



**Landcare Research**  
**Manaaki Whenua**

# New directions in pest animal research



# History

## Multi-Species Dynamics

*Wendy Ruscoe*

*2005 – 2009*



## Spatial Ecology & Modelling

*Andrea Byrom*

*2005 – 2009*



## Multi-Species Pest Control

*Bruce Warburton*

## Invasive Mammal Impacts (IMI)

*Roger Pech & Andrea Byrom*

*6 years: 2009 – 2015*

*\$1.3M pa (less GST)*



## Control of Small Mammal Pests

*Bruce Warburton*

## Species-Specific Toxins

*Brian Hopkins*



# IMI research: 4 'strands'



## 1. Forests



*Pen Holland &  
Richard Duncan*



*Wendy Ruscoe  
&  
Dean Anderson*



*Graeme Elliott*



# IMI research: 4 'strands'



## 1. Forests



*Pen Holland &  
Richard Duncan*



*Wendy Ruscoe  
&  
Dean Anderson*



*Graeme Elliott*



## 2. Drylands

*Andrea Byrom*



*Grant Norbury  
Deb Wilson &  
Dan Tompkins*



# IMI research: 4 'strands'

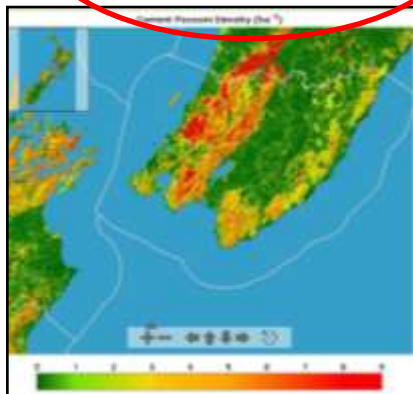


## 3. Global change

*Andrea Byrom  
&  
Jenny Christie*



*Mandy Barron  
&  
James Shepherd*



# IMI research: 4 'strands'

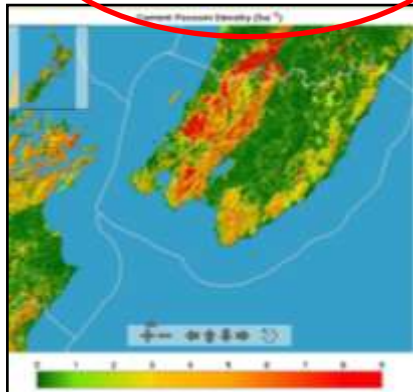


## 3. Global change

*Andrea Byrom  
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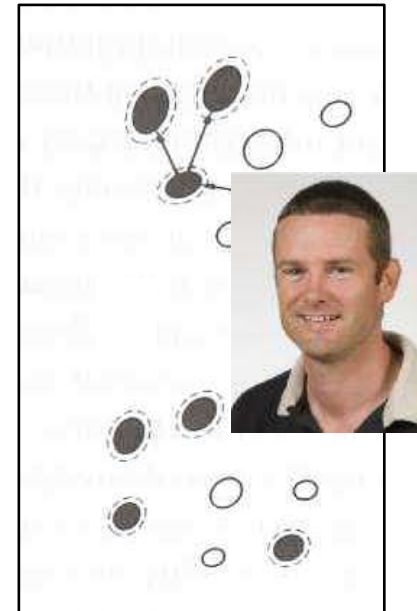


*Mandy Barron  
&  
James Shepherd*



## 4. Theory

*Al Glen  
Clare Veltman &  
Roger Pech*



*Amy Whitehead*





# Programme objectives

## Objective 1:

- pest management in a **landscape** context

## Objective 2:

- **impacts** of mammal pests on native biota

## Objective 3:

- population dynamics of invasive mammals
- management of **multiple** pest species

