

# NSW Threatened Species Scientific Committee

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## Conservation Assessment of *Prasophyllum wilkinsoniorum* D.L.Jones (Orchidaceae)

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### ***Prasophyllum wilkinsoniorum* D.L.Jones (Orchidaceae)**

Distribution: Endemic to NSW

Current EPBC Act Status: Not listed

Current NSW BC Act Status: Not listed

Proposed listing on NSW BC Act: Critically Endangered

### **Summary of Conservation Assessment**

*Prasophyllum wilkinsoniorum* was found to be eligible for listing as Critically Endangered under IUCN Criteria B1ab(iii,v).

The main reasons for this species being eligible are that (1) it has a very highly restricted geographic distribution with an estimated extent of occurrence of 12–24 km<sup>2</sup>, (2) the minimum number of threat-defined locations when considering the most serious plausible threat of herbivory and habitat degradation by feral pigs is one (range 1–3), and (3) there is an observed and inferred continuing decline in habitat quality from anthropogenic habitat degradation and widespread feral pig diggings, as well as damage to potential habitat by domestic cattle, and an inferred continuing decline in the number of mature individuals from damage or consumption by pigs, deer, and rabbits, as well as anthropogenic habitat degradation.



*Prasophyllum wilkinsoniorum*. Credit: Gavin Phillips

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## Description and Taxonomy

*Prasophyllum wilkinsoniorum* D.L.Jones (family Orchidaceae), commonly known as Wilkinson’s leek orchid, was most recently described in Jones (2021) as follows: “Plants 250–450 mm tall. Free part of leaf to 200 x 4–8 mm. Spike 80–150 mm long, 15–45-flowered. Ovary shortly stalked, brownish. Flowers moderately crowded, scented, 15–19 x 12–15 mm, dark greenish-brown to dark brownish-red, labellum greenish to greenish-pink, callus green to brown. Dorsal sepal 8–11 x 3.5–4.5 mm, decurved. Lateral sepals free, 8–11 x 2 mm, widely spreading, margins pale. Labellum stalked, broadly ovate-lanceolate, 7.5–8.5 x 4.5–5.5 mm, sharply recurved near middle, constricted above middle then tapered to apex. Callus broad, with raised margins, extending nearly to labellum apex”. An individual approximately 650 mm tall has been observed (K.J. Smith and J. Miles pers. obs. January 2025).

*Prasophyllum wilkinsoniorum* is the currently accepted name (CHAH 2018; PlantNET 2025). However, based on molecular analysis, Clements and Jones (2019) include the species in the genus *Paraprasophyllum*. The NSW Herbarium does not currently recognise *Paraprasophyllum* as a genus, with all taxa retained within *Prasophyllum* (PlantNET 2025). *Prasophyllum wilkinsoniorum* differs from the closely related *P. canaliculatum* (channelled leek orchid) by having a more elongated labellum and dorsal sepal, and a labellum callus that has a flat area towards the tip, rather than the deep groove of *P. canaliculatum* (Miles 2017).

## Distribution

There are 2–4 known subpopulations of *Prasophyllum wilkinsoniorum* (detailed in Table 1). These occur in the Kybeyan-Gourock subregion of the South Eastern Highlands (IBRA region, Commonwealth DCCEEW 2024a, 2024b), north-east of Bombala in New South Wales (NSW). The minimum number excludes the Hains Swamp subpopulation, which may no longer be extant, and the Tantawangalo subpopulation, which could not be distinguished from *P. canaliculatum* at the time of survey due to a lack of diagnostic reproductive material.

**Table 1.** Details of *Prasophyllum wilkinsoniorum* subpopulations based on surveys undertaken 13–15<sup>th</sup> January 2025 (K.J. Smith, T.L. Collins, J. Miles pers. obs.).

Subpopulation	Mature individuals	Notes
Nunnock Swamp	183 (across three sites)	Land tenure: National Park. Fire history: No record of burning. Both flowering and fruiting individuals were observed. Cursory survey of an additional two sites in the vicinity found no individuals. Before being sold to the NSW National Parks and Wildlife Service in 1999, these grasslands were used for cattle grazing during the warmer months of the year.
Dragon Swamp	16 (across two sites)	Land tenure: National Park. Fire history: Burnt 1957/58 and 2019/20. Both flowering and fruiting individuals were observed.
Tantawangalo	8 (uncertain ID)	Land tenure: State Forest.

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		Fire History: Burnt 1987/88 and 2019/20. One individual was fruiting, and the remainder were dehisced. Timing relative to other sites suggests these may be <i>P. canaliculatum</i> , not <i>P. wilkinsoniorum</i> .
Hains Swamp	None found on roadside (private property not surveyed).	Land tenure: Private property and public (Crown land) roadside Fire history: Burnt 2019/20. Based on a single herbarium specimen from 2000 with coordinate accuracy of 1 km.

## Area of occupancy and extent of occurrence

*Prasophyllum wilkinsoniorum* has an estimated area of occupancy (AOO) of 12–20 km<sup>2</sup>, and an estimated extent of occurrence (EOO) of 12–24 km<sup>2</sup>. The minimum EOO was adjusted from 4.6 km<sup>2</sup> to match the minimum AOO because, by definition, EOO cannot be less than AOO (IUCN 2024). The minimum estimates exclude the Hains Swamp and Tantawangalo subpopulations (Table 1), as well as one site from the Nunnock subpopulation (Wilkinsons Hut) where the species could not be relocated in January 2025, and potential habitat appeared heavily grazed.

