



Manaaki Whenua
Landcare Research

Monitoring and prioritizing management of deer and other wild animals

Graham Hickling & Markus Gronwald



Why manage deer?

Ecosystem health



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Photos: Department of Conservation

Animal health

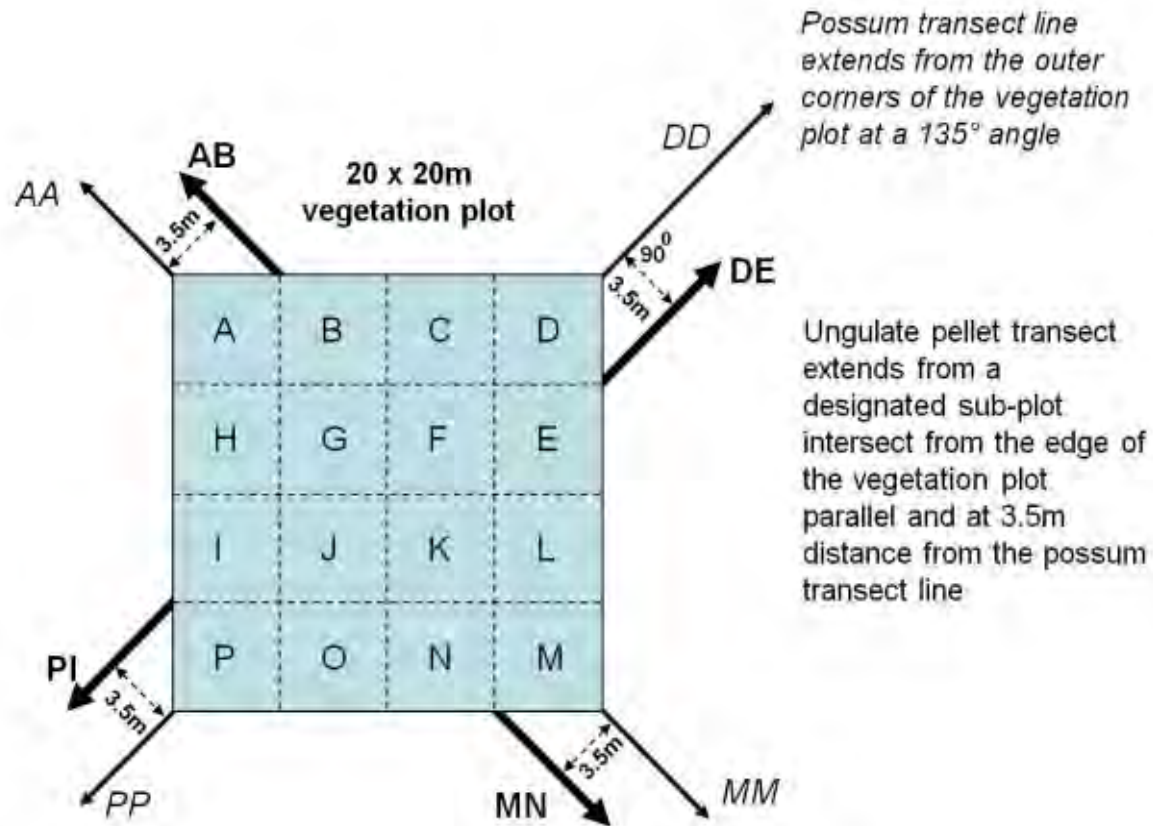


Bushnell CAM56 52°F 11°C 06-10-2022 15:18:06

Fallow deer



How are deer monitored?



DOC Tier 1 monitoring

- 20 x 20 m vegetation plots
- Flora and fauna monitoring
- 280 sites per year in a 5-year rotation
- Faecal pellet counts are part of DOC Tier 1 monitoring

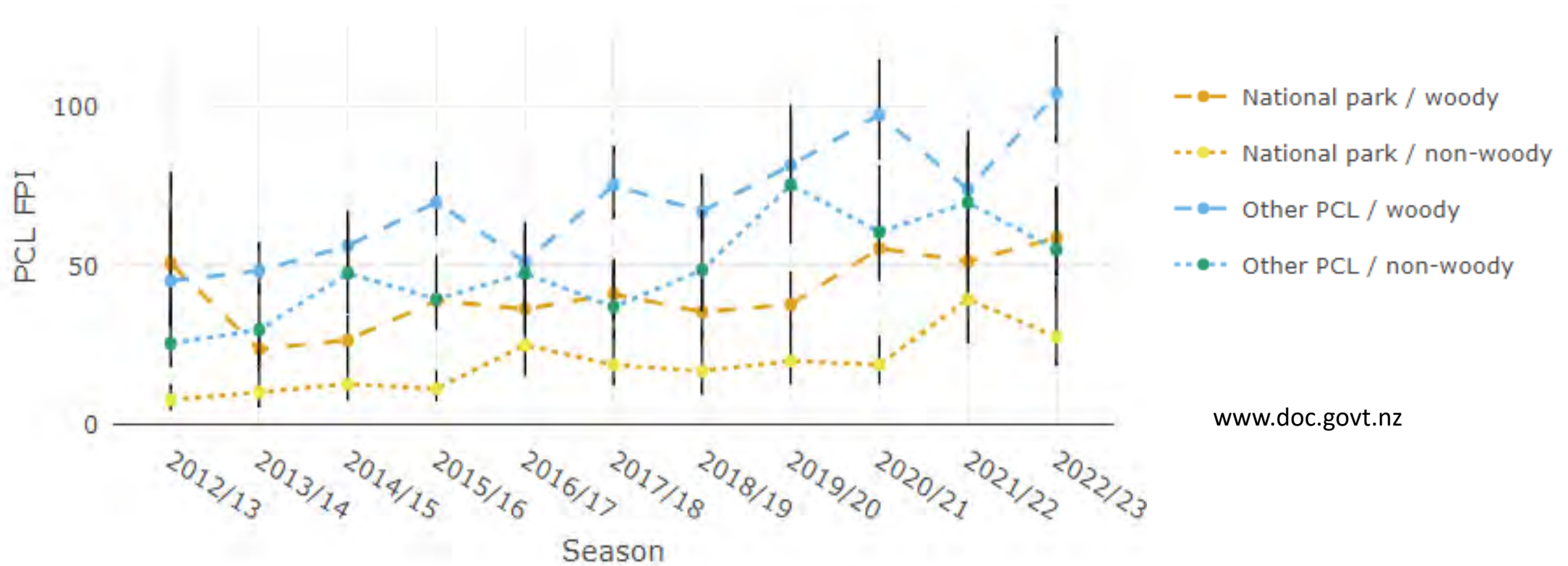
Faecal pellet index (FPI) surveys

- Number of faecal pellets in 30 plots along 150 m long transect lines.
- Four lines at each site.



