



Dama wallaby surveillance using detection dogs



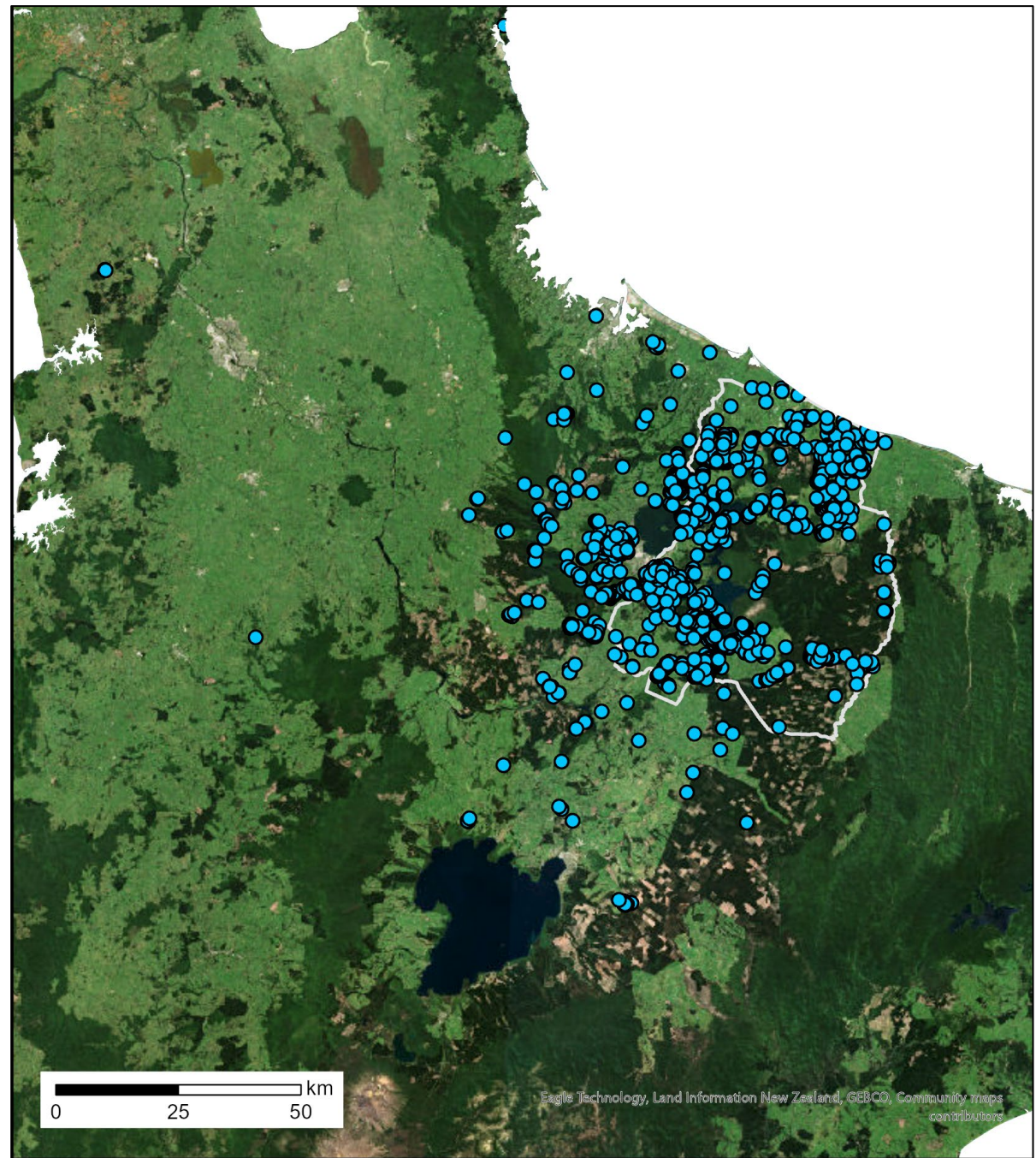
