NSW National Parks and Wildlife Service

Kosciuszko offset action plan – slender greenhood

Kosciuszko Offset Project

environment.nsw.gov.au

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This resource may contain images or names of deceased persons in photographs or historical content.

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

Cover photo: Slender greenhood. Barry Collier/DCCEEW

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

ISBN 978-1-923516-48-9
EH 2025/0261
August 2025

NSW GOVERNMENT

Find out more about your environment at:

environment.nsw.gov.au

Contents

List of tables

List of figures

Objective

This plan sets out management actions that, when implemented and measured, will deliver biodiversity gains for slender greenhood plants (*Pterostylis foliata*) 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 assessments for Exploratory Works and Main Works, up to 0.6 hectares of slender greenhood habitat was identified as being impacted. (Assessments for the Snowy 2.0 Transmission Connection project did not identify any impacts to slender greenhood.) At an estimated 1,000 individuals per hectare (see Step 1), the impact of the project on slender greenhood is estimated to be a reduction in the population by 600 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 slender greenhood plants in Kosciuszko National Park by 720 individuals.**

As slender greenhood is not a Commonwealth-listed species, this action plan has been approved only by the acting Deputy Secretary, NSW National Parks and Wildlife Service.

Species overview and key threatening processes

Slender greenhood is listed as **vulnerable** under the NSW *Biodiversity Conservation Act 2016*. It is not a listed species under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*.

Table 1 provides a species summary for slender greenhood, including a description of the species, its habitat, and its distribution within Kosciuszko National Park.

Table 1 Species summary – slender greenhood

Category	Summary
Description	Slender greenhood is a terrestrial orchid which generally has 3 to 6 roughly ovate leaves 2 cm to 5 cm long and 8 mm to 16 mm wide. The flowering stem is up to 30 cm high and is smooth. The flower is about 2 cm long, dark green and white with brown in the galea (a helmet-shaped part that protects the flower).
Habitat	In New South Wales, slender greenhood grows in eucalypt forests among an understorey of shrubs, ferns and grasses. It grows on loam or clay loam soils found on sheltered sloping to steep ground. Populations may be found in localised open seepage areas. Flowering occurs infrequently from September to December.
Distribution and population	Slender greenhood is found in New South Wales, the Australian Capital Territory, Victoria, South Australia, Tasmania and New Zealand. In New South Wales, the species occurs mainly in the Southern Tablelands, south from the town of Batlow.

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

Table 2 provides a list of key threatening processes to slender greenhood within Kosciuszko National Park that will be addressed via cost-effective management actions (see Table 3).

Table 2 Key threatening processes to slender greenhood in Kosciuszko National Park

Threat	Description
Weeds	Habitat degradation and competition through invasion, establishment, intensification and spread of weeds such as blackberry and sweet vernal grass, especially after disturbance from fire.
Feral herbivores	Damage to individual plants and degradation of slender greenhood habitat by introduced herbivores such as horses.
Feral pigs	Damage to individual plants, and degradation of habitat, by feral pigs through browsing, trampling, wallowing and rooting.
Anthropogenic climate change	Severe weather events, changes to rainfall and temperature that limit plant recruitment and survivorship.

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 (NPWS). 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 slender greenhood and benefits that must be delivered

It is estimated that 600 slender greenhood plants will be impacted by Snowy 2.0 Exploratory Works and Main Works. The benefit that must be delivered is therefore the successful and sustainable establishment of an additional 720 slender greenhood plants in Kosciuszko National Park (being 120% of the impact). This calculation is based on impacts to 0.6 hectares of slender greenhood habitat from Snowy 2.0 with an estimated population density of 1,000 individuals per hectare.

Step 1 limitations, assumptions and notes

- As slender greenhood plants can only be identified when in flower, estimating accurate population size is very difficult as they have a short and unpredictable flowering period, and can become dormant across seasons or even years when environmental conditions are unsuitable.
- The population estimate of 1,000 plants per hectare in this action plan is higher than previously published estimates of slender greenhood in New South Wales; for example, the estimate published by the NSW Scientific Committee established under the then *Threatened Species Conservation Act 1995*. However, population estimates are likely to be underestimated due to the lack of systematic plant density survey efforts and the challenges of surveying the steep and wet habitat preferred by this species.
- The Snowy 2.0 environmental assessments for Exploratory Works and Main Works were the first significant surveys conducted for this species in Kosciuszko National Park. The assessments concluded that at least one flowering slender greenhood plant will be impacted by Snowy 2.0 activities per 100 square metres, along with 10 non-flowering (and therefore unconfirmed) plants across the same area. A conservative approach was

taken and unconfirmed plants were included in this estimate to account for the difficulties in accessing the vegetation and terrain inhabited by the species.