How many deer are there?

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www.doc.govt.nz

- Faecal Pellet Indices on Public Conservation Land are trending upwards
- **Ungulates** are present at 83% of surveyed sites, across all habitats

Harper-Avoca RHA, 1981



DOC's Monitoring and Evaluation Unit recently commissioned a review of wild animal population monitoring methods

'Wild animals' as defined by the Wild Animals Control Act, but with a focus on deer and goats



**Wild animal monitoring methods for the
Department of Conservation's Inventory
and Monitoring Toolbox**

Prepared for: Department of Conservation

May 2024



Ground counts:

- sightings/sign
- faecal pellet index (FPI):
 - *faecal DNA for species identification*
- direct counts from the ground:
 - *double counts*
 - *distance sampling*
 - *thermal imagery.*

Aerial counts:

- direct counts from the air:
 - *aerial double counts*
 - *aerial distance sampling*
 - *aerial thermal imagery.*

Motion-sensor cameras:

- camera trap catch index (CTCI):
 - *distance sampling*
 - *capture–recapture*
 - *other camera-based methods.*

Hunting:

- kill locations
- catch per unit effort (CPUE).

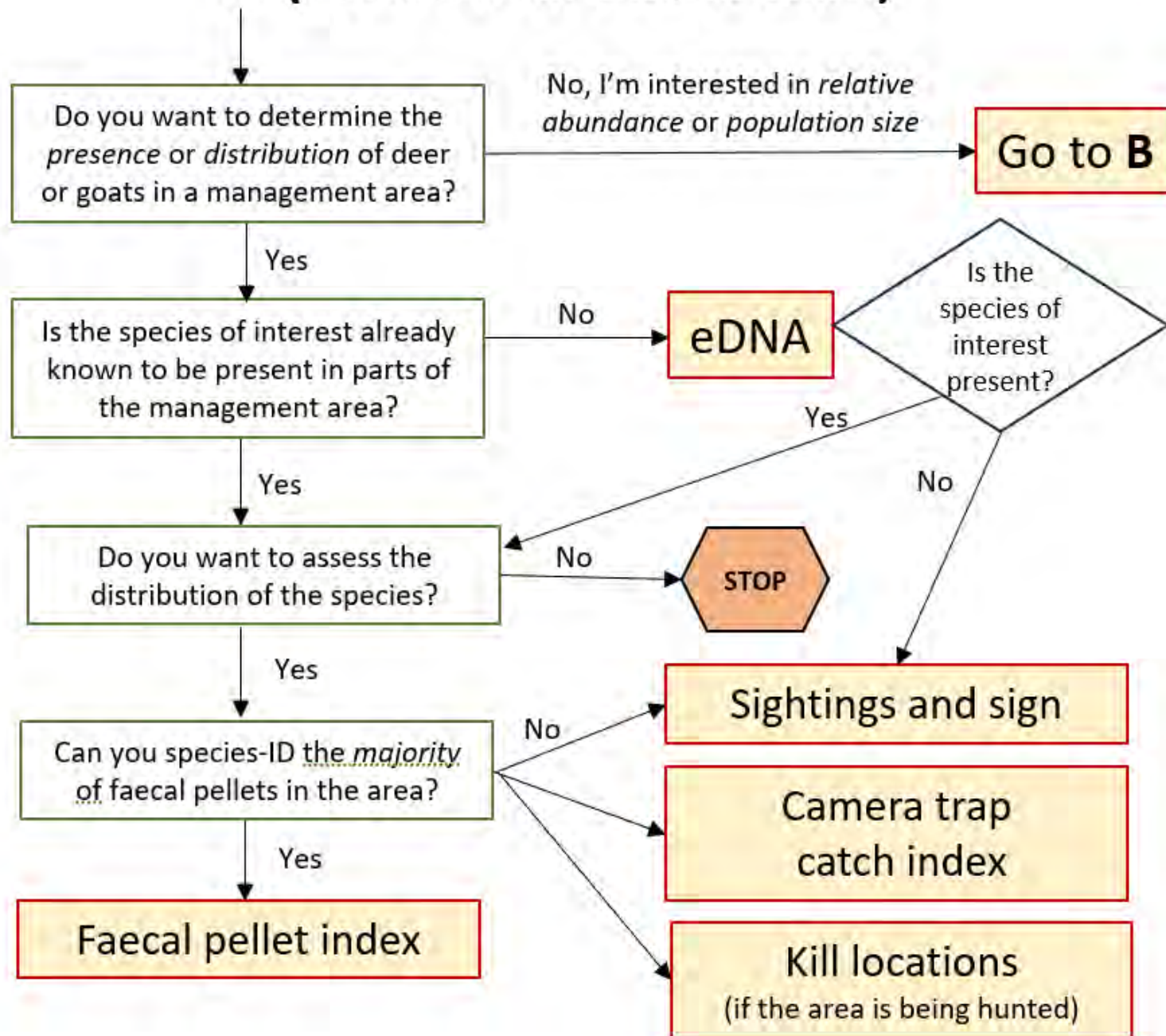
DNA methods:

- DNA capture-recapture
- eDNA.