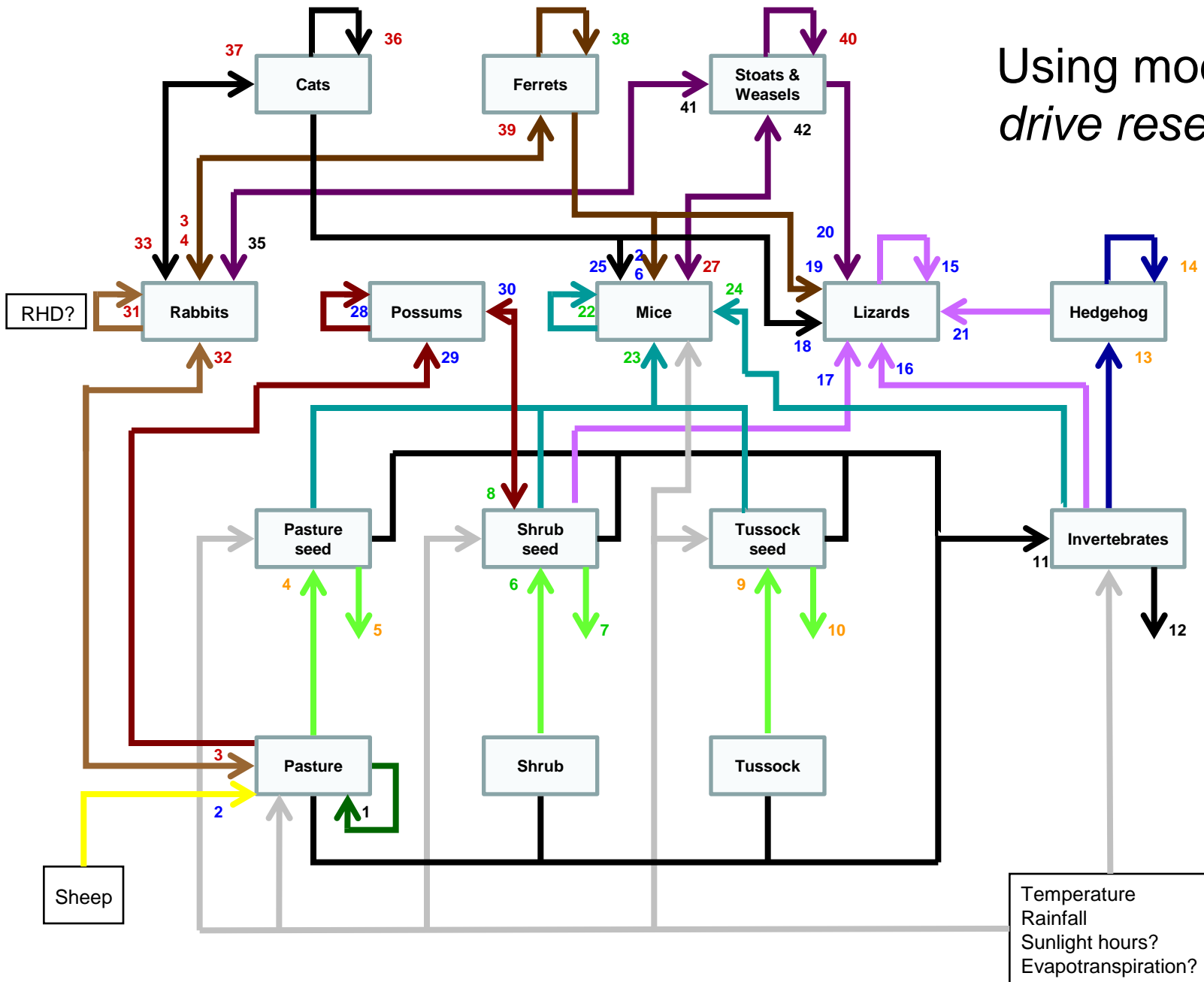


Using models to  
*drive research ...*

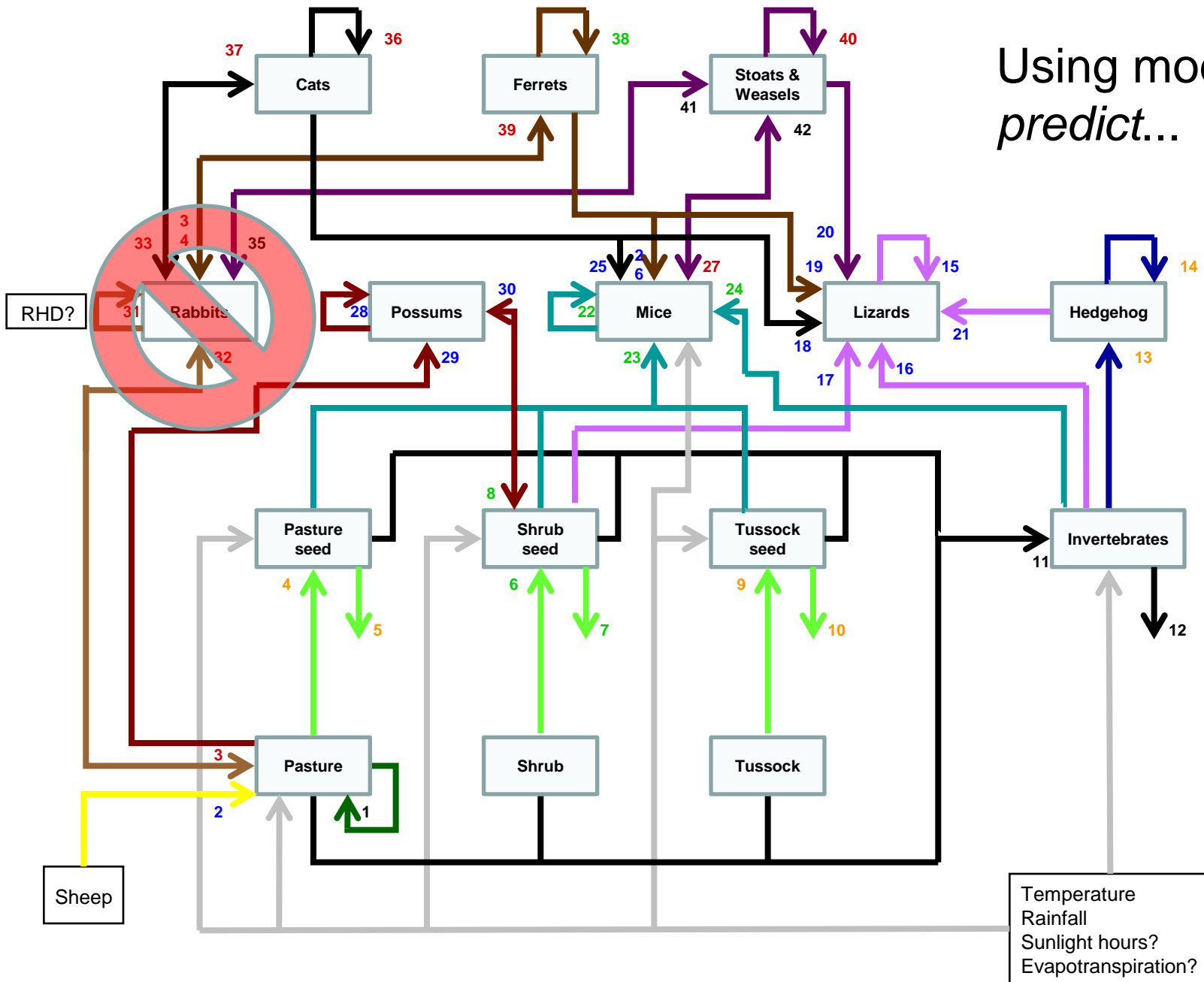


Dan Tompkins

Dan  
Roger  
Andrea  
Grant  
James

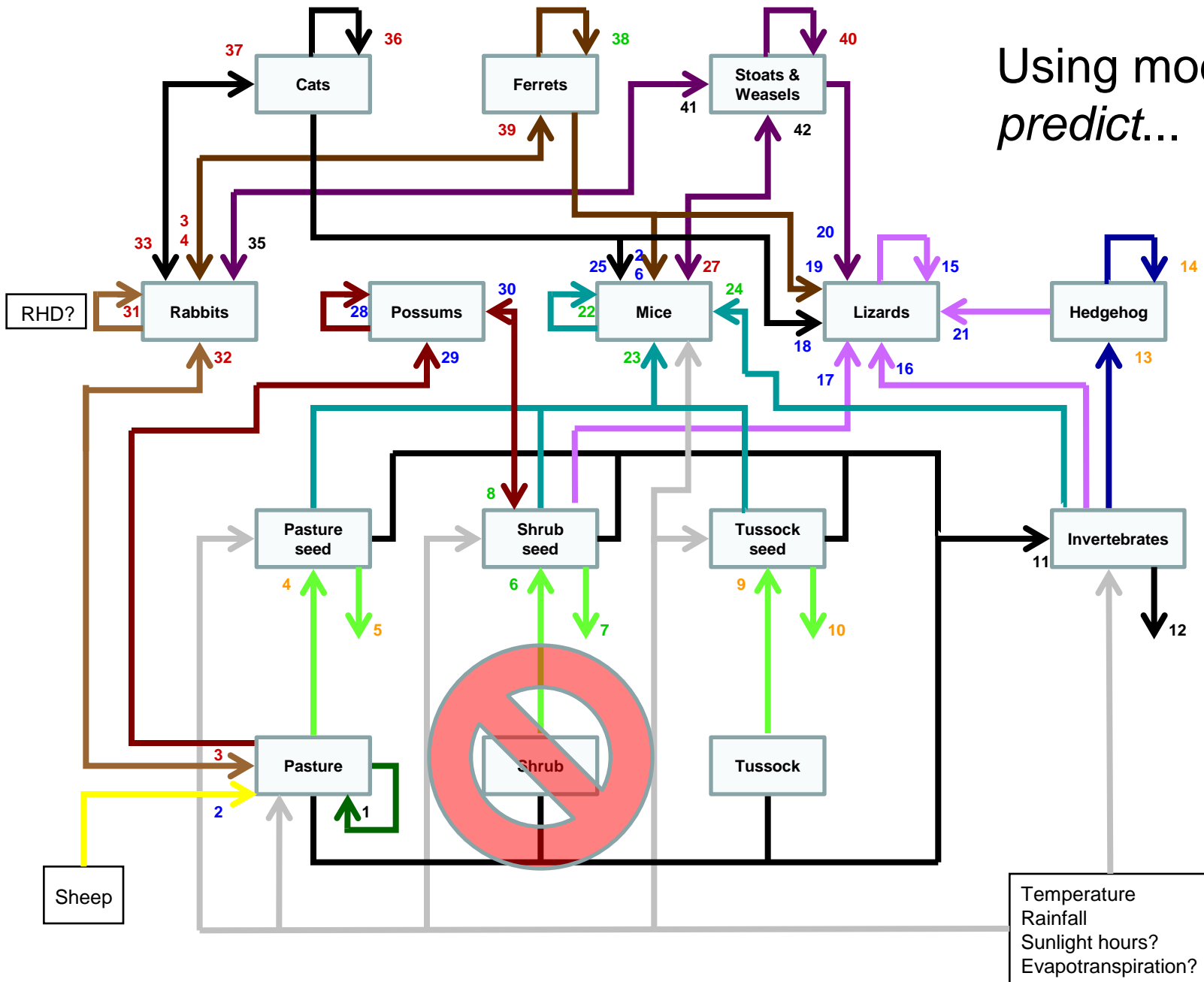


Using models to  
*predict...*



Dan  
Roger  
Andrea  
Grant  
James

Using models to  
*predict...*



Dan  
Roger  
Andrea  
Grant  
James



Wendy Ruscoe

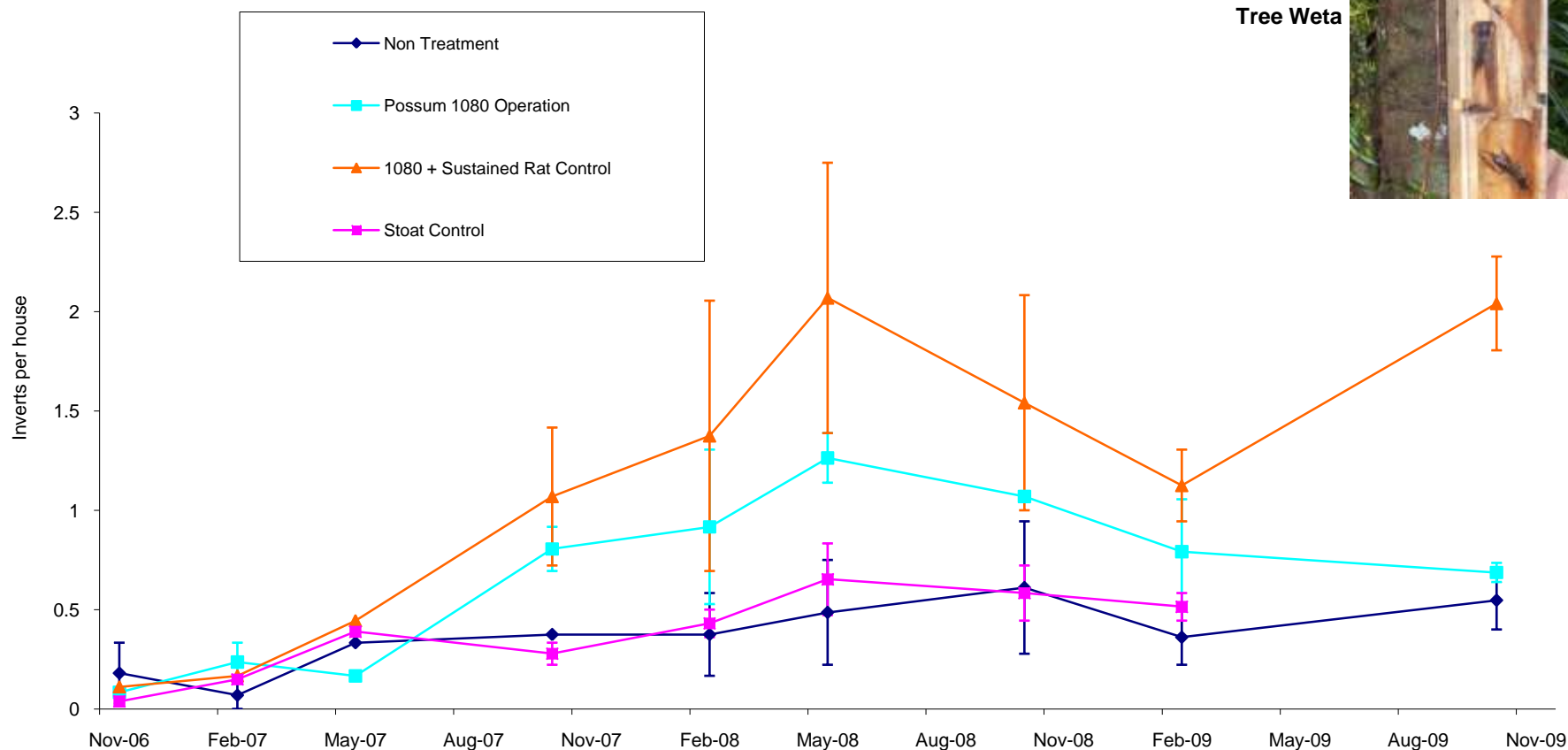


## 2. Impacts of invasive mammals

50% of rat diet is invertebrates, including tree weta and stick insects



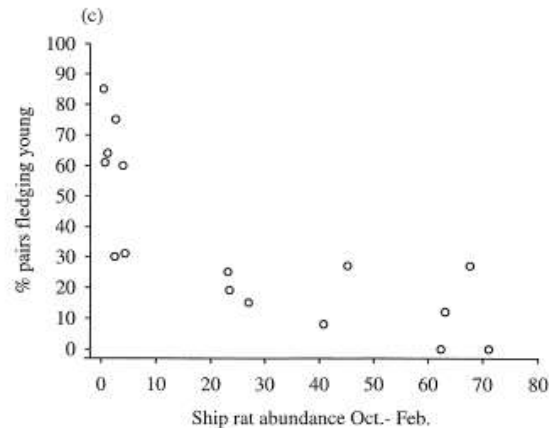
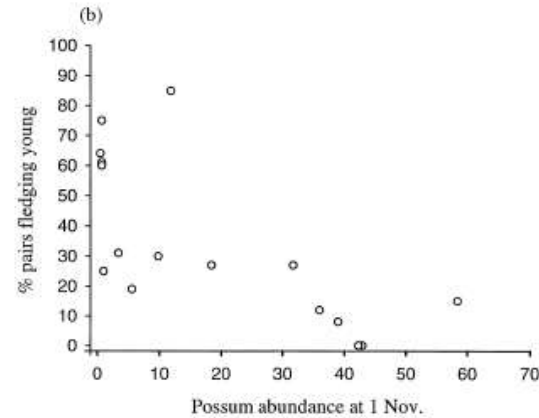
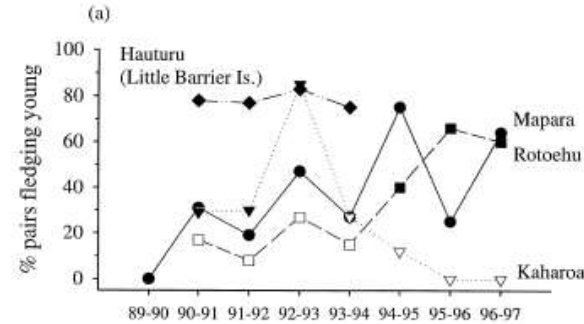
Tree Weta



# How much pest control is enough?



Dark symbols indicate seasons with pest control



Successful recovery of North Island kokako *Callaeas cinerea wilsoni* populations, by adaptive management

John Innes<sup>a,\*</sup>, Rod Hay<sup>b,1</sup>, Ian Flux<sup>b</sup>, Philip Bradfield<sup>c</sup>, Hazel Speed<sup>d,2</sup>, Paul Jansen<sup>d,3</sup>

