

Networked socioecological models for biosecurity decision-making

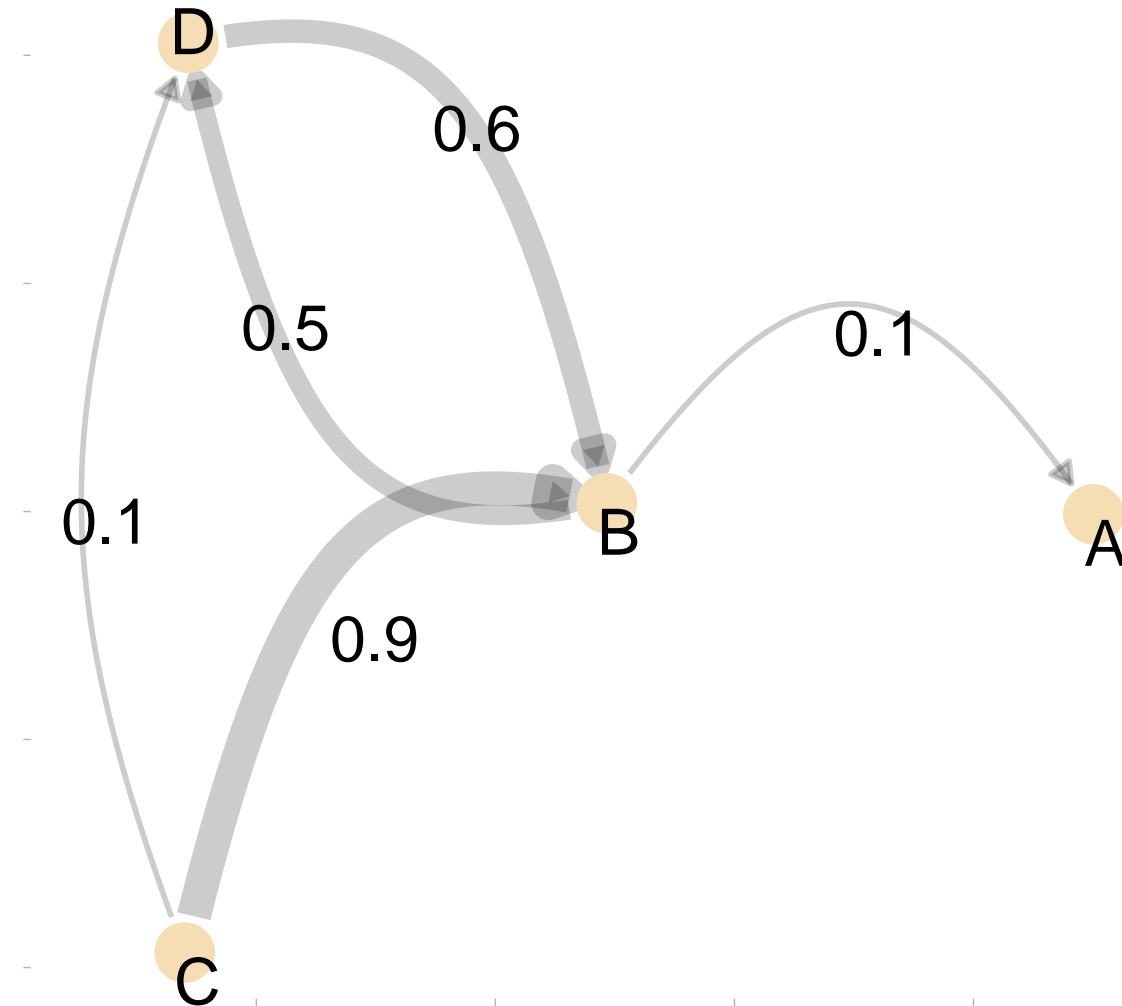
Christopher E. Buddenhagen, Shona Lamoureaux, Graeme Bourdôt, Karen A. Garrett and Norman Mason