As recommended by IUCN (2024), AOO is based on 2 x 2 km grid cells, while EOO is based on a minimum convex polygon enclosing mapped records for the species. The records used for these estimates were obtained during surveys undertaken in January 2025 (K.J. Smith, T.L. Collins and J. Miles pers. obs.), supplemented by records retrieved from NSW Government (2024), Atlas of Living Australia (2024), the National Herbarium of New South Wales (RBGDT 2024), C. Steele (*in litt.* December 2024), and A. Morrison (*in litt.* March 2025). Of a total of 115 database records, 68 were excluded because they were duplicates or lacked coordinate attributes. An additional six were excluded based on high coordinate uncertainty or inconsistency of coordinates with the locality description, and there was one likely misidentification from Bega Swamp (J. Miles *in litt.* December 2024).

## **Abundance**

*Prasophyllum wilkinsoniorum* has an estimated total population size of 2,080 mature individuals. In January 2025, ~200 mature individuals were detected (Table 1). However, this survey did not cover all potential habitat, nor the entire flowering period of this species. Moreover, it is possible that other mature individuals remained dormant underground, as has been observed for *P. correctum* (gaping leek-orchid) (Coates *et al.* 2006). In addition, it is unlikely that all emergent individuals would be detected in surveyed areas due to concealment within shrubs or long grass, and the small size and cryptic appearance of *P. wilkinsoniorum* (especially if not flowering or when grazed).

The observations of population dynamics for *Prasophyllum correctum* (Coates *et al.* 2006) were applied to derive a preliminary population size estimate for *P. wilkinsoniorum* that included the individuals that may not have been counted because they emerged without flowering or were dormant underground. Analysis of monitoring data showed that under fire intervals of >3 years ~78% of *P. correctum* individuals are expected to be dormant, ~18% will emerge with a leaf only, and ~4%

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will flower (Coates *et al.* 2006). Seedlings would be present, but are very difficult to detect, and therefore contribute less than 1% (*i.e.*, a negligible proportion) to the expected population life stage distribution (Coates *et al.* 2006). Given the most recent fire in any of the *P. wilkinsoniorum* subpopulations occurred in 2019/20, it is assumed only 4% of individuals were counted in January 2025. This provides a preliminary maximum population estimate of 5,000 mature *P. wilkinsoniorum*.

A precautionary approach to the estimation of *Prasophyllum wilkinsoniorum* population size is necessary given that the actual flowering rate for this species is unknown (*i.e.*, may differ from *P. correctum*), and there is an observed continuing decline in habitat quality alongside an inferred decline in the number of mature individuals (detailed under 'Threats' below). It is considered likely that a large proportion of the individuals that would normally be dormant have been killed or consumed by targeted pig diggings. In accordance with the recommendations of IUCN (2024) for resolving uncertainty, a slightly lower than mid-value of 2,080 is considered a reasonable maximum estimate for the population size of *P. wilkinsoniorum*. This value is 40% of the sum of the preliminary maximum estimate and the approximate number of individuals detected in the most recent surveys.

## Ecology

### Habitat

Jones (2021) described *Prasophyllum wilkinsoniorum* as “restricted to montane areas growing among tussocks and low shrubs in snowgum woodland, grassy flats, treeless plains, frost hollows and among sedges and rushes in swamps in brown basaltic loam, dark loam and peaty loam”. It has been described as being “in drier grassland than *P. canaliculatum*, but probably periodically waterlogged” (J. Miles in NSW Government 2024) and “found in closely grazed grassland with a high proportion of *Hypoxis hygrometrica*, *Brachyscome scapigera* and *Stylidium montanum*, species”, which were not typically found with *P. canaliculatum* (Miles 2013).

*Prasophyllum wilkinsoniorum* detected in January 2025 were most commonly found in flat grassy herb fields adjacent to swamps, often near shrubs or scattered trees and in association with *Epacris* spp. and *Stylidium* species. However, in the northern Dragon Swamp site, three individuals were found among sedges and rushes under *Leptospermum* sp. shrubs. Individuals found in previously known subpopulations occurred at elevations of 912–952 m. In the Tantawangalo subpopulation, where the species identification is uncertain (Table 1), elevation is ~866 m, which is slightly higher than that at Hains Swamp.

Other associations for *Prasophyllum wilkinsoniorum* include humus on granite, *Coronidium monticola*, *Eucalyptus parvula*, *Eucalyptus viminalis*, *Hakea microcarpa*, *Juncus* spp., *Poa* sp., *Ranunculus lappaceus*, *Rumex brownii*, *Rytidosperma* sp., and *Tricoryne elatior* (G. Phillips in RBGDT 2024; G. Phillips *in litt.* March 2025).

### Flowering, pollination, and dormancy

*Prasophyllum wilkinsoniorum* flowers from late December to January (Jones 2021). Between 13–15<sup>th</sup> January 2025, some individuals were still flowering, but the majority were fruiting (K.J. Smith pers. obs.). In 2021, fruits had released seed by the 1<sup>st</sup> of February (G. Phillips in RBGDT 2024).

