



NSW National Parks and Wildlife Service

Kosciuszko offset action plan – alpine tree frog

Kosciuszko Offset Project



Acknowledgement of Country

Department of Climate Change, Energy, the Environment and Water acknowledges the Traditional Custodians of the lands where we work and live.

We pay our respects to Elders past, present and emerging.

This resource may contain images or names of deceased persons in photographs or historical content.

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Artist and designer Nikita Ridgeway from Aboriginal design agency – Boss Lady Creative Designs, created the People and Community symbol.

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Published by:

Environment and Heritage
Department of Climate Change,
Energy, the Environment and Water
Locked Bag 5022, Parramatta NSW 2124
Phone: +61 2 9995 5000 (switchboard)
Phone: 1300 361 967 (Environment and Heritage enquiries)
TTY users: phone 133 677, then ask for 1300 361 967
Speak and listen users: phone 1300 555 727, then ask for 1300 361 967
Email: info@environment.nsw.gov.au
Website: www.environment.nsw.gov.au

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Objective

This plan sets out management actions that, when implemented and measured, will deliver biodiversity gains for the alpine tree frog (*Litoria verreauxii alpina*) within Kosciuszko National Park.

The Kosciuszko Offset Strategy 2023 sets out a framework for the development of offset action plans. It is based on a clear objective – to deliver a biodiversity gain in the park equivalent to 120% of the biodiversity loss identified in the Snowy 2.0 environmental assessments.

In the Snowy 2.0 environmental assessment for Main Works, up to 54 hectares of alpine tree frog habitat was identified as being impacted. (Assessments for the Snowy 2.0 Exploratory Works and Transmission Connection projects did not identify any impacts to the alpine tree frog.) At an estimated 25 individuals per hectare (see Section 3 – Step 1), the impact of the Snowy 2.0 project on the alpine tree frog is estimated to be a reduction of the population by 1,350 individuals.

To deliver the 120% biodiversity gain identified under the Kosciuszko Offset Strategy, the objective of this action plan is to **increase the population of alpine tree frogs in Kosciuszko National Park by 1,620 individuals.**

As this is a Commonwealth-listed species and the potential impacts on it are significant, this action plan has been approved by both the Deputy Secretary, NSW National Parks and Wildlife Service and the Deputy Secretary, Commonwealth Department of Climate Change, Energy, the Environment and Water.

Species overview and key threatening processes

The alpine tree frog is listed as **endangered** under the NSW *Biodiversity Conservation Act 2016* and **vulnerable** under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*.

Table 1 provides a species summary for the alpine tree frog, including a description of the species, its habitat, its preferred food sources and its distribution within Kosciuszko National Park.

Table 1 Species summary – alpine tree frog

Category	Summary
Description	The alpine tree frog is a relatively small tree frog, growing to about 3 cm long. Colouration is highly variable; there are green, brown and grey forms. They have a black stripe from the nostrils, through the eyes, to the top of the foreleg, and a (usually divided) broad brown stripe from the eyes and down the back. The distinguishing feature of the alpine tree frog is its warty back.
Habitat	The alpine tree frog is found in a variety of habitats including woodland, heath, grassland and herb fields. They breed in natural and artificial wetlands including ponds, bogs, fens, streamside pools, stock dams and drainage channels that are still or slow flowing. They do not climb well and spend most of their time on the ground.
Diet	Beetles, flies, spiders and moth larvae are key food sources for the alpine tree frog.
Distribution and population	The alpine tree frog occurs in the south-eastern NSW and Victorian high country (alpine and subalpine zones) generally above 1,100 m above mean sea level. Most locations are within Kosciuszko National Park, and some are close to alpine resorts. Current knowledge about the species' distribution and population dynamics across its range is poor.

Source: Saving our Species and personal communication NSW Department of Climate Change, Energy, the Environment and Water, Biodiversity Conservation Division

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Table 2 provides a list of key threatening processes to alpine tree frogs within Kosciuszko National Park that will be addressed via cost-effective management actions (see Section 3). Actions will also consider relevant Australian Government threat abatement plans to reduce the impacts from key threatening processes on native species.