- Population estimates during Snowy 2.0 environmental assessments range from one plant (Snowy 2.0 Main Works environmental impact assessment plots) to 'locally frequent' (Snowy 2.0 Main Works final determination report). Due to this variability, this action plan adopts a precautionary approach by incorporating a population density of 1,000 individuals per hectare. This is based on the likelihood of presence and known abundance and distribution of similar species such as the lowly greenhood (*Pterostylis despectans*) and Woorndoo greenhood (*Pterostylis sp. aff. bicolor*).
- Following completion of actions 1 and 2 (see Table 3 below), and as further studies and information on slender greenhood populations and densities in Kosciuszko National Park become available over the life of this action plan, the benefit that must be delivered will be refined and adjusted in this plan.

Step 2: implementing the management actions for slender greenhood plants to deliver the required offset

Delivering an offset of at least 720 additional slender greenhood plants in Kosciuszko National Park will involve the following management interventions:

- identifying an area (or areas) suitable for delivery of the offset (see actions 1 and 2 in Table 3)
- increasing the number of slender greenhood plants at that location through a targeted series of offset actions such as intensive feral herbivore and weed control above and beyond core management (see actions 3 and 4 in Table 3).

This action plan will initially focus on determining species presence by conducting surveys in areas identified in Figure 1. These areas have been identified by ecologists and recorded in the NSW Bionet database as previously having species presence (see action 1 in Table 3). Once species presence has been confirmed, desktop mapping will be undertaken to determine the required area across which the offset actions are to be delivered (see action 2 in Table 3). As there is no known population to survey, there is no known area to accurately assess for suitable threat abatement measures. However, this action plan has pre-emptively assigned threats to be addressed based on threats applicable to other threatened plant species in Kosciuszko National Park. Threats to slender greenhood plants will be updated as new information becomes available.

Actions under this action plan may, where appropriate, occur within Assets of Intergenerational Significance (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 condition of those areas and addressing the identified key threatening processes (Table 2).

Table 3 Management actions for slender greenhood to deliver the required offset in Kosciuszko National Park

Action number	Action	Threat addressed	Location	When	Who	Total cost (preliminary estimates)	Comment
1	Conduct site visits to confirm habitat suitability and survey for species presence	–	Area shaded in red (Figure 1)	2024 onwards until species is located	NPWS	$20,000	Figure 1 identifies locations where the species was previously recorded and locations with the same plant community types as those identified during the Snowy 2.0 environmental assessments. If no presence is detected, additional vegetation mapping and site condition assessments will occur.
2	Undertake a desktop assessment to determine the required area across which the offset actions are to be delivered	–	Sites identified in action 1, plus any other sites identified by NPWS	2024 onwards until species is located	NPWS	$0	Based on the results of action 1.
3	Additional feral herbivore control in areas identified in action 2	Feral herbivores	Designated slender greenhood offset area	Once the species is located	NPWS	Up to $10,000 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.
4	Additional weed control in areas identified in action 2	Weeds	Designated slender greenhood offset area	Once the species is located	Integrate into, but additional to, existing weed control programs	Up to $10,000 over a minimum of 20 years	Additional to core weed management.

Action number	Action	Threat addressed	Location	When	Who	Total cost (preliminary estimates)	Comment
5	Additional monitoring of feral animal numbers	Feral herbivores	Designated slender greenhood offset area	Once the species is located	Integrate into existing feral animal monitoring	Up to $4,000 over a minimum of 20 years	As required, implement monitoring to measure and track feral animal densities in the designated slender greenhood offset area consistent with NPWS protocols.
					Total cost	**$44,000**	

Step 2 limitations, assumptions and notes

- Fencing, seed collection and translocation is currently not considered under this action plan as threat management should be adequate to allow for improvement in the natural occurrence of the species. This will be reviewed and reassessed when a population is located, depending on where the species is located (such as within a horse retention area).
- Threat control strategies and actions will continue to evolve throughout the life of this action plan. This plan will be updated accordingly 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 application of broadleaf herbicides used to target weeds is likely to have a negative impact on slender greenhood plants. Any weed control will be undertaken with caution.
- Slender greenhood plants are only observable at certain times of the year and only flower under the right environmental conditions, hence population estimates are likely to remain as estimates.
- 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.

Step 3: measuring and reporting on the biodiversity benefit to slender greenhood plants

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.

1. The population density of a species is the desirable measurement attribute.
2. If this is not feasible due to challenges such as difficulty in detecting populations due to low numbers, then other metrics combined with modelling will be considered instead.
3. If the attribute and monitoring design in (1) or (2) 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 slender greenhood

Attribute to be measured	Metric	Location	Methodology	Monitoring design	Timing	Cost	Frequency of measurement
Number of slender greenhood plants	Density (number of plants per hectare)	Designated slender greenhood offset area	Site visits and individual plant counts	Establish monitoring plots/transects across the designated offset area. Track changes in species density (number of plants) within plots/transects	During the active months (spring and summer: September to February)	Up to $30,000 over 20 years for ongoing population monitoring	Annually

Step 3 limitations, assumptions and notes

- It is expected that the removal of threats in the designated offset area will support an increase in target population numbers. However, if populations are not increasing following threat abatement implementation, seed collection and plantings will be considered.
- The species is difficult to detect as it cannot be identified by leaves alone. It is also difficult to find due to its dormancy and its requirement for specific seasonal and environmental conditions to stimulate flowering. Like many similar orchid species, population trends can usually only be determined following 8 or more years of monitoring.
- It is believed that more than one orchid species has been recorded under the name slender greenhood (*Pterostylis foliata*). This taxonomic uncertainty makes it difficult to ensure accuracy when recording species presence, especially when comparing any species finds with previously recorded and/or collected individuals.

