

# Evaluating the effects of feral deer management on endangered alpine peatlands: The Alpine National Park deer control trial

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## Introduction

A significant expansion of feral deer populations, most significantly sambar deer (*Cervus unicolor* Kerr), has been observed in the Alpine National Park (ANP) in eastern Victoria over the past decade. In particular, increasing signs of deer activity have been observed at higher elevations, which corresponds with observed increases in deer impacts on significant environmental assets including Alpine Sphagnum Bogs and Associated Fens<sup>1</sup> (hereafter known as alpine peatlands), an endangered ecological community, listed under the Australian *Environmental Protection and Biodiversity Conservation Act 1999* and Victorian *Flora and Fauna Guarantee Act 1988* (Figure 1).

While some impacts have been documented in reports, photographs and through recording ad-hoc field observations, they have not been formally investigated or quantified prior to this project. In order to develop a greater understanding of deer impacts, the relationship between impacts and deer density or abundance, and how these impacts can be mitigated, Parks Victoria is implementing a deer control trial.

The aim of the trial is to investigate whether ground shooting can mitigate deer impacts on alpine peatlands in selected parts of the ANP. Strategically controlling deer to achieve conservation outcomes has not been attempted in the ANP prior to this project. Little is known about what level of control is required to achieve conservation goals, and which control approaches are the most efficient and effective. The trial is a discreet short-term 'experimental' program not intended to provide ongoing deer control, but will adopt a structured 'learning by doing' approach to facilitate an adaptive,

<sup>1</sup> This broad ecological community encompasses the alpine bog, *Caltha introloba* F.Muell herbland, fen (bog pool) and montane swamp complex communities which are listed under the Victorian *Flora and Fauna Guarantee Act 1988*. These communities will be referred to collectively as 'alpine peatlands' hereafter in the document.

evidence-based assessment of options for deer management in the ANP.

## Legislative framework

There are several pieces of Victorian legislation either directly or indirectly relevant to deer management in the ANP, with three key pieces of legislation relevant to the trial design and implementation.

The *Wildlife Act 1975* creates protection for deer as a game species and provides for the control of deer (as wildlife for the purpose of the Act) where required for habitat protection, health and safety reasons, protection of agricultural land, and/or to support a recognised wildlife management plan.

The environmental threat posed by sambar deer is recognised in the *Flora and Fauna Guarantee Act 1988* with 'reduction in biodiversity of native vegetation by Sambar' listed as a potentially threatening process. Action Statements are prepared by the Department of Environment, Land, Water and Planning (DELWP) to implement approved actions to manage the listed threat. At time of writing an Action Statement for this listing has not yet been released.

The *National Parks Act 1975* requires the Secretary to: preserve and protect indigenous flora and fauna in the park; preserve and protect the park's natural condition for the use, enjoyment and education by the public; and exterminate or control exotic fauna in the park.

## Study design

### Development

Parks Victoria has led the design of the ANP deer control trial with input and advice from a range of experts, scientists and stakeholders.

Parks Victoria hosted a 'design workshop' in August 2014 to bring together a group of skilled people with knowledge and expertise in a range of areas including environmental management, deer ecology, deer control and hunting, and the design of monitoring and evaluation programs. Twenty-six people attended the workshop which provided expert advice on trial design. As a whole, the group supported the ANP deer control trial and highlighted the importance of the trial in improving our understanding of deer population dynamics, behaviour, habitat use, impacts, and the efficacy of control (Parks Victoria 2015). Based on the outcomes of the design workshop, Parks Victoria developed a trial design and engaged consultants to develop specific deer impact and abundance monitoring techniques (Bennett et al. 2015a, b).

The trial is designed to test the hypothesis that ground shooting can reduce deer abundance/density in the identified study sites, which will in turn reduce deer activity in proximity to high



Figure 1. Image of a feral sambar deer wallowing in an alpine peatland in the Alpine National Park, Victoria.