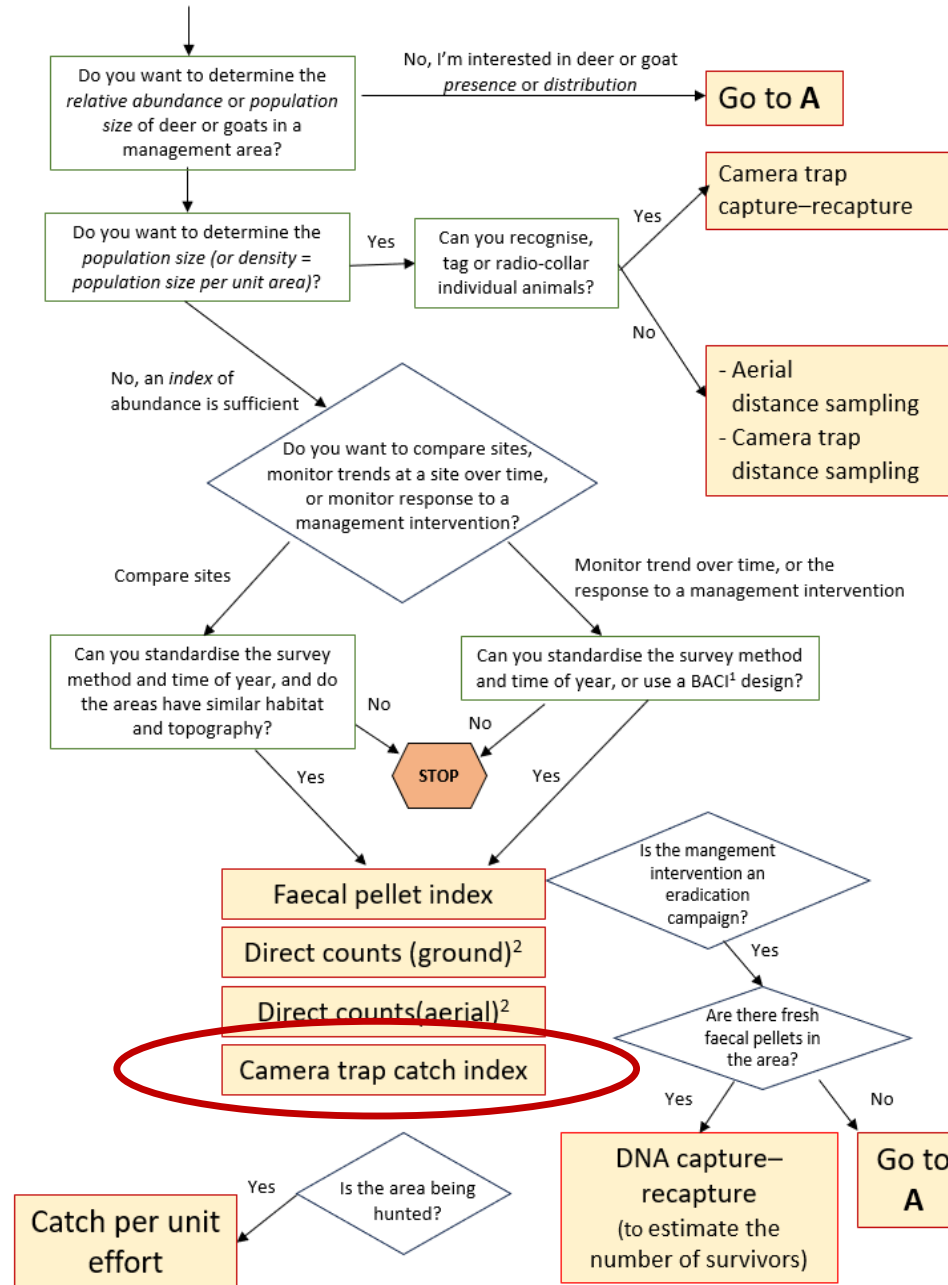
Decision trees

A (Presence or distribution)



Decision trees

B (Relative abundance or population size)



¹ Before After Control Impact

² Not appropriate if the management intervention itself involves ground or aerial hunting