Integrating social and ecological processes – what is behind network models

from

	to			
	A	B	C	D
A				
B	0.1			0.5
C		0.9		0.1
D		0.6		



RESEARCH ARTICLE

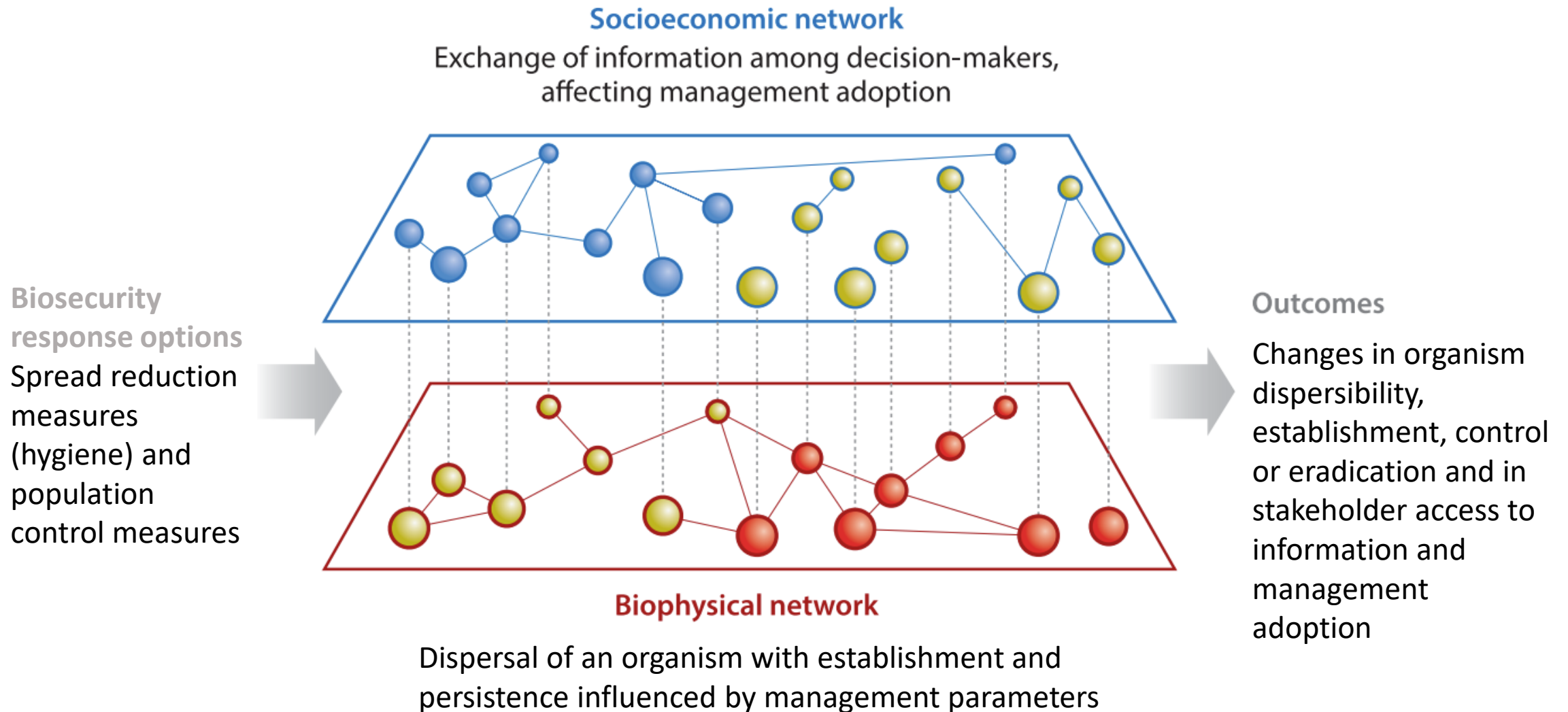
Impact network analysis and the `INA` R package: Decision support for regional management interventions