Table 2 Key threatening processes to alpine tree frogs in Kosciuszko National Park

Threat	Description
Feral herbivores Weeds	Loss or modification of habitat caused by weeds and feral animals, including damage by feral horses
Pathogens, diseases and microorganisms	Disease such as chytrid fungus
Anthropogenic climate change	Causing severe drought

Source: Saving our Species and personal communication NSW Department of Climate Change, Energy, the Environment and Water, Biodiversity Conservation Division

Kosciuszko Offset Strategy: metrics-based approach

The Kosciuszko Offset Strategy requires expenditure of Snowy 2.0 offset funds to deliver biodiversity gains for Kosciuszko National Park equivalent to 120% of the loss for threatened species, threatened ecological communities, and ecosystems impacted by the Snowy 2.0 project. The benchmark of 120% has been set because this is considered achievable over the life of this action plan and it can be demonstrated as a biodiversity gain.

In setting an objective to exceed the statutory requirements, the strategy recognised the difficulties in measuring biodiversity gains and the inherent fluctuations in biodiversity over time. This benchmark provides a margin that will increase confidence that the minimum statutory requirements are being met. The strategy takes a metrics-based approach that will be applied to the delivery of biodiversity offsets by the NSW National Parks and Wildlife Service. This will be achieved by following a 3-step process:

Step 1: quantifying the impacts and benefits that must be delivered

Step 2: implementing actions to deliver the required offset

Step 3: measuring and reporting on the biodiversity benefit.

Step 1: quantifying the impacts on alpine tree frogs and benefits that must be delivered

It is estimated that 1,350 alpine tree frogs will be impacted by Snowy 2.0 Main Works. The benefit that must be delivered is the successful and sustainable establishment of an additional 1,620 alpine tree frogs in Kosciuszko National Park (being 120% of the impact). This calculation is based on impacts to 54 hectares of alpine tree frog habitat from Snowy 2.0 with an estimated population density of 25 individuals per hectare.

Step 1 limitations, assumptions and notes

- The methodology below is based on expert departmental species knowledge.
- Previous attempts to estimate actual abundance of alpine tree frogs using mark-recapture methods have demonstrated major limitations for the study of this species.
- For this action plan, the estimate of 25 alpine tree frogs per hectare has been derived from auditory surveys of 10 local breeding populations in Kosciuszko National Park during spring in 2021 and 2022. For each of the 10 breeding populations:
 - a 1:1 sex ratio and 500 m breeding occupied zone around breeding habitat was assumed
 - to estimate population density (the number of individuals per hectare), the recorded relative abundance of calling male alpine tree frogs was multiplied by 4 to account for detectability (assumed ability to discern individual calling males)
 - this estimated total adult population size was divided by the number of hectares within 500 m of breeding habitat to provide an estimate of the number of frogs per hectare for that site.

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- The average of the estimated frogs per hectare for the 10 local breeding populations was then used as the population density or ‘number of alpine tree frogs per hectare’ for this action plan.
- This action plan recommends continuing with auditory surveys and relative abundance to estimate population density as alternative methods such as capture–recapture are not feasible, accurate or necessary (see Step 2).
- Upon actions 1 to 4 (see Table 3 below), and as further studies and information on alpine tree frog populations and densities in Kosciuszko National Park become available over the life of the action plan, the benefit that must be delivered will be refined and adjusted accordingly.

Step 2: implementing the management actions for alpine tree frogs to deliver the required offset

Delivering an offset of at least 1,620 additional alpine tree frogs in Kosciuszko National Park will involve the following management interventions:

