NSW National Parks and Wildlife Service

Kosciuszko offset action plan – clover glycine

Kosciuszko Offset Project

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This resource may contain images or names of deceased persons in photographs or historical content.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

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Objective

This plan sets out management actions that, when implemented and measured, will deliver biodiversity gains for clover glycine (*Glycine latrobeana*) 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 1.5 hectares of clover glycine habitat was identified as being impacted. (Assessments for the Snowy 2.0 Exploratory Works and Transmission Connection projects did not identify any impacts to clover glycine.) At an estimated 15 individuals per hectare (see Step 1), the impact of the Snowy 2.0 project on clover glycine is estimated to be a reduction of the population by 23 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 clover glycine in Kosciuszko National Park by 28 individuals**.

The impact to this species was not identified as being of national environmental significance under the Snowy 2.0 assessments. Therefore, this action plan has been approved only by the Deputy Secretary, NSW National Parks and Wildlife Service.

Species overview and key threatening processes

Clover glycine is listed as **critically 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 clover glycine, including a description of the species, its habitat, and distribution within Kosciuszko National Park.

Table 1 Species summary – clover glycine

Category	Summary
Description	Clover glycine is a low-growing herb, growing to only a few centimetres high. Leaves are split into 3, like a classic clover leaf, and are 5 to 20 mm long and 4 to 12 mm wide. The species generally flowers inconsistently in spring in the lower elevation areas of its range, and also flowers in summer in higher elevation areas. Up to 8 small, compact, deep purple flowers are borne on stems 5 to 10 cm long. Seed pods are 20 to 25 mm long and 5 mm wide, are dark brown, and contain 3 to 5 ovoid, smooth, dark brown seeds.
Habitat	Clover glycine occurs mainly in grassland and grassy woodland habitats, less often in dry forests, and only rarely in heathland. Populations occur at altitudes between 900 and 1300 m and grow in a range of soil types.
Distribution and population	Little is known about the population size and distribution of clover glycine in Kosciuszko National Park. Populations have been found in south-eastern Australia where the species is widely distributed from Port Pirie in South Australia through much of Victoria, and also near Hobart in Tasmania.

Source: Saving our Species, *Conservation Action Plan: Clover glycine (Glycine latrobeana)*, 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 clover glycine within Kosciuszko National Park that will be addressed by cost-effective management actions (see Table 3).

Table 2 Key threatening processes to clover glycine in Kosciuszko National Park

Threat	Description
Weeds	Habitat degradation and competition through invasion, establishment, intensification and spread of weeds such as ox-eye daisy, to the extent that recruitment or establishment is impaired. This risk is exacerbated by the small population size and very low seed viability
Feral herbivores	Damage to individual plants and degradation of habitat by introduced herbivores such as horses and deer through grazing and trampling
Feral pigs	Damage to individual plants and degradation of habitat by feral pigs through grazing, trampling, rooting and digging

Source: Saving our Species, *Conservation Action Plan: Clover glycine (Glycine latrobeana)*, 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 clover glycine and benefits that must be delivered

It is estimated that 23 clover glycine plants will be impacted by Snowy 2.0 Main Works. The benefit that must be delivered is the successful and sustainable establishment of an additional 28 clover glycine plants in Kosciuszko National Park (being 120% of the impact). This calculation is based on impacts to 1.5 hectares of clover glycine habitat from Snowy 2.0 with an estimated population density of 15 individuals per hectare.

Step 1 limitations, assumptions and notes

- The methodology outlined in this section is based on expert species knowledge from the Department of Climate Change, Energy, the Environment and Water.
- Very few targeted surveys of clover glycine in Kosciuszko National Park have occurred to date, limiting current understanding of the species. The Snowy 2.0 Main Works environmental assessment in 2019 and 2020 at the Tantangara Creek area, Kellys Plain, Boggy Plain and Gulf Plain was the first significant survey of the species in the park.
- Previous recordings of the species by ecologists engaged by the department in 2011 at Kellys Plain are incidental records and are not suitable to estimate population densities.
- The estimate of 15 individuals per hectare is an average based on the distribution recorded in neighbouring areas of Gulf Plain, Boggy Plain and Kellys Plain in Kosciuszko National Park during the Snowy 2.0 Main Works environmental assessment.
- The population density figure used in this action plan is an extrapolation that relies on the accuracy and consistency of ecologist recordings during surveys in the park.

