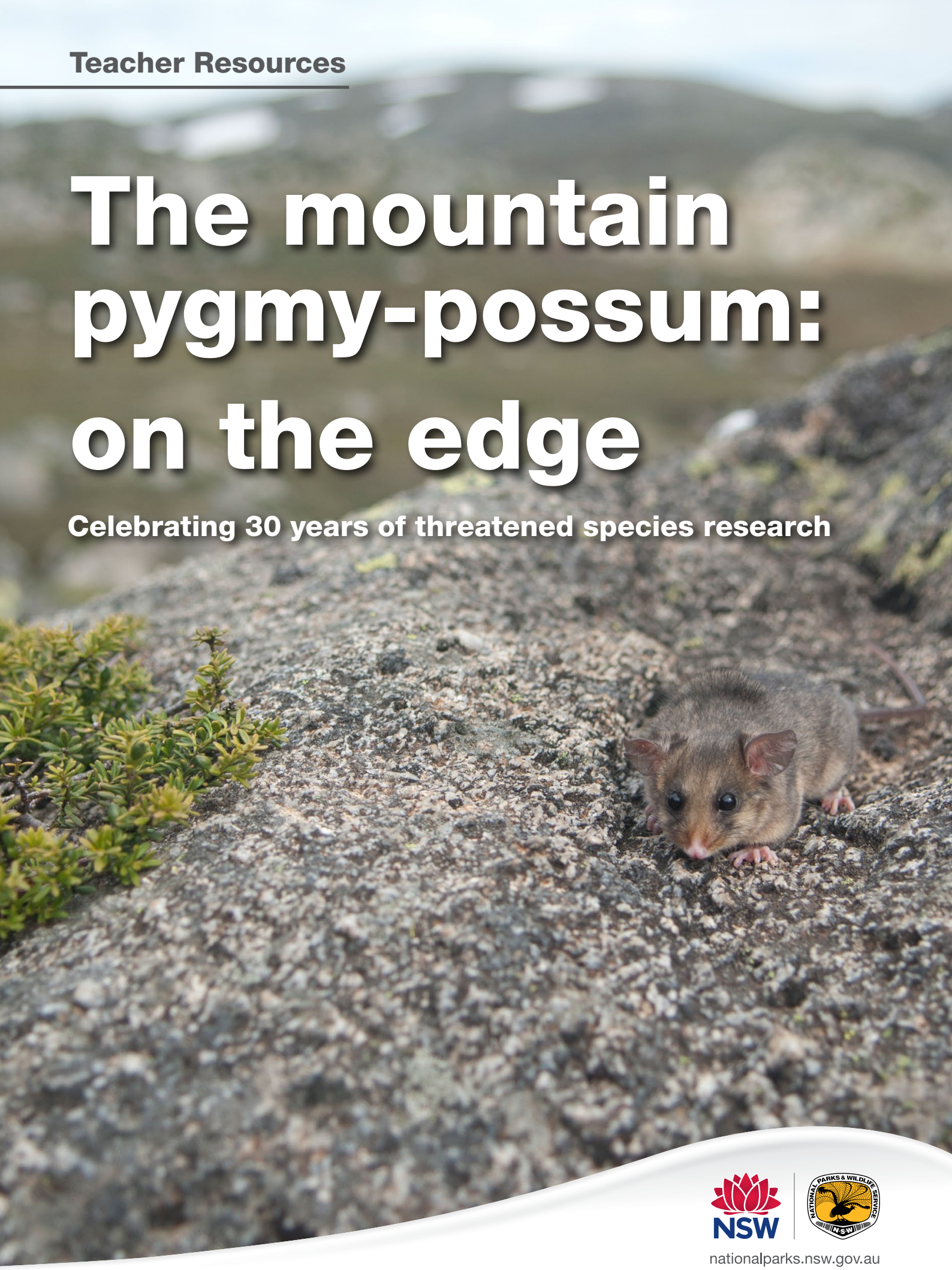
Teacher Resources

The mountain pygmy-possum: on the edge

Celebrating 30 years of threatened species research



NSW National Parks & Wildlife Service

nationalparks.nsw.gov.au

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Mountain pygmy-possum, Kosciuszko National Park. (Dan Nicholls)

