Threatened Species Assessment

Carex nemoralis
River Hook-sedge

Taxonomy

Carex nemoralis (K.L. Wilson) K.L. Wilson

This taxon was known until recently as *Uncinia nemoralis.* In 2015 the genus *Uncinia* was synonymised within a broad circumscription of *Carex* (VicFlora 2018). Of the species previously placed in *Uncinia,* this taxon is characterised by its robust tussocks with fibrous bases and smooth culms. It is very similar to, and previously included in *C. umbricola* (as *Uncinia riparia*) from which it can be distinguished by the more tufted habit, deciduous female glumes, shorter utricles and culms that are smooth throughout (VicFlora 2019).

Current conservation status

Categorised as Rare in the 2014 Advisory list of rare or threatened flora (DEPI 2014).

Proposed conservation status

Endangered in Victoria

Criteria A2ace+3ce+4ace; B2ab(i,ii,iii,iv,v)

Species Information

Description and Life History

The taxon is an erect, tufted perennial with a very short rhizome. Culms trigonous to triquetrous, very slender, smooth, 20-55 cm high, c. 0.5 mm diam. Leaves flat, exceeding culms, 1.6-2.2 mm diam. Inflorescence loose, 4-6 cm long, including male portion 8-14 mm long; female glumes deciduous, acute, straw-coloured, membranous, faintly few-nerved, 3.5-4 mm long; stamens 3; utricles trigonous, narrow-ellipsoid, scarcely spreading, glabrous, smooth, yellow-brown, about as long as glumes, 4.7-6 mm long, 1-1.5 mm diam.; rachilla produced far beyond mouth of utricle, strongly hooked at the top. Nut trigonous, narrow-ellipsoid, yellow-brown, glistening, minutely pustulate, c. 3 mm long, 1-1.3 mm diam. The taxon flowers in summer (VicFlora 2019).

Generation Length

The generation length of *Carex nemoralis* is estimated to be 30 to 100 (midpoint 50) years. This is based on a plausible longevity exceeding 50 years, and the inference that vegetative resprouting is likely to be as important as seed-based recruitment for population maintenance under pre-settlement conditions. The pre-settlement fire interval was probably in the 150-1000 year range, with fire affecting only a mosaic proportion of plants at any one site. Seed-based recruitment is likely to be opportunistic in response to localised site disturbance events and seasonal conditions.

The taxon is most frequently associated with old-growth stands of Cool Temperate Mixed Forest, dominated by an emergent stratum of *Eucalyptus denticulata* (Errinundra Shining-gum) of low to moderate stocking rate or density. These stands have recently been reliably dated by radio carbon dating at 600-800 years, whilst still in healthy non-senescent merchantable condition, suggesting such forests can be perpetuated by fire intervals as low as 1000 years.

Distribution

The taxon has been reliably recorded in South Gippsland in the Strzelecki Ranges, in the North-East between Mt Gibbo and the Bowen Range, and in East Gippsland. It occurs on the Nunniong Plateau, from the Yalmy River and Sardine Creek districts east to the Coast Range and Wingan River headwaters, and from Mt Cann inland to the Delegate River headwaters on the Errinundra Plateau. The Victorian stronghold of the taxon is the Errinundra Plateau.

Site and specimen records on Wilsons Promontory previously assigned to this taxon apparently represent the only records of the closely related *Carex umbricola* on the Australian mainland.

Habitat

Field observations and site data in the Victorian Biodiversity Atlas (VBA) confirm that the taxon demonstrates high fidelity to rainforest dominated by *Atherosperma moschatum* (Southern Sassafras), *Elaeocarpus holopetalus* (Black Oliveberry), *Nothofagus cunninghamii* (Myrtle Beech) or *Syzygium smithii* (Lilly Pilly), extending to fern gully vegetation dominated by *Dicksonia antarctica* (Soft Tree-fern) and to sheltered ecotonal sites in Wet Forest.

The Victorian stronghold of the taxon is the Cool Temperate Mixed Forest and Cool Temperate Rainforest across the Errinundra Plateau, from Cobb Hill east to the Coast Range, and from the headwaters of the Delegate River in the north to the headwaters of the Errinundra River in the south. The greatest concentrations are found on both the north and south aspects of the Gunmark Range. The taxon also occurs frequently in Warm Temperate Rainforest across the foothills of East Gippsland. On the Nunniong Plateau and near Mt Gibbo the taxon is restricted to Montane Riparian Cool Temperate Rainforest. In the Strzelecki Ranges the taxon is restricted to Cool Temperate Rainforest.