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Similar to *Prasophyllum canaliculatum*, extreme dry conditions prior to and during the flowering season may cause *P. wilkinsoniorum* to abort flowering (Miles 2019, Miles 2024). Some individuals may not emerge at all during the flowering season, instead remaining dormant underground (NSW NPWS 2022), possibly due to waterlogging, drought, or competition from dense growth of grasses and sedges (Miles 2017, Miles 2019, Miles 2024). Additionally, as is the case in *P. correctum* and *P. canaliculatum*, emergent *P. wilkinsoniorum* may not always produce flowers (Coates *et al.* 2006; Miles 2024). Individuals that emerge in the vegetative (*i.e.*, leaf only) state appear grass-like, and as such, may be easily missed during surveys (Coates *et al.* 2006).

Flies, weevils (Curculionidae), other beetles (*e.g.*, Cryptocephalinae), bees and wasps are potential pollinators of *Prasophyllum wilkinsoniorum* inferred from other *Prasophyllum* species (Bernhardt and Burns-Balogh 1986; Adams and Lawson 1993; Jones 1997; Kuitert 2018; Encinas-Viso *et al.* 2022; Hayashi *et al.* 2024).

Outside the flowering season, all *Prasophyllum wilkinsoniorum* individuals persist only as underground root tubers and are not visible aboveground. This seasonal dormancy may allow *P. wilkinsoniorum* to avoid cold winters (Weston *et al.* 2005). Based on the observations of *P. correctum* (Coates *et al.* 2006), it is inferred that *P. wilkinsoniorum* individuals can remain dormant (*i.e.*, without seasonal emergence) for 1–5 years.

## Seed dispersal and germination

Orchids produce many tiny balloon-like seeds that are dispersed by wind and water, and may also be transported by animals in their fur, feathers, or muddy feet (Arditti and Ghani 2000). Because *Prasophyllum wilkinsoniorum* seeds are only released at around 45 cm high, many of them are expected to settle close to the parent plant (Murren and Ellison 1998; Arditti and Ghani 2000). However, given the large numbers produced, it is reasonable to assume that some seeds are dispersed over larger distances (Arditti and Ghani 2000).

Based on the life history of other orchid species (Coates *et al.* 2006; Shefferson *et al.* 2020), and the small population size of *Prasophyllum wilkinsoniorum*, it is inferred that relatively few *P. wilkinsoniorum* seeds become mature adults. Assuming a seed is deposited in an area of suitable vegetation, soil, and climate, like other orchids, *Prasophyllum* species also require the presence of specific types of mycorrhizal fungi for germination and growth (Grant and Koch 2003; Freestone *et al.* 2023). A symbiotic association is formed with the fungi, which serves to supply nutrients to the seedling (Rasmussen and Rasmussen 2009). There is evidence indicating that the local abundance of orchids is positively related to the local abundance of their mycorrhizal fungi (McCormick *et al.* 2018).

## Lifespan and generation length

The lifespan of *Prasophyllum* species is considered to be indefinite because death occurs due to outside factors (*e.g.*, unsuitable environment, herbivory) rather than inherent growth (Benson and McDougall 2005). *Prasophyllum wilkinsoniorum* lacks the stolonoid roots that produce colonies of daughter tubers (Pridgeon and Chase 1995; Clements and Jones 2019). For *P. wilkinsoniorum* it is inferred that a single dropper is produced each year to form a replacement tuber (Pridgeon and Chase 1995), which is considered the same individual.

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Given the difficulties of monitoring underground individuals, the lack of a reliable method for estimating the age of individuals, and that mortality rates are likely to vary temporally and between subpopulations, the generation length for *Prasophyllum wilkinsoniorum* is uncertain. Generation lengths estimated for other *Prasophyllum* species range between 10–50 years (Commonwealth TSSC 2014; DELWP 2021, DELWP 2022; Commonwealth of Australia 2023).

## Fire Ecology

It is evident from the long absence of fire from the Nunnock subpopulation (Table 1) that *Prasophyllum wilkinsoniorum* does not flower exclusively within the first five years after fire, as occurs in some other *Prasophyllum* species (Ferrer-Paris and Keith 2022). Related species, such as *P. pallens*, *P. fuscum*, *P. montanum*, and *P. correctum* are known to respond to fire with an increase in the number of flowering individuals (Coates *et al.* 2006; G. Phillips *in litt.* February 2025). Some increases in the number of flowering *P. wilkinsoniorum* were observed after a large wildfire that started on 23<sup>rd</sup> January 2020, for example at one burnt site in Dragon Swamp there were approximately six individuals in 2020 where there had been none in 2019 (G. Phillips *in litt.* March 2025). However, increases were also observed in unburnt areas, which suggests that the increased flowering in burnt sites was at least in part due to the combination of drought-breaking rain and increased feral animal control (Miles 2020a).

In December 2020, a larger number of *Prasophyllum wilkinsoniorum* were found in one of the unburnt Nunnock sites (39 individuals; *cf.* 17 in 2013), compared to one of the Dragon Swamp sites that was burnt (seven individuals; *cf.* one in 2013 and 30 in 2017) (Miles 2020a). In the February of the same flowering season, the species was described as “locally common” at a different unburnt Nunnock site, and “locally occasional” at the burnt Dragon Swamp (it is unknown whether the same patch was surveyed) (G. Phillips in Atlas of Living Australia 2024).

