RESTORING BALANCE?

Exploring invertebrate response to mice removal at the Brook Waimarama Sanctuary

University of Otago
ŌTĀKOU WHAKAIHU WAKA

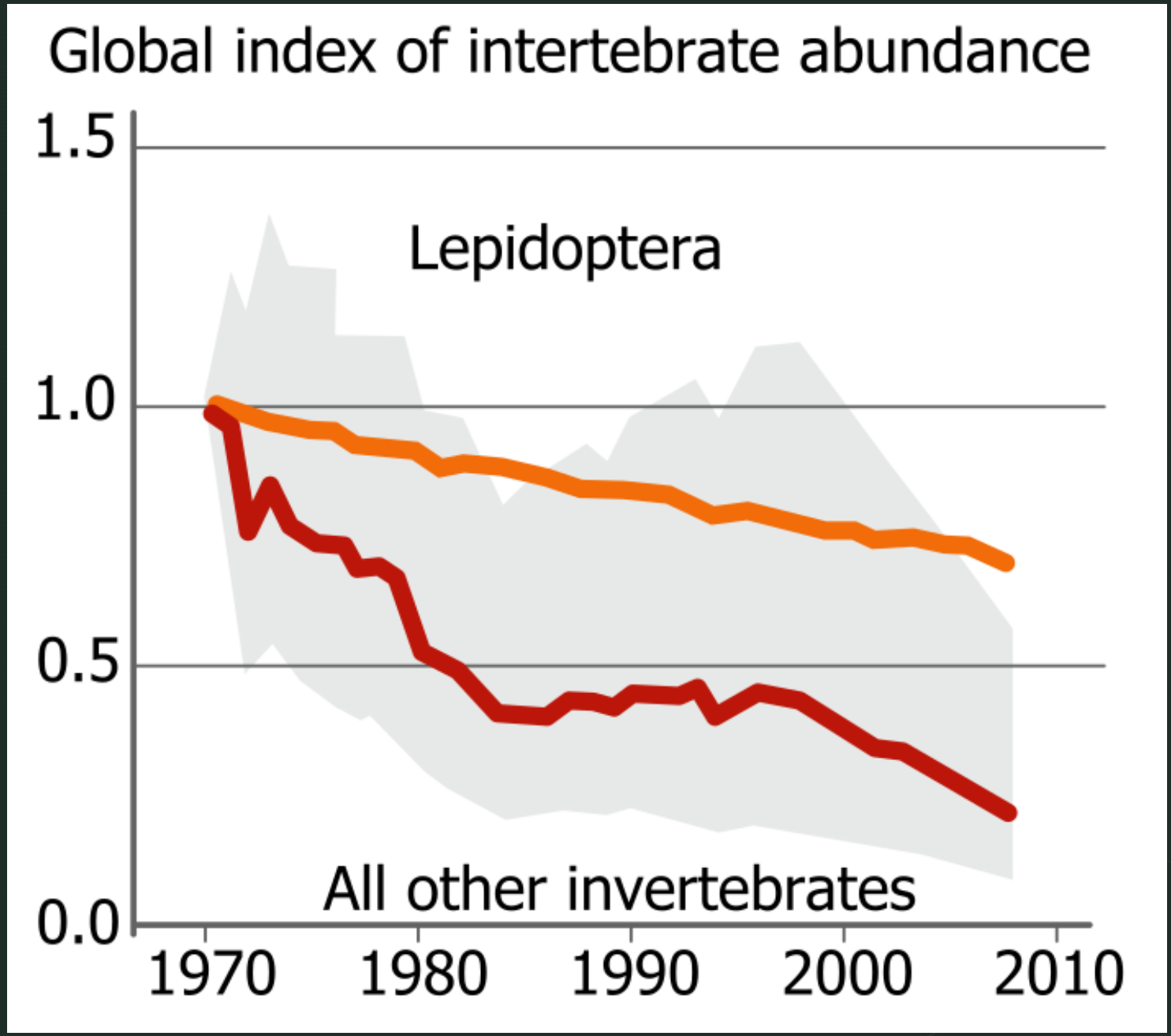
THE Brook Waimārama Sanctuary
NELSON NEW ZEALAND

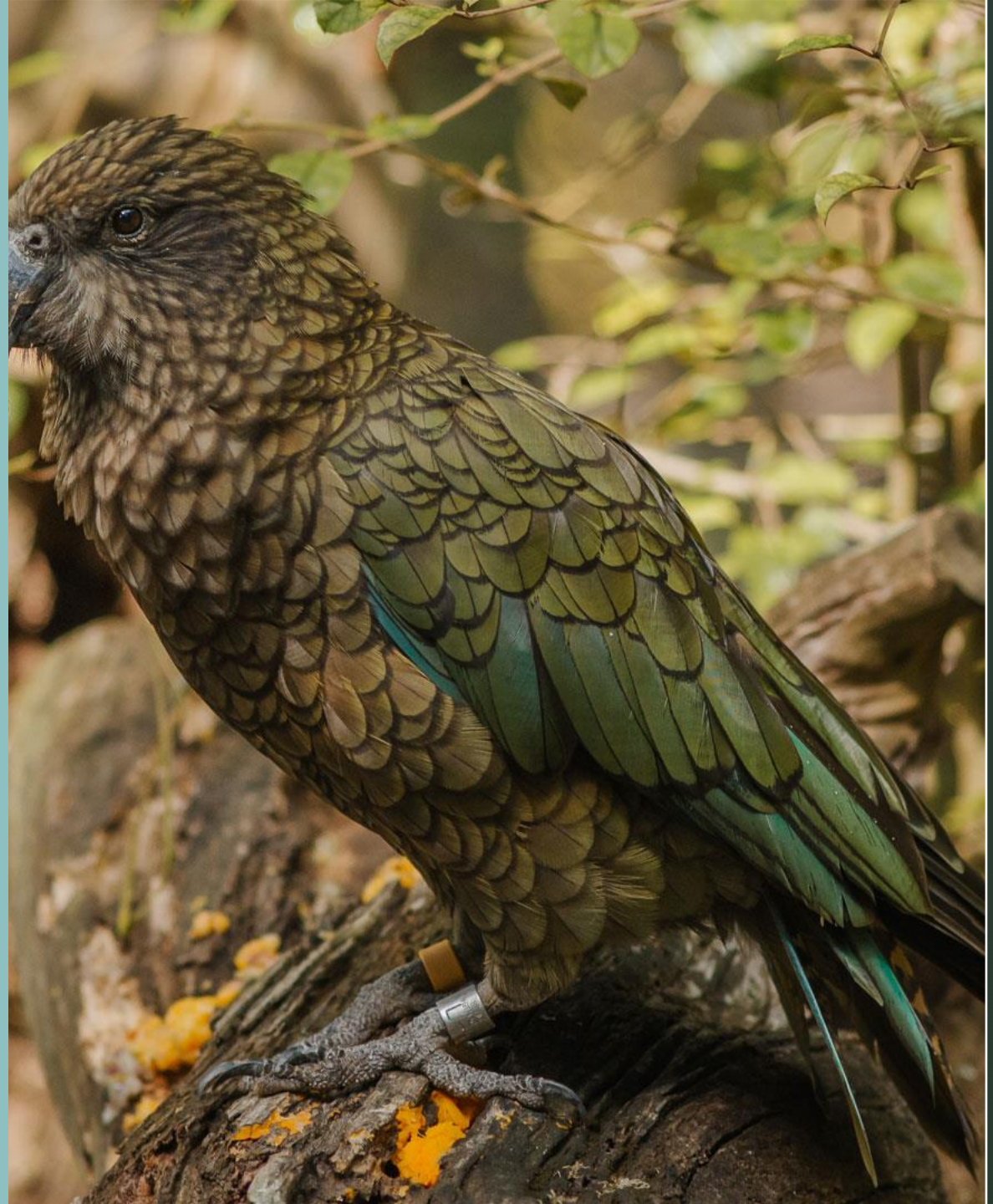
AGENDA

- The Global Invertebrate Decline & Conservation in New Zealand
- The Brook Waimarama Sanctuary and my project.
- Part 1: Pitfall trapping
  - Methods
  - Results
- Part 2: Tracking Cards
  - Methods
  - Results
- Conclusions

GLOBAL INVERTEBRATE DECLINE

- Bedrock of earth's terrestrial systems.
- 40% of Insect Species threatened with Extinction
- Pesticides, habitat degradation, introduced predators


Global index of intertebrate abundance
1.5
1.0
0.5
0.0
Lepidoptera
All other invertebrates
1970
1980
1990
2000
2010



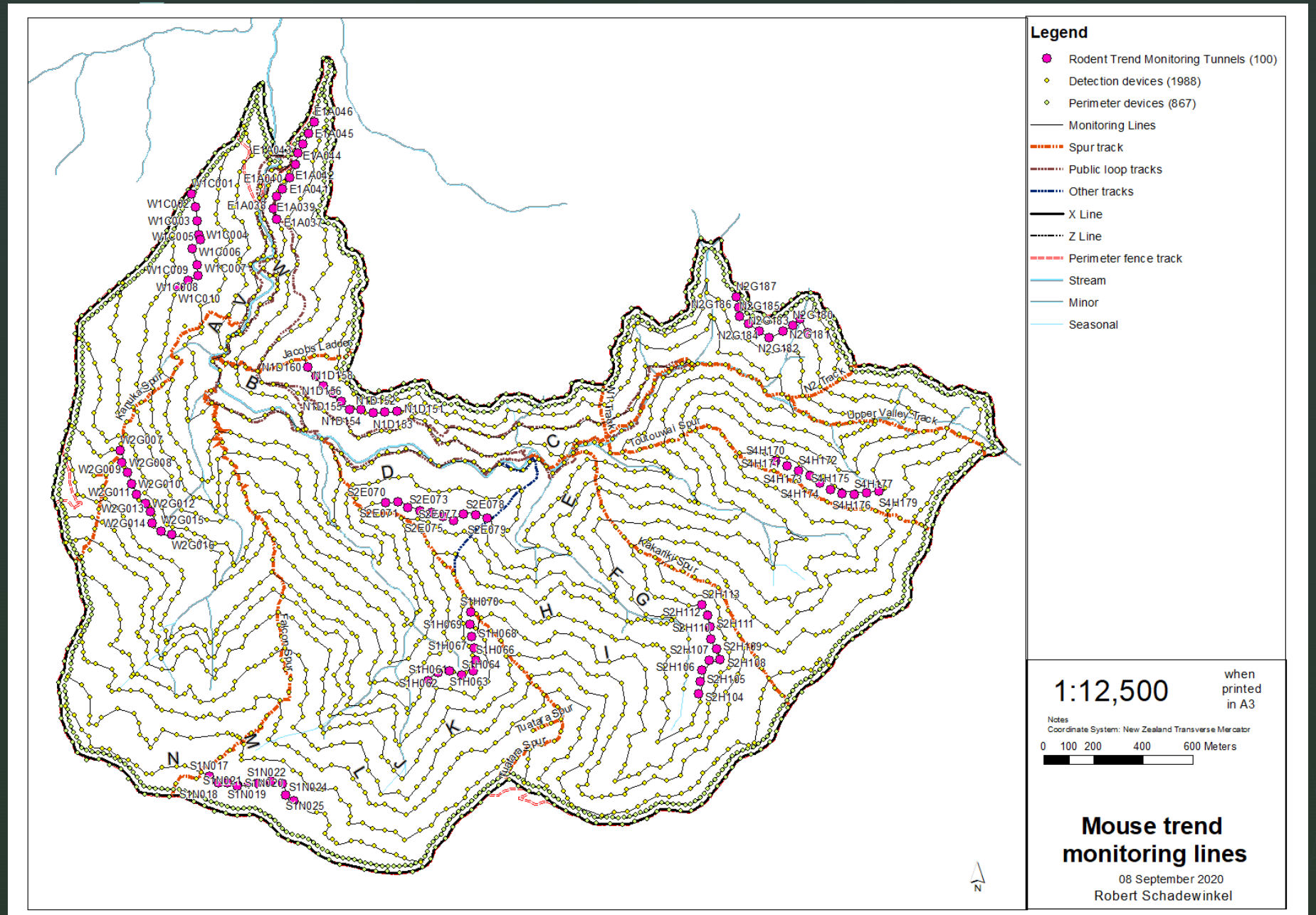
CONSEVATION AND INVERTEBRATES IN NEW ZEALAND

