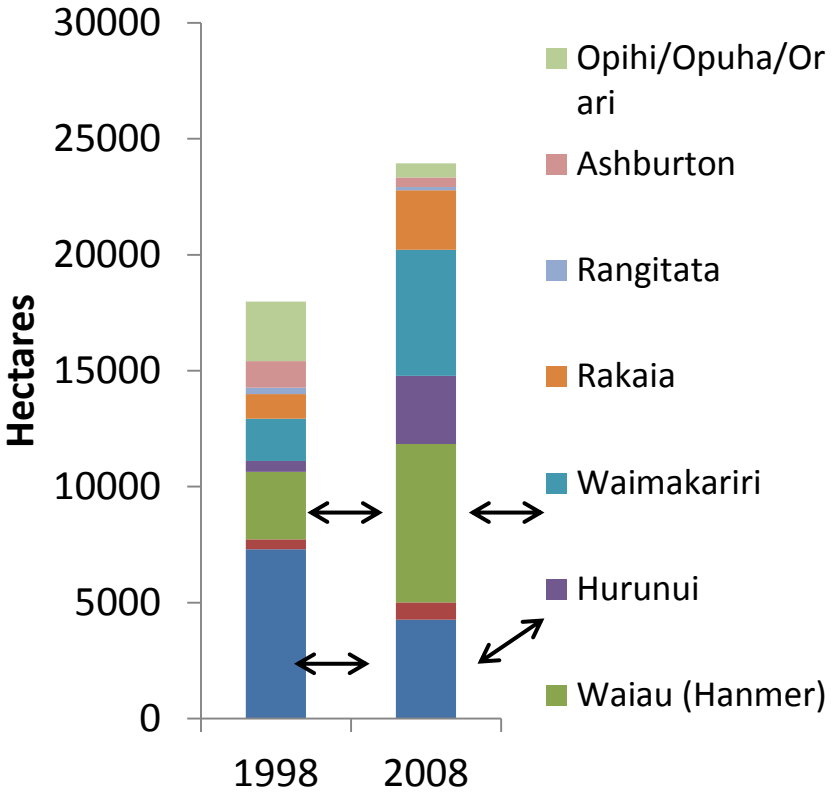


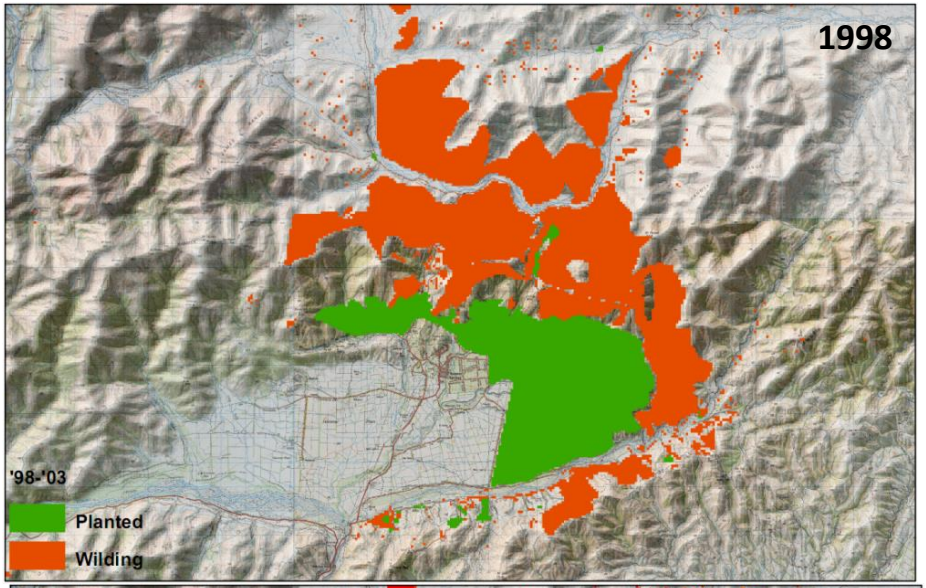


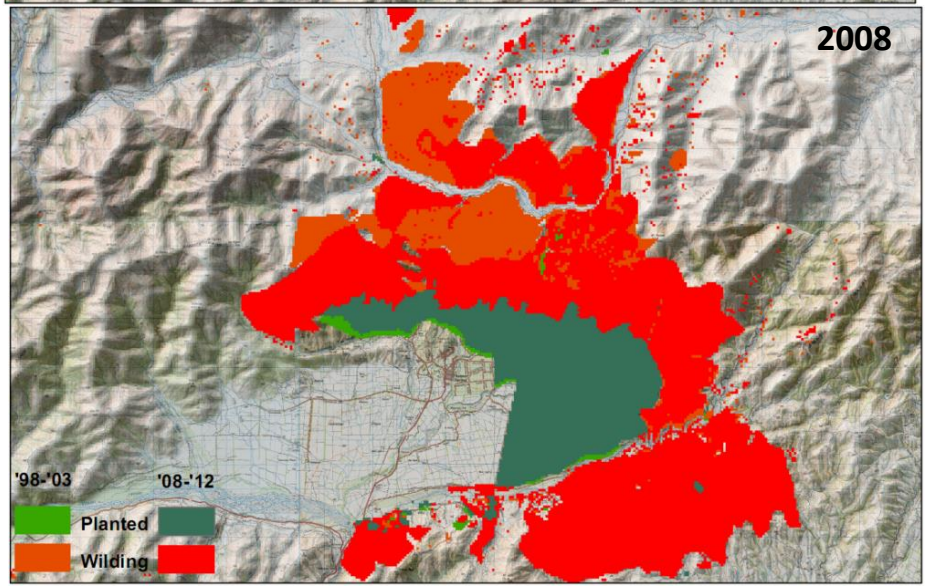
Change in national wilding conifer extent over ~100 years (%/annum)



Conifers have continued to expand their distribution (e.g., Waiau and Clarence catchments)

