

NSW National Parks and Wildlife Service

Kosciuszko offset action plan – Raleigh sedge 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This resource may contain images or names of deceased persons in photographs or historical content.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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Objective

This plan sets out management actions that, when implemented and measured, will deliver biodiversity gains for Raleigh sedge (*Carex raleighii*) 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 Main Works, up to 0.8 hectares of Raleigh sedge habitat was identified as being impacted. (Assessments for the Snowy 2.0 Exploratory Works and Transmission Connection projects did not identify any impacts to Raleigh sedge.) At an estimated 80 individuals per hectare (see Step 1), the impact of the Snowy 2.0 project on Raleigh sedge is estimated to be a reduction of the population by 64 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 Raleigh sedge in Kosciuszko National Park by 77 individuals.**

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

Species overview and key threatening processes

Raleigh sedge is listed as **endangered** 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 Raleigh sedge, including a description of the species, its habitat and its distribution within Kosciuszko National Park.

Category	Summary
Description	Raleigh sedge is a small and inconspicuous perennial sedge that grows from underground stems (rhizomes) and can be up to 25 cm tall. Its leaves and stems are thin and wiry. Up to 5 flowering spikes are clustered towards the ends of the stems, with a leaf-like process (bracts) extending beyond the flowering spikes.
Habitat	The species grows in sphagnum bogs and high mountain wetlands, as well as damp grasslands and stream edges of subalpine plains.
Distribution and population	Raleigh sedge is found only in areas above about 1,000 m on the Southern Tablelands of New South Wales. Most populations are found in Kosciuszko National Park within the vicinity of Snowy Plain. It is also found at the headwaters of Tantawangalo Creek within South East Forest National Park (south-eastern New South Wales).

 Table 1
 Species summary – Raleigh sedge

Source: Saving our Species, *Conservation Action Plan: Raleigh sedge (Carex raleighii)*, 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 Raleigh sedge within Kosciuszko National Park that will be addressed by cost-effective management actions (see Table 3).

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 of plants is impaired
Feral herbivores	Damage to individual plants and degradation of Raleigh sedge 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 browsing, trampling, wallowing and rooting) may lead to a decline of Raleigh sedge at habitat sites
Alteration of hydrological regimes	Scheduled or emergency water releases from nearby dams within the park may damage individuals and/or habitat, which may affect the persistence of Raleigh sedge

 Table 2
 Key threatening processes to Raleigh sedge in Kosciuszko National Park

Source: Saving Our Species, *Conservation Action Plan: Raleigh sedge (Carex raleighii)*, 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 Raleigh sedge and benefits that must be delivered

It is estimated that 64 Raleigh sedge 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 77 Raleigh sedge plants in Kosciuszko National Park (being 120% of the impact). This calculation is based on impacts to 0.8 hectares of Raleigh sedge habitat from Snowy 2.0 with an estimated population density of 80 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.
- Minimal survey data exists for this species. Population density and distribution are mostly unknown for Kosciuszko National Park.
- The population density stated in this action plan is an estimate. Actual population numbers are likely to vary from this.
- The estimate of 80 individuals per hectare is based on plant sightings made during visits to Kosciuszko National Park by officers from the department's Biodiversity Conservation Division in 2002 and 2011, and from the Snowy 2.0 Main Works environmental assessments, which were the first significant monitoring of the species in the park.
- Identifying individual plants in the field is not possible as they grow from underground stems (rhizomes) and are small and inconspicuous. Identification is usually undertaken by counting stems rather than entire plants.
- Due to its resemblance to other native sedge species, Raleigh sedge will initially require expert identification. Identification and subsequent monitoring of the species is

inherently difficult as it is small and inconspicuous, and must be fruiting for a positive identification.

- Future monitoring will use expert ecological knowledge to attempt to identify individual Raleigh sedge plants by estimating the number of stems a plant may have, from which a further estimate of population density can be made.
- Following action 1 (see Table 3 below) and as further studies and information on Raleigh sedge 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 accordingly.

Step 2: implementing the management actions for Raleigh sedge plants to deliver the required offset

Delivering an offset of at least 77 additional Raleigh sedge 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 Raleigh sedge plants at that location through a targeted series of offset actions such as intensive feral herbivore, feral pig and weed control above and beyond core management (see actions 2 and 3 in Table 3).

