

Saving the Endangered northern bettong with fire management

In brief

The Endangered northern bettong has suffered extensive declines despite on-going conservation management and is now found at only two locations. Changed fire patterns and predation by feral cats are believed to be major causes of declines but there is a lack of certainty about these threats and how best to manage them.

This collaboration with the Queensland Parks and Wildlife Service investigated the impact of alternative fire regimes and predation by cats on the last secure northern bettong population in the Lamb Range, Queensland.

We found that patchy, cool burns are appropriate for bettong conservation goals. This fire regime did not impact population size or breeding success or cause bettongs to shift their home ranges.

Patches of tall grass and fallen timber left unburnt were critical refuges for bettongs to use for shelter and foraging.

In a further encouraging finding, we have detected only one cat in the Lamb Range across three years of surveys, but sightings of roaming cats on private land adjacent to the national park habitat for the northern bettong indicate that monitoring should continue, and that nearby landholders be encouraged to control any feral cat populations that may become established.

The outcomes of this project will directly inform the management of fire and control of predators for these two existing populations of the northern bettong, as well as any new translocated populations.

Background

The northern bettong (*Bettongia tropica*) has suffered major range contractions and is currently restricted to just two populations in the Wet Tropics region of far north Queensland. A larger population occurs in the Lamb Range at Davies Creek, at the north-eastern edge of the Atherton Tablelands. A smaller less secure population occurs at Mt Spurgeon. The populations occur almost exclusively in national parks and are managed by Queensland Parks and Wildlife Service.

Australian Wildlife Conservancy has plans to translocate a population to their Mt Zero–Taravale property where the species historically occurred.

The species is listed as Endangered under state and national law and by the International Union for the Conservation of Nature (IUCN). Despite active conservation management northern bettong populations have continued to decline in range in the past decade.

Predation by feral cats and altered fire regimes are suspected to be the major threats preventing recovery. Existing scientific evidence to inform fire management is based on a single experimental fire in 1995, which indicated that low to moderate intensity fires do not adversely affect northern bettongs.



We fitted GPS collars to bettongs to track their movement and habitat use before, during and after fire.
Image: Chris Pocknee/AWC/QPWS



Background (continued)

Fire is believed to be important for several reasons, firstly due to the effect on food resources and habitat for the bettong, and secondly as increasing the intensity, frequency or extent of fires has been shown in other areas to attract feral cats and to increase their hunting efficiency.

Since the 19th century, traditional patchy “mosaic burning” undertaken in Indigenous fire management has given way to more extensive and intense, often uncontrolled, late dry season fires across the region.

Cats are not currently managed in the Lamb Range. There is insufficient data to determine the

level of impact that feral cats have had on northern bettongs to date, as the level of cat predation on bettongs and how it is influenced by alternative fire regimes is not currently known.

Given the ongoing decline of this species land managers need evidence-based advice on the best ways to manage fire and cats in order to support the persistence and recovery of the northern bettong.

The research builds on previous research by partners which has established the distribution and size of the population in the Lamb Range, assessed the bettong’s role

in the ecosystem as a keystone species for truffle and other ectomycorrhizal fungi dispersal, confirmed the presence of northern bettongs throughout the area of the Lamb Range that has been assessed as suitable habitat, and a second small population at Mt. Spurgeon, and established preliminary fire management guidelines for northern bettong habitat.

The Queensland Parks and Wildlife Service has a long history of investment in the management of the northern bettong and has been crucial in the development and implementation of this project.

What we did

The research was a close collaboration between The University of Queensland and the Queensland Parks and Wildlife Service, with additional support from the Northern Bettong Recovery Team, Djabugay Indigenous Rangers, Buluwai Indigenous rangers Australian Wildlife Conservancy, WWF and the Wet Tropics Management Authority.

The study was undertaken from 2019–21 across a range of northern bettong habitats in the stronghold of the species in the Lamb Range.

We utilised an experimental design to test the effect of a range of potential fire regimes, monitoring before and after fires, examining:

1. Spatial use of habitat by northern bettongs including their foraging and nesting areas
2. Northern bettong pouch young survival

3. Fire patchiness, scale, intensity and season, and the amount of remaining vegetation cover
4. Cat activity, including the prevalence of feral cats, hunting locations, and hunting effectiveness

We used a range of methods to collect evidence before and after burns.

We used GPS collars to track the movement and habitat use of individual bettongs before, during and after fire. This enabled observations of how bettongs survived during early and late burning regimes, and how they changed their use of the area immediately after a fire.