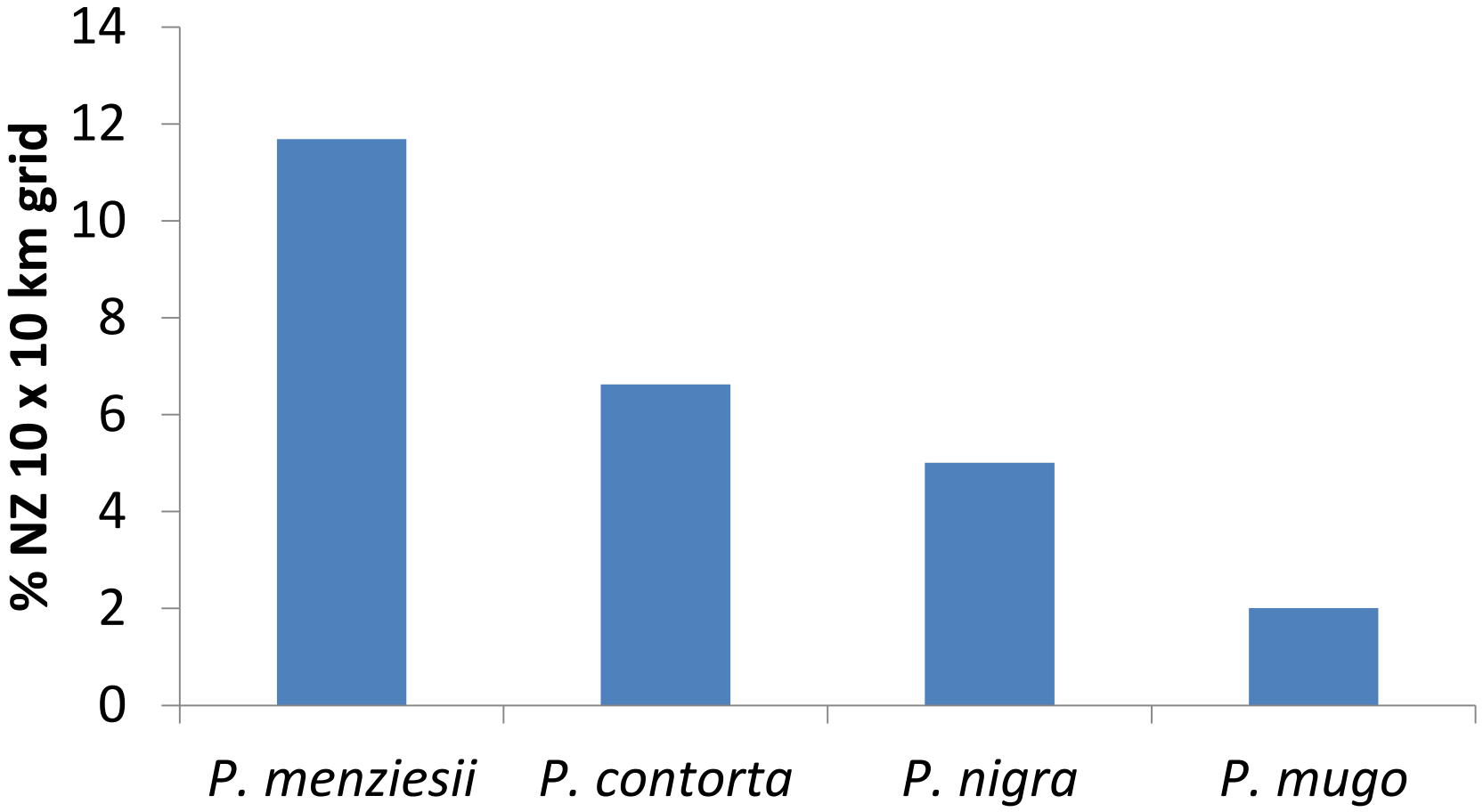




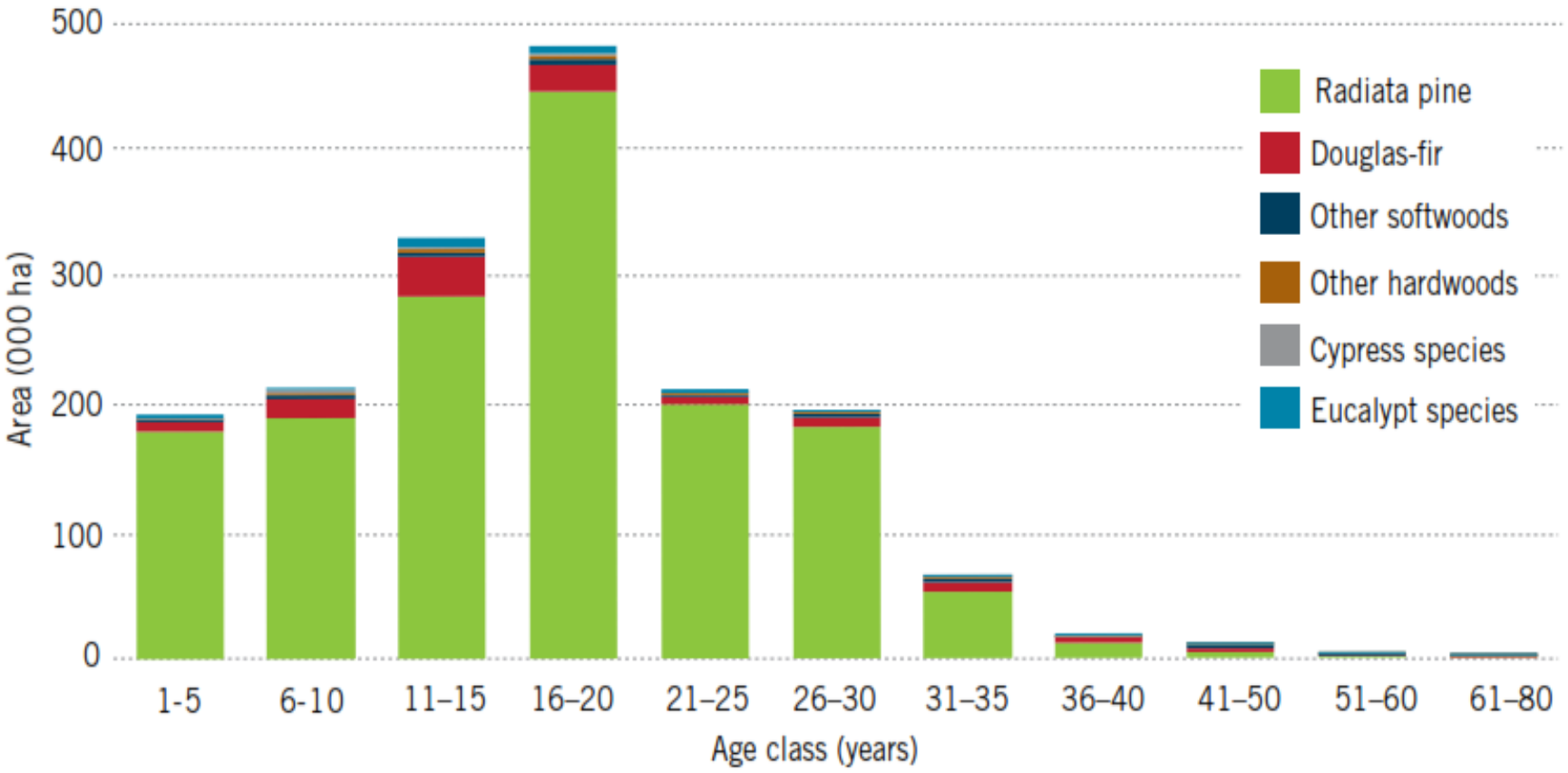


(Environment Canterbury 2012)

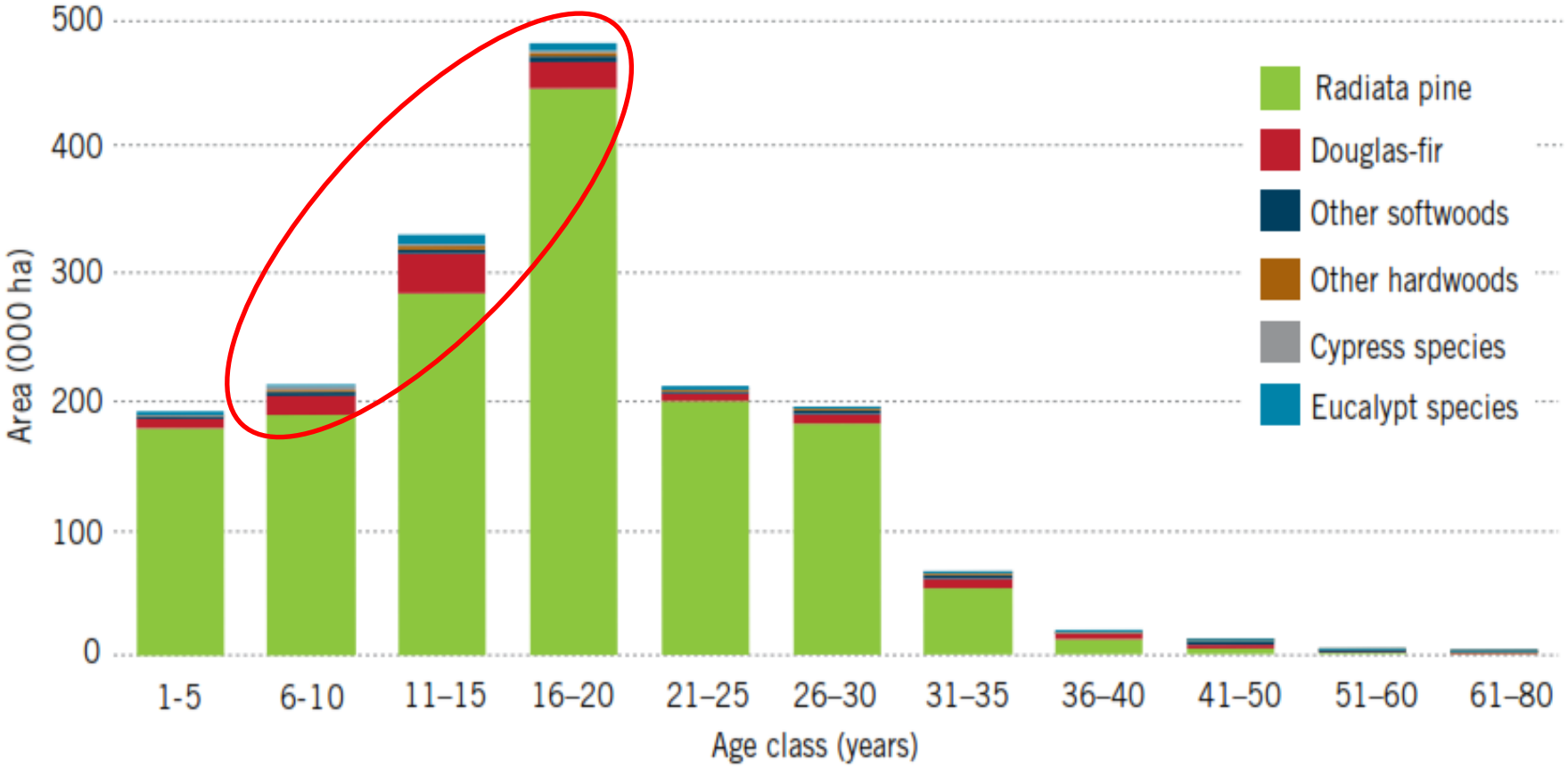
Which species are most widespread?



(DOC Weeds database - Clayson Howell)



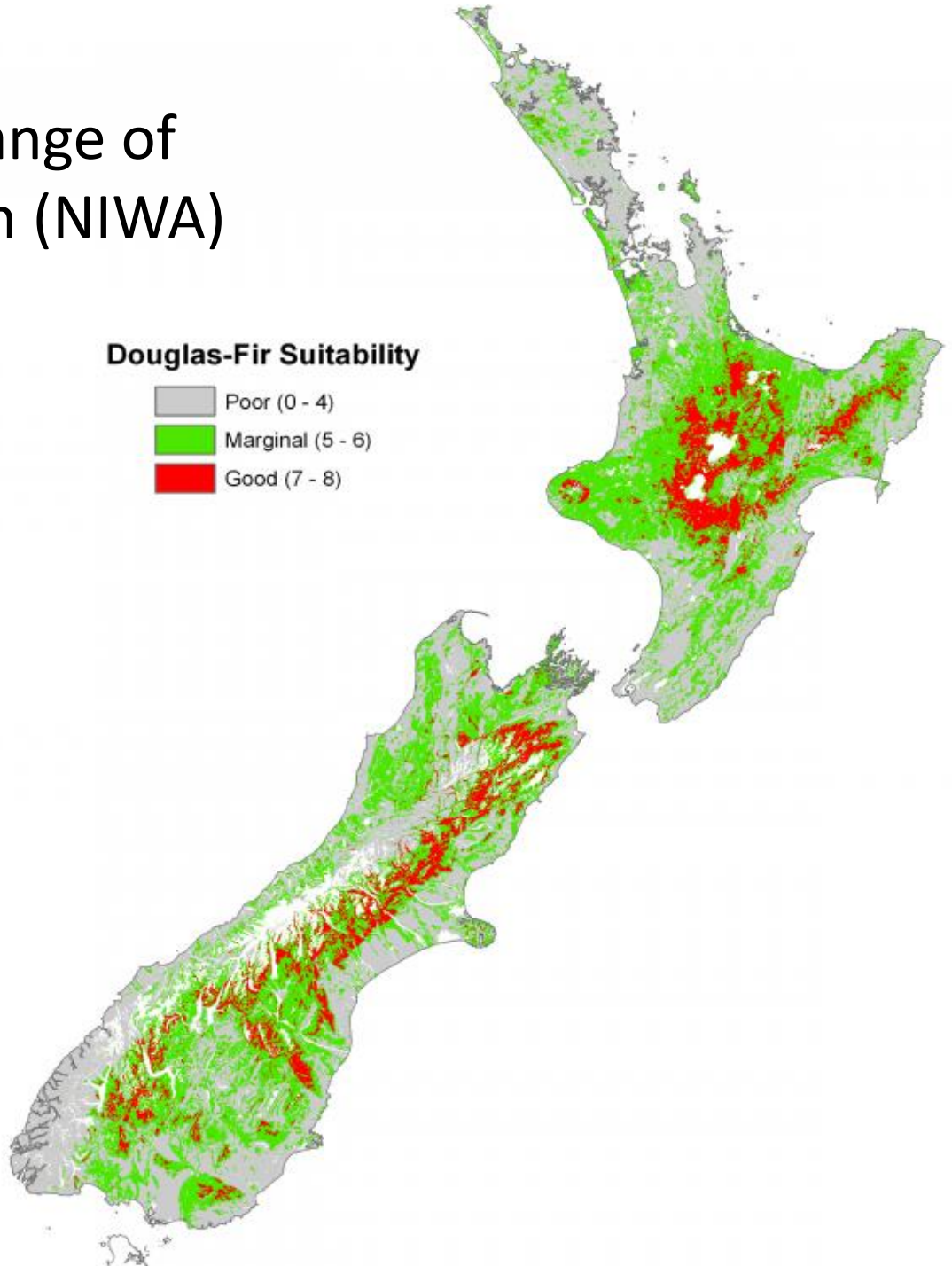
From: National Exotic Forest Description (NEFD) Report, 1 April 2013.
http://www.mpi.govt.nz/news-and-resources/statistics-and-forecasting/forestry/