- identifying an area (or areas) of suitable habitat for delivery of the offset (see actions 1 and 2 in Table 3)
- measuring the current density (or other suitable metric such as occupancy) of alpine tree frogs at that location and identifying the target density and thus the required area across which the offset actions are to be delivered (see actions 3 and 4 in Table 3)
- increasing the density (or other suitable metric) of alpine tree frogs at that location through a targeted series of offset actions such as intensive feral predator and feral herbivore control above and beyond core management (see actions 6, 7 and 8 in Table 3), and, if required, the reintroduction of alpine tree frogs if the current density is zero or very low (see Step 2 limitations, assumptions and notes below)
- continue funding contributions for chytrid fungus research, an amphibian disease of international concern, subject to successful progress/outcomes from the research. In 2022, the University of Melbourne commenced a project to increase amphibian survival of chytrid fungus, by identifying resistant genes and increasing their frequency in the population. The project is funded, in part, through an Australian Research Council Linkage Projects grant, with international research partners. If this research is successful, management actions such as genetic screening and/or genetic manipulation can be implemented for the alpine tree frog. This would be expected to result in the recovery and increase of alpine tree frog populations across all of Kosciuszko National Park by many orders of magnitude, above and beyond the required offset delivery (see action 5 in Table 3).

Since the noticeable decline of alpine tree frogs starting in the late 1980s, there have been considerable target (auditory) surveys for this species across all of Kosciuszko National Park, particularly from the Main Range through to Kiandra. However, these surveys determined a low species persistence across this range.

Recent studies by the then NSW Department of Environment and Heritage, and the Snowy Hydro Limited environmental assessments for Snowy 2.0 Main Works, have indicated that the core area of persistence for this species is in northern Kosciuszko National Park (Long Plain, Kiandra, Tantangara and Coolamine Plain), making this the core area for offset actions to take place.

To date, approximately one-third of this area has been surveyed (auditory surveys with 2 persons per potential wetland breeding habitat). These surveys suggest there is

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considerable scope to protect and enhance habitat in these northern areas to support alpine tree frog population growth.

To provide this action plan with reliable and measurable density estimates for both the initial impact and potential offset areas, the methodology must be applicable across multiple sites in a season and provide consistent and meaningful results that reflect the health of local breeding populations, and actual changes in abundance over time (that is, sources of variation relate to actual variation in abundance rather than sampling error).

Like many frog species, male alpine tree frogs congregate at wetlands and call for potential mates during the spring and early summer breeding season. Undertaking surveys during the core breeding period provides an opportunity to assess population size efficiently and reliably.

Capture–recapture techniques to estimate actual alpine tree frog abundance require a minimum of 15 hours per site over 5 separate occasions (3 hours per night). This is not achievable over the large number of sites required to adequately inform actions under this action plan– more than 50 sites would need to be surveyed each season. Additionally, recapture rates for the alpine tree frog are very low, which results in highly variable and inaccurate estimates. Apart from the considerable logistical issues, hand capturing large numbers of alpine tree frogs has ethical implications.

Using biometrical support (action 3, Table 3) to calibrate observer bias, relative abundance is the most appropriate scientific methodology to estimate population density and monitor the alpine tree frog response to management actions going forward. Calculating relative abundance by estimating the number of calling males (auditory surveys) is efficient, requiring only 15 minutes per site. This technique allows:

- many sites to be surveyed within a night
- the actual abundance of the adult population to be accurately reflected
- population responses to management actions to be tracked over time.

Monitoring via auditory surveys to calculate relative abundance can be adequately undertaken by field ecologists and staff of differing experience, and with limited licensing complications. Auditory surveys to calculate relative abundance of calling males has been used to successfully monitor alpine tree frogs over the past 25 years.

The proposed survey area in Figure 1 includes burnt and unburnt sites, and some sites are now also identified under the Assets of Intergenerational Significance (AIS) program. Actions under this action plan may, where appropriate, occur within AIS sites where offset funds are used to benefit the species, and actions go above and beyond those identified under the AIS program.

Table 3 lists the actions needed to deliver the required biodiversity gains. These include identifying suitable habitat areas, measuring the current species density in those areas, and addressing the identified key threatening processes (Table 2).