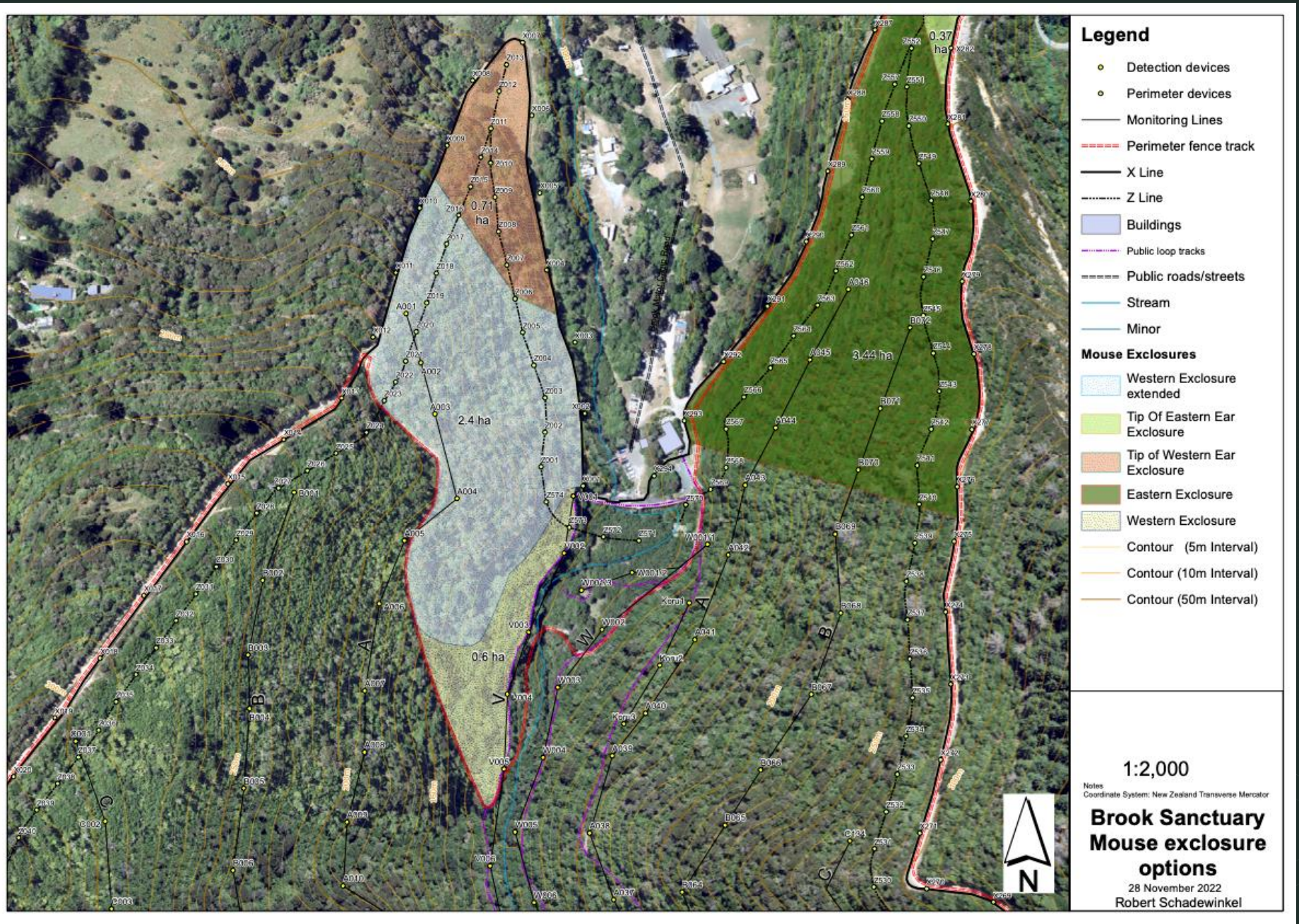
- 51 extinct species of birds
- Focused on the control of rats, possums stoats etc.
- Mice now seen as more of a threat

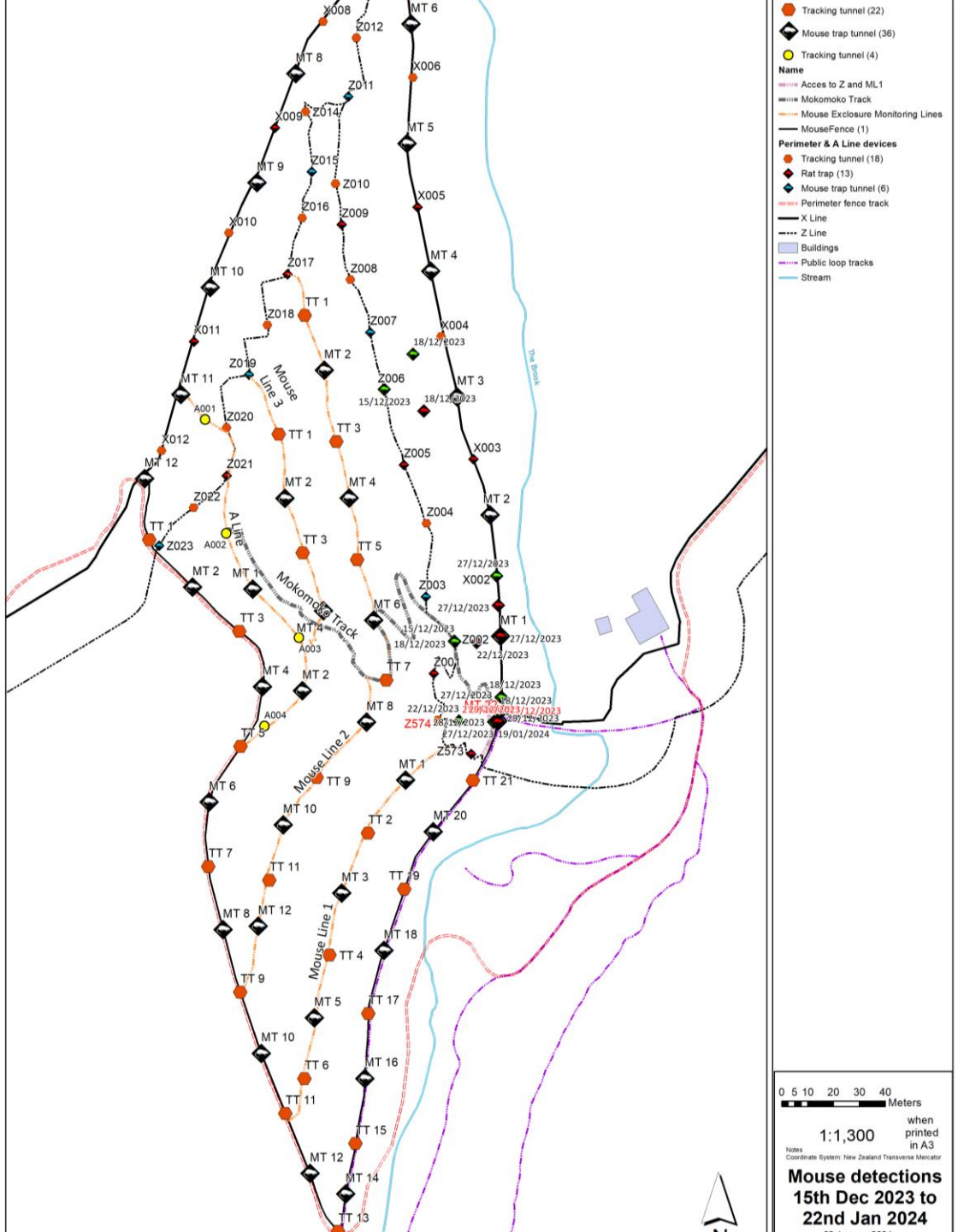
The Brook Waimarama Sanctuary

- 690 Hectares
- 14km of fence-line
- 100-870m above sea-level
- Surrounded by continuous Beech Forest

MOUSE PROOF AREA




Legend
Detection devices
Perimeter devices
Monitoring Lines
Perimeter fence track
X Line
Z Line
Buildings
Public loop tracks
Public roads/streets
Stream
Minor
Mouse Exclosures
Western Exclosure extended
Tip Of Eastern Ear Exclosure
Tip of Western Ear Exclosure
Eastern Exclosure
Western Exclosure
Contour (5m Interval)
Contour (10m Interval)
Contour (50m Interval)
0.37 ha
0.71 ha
2.4 ha
3.44 ha
0.6 ha
N
1:2,000
Notes
Coordinate System: New Zealand Transverse Mercator
Brook Sanctuary
Mouse exclosure options
28 November 2022
Robert Schadewinkel



- 3.7Ha of steep Beech Forest
- 6 Main monitoring lines
  - 590m of monitoring tracks
- Over 100 tracking tunnels
- Combination of tracking tunnels, rat traps and mouse trap tunnels.

MOUSE PROOF AREA

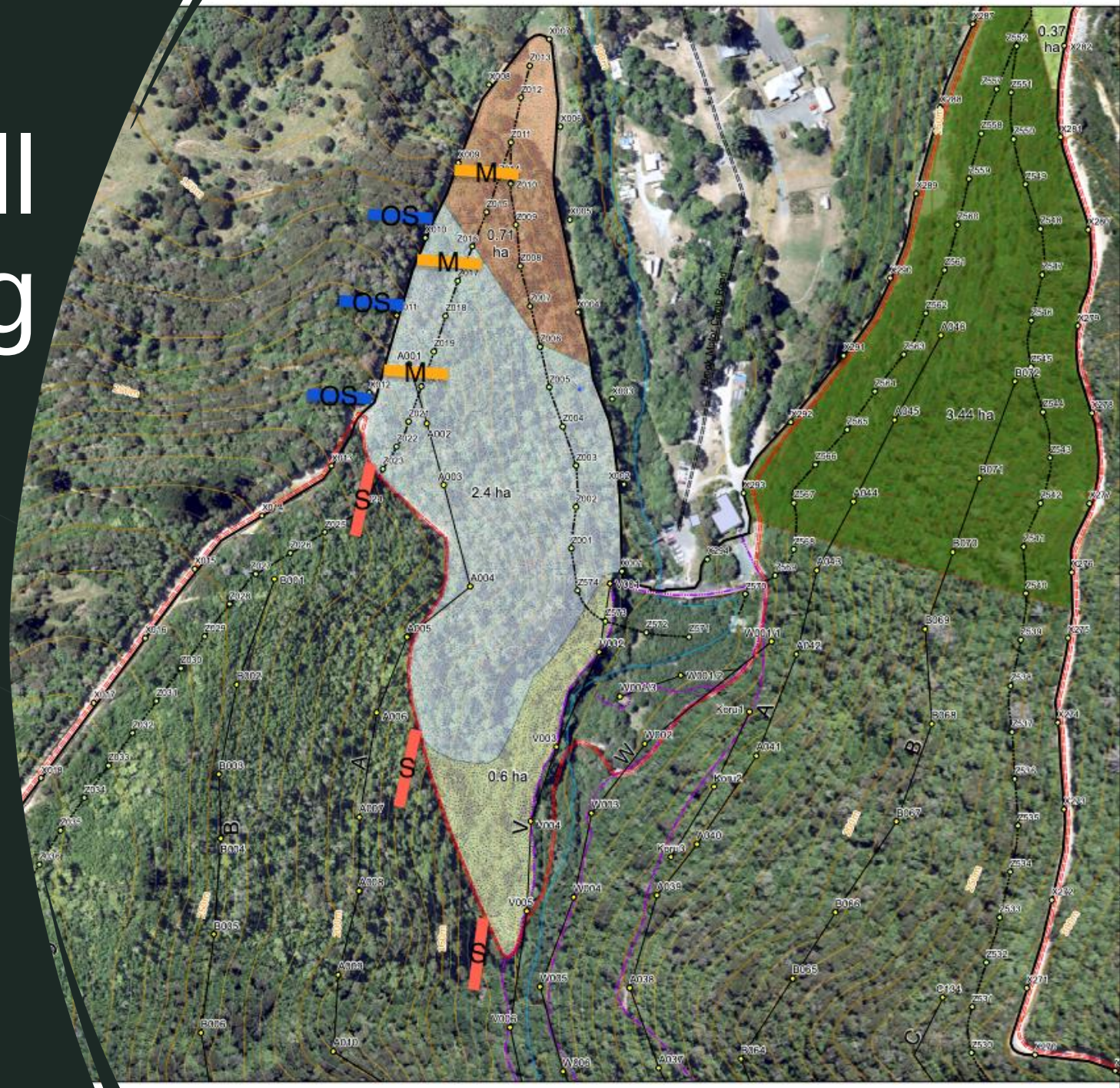
- Eradicated using bait stations and trapping
- Mouse incursion following this
- Mouse-free since February 2024