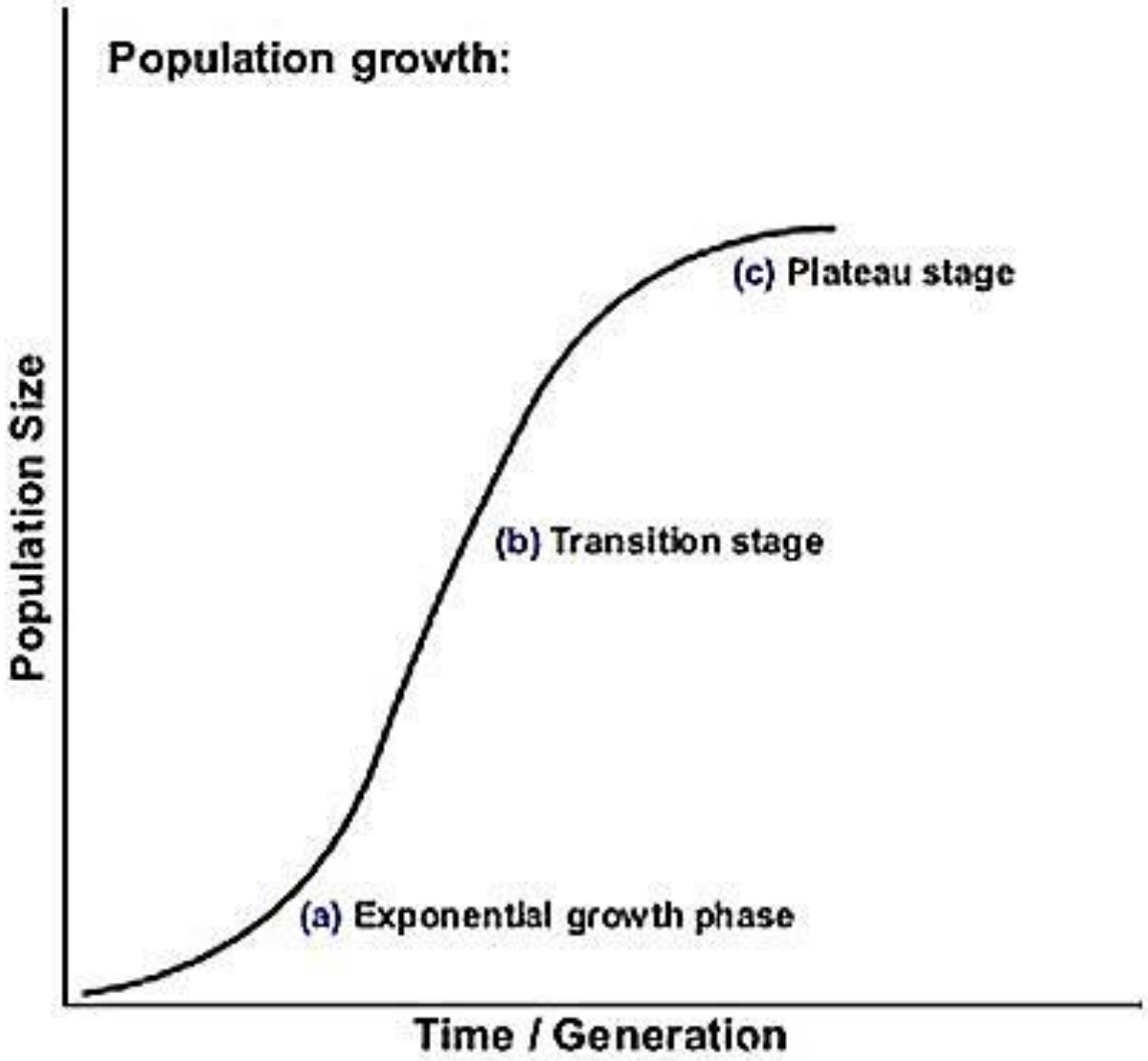
From: National Exotic Forest Description (NEFD) Report, 1 April 2013.
http://www.mpi.govt.nz/news-and-resources/statistics-and-forecasting/forestry/

Douglas fir spread from a 15 year-old plantation

The potential range of Douglas Fir is high (NIWA)



Why does detection of invaders (or any rare events) matter?



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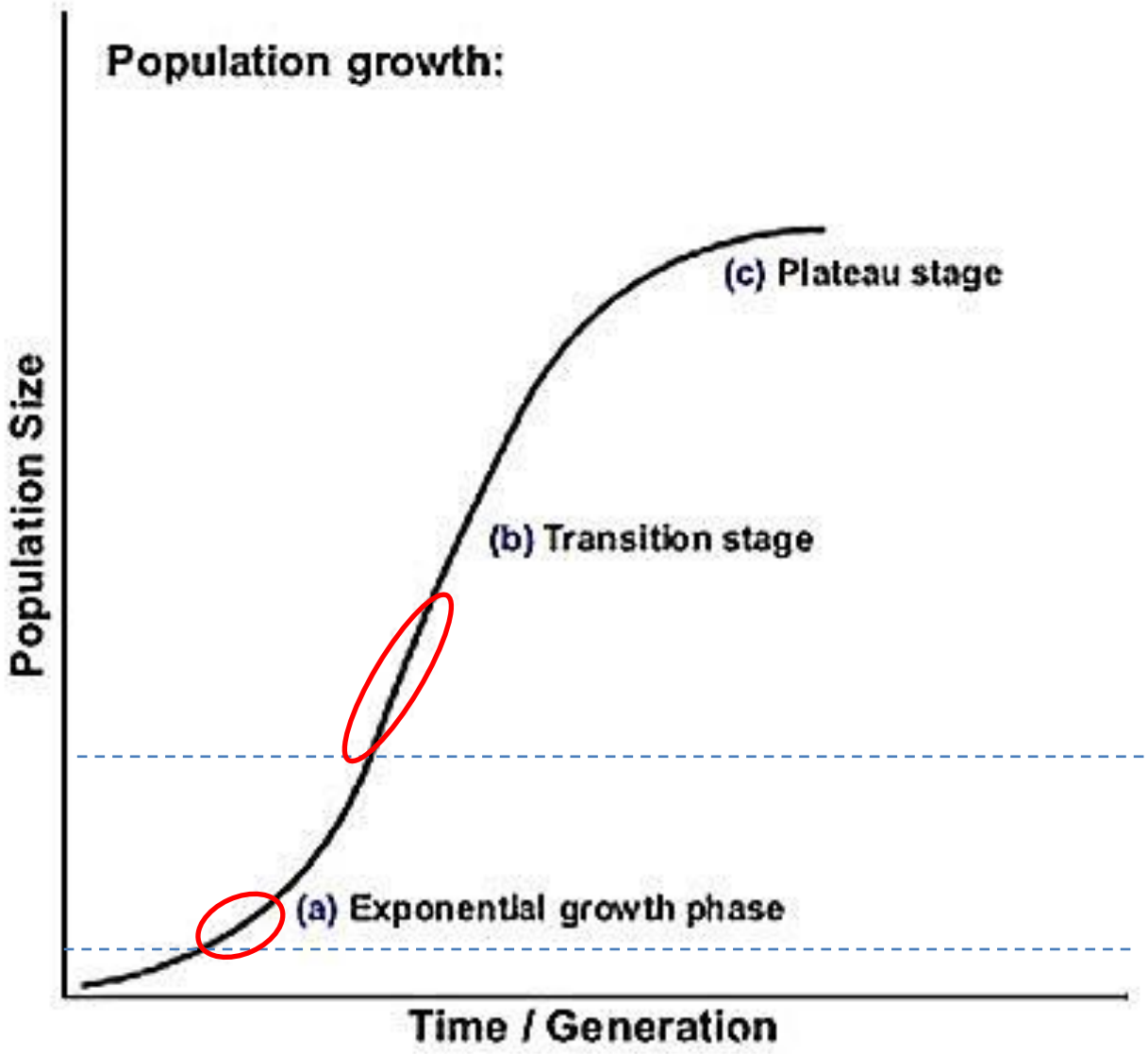


Thresholds of detection

Setting the scene

How BIG an issue are wilding conifers?

Why are they a problem?

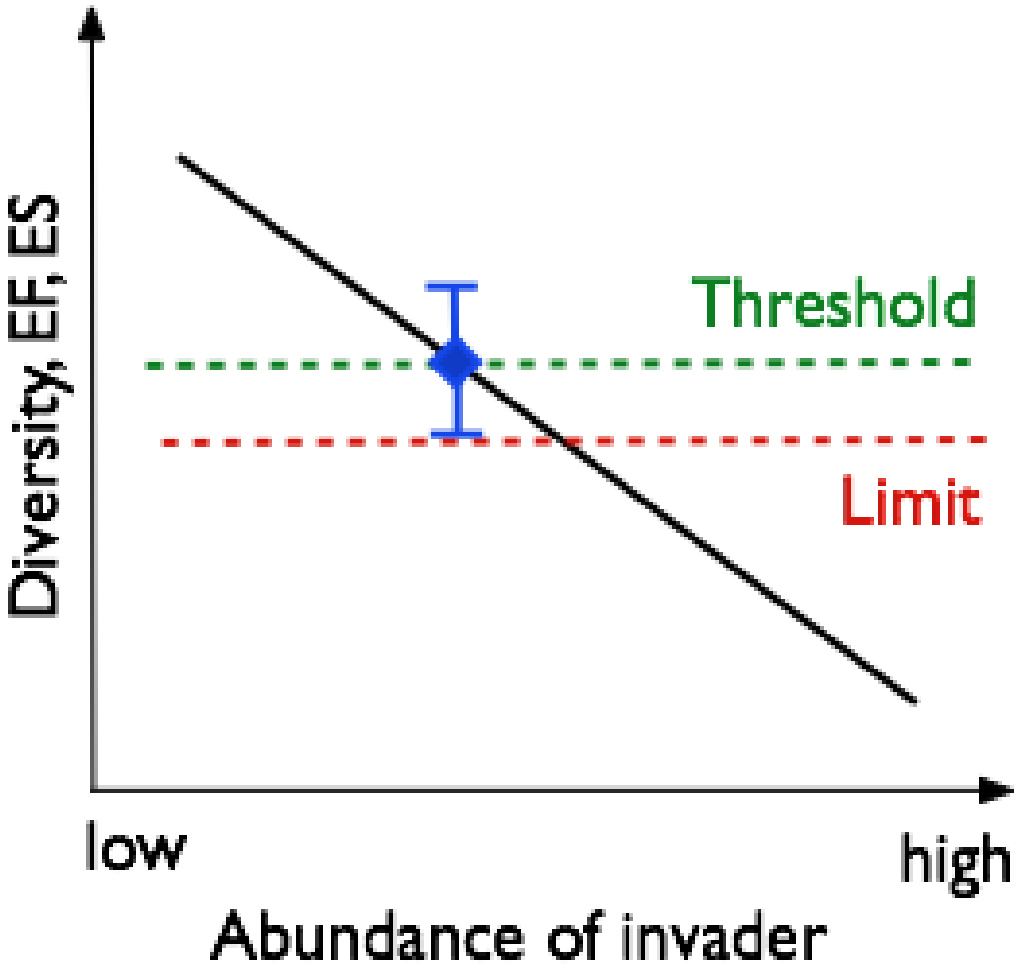
What is being done to solve the problem?