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Table 3 Management actions for alpine tree frogs to deliver the required offset in Kosciuszko National Park

Action number	Action	Threat addressed	Location	When	Who	Total cost (preliminary estimates)	Comment
1	Identify potential alpine tree frog habitat for the remaining two-thirds of the identified northern survey area from desktop wetland assessment	–	Area shaded in blue (Figure 1 – ‘additional survey areas’)	2022 to 2023	NSW National Parks and Wildlife Service (NPWS)	\$500	Completed. NPWS identified suitable habitat areas in collaboration with Saving our Species investment. Part of generating baseline information.
2	Complete alpine tree frog auditory surveys for the northern habitat sites identified in action 1, plus any additional sites determined by NPWS, and determine current relative abundance of alpine tree frog	–	Area marked in blue (Figure 1 – ‘additional survey areas’), plus any additional sites determined by NPWS	2023 to 2027	NPWS	\$100,000	Identify presence and calculate relative abundance of alpine tree frogs. Auditory surveys require 2 persons per survey event. Implement in collaboration with Saving our Species investment. Part of generating baseline information. Works proposed to be partially undertaken by external sources.
3	For sites with currently confirmed alpine tree frog populations and relative abundance estimates, calibrate the margin of error between observers to provide an index of relative abundance (population density)	–	Monitoring sites marked with yellow circles (Figure 1) initially, followed by new sites surveyed in action 2	2023 to 2027	Biometrician engaged to calibrate observational margin of error	\$50,000	Required to calculate certainty around the index of relative abundance and provide current population density figures which are robust and reliable. Staged assessment based on the results of action 2.
4	Undertake a desktop assessment/calculation to determine the required area across	–	Select sites from those identified in Figure 1, plus any other sites	2023 to 2027	NPWS	\$500	Staged assessment based on the results of actions 2 and 3

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Action number	Action	Threat addressed	Location	When	Who	Total cost (preliminary estimates)	Comment
	which the offset actions are to be delivered		identified by NPWS				
5	Continue funding contributions for chytrid fungus research to identify resistant genes, and ultimately increase their frequency in the population	Pathogens, diseases and microorganisms	All populations	2021 to 2041	NPWS	Up to \$1 million over a minimum of 20 years (\$50,000 per year commitment)	Successfully achieving this action may result in an applied management outcome, for example, screening and selective breeding and/or gene manipulation. This would result in an expected recovery of alpine tree frogs across the whole park and an increase of population density by many orders of magnitude. Funding is subject to satisfactory performance of the research project through regular assessments of research results and viability of its implementation.
6	Additional feral deer, horse and pig control in areas identified in action 4 (designated alpine tree frog offset areas)	Feral herbivores	Designated alpine tree frog offset areas (preliminary data suggests sites identified in blue in Figure 2)	2024 to 2044	Integrated into existing feral herbivore control programs for northern area	Up to \$600,000 over a minimum of 20 years	Additional to core feral herbivore management. Horse removal will be consistent with the Kosciuszko National Park Wild Horse Heritage Management Plan. Action will support bog and fen restoration.
7	Additional blackberry, willow (and other weeds as appropriate) control in areas identified in action 4 (designated alpine tree frog offset areas)	Weeds	Designated alpine tree frog offset areas. Preliminary data suggests sites identified in yellow and green in Figure 2.	2024 to 2044	Integrate into existing weed control programs	Up to \$600,000 over a minimum of 20 years	Additional to core weed management. The area (ha) of land controlled will be recorded.

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Action number	Action	Threat addressed	Location	When	Who	Total cost (preliminary estimates)	Comment
8	Additional monitoring of feral animal numbers	Feral herbivores	Designated alpine tree frog offset areas	2025 to 2045	Integrate into existing feral animal monitoring	Up to \$150,000 over a minimum of 20 years	As required, implement monitoring to measure and track feral animal densities in the designated alpine tree frog offset areas consistent with NPWS protocols.
Total cost						\$2.5 million	

Step 2 limitations, assumptions and notes

- Captive breeding programs and translocation of alpine tree frogs into areas of Kosciuszko National Park will be considered if the measures identified in Table 3 do not deliver increases in alpine tree frog density.
- Threat control strategies and actions will continue to evolve throughout the life of this action plan. The plan will be updated as new information, knowledge and management techniques become available.
- Costs identified above will be revised as required, taking into account the relative cost effectiveness of different measures.
- The success of using an index of relative abundance as an approximation for density will continue to be evaluated through the project.
- It is expected that designated offset areas for different species will overlap, with resulting management actions being carried out across multiple areas at once. This will maximise biodiversity gains and create cost savings, potentially enabling additional management actions to be undertaken or timeframes increased.
- Actions under this plan will not apply to sites directly impacted by Snowy 2.0 construction activities. Snowy Hydro Limited is required under planning approvals to undertake habitat rehabilitation at these sites. Reintroducing alpine tree frogs into Snowy 2.0 project sites is outside the scope and timeframe of this project and action plan.