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ABOUT THIS RESOURCE

The Mountain pygmy-possum: on the edge Student Workbook, online geographic information system tool and the Teacher Resources supports the study of:

- Biophysical Interactions (preliminary course)
- Ecosystems at Risk (HSC course)

The Geographical Information System (GIS) and Capture-Mark-Recapture (CMR) surveys are valuable geographical inquiry methodologies.

Students will learn to interpret visual data by using GIS to examine spatial and ecological issues relevant to the protection and management of ecosystems.

Biophysical Interactions

As part of a case study of biodiversity in the alpine environment.

Students will:

- identify geographical methods applicable to, and useful in the workplace
- be able to illustrate how an understanding of biophysical processes contributes to sustainable management in the environment.

The investigation will include:

- identification and explanation of the key biophysical processes which relate to the issue
- scale of operation
- interactions with other components of the biophysical environment
- the sensitivity of the biophysical environment to change
- the importance of understanding key biophysical processes for effective management

Ecosystems at Risk

The tasks may be integrated into the study of ecosystems and their management and could be part of an Alpine case study.

Students will:

- be able to identify geographical methods applicable to and useful in the workplace, such as constructing environmental maps and compiling environmental impact reports.
- understand the relevance of ecosystems at risk to a particular vocation such as managing a national park and guiding tourist groups as well as ecological mapping for research and cross-government programs such as Saving Our Species.

Following these tasks, the students should discuss the methods, evaluate them and consider if the methods are justifiable.

Contact and feedback

We would be grateful to learn of any issues or challenges you may have using the resource and for any other feedback. If you have any questions please contact us via

Kosci.Education@environment.nsw.gov.au

Glossary

There is a glossary at the back of the Student Workbook. Look for the g within the document text of the Student Workbook.

Mountain pygmy-possum (Linda Broome)

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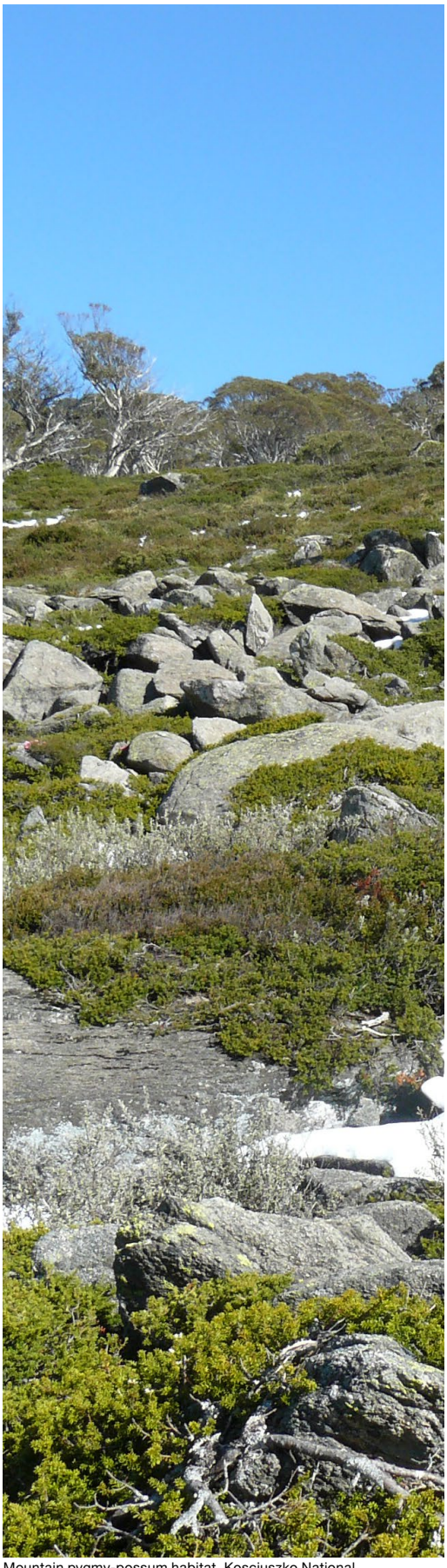

