Landcare Research
Manaaki Whenua

Pest-Free New Zealand

Challenges & Opportunities

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May 2012

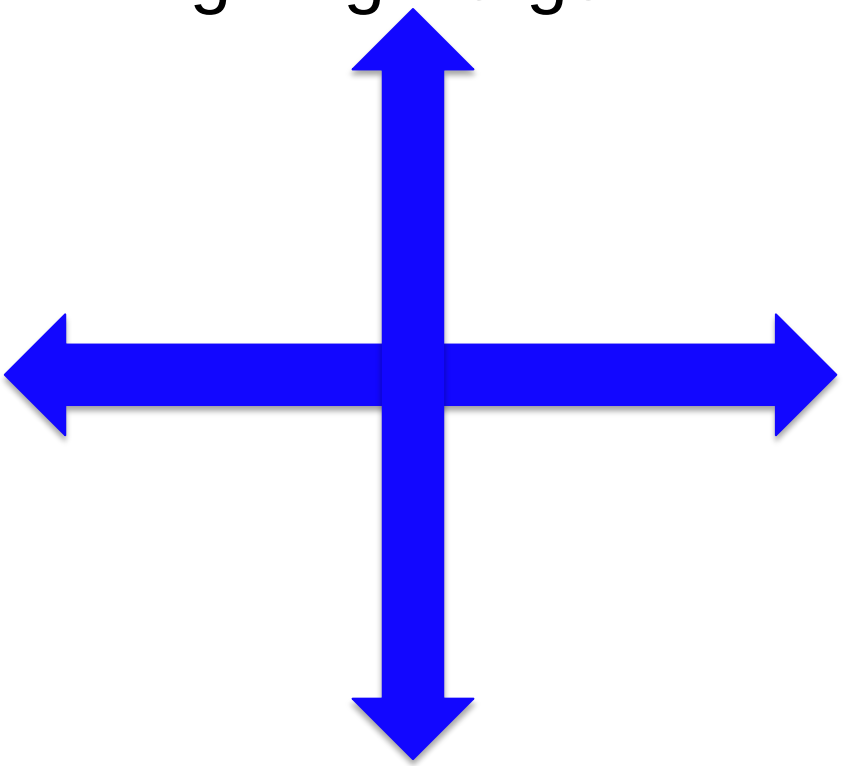
Pest-Free New Zealand

- What does it mean to you?

Pest-Free New Zealand

It's worth
giving it a go

It's Impossible



It's Possible

It's not even
worth trying

Pest-Free New Zealand

- What does it mean to you?

- Kate Wilkinson: Pest-Free South Island aspirational goal
- Predator-Free New Zealand (F&B)
- Paul Callaghan's challenge
- Many more

Pest-Free New Zealand

- Step 1:

  Clarify the vision

  Decide on the goal

Pest-Free New Zealand

- Step 1:

  Clarify the vision

  Decide on the goal

- Step 2:

  If an aspirational goal, motivate people for sustained pest control and long-term biodiversity protection

Pest-Free New Zealand

Definitions

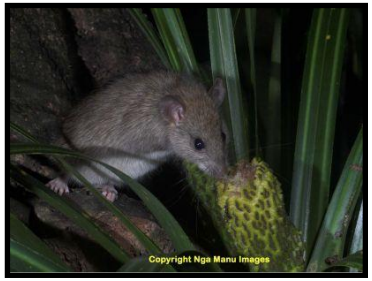
- Control:

  Removal of target pests to low density

  Sometimes sustained in perpetuity

- Eradication:

  One-off, complete removal of all target pests; not necessary to repeat

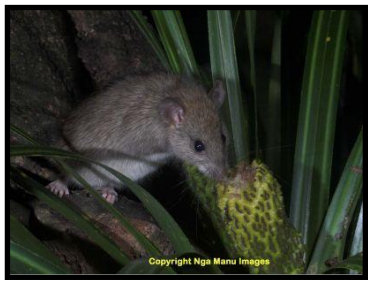


Pest-Free New Zealand

Sobering facts and figures:

- NZ land area: 26.9M ha
- Cost of multi-pest control: $20/ha
- Cost of PFNZ: $27B (quarter NZ's GDP)
- DOC's current budget ~ $391M (less!)

- $0.5B per year for 50 years
- At ½ or ¼ the cost, still a lot of $$



Pest-Free New Zealand

And yet…

- It’s an idea with magic
- Captures the imagination
- Provides vehicle for awareness
- Offers hope, not despair
- Something positive for the next generation

… Are there opportunities as well as challenges?

6 Rules for Eradication

Critical Rules

1. All target animals are put at risk
2. Target species is killed at rates faster than its rate of increase *at all densities*
3. Risk of recolonisation is zero

Desirable rules

4. Social and economic conditions are conducive to meeting the critical rules
5. Animals are detectable at low densities
6. One-off eradication is cheaper than sustained control

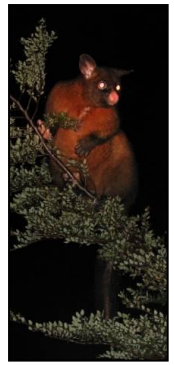
Rule 1

All target animals must be put at risk

- Need technologies for all chosen pests, all densities, all locations, all circumstances
- Some species never eradicated, anywhere
- Some techniques never/can't be 'scaled up'
- Techniques tuned to control, not eradication
- Technical challenge: multiple species
- Ecological release: critical for native biota





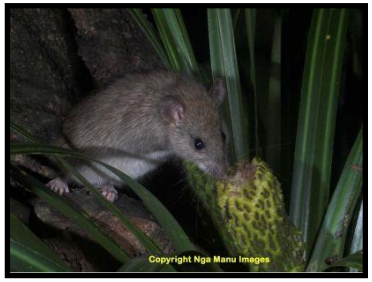
Example: Rule 1

Pest-free NZ

- All pests?
- Cats?
- Cities?
- Birds?
- Weeds?

Predator-free NZ

- Possums, rats, mice, mustelids
- Deer, tahr?
- Rabbits?
- Weeds?