Karen A. Garrett 

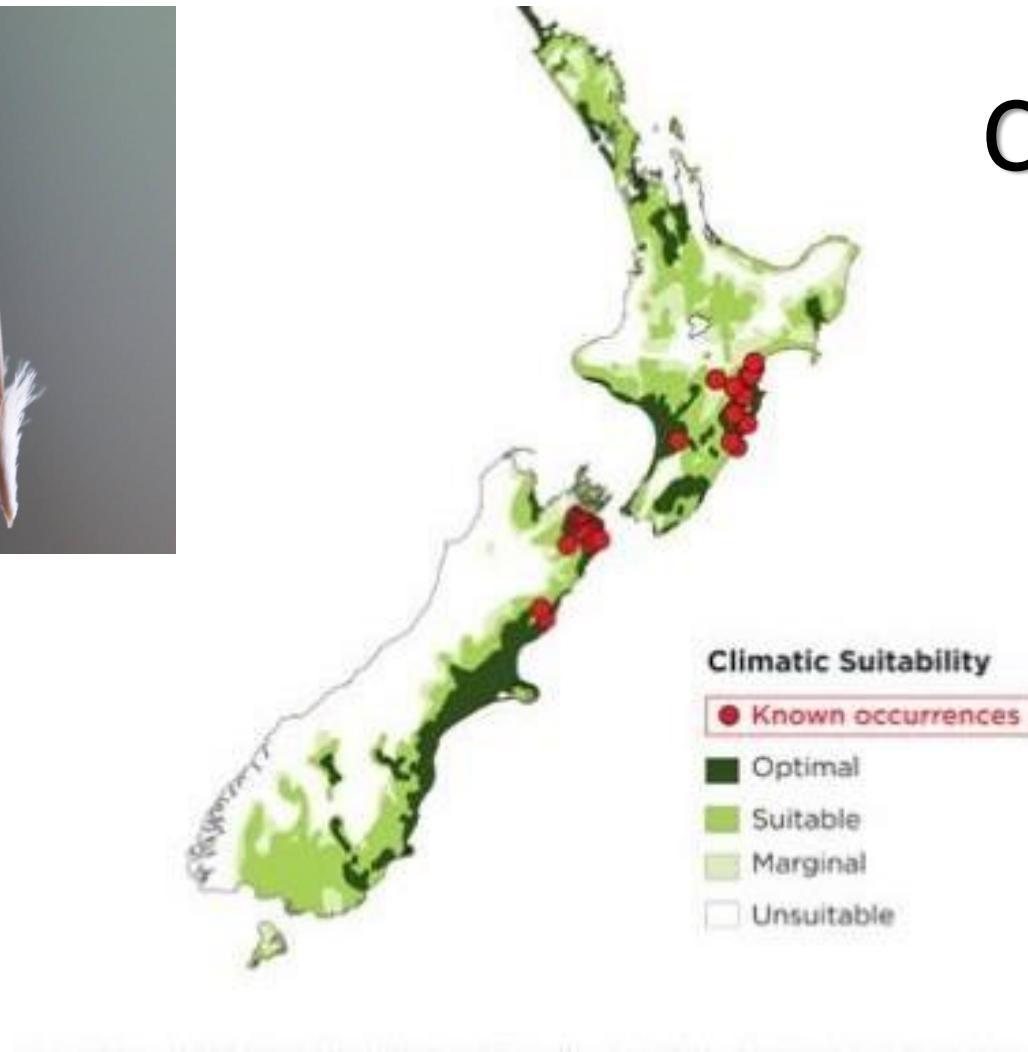


- This R package is available for R&D teams that include an R user
- We are developing an online app for non-R users

Impact network analysis (INA) for effective biosecurity responses



Chilean Needle Grass



Bourdôt GW, et al 2012. The potential global distribution of the invasive weed *Nassella neesiana* under current and future climates. Biol Invasions. 14(8):1545–1556.

INA scenario analysis new functionality

SPREAD: self-mediated and human-mediated dispersal*

BIOSECURITY RESPONSES: hygiene/movement restrictions & control measures

CLIMATE CHANGE: Impact on ability to eradicate, contain or mitigate impacts

EXTENSION/OUTREACH: e.g., alerting neighbours to new infestations

INTEGRATED SCENARIO ANALYSIS – flexible

Simulation Process

New function “INApest” – a **wrapper** around INA



Annual call to the original INAscene function



Management adoption probabilities are assigned **outside** INAscene (detection dependent and based on proximity to new infestations)