Given the largest number of plants in the burnt site was observed in 2017, which was a drier year than 2020, it is inferred that the timing of the January 2020 fire may have had an adverse effect on recruitment and/or survival in the Dragon Swamp subpopulation because it occurred during the period when *Prasophyllum wilkinsoniorum* develops fruit and releases seed. Notably, it was the parts of Dragon Swamp that were usually the wettest that burnt most severely, likely because they supported higher volumes of vegetation, which had become flammable under the extreme dry conditions (J. Bentley *in litt.* October 2020). In these areas the top 10 cm or so of organic matter also burnt (J. Bentley *in litt.* October 2020). This may have resulted in mortality of some tubers.

In January 2025, the majority of *P. wilkinsoniorum* were again found in the unburnt Nunnock Swamp subpopulation, though some parts of Dragon Swamp were not revisited.

## **Cultural Significance**

The traditional custodians of the lands on which *Prasophyllum wilkinsoniorum* occurs are the Bidwell, Ngarigo, and Yuin peoples (Horton 1996; Native Land Digital 2025). Several *Prasophyllum* species were commonly eaten by Aboriginal peoples (Lawler 1984 in Presland 2004). The traditional Aboriginal plant use guide for the ACT region,

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which records traditional plant knowledge of Ngunnawal people, has the following entry for the related *Prasophyllum tadgellianum* (small alpine leek-orchid): “Like all orchids this species has an edible tuber which is best eaten roasted” (ACT Government and Ngunnawal Community 2014).

This assessment is not intended to be comprehensive of the traditional ecological knowledge that exists for *Prasophyllum wilkinsoniorum*, or to speak for Aboriginal people. Aboriginal people have a long history of biocultural knowledge, which comes from observing and being on Country, and evolves as it is tested, validated, and passed through generations (Woodward *et al.* 2020). Aboriginal peoples have cared for Country for tens of thousands of years (Bowler *et al.* 2003; Clarkson *et al.* 2017). There is traditional ecological knowledge for all plants, animals and fungi connected within the kinship system (Woodward *et al.* 2020). Traditional ecological knowledge referenced in this assessment belongs to the relevant knowledge custodian and has been referenced in line with the principals of the NSW *Indigenous Cultural and Intellectual Property* (ICIP) protocol (Janke and Company 2023).

## Threats

The major threats to the persistence of *Prasophyllum wilkinsoniorum* are herbivory and habitat degradation by feral animals and domestic cattle, anthropogenic habitat degradation, and competition with exotic plants. The resilience of *P. wilkinsoniorum* to these threats may be reduced by human-induced changes to rainfall and fire regimes.

The adverse effects of threatening processes may be exacerbated by natural processes such as competition with dense growth of native species (Coates *et al.* 2006; Miles 2024) and grazing by macropods and wombats.

### Herbivory and habitat degradation by feral animals and domestic cattle

*Prasophyllum wilkinsoniorum* was observed to be threatened by the activities of feral pigs (*Sus scrofa*) when first formally described in 1999 (Jones 2000). In January 2025, continuing decline in habitat quality from extensive feral pig diggings was observed in the Nunnock, Dragon Swamp and Tantawangalo subpopulations. Widespread older diggings were evident as uneven vegetated ground (particularly in Dragon Swamp), while the newer diggings were patches of bare ground with upturned groundcover vegetation. *Prasophyllum wilkinsoniorum* was absent where the ground was recently turned over by pigs (K.J. Smith pers. obs. January 2025). The frequent association of *P. wilkinsoniorum* with patches of shrubs may be because the structural complexity, toughness, or unpalatability of shrubs provides some protection from grazing, trampling, and digging.

There is also an inferred continuing decline in the number of mature individuals of *Prasophyllum wilkinsoniorum* based on damage to, or consumption of, stems and tubers associated with feral animal activities. Targeting of *P. wilkinsoniorum* by feral pigs appears to have occurred in one of the Nunnock sites where a patch of 26 individuals detected on 14<sup>th</sup> January 2025 was found almost completely turned over by pigs two weeks later (Figure 1). Three partially consumed *P. wilkinsoniorum* stems were also observed in other patches, though it is unknown whether the agent was feral pigs, deer, rabbits, native herbivores, or invertebrates. Evidence of debarking by deer was observed at one of the Nunnock sites, and a rabbit was seen. Damage to flowering

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stems adversely affects an individual's ability to produce seed in a given year (McPherson 2004). Consecutive years of limited seed production, together with mortality caused by exposure or consumption when tubers are unearthed, places subpopulations at increased risk of extinction (McPherson 2004).

Adverse effects on *Prasophyllum wilkinsoniorum* from the activities of deer and rabbits are suspected from evidence of their presence (McPherson 2004), and observations of rabbits digging up *Caladenia saggicola* (sagg spider orchid) tubers (Threatened Species Section 2017). Their adverse effects may be greatest during dry periods when the moisture of the swamp habitat may attract a greater number and/or frequency of these animals (McPherson 2004).