Biological Conservation 87 (1999) 201–214

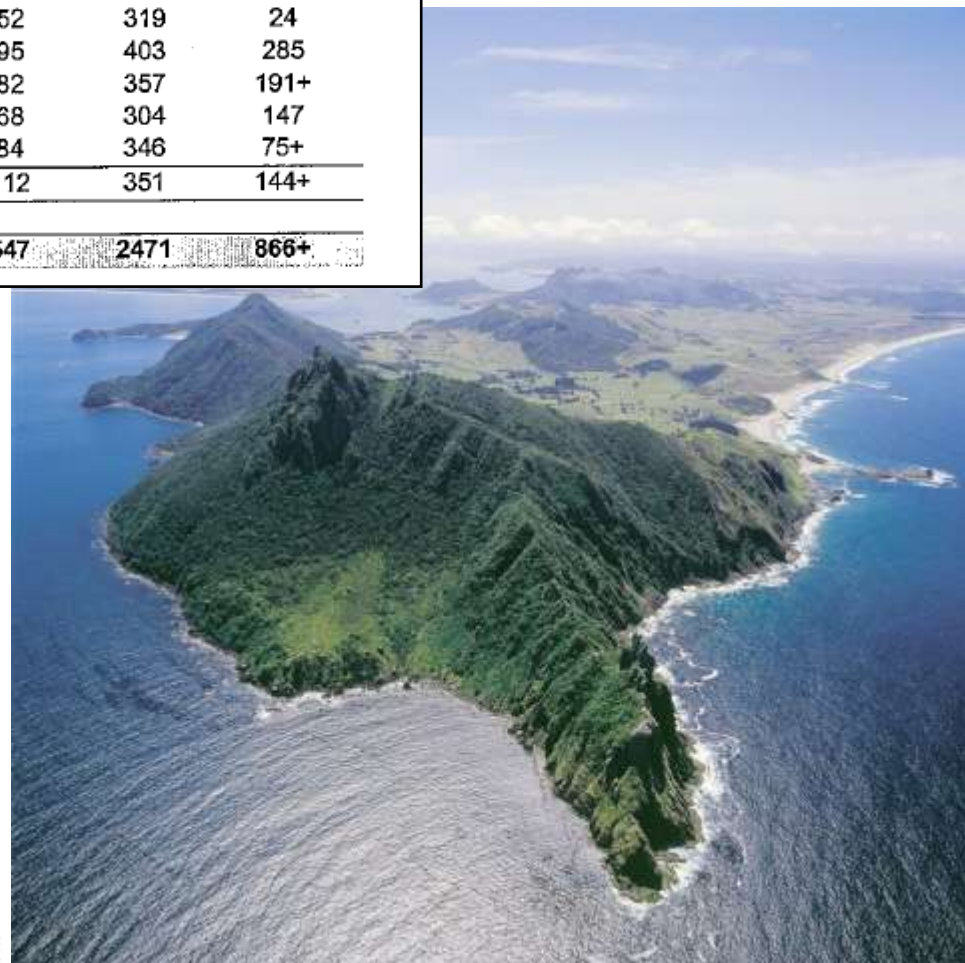
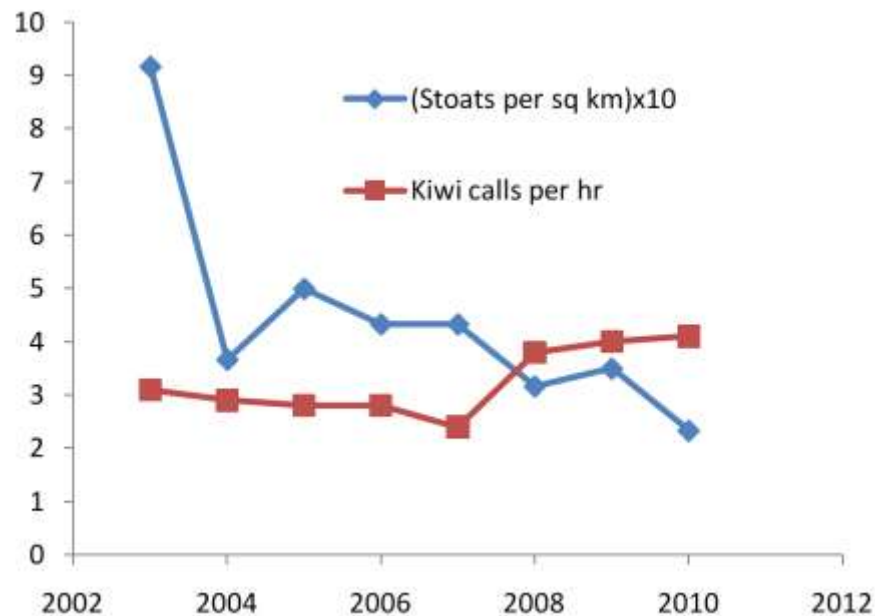


John Innes



Todd Hamilton

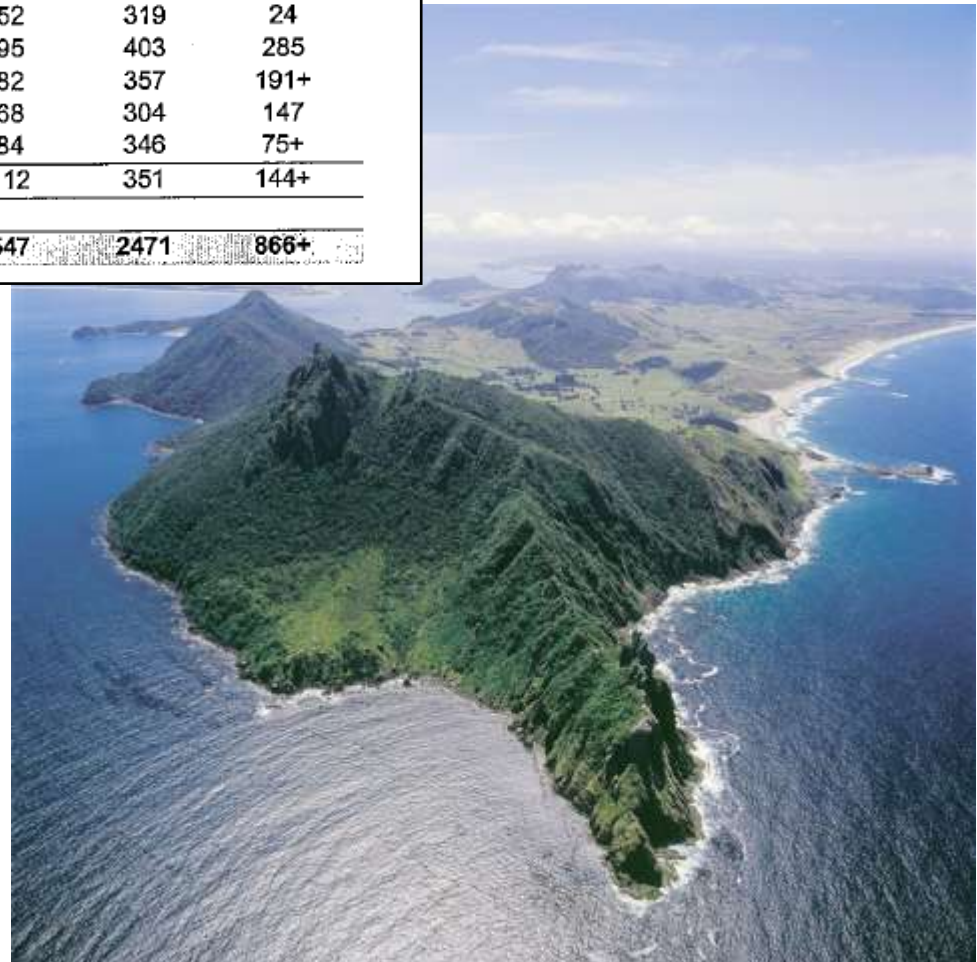
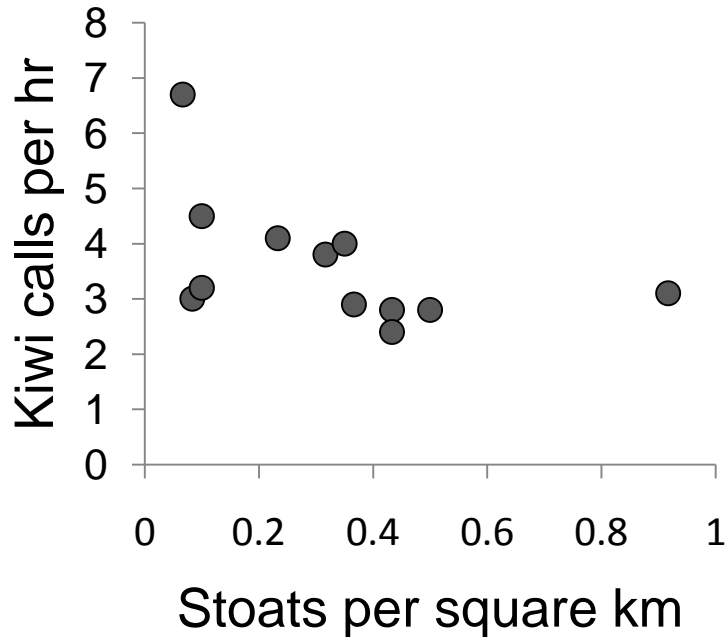
Total captures (October to September each year)							
	Ferret	Stoat	Weasel	Cat	Hedgehog	Rat	Possum
2002/2003	1	55 ✓	46	18	65	391	Not recorded
2003/2004	4	22 ✓	21	22	52	319	24
2004/ 2005	1	30 ✓	17	38	95	403	285
2005/2006	0	26 ✓	13	29	82	357	191+
2006/2007	0	26 ✓	8	17	68	304	147
2007/2008	0	19 ✓	22	18	84	346	75+
2008/2009	0	21 ✓	25	12	112	351	144+
2009/2010*	0*	14* ✓	8*	11*			
<b>Total</b>	<b>6</b>	<b>213</b>	<b>160</b>	<b>165</b>	<b>547</b>	<b>2471</b>	<b>866+</b>