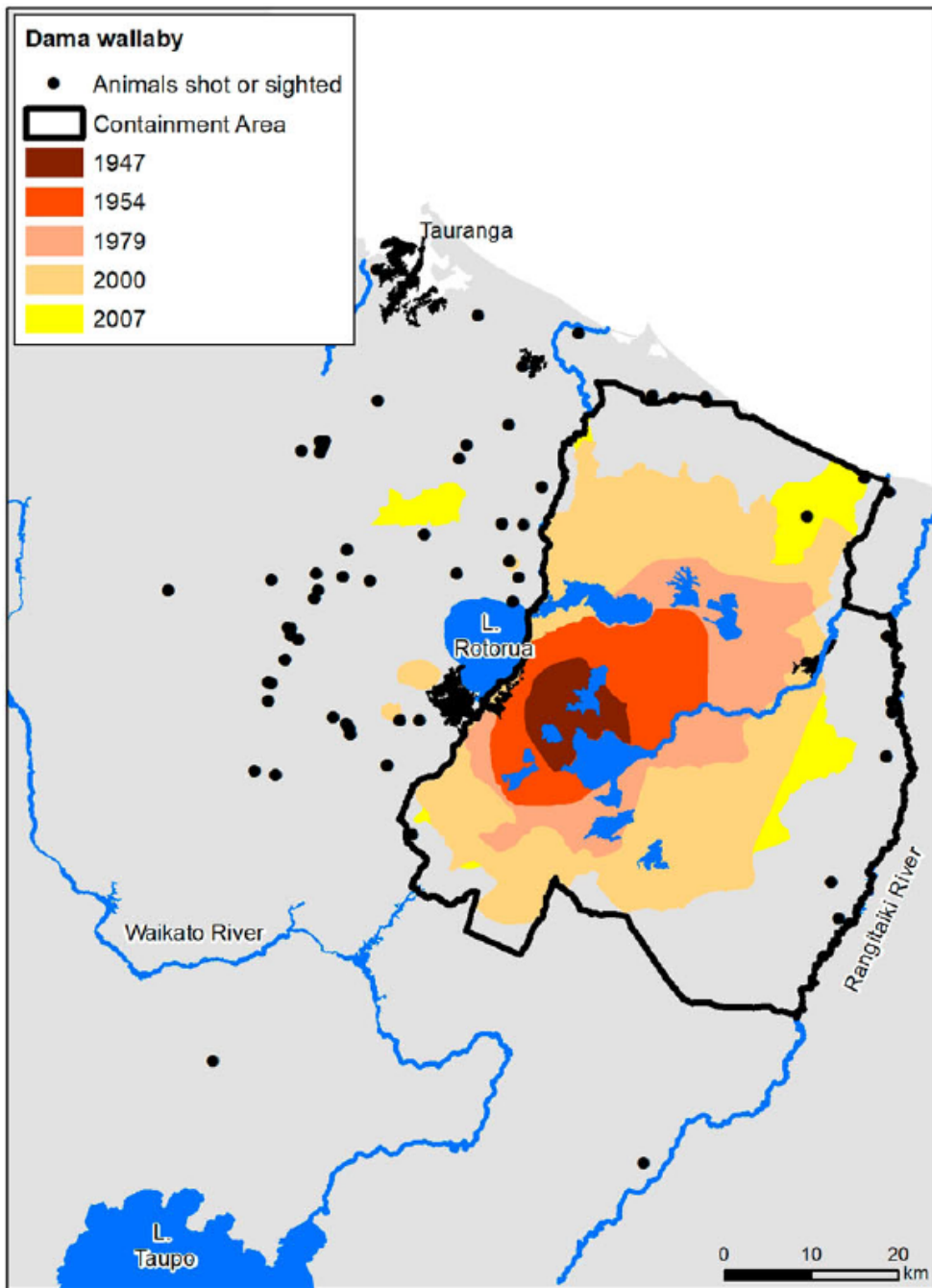
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Background