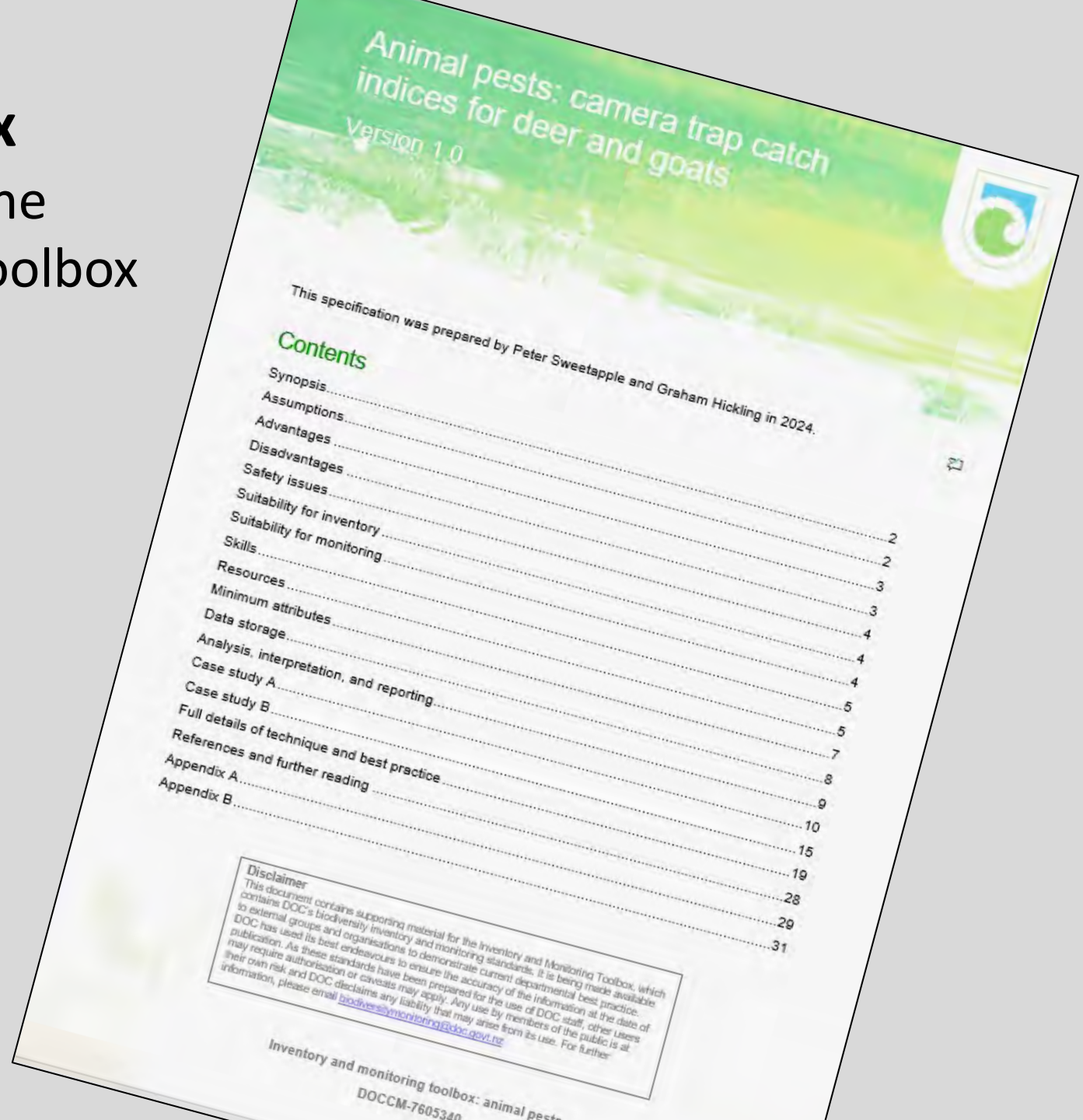


Timaru Creek Recreation Reserve, Otago

Camera trap catch index

Camera Trap Catch Index

will be added to DOC's on-line
Inventory and Monitoring Toolbox





Why estimate population density?

Relative abundance...

- informs about **change** in activity/abundance **over time** in the same location.
- indices can correlate with true abundance.

Density...

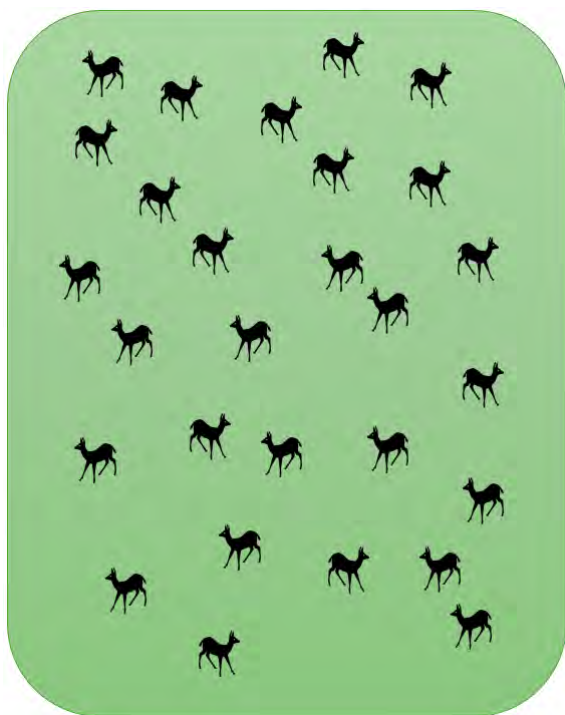
- informs about **population size**.
- immediately informs about the need for or the success of species management.
- allows for clear and precise goals of invasive species management.
- alongside biodiversity monitoring data can be used to develop density impact functions for ungulates.



How to estimate density

Capture Mark Recapture (CMR)

1st trapping session: Capture animals

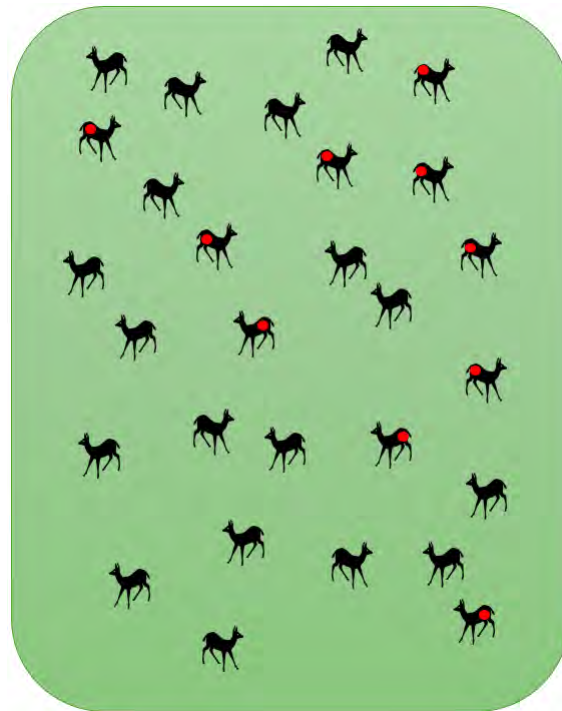
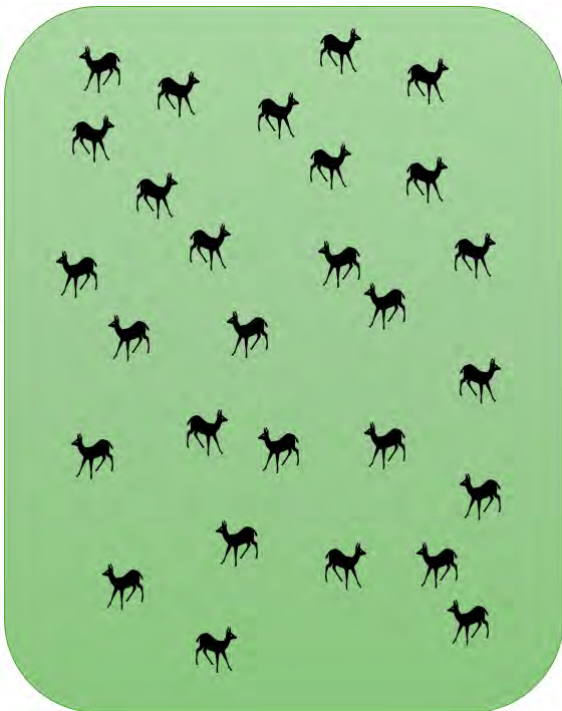