How does mice predation impact invertebrate community composition

- **Part 1: Pitfall Trapping**
  - To understand the impact of the removal of mice on invertebrate community composition
- **Part 2: Tracking Tunnels**
  - To understand the spatial relationship between Mice and Wētā

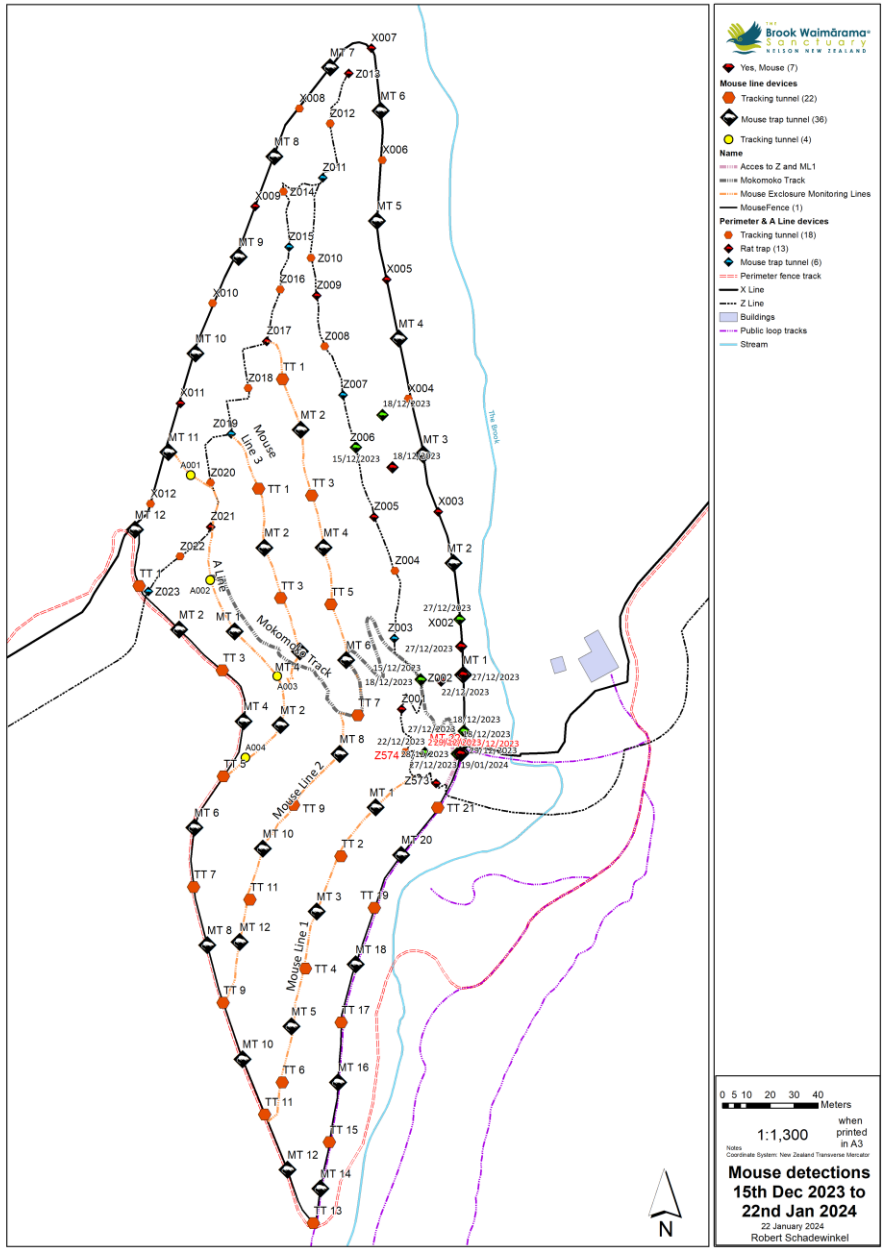
Part 1 - Pitfall Trapping

- **3 study areas**
  1. **M: Inside the Mouse fence**
  2. **S: Inside the Sanctuary**
  3. **OS: Outside the Sanctuary**



Pitfall Trapping Methods

- 3 Areas
- 3 Transect lines per area
- 10 Pitfall traps per transect
- Roughly 10m between each pitfall trap
- 4 Sampling trips
  - February 23, October 23, February 24, May 24.



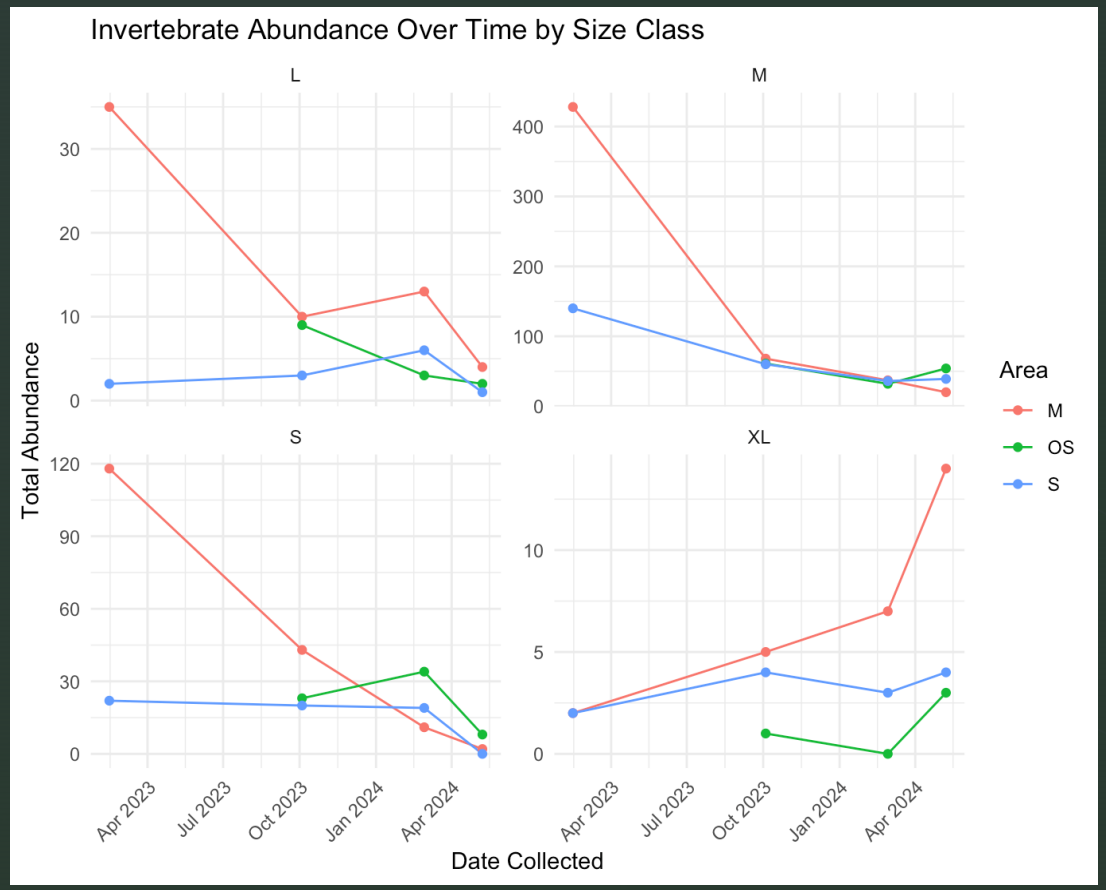
Part 2 – tracking tunnels

- 6 Main monitoring lines
  - 590m of monitoring tracks
- Over 100 tracking tunnels
- Combination of tracking tunnels, rat traps and mouse trap tunnels.