- Dama wallaby was introduced into the Rotorua District in the early- to mid-1900s
- Rapidly became invasive, negatively impacting native vegetation, agriculture, and silviculture
- They have progressively expanded their geographic range, occupying between c. 1,800 and 4,100 km²





Background

- MPI-led national wallaby eradication programme established to manage the progressive spread of wallabies
- Two key management strategies:
 - Sustained control within containment areas
 - Eradication of populations outside of containment areas



Objectives

- This research contributes to the eradication strategy
- Determine the detection probabilities and derived surveillance system sensitivities of detection dogs searching for dama wallaby faecal pellets in native forest, pine forest, and pasture
- Use these two quantities to estimate the cost per ha to have confidence (using a target probability of 0.95) that eradication has been achieved

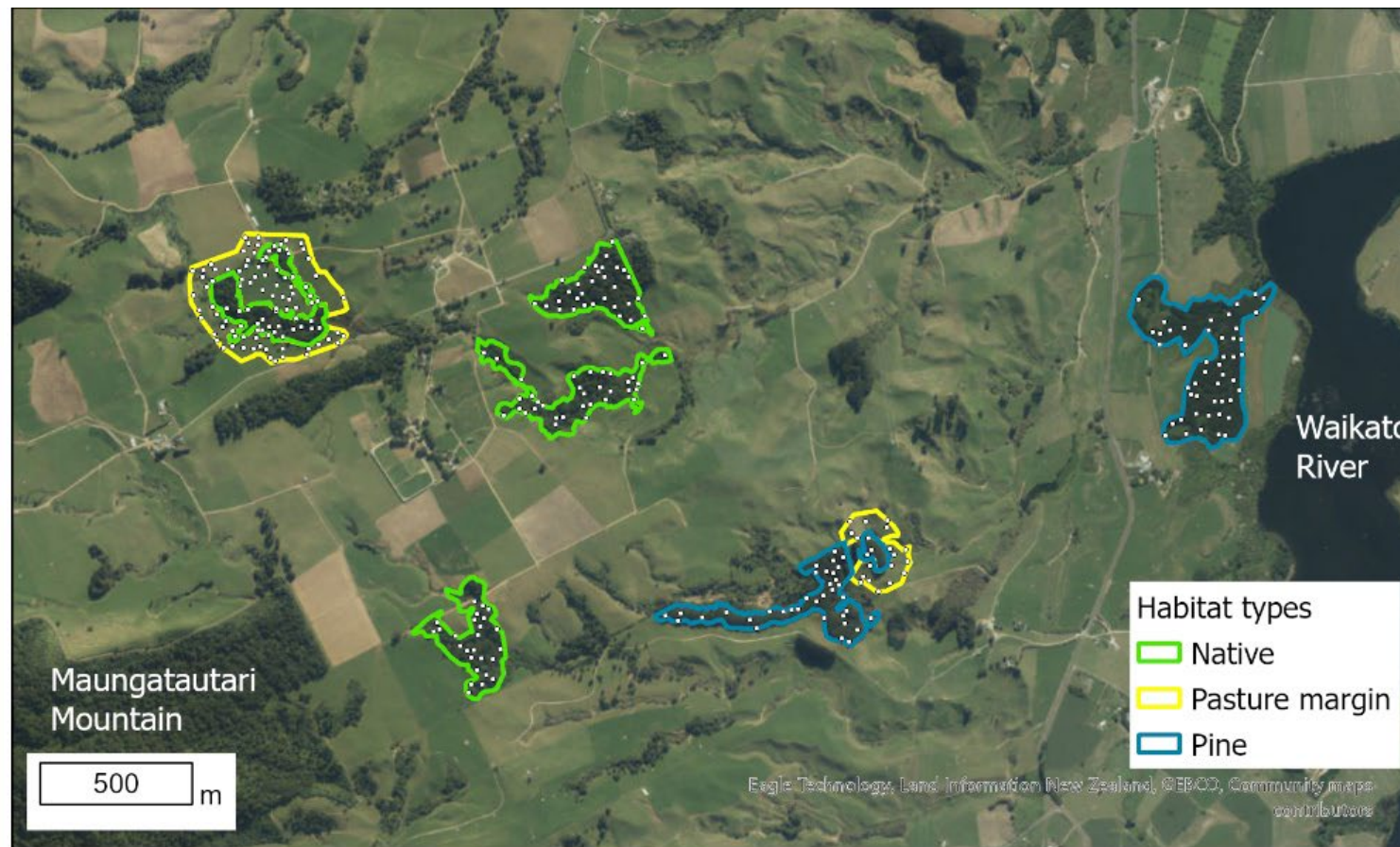
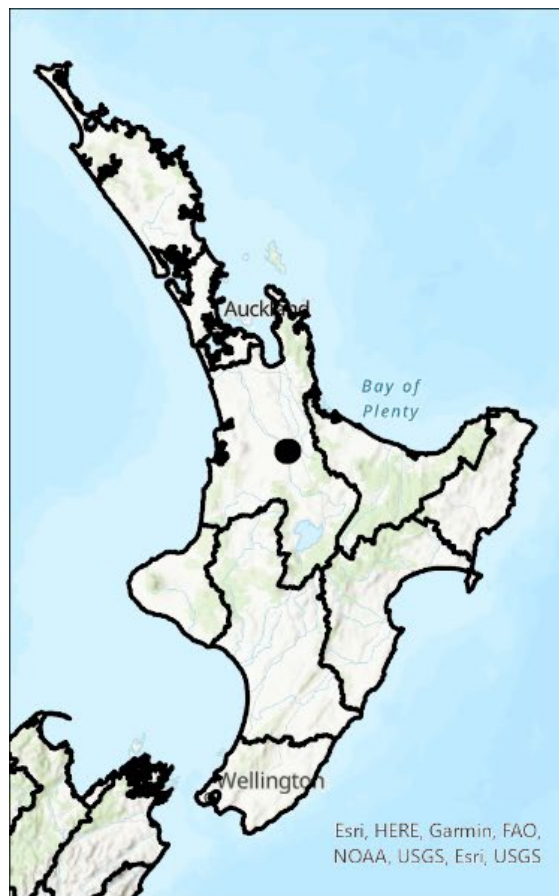