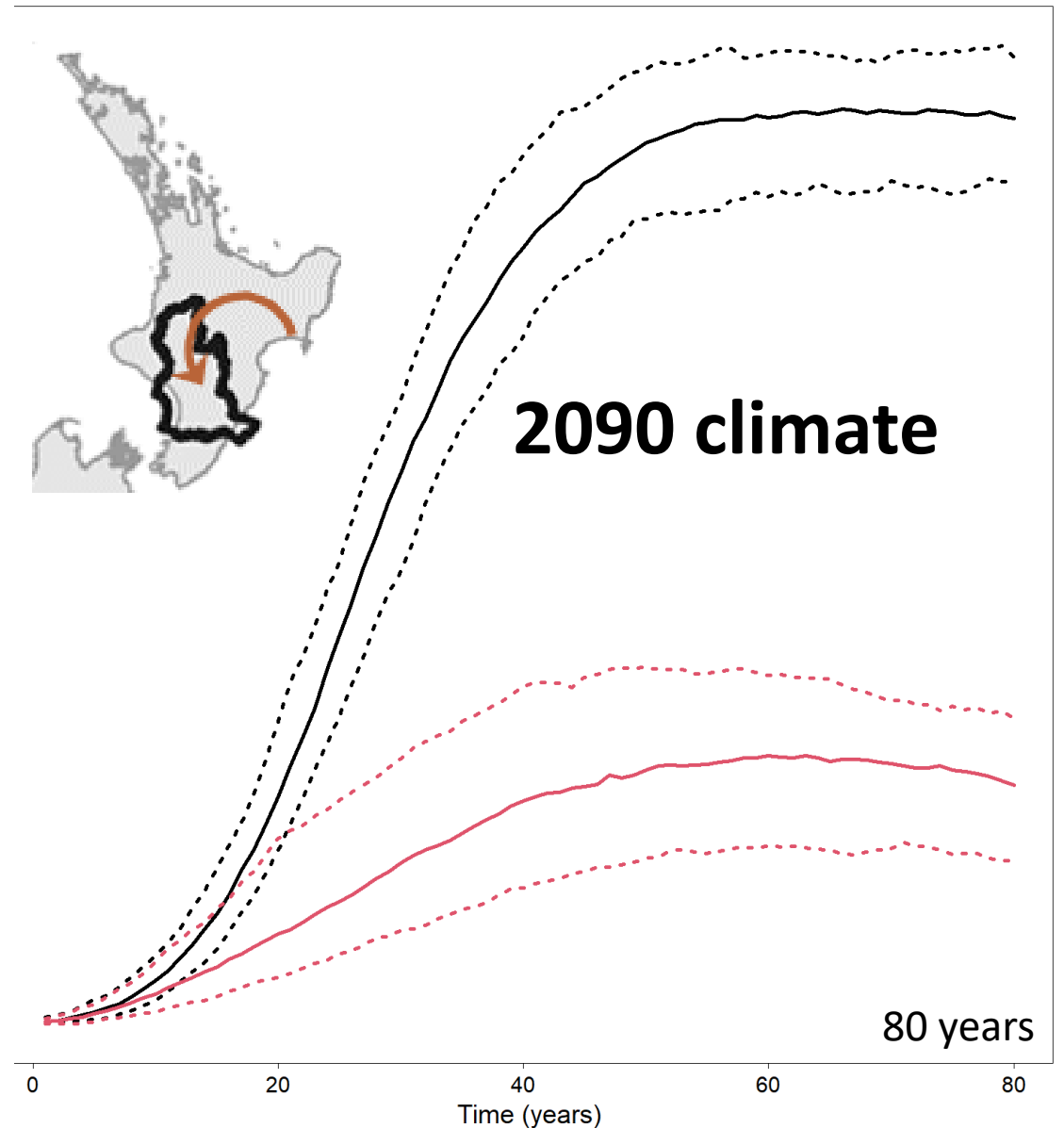
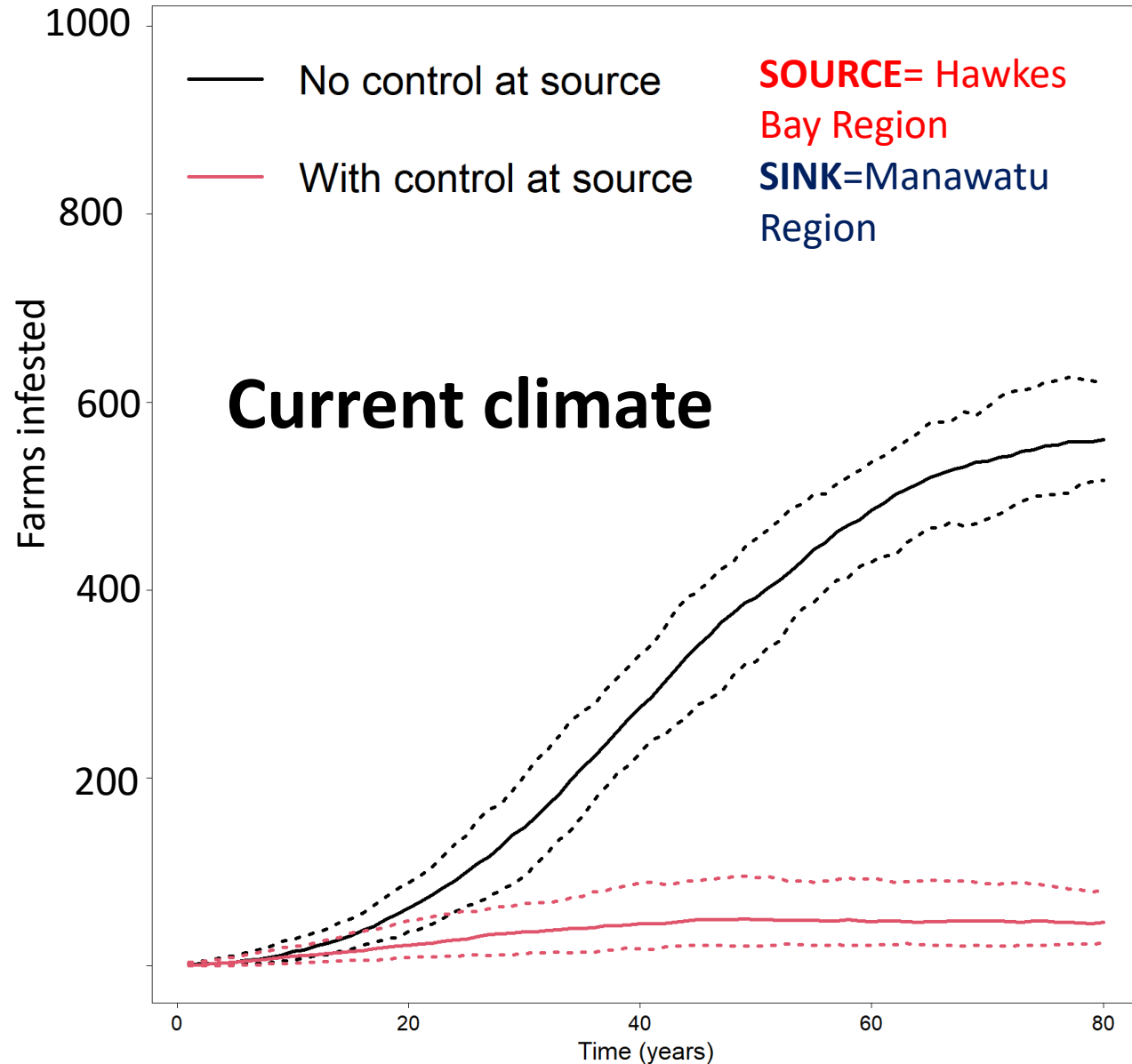


Self/human mediated dispersal and habitat suitability are integrated **outside** INAscene to produce invasion probabilities