Mountain pygmy-possum habitat, Kosciuszko National Park. (Mel Schroder)

TASK ONE

GIS TASK - WORKSHEET

The GIS Viewer for this task is located http://webmap.environment.nsw.gov.au/PlanningHtml5Viewer/?viewer=MPP

PART ONE

study area	STEP ONE		STEP TWO		STEP THREE
	altitude	rank	temperature	rank	OVERALL RANK
Byron	1280 m	5	14.0-15.1°C	5	*5*
Happy Jacks	1640m	3	10.5 - 11.6°C	3 or 4	3
Farm Ridge	1620m	4	10.5 - 11.6°C	3 or 4	4
Whites River	1960m	2	9.4 - 10.4°C	2	2
Charlotte Pass	2040m	1	8.2 - 9.3°C	1	1

Rank 1-5, the highest/coldest site = 1 and the lowest/warmest site = 5

Based on your overall ranking, the study area site with the most suitable conditions is: Charlotte Pass

PART TWO

boulder field	aspect	water availability	mountain plum-pine	abundance bogong moth	boulder field depth	snow cover days	SUM RESULTS
A	East 2	2	1	3	1	4	13
B	South 1	1	2	1	3	1	9
C	North 3	1	1	2	3	7	17
D	North 3	1	6	5	4	7	26
E	South 1	3	6	3	4	5	22
F	South 1	3	6	4	5	5	24
G	South 1	1	6	5	5	6	24
H	North 3	1	3	5	4	7	23

Based on the factors investigated here, the field with the lowest total sum should offer the most suitable conditions for the species.

Priority sites to survey – Result: Sites in priority order: B, A and C

TASK ONE

FOLLOW-UP QUESTIONS

1. List the biophysical (biotic and abiotic) interactions that influence or identify suitable mountain pygmy-possum habitat.

Biophysical interaction	Sphere
e.g. Bogong moths – important source of food in the breeding season	Biosphere
e.g. Snow cover – helps prevent extremely cold winter temperatures from sinking into mountain pygmy-possum habitat	Cryosphere and Hydrosphere
Altitude – mountain pygmy-possums are cold weather specialists and depend on the cool environments found at higher altitudes	Lithosphere and Atmosphere
Aspect – influences the accumulation and duration of snow cover, and exposure to the heat associated with afternoon sunshine.	Lithosphere
Boulder fields – the rocky boulders at these sites regulate temperatures and provide shelter from predators.	Lithosphere
Mountain plum-pine – these shrubs grow among boulder fields where the rocks hold some heat from the sun. The seeds and fruits are source of food for mountain pygmy-possums.	Biosphere and Lithosphere
Water availability – water in mountain streams and stored in sphagnum bogs provide water in or adjacent to possum habitat.	Hydrosphere

TASK ONE

FOLLOW-UP QUESTIONS

2. Mountain pygmy-possum capture-mark-recapture population surveys run at Charlotte Pass reveal that boulder fields A, B & C are the most active habitats, with a recent survey returning a total abundance of A – 5; B – 45; C – 8. This confirms site B, the largest boulder field, as the most active in the Charlotte Pass area.

   However, considering population density (animals per hectare), boulder field A, though a smaller site, supports more animals per hectare than boulder field B and more than twice the number of animals per hectare than boulder field C.

   A – 21.28 animals per hectare

   B – 20.10 animals per hectare

   C – 10.13 animals per hectare

   From your understanding of habitat requirements and preferences of the mountain pygmy-possum can you identify any factors that could explain this observation?

Response

Boulder field A also has higher % Mountain plum-pine cover than site B, providing access to more food.