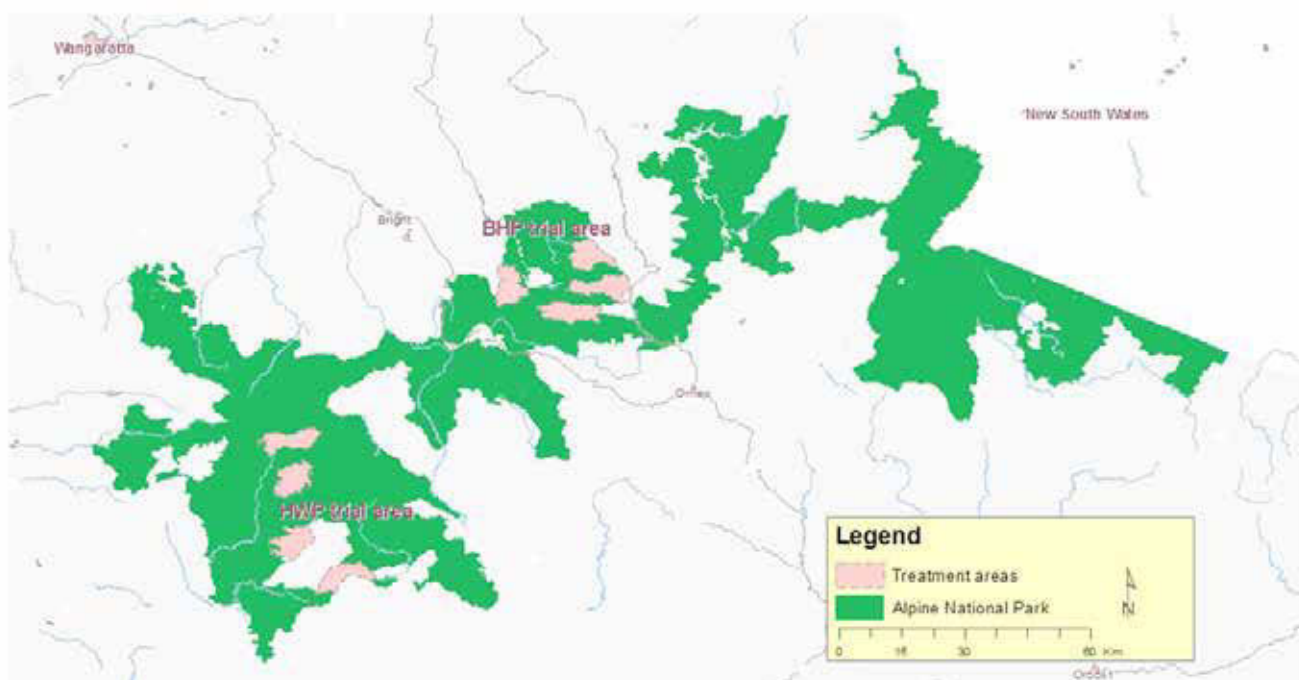


Figure 2. Overview of deer control trial areas in Alpine National Park, Victoria.

value assets<sup>2</sup> in the identified study sites and subsequently mitigate deer impacts on these assets.

### Broad experimental design

The trial uses a before, after, control, impact (BACI) experimental approach. This involves measuring parameters (deer abundance/density and impacts) prior to and after undertaking the intervention (deer control operations) in both treatment (where deer control occurs) and non-treatment control sites (where no deer control occurs). This design accounts for natural temporal variations in parameters and will enable effects due to the management intervention to be more readily and reliably detected against any background 'noise'.

The trial will be conducted over a six year period, with works undertaken in each treatment area for three years. The trial comprises the following components:

- assessments of alpine peatland condition related to deer-specific impacts prior to implementing targeted deer control measures (pre-control assessments);
- ground shooting operations within the treatment areas;
- assessments of alpine peatland condition related to deer-specific impacts after implementing targeted deer control measures (post-control assessments);

<sup>2</sup> Alpine peatlands and alpine/sub-alpine drainage lines.