- The actual population density may be higher. However, due to a lack of targeted surveys, the species distribution and density is somewhat unknown for Kosciuszko National Park.

Step 2: implementing the management actions for clover glycine plants to deliver the required offset

Delivering an offset of at least 28 additional clover glycine plants in Kosciuszko National Park will involve the following management interventions:

- identifying an area (or areas) of suitable habitat for delivery of the offset (see action 1 in Table 3)
- increasing the number of clover glycine 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 2 and 3 in Table 3).

Clover glycine is a managed threatened species for the Saving our Species program, with that program identifying Kellys Plain in Kosciuszko National Park as a priority management site for the species. However, under this action plan, Boggy Plain is proposed as the offset area as it has known populations of clover glycine and is believed to be capable of supporting the target population.

Kellys Plain is heavily infested with ox-eye daisy and any attempt to remove ox-eye daisy through intensive spraying may have a negative effect on clover glycine plants. Similarly, Gulf Plain was considered as an offset area; however, it has increasing infestations of sweet vernal grass.

The number of plants per hectare to be delivered as a biodiversity offset under this action plan was derived from the Snowy 2.0 Main Works environmental assessments, which were the first significant monitoring of clover glycine in Kosciuszko National Park. The known distribution for this species is therefore limited to these targeted surveys which were only conducted in part of its potential habitat.

Positively identifying and monitoring clover glycine plants is a challenge as the species is rare and difficult to identify unless it is in flower. Flowering does not occur every year. Actions under this plan will address the threats to the species identified in Table 2 and will seek to identify additional populations in Boggy Plain during suitable conditions. This will help to build understanding and inform conservation efforts.

Clover glycine is a species listed under the Assets of Intergenerational Significance (AIS) program. Actions under this 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 actions needed to deliver the required biodiversity gains. These include identifying suitable habitat areas, assessing the current condition of clover glycine populations in those areas, and addressing the identified key threatening processes (Table 2).

Table 3 Management actions for clover glycine 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 offset areas, species presence and threat abatement measures	–	Area shaded in red (Figure 1 – designated clover glycine offset area)	2022 to 2023	NSW National Parks and Wildlife Service (NPWS)	$0	Completed. Site suitability assessments conducted in collaboration with Saving our Species. The condition and suitability assessments included size of the sites, infestation of ox-eye daisy cover, accessibility and presence of clover glycine populations.
2	Additional feral deer, horse and pig control in areas identified in action 1	Feral herbivores	Offset area	2025 to 2045	Integrate into existing feral herbivore control programs	Up to $15,000 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.
3	Additional ox-eye daisy control (and other weeds as appropriate) in areas identified in action 1	Weeds	Offset area	2025 to 2045	Integrate into existing weed control programs	Up to $15,000 over a minimum of 20 years	Additional to core weed management. Weed control will be undertaken with caution as any attempt to remove ox-eye daisy through spraying may have a negative effect on clover glycine. The area of land sprayed will be recorded.
4	Additional monitoring of feral animal numbers	Feral herbivores	Offset area	2025 to 2045	Integrate into existing feral animal monitoring	Up to $5,000 over a minimum of 20 years	As required, implement monitoring to measure and track feral animal densities in the designated clover glycine offset area consistent with NPWS protocols.
					Total cost	**$35,000**	

Step 2 limitations, assumptions and notes

- Seed collection and planting is currently not considered under this action plan because threat management should be adequate to allow for the natural regeneration of the species.
- Threat control strategies and actions will continue to evolve throughout the life of this action plan. This 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 application of broadleaf herbicides used to target ox-eye daisy is likely to have a negative impact on clover glycine plants. Any weed control will be done with caution.
- Fire protection and burning is not listed as an action in this plan as fire response and fire management for this species is unknown.
- 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 clover glycine 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.

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 detecting populations due to low numbers, then other metrics 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 as part of the adaptive management approach under the Kosciuszko Offset Strategy.

Table 4 Measuring biodiversity benefits to clover glycine

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

Step 3 limitations, assumptions and notes

- Identifying and monitoring clover glycine is difficult as it is an inconspicuous, small species that flowers inconsistently. Effective population monitoring will rely on the knowledge, skill and experience of the person undertaking the surveys to accurately identify the species.