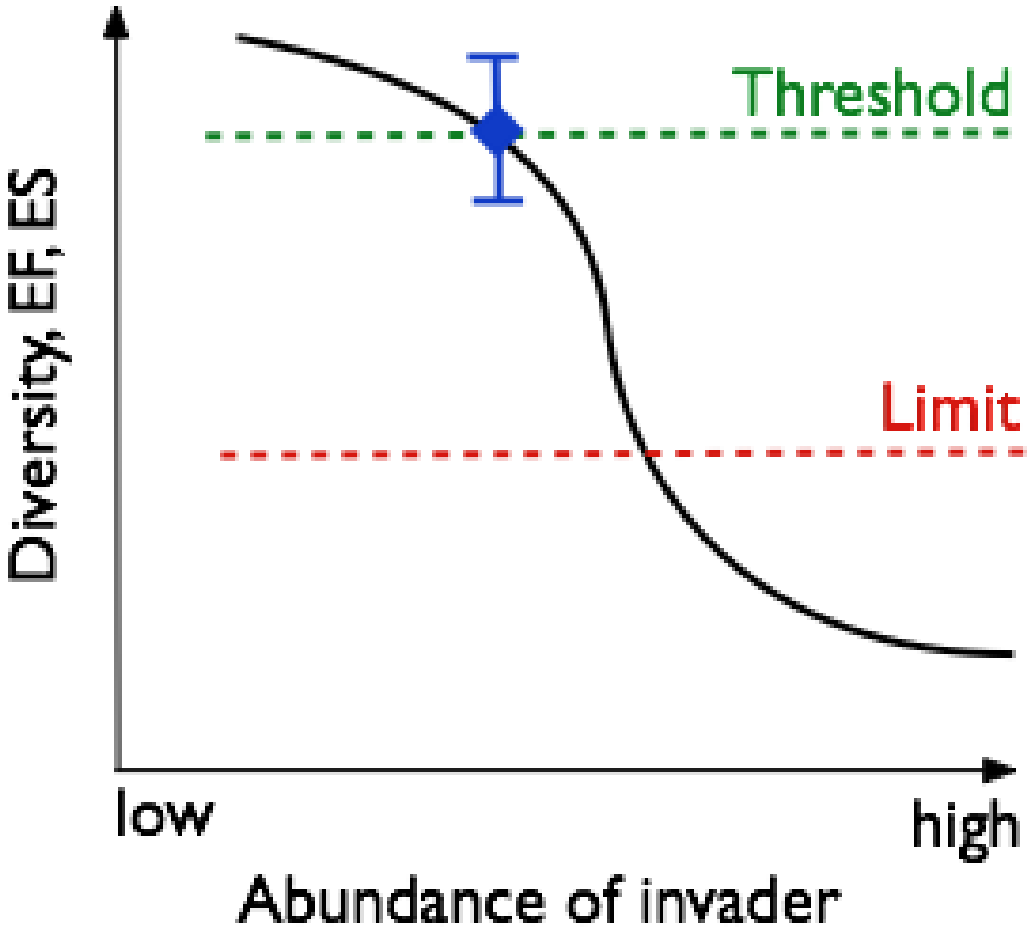
What could be done from here?