Spread of pest and information occur **inside** INAscene

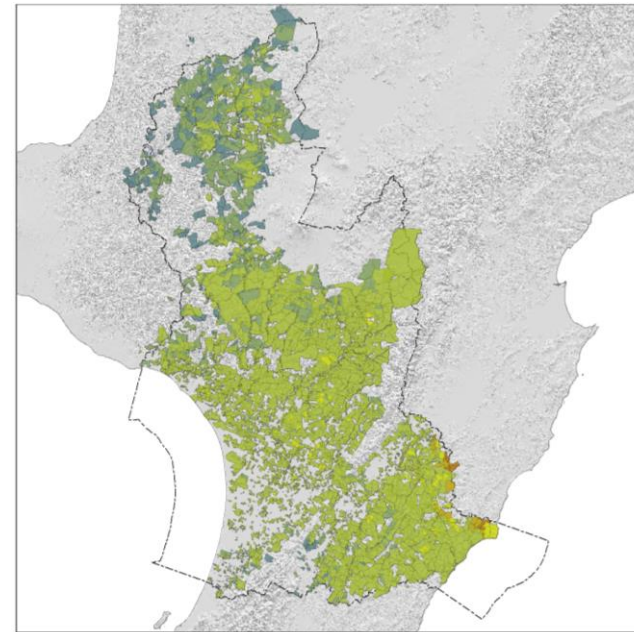
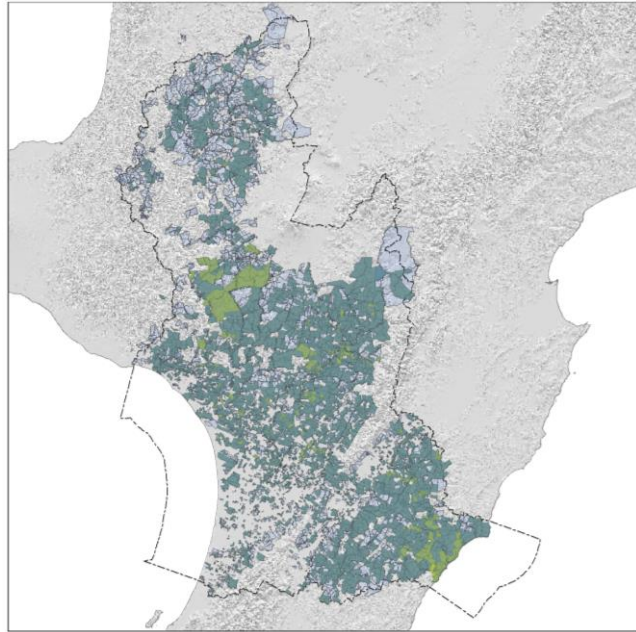
Influence of external threats



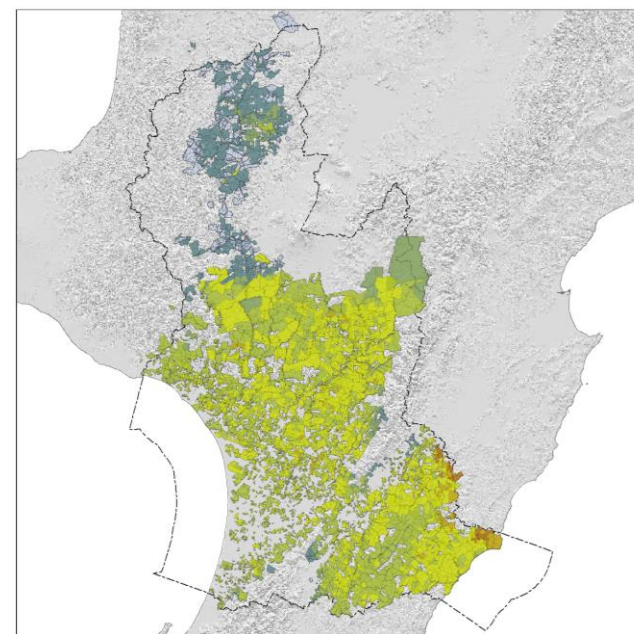
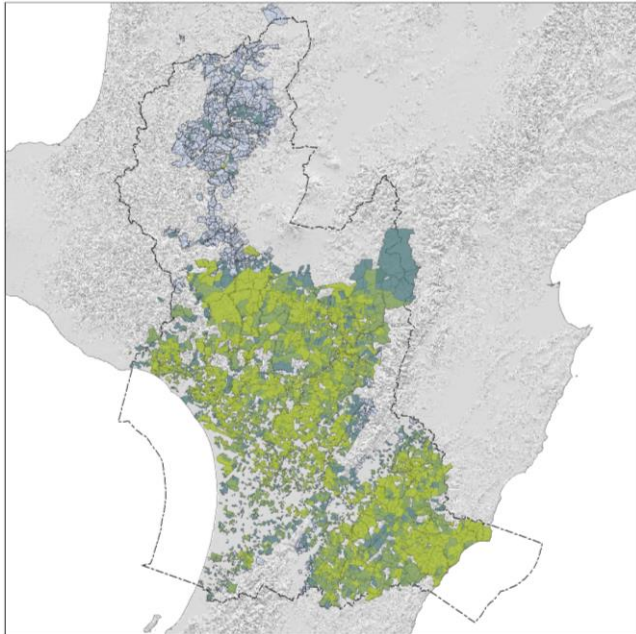
Control at source