Governance

Reporting

As required under Snowy 2.0 approvals, NPWS 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 slender greenhood plants. The report will be provided to the Commonwealth Department of Climate Change, Energy, the Environment and Water, and published on the environment.nsw.gov.au 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
- 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 slender greenhood plants 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 the species. 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	February 2025
Date approved	April 2025
Approved by	Naomi Stephens, Acting Deputy Secretary NSW National Parks and Wildlife Service
Date for review	February 2030

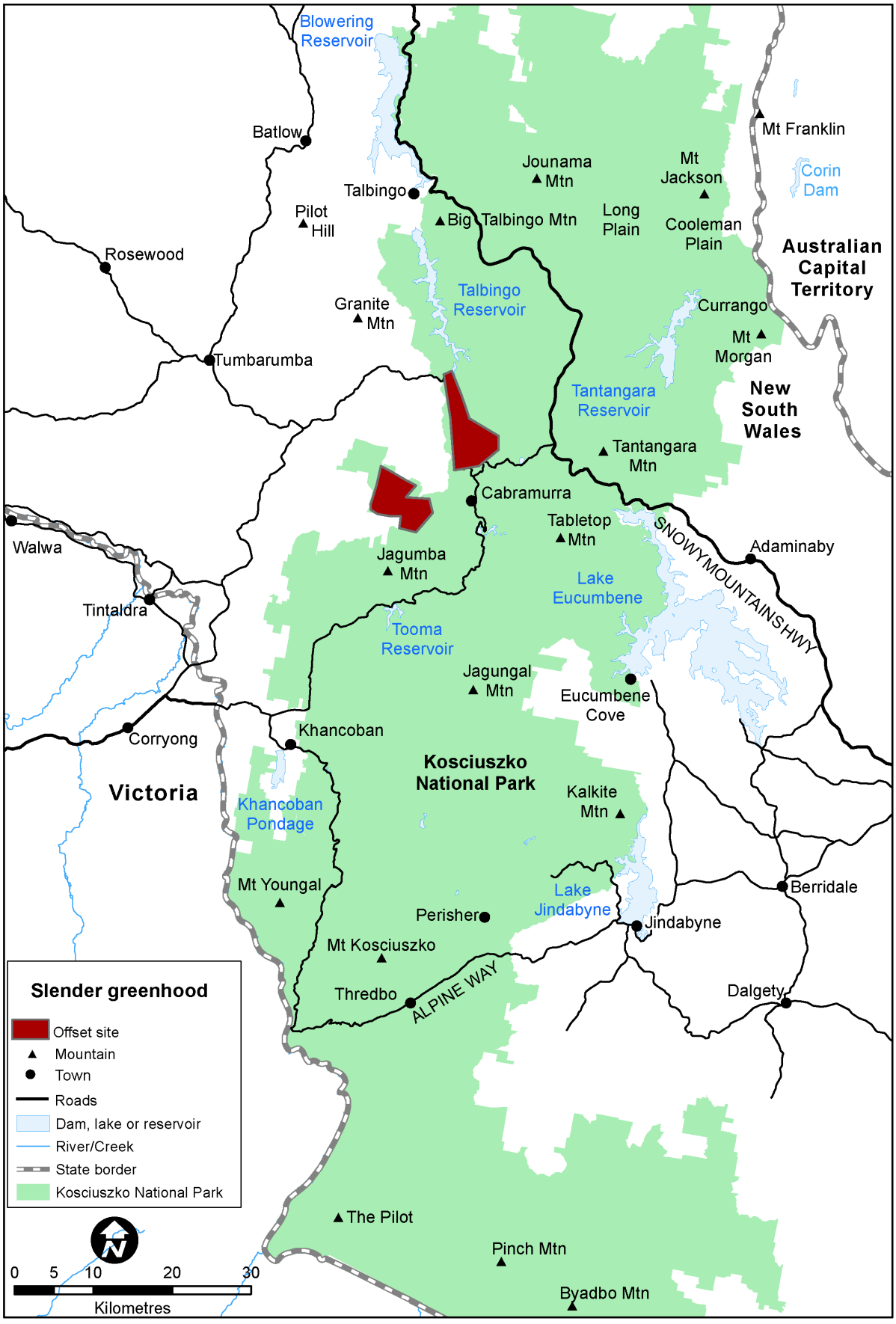

Figure 1 **Slender greenhood offset area – Kosciuszko National Park**

More information

- Assets of Intergenerational Significance