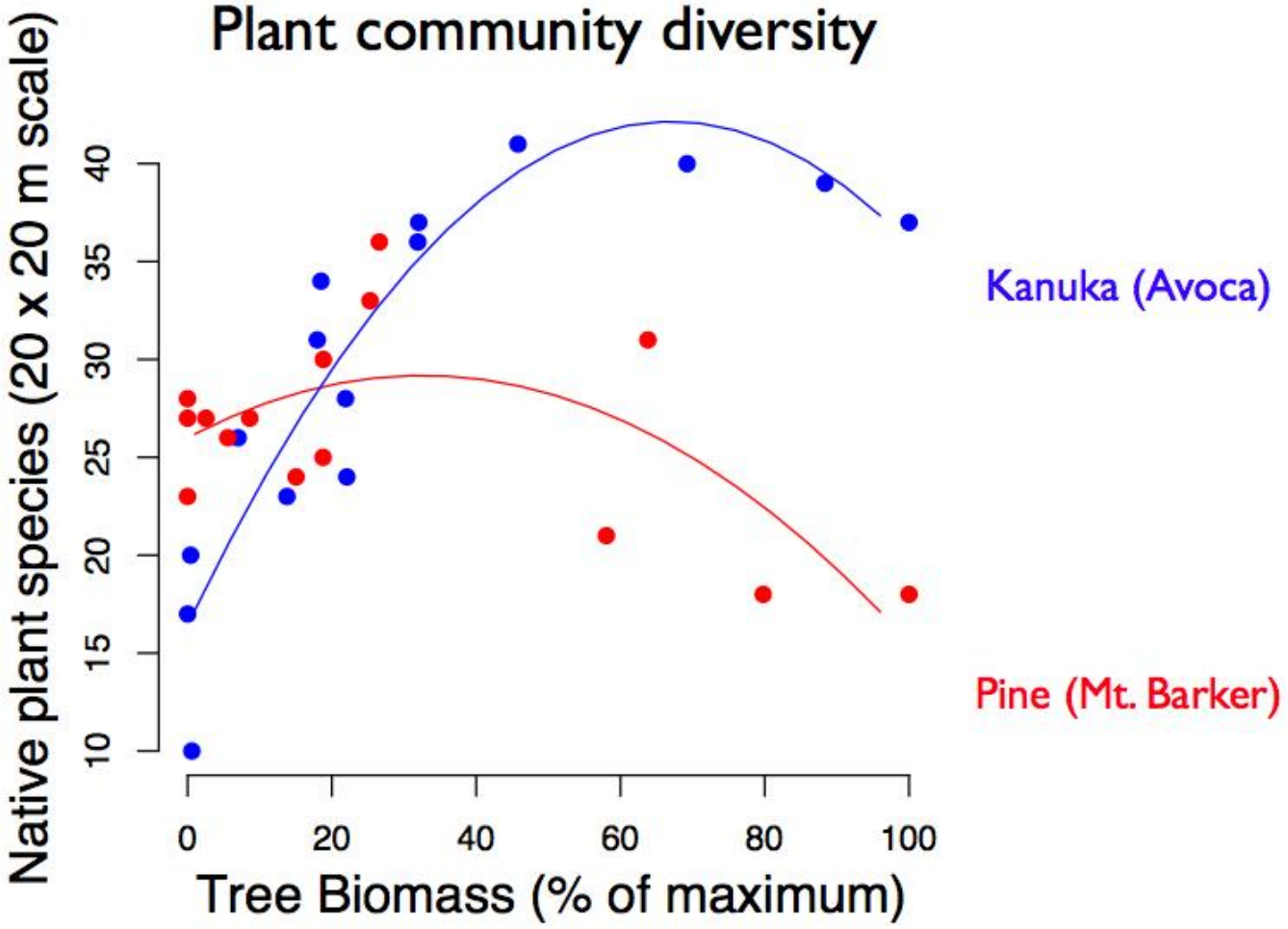
Ribbonwood Stn, Mackenzie Country

Ribbonwood Stn, Mackenzie Country

Neighbouring Ben Dhu Reserve

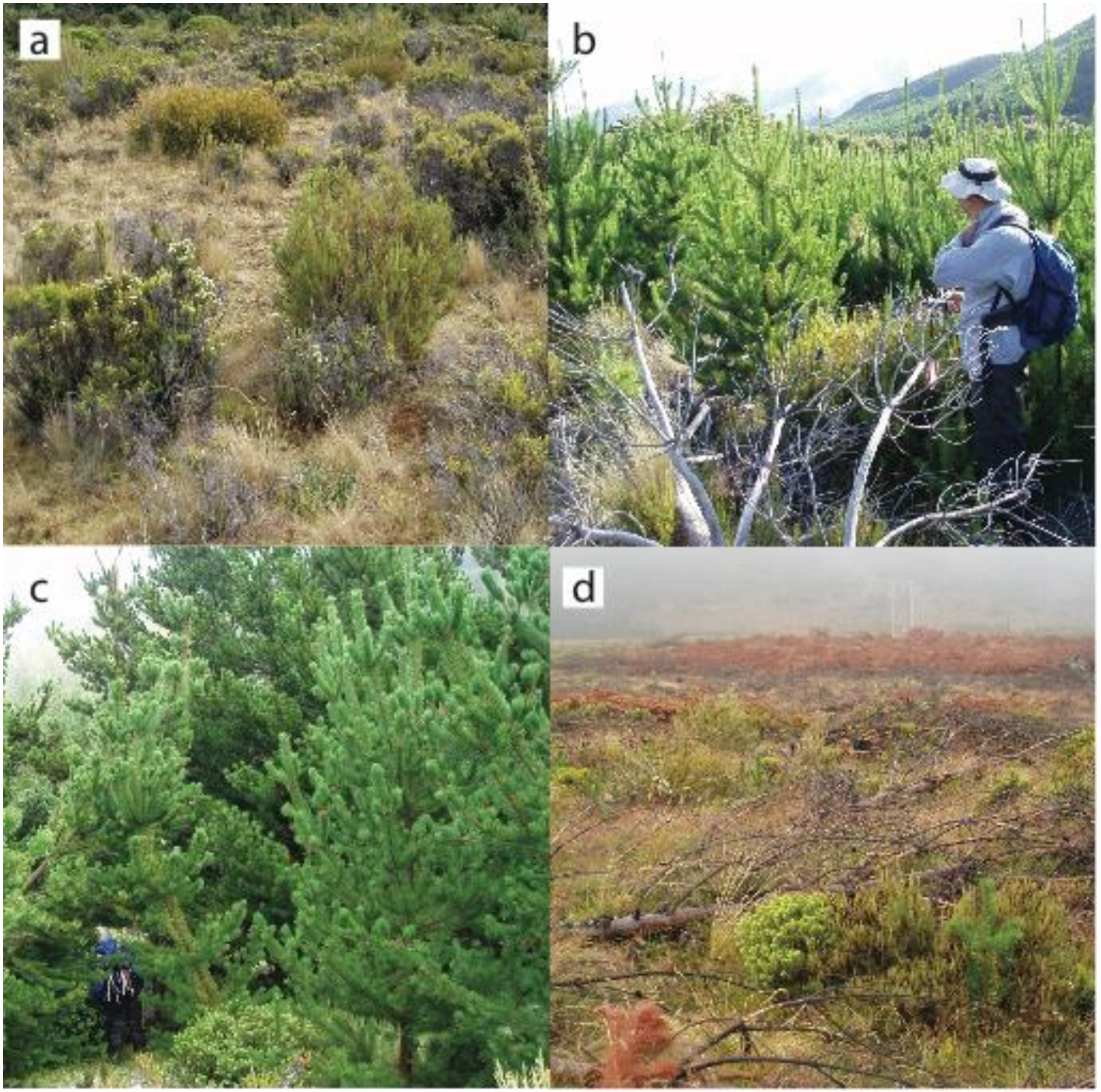

Diversity, EF, ES
Threshold
Limit
low
high
Abundance of invader

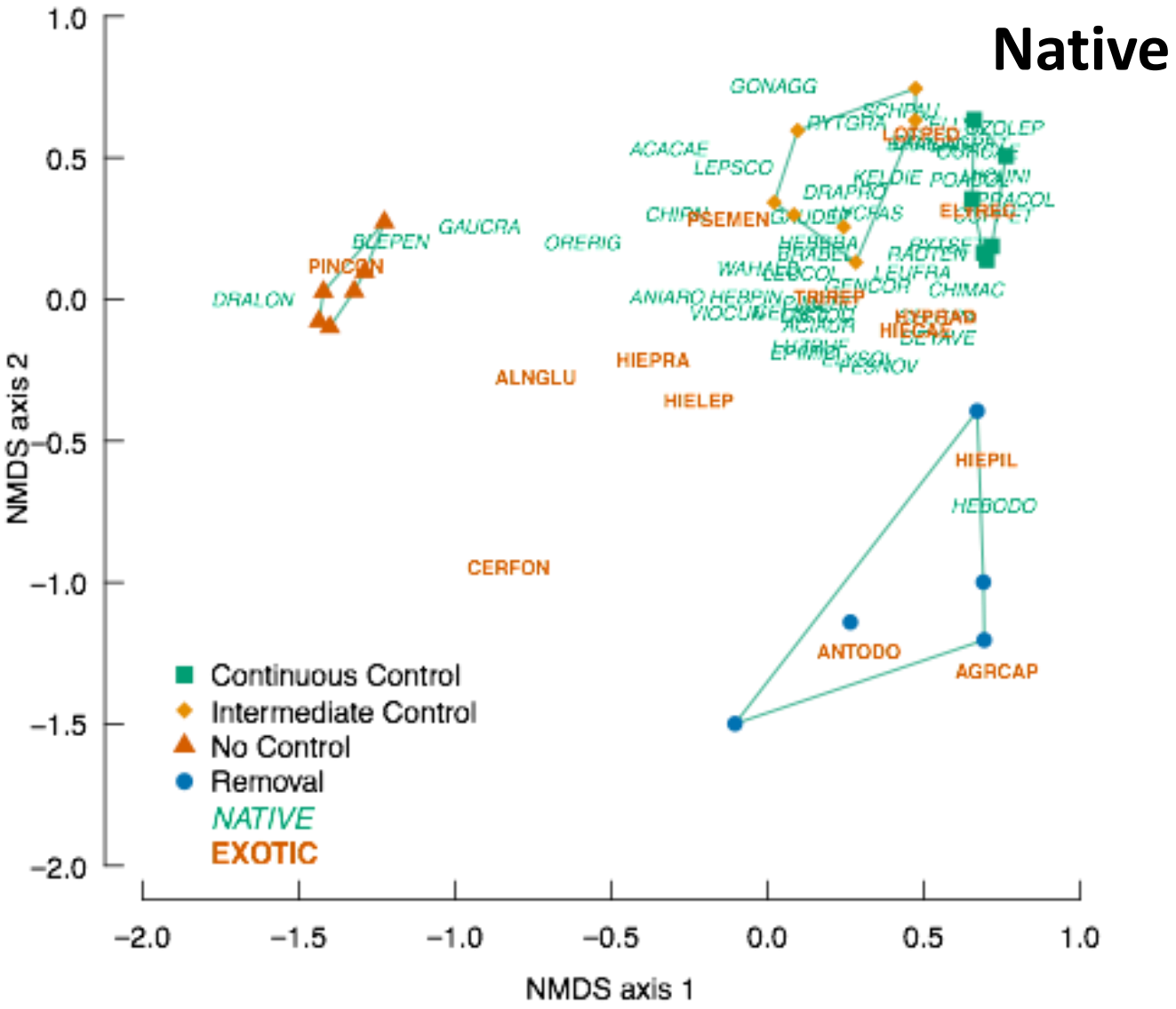

Threshold
Limit
Diversity, EF, ES
low
high
Abundance of invader



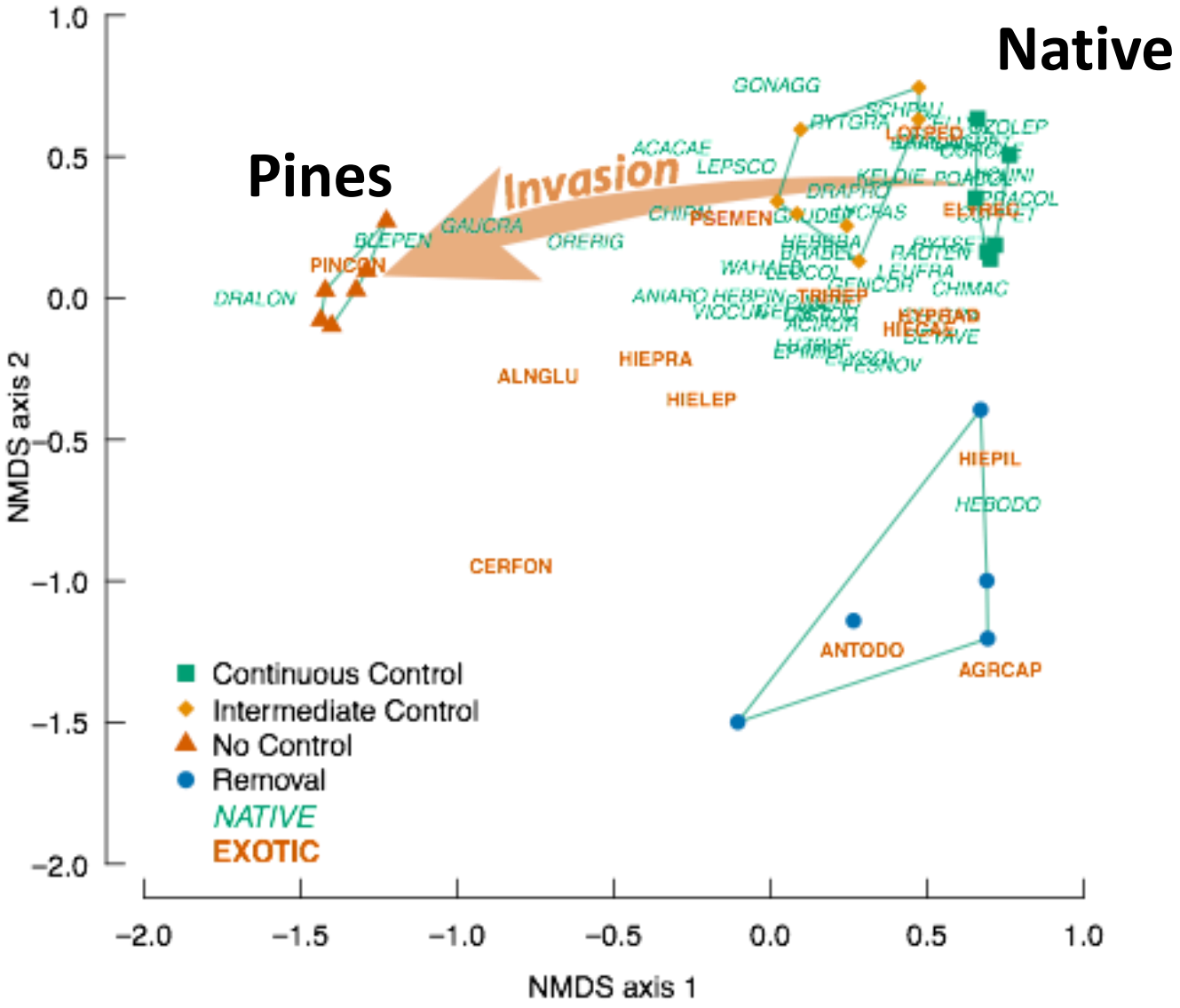
Dickie et al. 2011 J. Applied Ecol. 48: 926

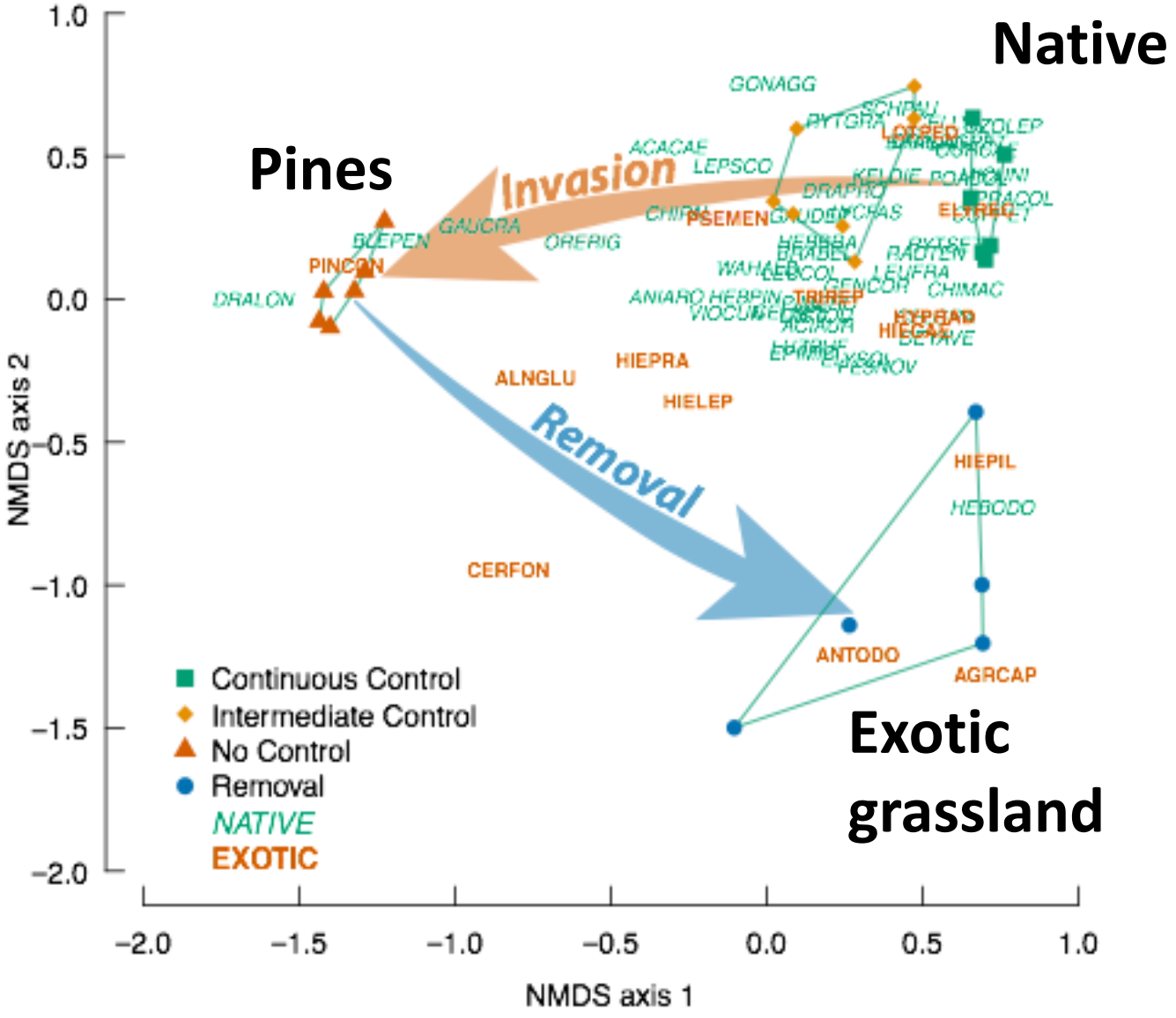
Torlesse Range


a
b
c
d



Dickie et al. 2014 AoB


Native
Pines
Invasion
GONAGG
ACACAE
LEPSCO
GAUCRA
ORERIG
PINCON
DRALON
PSEMEN
DRAPRO
ANIARO
HERPIN
TRIREP
HYPRAD
HIEGAS
HIEPRA
ALNGLU
HIELEP
CERFON
HIEPIL
HEDODO
ANTODO
AGRCAP
CHIMAC
Continuous Control
Intermediate Control
No Control
Removal
NATIVE
EXOTIC
NMDS axis 1
NMDS axis 2
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.0
−1.5
−1.0
−0.5
0.0
0.5
1.0