Grazing and trampling of potential habitat by domestic cattle was evident in the paddocks adjoining the northern side of the road in the Hains Swamp locality, where adverse effects from feral pigs are also inferred. It is currently unknown whether the Hains Swamp subpopulation of *Prasophyllum wilkinsoniorum* still persists (Table 1). In addition, bare patches created by feral and domestic animals may facilitate the encroachment of exotic plants that compete with *P. wilkinsoniorum* (McPherson 2004).

'Predation, habitat degradation, competition and disease transmission by feral pigs, *Sus scrofa* Linnaeus 1758', 'Herbivory and environmental degradation caused by feral deer', and 'Competition and grazing by the feral European Rabbit, *Oryctolagus cuniculus* (L.)' are listed as Key Threatening Processes under the NSW *Biodiversity Conservation Act 2016*.

'Predation, habitat degradation, competition and disease transmission by feral pigs', 'Competition and land degradation by rabbits', and 'Novel biota and their impact on biodiversity' are listed as Key Threatening Processes under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*.

## Anthropogenic habitat disturbance and degradation

There is an inferred continuing decline in habitat and the number of mature *Prasophyllum wilkinsoniorum* based on the direct anthropogenic threats that were present at two localities in January 2025. In one Nunnock site, vehicle tracks were present through a patch of 27 individuals. The tracks were less than 1 m from remaining flowering and fruiting stems. There were no individuals in the area where vehicles had torn up some ground vegetation and compacted the soil.

At the Hains Swamp locality, a main road was constructed through the swamp, and excavated soil is present as mounds along the roadsides. Part of the roadside at Hains Swamp was bulldozed in 2020 to serve as a firebreak (G. Phillips *in litt.* November 2024). This contrasts with the historical description of the Hains Swamp locality: Around 1999–2000 it was "in really good condition, quite wet and with a dense cover. There was also good grassy verge on both sides of the road that supported several species of orchid, and other monocots" (D.L. Jones in Miles 2020b).

'Clearing of native vegetation' is listed as a Key Threatening Process under the NSW *Biodiversity Conservation Act 2016*. 'Land clearance' is listed as a Key Threatening Process under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*.



**Figure 1.** (A) Blue flags indicating the location of 26 *Prasophyllum wilkinsoniorum* individuals recorded in one Nunnock patch on 14<sup>th</sup> January 2025 (K.J. Smith and T.L. Collins pers. obs.); some recent pig diggings (bare ground) were evident. (B) The same patch with a larger area of pig diggings observed on 30<sup>th</sup> January 2025.

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## Competition with exotic plants

Exotic plants may degrade *Prasophyllum wilkinsoniorum* habitat by competing for space and resources. *Rubus fruticosus* sp. agg. (blackberry) around Dragon Swamp was noted as likely to require long-term control (J. Bentley *in litt.* October 2020). The 2019/20 wildfire at Dragon Swamp was followed by an increase in weed populations, principally *Cirsium vulgare* (spear thistle) and *Holcus lanatus* (Yorkshire fog grass) (Miles 2020a). *Senecio madagascariensis* (fireweed) is also present (A. Morrison pers. comm. March 2025). In January 2025, *Holcus lanatus* was present in all subpopulations but particularly dense in some of the Nunnock sites. The Hains Swamp locality is most at risk of weed incursion due to the main road that runs through it. *Rubus fruticosus* sp. agg. is also present at Hains Swamp (K.J. Smith pers. obs. January 2025).

'Invasion of native plant communities by exotic perennial grasses' and 'Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants' are listed as Key Threatening Processes under the NSW *Biodiversity Conservation Act 2016*.

'Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants' is listed as a Key Threatening Process under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*.

## Human-induced changes to rainfall and fire regime

Modelling of human-induced climate change predicts, with high confidence, that by 2090 there will be less spring rainfall (up to 45% reduction, though 5% increase also possible), less winter rainfall (up to a 30% reduction), and a harsher fire-weather climate in the region occupied by *Prasophyllum wilkinsoniorum* (Grose *et al.* 2015). Adverse effects on *P. wilkinsoniorum* from these changes are uncertain. However, it is suspected that the combination of (1) increased frequency of dry years, in which flowering may be limited; (2) loss of flowers to fire because they emerge during peak bushfire season; and (3) wildfires occurring (or burning with greater intensity) in areas of swamp habitat not previously affected, would result in a greater magnitude and/or frequency of reduced reproductive output. In turn, a lower reproductive output would reduce the species' resilience to the other threats implicated in its decline (*i.e.*, compounding their adverse effects).

'Anthropogenic climate change' and 'High frequency fire resulting in the disruption of life cycle processes in plants and animals and loss of vegetation structure and composition' are listed as Key Threatening Processes under the NSW *Biodiversity Conservation Act 2016*.

'Loss of climatic habitat caused by anthropogenic emissions of greenhouse gases' and 'Fire regimes that cause declines in biodiversity' are listed as Key Threatening Processes under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*.