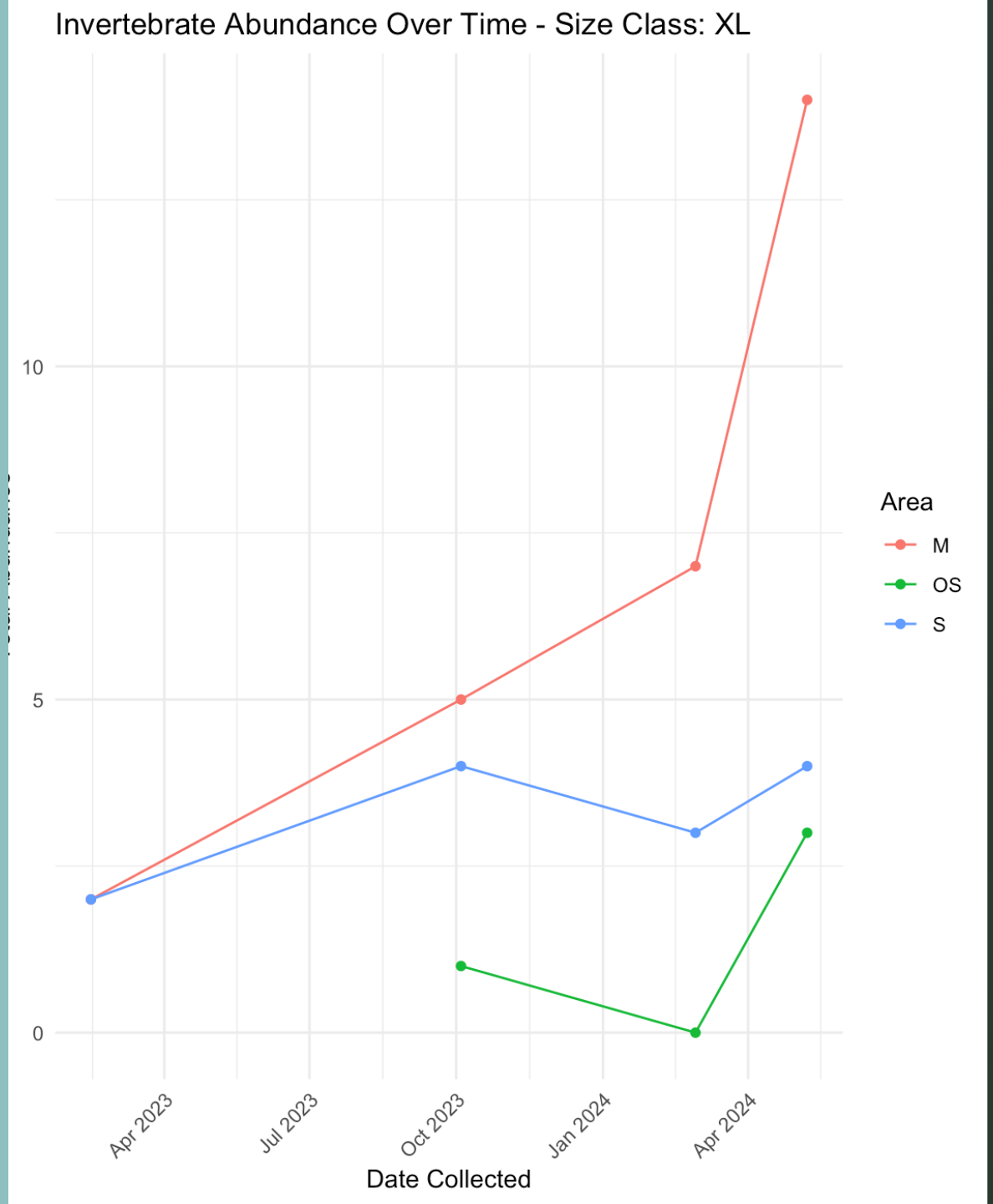
Tracking tunnel methods

- Data ranges from April 2022 – April 2024
- 1790 Cards collected
- Deployed for 5-10 days

Pitfall trapping results



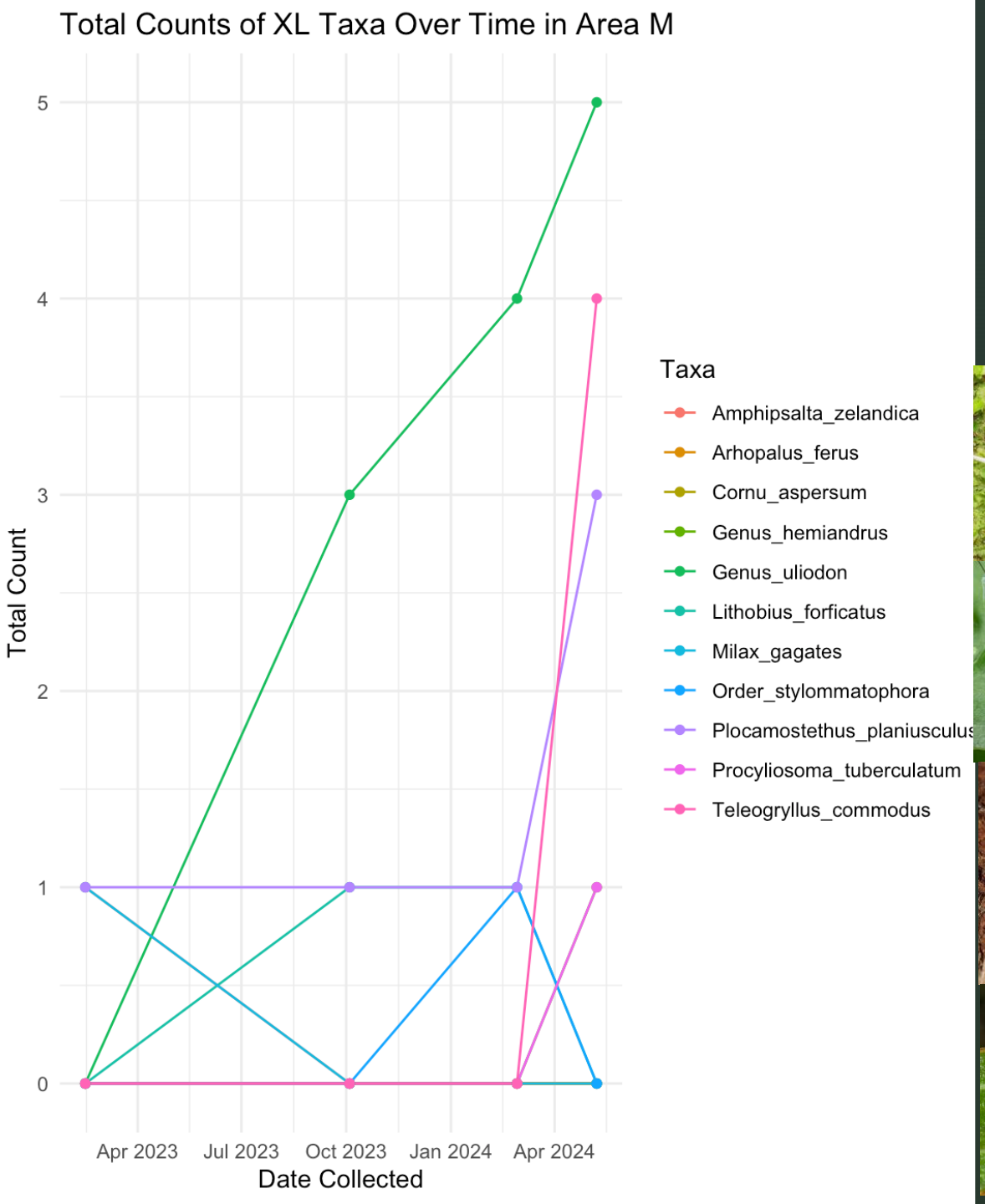
- Increase in large bodied Invertebrates in the mouse-proof area
- general decrease in smaller invertebrates within the mouse-proof area
- Reasonably stable results across the other areas.

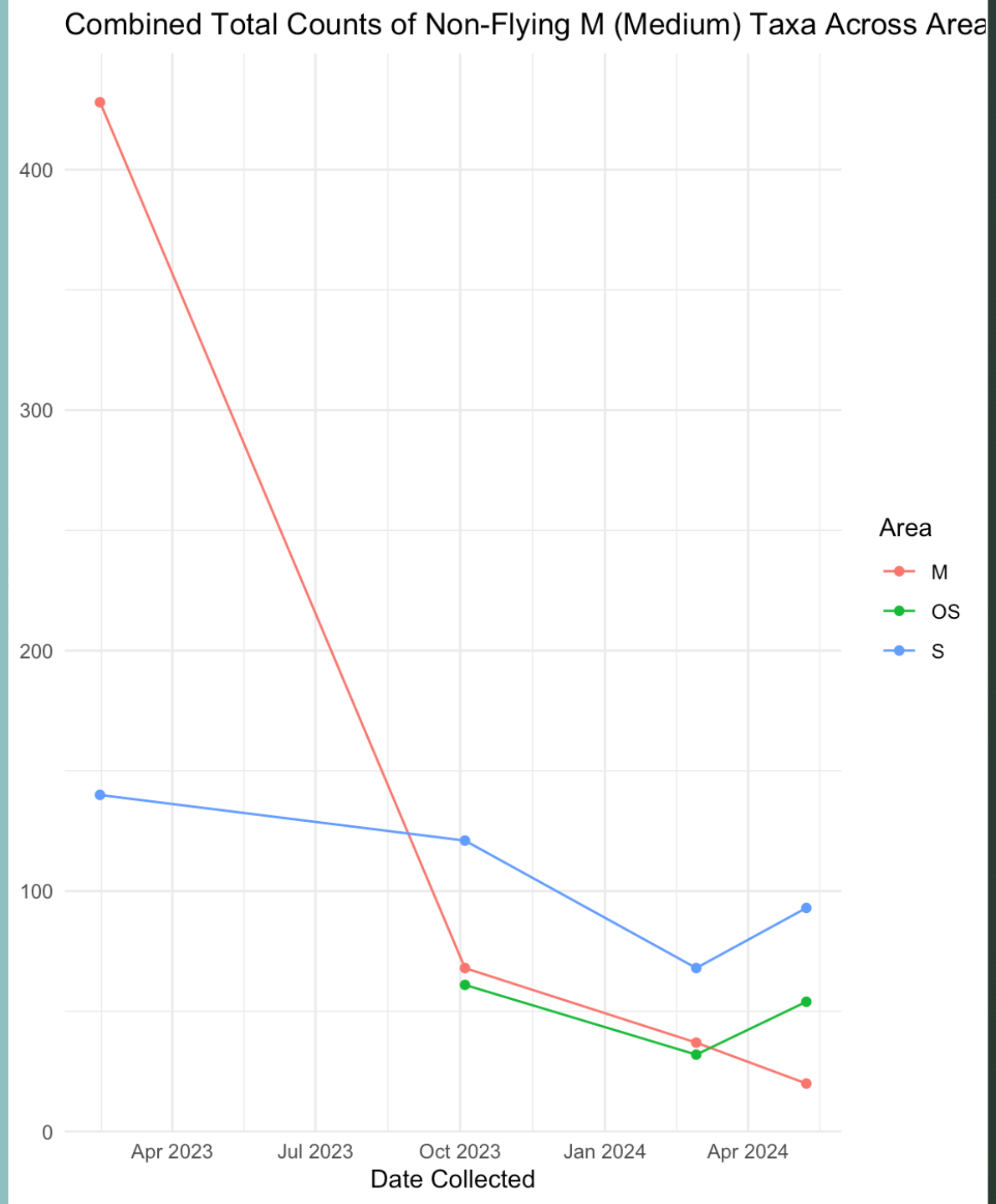


Pitfall trapping results XL (30mm<) Taxa

- Sharp Increase in XL taxa within the Mouse proof area
- Stable results across both within the sanctuary and outside