Example: Rule 1

- Indian musk shrew
- One 2-ha island off Mauritius only known successful eradication
- Quantitative methods for declaring failure/success

Journal of Applied Ecology 2008, **45**, 424–427 doi: 10.1111/j.1365-2664.2007.01446.x

METHODOLOGICAL INSIGHTS

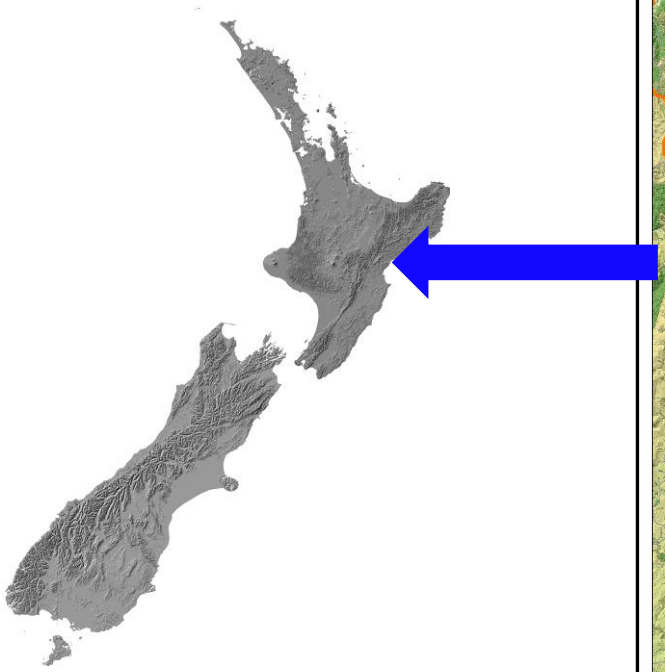
The untamed shrew: on the termination of an eradication programme for an introduced species

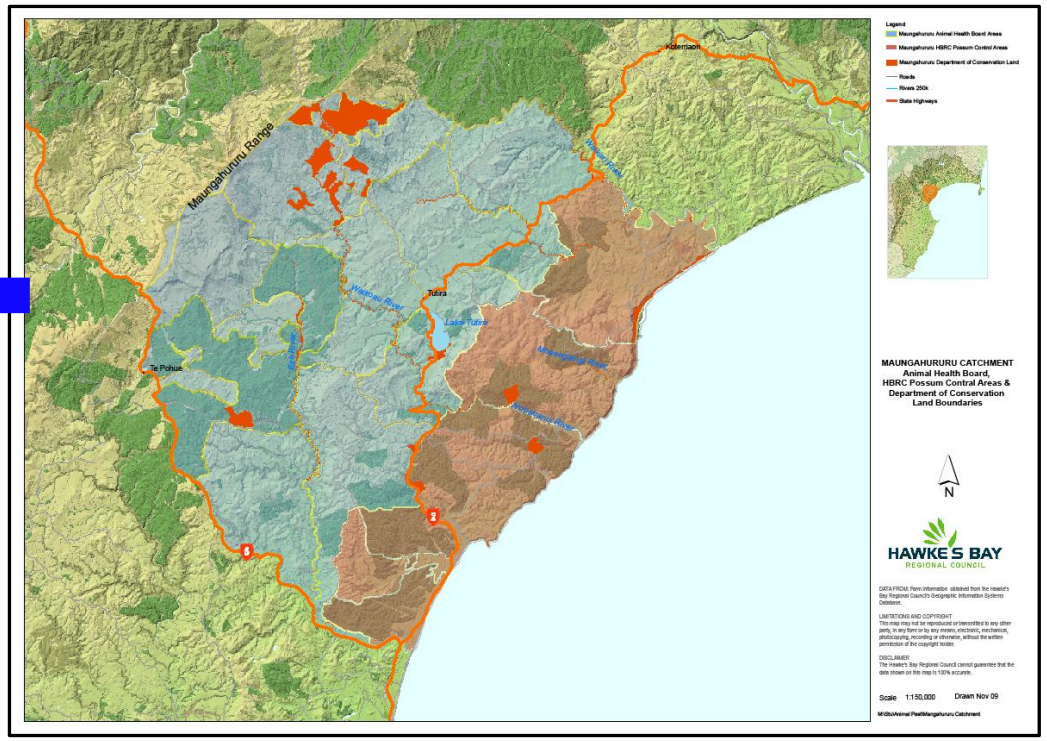
Andrew Solow[1]*, Adrian Seymour[2], Andrew Beet[1] and Stephen Harris[2]

[1]Woods Hole Oceanographic Institution, Woods Hole, MA 02543, USA; and [2]School of Biological Sciences, University of Bristol, Woodland Road, Bristol BS8 1UG, UK

Rule 2

Target species killed faster than rates of increase





- Need to know rates of increase at all densities
- Roll-out campaign may take decades

  Reinvasion high rates of increase

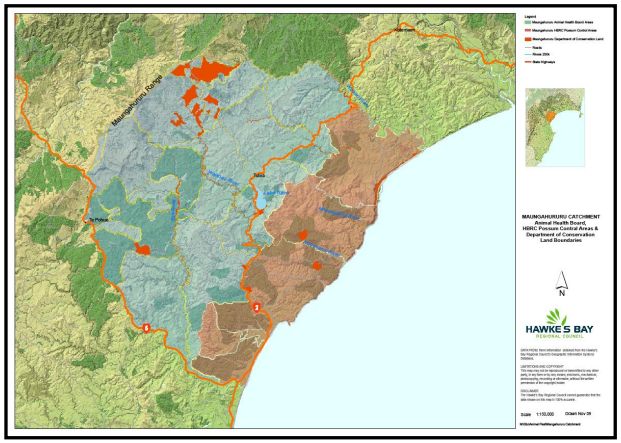
Example: Rule 2

- Goats on Raoul Island
- Measured recruitment as well as harvest rate
- Female goats increased breeding in response to culling
- Took many years to achieve eradication (1972 – 1985)
- Because harvest rate only just above breeding rate