Terminology

- Detection probability:
 - The probability that an individual device or person/dog will detect a specific animal (or its sign) given the animal is present in the detection range at a specified time
- Surveillance system sensitivity:
 - The probability that multiple devices or people/dog search paths will detect a specific animal (or its sign) given that it is present anywhere within the total area of interest



Methods







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- Deployed fresh faecal pellets in an area where dama do not occur (to avoid naturally deposited pellets confounding the study)
- 10–15 pellets per pile at a density of 4 per ha in native forest, pine forest, and pasture





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- Deployed fresh faecal pellets in an area where dama do not occur (to avoid naturally deposited pellets confounding the study)
- 10–15 pellets per pile at a density of 4 per ha in native forest, pine forest, and pasture
- Also deployed small pieces of dowel as an experimental control and sheep pellets (to determine if dogs focussed only on wallaby pellets, or were interested in any herbivore faeces)





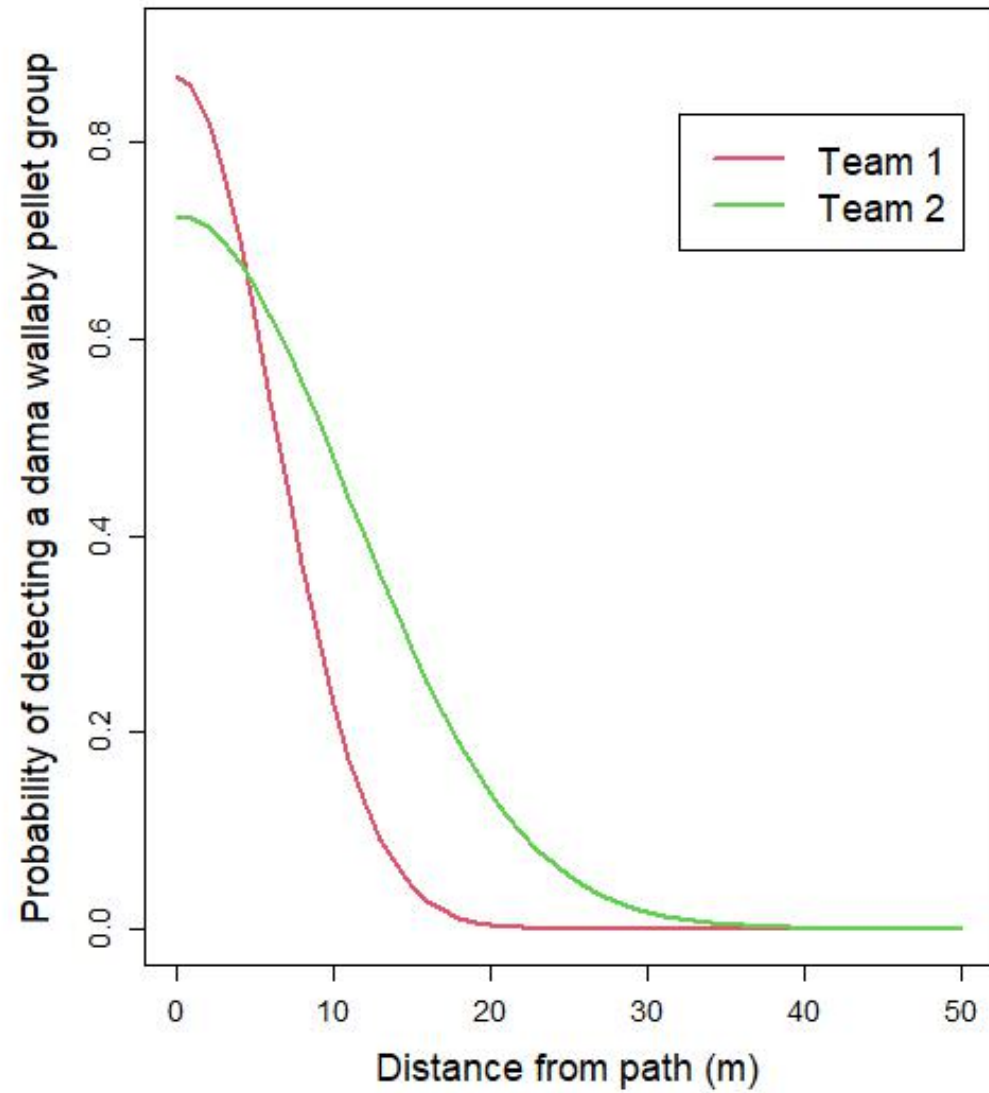
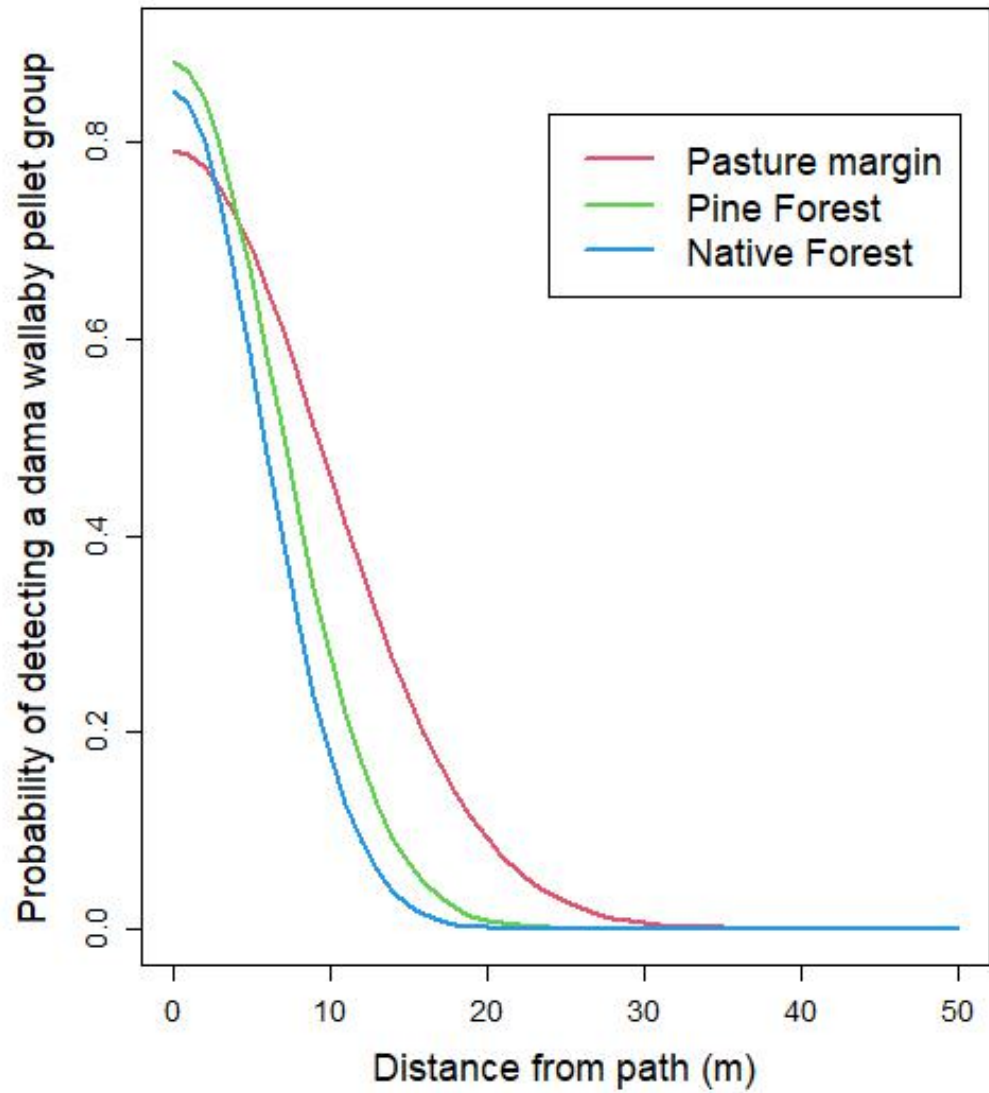
Methods