No control at source

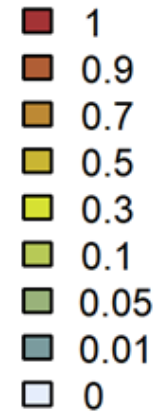
Current climate



2090 climate



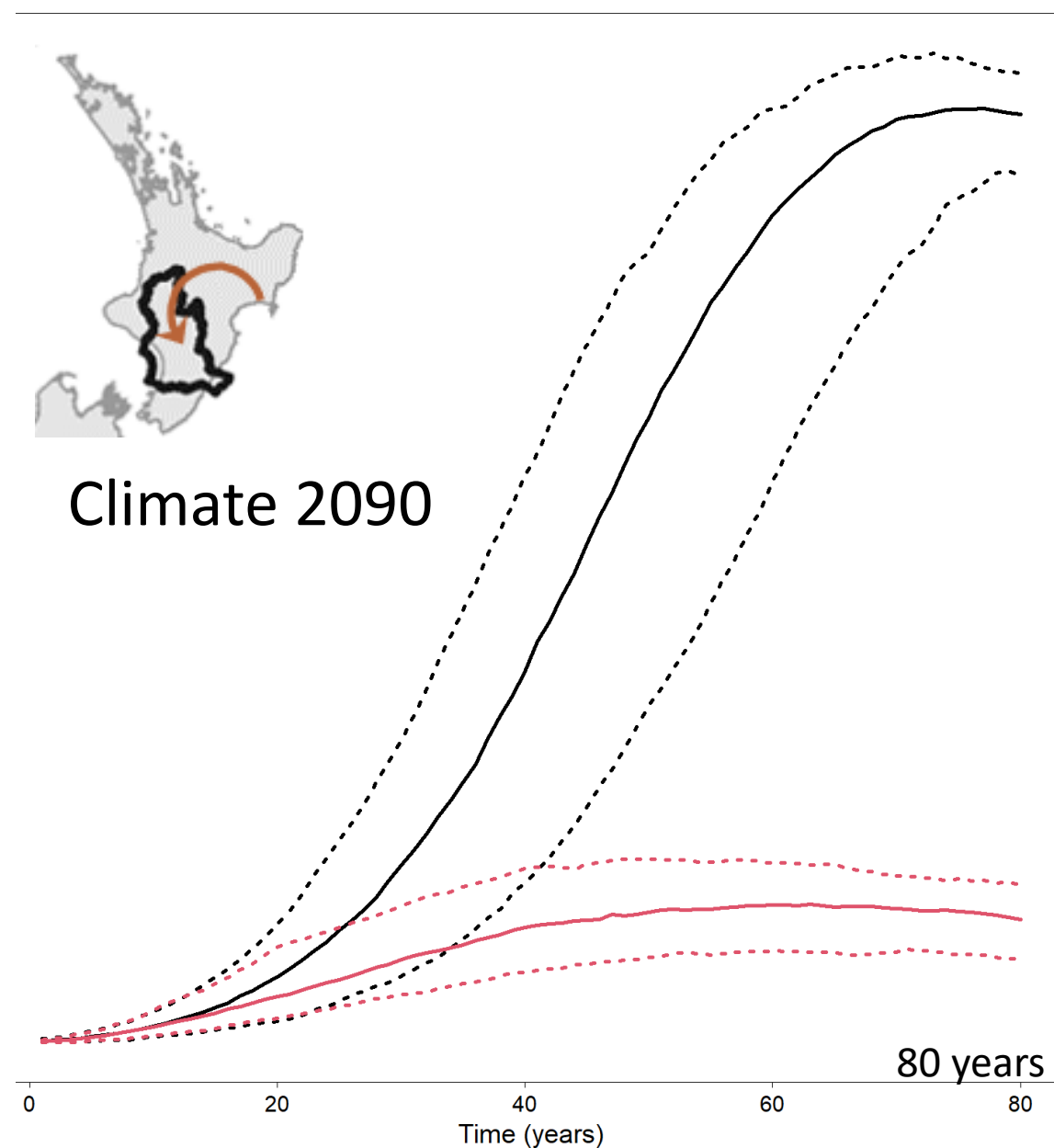
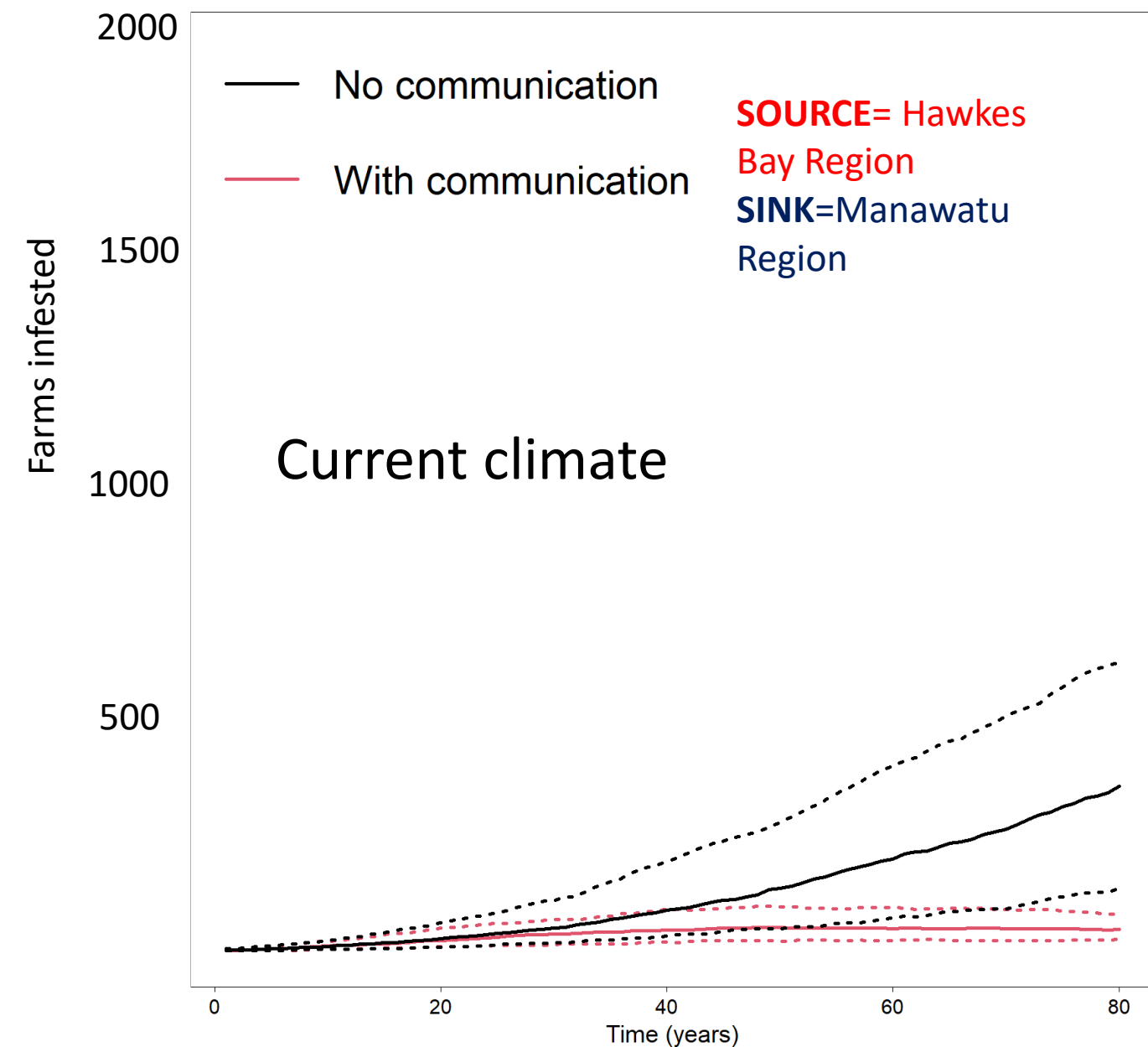
Invasion probability