Step 3: measuring and reporting on the biodiversity benefit to alpine tree frogs

The Kosciuszko Offset Strategy states that each action plan must describe how the required biodiversity benefit (offset) will be measured. This involves setting out the attributes to be measured and the methodology, timing and other details relevant to monitoring. A hierarchical approach is being taken to measure the biodiversity benefit.

- i. The population density of a species is the desirable measurement attribute.
- ii. If this is not feasible due to challenges such as difficulty in capturing and detecting populations due to low numbers or species known to be trap shy, then other metrics (such as occupancy) combined with modelling will be considered instead.
- iii. If the attribute and monitoring design in (i) or (ii) above is not working, then the attribute being measured will be revisited and another metric considered.

Any changes to metrics over time will be updated in the action plan and reported on as part of the adaptive management approach under the Kosciuszko Offset Strategy.

Table 4 Measuring biodiversity benefits to alpine tree frogs

Attribute to be measured	Metric	Location	Methodology	Monitoring design	Timing	Cost	Frequency of measurement
Population	Index of relative abundance (used to generate density estimates)	Designated alpine tree frog offset areas	Auditory surveys (2 persons per survey effort)	Detailed monitoring design to be determined during implementation of actions 1 to 4, and to be integrated with ecological health surveys	During the breeding season annually (spring: September to November)	Up to \$1 million over a minimum of 20 years for ongoing population monitoring to identify extent of offset delivered	To be determined as part of the detailed monitoring design

Step 3 limitations, assumptions and notes

- As outlined in Step 2 above, it is difficult to estimate actual abundance (density) for alpine tree frogs due to limitations with mark-recapture methods. An index of relative abundance should be sufficient to be used as a surrogate measure for density and for estimating biodiversity gain or loss.
- Monitoring the alpine tree frog will focus on tracking temporal trends in occupancy and relative abundance of breeding populations.

Governance

Reporting

As required under Snowy 2.0 approvals, the NSW National Parks and Wildlife Service must monitor, evaluate and publicly report on progress of the implementation program and the effectiveness of the specific projects and actions. They will prepare an annual report on the Snowy 2.0 biodiversity offset program for Kosciuszko National Park and its implementation, including progress with achieving the required increase in the population of the alpine tree frog. The report will be provided to the Commonwealth Department of Climate Change, Energy, the Environment and Water, and published on the National Parks and Wildlife Service website within 3 months of the end of each financial year.

The annual report will:

- detail the expenditure from the biodiversity offset fund on agreed actions under the Kosciuszko offset action plans
- outline any interest earned and reinvested into the offset program
- provide details about the conservation actions carried out for each approved threatened species, threatened ecological community and threatened ecosystem action plan such as:
 - the type of conservation action implemented – for example, feral animal control, habitat restoration
 - the geographic extent and location of the conservation actions
 - the proportion of the proposed conservation actions achieved, and proportion yet to be achieved
 - an analysis and summary of monitoring data
 - future conservation actions, with key timeframes including intended completion
- include details on progress towards each action plan objective that has been delivered
- document where adaptive management principles have been applied to each action plan to improve their effectiveness.

Adaptive management

Quantifying and measuring the biodiversity benefit for alpine tree frogs may present significant technical challenges. Together with the influence of natural variability, it is anticipated there will be a level of uncertainty to both measuring and interpreting biodiversity benefits relevant to them. This uncertainty will be addressed by applying an adaptive approach, including reviewing and updating density numbers, monitoring, methodologies and strategies as new information, data or technology become available. At a minimum, action plans will be reviewed every 5 years.