## **Threat-defined Locations**

*Prasophyllum wilkinsoniorum* is considered to occupy 1–3 threat-defined locations based on the most serious plausible threat of herbivory and habitat degradation by

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feral pigs. Given that the core range of feral pigs can be many square kilometres (Wilson *et al.* 2023), simultaneous adverse effects on multiple sites containing *P. wilkinsoniorum* are plausible. The minimum number of threat-defined locations (*i.e.*, one) is plausible under two scenarios:

1. The Nunnock and Dragon Swamp subpopulations are grouped into one location, and it is assumed that the Hains Swamp subpopulation is extinct and the Tantawangalo individuals are not *P. wilkinsoniorum*.
2. The species occurs at all four subpopulations and the adverse effects of feral pigs operate cumulatively across all of them within a single generation.

Up to two additional locations may exist if *P. wilkinsoniorum* is confirmed from Tantawangalo and Hains Swamp and the adverse effects of feral pigs are operating over a different time frame at these sites due to the distance from Nunnock and Dragon Swamps.

## Assessment against IUCN Red List criteria

For this assessment it is considered that the survey of *Prasophyllum wilkinsoniorum* has been adequate and there is sufficient scientific evidence to support the listing outcome.

### Criterion A Population size reduction

A. Population size reduction. Population reduction (measured over the longer of 10 years or 3 generations) based on any of A1 to A4			
	Critically Endangered	Endangered	Vulnerable
A1	≥ 90%	≥ 70%	≥ 50%
A2, A3 & A4	≥ 80%	≥ 50%	≥ 30%
A1 Population reduction observed, estimated, inferred, or suspected in the past where the causes of the reduction are clearly reversible AND understood AND have ceased. A2 Population reduction observed, estimated, inferred, or suspected in the past where the causes of reduction may not have ceased OR may not be understood OR may not be reversible. A3 Population reduction projected, inferred or suspected to be met in the future (up to a maximum of 100 years) [(a) cannot be used for A3]. A4 An observed, estimated, inferred, projected or suspected population reduction where the time period must include both the past and the future (up to a max. of 100 years in future), and where the causes of reduction may not have ceased OR may not be understood OR may not be reversible.		based on any of the following: (a) direct observation [except A3] (b) an index of abundance appropriate to the taxon (c) a decline in area of occupancy (AOO), extent of occurrence (EOO) and/or habitat quality (d) actual or potential levels of exploitation (e) effects of introduced taxa, hybridization, pathogens, pollutants, competitors or parasites.	

## Outcome

*Prasophyllum wilkinsoniorum* is considered data deficient under Criterion A.

## Population reductions

Assessment under this criterion requires information on the generation length of *Prasophyllum wilkinsoniorum*. Given the difficulties of monitoring underground individuals, the lack of a reliable method for estimating the age of individuals, and that mortality rates are likely to vary temporally and between subpopulations, the generation length for *P. wilkinsoniorum* is uncertain. Generation lengths estimated for other *Prasophyllum* species range between 10–50 years (Commonwealth TSSC 2014; DELWP 2021, 2022; Commonwealth of Australia 2023). Furthermore, quantification of a population reduction is complicated by a limited understanding of the factors influencing the species' dormancy, emergence, and flowering.

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## Conclusion

There is insufficient data to assess *Prasophyllum wilkinsoniorum* under Criterion A.

## *Criterion B*      *Geographic range*

B. Geographic range in the form of either B1 (extent of occurrence) AND/OR B2 (area of occupancy)			
	Critically Endangered	Endangered	Vulnerable
B1. Extent of occurrence (EOO)	< 100 km <sup>2</sup>	< 5,000 km <sup>2</sup>	< 20,000 km <sup>2</sup>
B2. Area of occupancy (AOO)	< 10 km <sup>2</sup>	< 500 km <sup>2</sup>	< 2,000 km <sup>2</sup>
AND at least 2 of the following 3 conditions:			
(a) Severely fragmented OR Number of locations	= 1	≤ 5	≤ 10
(b) Continuing decline observed, estimated, inferred or projected in any of: (i) extent of occurrence; (ii) area of occupancy; (iii) area, extent and/or quality of habitat; (iv) number of locations or subpopulations; (v) number of mature individuals			
(c) Extreme fluctuations in any of: (i) extent of occurrence; (ii) area of occupancy; (iii) number of locations or subpopulations; (iv) number of mature individuals			

## Outcome

*Prasophyllum wilkinsoniorum* is eligible for listing as Critically Endangered under Criterion B1ab(iii,v)

## EOO and AOO

*Prasophyllum wilkinsoniorum* has an estimated AOO of 12–20 km<sup>2</sup>, and an estimated EOO of 12–24 km<sup>2</sup>. The minimum EOO was adjusted from 4.6 km<sup>2</sup> to match the minimum AOO because, by definition, EOO cannot be less than AOO (IUCN 2024).

## Number of threat-defined locations

*Prasophyllum wilkinsoniorum* is found at 1–3 threat-defined locations when considering the most serious plausible threat of herbivory and habitat degradation by feral pigs. The minimum plausible number (*i.e.*, one location) is used in this assessment in accordance with a precautionary approach.

## Severely fragmented

*Prasophyllum wilkinsoniorum* does not meet the IUCN (2024) definition of severely fragmented because >50% of the species' individuals are likely to occur in a viable subpopulation.

## Continuing decline

For *Prasophyllum wilkinsoniorum*, there is an observed and inferred continuing decline in habitat quality from anthropogenic habitat degradation and widespread feral pig diggings, as well as damage to potential habitat by domestic cattle, and an inferred continuing decline in the number of mature individuals attributed to damage to, or consumption of, stems and tubers by pigs, deer, and rabbits, as well as anthropogenic habitat degradation.