Threats

In the longer term, the taxon is threatened by the combined impact of an altered fire regime and climatic drying and warming. This can increase the risk of repeat fire events at intervals below the tolerable fire interval of the taxon. Although the taxon can recruit vegetatively by resprouting following a single fire event of moderate intensity, high intensity repeat fire events and extreme drought stress are likely to increase the risk of adult mortality and recruitment failure, resulting in a progressive decline in population density. In the short term, forestry operations may pose a threat to some populations. Spatial analysis of likely habitat for the River Hook-sedge indicates that XX% occurs within the CAR reserve system, including parks and reserves, special protection zones and areas excluded from harvesting by prescription under the Victorian *Code of Practice for Timber Production 2014* (the Code). No species-specific protections for River Hook-sedge are included in the Code. Other more general prescriptions such as protection and buffering of rainforest and waterways may provide protection from forestry operations. The significant reduction in 2024 of native forest harvesting levels will reduce the possible future impact of forestry operations on populations and habitat of River Hook-sedge. The final phase-out of native forest timber harvesting on public land by 2030 will largely eliminate any further impact of forestry operations on this species. Since 2019, modified harvesting and forest regeneration practices have been implemented in areas of high conservation value, adding to the retention of current and future habitat patches and individual trees.

IUCN Criteria

Criterion 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 and the causes of the reduction are clearly reversible AND understood AND ceased.

A2 Population reduction observed, estimated, inferred or suspected in the past where the causes of the reduction may not have ceased OR may not be understood OR may not be reversible.

A3 Population reduction, projected 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, extent of occurrence and/or quality of habitat

(d) actual or potential levels of exploitation

(e) the effects of introduced taxa, hybridization, pathogens, pollutants, competitors or parasites

Evidence:

Eligible under Criterion A2 as Endangered

The population reduction over the past 90 to 300 years is estimated to be 30 to 50%, based on (a), (c) and (e) above.

Past decline is based on the impacts of forestry operations, particularly across the Errinundra Plateau.

The causes of the reduction may not have ceased, be understood or be reversible.

Eligible under Criterion A3 as Endangered

The population reduction over the next 90 to 100 years is suspected to be 30 to 80 (midpoint 50)%, based on (c) and (e) above.

Future decline cannot be estimated with confidence since the climate change related threats operate stochastically.

Eligible under Criterion A4 as Endangered

The population reduction over any 90 to 300 year period, including both past and future (up to 100 years in the future), is inferred to be 50 to 90 (midpoint 65)%, based on (a), (c) and (e) above. The causes of reduction may not have ceased, be understood or be reversible.

Criterion B. Geographic range in the form of either B1 (extent of occurrence) and/or B2 (area of occupancy			
	Critically Endangered Very restricted	Endangered Restricted	Vulnerable Limited
B1. Extent of occurrence (EOO)	< 100 km²	< 5,000 km²	< 20,000 km²
B2. Area of occupancy (AOO)	< 10 km²	< 500 km²	< 2,000 km²
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			

Evidence:

Eligible under Criterion B2 as Endangered

The Area of Occupancy (AoO) across the taxon's range is estimated to be 332 km², based on 2 x 2 km grids derived from accepted, post-1970 records in the VBA.

The taxon is estimated to be severely fragmented, and is estimated to have 2 locations. It has a continuing decline in (i), (ii), (iii), (iv) and (v) above, based on the current and projected impact of the identified threats.

The taxon is severely fragmented naturally at the regional and landscape scales and anthropogenically at the landscape scale, with geographically isolated stands likely to be separated by spacings exceeding the dispersal range of the taxon, which has no specialised mechanism for long-distance dispersal. Seed-bearing utricles bear a terminal hook and may be dispersed by indigenous mammalian vectors at the 10 m to kilometre scale. This precludes the possibility of recolonisation in the event of local extinction.

Criterion 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 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				

Evidence:

Ineligible under Criterion C as Data Deficient

There is no available estimate of population size, although it is likely to be in the thousands.

Criterion D. Very small or restricted population			
	Critically Endangered	Endangered	Vulnerable
Number of mature individuals (observed or estimated)	< 50	< 250	< 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 species to critically endangered or Extinct in a very short time.	-	-	D2. Typically: AoO < 20 km2 or number of locations ≤ 5

Evidence:

Eligible under criterion D2 as Vulnerable

The taxon is estimated to be very restricted.

Criterion E (Quantitative Analysis) was not addressed as the taxon does not have a detailed Population Viability Analysis.

References

DEPI (2014) *Advisory list of rare or threatened plants in Victoria - 2014*. Department of Environment and Primary Industries, Melbourne.

VicFlora (2018). Flora of Victoria, Royal Botanic Gardens Victoria: *Carex.* Retrieved from: https://vicflora.rbg.vic.gov.au/flora/taxon/07db10ef-2850-4a72-bfe8-364908d5d6d9

VicFlora (2019). Flora of Victoria, Royal Botanic Gardens Victoria: *Carex nemoralis*. Retrieved from: https://vicflora.rbg.vic.gov.au/flora/taxon/904bf3ff-43e7-4b78-8169-91b129add521