Approvals

Date/approval	
Date prepared	December 2023
Date approved – NPWS	31 January 2024
Approved by	Atticus Fleming, Deputy Secretary NPWS
Date approved – DCCEEW	29 April 2024
Approved by	Kate Gowland, Branch Head, Commonwealth Department of Climate Change, Energy, the Environment and Water
Date for review	April 2029

Kosciuszko offset action plan: alpine tree frog

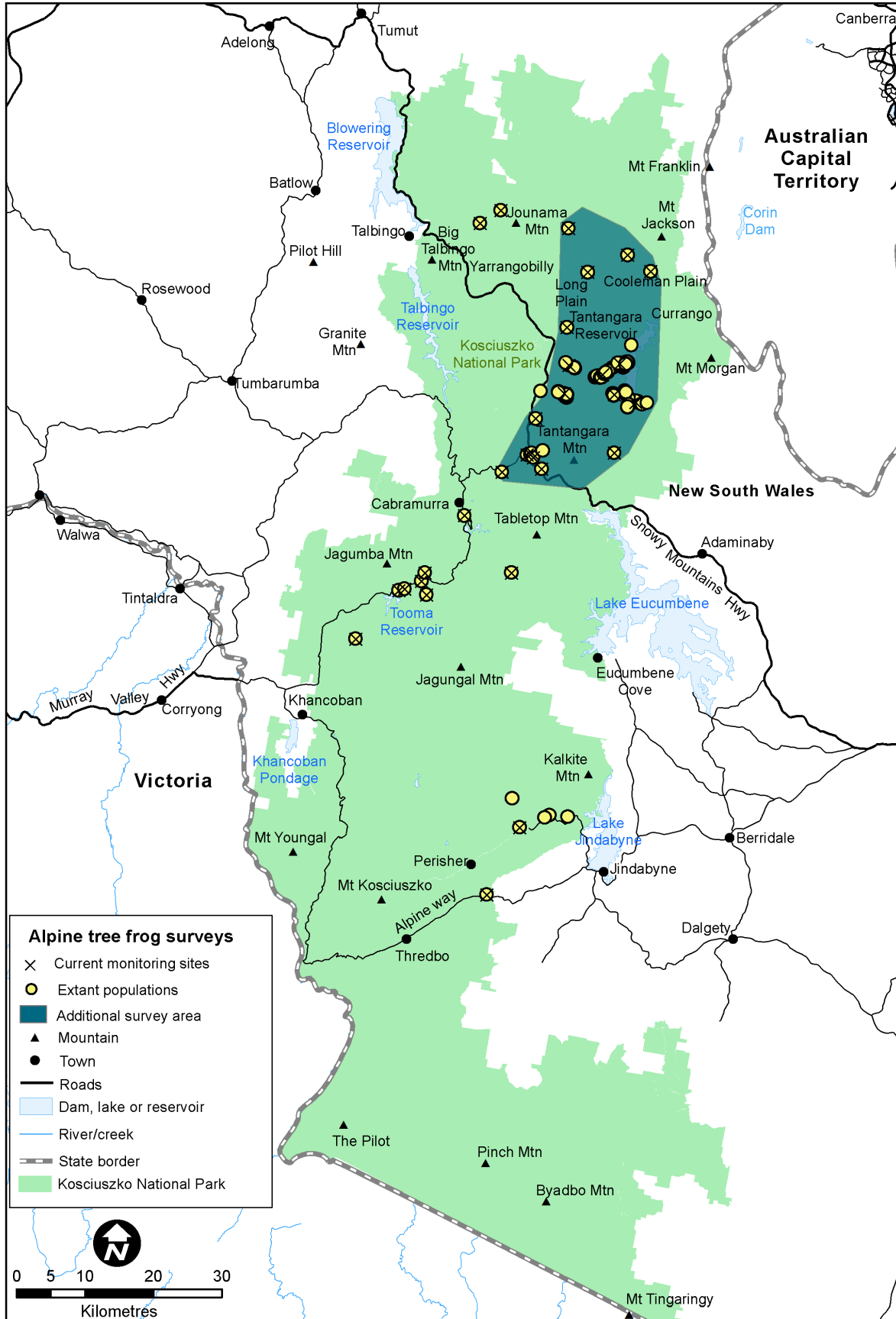


Figure 1 Alpine tree frog surveys – Kosciuszko National Park

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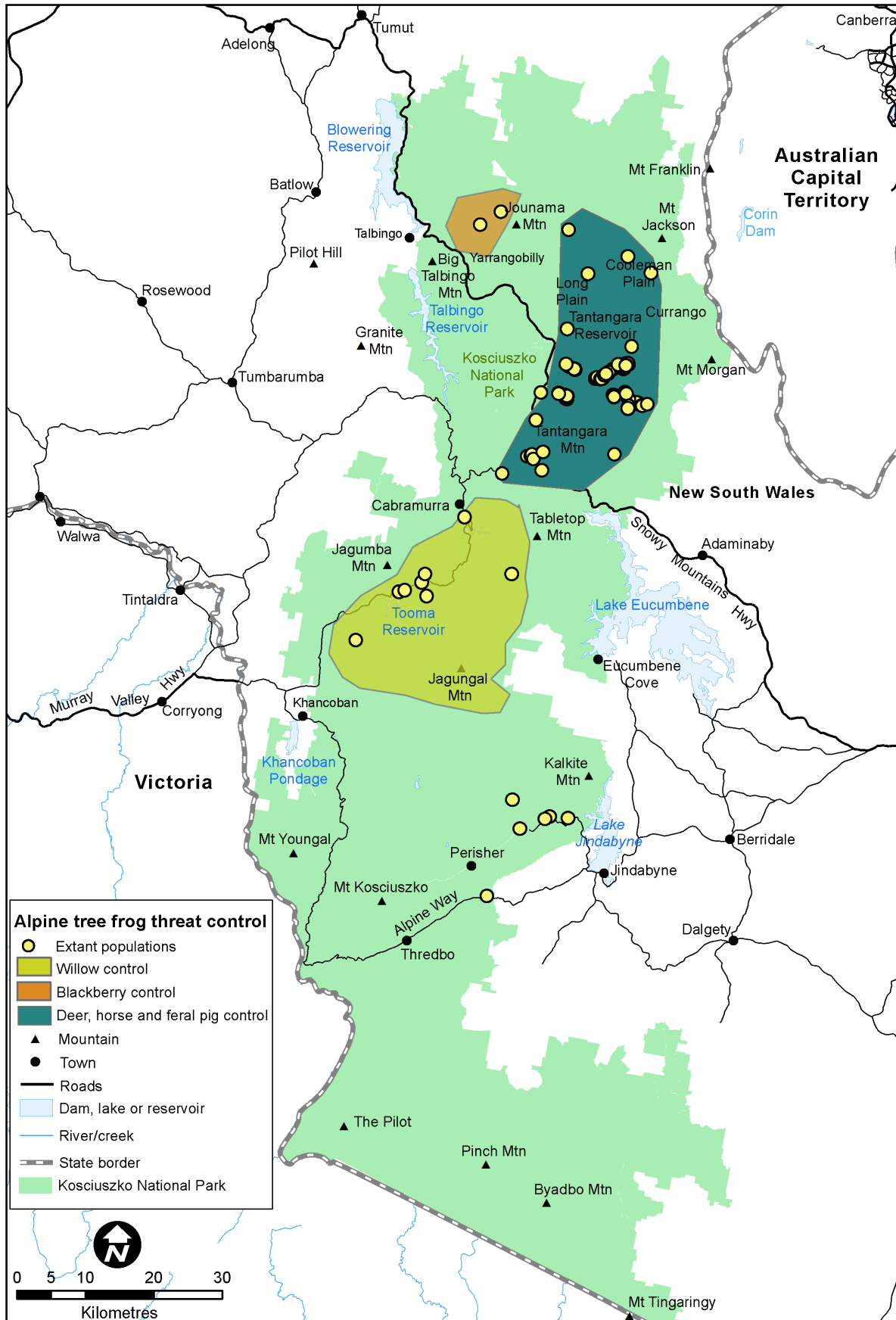


Figure 2 Alpine tree frog threat control – Kosciuszko National Park (August 2022)

More information

- [Approved threat abatement plans](#)
- [Assets of Intergenerational Significance](#)