## Extreme fluctuations

*Prasophyllum wilkinsoniorum* is not known to undergo extreme fluctuations in geographic distribution, number of locations or subpopulations, or number of mature individuals.

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## Conclusion

*Prasophyllum wilkinsoniorum* is eligible to be listed as Critically Endangered because (1) it has a very highly restricted geographic distribution with an estimated extent of occurrence of 12–24 km<sup>2</sup>, (2) the minimum plausible number of threat-defined locations when considering the most serious plausible threat of herbivory and habitat degradation by feral pigs is one, and (3) there is an observed and inferred continuing decline in habitat quality from anthropogenic habitat degradation and widespread feral pig diggings, as well as damage to potential habitat by domestic cattle, and an inferred continuing decline in the number of mature individuals from damage or consumption by pigs, deer, and rabbits, as well as anthropogenic habitat degradation.

## *Criterion C Small population size and decline*

C. Small population size and decline			
	Critically Endangered	Endangered	Vulnerable
Number of mature individuals	< 250	< 2,500	< 10,000
AND at least one of C1 or C2			
C1. An observed, estimated or projected continuing decline of at least (up to a max. of 100 years in future):	25% in 3 years or 1 generation (whichever is longer)	20% in 5 years or 2 generations (whichever is longer)	10% in 10 years or 3 generations (whichever is longer)
C2. An observed, estimated, projected or inferred continuing decline AND at least 1 of the following 3 conditions:			
(a) (i) Number of mature individuals in each subpopulation	≤ 50	≤ 250	≤ 1,000
(ii) % of mature individuals in one subpopulation =	90–100%	95–100%	100%
(b) Extreme fluctuations in the number of mature individuals			

## Outcome

*Prasophyllum wilkinsoniorum* is considered data deficient under Criterion C.

### Number of mature individuals

The estimated population for *Prasophyllum wilkinsoniorum* is 2,080 mature individuals.

### Continuing decline

For *Prasophyllum wilkinsoniorum*, there is an inferred continuing decline in the number of mature individuals attributed to damage to, or consumption of, stems and tubers by pigs, deer, and rabbits, as well as anthropogenic habitat degradation. There is insufficient monitoring data to quantify this decline into the future.

### Mature individuals in each subpopulation

The largest known subpopulation of *Prasophyllum wilkinsoniorum*, Nunnock Swamp, contains an estimated minimum of ~1,900 mature individuals. The calculation for this subpopulation follows the same as that used to estimate the total population size (see 'Abundance' section) and is a precautionary 40% of the sum of the preliminary maximum estimate (*i.e.*, 4,575 individuals) and the approximate number of individuals detected in the most recent surveys of Nunnock Swamp (*i.e.*, 183).

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## % of mature individuals in a single subpopulation

The largest known subpopulation of *Prasophyllum wilkinsoniorum*, Nunnock Swamp, is estimated to contain ~91% of mature individuals.

## Extreme fluctuations

*Prasophyllum wilkinsoniorum* is not known to undergo extreme fluctuations in the number of mature individuals.

## Conclusion

Although *Prasophyllum wilkinsoniorum* is estimated to have a low number of mature individuals and there is an inferred continuing decline, the remaining subcriteria for listing as Endangered or Vulnerable are not met (C2) and data deficient (C1).

## *Criterion D Very small or restricted population*

D. Very small or restricted population			
	Critically Endangered	Endangered	Vulnerable
D. Number of mature individuals	< 50	< 250	D1. < 1,000
D2. Only applies to the VU category Restricted area of occupancy or number of locations with a plausible future threat that could drive the taxon to CR or EX in a very short time.	-	-	D2. typically: AOO < 20 km <sup>2</sup> or number of locations ≤ 5

## Outcome

*Prasophyllum wilkinsoniorum* is eligible for listing as Vulnerable under Criterion D2.

## Number of mature individuals

The estimated population for *Prasophyllum wilkinsoniorum* is 2,080 mature individuals.

## Risk of future extinction in a very short amount of time (D2)

*Prasophyllum wilkinsoniorum* occurs at 1–3 threat-defined locations and has an estimated AOO of 12–20 km<sup>2</sup>. Feral pig activities could rapidly drive the species to extinction, particularly if compounded by human-induced changes to rainfall and fire regime.

## *Criterion E Quantitative Analysis*

E. Quantitative Analysis			
	Critically Endangered	Endangered	Vulnerable
Indicating the probability of extinction in the wild to be:	≥ 50% in 10 years or 3 generations, whichever is longer (100 years max.)	≥ 20% in 20 years or 5 generations, whichever is longer (100 years max.)	≥ 10% in 100 years

## Outcome

*Prasophyllum wilkinsoniorum* is considered data deficient under Criterion E.

## Probability of extinction

There is currently insufficient data to undertake a quantitative analysis to determine the extinction probability of *Prasophyllum wilkinsoniorum*.

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## **Conservation and Management Actions**

*Prasophyllum wilkinsoniorum* is currently not listed on the NSW *Biodiversity Conservation Act 2016*. Following publication of a Final Determination by the NSW Threatened Species Scientific Committee, a conservation strategy will be developed by the NSW Department of Climate Change, Energy, the Environment and Water.