Rule 3

Risk of recolonisation must be zero

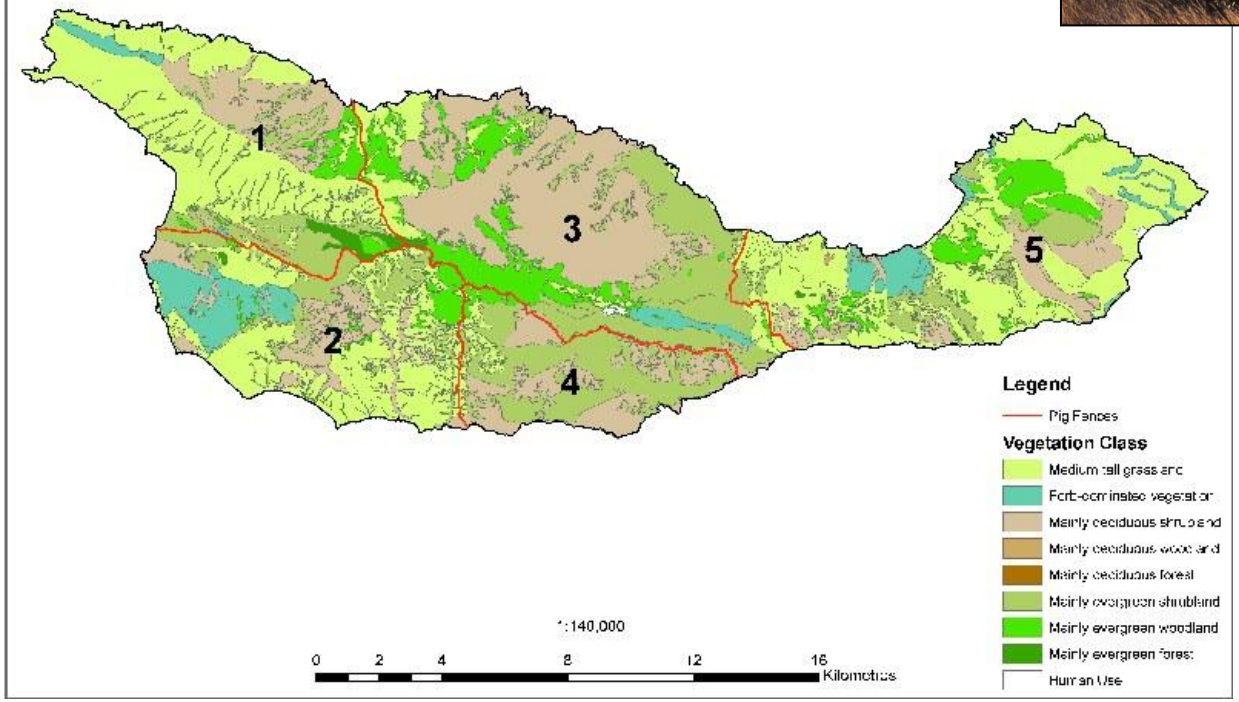
- ‘In situ’ breeders
- Biosecurity
  - International
  - Inter-island
  - On the ‘rolling front’ border



Example: Rule 3

- Feral pig eradication
- Santa Cruz Island

Figure 1. Boundaries of the five fenced zones and vegetation types on Santa Cruz Island.



Example Rule 3

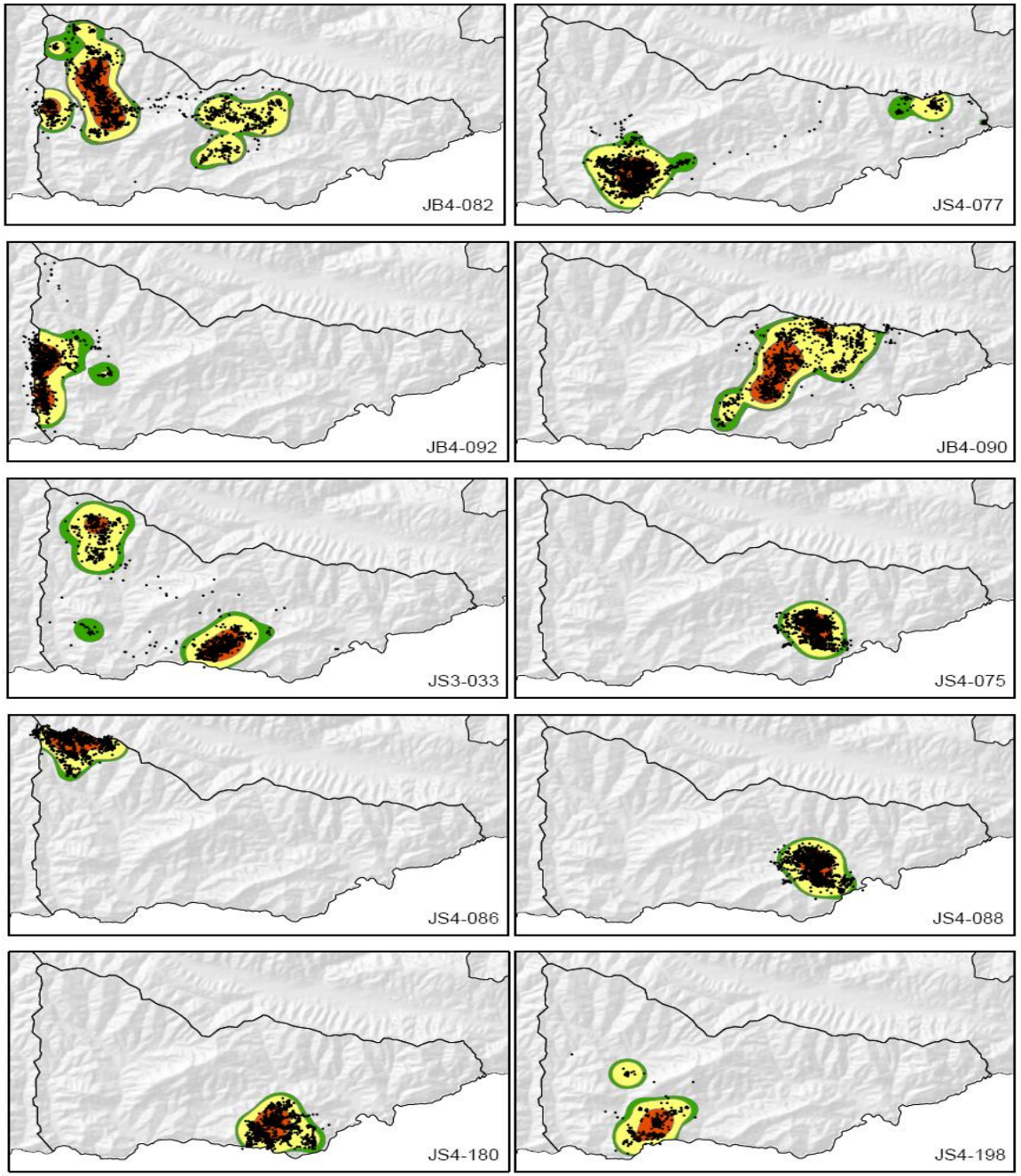


Figure 9. Home ranges enclosing 50, 90 and 95% of locations of 10 pigs caught and released in zone 4, Santa Cruz Island.

Example: Rule 3

- Resolution Island
- Recolonisation ≠ 0, yet

Rule 4

Social and economic conditions

- This is a huge challenge
- Social, technical, economic, policy

Hawaii's Plan to Eradicate Deer Angers Big-Game Hunters

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Submitted by Phyllis M Daugherty on May 25, 2012

HONOLULU - Hawaiian wildlife officials say they have identified about 100 non-native Axis deer on the northern and southern ends of the Big Island.

Authorities believe the mysterious appearance is actually the result of someone lowering some of the deer onto the northern tip of the island by helicopter. On the southern coast, tracks indicate that deer were pushed into the ocean and forced to swim to shore.