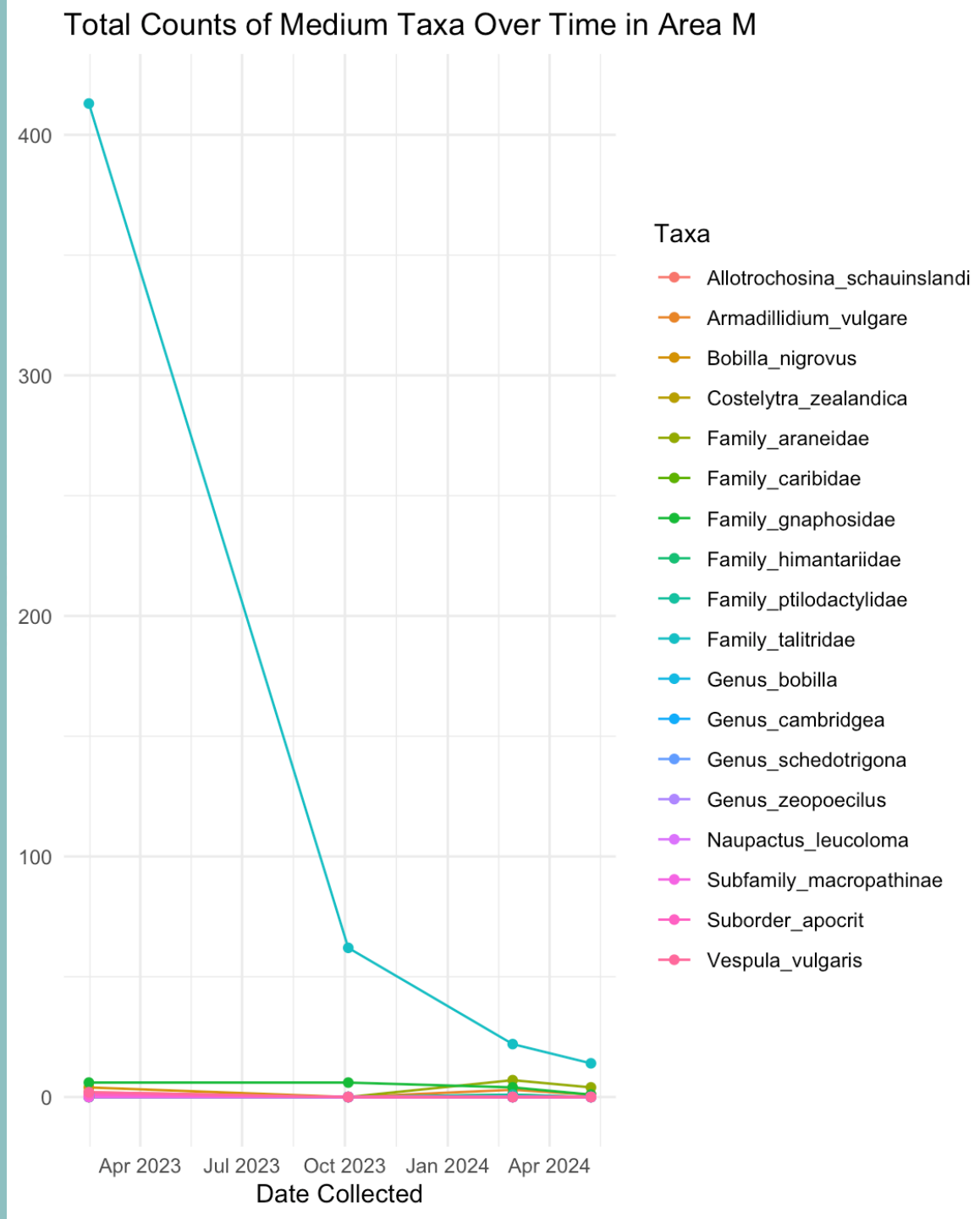
XL (Greater than 30mm) Taxa in Mouse Proof area





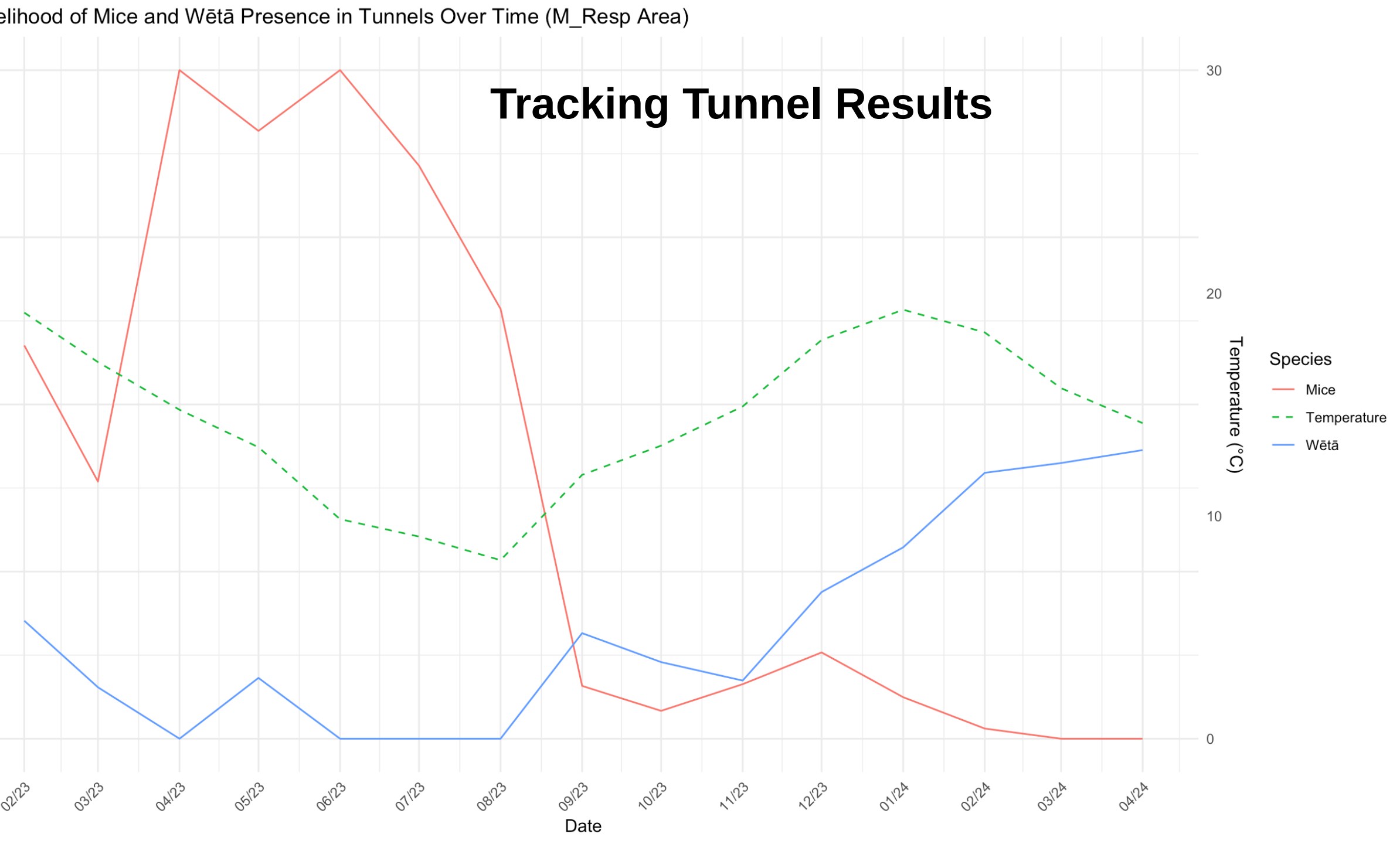
Pitfall trapping results M (15-20mm) Taxa

- Sharp decrease in M taxa within the Mouse Proof area
- Relatively stable results within other two areas

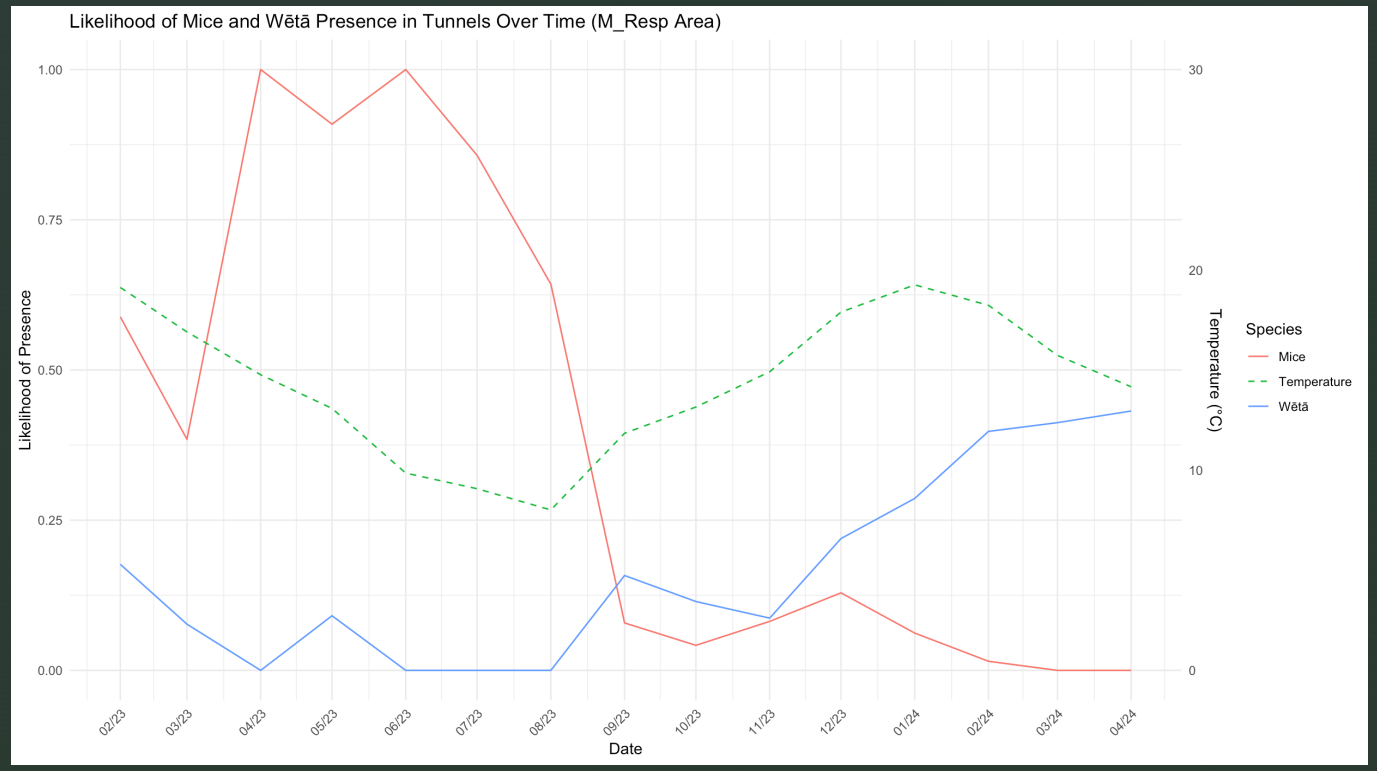


M (15-20mm) Taxa in Mouse proof area

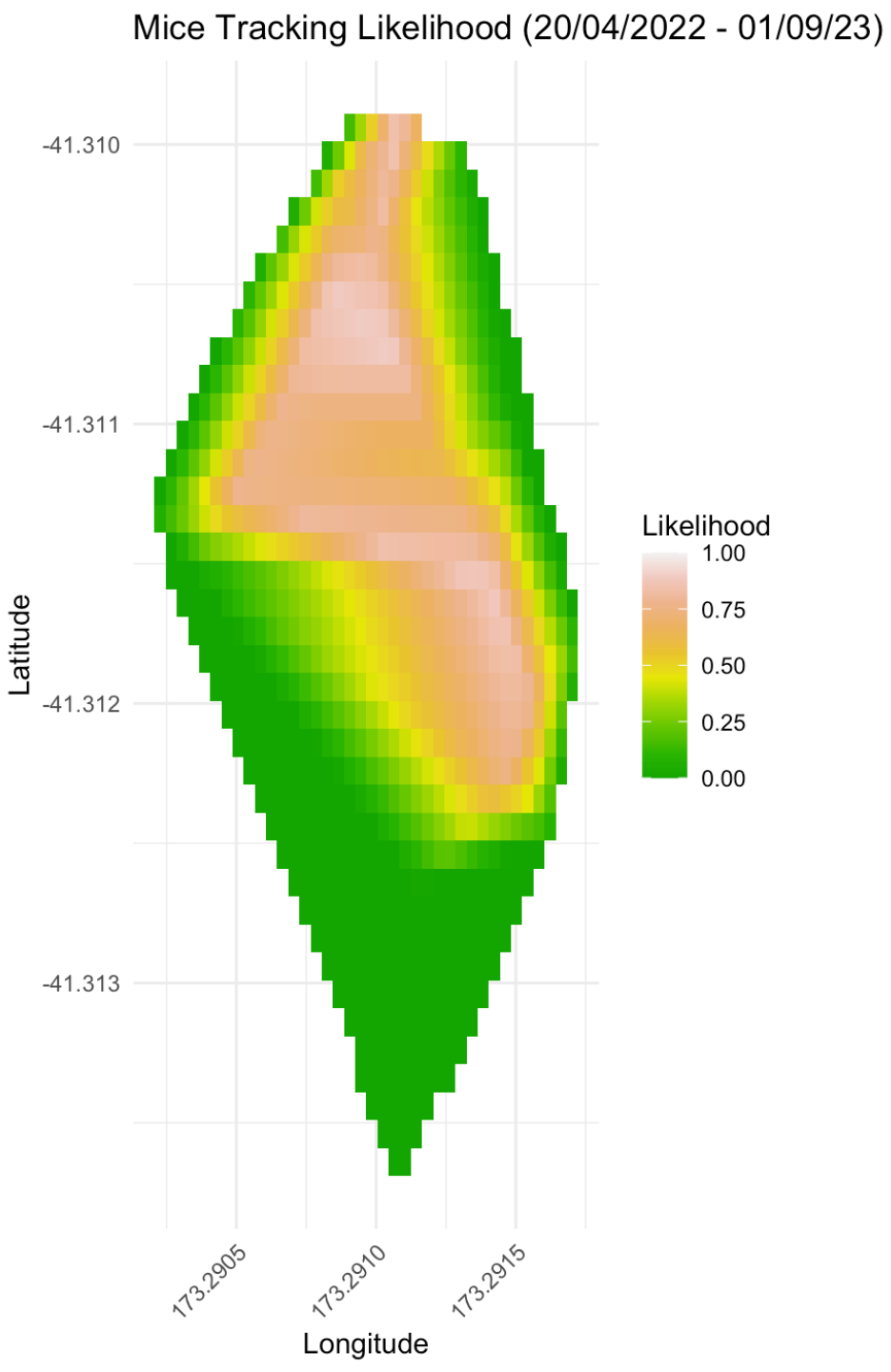
- Sharp Decrease in land Hoppers
- Stable counts of other taxa