Boulder field A is almost 20% deeper than both sites B & C and has approx. 14 days longer snow cover than site C. The deeper boulder field provides better protection from climate extremes and may offer better protection from introduced predators.

The easterly aspect of boulder field A will accumulate more snow and hold snow cover longer, providing better protection for late winter cold temperatures when compared to the northerly aspect of boulder field C.

3. The mountain pygmy-possum is listed as an ENDANGERED animal under the Australian Environmental Protection and Biodiversity Conservation Act and the NSW Threatened Species Conservation Act. There are a variety of threats that are both natural and cultural and some are more significant in the short term, up to 5 years. Others are of more significance in the long term, 20 years and more. LISTING Use this page to review the threats to the mountain pygmy-possum and, using information from your Tasks, answer the following:

   Select two threats to the MPP identified in the National Recovery Plan (Page 13) and describe the nature of the threatening processes and any human activities involved.

Response

See National Recovery Plan (Pages 13-17) for a “Summary of threats”

Suggest ways these changes or disturbance could be reduced or nullified.

TASK ONE

FOLLOW-UP QUESTIONS

4. Research indicates that 40% of mountain pygmy-possum habitat is located in recognised downhill ski resort areas. List some strategies that resort operators could undertake to promote the sustainability of the mountain pygmy-possum habitat.

   References:

   Charlotte Pass Resort

   Perisher Ski Resort

   NSW Alpine Resorts Environmental Performance report 2013-14 (PDF 5.4 MB) (see page 20)

Response

Resort operators and environmental managers

- Avoid the use of poisons and kill traps when managing rats and mice
- Education programs for resort users on how to control pests without poisons or snap traps
- Restrict resort activities in sensitive habitat areas
- Construction of wildlife crossings (rock filled boulder crossings / underground rock filled culvert crossings) across ski slopes to improved habitat connectivity
- Revegetation of ski slopes to improve habitat connectivity – planting of species known to be important food sources for MPPs
- Wildlife crossings and revegetation also protect MPPs from predation
- Care in the management of waste as food scraps can support feral animals
- Feral predator control programs – cat and European fox
- Control of grazing animals (rabbits, hares, deer) that may impact on vegetation and decrease foraging habitat for MPPs
- Minimise further development within the vicinity of habitat

5. Individuals can be part of the solution to help reduce the impact on threatened species. Suggest ways that individual visitors to the Kosciuszko National Park can help the mountain pygmy-possum survive in the long term. Consider actions of visitors in both winter and summer.

Response

Visitors in winter

- Observe resort regulation and avoid restricted habitat areas
- Take care of rubbish and food scraps that could be scavenged by foxes or cats

Visitors in summer

- Take care of rubbish and food scraps that could be scavenges by foxes or cats
- Do not bring animals into the park
- Volunteer to work on mountain pygmy-possum survey programs or other conservation projects in the park
- Observe fire restrictions and manage any camp fires with care. Fire-damaged mountain pygmy-possum habitat recovers very slowly.

TASK ONE

GIS TASK - WORKSHEET

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PART TWO

boulder field	aspect	water availability	mountain plum-pine	abundance bogong moth	boulder field depth	snow cover days	SUM RESULTS
A							
B							
C							
D							
E							
F							
G							
H							

Based on the factors investigated here, the field with the lowest total sum should offer the most suitable conditions for the species.

Priority sites to survey – Result: _____

TASK TWO

CAPTURE-MARK-RECAPTURE WORKSHEET

Repeat the test several times using a random number of mountain pygmy-possum cards. Vary the number of animals caught in the:

- 1st trapping session
- 2nd trapping session

Does this impact the accuracy of the population estimates?