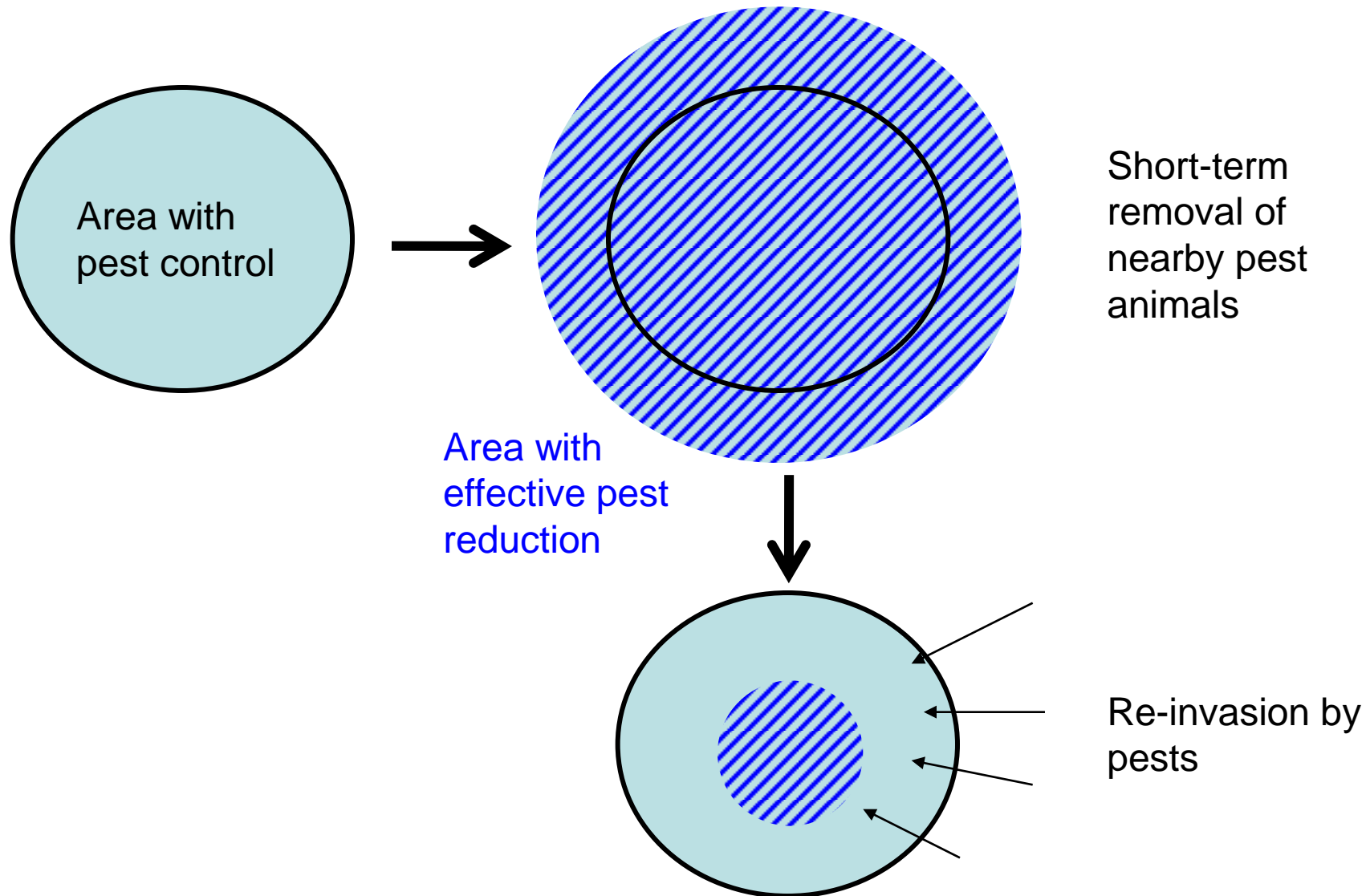


Todd Hamilton

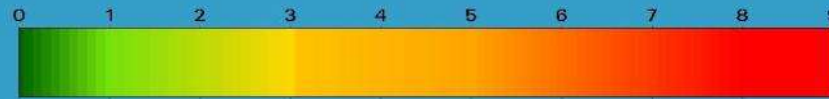
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# 1a. Pest management in a landscape