elihood of Mice and Wētā Presence in Tunnels Over Time (M_Resp Area)
Tracking Tunnel Results
30
20
10
0
Temperature (°C)
Species
Mice
Temperature
Wētā
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
10/23
11/23
12/23
01/24
02/24
03/24
04/24
Date

Tracking tunnel results

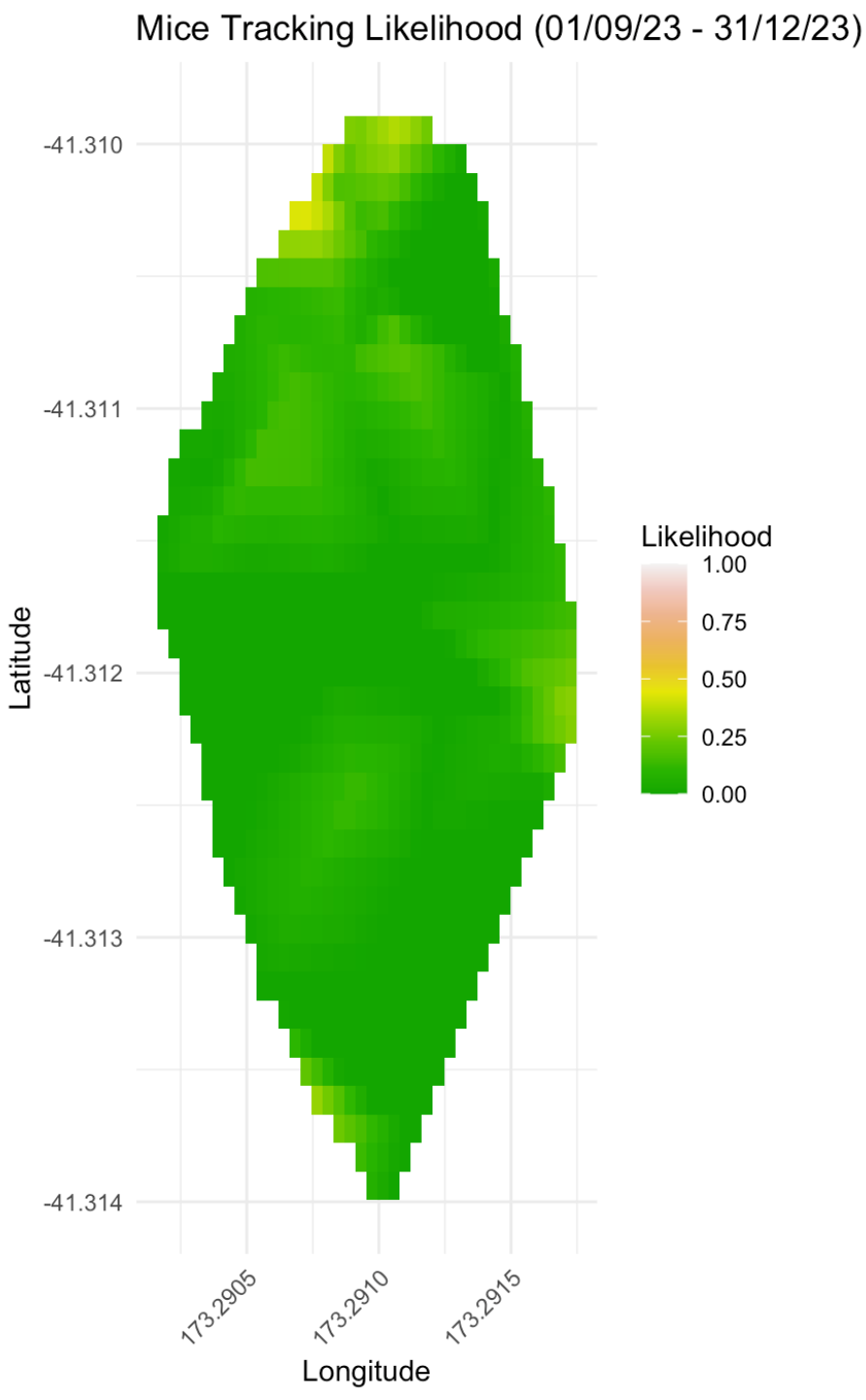


- Mice tracking rates go from 100% to 0%
- Wētā tracking rates go from 13% to 40%
- Temperature has large effect on Wētā



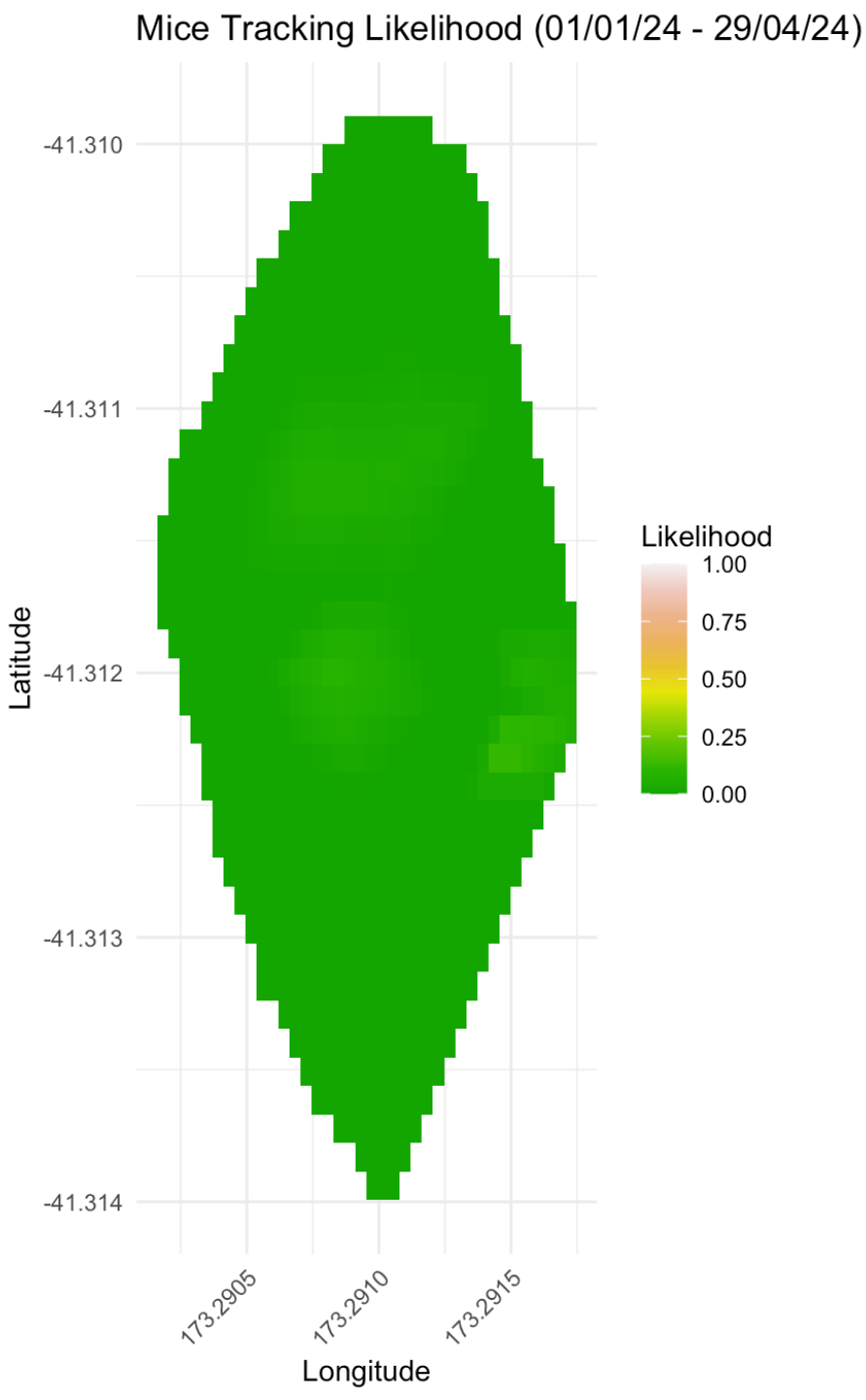
Mice Tracking 20/4/2022-01/09/2022

- 90-100% Tracking rates of Mice within fenced area prior to fence
- Limited data/tunnels prior to fence