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 clover glycine 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 clover glycine 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	January 2025
Date approved	15 January 2025
Approved by	Atticus Fleming, Deputy Secretary NSW National Parks and Wildlife Service
Date for review	January 2030

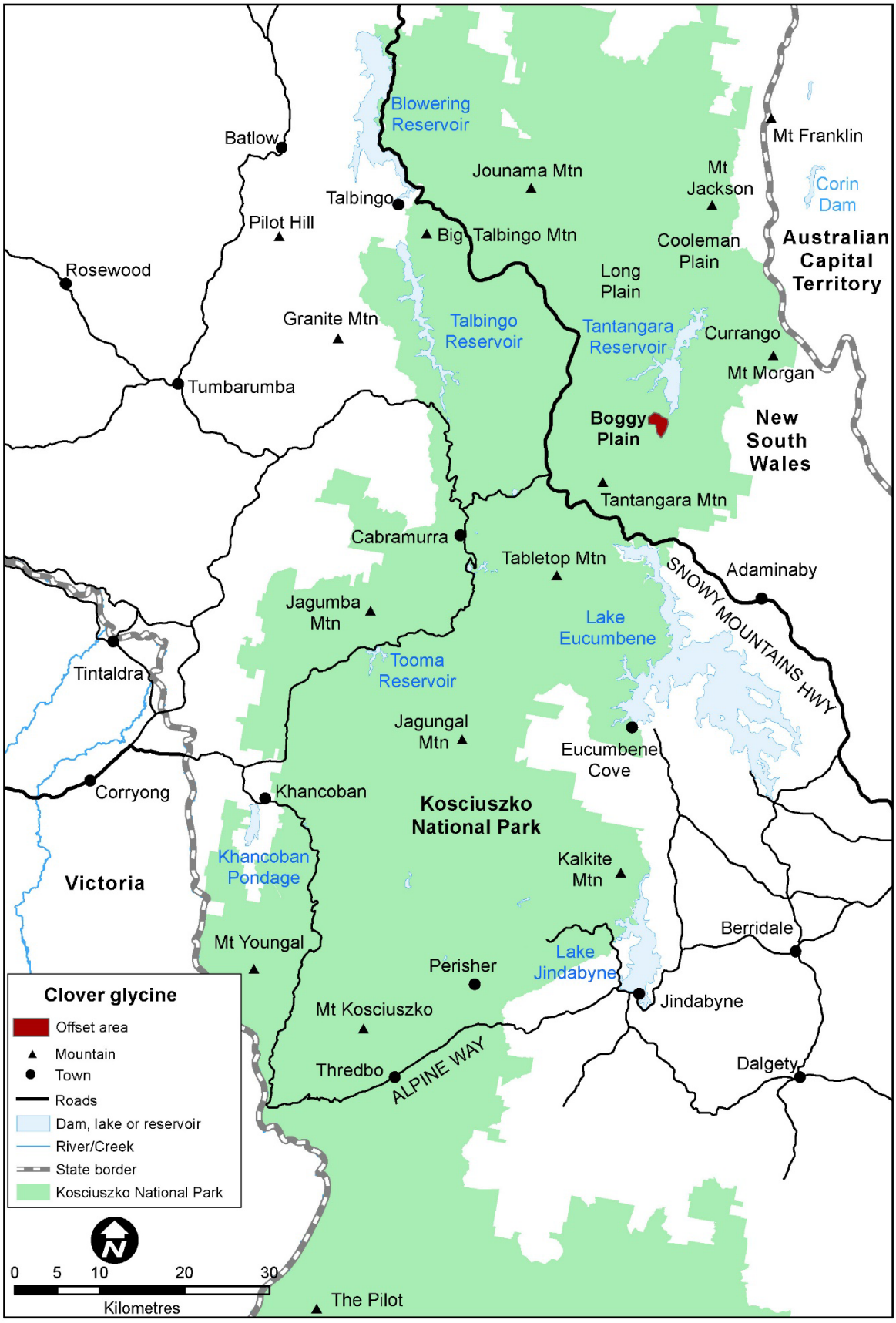

Figure 1 Clover glycine offset area – Kosciuszko National Park

More information

- Assets of Intergenerational Significance