Record your data.

$$P = \frac{CT1 \times C2}{T2}$$

CMR 1 - 20 trapped each time P = ____ x ____ = ____ = ☐ Result

CMR 2 - change trap 1 number, 20 in trap 2 P = ____ x ____ = ____ = ☐ Result

CMR 3 - 20 in trap 1, change trap 2 number P = ____ x ____ = ____ = ☐ Result

CAPTURE-MARK-RECAPTURE-PART TWO

2.3 MPP POPULATION ESTIMATE

The following are real data derived from a Charlotte Pass mountain pygmy-possum CMR survey

Caught Trap One	*Caught Trap Two*	*Tagged in Trap One and caught in Trap Two*
CT1 - 22	C2 - 16	T2 - 6

P = ____ x ____ = ____ = ☐ Result

TASK TWO

FOLLOW-UP QUESTIONS

1. Given that you know how many animals there are in the population, did this technique give you a close estimate of the total population size?

Response

This technique gives a good estimate provided a large enough proportion of the population is caught and tagged at the first trapping event.

2. How does changing the number of animals caught in the first trapping event (and tagged) affect the population size estimate?

Response

If more animals are caught and tagged in the first trapping session, the estimate of population size will be closer to the actual population size because a higher proportion of the population is tagged.

3. How does changing the number of animals caught in the second trapping event affect the population size estimate?

Response

If more animals are caught in the second trapping, then more tagged animals are likely to be caught. This will mean that a higher proportion of the tagged animals are likely to be caught. The higher the proportion of tagged animals caught during recapture, the closer the estimate will be to the actual population size.

For the Mountain pygmy-possum capture-mark-recapture research conducted in Kosciuszko National Park to be successful and valid, many factors are considered. As well as ensuring the tags are permanent and will not affect the likelihood of survival or recapture, the confounding effects likely to exist in a wild population are births and immigration which will add non-tagged individuals to your population between captures. These will increase the actual population size and decrease the proportion of tagged animals; meaning you would underestimate the population size. Deaths and emigration will have the opposite effect.

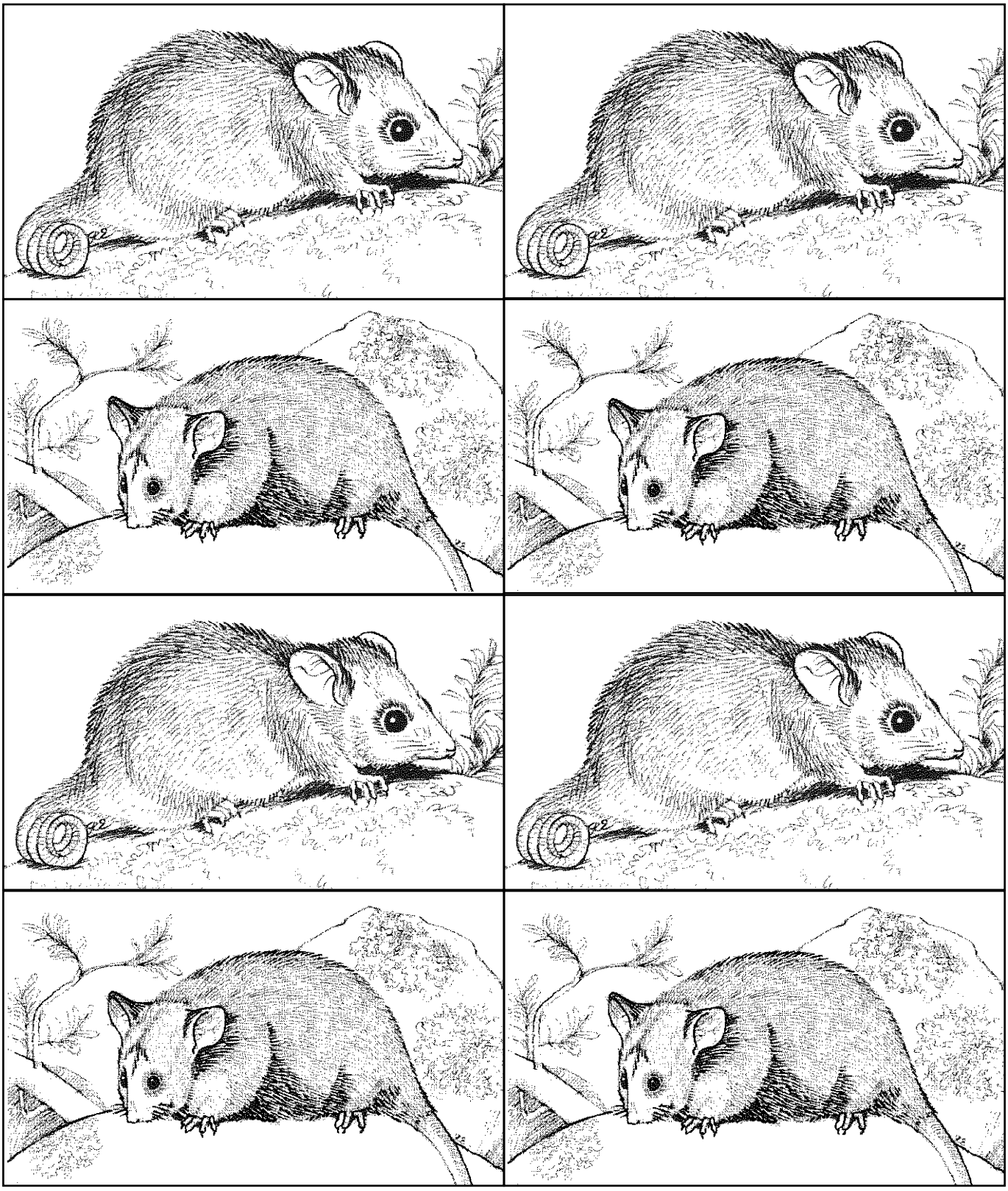
4. Are there any steps or elements of the experiment, as you conducted it, which could be confounding the results (causing confusion)?