# How many possums and where?



Possums per ha



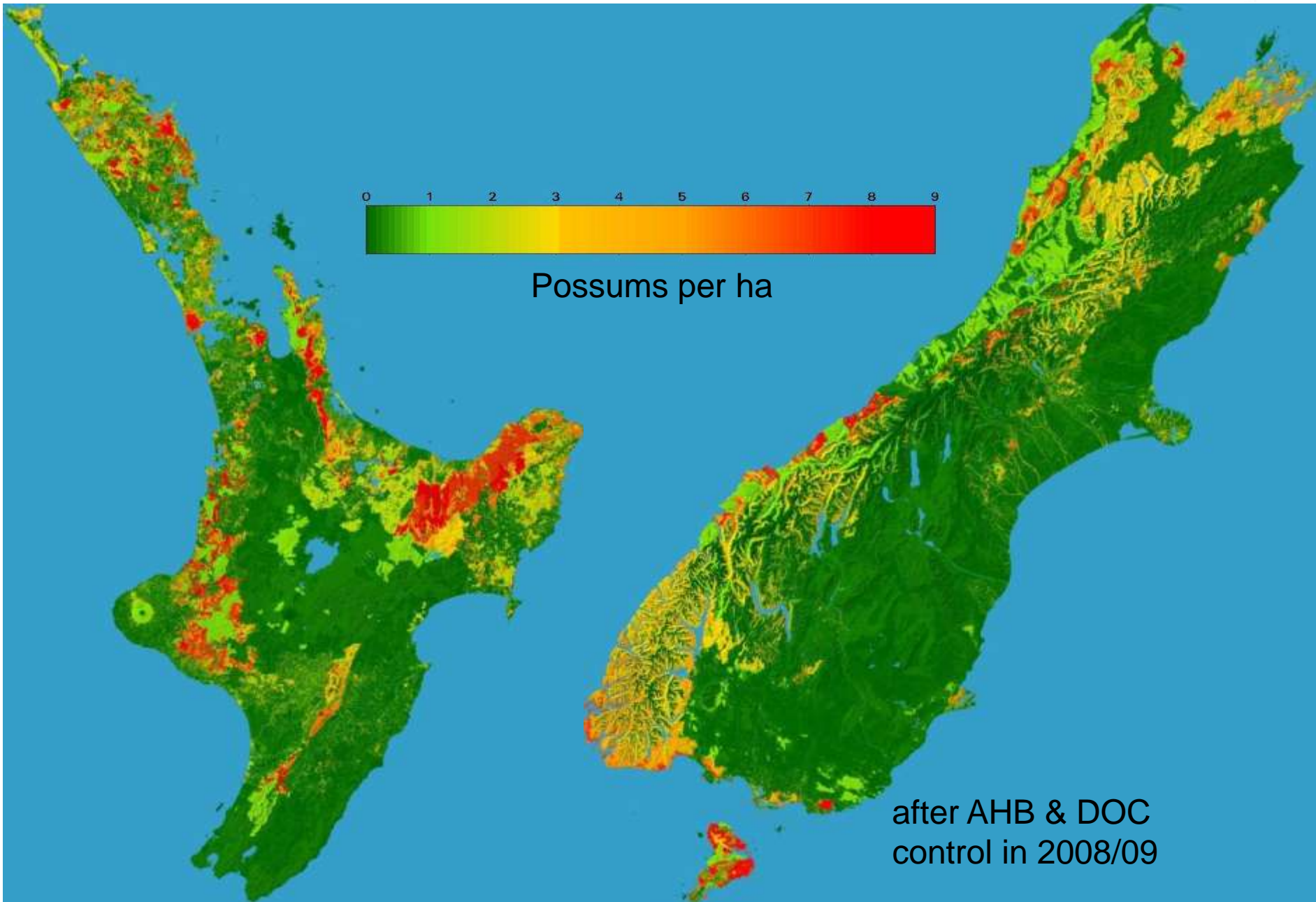
James  
Shepherd



Mandy Barron

No Control

Estimated ~ 50 million possums

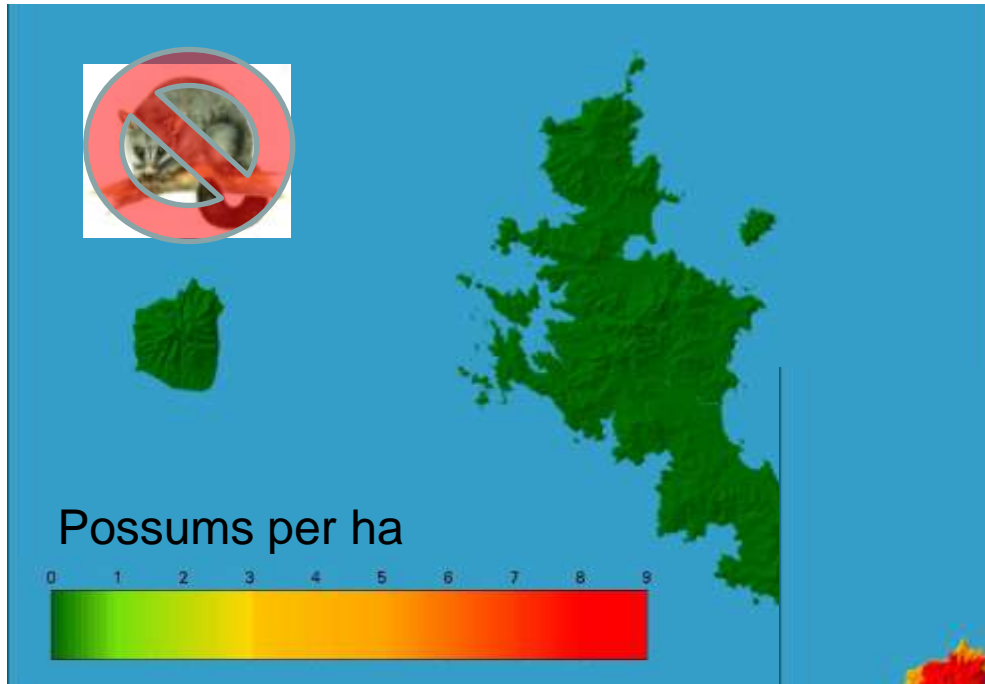


Possums per ha

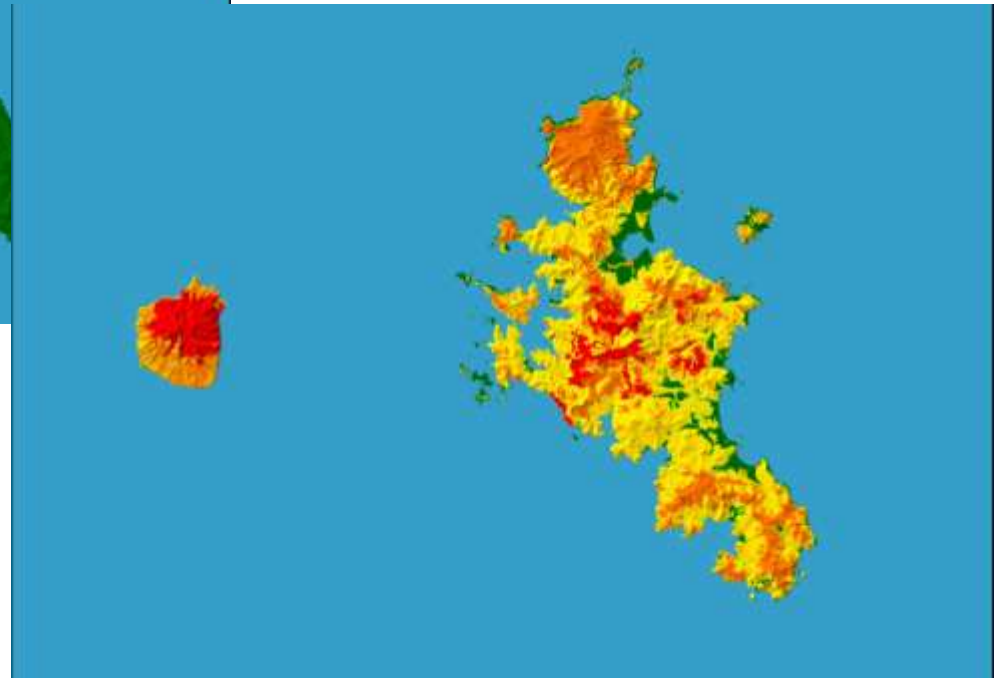
after AHB & DOC  
control in 2008/09

Estimated 30.3 million possums

# Great Barrier Island & Little Barrier Island



Estimated 131,000



# NPM – Web demonstration



Staffroom

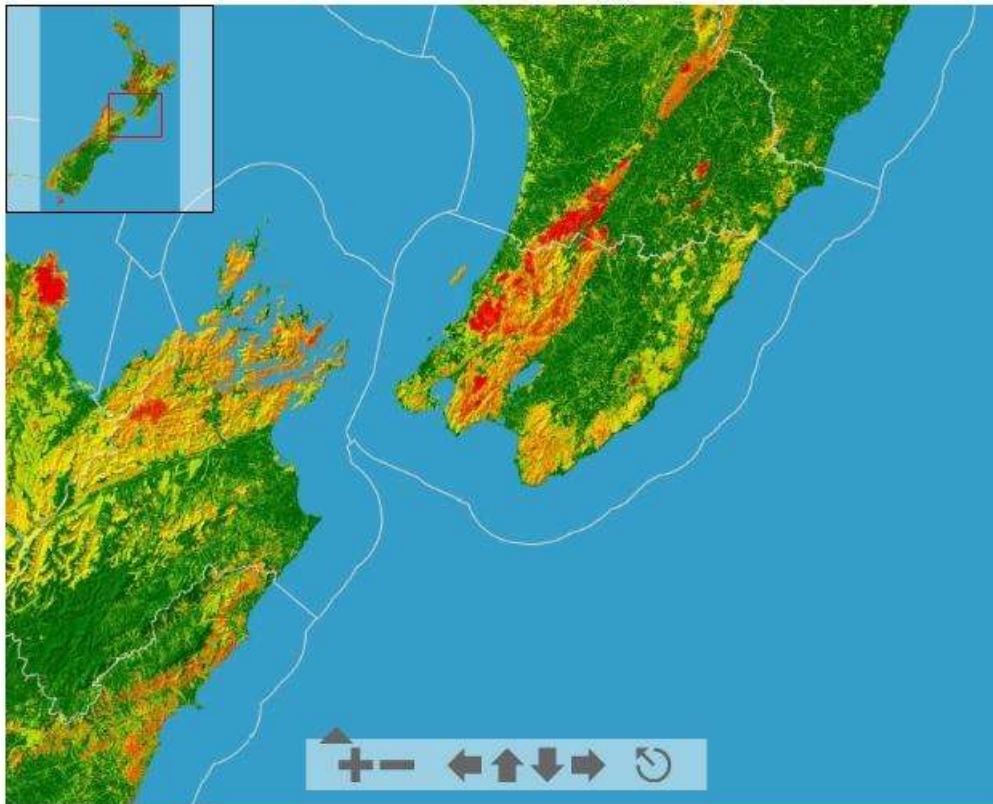


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National possum forecast

[VIEW DENSITY MAP](#) | [UPLOAD CONTROL DATA](#)

Current Possum Density ( $\text{ha}^{-1}$ )



Demonstration model prediction at carrying capacity - input control information is required for future prediction.



# NPM – Web demonstration



Staffroom

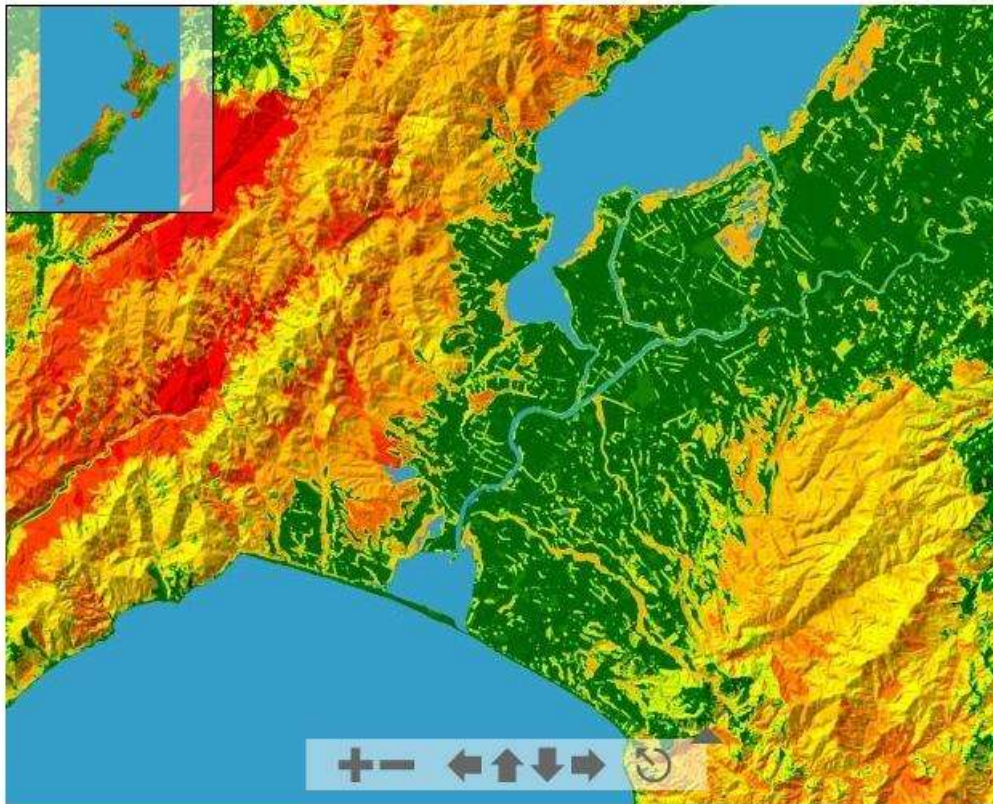


Landcare Research  
Manaaki Whenua

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[VIEW DENSITY MAP](#) | [UPLOAD CONTROL DATA](#)

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[VIEW DENSITY MAP](#) | [UPLOAD CONTROL DATA](#)

How do you want to input your control data?

Upload GIS data

GIS file:

Date:

RTC:

Manual input using Google maps

Map Satellite Terrain

Zoom to Polygon Clear Polygon Submit Polygon

[VIEW DENSITY MAP](#) | [UPLOAD CONTROL DATA](#)

How do you want to input your control data?

Upload GIS data

GIS file:

Date:

RTC:

Manual input using Google maps

Map **Satellite** Terrain

Google

Globe, Horizons Regional Consortium, GeoEye, Map data ©2008 MapData Sciences Pty Ltd - [Terms of Use](#)

[VIEW DENSITY MAP](#) | [UPLOAD CONTROL DATA](#)

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Date:

RTC:

Manual input using Google maps

Map **Satellite** Terrain

Google Globe, Horizons Regional Consortium, GeoEye, Map data ©2008 MapData Sciences Pty Ltd - [Terms of Use](#)

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Globe, Horizons Regional Consortium, GeoEye, Map data ©2008 MapData Sciences Pty Ltd - [Terms of Use](#)

[VIEW DENSITY MAP](#) | [UPLOAD CONTROL DATA](#)

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GIS file:

Date:

RTC:

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Map **Satellite** Terrain

Google

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[VIEW DENSITY MAP](#) | [UPLOAD CONTROL DATA](#)

How do you want to input your control data?

Upload GIS data

GIS file:

Date:

RTC:

Manual input using Google maps

Map **Satellite** Terrain

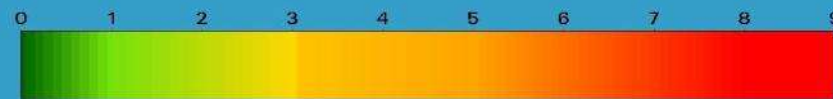
↑  
← →  
↓  
+  
-

**SITE DETAILS** [X]

Date:

RTC:

Google [Globe icon] Globe, Horizons Regional Consortium, GeoEye, Map data ©2008 MapData Sciences Pty Ltd - [Terms of Use](#)