How to estimate density

Capture Mark Recapture (CMR)

1st trapping session: Capture animals, mark them and release them again



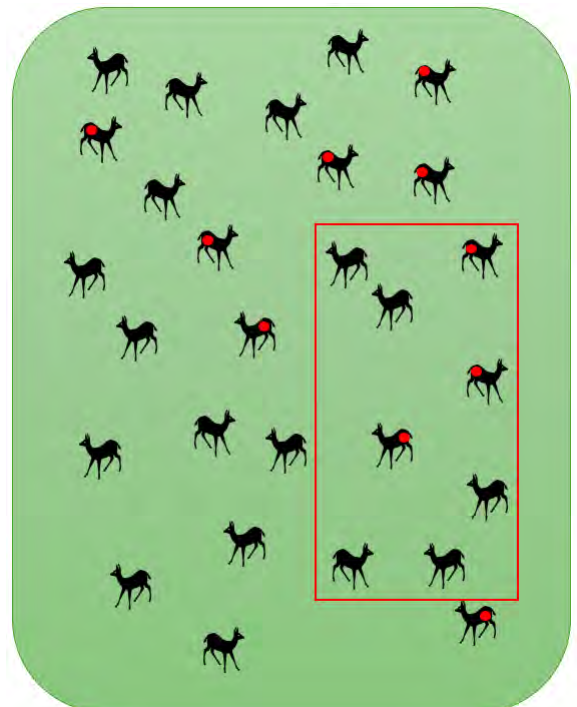
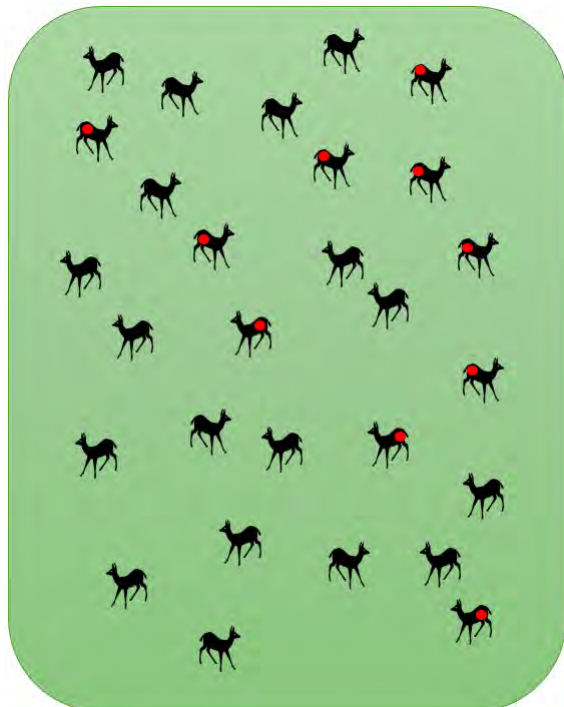
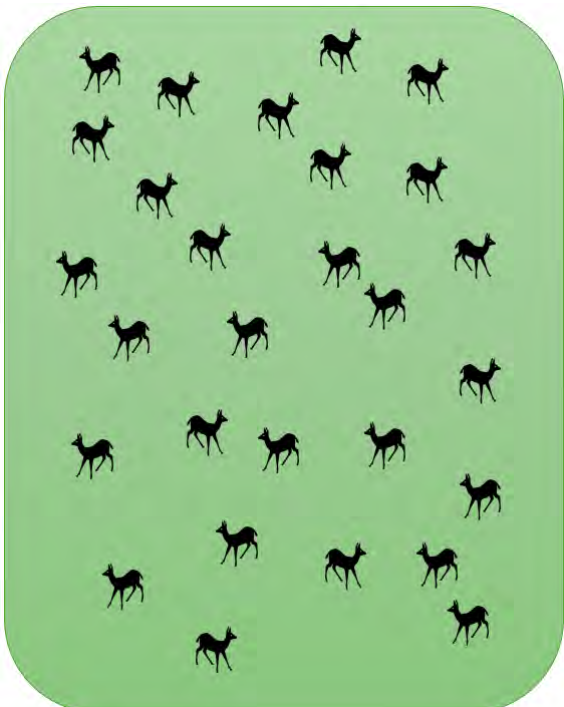


How to estimate density

Capture Mark Recapture (CMR)

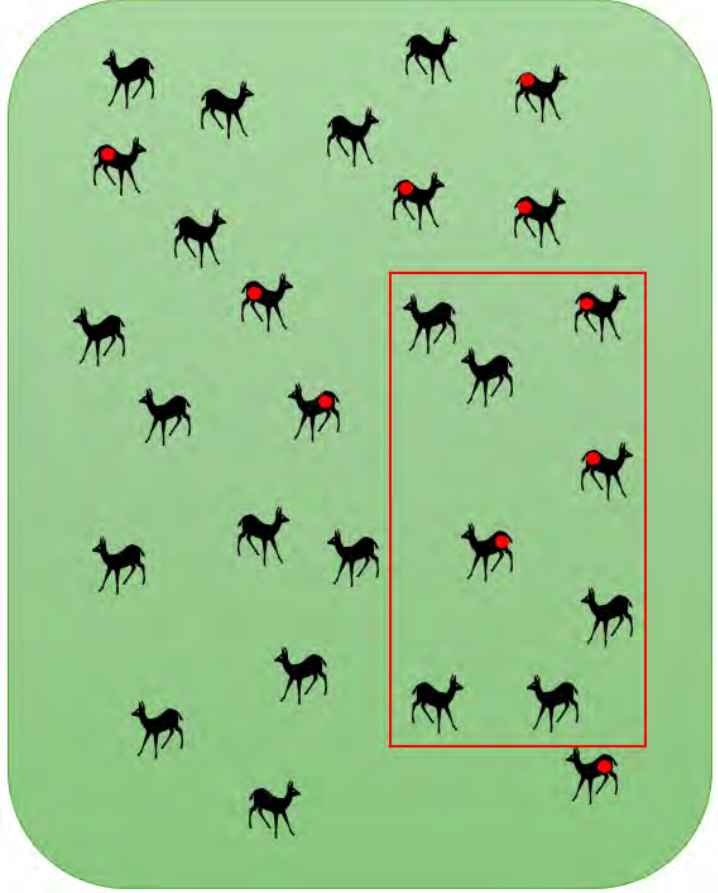
1st trapping session: Capture animals, mark them and release them again