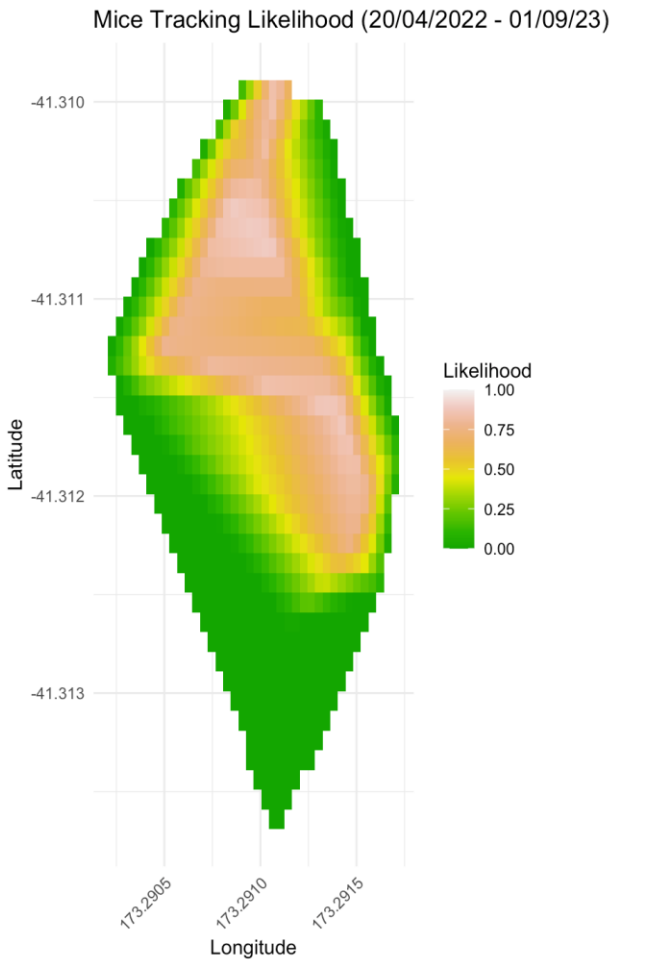
Mice Tracking 01/09/2023-31/12/23

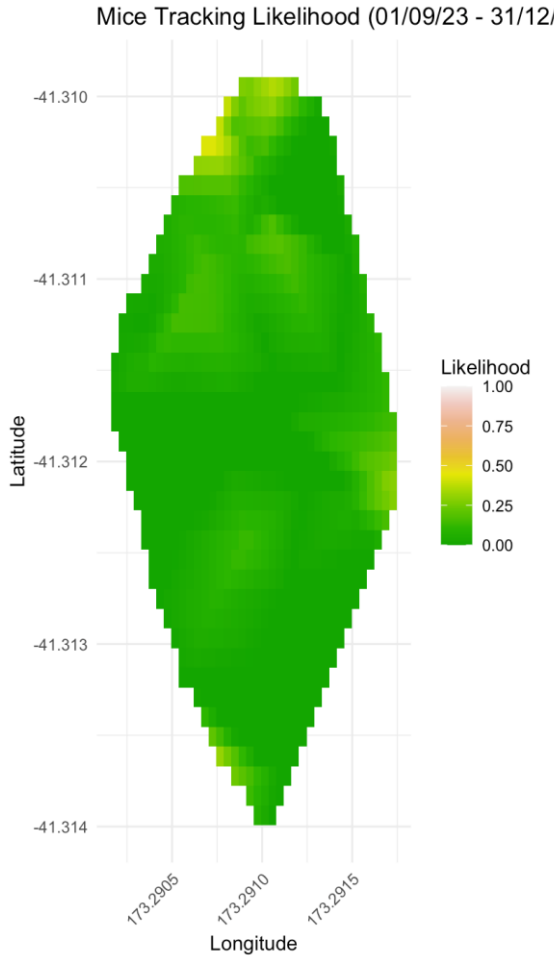
- 5-10% tracking of Mice across the whole area
- Far more lines/tunnels implemented after fence



Mice Tracking 01/01/2024-29/04/2024

- Near 1% Tracking of Mice across whole area from January 2024
- 0% tracking from February 2024
- Full number of tunnels implemented


Mice Tracking Likelihood (20/04/2022 - 01/09/23)
-41.310
-41.311
-41.312
-41.313
Latitude
Likelihood
1.00
0.75
0.50
0.25
0.00
173.2905
173.2910
173.2915
Longitude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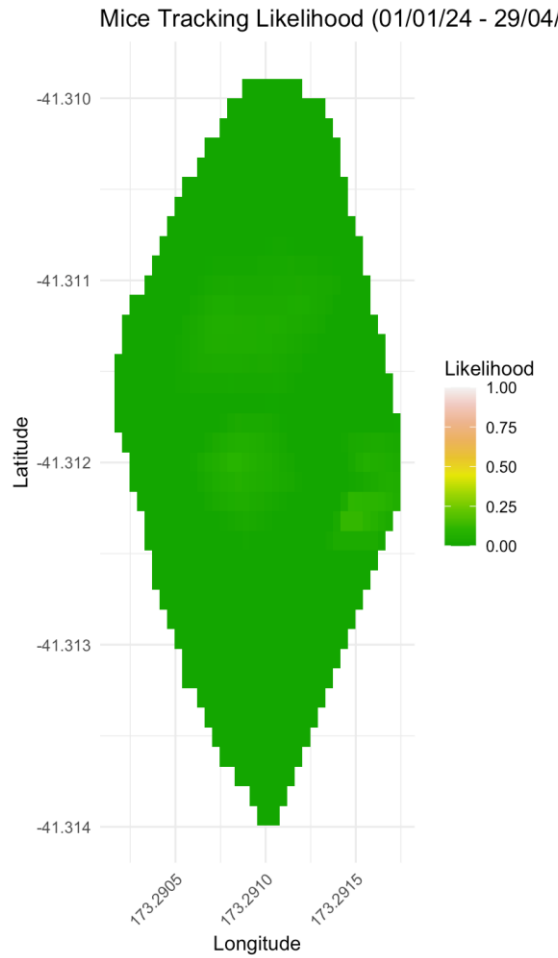
Mice Tracking Likelihood (01/01/24 - 29/04/24)
-41.310
-41.311
-41.312
-41.313
-41.314
Latitude
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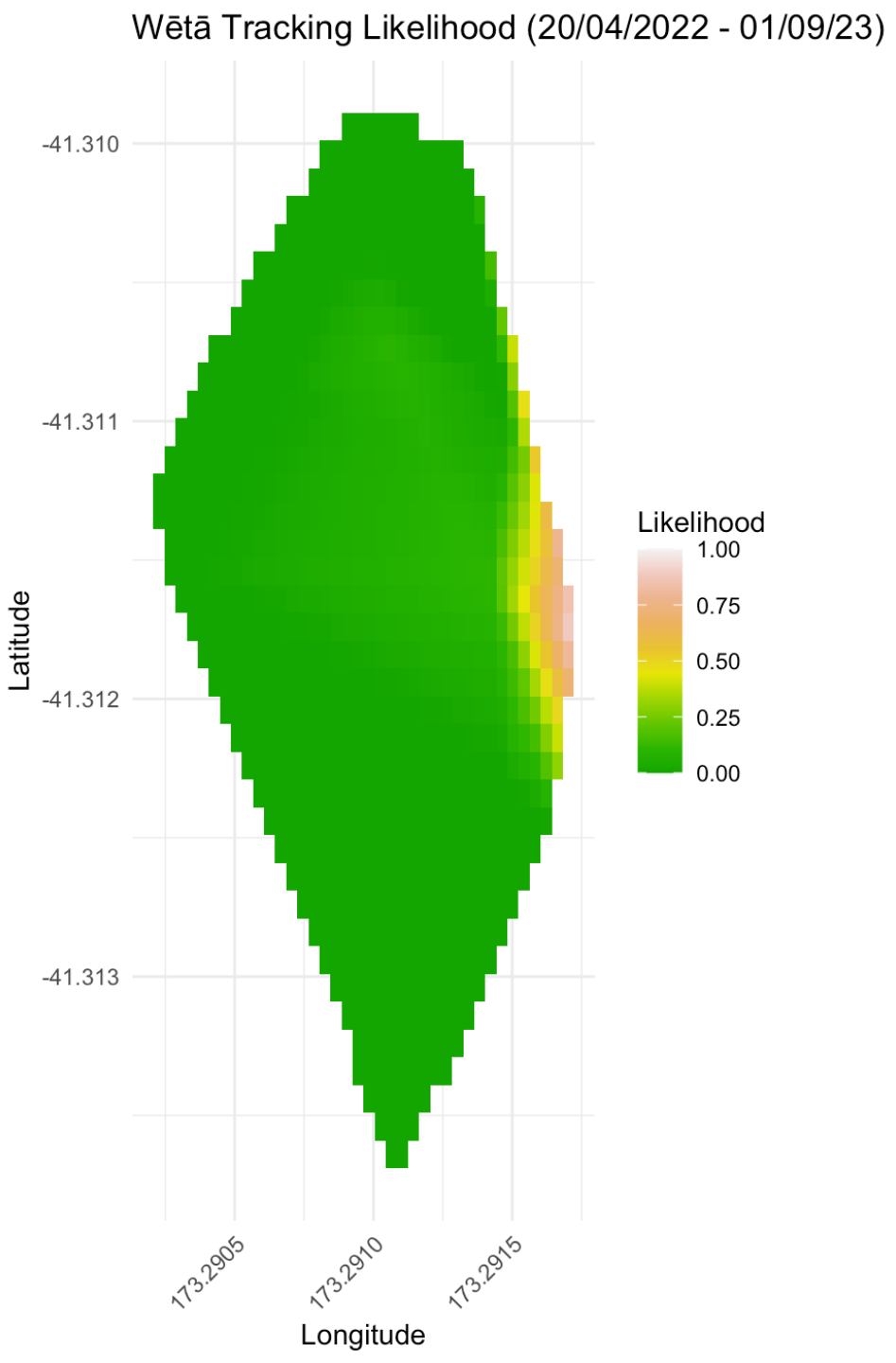
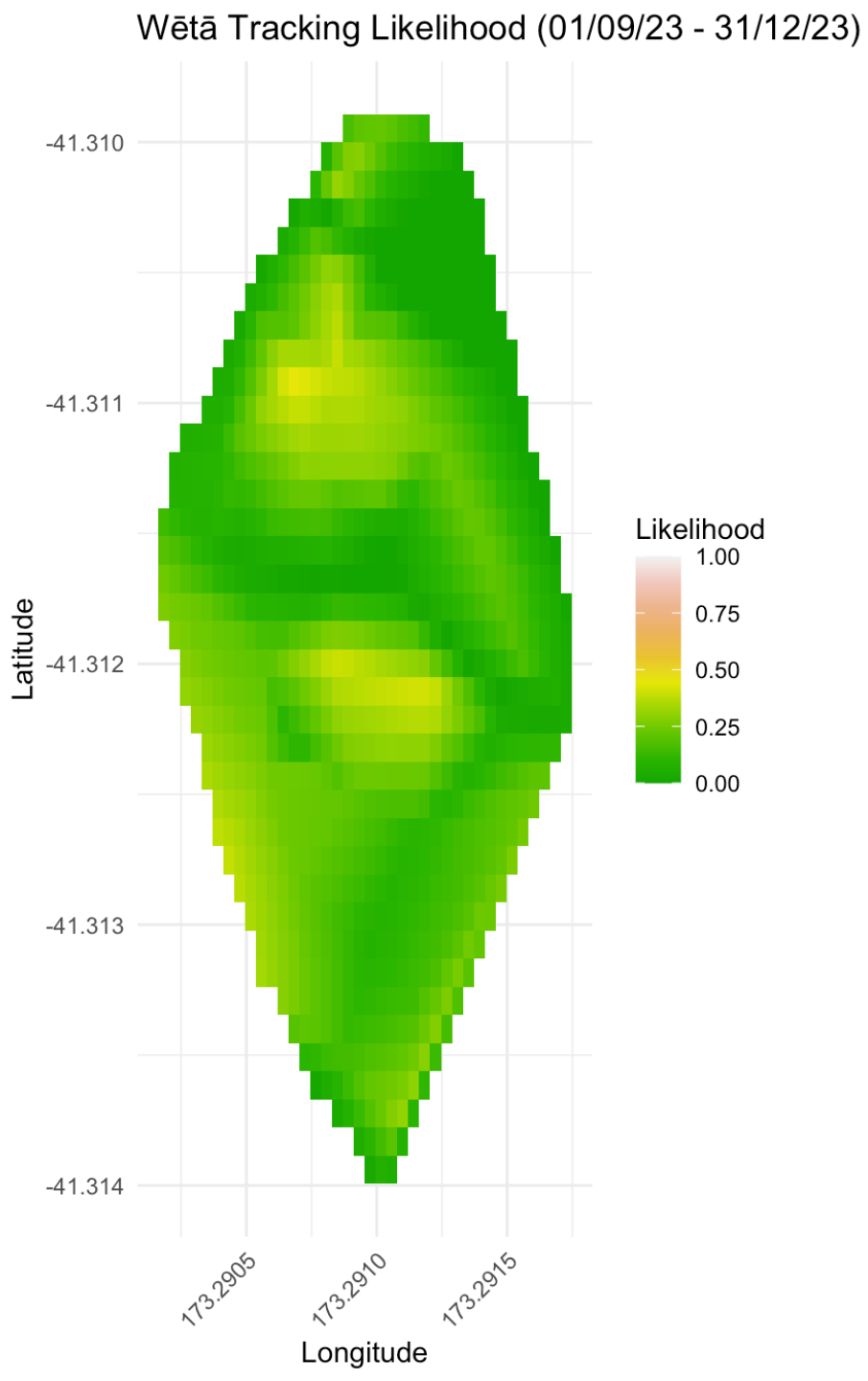