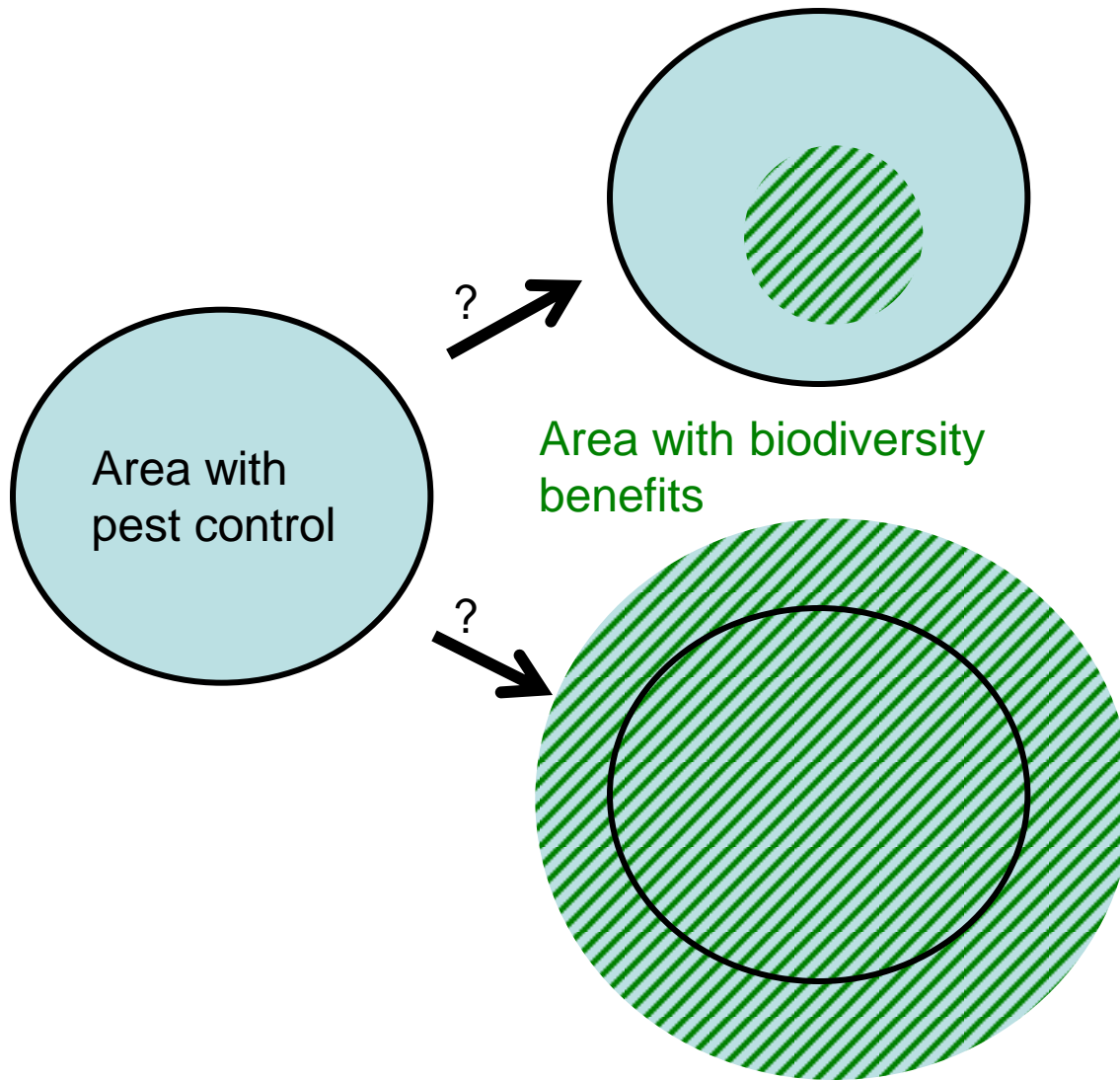


Possums per ha

after AHB & DOC  
control in 2008/09



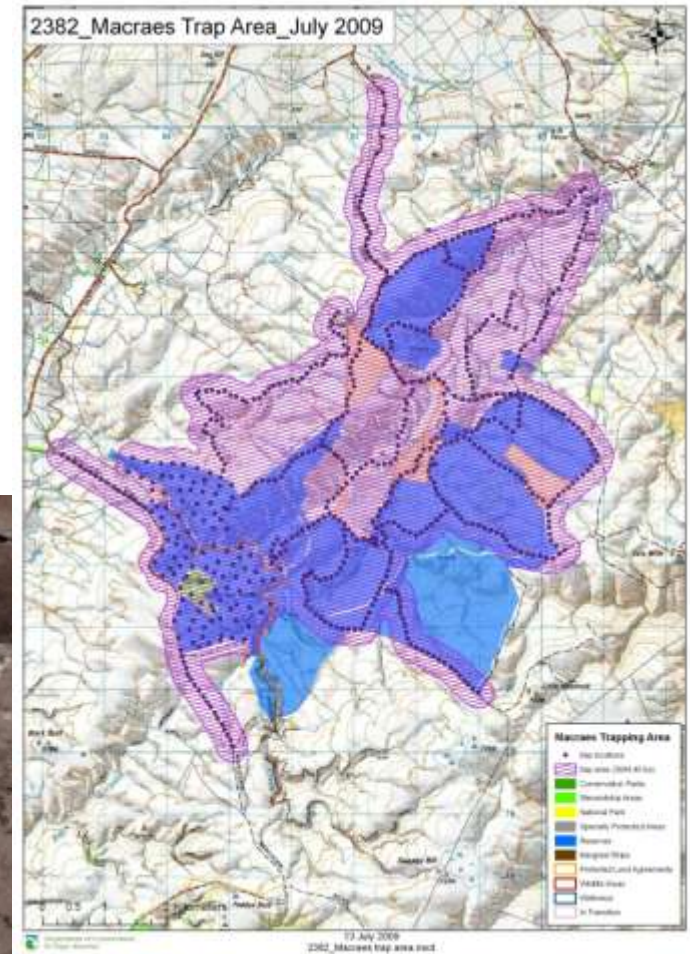
## 1b. Conservation in a landscape



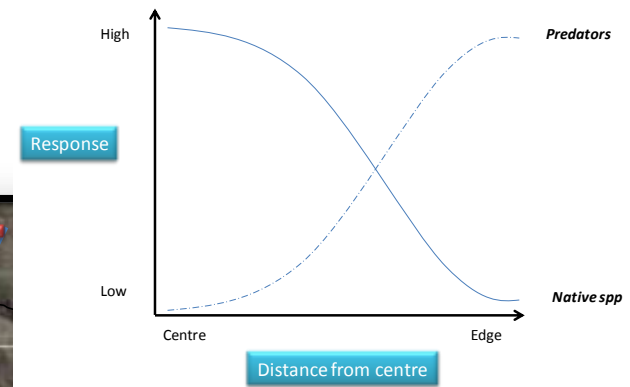
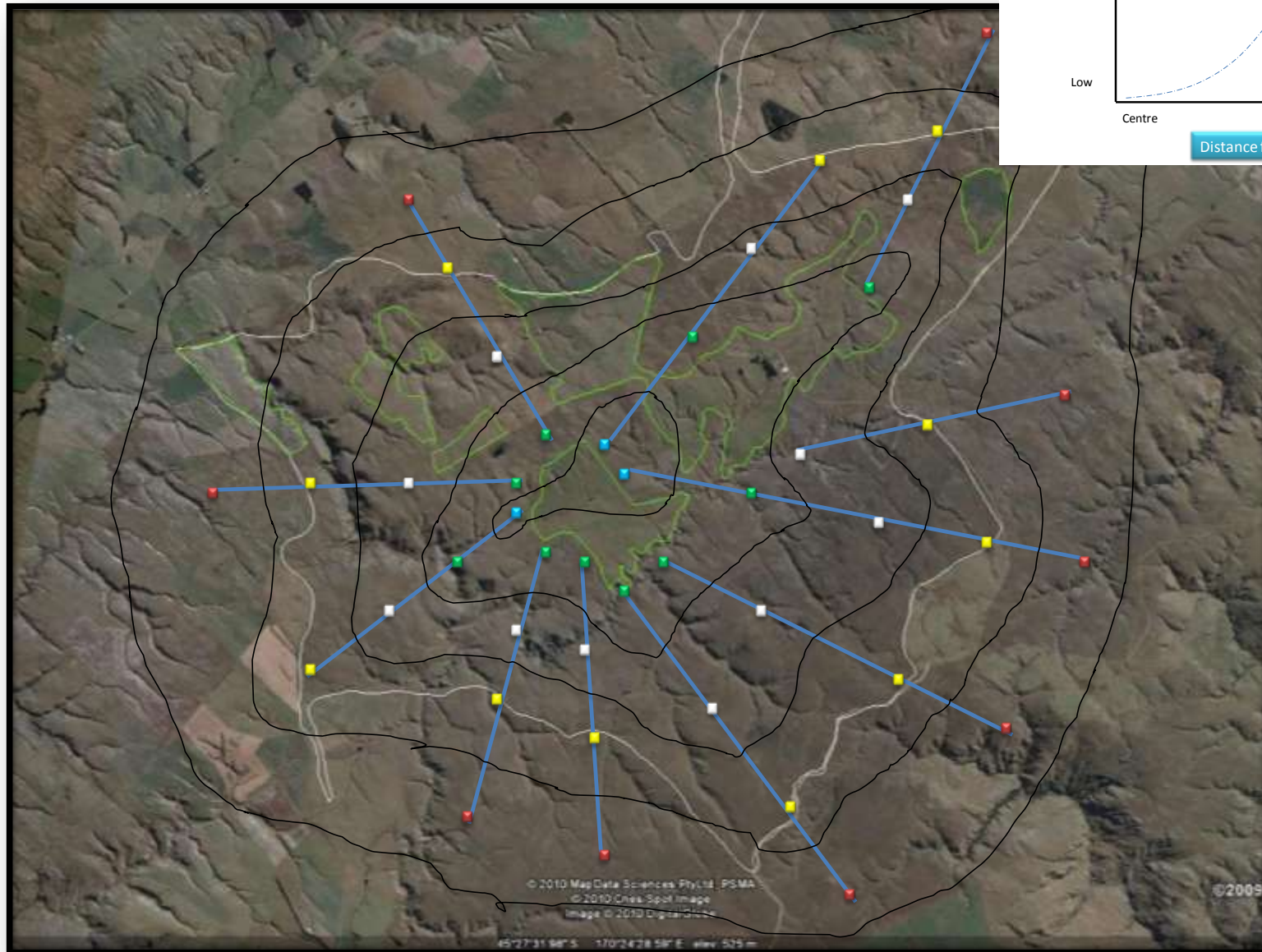
# Grand & Otago skinks: Mokomoko



# Grand & Otago skinks: Macraes Flat



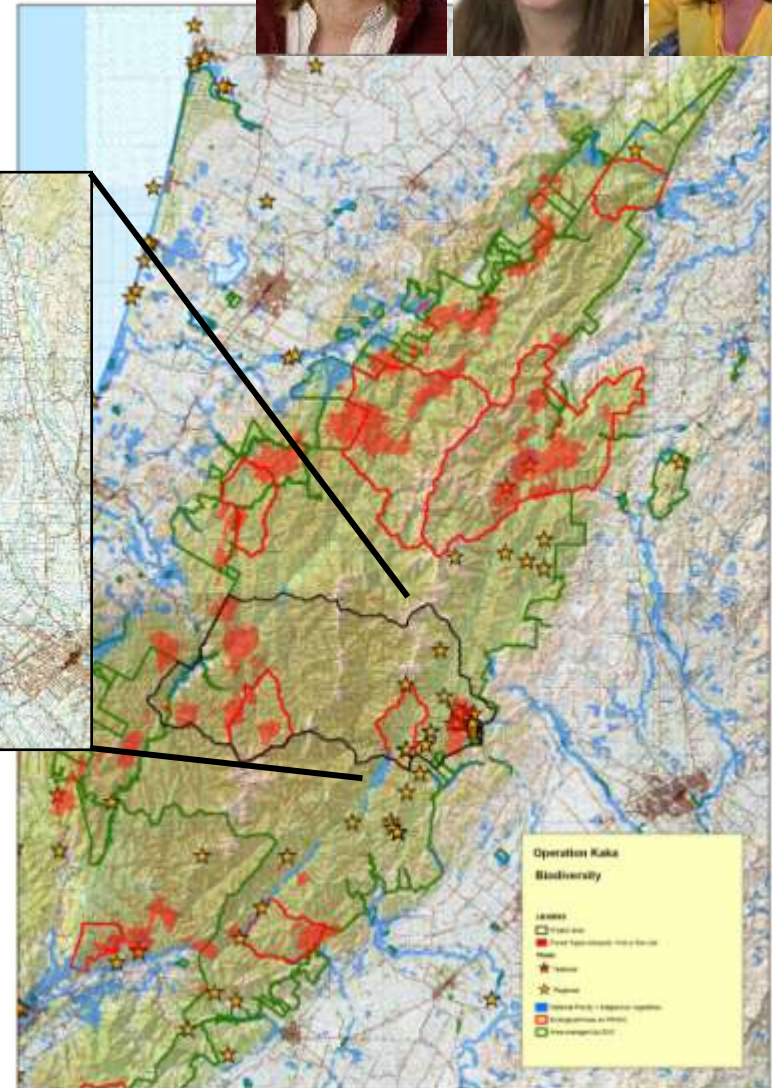
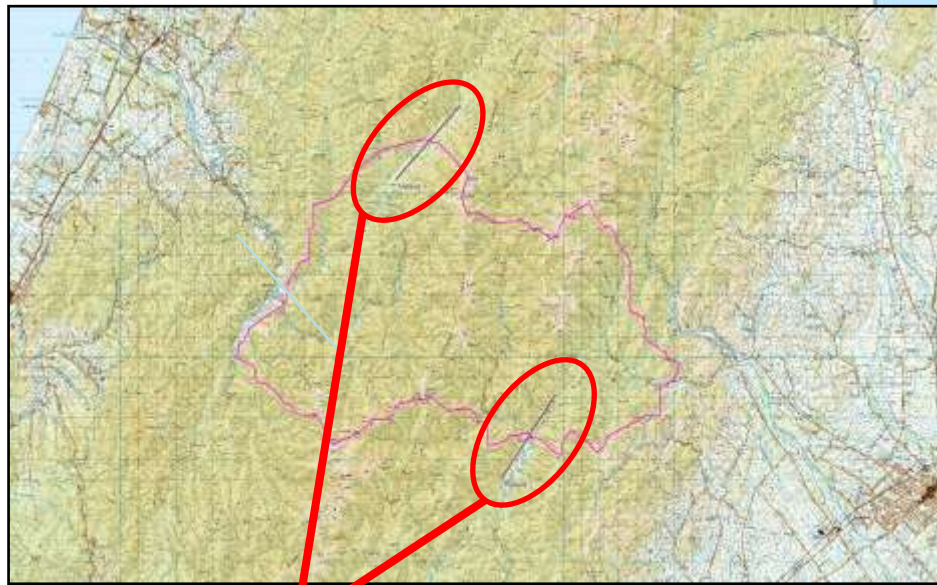
# Planned research at Macraes Flat