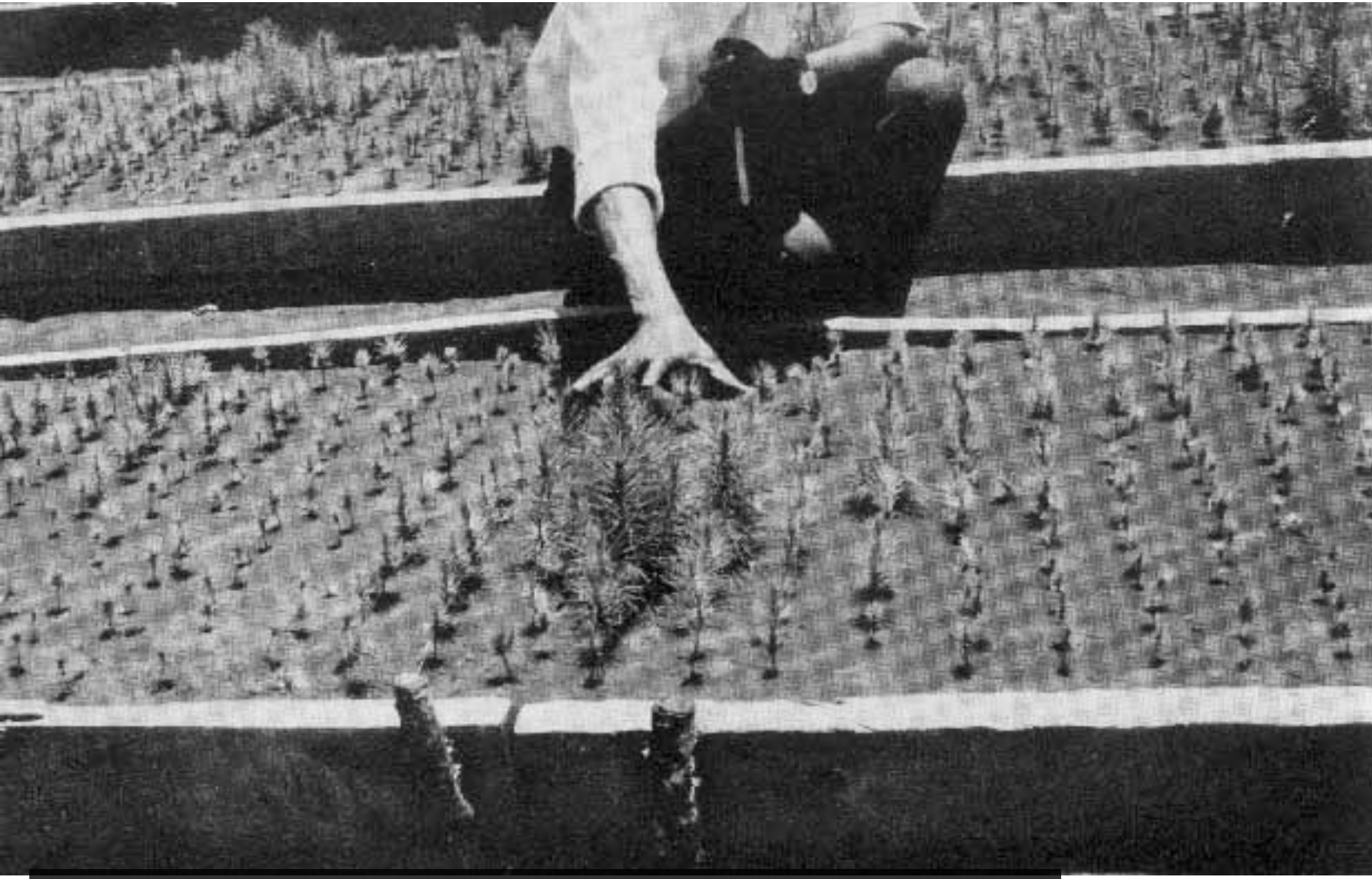


Dickie et al. 2014 AOB special issue

The final frontier?

Invasive lupines and pines, Kaweka Forest Park

How have conifers become so invasive?



Patchy mycorrhizal inoculum in Tanzanian pine nursery
Mikola 1969

Photo courtesy of Ian Dickie

Conifer seedling

Roots and mycorrhizal fungi

Photo courtesy of Ian Dickie

Native *Nothofagus forest*

G. Roberts


Native
Chamonixia

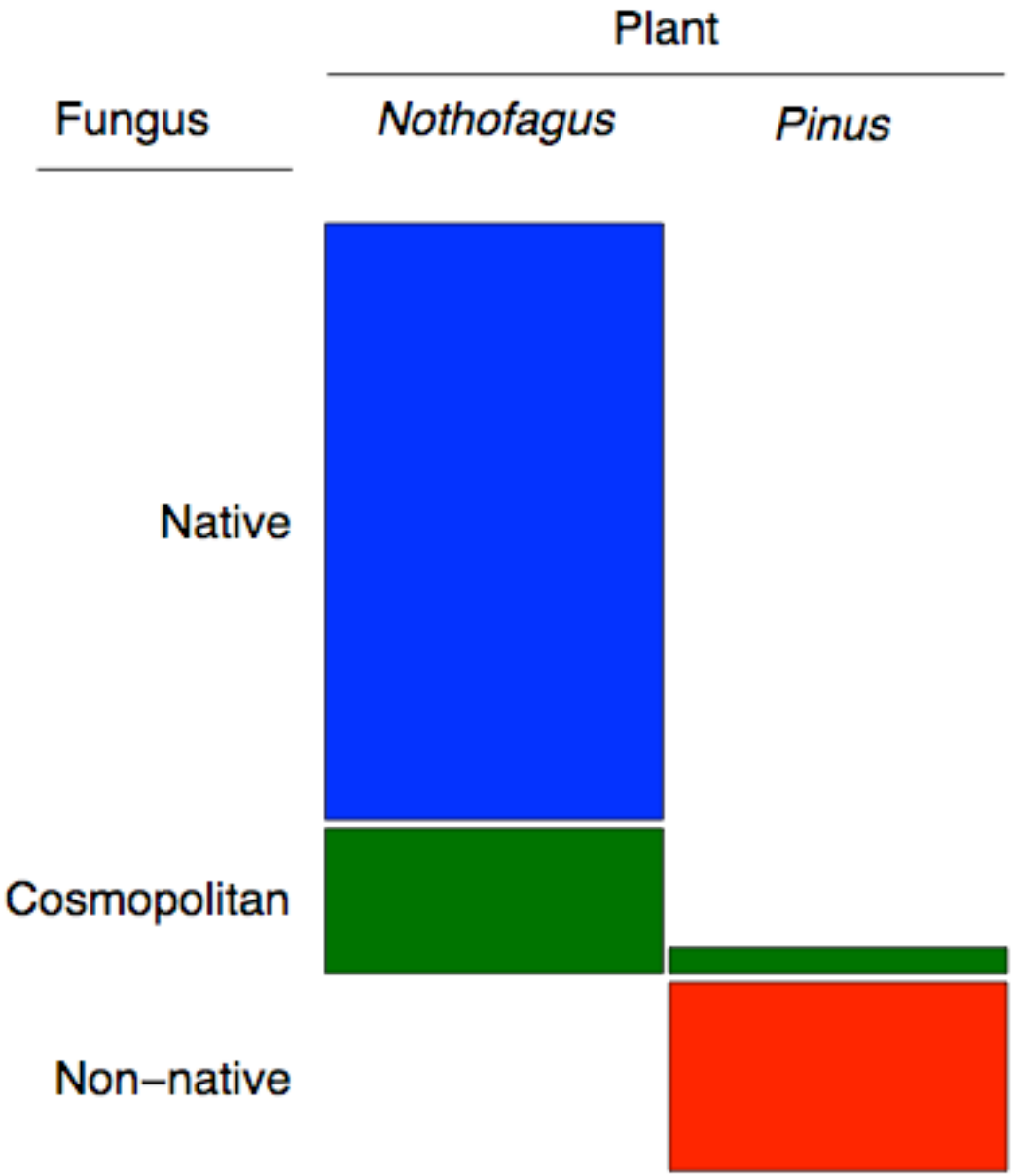

Cortinarius


Non-native
Rhizopogon


Lactarius


Octaviania


Suillus



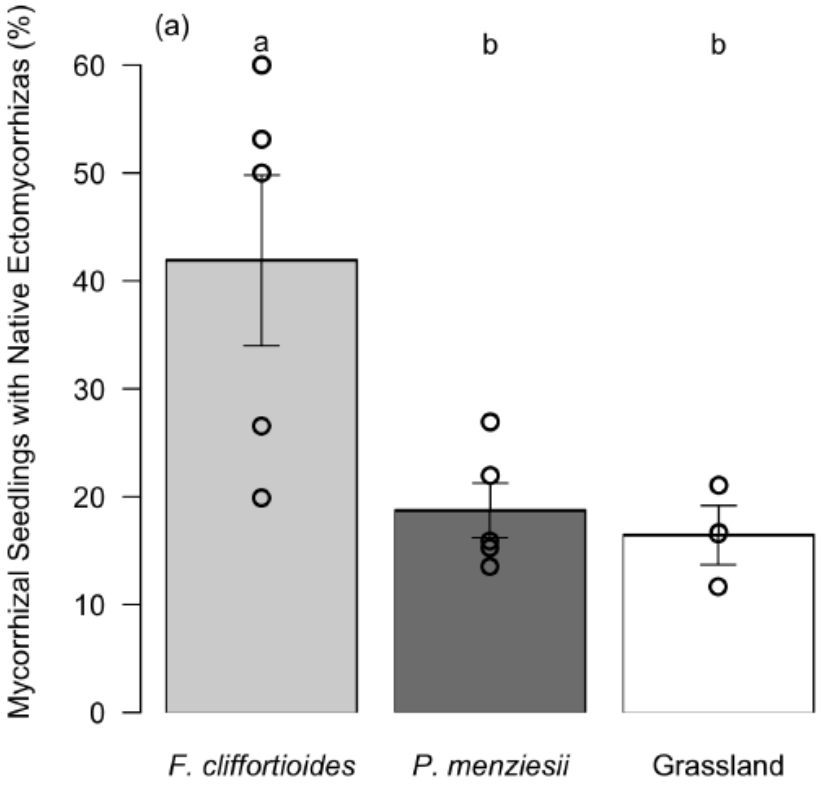
Novel associations

Cosmopolitan associations

Co-invasion

Vertical scale = proportion of total occurrences

Dickie et al. 2010
New Phytologist


(a)
Mycorrhizal Seedlings with Native Ectomycorrhizas (%)
0
10
20
30
40
50
60
a
b
b
F. cliffortioides
P. menziesii
Grassland

How do fungi spread?