Response

The majority of possible confounding elements in the example experiment, conducted here relate to the markings on the cards. If the markings come off between captures, the proportion of the recapture population that is tagged will be lower than it should be, meaning that the population estimate will be high. If the markings can be detected by the student 'trapping' the recapture, they may either select these or avoid them, skewing the results. Selecting tagged individuals would reduce the population estimate and avoiding them would inflate the population estimate. This is why scientists need to ensure tags are permanent and don't affect the likelihood of recapture.

TASK TWO

CAPTURE-MARK-RECAPTURE-MPP CARDS



Images: ©OEH

ADDITIONAL RESOURCES & USEFUL LINKS

Australian Alps Education Kit
https://theaustralianalps.wordpress.com/the-alps-partnership/education/

Australian Government website: Mountain pygmy-possum fact sheet
https://www.environment.gov.au/biodiversity/threatened/publications/factsheet-mountain-pygmy-possum-burramys-parvus-2002

Charlotte Pass Resort; Environment
http://www.charlottepass.com.au/environment.html

National Recovery Plan for the mountain pygmy-possum *Burramys parvus* (PDF 1.4mb)
http://www.environment.nsw.gov.au/resources/nature/recoveryplanMountainPygmy-possum.pdf

NSW Alpine Resorts Environmental Performance report 2013-14 - (see page 20)
http://www.environment.nsw.gov.au/resources/alpineresorts/alpine-resorts-environment-report-2013-14.pdf (PDF 5.74mb)

OEH website: Saving our Species, NSW Government Threatened Species program
http://www.environment.nsw.gov.au/savingourspecies/about.htm

OEH website: NSW Scientific Committee
http://www.environment.nsw.gov.au/committee/AboutTheNSWScientificCommittee.htm

OEH website: Threatened Species
http://www.environment.nsw.gov.au/threatenedspecies/index.htm

OEH website: Threatened species mountain pygmy-possum profile
http://www.environment.nsw.gov.au/threatenedSpeciesApp/profile.aspx?id=10114

Perisher Ski Resort: Biodiversity, Helping the Mountain Pygmy-possum at Blue Cow
https://www.perisher.com.au/resort-info/environment/biodiversity