Deb Wilson  
&  
Grant Norbury

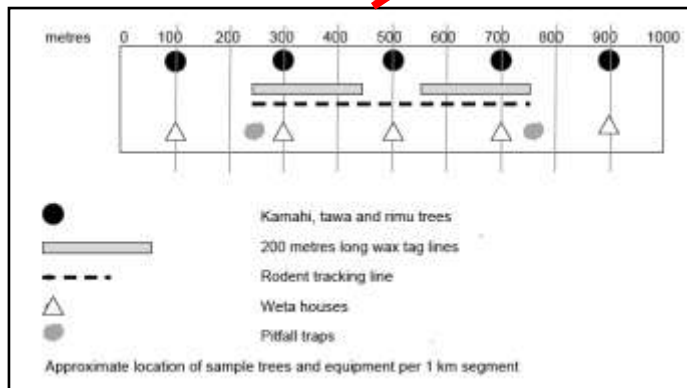
# Possums, stoats & rats: Tararua Range

Mandy Barron  
Pen Holland  
Wendy Ruscoe



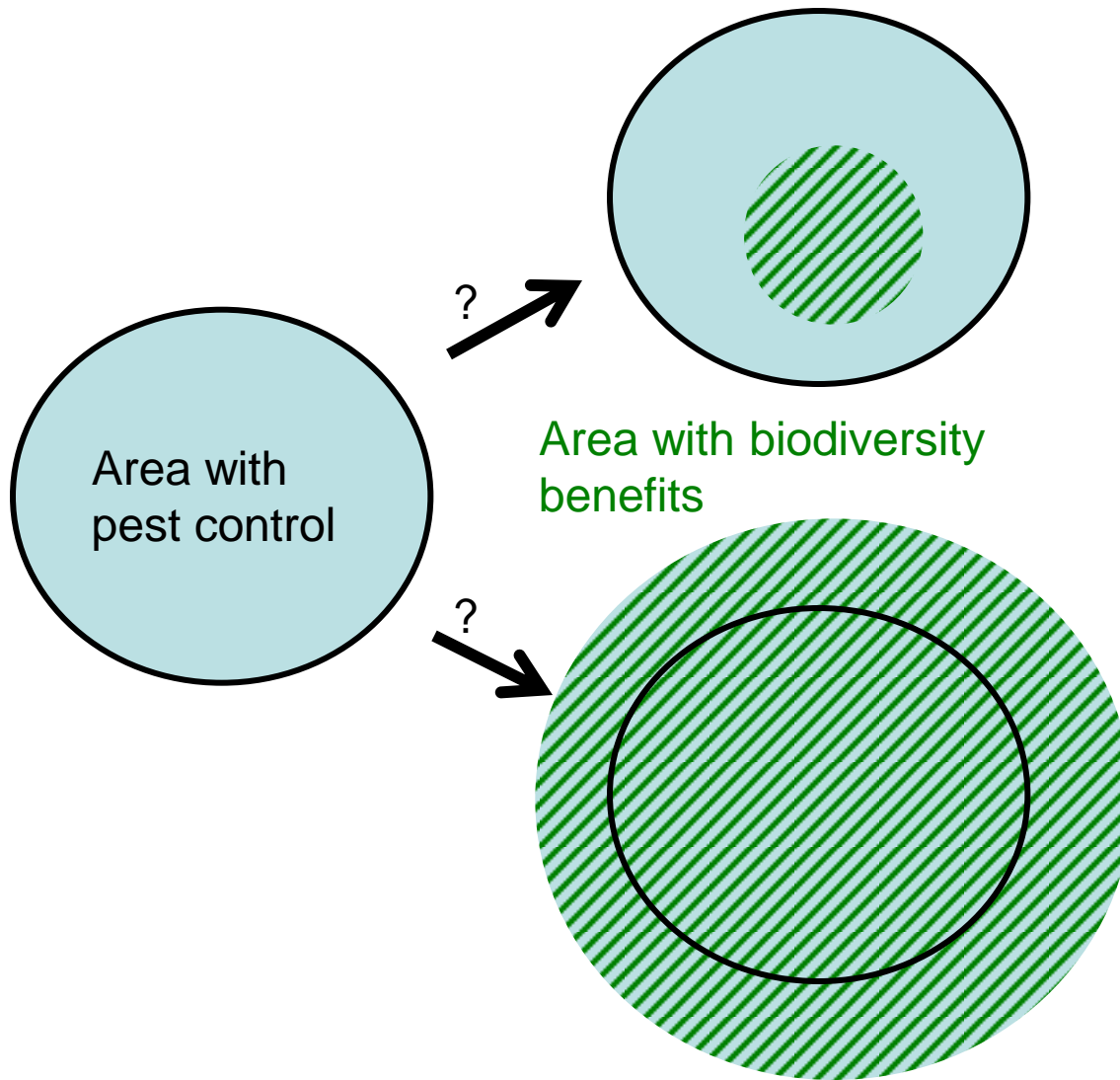
W. Green

*Optimising biodiversity protection in Wellington's Forest Parks*



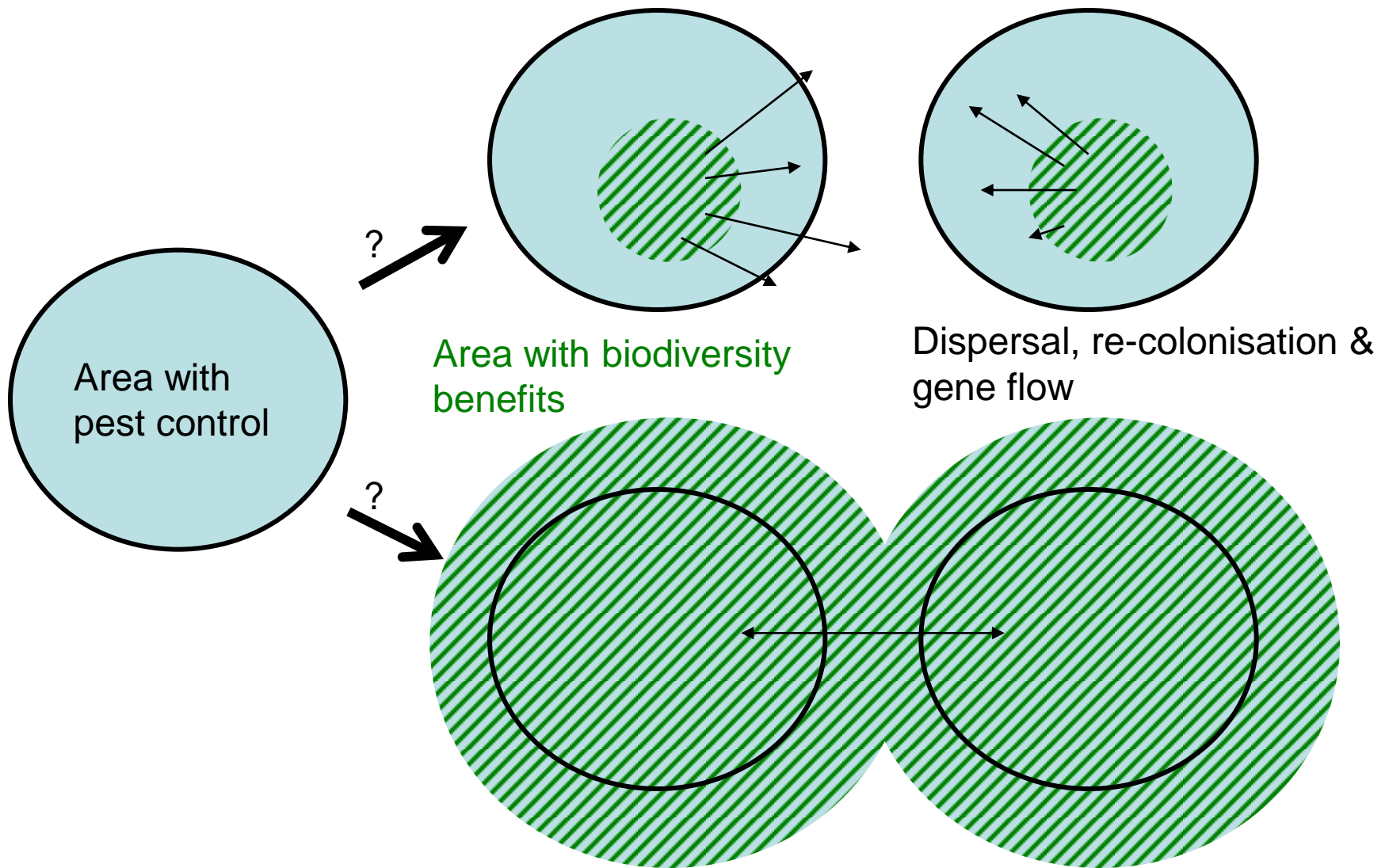


# 1c. Conservation in a landscape



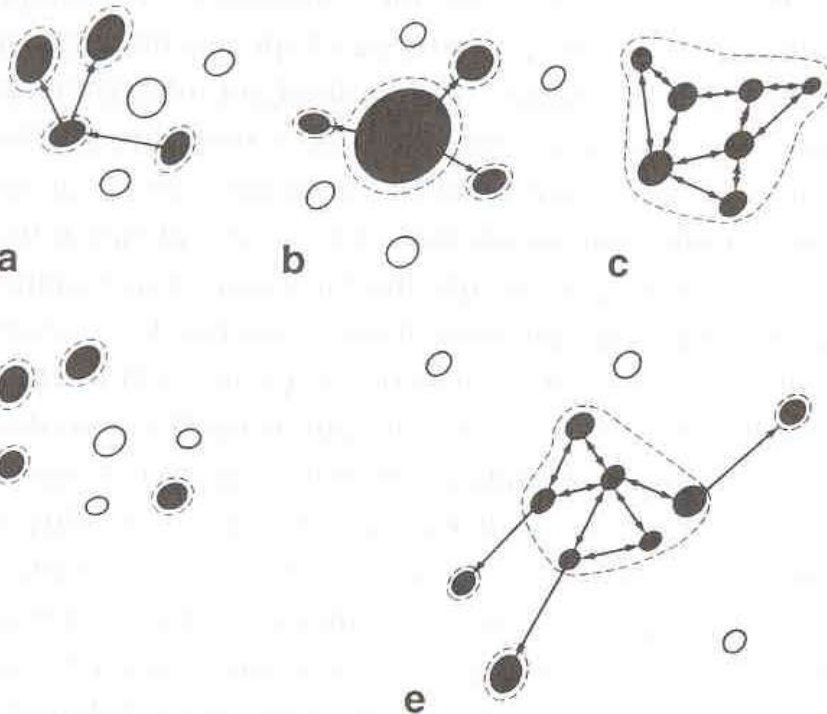


# 1c. Conservation in a landscape





# From single sites to future networks: 'metapopulation models'



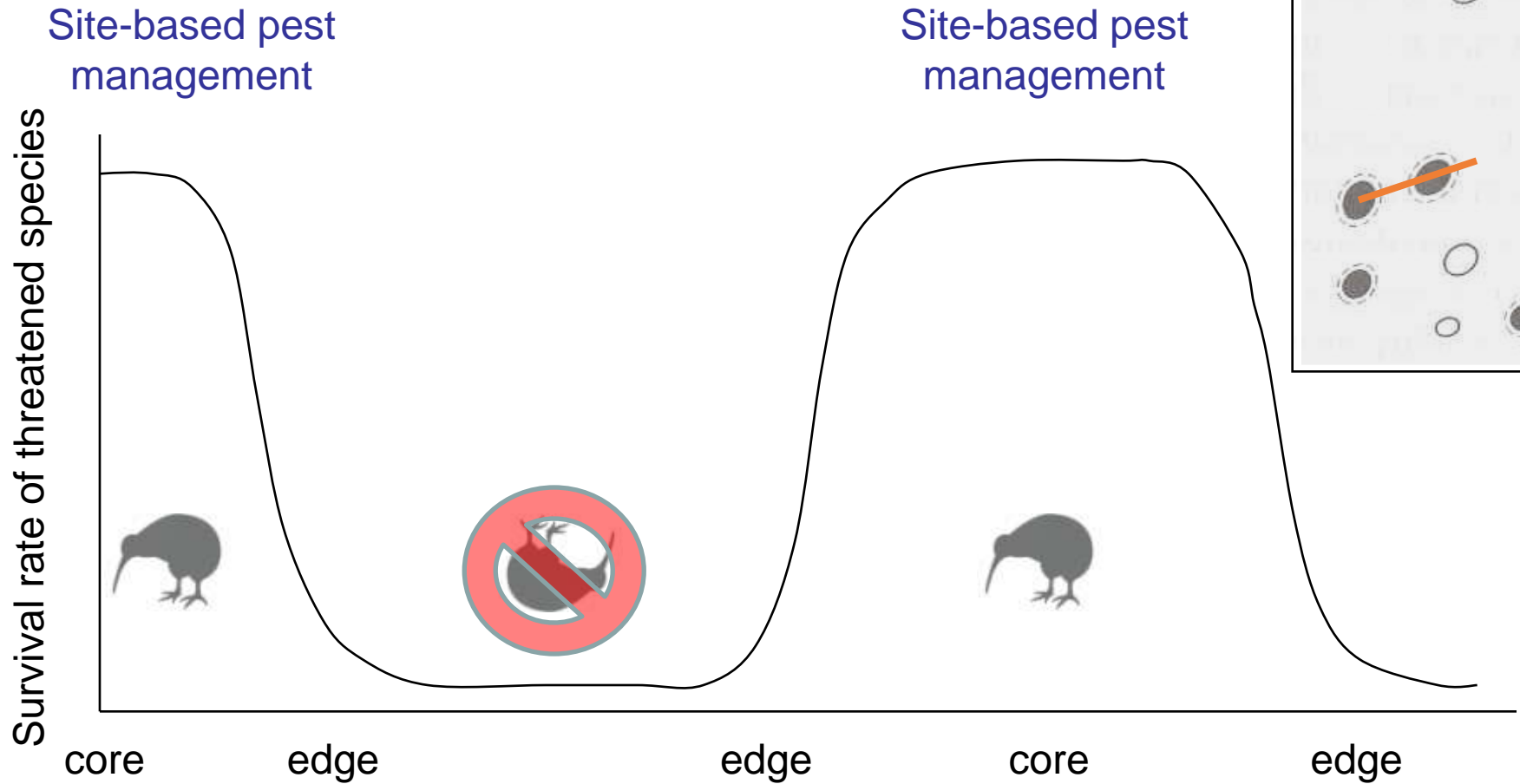
- a. 'Classic' (Levin)
- b. Mainland – island
- c. Patch population
- d. Non-equilibrium metapopulation
- e. combination of a - d

Harrison & Taylor (1997)

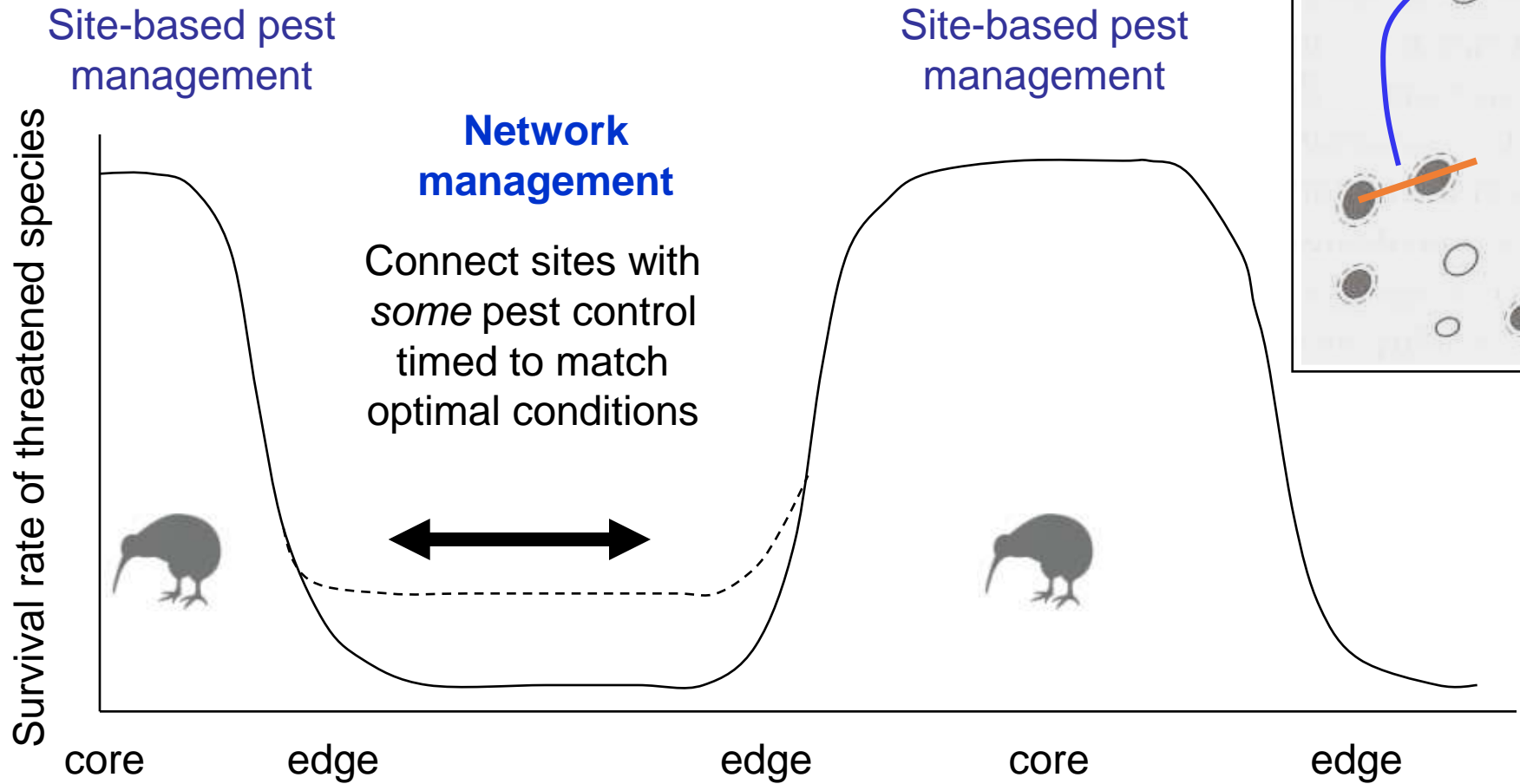
Al Glen