Wood et al. 2015 J. Ecol. doi: 10.1111/1365-2745.12345

Possums and deer disperse co-invading mycorrhizal fungi.

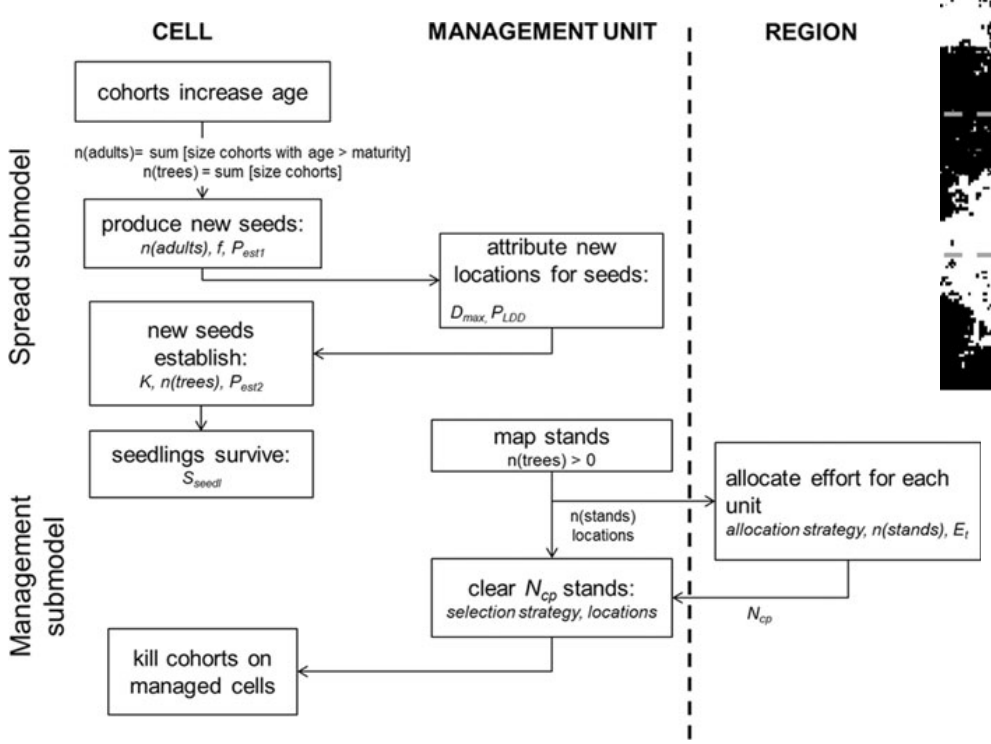

Jollies Pass, Hanmer Springs

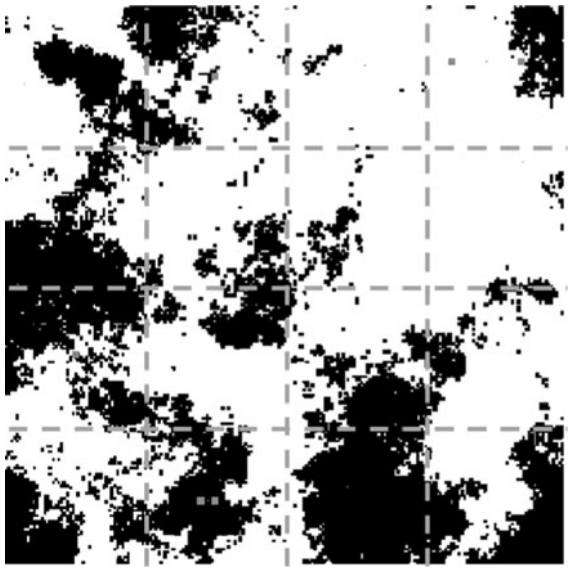
Biol Invasions (2014) 16:677–690
DOI 10.1007/s10530-013-0608-7

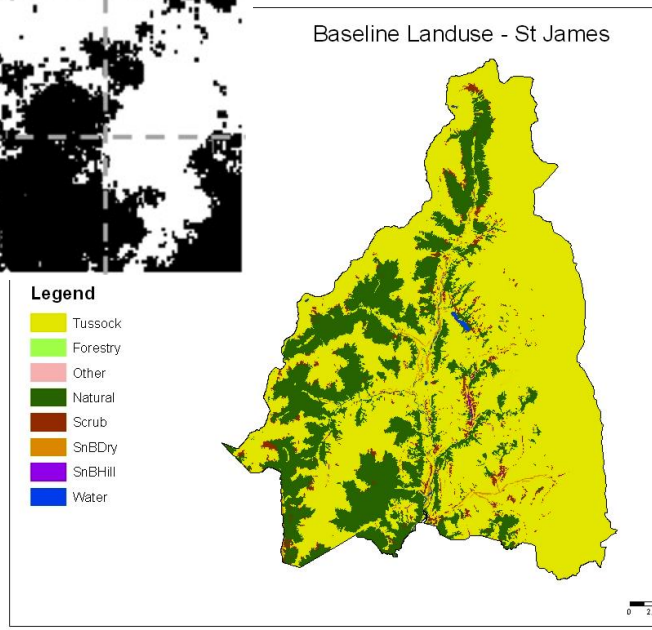
ORIGINAL PAPER

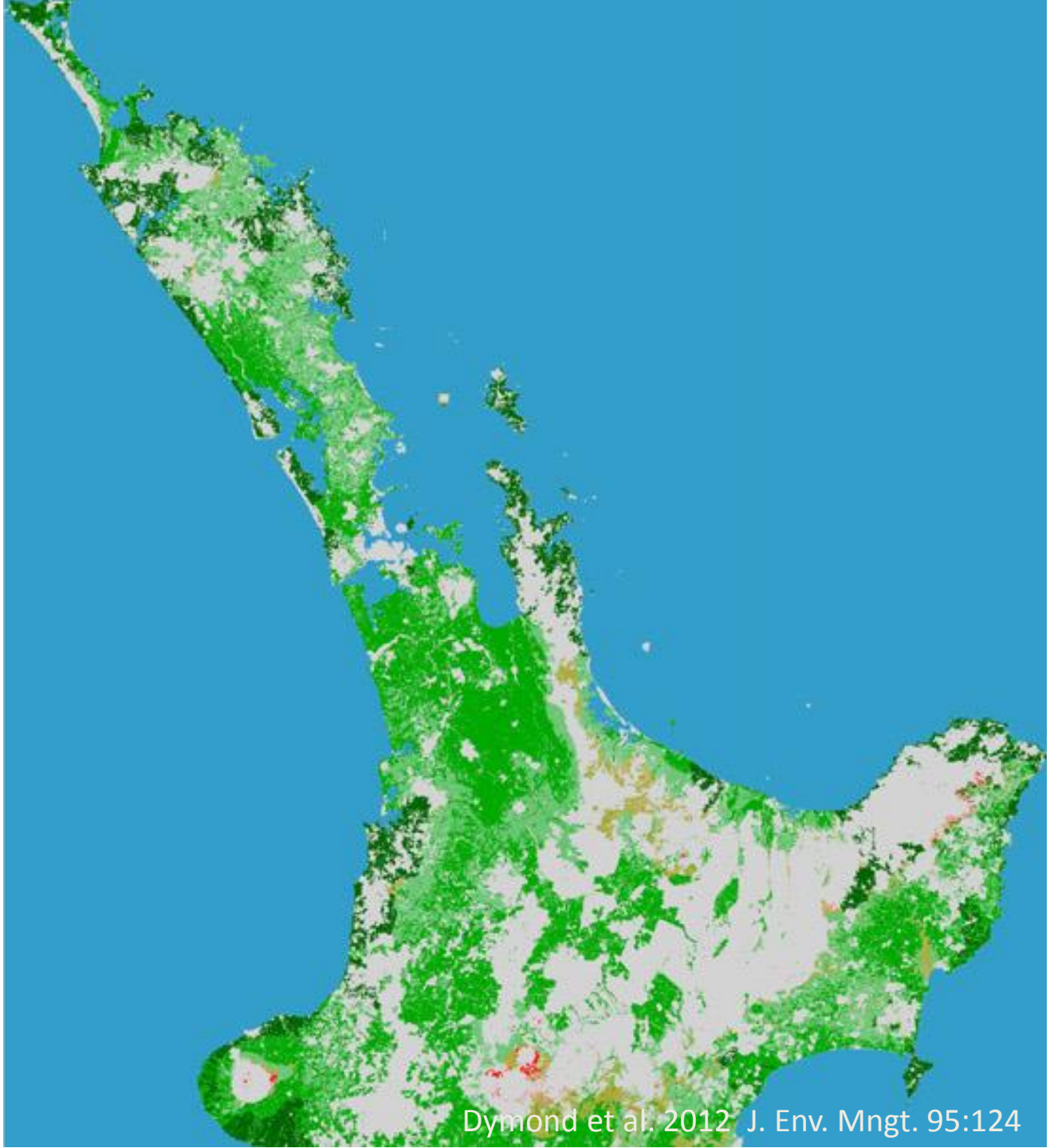
Cross-scale management strategies for optimal control of trees invading from source plantations

P. Caplat · C. Hui · B. D. Maxwell · D. A. Peltzer








Dymond et al. 2012 J. Env. Mngt. 95:124

Setting the scene

How BIG an issue are wilding conifers?

Why are they a problem?

What is being done to solve the problem?

What could be done from here?

Invasive pines, and dwarves. Twizel NZ
Screen shot from The Hobbit

Are wilding conifers under control?

Pinus contorta invasion, Craigieburn


11/8/2012
Craigieburn Forest Park
73
West Coast Rd
© 2013 Google
Image © 2014 DigitalGlobe
892 m
Google earth
Imagery Date: 2/15/2010
2010
43°09'20.03" S 171°43'41.70" E elev 803 m
Eye alt 4.54 km

Control operations, Craigieburn Forest Park

Glenfellen Stn, Slate Range, Nth Southland:

Removal of Douglas fir plantation, 190ha, 2012.

DOC Cost ~$200,000

DOC - Lammerlaws – Te Papanui Conservation Park

AGS Cost ~$260,000

Ongoing Costs of $?

To whom?