- Estimated detection probabilities using two approaches:
 - Detection was constant across to a maximum perpendicular distance of 15 m and 30 m on either side of the observer
 - Detection probability decays with lateral distance from the observer following a half-normal curve



Results

- In total we deployed 299 faecal pellet groups or dowl (198 wallaby, 55 dowl, and 46 sheep)
- 103 detections by dogs, all of which were on dama wallaby pellet groups, i.e., neither of the dogs indicated on dowl or sheep pellets
- Detection probabilities ranged from 0.59–0.89 (depending on the assumed effective swathe width)
- No statistical differences between habitats, or different detection dogs and handlers





Results

- Detection probability for dogs was relatively high ($\geq 59\%$), irrespective of the assessed search swathe width
- But, the standardised surveillance system sensitivity (SSe) was low (≤ 0.035 for a single 1 km transect in a 100 ha area)
 - Relatively narrow search swathe
 - Many transects needed to increase SSe



Results

- Detection range for dogs searching for brocket deer faecal pellets was 7.2 m (de Oliveira et al. 2012)





Costs

- Surveillance cost to achieve a 95% probability of dama wallaby eradication using detection dogs searching for pellets in a 100 ha area
 - \$1,349 for a 60 m (30 m either side) effective swathe width
 - Or, \$13.49 ha⁻¹
- More expensive than two hunting dogs and a handler searching for live Bennett's wallabies (\$3.67 ha⁻¹), using an effective swathe width of 200 m