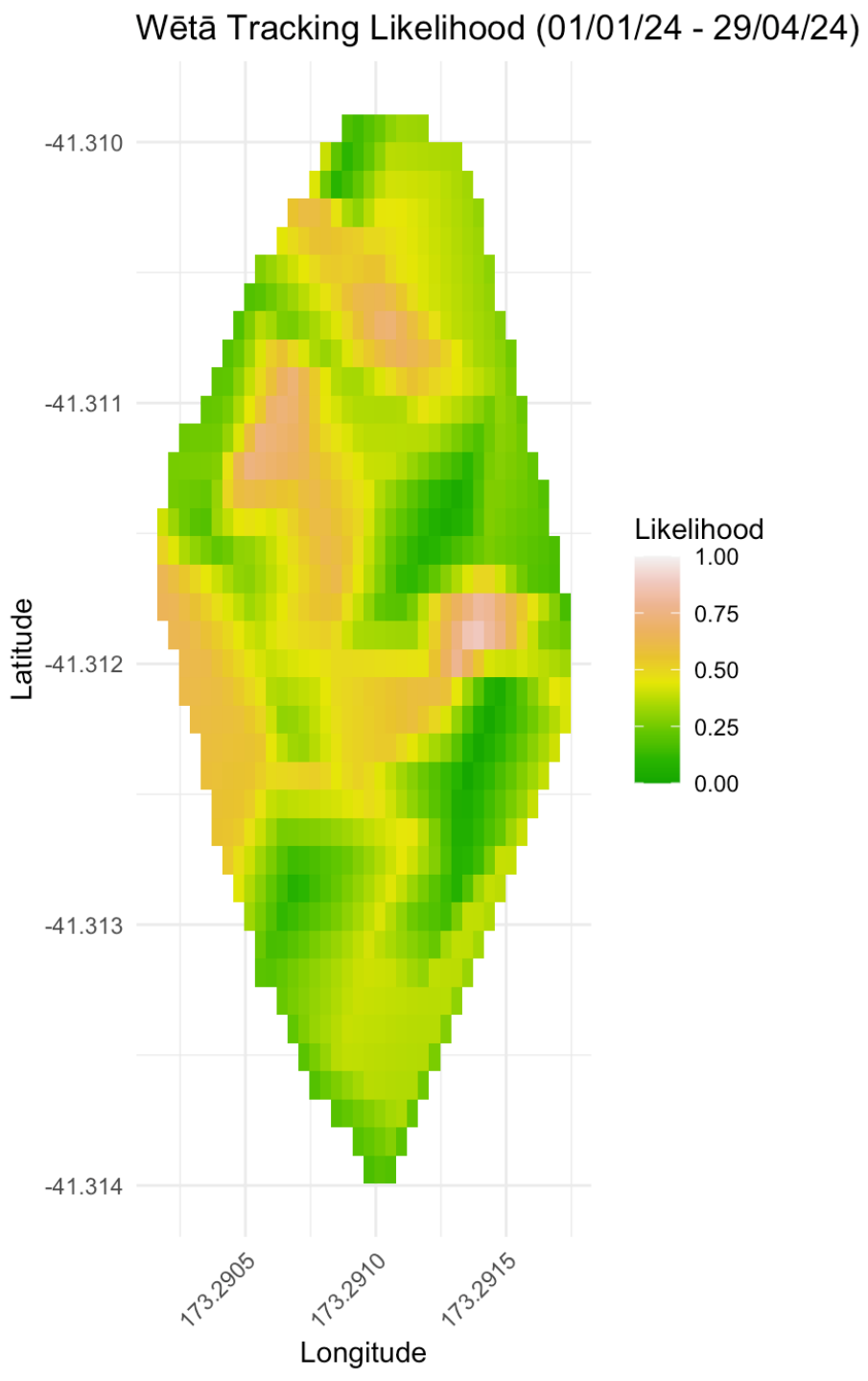
Wētā Tracking 20/04/2022-01/09/2023

- Low number of tunnels/data for detection
- High tracking rate in certain areas due to low sample size
- <5% tracking rate



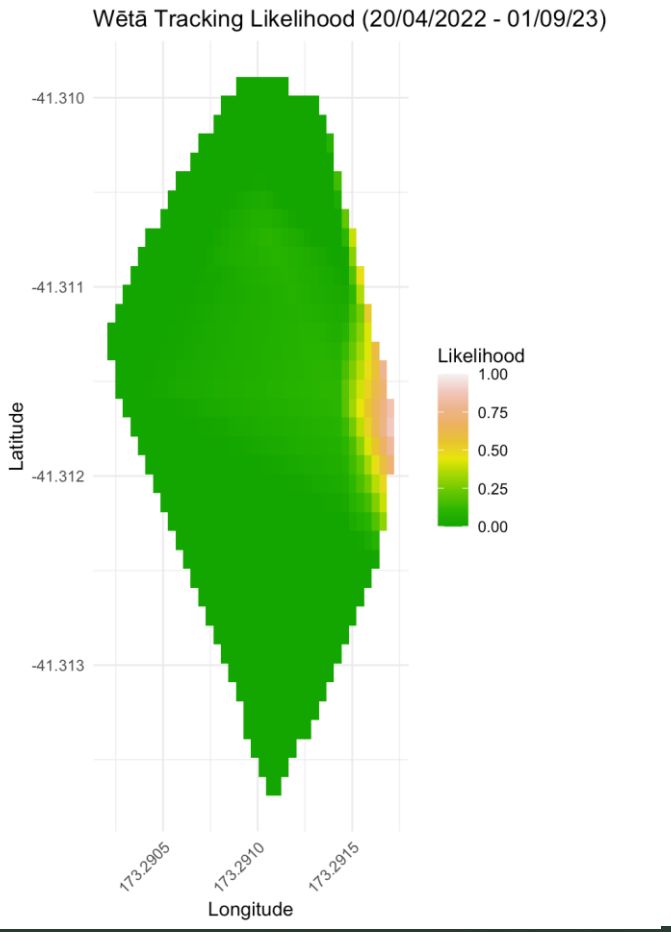
Wētā Tracking 01/09/2023-31/12/23

- Greater number of tunnels implemented for tracking
- 10-20% tracking rate across whole area



Wētā Tracking 01/01/24-29/04/24

- All tracking tunnels and lines now implemented
- Average 40% tracking across whole area of Wētā
- Some areas as high as 90%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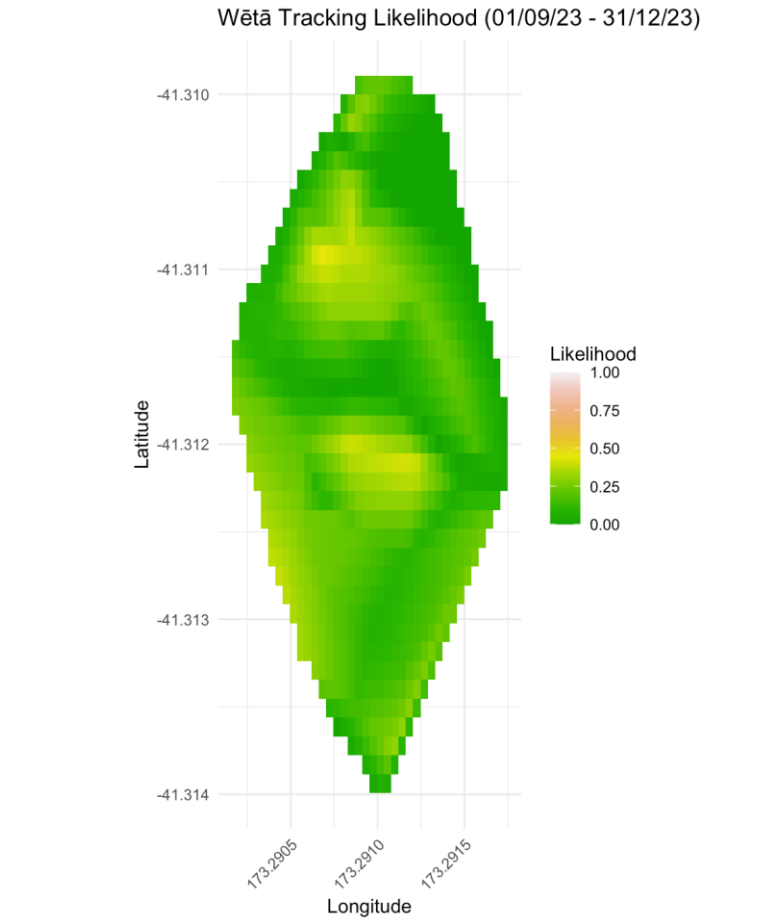
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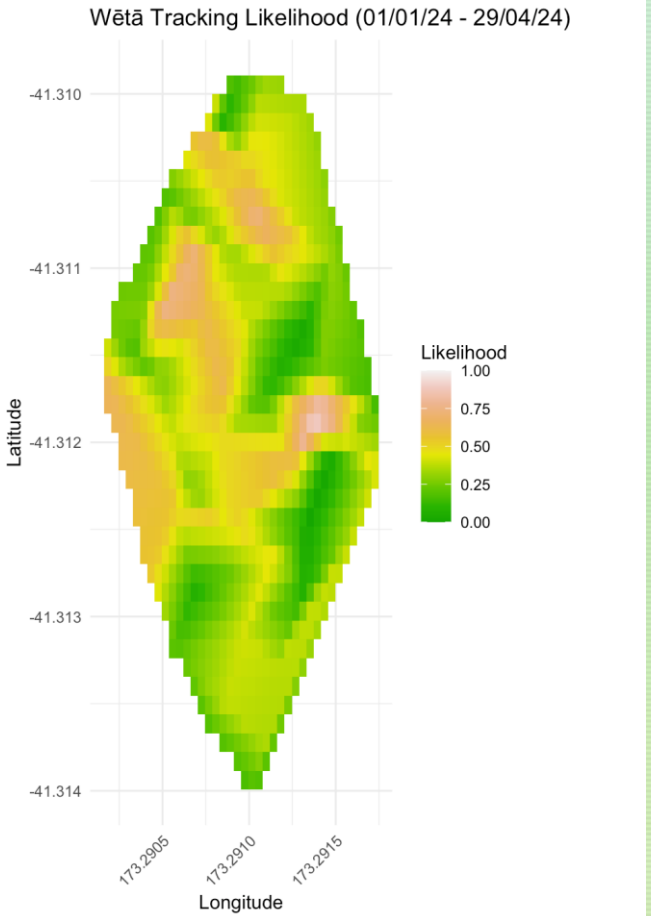
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0.25
0.00
173.2905
173.2910
173.2915
Longitude

SUMMARY OF RESULTS

- Very successful mice eradication
- Increase in XL Invertebrates within mouse-free area
- Decrease in smaller invertebrate taxa
- Sharp increase in Wētā following mice eradication
  - Temperature will have played large part.

IMPLICATIONS

ACKNOWLEDGEMENTS

- The Brook Waimarama Sanctuary Staff and Volunteers
- Robert Schadewinkel
- Nick Robson
- Jo Monks
- The University of Otago

NGĀ MIHI NUI

ANY QUESTIONS?