Axis deer are similar in size to the whitetail deer found in the United States, but they originate in India, where they are called "chital." Lacking India's tigers and leopards to keep their numbers at a manageable level, the government is funding an effort to eradicate the deer from the island of Hawaii before they breed, according to the Associated Press.

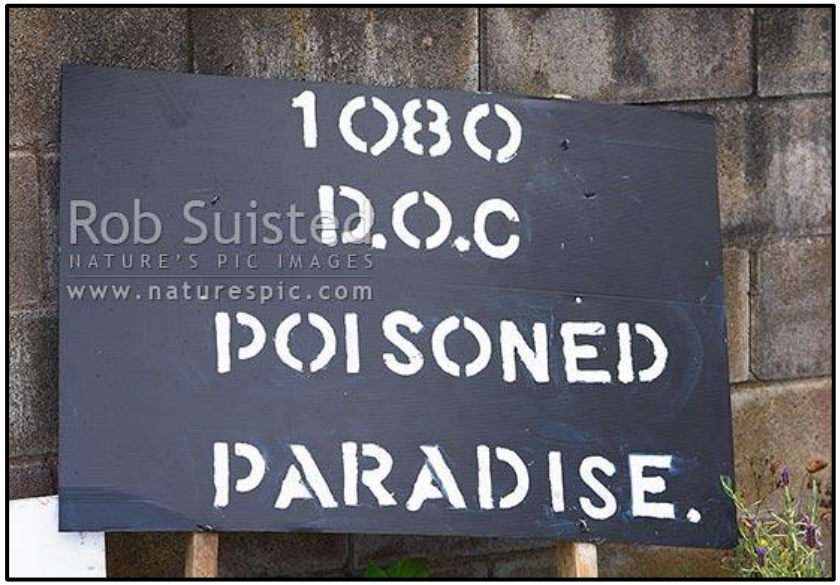
Rule 4

Social and economic conditions – social

- Compromised individual freedoms
    - Owning a cat
    - Internal biosecurity/quarantine
- Hunting lobby
- Iwi values
- Possum fur harvesters
- Bounties
- School education programmes
- Personnel recruitment

Rule 4

Social and economic conditions – technical



- Brodifacoum in cities
- Animal welfare
- Planning for unforseen consequences
  - Litigation
  - Ecological release

Rule 4

Social and economic conditions – economic

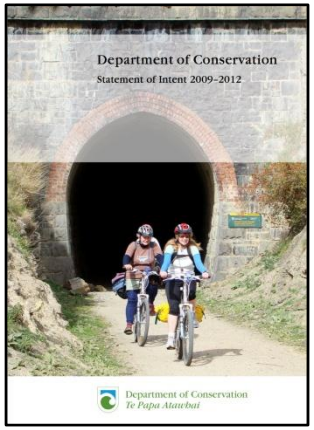
- Will philanthropists and big business want money spent on education, dialogue, and awareness?

- Attractiveness of the package for big business – as a business proposition
- Benefit for primary industries
    - If farmers benefit, who should pay?

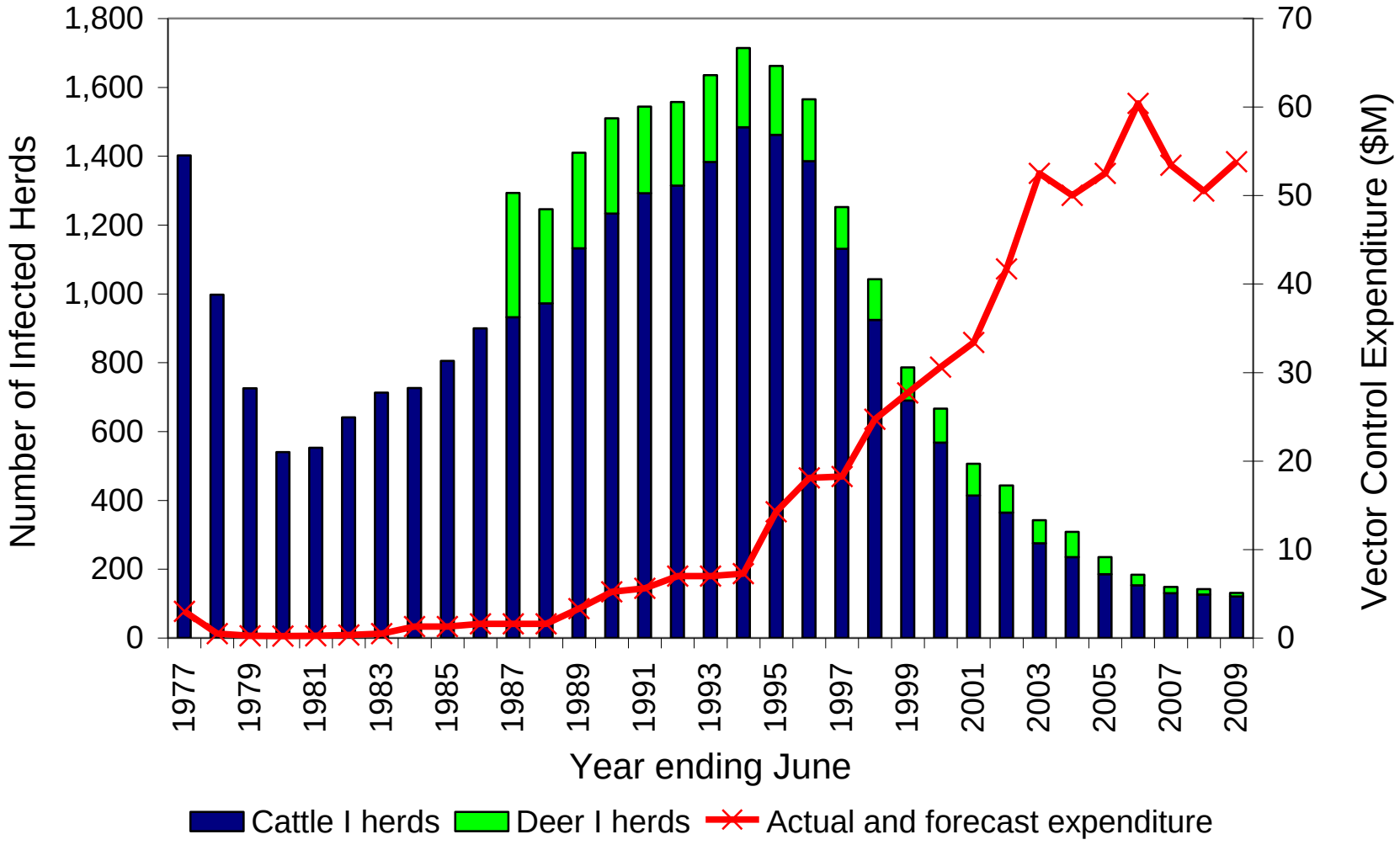
Rule 4

Social and economic conditions – policy

- Effort & time scale put PFNZ well beyond anything attempted
  - Inter-generational
  - Transcends politics – in time and space
- Inter-agency ownership
  - Currently no agency has the mandate, or could do it alone
- Convincing politicians to continue at 25-year mark