We undertook live animal surveys of bettongs using cage traps before and after burns. We recorded measures of condition and reproductive success

for all captured bettongs, as well as using mark-recapture methods to make estimates of population size and survival.

We undertook vegetation surveys before fire in paired plots, where one plot in each pair has fire excluded from it, and the other may burn as part of the surrounding landscape. We are revisiting these plots approximately every six months to track how fire alters the habitat structure, ground cover and food availability over time compared to fire-exclusion areas.

We deployed cameras at least a month before each burning experiment. The cameras operated continually throughout the dry season, to investigate how cat activity changed with fire regime and how best to target cat control.

Research aims

The project aimed to better understand the threats facing the northern bettong by comparing northern bettong habitat use, reproductive success and survival, as well as feral cat activity, before and after fires occurring early or late in the year, in a range of bettong habitats.



The GPS data showed that bettongs do not shift their home range in response to fire, but may retreat to unburnt patches following burns. Image: Chris Pocknee

Key findings

Analysis of the GPS data from northern bettongs collared in 2019 and 2021 has shown that individuals do not shift their home range in response to a fire, but may contract their activity into smaller unburnt patches of vegetation following burns. This is an encouraging result, as current management practices in bettong habitat utilise cool, patchy burns that leave behind sufficient unburnt habitat.

Data from the mark-recapture surveys show no evidence after fire of change in the population size of bettongs and no change in reproductive success, but some evidence of declines in body condition, indicated by lower fat and muscle stores. This appears to be due a reduction in the quality and quantity of food (particularly truffles) in the late dry season which may be a seasonal effect rather than an impact of fire on food resources. However, further work is occurring to investigate this point.

Targeted camera-trapping from 2019 to 2021 has returned just one cat detection in bettong habitat. These results are consistent with the low or undetected feral cat

populations previously reported in bettong habitat in the Lamb Range. This is a positive result overall, but the one detection is a reminder of the importance of ongoing monitoring to enable timely action if even a small population of feral cats becomes established, as this could have a severe impact on the northern bettong.

Recent sightings of roaming cats on a private conservation property within the study area have reaffirmed the importance of this ongoing monitoring, and we are seeking to clarify whether these

animals are likely to be part of a larger feral population in the area that has gone undetected to date. Cameras deployed on this property in 2020 and 2021 returned no cat detections, a promising sign that there is not a large population at this stage. Continuing to survey national parks and private property will hopefully reveal important information about habitat use by cats in this region that will help guide targeted predator management.



Chris Pocknee releasing a bettong after processing. Image: Erlend Harstad

Work cited

Pocknee, C. (in prep.) The impacts of fire and predation on the Endangered northern bettong (*Bettongia tropica*). PhD thesis, The University of Queensland.

Implications

Findings from this project give land managers a clearer picture of the relative importance of the threats facing bettongs, and will help to guide future conservation actions, including the proposed translocation of northern bettongs by the Australian Wildlife Conservancy to Mt Zero–Taravale.

This work confirms that early season patchy burns at the scale of current management, though currently aimed at habitat maintenance rather than species conservation, are nevertheless appropriate for bettong conservation goals. These create a habitat matrix, including multiple small areas of tall grass and fallen timber in individual home ranges, leaving critical unburnt refuges for bettongs to use for both shelter and foraging.

This result may present opportunities for land managers and Indigenous fire practitioners to cooperate in planning future burning, as patchy burns on a small scale are a feature of traditional burning practices.

Private landholders adjacent to bettong habitat may change their fire and/or cat management practices to benefit the northern bettong.

While the low number of cat detections in the area is encouraging, the sightings on private land adjacent to national parks indicate that monitoring for feral cats should continue regularly. This will allow the timely detection of any cats entering the area, and help us to understand whether such sightings are a sign of an increasing population of feral cats, so that managers can take appropriate

control actions rather than waiting for a decline in bettong numbers.

If cats largely continue to go undetected within national parks in the region, but are detected on private land, this may trigger private land managers to revisit their habitat management practices and seek a solution that minimises the risk of a cat population becoming established.

The findings from this work are of immediate benefit to managers of the northern bettong and the land where it occurs, the Queensland Parks and Wildlife Service, Djabuguy Aboriginal Corporation and the Buluwai Indigenous Corporation.

Additionally, the Northern Bettong Recovery Group plays an active role overseeing research and conservation actions for this species, and will apply these results.

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A bettong being released during a survey, after having measurements taken. Image: Chris Pocknee

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