The actions listed below are general suggestions only.

### Habitat loss, disturbance and modification

- Control feral animals and exotic plants and maintain at low levels.
- Incorporate considerations of the species' ecology during the planning of management activities for wildfire control.

### Stakeholders

- Inform landholders and managers of sites where there are known subpopulations and consult with these groups regarding options for conservation management and protection of the species.

### Survey and monitoring

- Search areas with previous records or potential habitat to quantify additional subpopulations.
- Conduct annual counts of flowering individuals to track species abundance/condition over time.
- Monitor feral animal activities and density of exotic plants.

### Information and research priorities

- Investigate the extent to which native and feral herbivores may be contributing to stem damage, mortality or disruption of reproduction.

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## APPENDIX 1

### Assessment against *Biodiversity Conservation Regulation 2017* criteria

The Clauses used for assessment are listed below for reference.

#### Overall Assessment Outcome:

*Prasophyllum wilkinsoniorum* was found to be Critically Endangered under Clause 4.3(a)(d)(e i,iii).

#### Clause 4.2 – Reduction in population size of species

(Equivalent to IUCN criterion A)

Assessment Outcome: Data Deficient

<b>(1) - The species has undergone or is likely to undergo within a time frame appropriate to the life cycle and habitat characteristics of the taxon:</b>			
	(a)	for critically endangered species	a very large reduction in population size, or
	(b)	for endangered species	a large reduction in population size, or
	(c)	for vulnerable species	a moderate reduction in population size.
<b>(2) - The determination of that criteria is to be based on any of the following:</b>			
	(a)	direct observation,	
	(b)	an index of abundance appropriate to the taxon,	
	(c)	a decline in the geographic distribution or habitat quality,	
	(d)	the actual or potential levels of exploitation of the species,	
	(e)	the effects of introduced taxa, hybridisation, pathogens, pollutants, competitors or parasites.	

#### Clause 4.3 - Restricted geographic distribution of species and other conditions (Equivalent to IUCN criterion B)

Assessment Outcome: Critically Endangered under Clause 4.3(a)(d)(e i,iii)

<b>The geographic distribution of the species is:</b>			
	(a)	for critically endangered species	very highly restricted, or
	(b)	for endangered species	highly restricted, or
	(c)	for vulnerable species	moderately restricted,
<b>and at least 2 of the following 3 conditions apply:</b>			
	(d)	the population or habitat of the species is severely fragmented or nearly all the mature individuals of the species occur within a small number of locations,	
	(e)	there is a projected or continuing decline in any of the following:	
		(i)	an index of abundance appropriate to the taxon,
		(ii)	the geographic distribution of the species,
		(iii)	habitat area, extent or quality,
		(iv)	the number of locations in which the species occurs or of populations of the species,
	(f)	extreme fluctuations occur in any of the following:	
		(i)	an index of abundance appropriate to the taxon,
		(ii)	the geographic distribution of the species,

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		(iii)	the number of locations in which the species occur or of populations of the species.
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**Clause 4.4 - Low numbers of mature individuals of species and other conditions  
(Equivalent to IUCN criterion C)**

**Assessment Outcome: Data Deficient**

<b>The estimated total number of mature individuals of the species is:</b>			
	(a)	for critically endangered species	very low, or
	(b)	for endangered species	low, or
	(c)	for vulnerable species	moderately low,
<b>and either of the following 2 conditions apply:</b>			
	(d)	a continuing decline in the number of mature individuals that is (according to an index of abundance appropriate to the species):	
	(i)	for critically endangered species	very large, or
	(ii)	for endangered species	large, or
	(iii)	for vulnerable species	moderate,
	(e)	both of the following apply:	
	(i)	a continuing decline in the number of mature individuals (according to an index of abundance appropriate to the species), and	
	(ii)	at least one of the following applies:	
		(A)	the number of individuals in each population of the species is:
		(I)	for critically endangered species extremely low, or
		(II)	for endangered species very low, or
		(III)	for vulnerable species low,
		(B)	all or nearly all mature individuals of the species occur within one population,
		(C)	extreme fluctuations occur in an index of abundance appropriate to the species.

**Clause 4.5 - Low total numbers of mature individuals of species  
(Equivalent to IUCN criterion D)**

**Assessment Outcome: Not met**

<b>The total number of mature individuals of the species is:</b>			
	(a)	for critically endangered species	extremely low, or
	(b)	for endangered species	very low, or
	(c)	for vulnerable species	low.

**Clause 4.6 - Quantitative analysis of extinction probability  
(Equivalent to IUCN criterion E)**

**Assessment Outcome: Data Deficient**

<b>The probability of extinction of the species is estimated to be:</b>			
	(a)	for critically endangered species	extremely high, or
	(b)	for endangered species	very high, or

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	(c)	for vulnerable species	high.
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**Clause 4.7 - Very highly restricted geographic distribution of species—vulnerable species**

**(Equivalent to IUCN criterion D2)**

**Assessment Outcome: Vulnerable under Clause 4.7**

For vulnerable species,	the geographic distribution of the species or the number of locations of the species is very highly restricted such that the species is prone to the effects of human activities or stochastic events within a very short time period.
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