Example: Rule 4



Example: Rule 4

- 210 ha North Island, Seychelles group
- One of the world's top eco-tourism locations
- Rat eradication critical component of restoration
- Reintroduction of lost species, development of eco-tourism
- Few examples: eradication from inhabited islands

Rule 5

Detection and response at low density

- Demonstration of ‘pest free’ status is not trivial

- Surveillance will play a huge role
    - Because we need to address Rule 2
      (target species killed faster than rate of increase at all densities)
- Technical challenges for several species

Example: Rule 5

- Detection probabilities of NZ pest species

Spatial detection parameters: NZ small mammal vertebrate pests

Species	*g0* * (range for particular study)	*σ* (range for particular study)	Device	Season	Reference	Location/habitat
Possum *Trichosurus vulpecula*	0.05	63	Victor #1 leg-hold traps	May-Dec	Ball et al. 2005	Mt Somers
	??	??	Live-trap	??	Efford 2004	Orongorongo Valley
Ship rat *Rattus rattus*	0.039 – 0.106	17.92 – 38.16	Live-trap (19RT10 cage)	Autumn	Byrom et al. unpublished	Orongorongo Valley Mixed beech/podocarp forest
	0.020 – 0.080	26.09 – 49.21	Live-trap (19RT10 cage)	Spring	Byrom et al. unpublished	Orongorongo Valley Mixed beech/podocarp forest
	0.023 – 0.041	27.8 – 37.4	Live-trap (19RT10 cage)	Autumn	Wilson et al. 2007	Orongorongo Valley Mixed beech/podocarp forest
Stoat *Mustela erminea*	0.024 – 0.113	162 – 482	Hair tube/ genotype ID	Summer	Efford et al. 2009	Matakitaki Valley Red beech forest
	0.03	518	Hair tube/ genotype ID	Winter	Byrom et al. unpublished	Resolution Island Mixed coastal forest to alpine
	0.040 – 0.077	429 – 891	Live-trap (Elliott?)	Summer	Smith D et al. 2008	Fiordland Beech forest
	0.017 – 0.047	521 – 726	Live-trap (Elliott?)	Summer	Smith D et al. 2008	Fiordland Alpine grassland
Ferret *Mustela furo*	0.079	466	Victor #1 leg-hold traps	Summer and autumn	Norbury & Efford 2003(?)	Semi-arid dry grassland
Mouse *Mus domesticus*	0.126 – 0.245	15.425 – 31.319	Live-trap (Elliott)	Autumn/winter	Smith J et al. unpublished	Semi-arid dry grassland
	0.027 – 0.465	2.21 – 50.4	Live-trap (Elliott)	Spring/summer	Smith J et al. unpublished	Semi-arid dry grassland
	0.08 – 0.534	9.1 – 32.2	Live-trap		Efford 2004	Mana Island
Feral cat *Felis catus*						
Norway rat *Rattus norvegicus*						

Rule 6

One-off eradication cheaper than sustained control

- Need to consider this rule for each species of interest
- May satisfy economic criterion but must be affordable now ($27B!)

- Benefits of eradication need to be better than sustained control

Example: Rule 6

- Focus on goal, not just pests
- PFNZ may *not* be the cheapest way to achieve biodiversity goals
- Will PFNZ ‘derail’ or ‘skew’ current national prioritisation efforts?
- How does PFNZ fit with threatened species management?

Example: Rule 6

- Resolution Island
- Acknowledged that *pest* goal may shift from ‘eradication’ to ‘sustained control’ (due to reinvasion)
- Importantly: *threatened species* goal has not changed
    - Planned introductions still going ahead

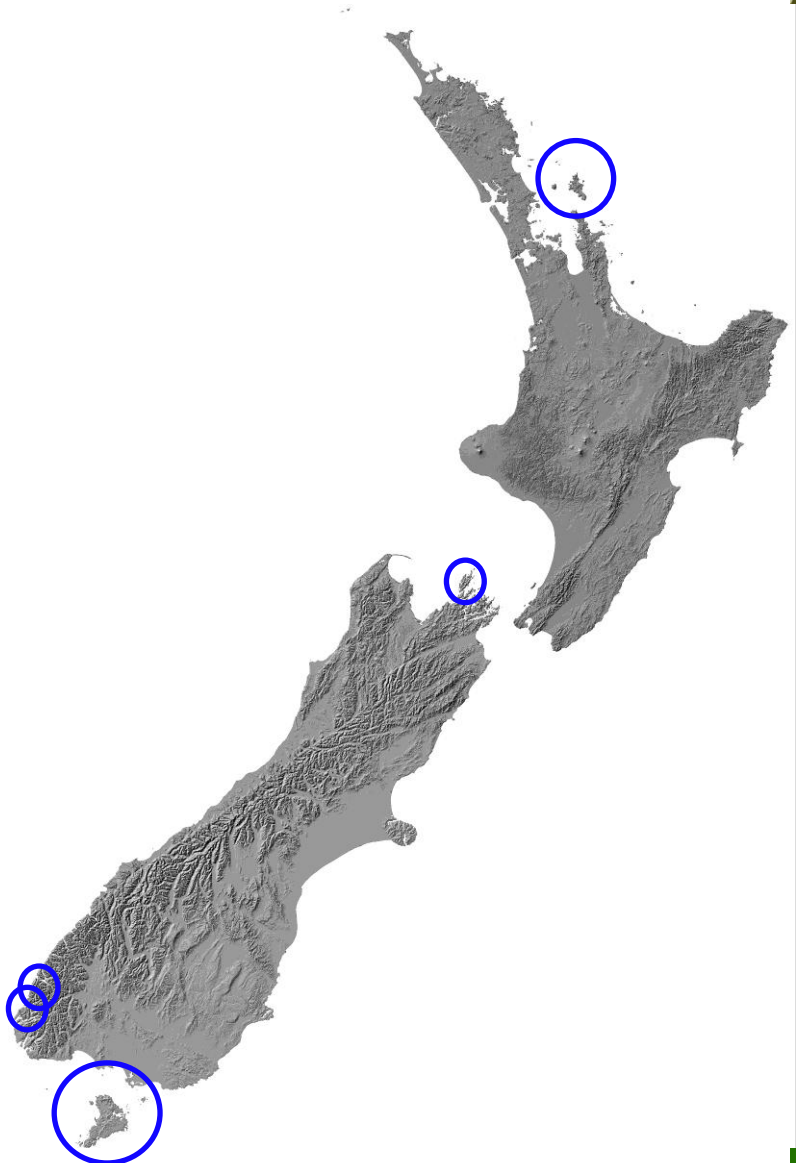
Pest-Free New Zealand

- It’s an idea with magic
- Captures the imagination
- Provides vehicle for awareness
- Offers hope, not despair
- Something positive for the next generation

… Visions for getting there?