Only minimal data exists for Raleigh sedge. During field trips to Kosciuszko National Park by ecologists engaged by the now NSW Department of Climate Change, Energy, the Environment and Water, sightings of Raleigh sedge occurred in 2002 and 2011 along rivers and streams in Gulf Plain. In 2023, similar visits at Wild Horse Plain identified the species within bogs and fens. Sightings of Raleigh sedge were also recorded during Snowy 2.0 Main Works environmental assessments.

The addition of 77 Raleigh sedge plants will therefore be estimated based on an assumed increase in population numbers by counting visible fruiting heads and estimating the number of individual plants. As records indicate the presence of the species in Wild Horse Plain, this will be the primary focus area under this action plan.

Raleigh sedge is a species listed 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, assessing the condition of those areas, and addressing the identified key threatening processes (Table 2).

Action number	Action	Threat addressed	Location	When	Who	Total cost (preliminary estimate)	Comment
1	Conduct site visits to confirm (if possible) species presence and condition, and suitability of Wild Horse Plain as the core offset area. Site visits will also determine site accessibility and suitability for offset actions		Area shaded in red (Figure 1 – 'offset area')	2024 to 2025	NSW National Parks and Wildlife Service (NPWS)	\$0	Collaborate with Saving our Species to conduct site suitability assessments. The condition and suitability assessments will include size of the sites, accessibility, and presence/condition of Raleigh sedge populations. Undertake desktop mapping (as required) to amend the area where the offset actions are to be delivered.
2	Fencing suitable areas identified in action 1 (designated Raleigh sedge offset area)	Feral herbivores Feral pigs	Designated Raleigh sedge offset area	2025 to 2045	NPWS	Up to \$1,000 over a minimum of 20 years (funding for fencing will mainly be covered through fencing of bogs and fens)	Integrate into existing feral herbivore control programs. If the designated offset area is within an identified bog and fen area, it is likely that a fence will be installed. If required, funds from this species action plan will support fence installation and/or maintenance.
3	Additional weed control in areas identified in action 1 (designated Raleigh sedge offset area)	Weeds	Designated Raleigh sedge offset area	2025 to 2045	NPWS	Up to \$1,000 over a minimum of 20 years	Integrate into existing weed control programs. Physical and spot chemical weed removal is proposed. This would be in addition to core weed management.
4	Additional monitoring of feral animal numbers	Feral herbivores	Designated Raleigh sedge offset area	2025 to 2045	NPWS	Up to \$1,000 over a minimum of 20 years	Integrate into existing feral animal monitoring. As required, implement monitoring to measure and track feral animal densities in the designated Raleigh sedge offset area consistent with NPWS protocols.
					Total cost	\$3,000	

Table 3 Management actions for Raleigh sedge plants to deliver the required offset in Kosciuszko National Park

Step 2 limitations, assumption and notes

- Seed collection and planting is currently not considered under this action plan because threat management should be adequate to allow for natural regeneration of the species.
- 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.
- Determining the designated offset area for Raleigh sedge will rely on site visits during its fruiting season, and on experts being able to identify the species and train officers to identify the species for ongoing protection.
- Ongoing species monitoring using photo plot points will allow for targeted spot spraying or physical weed removal.
- It is assumed that the removal of weeds will support the growth of more Raleigh sedge plants.
- The application of herbicides used to target ox-eye daisy may have a negative impact on Raleigh sedge plants. Appropriate herbicides should be selected when operating within this species' habitat.
- 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 Raleigh sedge 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.

Attribute to be measured	Metric	Location	Methodology	Monitoring design	Timing	Cost	Frequency of measurement
Number of Raleigh sedge plants	Density (number of plants per hectare)	Designated Raleigh sedge offset area	Site visits and individual plant counts	Establish monitoring plots/transects across designated offset area. Track changes in species density (number of plants) within plots/transects	During the active flowering months (spring/summer: November to February)	Up to \$1,000 over 20 years for ongoing population monitoring	Annually, although a reduction in frequency to every 5 years may be considered based on survey results and expert advice

Table 4 Measuring biodiversity benefits to Raleigh sedge

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 after threat abatement, then seed collection and plantings will be considered.
- Monitoring of populations is difficult as Raleigh sedge plants grow from underground stems (rhizomes) and can only be positively identified during fruiting.
- This species is small and inconspicuous and is similar to another native sedge species. Expert identification is required to verify 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 Raleigh sedge 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
 - o an analysis and summary of monitoring data
 - o 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 Raleigh sedge 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 the 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 National Parks and Wildlife Service
Date for review	January 2030



Figure 1 Proposed Raleigh sedge offset area – Kosciuszko National Park

More information

• Assets of Intergenerational Significance