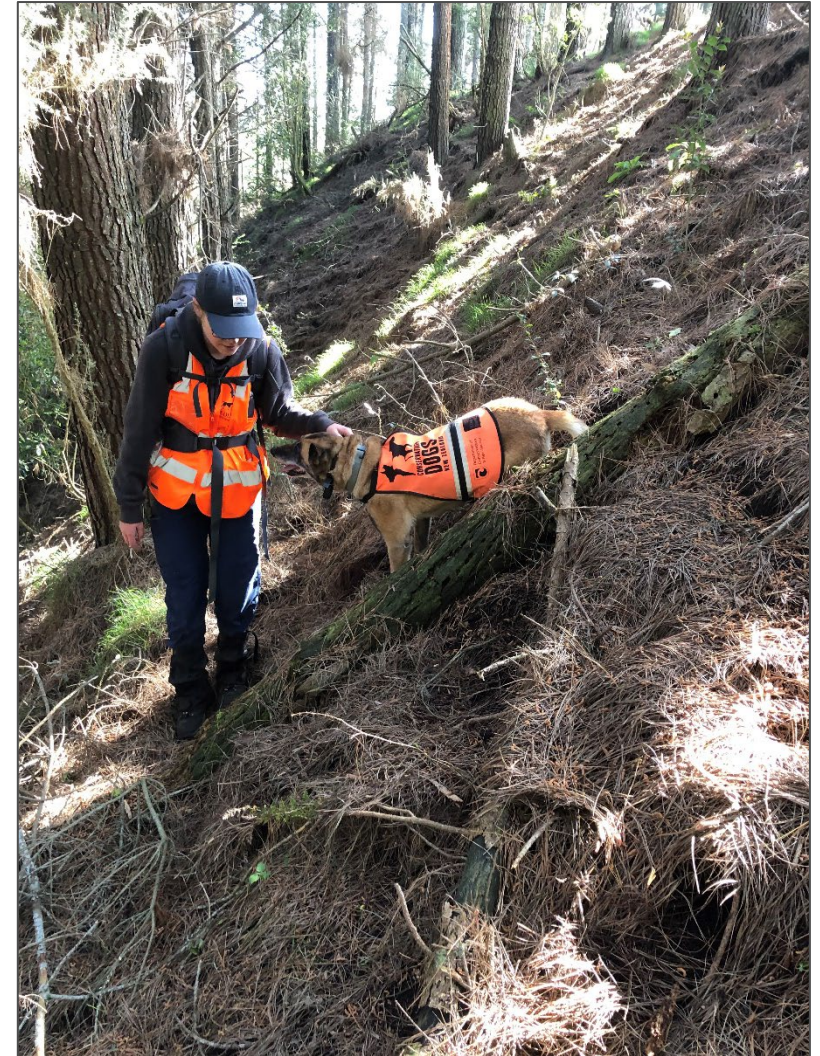
Correction factor

- However, must correct SSe for defecation rates
- Macropods can produce 20–90 pellet groups per day (Johnson et al. 1987)
- How do SSe and cost per hectare change if we assume a conservative rate of 20 voided pellet groups per day, detectable over 2 days?



Correction factor

- SSe increases from 0.019 to 0.250
- Cost per hectare decreases from \$13.49 to, potentially as low as, \$1.30 (assuming an effective swathe width of 30 m and an uninformative prior of 0.5)





Summary

- Detection dogs have high efficacy searching for faecal pellets of dama wallaby
 - Effective in all habitats we assessed
 - No observer bias
 - Resilient to light rain
- Cost effective surveillance method, but limited in the area they can cover
- We recommend using detection dogs searching for faecal pellets as part of surveillance for dama wallaby



Acknowledgements

- Funding:
 - Tipu Mātoro National Wallaby Eradication Programme under Ministry for Primary Industries (MPI) Contract 23170
 - Waikato Regional Council (WRC)
 - Manaaki Whenua – Landcare Research (MWLR) Strategic Science Investment Funding
- Landowners/managers: Geoff Scott, Sam Le Cren, and Simon Clarke
- Guus Knopers and the team at K9 Detection Services/Wildlife Contractors Ltd
- Travis Ashcroft (MPI), Dave Byers and Alastair Fairweather (WRC)