Pest-Free New Zealand

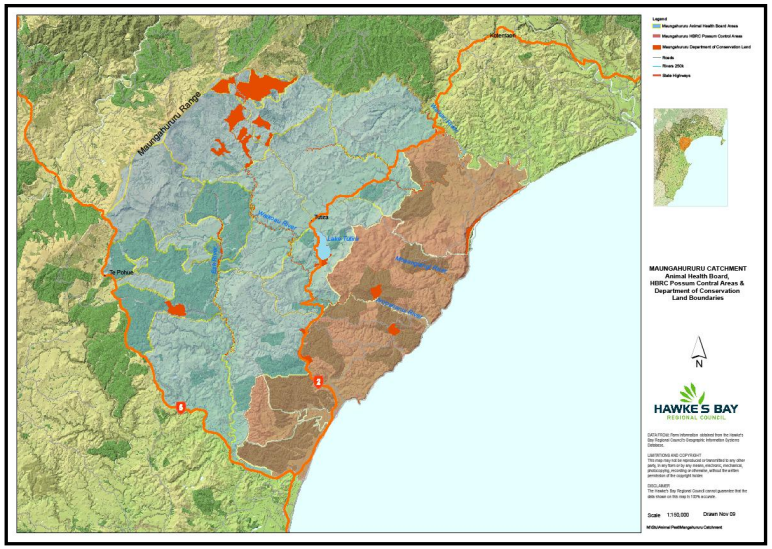
- Begin with islands
- Learn as we go

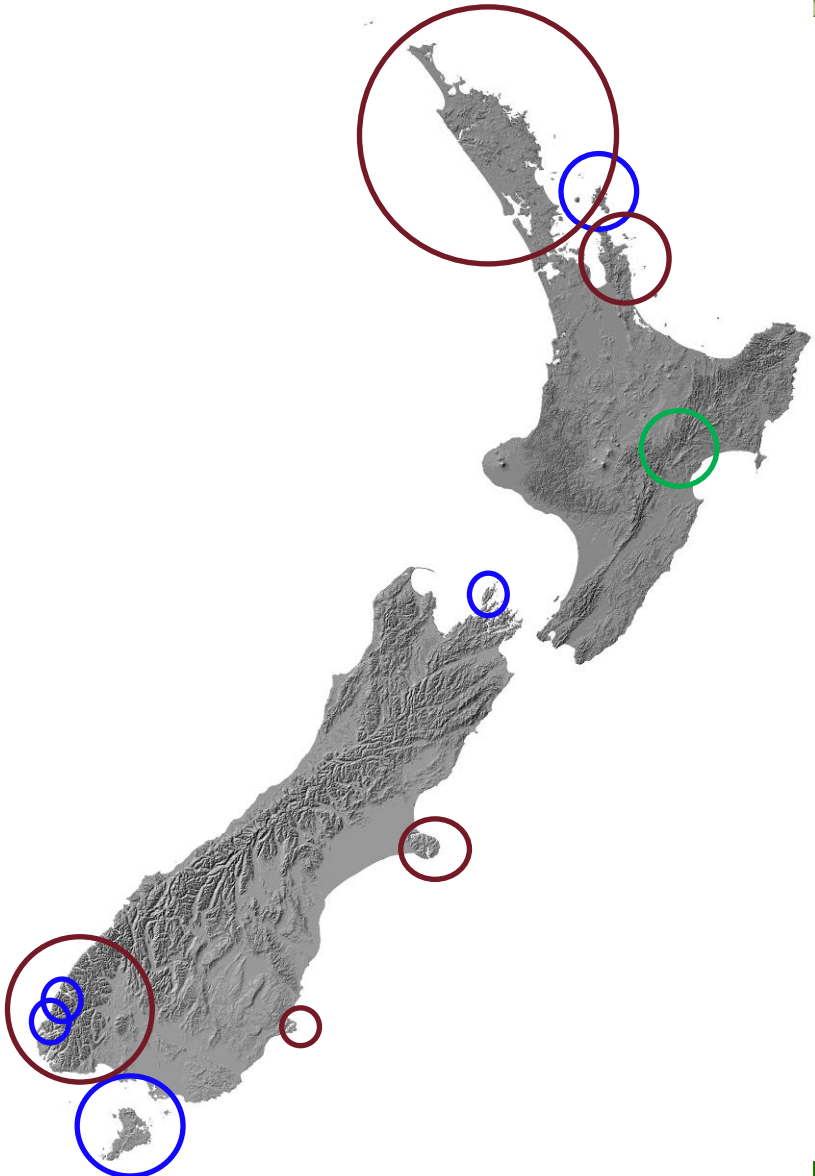


Pest-Free New Zealand

- Begin with islands
- Learn as we go

- Then add ‘defendable’ chunks of the mainland



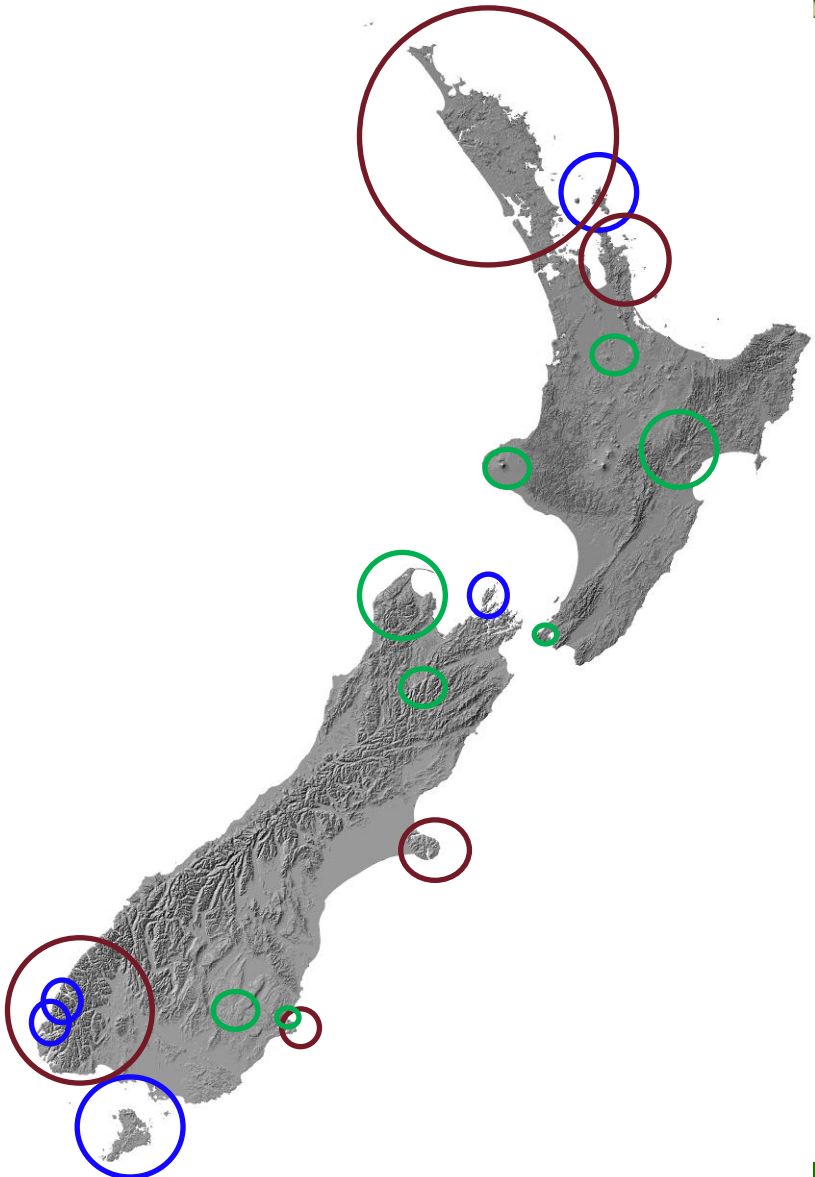


Pest-Free New Zealand

- Begin with islands
- Learn as we go