- an evaluation of the efficiency of deer control techniques used; and
- an evaluation of the effectiveness of the management actions on deer relative abundance and alpine peatland condition and recovery following completion of the trial.

### Trial areas

The trial is being conducted on the Bogong High Plains (BHP), near Falls Creek, and the Howitt – Wellington Plains (HWP), north of Heyfield and Licola (Figure 2). These areas are both largely above 1200 m elevation and contain a range of alpine, sub-alpine and montane ecological communities including treeless plains, sub-alpine woodlands, alpine peatlands, montane wet forest and riparian forest.

Recreational deer hunting is currently prohibited in the Bogong High Plains trial area. Deer stalking (hunting without the use of dogs) by licensed recreational hunters is currently permitted in the Howitt–Wellington Plains trial area between 15 March and 15 December annually.

### Treatment areas

Treatment areas for the trial were identified based on the following considerations, that:

- treatment areas should be large enough for deer control to permit reductions in deer impacts on target environmental assets. Experience from similar experiments in New Zealand indicates that

study sites should be 3 000 hectares or greater (D. Forsyth personal communication 2015);

- there must be sufficient separation between the treatment areas to enable them to be independent from one another;
- they must be practical units for implementing control operations and relevant to testing the trial aim and hypotheses;
- they are stratified within the trial area to minimise biases and achieve maximum uniformity; and
- they must contain suitable amounts of the focus vulnerable environment and/or vegetation structure.

With consideration given to the above design requirements, four sites in the Bogong High Plains (Figures 2 and 3) and four in the Howitt-Wellington Plains trial areas (Figures 2 and 4) have been designated as treatment areas for the trial.

These treatment areas are separated by a minimum of two kilometres and in many cases by natural barriers such as steep river valleys.

### Treatments

Treatments refer to the proposed control approach to be applied to a treatment area. Within each treatment, all variables, other than the variable being investigated (i.e. the management of deer) are kept consistent in order to address the research questions. The two treatments are:

- targeted deer control: Undertaken primarily by volunteer hunters<sup>3</sup>, aimed at removing as many deer as possible using all the methods available. This treatment will be replicated twice within each trial area; and
- non-treatment control: No deer control measures, except recreational hunting where permitted<sup>4</sup>, are undertaken allowing comparisons to be made between other treatments and this un-manipulated treatment. This treatment will also be replicated twice within each trial location.

Each treatment area will have a single treatment applied to it, with two deer control treatments and two non-treatment controls within each trial area. To eliminate potential bias, experimental treatments have been randomly assigned to each of the treatment areas, with the exception of site C in the BHP trial area where logistical constraints meant that undertaking deer control at this site was not possible. All treatment areas will have monitoring undertaken pre- and post-targeted deer control.

### Implementing the control techniques

Targeted deer control will involve the implementation of a number of different ground shooting techniques and approaches. An adaptive approach is used with regard to employing specific control techniques with the goal to remove as many deer as possible. The following control techniques are available to be used adaptively through the trial:

- stalking, with or without indicator dogs;
- night hunting using spotlights, night vision and/or thermal imaging equipment;
- using attractants to lure deer into specific areas;
- actively driving deer into specific areas, including the use of helicopters and/or UAVs if required;
- using deer stands (sit and wait);
- shooting deer from strategic locations at long-range using specialised firearms (glassing);
- hound hunting with some/all of the

<sup>3</sup> The Australian Deer Association and the Sporting Shooters Association of Australia (Victoria).

<sup>4</sup> Recreational hunting is permitted in the Howitt–Wellington Plains but not the Bogong High Plains. It should be noted that some illegal hunting activity occurs in the Alpine National Park, including hunting occurring in prohibited areas, hunting outside of the declared season and the illegal use of dogs and/or spotlights.



Figure 3. The Bogong High Plains trial area is situated around the cluster of alpine peatlands near Falls Creek, Victoria.