2nd trapping session: Capture animals and check for mark => recaptures





How to estimate density



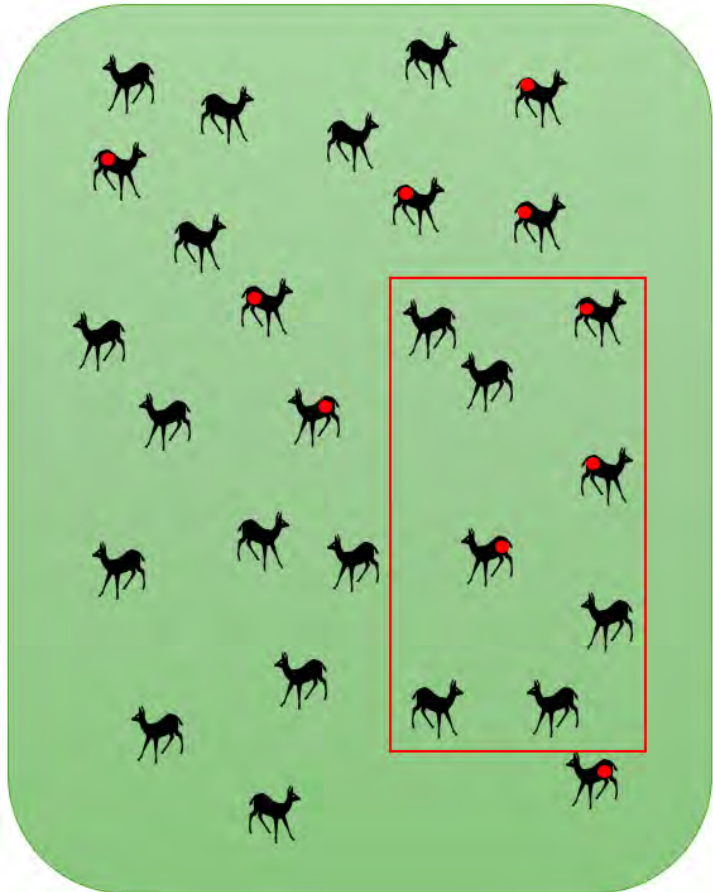
- Captured and marked 10 individuals in 1st session
- Captured 8 individuals, 3 were recaptures in 2nd session

$$\frac{\# \text{ of marked deer}}{\text{Population size}} = \frac{\# \text{ recaptures}}{\# \text{ captures 2nd session}}$$

$$\text{Population size} = \frac{8}{3} * 10 = 27$$



How to estimate density



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- Captured and marked 10 individuals in 1st session
- Captured 8 individuals, 3 were recaptures in 2nd session

- Expensive
- Difficult
- Need to handle animals



Better tools to monitor deer

Best models to estimate density require individual identification of captured animals
e.g. ear tag, collar, fur pattern, microchip





Better tools to monitor deer

- **DNA** from faecal pellets can identify individuals
- No animal handling required
- Individual ID allows use of robust CMR models

- Sampling design and evaluation of different genetic methods need to be tested





Better tools to monitor deer

- **Trail cameras** do not require animal handling
- Individual ID not possible for most species
- Analysis time-consuming
- Innovative models needed

- Trail cameras provide index of relative abundance as by-product

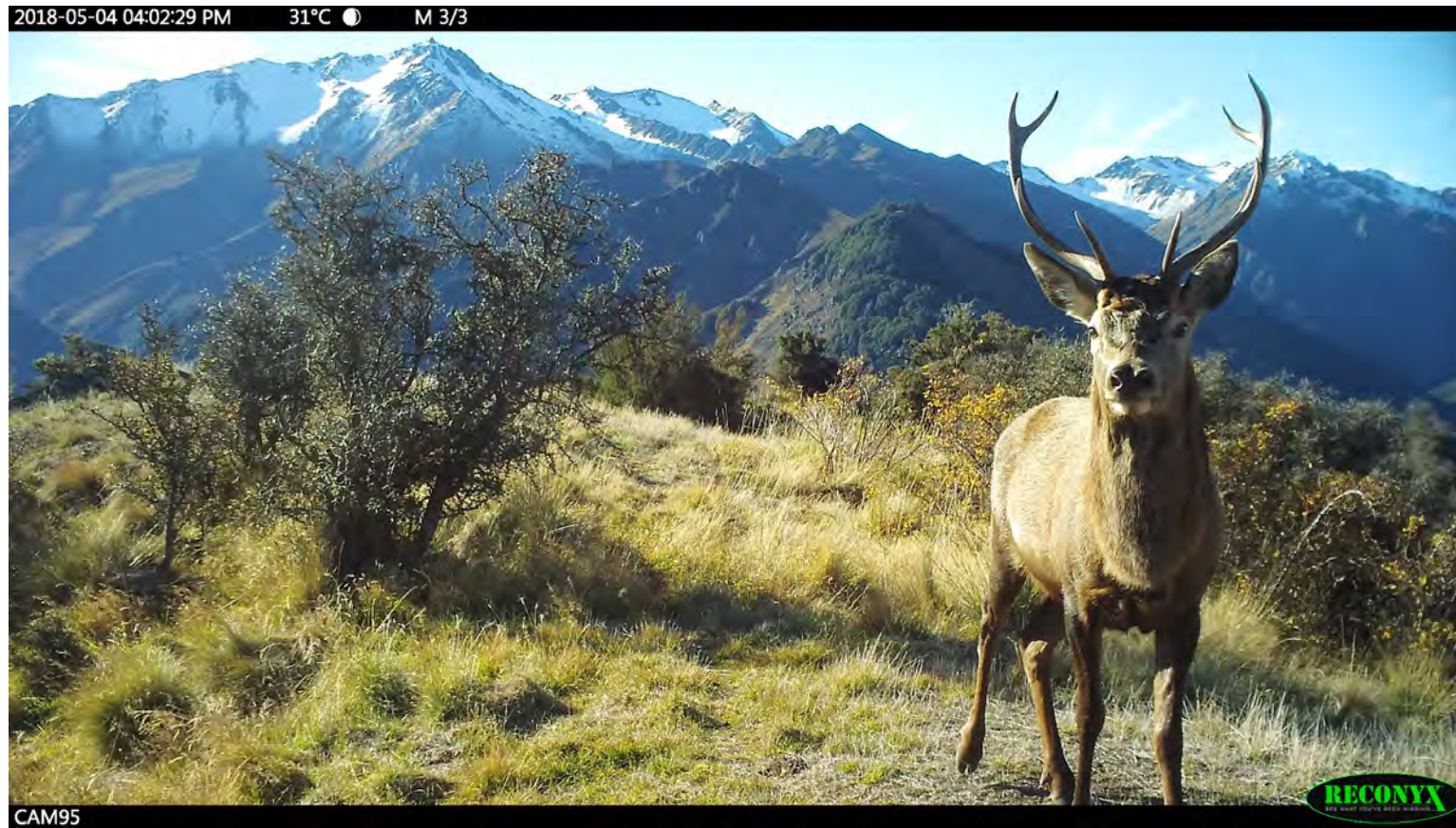
- Sampling design and evaluation of different models need to be tested