- Then add ‘defendable’ chunks of the mainland

- ‘Spheres’ of defended areas
- Buffer zones?



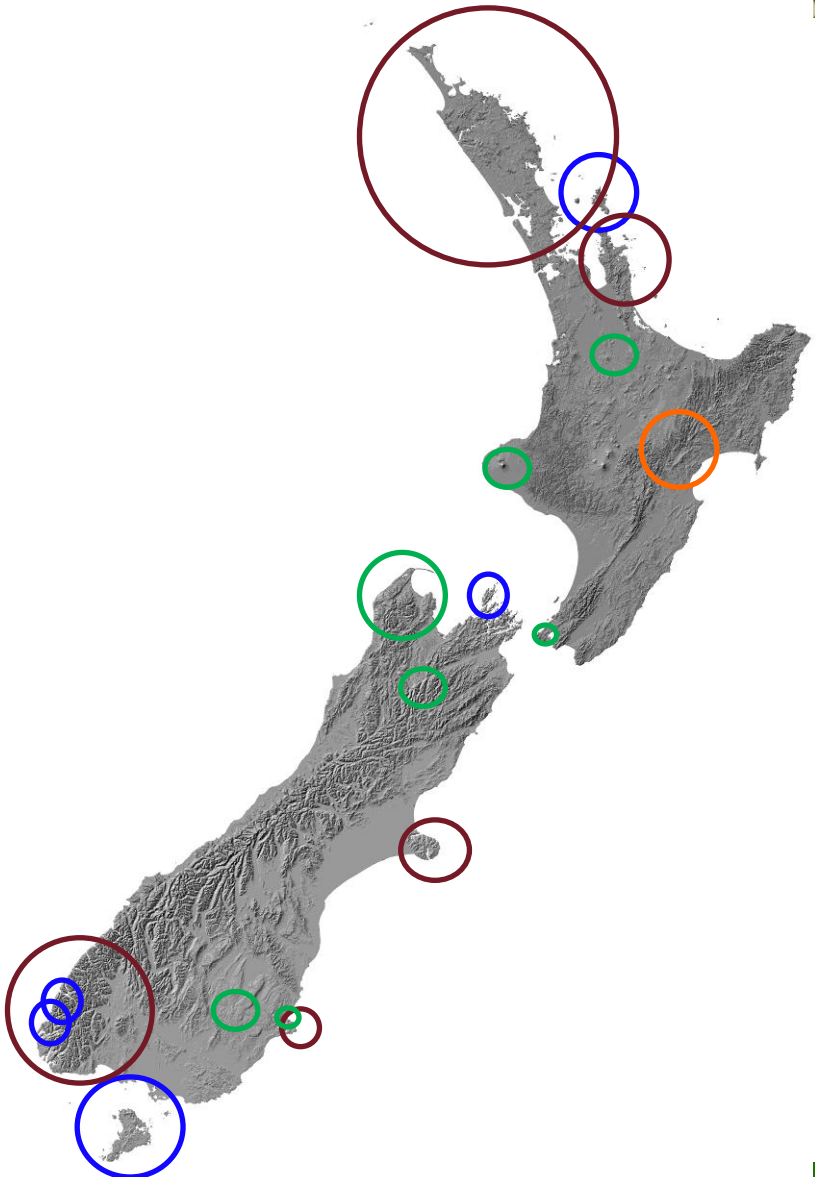
From: John Innes & Neil Fitzgerald, Landcare Research

Pest-Free New Zealand

- Begin with islands
- Learn as we go

- Then add ‘defendable’ chunks of the mainland

- Socio-political areas?
- By pest species
    - Antithesis of valued species?



