

# FINAL REPORT ON PROJECT SUPPORTED BY PADDY PALLIN SCIENCE GRANT

## 1. PROJECT IDENTIFICATION

### 1.1 PROJECT TITLE

The impact of large invasive herbivores on alpine and subalpine ecosystems; a case study of an Endangered alpine skink.

### 1.2 ADMINISTERING ORGANISATION

The Australian National University.

### 1.3 PROJECT LEADER AND PARTICIPANTS

Renée Hartley, Prof. David Lindenmayer, Dr Ben Scheele, Dr Chloe Sato, Mellea Schroder, Nick Clemann.

## 2. PROJECT DESCRIPTION & OBJECTIVES

### 2.1 100- Word Project Summary

Natural ecosystems in the Australian alpine region are increasingly under threat. Invasive herbivores, such as horses and deer, are thought to be having severe and sustained impacts on native ecosystems, threatening endemic species. However, these impacts are not well studied. This research is one of the first scientific investigations to quantify the effects of invasive herbivores on Australian alpine and subalpine fauna and focusses on the Endangered alpine she-oak skink (*Cyclodomorphus praealtus*) as a case study. This study will investigate alpine she-oak skink habitat requirements and quantify how invasive herbivores impact on its habitat to inform management.

### 2.2 Summary of original objectives (150 words max)

Data on alpine she-oak skink distribution and habitat are urgently needed to identify ecological requirements and management priorities. Similarly, quantification of invasive herbivore impacts at a landscape scale is required to understand the associated effect on ecosystem processes.

The research aims and hypotheses are as follows:

Aim 1 - To enhance understanding of alpine she-oak skink distribution and population connectivity across its geographical and elevational range.

Aim 2 - To determine alpine she-oak skink habitat requirements and the effects of habitat structural complexity on relative density, diet and morphology.

Aim 3 - To determine the effect of large invasive herbivores on alpine she-oak skink habitat and populations.

### **3. PROJECT OVER DURATION OF FOUNDATION GRANT**

#### **3.1 Have there been any changes to the project? If yes give details**

The 2019-20 bushfires burnt 47 of the 116 field sites. As such, I have incorporated the impacts of fire into the research project because I have data from before and after the conflagration.

#### **3.2 What were your research plans and objectives for the period covered by this report? (150 words max)**

The primary objective for the period was to re-survey the 116 sites established at the start of the project. Monthly reptile surveys were planned for November to March, subject to access. Surveys of herbivore sign and vegetation characteristics were planned for a four-week period in February and March 2021. Data of herbivore sign were to be analysed to determine associations between herbivores and vegetation characteristics. Alpine she-oak skink scat and genetic samples were to be collected and analysed.

#### **3.3 Did the research project proceed as planned? What have you achieved over this period? Outline the research findings to date (200 words max)**

Yes, the project proceeded as planned.

At 67 unburnt sites, I measured grazing pressure using herbivore sign such as scats and diggings. Concurrently, I measured vegetation and soil characteristics, such as vegetation height, foliage density, weed cover and soil compaction.

We found evidence of the presence of seven families of herbivorous mammals. The exotic herbivores were horses, deer, pigs, rabbits and hares. The native herbivores were macropods, wombats and broad-toothed rats.

We found that exotic herbivores were almost ubiquitous across the landscape, while native species occurred at about a third of sites and were mostly restricted to lower elevations. Horses and rabbits were associated with low vegetation height and low foliage density. Horses were associated with high soil compaction. High weed cover was related to total grazing pressure, which combined sign from all taxa.

Following approximately 20,000 trap checks, we found alpine she-oak skinks at 47 of our 116 sites, greatly improving our understanding of their distribution and habitat. This result required considerable effort because the detection rate was low, with alpine she-oak skinks being present during approximately 1% of trap checks. We measured habitat features and conducted genetic and dietary analyses. We found clear genetic structure between populations, and that they selectively consume a variety of terrestrial invertebrates.

#### **3.4 Have you experienced any difficulties that have affected the progress of the research project? If yes give details (150 words max)**

The 2019-20 fires burnt approximately 40% of our research sites and prevented access to field sites during the peak survey period. Overall, field survey time was reduced by the bushfires, Canberra hailstorm (which severely damaged fieldwork vehicles, affecting availability) and COVID-19. However, data was collected to address all research questions, though methods were modified for more rapid data collection. Responding to these unexpected events has somewhat delayed project milestones, in particular, publication submissions.

### **3.5 What are your research plans and objectives, including publication plans, for the coming year? (150 words max)**

This year I plan to submit a minimum of four scientific papers for publication: (i) vegetation and soil attributes associated with mammalian herbivores in high-elevation grasslands, (ii) alpine she-oak skink genetics, (iii) the impact of herbivores and fire on the alpine she-oak skink, and (iv) the impact of herbivores and fires on the reptile communities of high-elevation grasslands. Additional papers may be submitted if time allows.

## **4. ACADEMIC OUTPUTS**

### **4.1 Publications and other academic outputs directly related to this project.**

The first of a series of papers from this important project will be submitted in May 2021.

### **4.2 Evidence of scholarly impact and contribution. Is there evidence that this research project is having/has had an impact in the research field or the broader public domain?**

Yes.

#### **If yes, give details**

I was an invited speaker at both the Ecological Society of Australia Conference and for the Deakin University Centre for Integrative Ecology Seminar Series in 2020.

I was interviewed for an article in the Sydney Morning Herald and The Age regarding the impact of feral horses on wildlife following bushfires:

<https://www.theage.com.au/environment/conservation/fears-for-wildlife-as-brumbies-compete-for-reduced-kosciuszko-grassland-20200121-p53taa.html>

The article Driscoll, Worboys, Allan, Banks, Beeton, Cherubin, Doherty, Finlayson, Green, **Hartley**, et al. (2019) 'Impacts of feral horses in the Australian Alps and evidence-based solutions' Ecological Management & Restoration, 20(1), 63–72. <https://doi.org/10.1111/emr.12357> has been cited 26 times (Google Scholar).

I have provided information to the Federal Environment Minister, Susan Ley, and the Federal Member for Eden-Monaro, Ms Kristy McBain, regarding this research.

I provided an article for the Resort Round-up; a NPWS newsletter for the resorts community of Kosciuszko National Park: <https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Parks-reserves-and-protected-areas/Alpine-resorts/resort-round-up-no40-winter-2019-190302.PDF>

### **4.3 End-user interaction and other project outcomes If there are examples of the impact of this research Project not covered in item 4.2 above please provide details.**

This project has provided the information required for the alpine she-oak skink to be nominated at a 'Site-Managed Species' under the NSW Saving our Species program. This will enable a detailed set of management actions to be outlined and potentially funded.

## **5. ATTACHMENTS & OTHER MATERIAL**

Attachment 1: Web page summary update

Attachment 2: Video summary