Figure 4. The Howitt–Wellington Plains trial area is situated around the chain of alpine peatlands that lie between Mt Howitt and Mount Wellington, Victoria.

existing regulations removed or relaxed<sup>5</sup>, for example increasing the numbers of hounds that can be used during a hunt and increasing the numbers of hunters that can hunt at any one time.

### Measuring deer control effort

Catch and sighting per unit effort (CPUE) is measured by recording where deer are sighted and/or shot, what time they are seen and how many hunter hours (and shots taken) have been expended

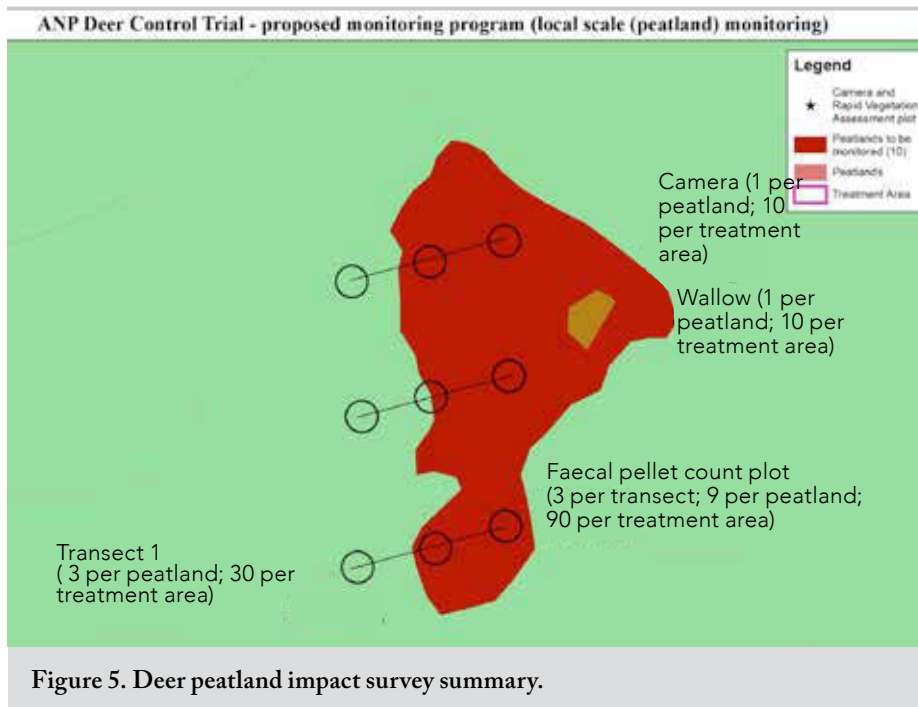
<sup>5</sup> Circumstances where deer control is required to mitigate deer impacts on important environmental assets in a National Park are different cases to regular recreational hunting situations. In such circumstances, the constraints of recreational hunting regulations need not apply, as per the provisions of the *National Parks Act 1975*, *Wildlife Act 1975* and *Firearms Act 1996*.

in control operations. Additionally, GPS track logs from hunters and dogs will be collected to help assess control effort. This information will be used to measure the number of deer removed from the treatment area and to evaluate the efficiency of various hunting techniques.

### Monitoring

#### Overview

Protocols have been developed by consultants with expertise in the field to monitor changes in levels of deer abundance, density and habitat use, and changes in impacts on alpine peatlands and other alpine/sub-alpine communities in the ANP in response to deer control (Bennett *et al.* 2015a, b). Deer abundance and habitat use are monitored using remote cameras and faecal pellet counts. Deer impacts are monitored by peatland impact surveys, targeted wallow and pool surveys and photopoints.



### Peatland impact surveys

Ten peatlands have been randomly selected within each treatment area. In each of these peatlands, three 50 m transects have been established. In each transect, faecal pellets are counted within a one metre radius circular plot at the beginning, middle and end of each transect. Within a one metre strip along each transect, the vegetation condition (i.e. amount of bare ground, trampled vegetation, intact vegetation), is assessed at five metre intervals. Key weed species, the presence of pugging and wallows are also recorded (Figure 5).