Better tools to monitor deer

- Improve non-invasive methods for density estimation
- Tools and analysis need to be affordable



Where in the landscape should we prioritise ungulate management?



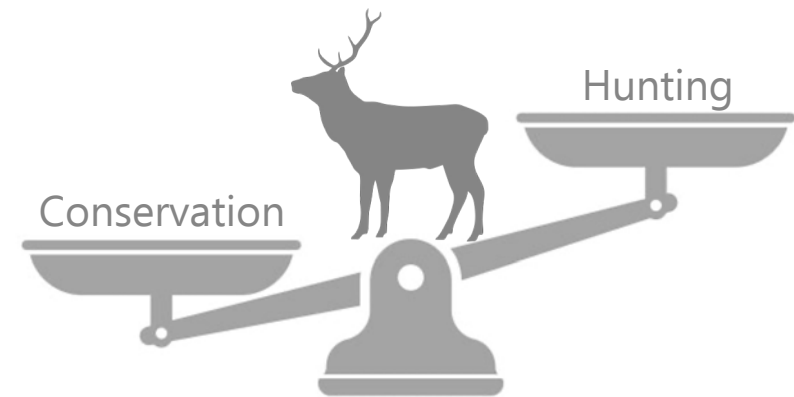
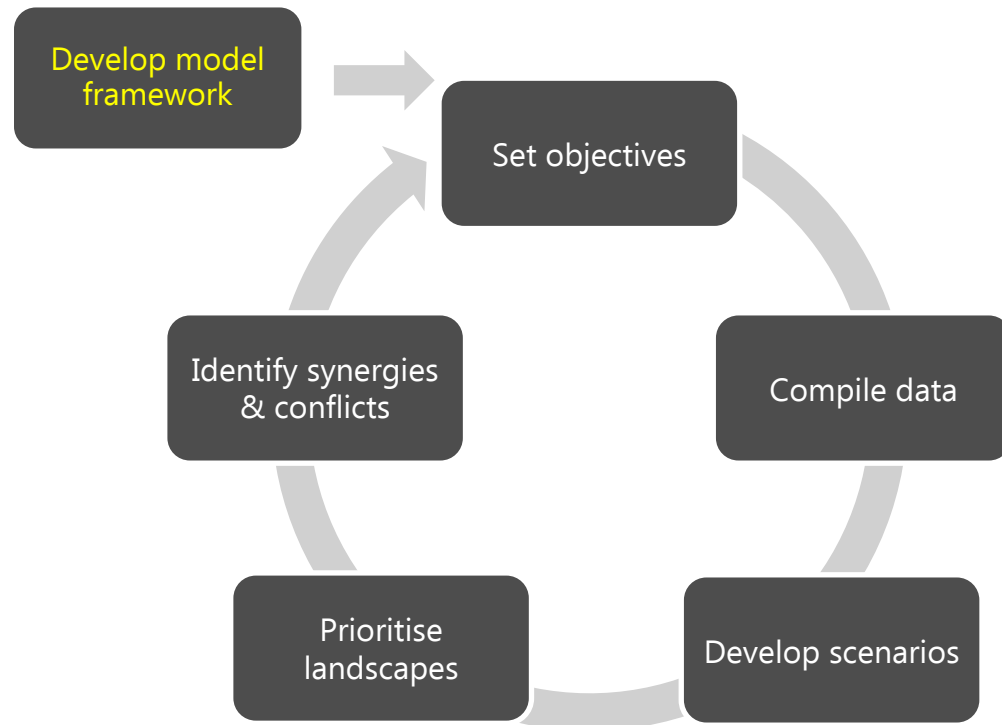
Amy's Project: Use spatial conservation planning tools to undertake a pilot study that prioritises areas for ungulate management in New Zealand