After 80 yrs.

0 50 km
EPSG:2193 (NZTM)

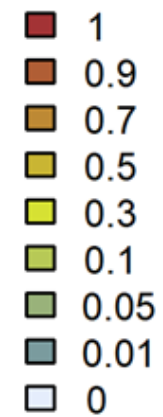
Warning neighbours about new infestations



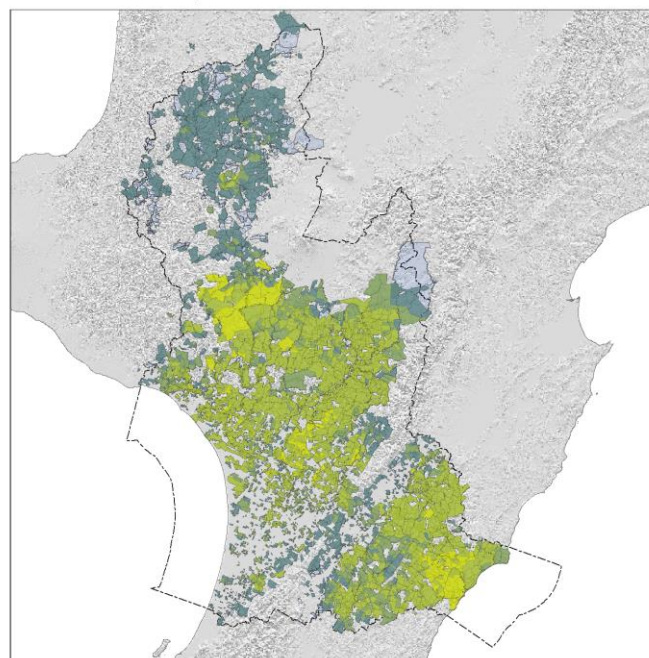
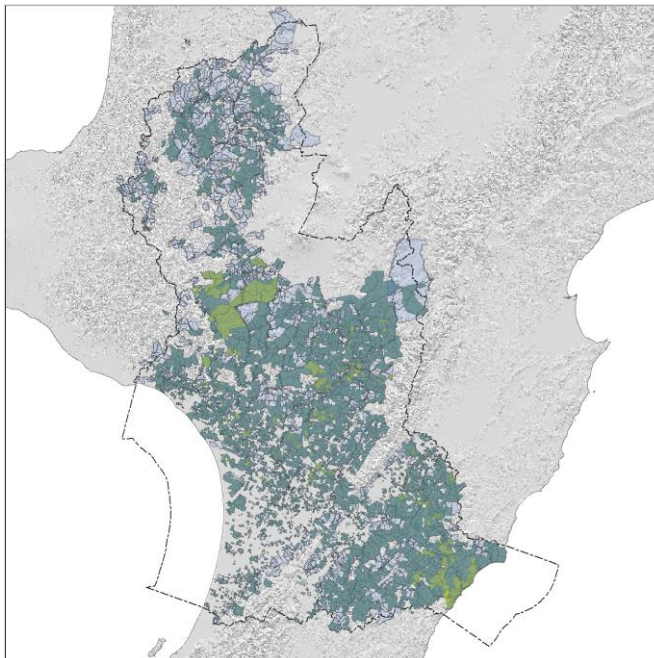
With communication