Extent of wilding conifers in NZ

(Refs: Smith 1903, Cheeseman 1925, Beauchamp 1962, Wardrop 1964, Hunter & Douglas 1984, Ledgard 1988, Harding 1990, Ledgard 2001, North etal 2007, Paul & Ledgard 2011)

Setting the scene

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Why are they a problem?

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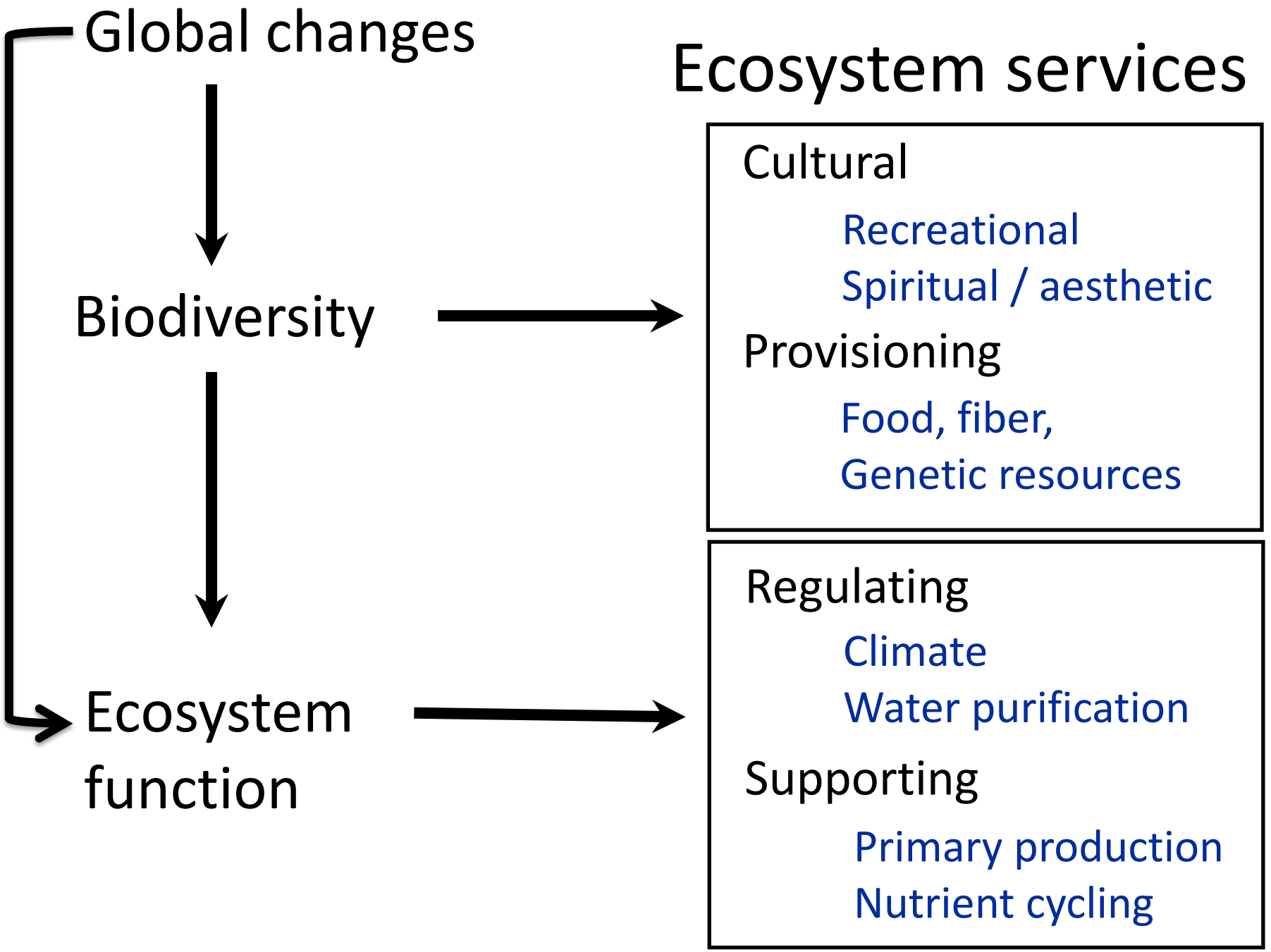
Craigieburn Forest Park


Craigieburn Forest Park
Large-scale adaptive management is ongoing
Align research efforts…


Eradicate?
Contain?
Leave and triage?

Many threatened ecosystems are vulnerable to wildings


Global changes
Biodiversity
Ecosystem function
Ecosystem services
Cultural
Recreational
Spiritual / aesthetic
Provisioning
Food, fiber,
Genetic resources
Regulating
Climate
Water purification
Supporting
Primary production
Nutrient cycling

Biol Invasions (2014) 16:705–719
DOI 10.1007/s10530-013-0609-6

ORIGINAL PAPER

Conflicting values: ecosystem services and invasive tree management

Ian A. Dickie · Brett M. Bennett · Larry E. Burrows · Martin A. Nuñez · Duane A. Peltzer · Annabel Porté · David M. Richardson · Marcel Rejmánek · Philip W. Rundel · Brian W. van Wilgen

Table 1 Ecosystem services, as defined by the Millennium Ecosystem Assessment (2005), and examples of their provision by invasive trees

Category	Example service	Major invasive tree genera commonly providing this service[a]
Cultural	Shade	*Acacia*, *Cinnamomum, Eucalyptus, Jacaranda, Pinus, Tamarix*
	Visual amenity/ornamental	*Acacia*, *Cinnamomum, Jacaranda, Larix, Pinus, Pseudotsuga, Rhamnus, Spathodea, Tamarix*
	Romantic trysts, privacy	*Eucalyptus, Pinus, Rhamnus, Salix*
Provisioning	Honey production	*Eucalyptus, Melaleuca*, *Robinia*
	Timber, building materials, poles, posts, pulp, crafts	*Acacia*, *Cinnamomum, Eucalyptus, Larix*, *Pinus*, *Pseudotsuga*, *Prosopis*, *Robinia, Tamarix*
	Tannins and other chemicals	*Acacia, Rhamnus*
	Firewood and charcoal	*Acacia, Eucalyptus, Pinus, Tamarix*
	Medicinal	*Acacia, Cinnamomum, Prosopis, Spathodea*
	Nut and fruit crops	*Psidium, Morus*
	Christmas trees	*Pinus, Pseudotsuga*
Supporting	Biodiversity (habitat and food provision for wildlife, protection from predators)	*Casuarina, Pinus, Tamarix*

New Zealand's Biological Heritage

A National Science Challenge

- Major shift in collaborations and funding
- Emphasis on novel ecosystems and biosecurity

Longer-term solutions also need to be developed

Novel ecosystems/restoration?

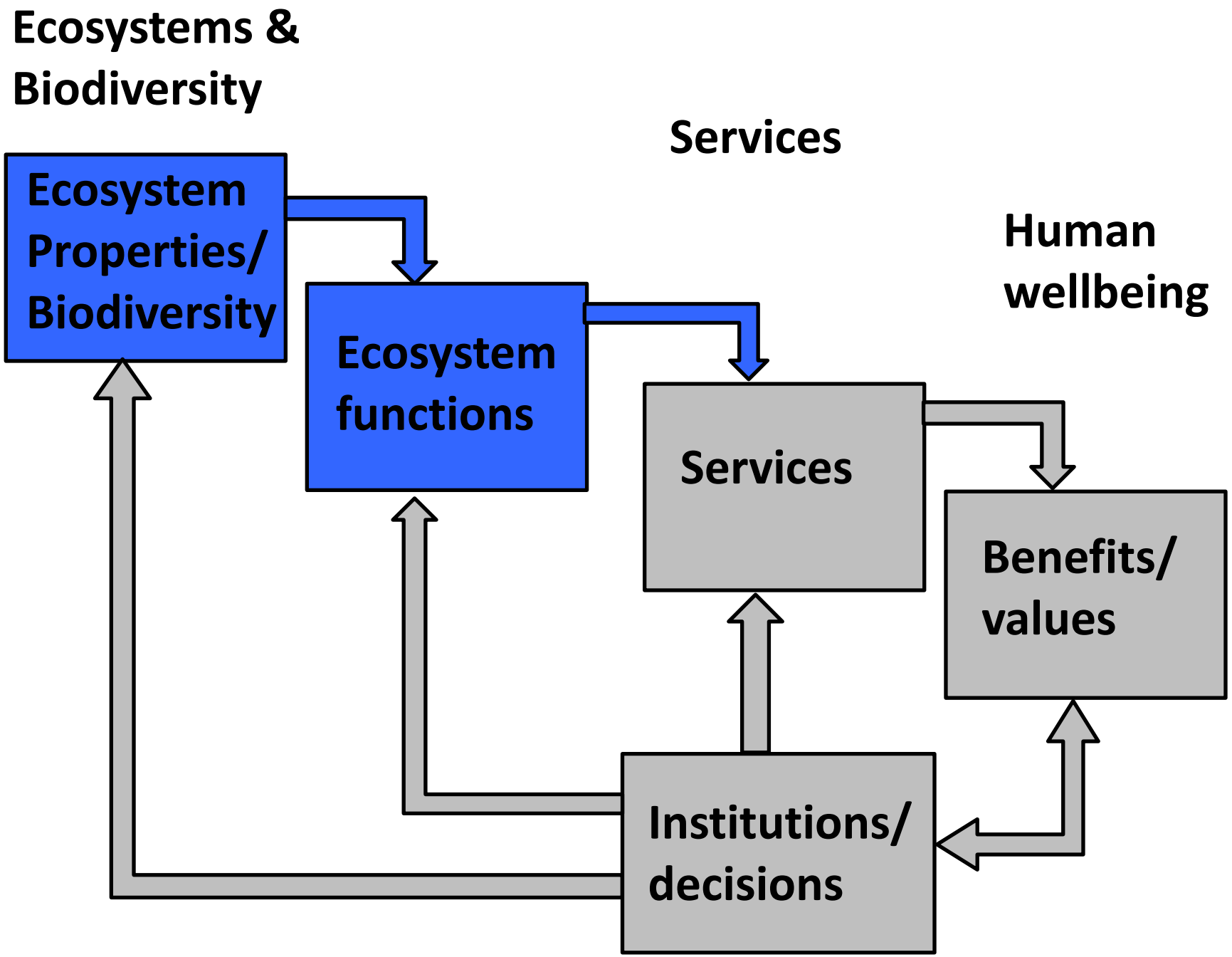
Longer-term solutions also need to be developed

Novel ecosystems/restoration?

Biological control?

DOUGLAS-FIR CONE GALL MIDGE
(*Contarinia oregonensis*)

Contarinia oregonensis adult on Douglas-fir foliage (D. Manastyrski)



Modified from Haines-Young and Potschin 2009; Lamarque et al. 2012

Setting the scene

How BIG an issue are wilding conifers?

Why are they a problem?

What is being done to solve the problem?

What could be done from here?

Landcare Research
Manaaki Whenua

Christmas: the season of joy...
... and a practical use for wilding pines!

All the best for the festive season from the team at Landcare Research