### Targeted wallow and pool surveys

Ten wallows and ten pools are selected from within pre-selected peatlands, or, if unavailable, from other peatlands. To survey wallows, the edge of the wallow is determined and the length and width

of the wallow is measured. A metre square quadrat is used to estimate the percentage of bare ground, trampled vegetation and intact vegetation on two sides of the wallow (Figure 6).

Water levels and the turbidity of water are measured. Similarly to survey pools, the percentage of damaged pool edge is estimated using a metre square quadrat to estimate the percentage of bare ground, trampled vegetation and intact vegetation on two sides of the pool, and the turbidity of water is measured.

### Conclusion

Feral deer are currently having an adverse impact on endangered alpine peatlands in the ANP. The frequency and magnitude of these impacts are likely to increase as feral deer become more abundant. Parks Victoria is implementing a deer control trial to investigate whether

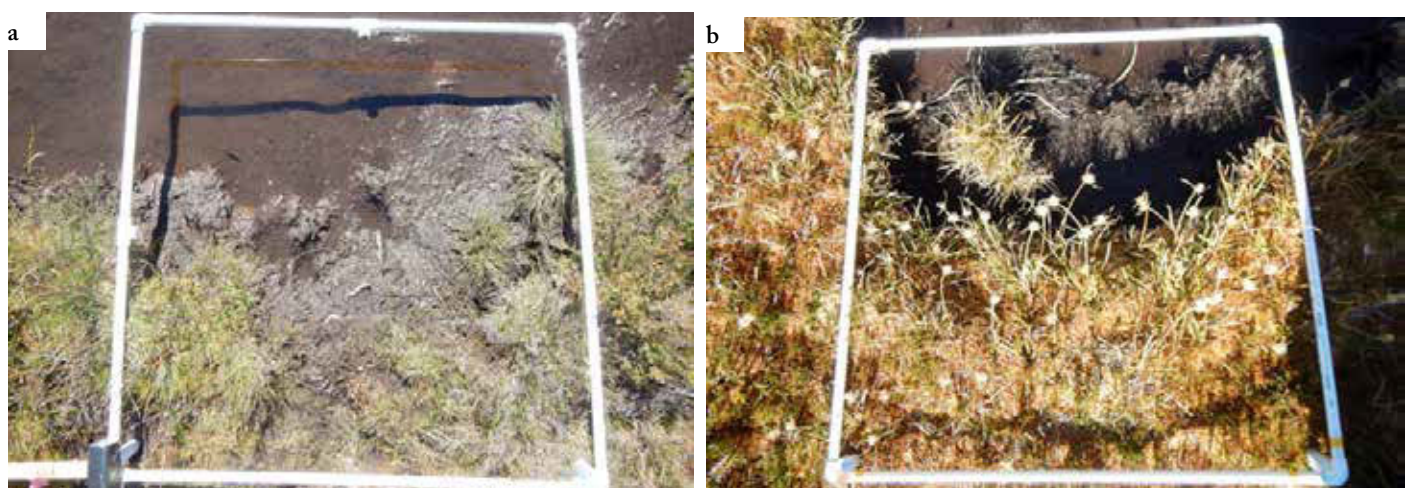
a reduction in deer abundance/density can mitigate deer impacts on alpine peatlands. The level of control required to mitigate impacts is unknown. Deer will be strategically controlled such as by targeting deer which reside in, or migrate to areas where peatlands occur. By monitoring the condition of peatlands before and after targeted deer control, changes in deer abundance and density can be related to changes in peatland condition to determine whether control activities are having the desired effect. The strong adaptive experimental approach of the trial will assist Parks Victoria in making evidence-based decisions on future deer management to protect alpine peatlands in the ANP.

### Acknowledgements

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### References

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**Figure 6. (a) a targeted wallow survey and (b) a targeted pool survey for deer impacts (Source: Ethos NRM).**