PROGRESS REPORT ON PROJECT SUPPORTED BY PADDY PALLIN SCIENCE GRANT

Instructions to Project Leaders for Completing This Form
Progress reports are required to be submitted 12 months after the start of the project, and then at 18-24 months as a final report. Grants usually begin on the 15TH September in the year in which the grant was awarded. Payment of the second grant instalment is contingent upon the receipt of this material. Updates are to be provided during the tenure of the grant, and at the time the final report is submitted. Payment of the final grant instalment is contingent upon receipt of the final summary which is to summarize the outcomes of the project during the tenure of the grant.

1. PROJECT IDENTIFICATION

1.1 PROJECT TITLE
Original: Testing the response of the threatened New Holland mouse to planned burns
Final: Time since fire is an over-simplified measure of habitat suitability for the New Holland mouse

1.2 ADMINISTERING ORGANISATION
The University of Melbourne

1.3 PROJECT LEADER AND PARTICPANTS
Dr Phoebe A. Burns, A/Prof Ben L. Phillips

2. PROJECT DESCRIPTION & OBJECTIVES

2.1 100- Word Project Summary
The New Holland mouse (NHM; *Pseudomys novaehollandiae*), a threatened and declining rodent species native to southeastern Australia, is traditionally considered an early post-fire successional species. We used a 48-year dataset to test whether this posited association with early time-since-fire (TSF) age classes was upheld, and whether the species' occurrence and abundance are governed by TSF. We found support for a minimal influence of TSF on the species' occurrence, and that while abundance of NHMs is partly explained by TSF, considerable uncertainty and variation among fire events and locations limit the usefulness of TSF in informing conservation management strategies.

2.2 Summary of original objectives (150 words max)
Stated in the original application, this project aimed to help inform planned burning operations in NHM habitat by determining:
1) The rate of primary mortality in NHMs during a planned burn
2) a. If NHM home range size changes following fire at the burrow location; and
   b. If so, whether individuals spend more time foraging in non-burned areas than burned areas
3) If NHM abundance at a burned site changes in the 12 months following a controlled burn
4) If predation on NHMs by feral predators increases post-fire

These objectives were to be achieved by radio tracking the animals before and after scheduled burns. This did not occur because the planned burns originally scheduled for 2017 were postponed every year up to and including 2019.

However, we still achieved our primary objective of helping to inform planned burning operations through other research pathways as detailed below.

3. PROJECT OVER DURATION OF FOUNDATION GRANT

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

The focus of this project switched from assessing the species' response to planned burns to assessing the species' long-term relationship with TSF age classes. As noted above, this was because the planned burns scheduled for Autumn 2017-2019 did not go ahead due to vegetation being too wet or too dry for an effective or safe burn. Funding from Paddy Pallin was directed toward extensive survey efforts across the state of Victoria, targeting poorly surveyed TSF age classes and vastly improving our understanding of the distribution of NHMs. We teamed our modern data with a 48-year historical dataset to investigate how the species responds to post-fire succession in terms of abundance and occupancy.

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

1) Survey locations of plausible occupancy in Victoria across a broad range of TSF age classes
2) Assess the relationship between the TSF and the occupancy and abundance of NHMs
3) Develop interim planned burn guidelines to support NHM persistence
4) Liaise with land management agencies to ensure our guidelines are practical and implemented
5) Publish all findings

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, we achieved all 5 objectives listed in 3.2.

Fire has shaped much of the Australian landscape, and alterations to natural or historical fire regimes are implicated in the decline of many native mammal species. Time since fire (TSF) is a common metric used to understand vegetation and faunal responses to fire but is unlikely to capture the complexity of successional changes following fire. The New Holland mouse (NHM; *Pseudomys novaehollandiae*), a threatened and declining rodent species native to southeastern Australia, is traditionally considered an early post-fire successional species. We used a 48-year dataset to test whether this posited association with early TSF is upheld, and whether the species' occurrence and abundance are governed by TSF. We found support for a minimal influence of TSF on the species' occurrence, and that while abundance of *P. novaehollandiae* is partly explained by TSF, considerable uncertainty and variation among fire events and locations limit the usefulness of TSF in informing conservation management strategies. Our findings indicate that it is not helpful to consider the species as early successional and that fire planning for NHM conservation is best considered at a local scale. Additionally, we have developed guidelines for maximizing individual survival and persistence during and after planned burns.

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

Yes, the planned burns did not go ahead, so we pursued an alternate path as described above.

3.5 What are your research plans and objectives, including publication plans, for the coming year? (150 words max) The work from this grant has all been published or accepted for publication.

4. ACADEMIC OUTPUTS

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

The data collected during this project was also used in a several other aspects of my PhD unrelated to fire ecology. As such, the RSZNSW Paddy Pallin Science Grant was acknowledged as a funding source of the following publications:

Burns, P. A. (2019). Testing the decline of the New Holland Mouse (*Pseudomys novaehollandiae*). PhD Thesis. University of Melbourne: Parkville, Victoria.

Burns, P. A., McCall, C., Rowe, K. C., Parrott, M. L., and Phillips, B. L. (2019). Accounting for detectability and abundance in survey design for a declining species. *Diversity and Distributions* **25**, 1655–1665. doi:10.1111/ddi.12966

Burns, P. A. (online early). Testing the decline of the New Holland Mouse (*Pseudomys novaehollandiae*). *Australian Mammalogy.* doi:10.1071/AM19006

Burns, P. A., and Phillips, B. L. (in press). Time since fire is an over-simplified measure of habitat suitability for the New Holland Mouse (*Pseudomys novaehollandiae*). *Journal of Mammalogy*

Burns, P. A., Clemann, N., and White, M. (in review). Testing the utility of generic approaches to species distribution modelling for species in decline. *Austral Ecology*.

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

If yes, give details

Invited presentations:

Burns, P. A. (2019) Fire management for threatened species that can't walk very far. Oral presentation to *DELWP Hume Fire Forum*, Winton Wetlands.

Burns, P. A. (2018) A Song of Mice and Fire: testing time since fire associations for the threatened New Holland Mouse (*Pseudomys novaehollandiae*). Oral presentation to *Victorian Biodiversity Conference*, Melbourne.

Burns, P. A. (2017) The New Holland Mouse (*Pseudomys novaehollandiae*). Oral presentation to *The La Trobe Valley Field Naturalists Club*, Melbourne.

Cited in:

Smith, L., and Bluff, L. A. (2018). New Holland Mouse pre and post burn monitoring program. DELWP Internal report, Gippsland Risk and Evaluation Team. Department of Environment, Land, Water and Planning, Bairnsdale, Victoria

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.

I have worked closely with land management agencies (Parks Victoria and the Department of Environment, Land Water and Planning (DELWP)) to adapt burning protocols to better suit NHMs. Additionally, this work has inspired DELWP to pursue further research into the impacts of planned burning on NHMs and engage in adaptive management.

5. ATTACHMENTS & OTHER MATERIAL

I have attached the resultant publications and an image of a New Holland Mouse. See 3.3 above for an updated webpage summary.