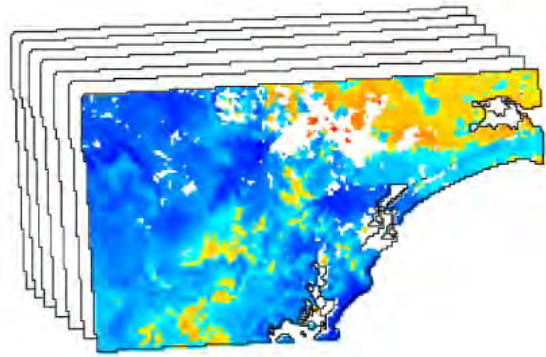
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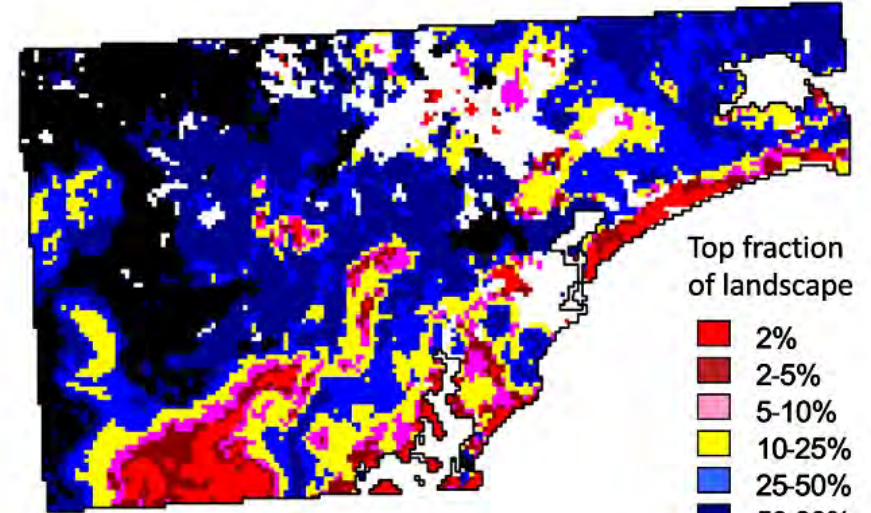
Amy's Project: Use spatial conservation planning tools to undertake a pilot study that prioritises areas for ungulate management in New Zealand



Zonation – A spatial conservation planning software



Feature layers



Top fraction of landscape

- 2%
- 2-5%
- 5-10%
- 10-25%
- 25-50%
- 50-80%
- 80-100%

Input data



What data will we need?

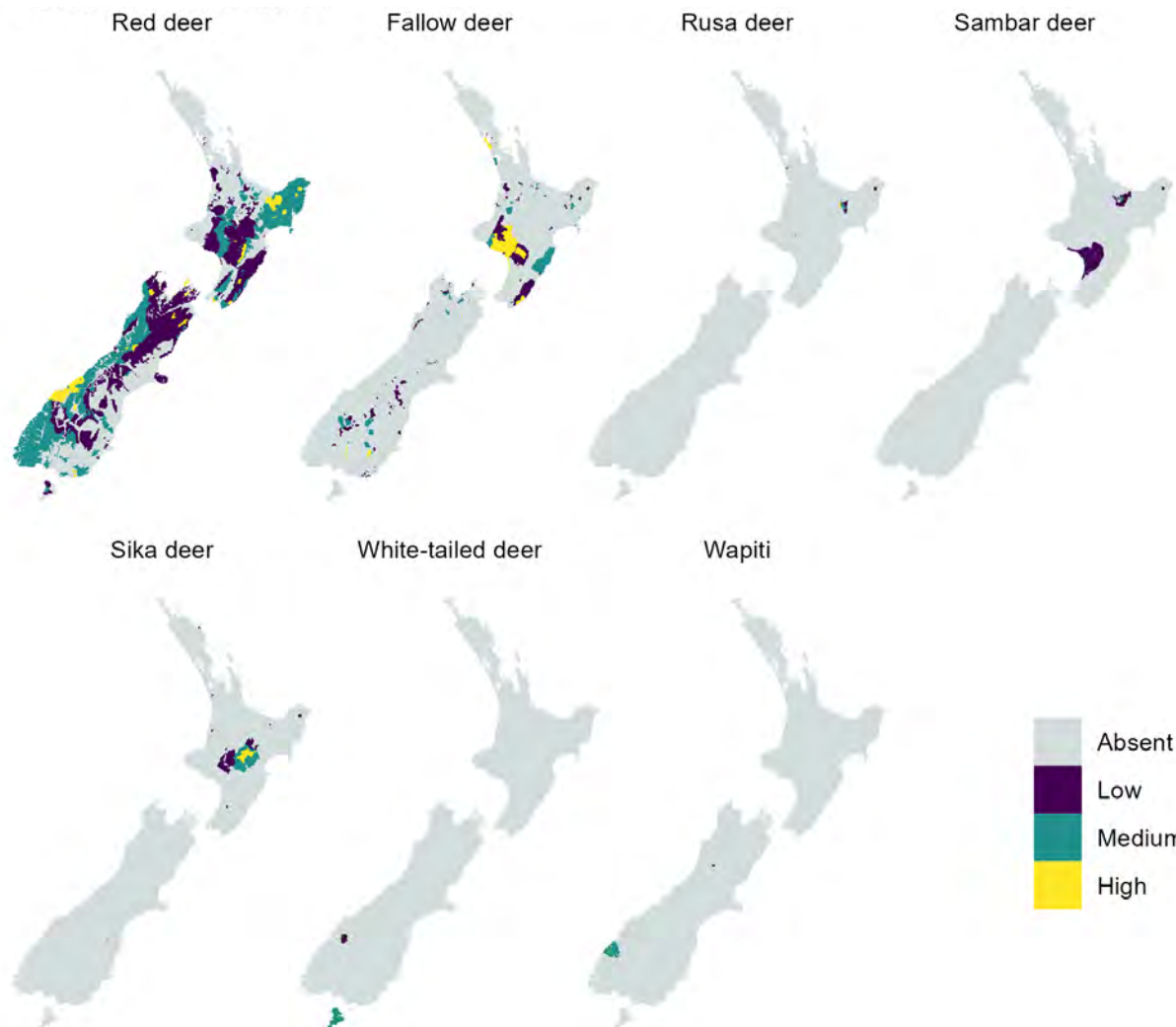


Spatial data

- Distribution of ungulate species
- Vegetation maps
- Ungulate management
 - DOC-led, Hunter-led, WARO, Commercial/Iwi
- Other ecosystem management
- Land tenure
- Social & cultural values
 - e.g. RAHs, Herds of Special Interests

Non-spatial data

- Ecosystem threats
- Ungulate impacts
- Management effectiveness
- Other benefits
 - e.g. Carbon sequestration



GronwaldM@landcareresearch.co.nz

HicklingG@landcareresearch.co.nz

Any questions?