No communication

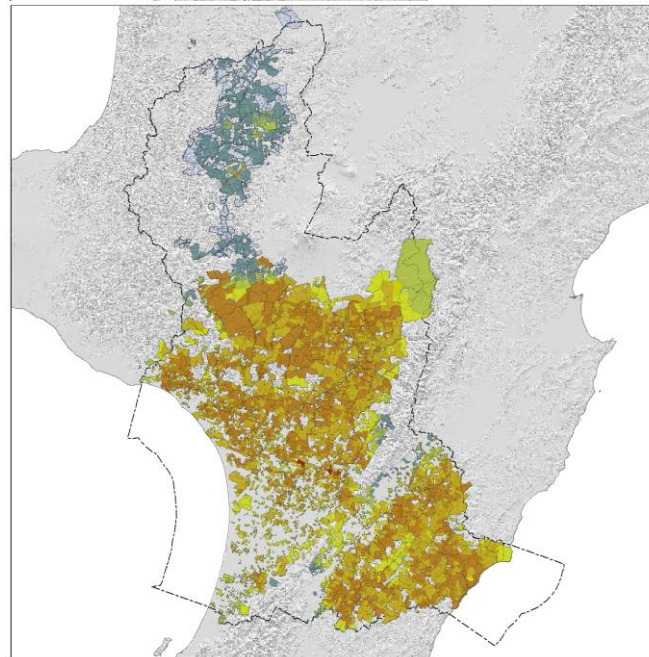
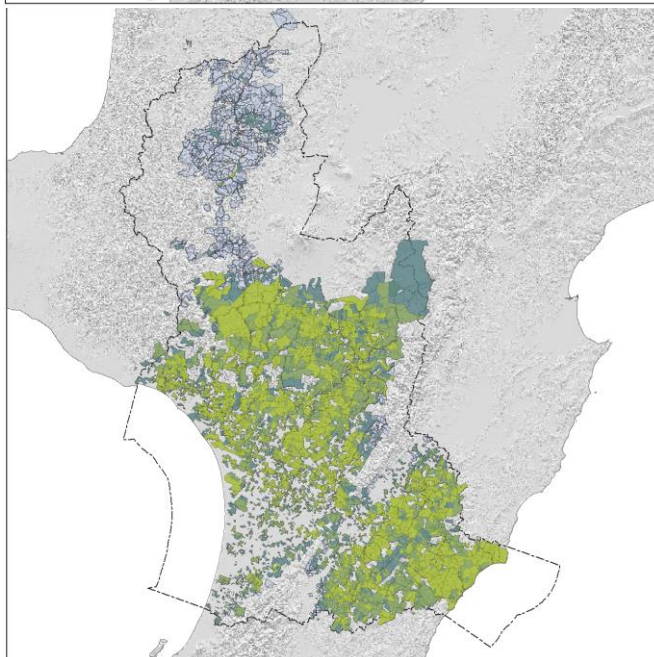
Invasion probability



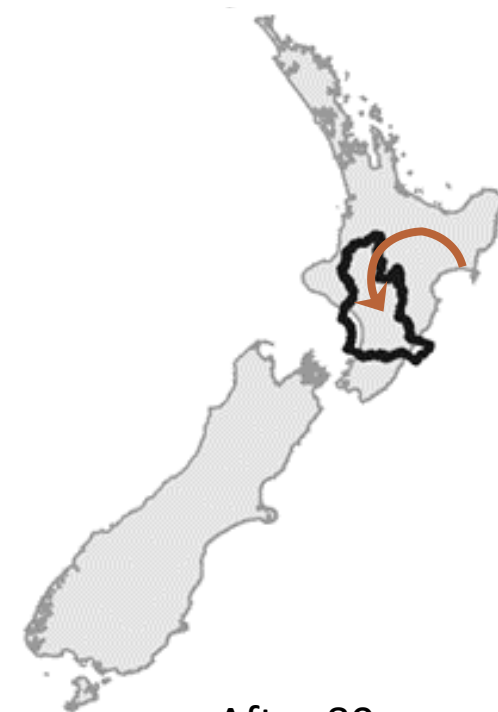
Current climate



2090 climate



0 50 km
EPSG:2193 (NZTM)






After 80 yrs.

Similar spread models available but we added management scenarios

Risk Analysis, Vol. 42, No. 6, 2022

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An Integrated Biosecurity Risk Assessment Model (IBRAM) For Evaluating the Risk of Import Pathways for the Establishment of Invasive Species

Lisa E. Jamieson ^{1,2,*} **Owen Woodberry**³ **Steven Mascaro**³ **Nicolas Meurisse** ^{2,4}
Rodelyn Jaksons⁵ **Samuel D. J. Brown** ^{1,2} and **Michael Ormsby**⁶

Summary

- New INApest functions allow us to test diverse management scenarios
- Climate change amplifies consequences of management decisions
- Management failures in an invaded region increases the harm in uninvaded regions
- Warning neighbours about new infestations can greatly reduce spread
- INA framework is a flexible, scalable, and adaptable tool for invasive species scenario analysis