# Creating a conservation network



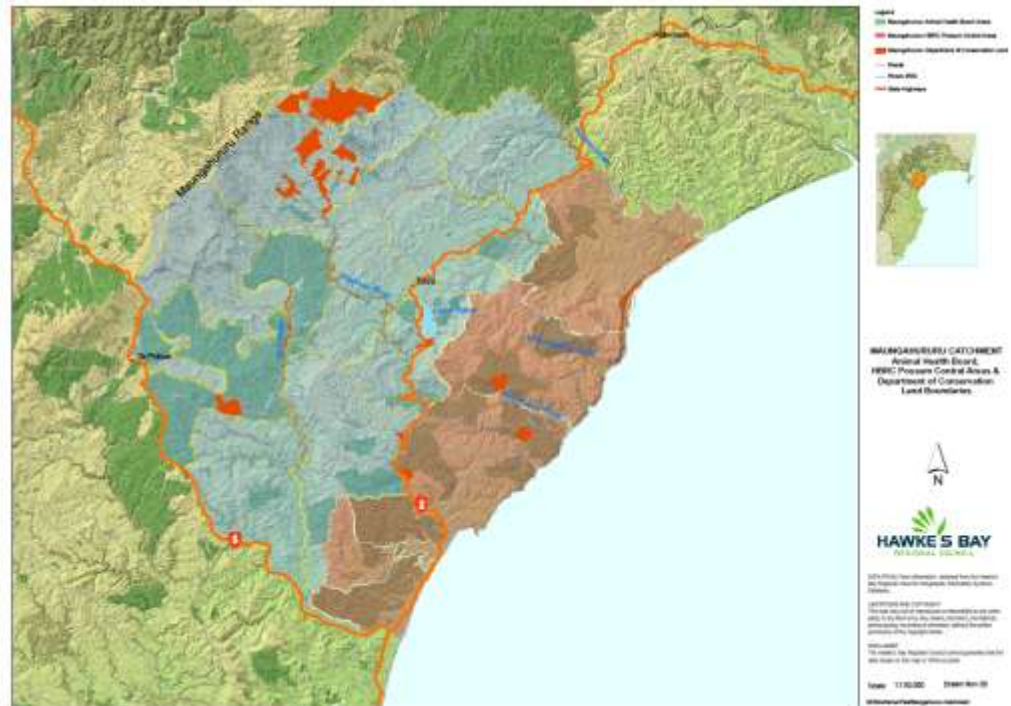
# Creating a conservation network





# Research summary

1. Focus on the *impacts* of invasive mammals
2. Ecosystems: forests, drylands, braided rivers, alpine areas
3. Research to *link sites across landscapes*





# Making a difference ...

- Close collaboration with agencies (DOC, regional councils, private groups) via 'management experiments'
- Students: next generation scientists
  - Rebecca Lawrence: rat behaviour & risk of predation*
  - Hannah Windley: plant defence & possum browse*
  - Tom Etherington: landscape connectivity & pest risk*
  - Maggie Triska: restoration ecology*
  - Liz Rayner: rabbit diet*
  - Eru Nathan: pest animal behaviour*
  - NEW STUDENT: braided river ecosystems*
- New technology for providing information