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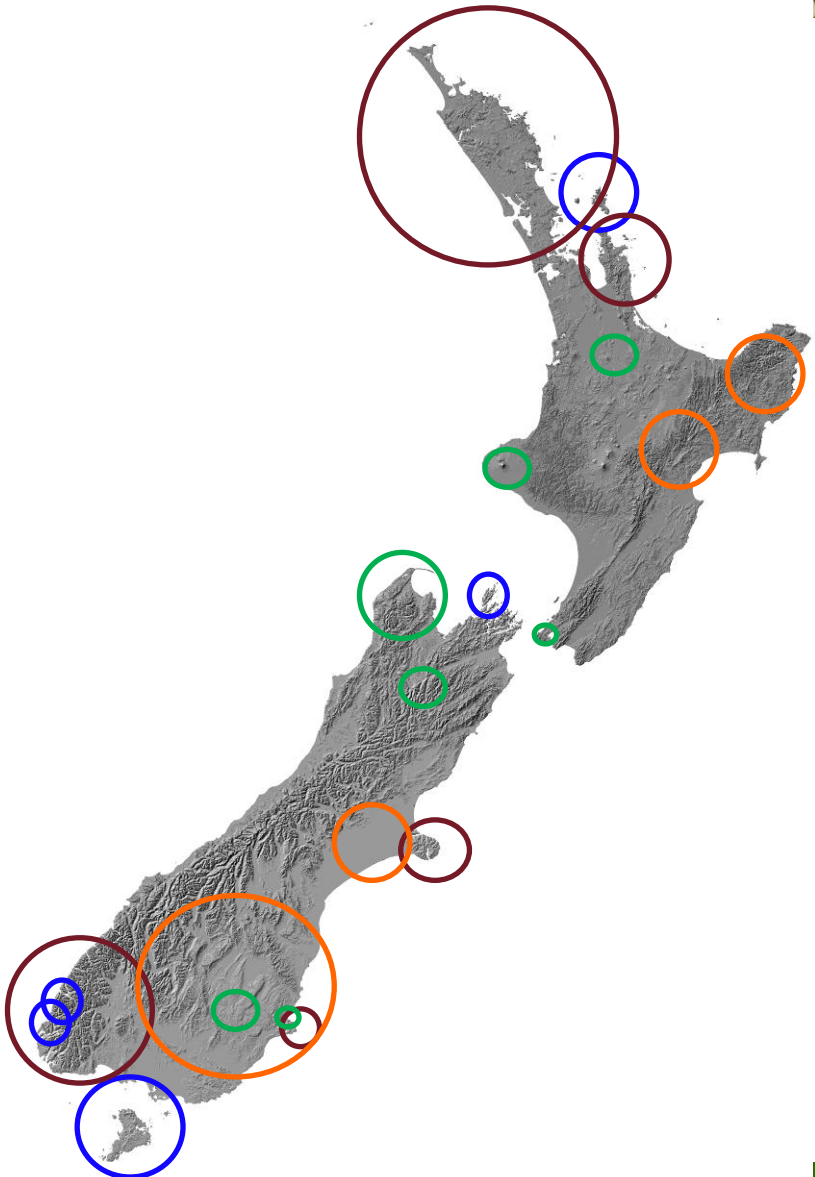
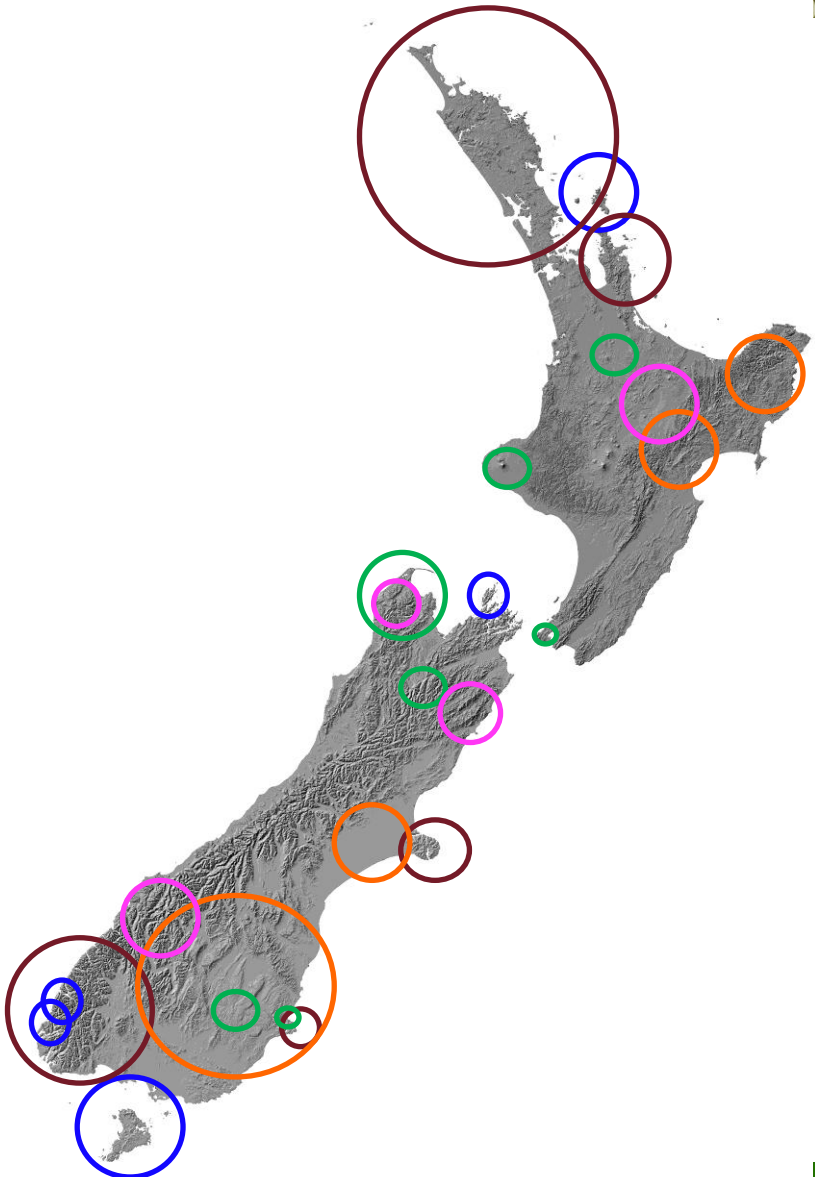


Pest-Free New Zealand

- Begin with islands
- Learn as we go

- Then add ‘defendable’ chunks of the mainland

- Socio-political areas?
- By valued native flora and fauna



Pest-Free New Zealand

- Can we capture the enthusiasm/magic to improve biodiversity outcomes?
- Important because:
    - Will re-direct prioritisation
    - May re-focus community efforts
    - Would re-focus research questions
- The ‘6 rules’ for eradication are a good place to start…






Pest-Free New Zealand

- … but PFNZ challenges the 6 rules
- Clarify vision and goal(s)
- Which pests are we targeting?
- Technical challenges
- Novel ecosystems and ecological release
- Huge range of social challenges
- Surveillance and detection






Pest-Free New Zealand

- Agency and NGO coordination
- We have optimisation tools
- We can anticipate making biodiversity gains from pest control
- Need to keep focused on biodiversity protection, not focus on killing pests

- Aspirational goal:
  - Sustained, large-scale pest suppression and long-term biodiversity protection






Pest Summit

- Budget 2012: ‘grand challenges’
- Technical issues
- Costs of control
- Surveillance and detection at low pest densities
- Meshing PFNZ with:
  - Biodiversity goals and priorities
  - Threatened species management

Rita Angus Central Otago 1953