Conservation Assessment of *Ancistrachne maidenii* (A.A.Ham.) Vickery (Poaceae)

Caren Taylor 21/09/2023
Science Economics and Insights Division, NSW Department of Planning and Environment

Ancistrachne maidenii (A.A.Ham.) Vickery (Poaceae)

Distribution: Endemic to NSW
Current EPBC Act Status: Not listed
Current NSW BC Act Status: Vulnerable
Proposed listing on NSW BC Act: Delist

Reason for change: Non-genuine change as there has been additional information on the population of *Ancistrachne maidenii* such that the species no longer meets any of the criteria for listing under the IUCN (2022) guidelines.

Summary of Conservation Assessment

Ancistrachne maidenii was found to be ineligible for listing as a threatened species as it does not meet any of the IUCN Red List criteria. Since the initial Final Determination listing *A. maidenii* as Vulnerable in NSW in 1999 (NSW Scientific Committee 1999) there has been new information recorded for the species that has increased the known Area of Occupancy, Extent of Occurrence, and the population size estimate. Threats that have been recorded at sites for the species include changed fire regimes, habitat disturbance from recreational activities, track maintenance, herbicide spraying and competition with weeds. However, these threats are minor and have not been shown to be resulting in subpopulation or total population decline.

Description and Taxonomy

Ancistrachne maidenii (A.A.Ham.) Vickery (Family Poaceae) has been described by Harden (1993, Flora of NSW, Vol. 4) as: “a scrambling perennial grass with slender, rigid decumbent stems and ascending branches. Leaves: sheath sparsely hairy; ligule ciliate; blade subcordate at the base. Racemes terminal or axillary, c. 4 cm long, the latter ones shorter and partially enclosed in the sheath. Spikelets falling entire at maturity, 2.5 - 3 mm long. Lower glume abaxial, a hyaline scale to 0.25 mm long or often reduced or absent. Upper glume distinctly 5 - nerved, subequal to the spikelet, obtuse to subacute and, together with the lower lemma, sprinkled with fine, mostly curved, tubercle-based hairs. Lower lemma like the upper glume, distinctly 7 - nerved, sterile, without a palea. Fertile floret elliptic to lanceolate, obscurely nerved, produced into a short but distinct mucro to 0.25 mm long, the palea subequal to the lemma and similar in texture.”

Ancistrachne maidenii was first described from the Hawkesbury River as *Eriochloa maidenii* by the botanist Arthur Hamilton (1913) where it was noted to be growing as large patches within a sandstone gully. Vickery (1961) subsequently revised the species to *Ancistrachne maidenii*. Recently, a new monotypic New South Wales (NSW) endemic genus, *Simonachne* has been described by Thompson (2022), renaming *Ancistrachne maidenii* (A.A.Ham.) to *Simonachne maidenii.* This taxon

change has not yet been accepted generally, nor has it been updated on PlantNET or the Australian Plant Name Index (APNI) (K. Wilson *in litt.* May 2022). Therefore, it is appropriate that the species be described under this conservation assessment as *Ancistrachne maidenii* (M. Duretto *in litt.* May 2022).

Ancistrachne maidenii can be difficult to identify and often requires examination of a spikelet when seed material is present on the plant in the summer (S. Douglas *in litt.* August 2022). The species has been described to be similar in appearance to that of *Entolasia stricta*, *E. whiteana* and even species of the genera *Microleana* and *Oplismenus*. Similarities with these other taxa are likely to have resulted in *A. maidenii* being misidentified as other relatively common grasses, limiting clear understanding of the full extent of the range and population (G. Phillips pers. comm. August 2022).

Distribution and Abundance

Ancistrachne maidenii is endemic to New South Wales (NSW) and occurs in three disjunct regions; the northern Sydney Basin region, the lower Blue Mountains region, and the Clarence–Moreton region surrounding Grafton (NSW Government 2021; Australian Government 2018). These are within the traditional lands of the Eora and Bundjalung Nations respectively (City of Sydney 2017; Lismore City Council 2022).

Ancistrachne maidenii is currently known from 23 discrete sites across these three regions (Table 1). Given the proximity of *A. maidenii* sites within and the distances between each region, the three regions are considered to be separate subpopulations, as per the IUCN definition (IUCN 2022).

Table 1 – Population distribution of Ancistrachne maidenii *(Ecoplanning 2022; P. Sheringham in litt. August 2022; DPE BioNet 2022). Estimates of mature individuals have been undertaken where patch sizes are known and using an average abundance of 1-2 plants per square metre.*

Subpopulation	Site	Tenure	Minimum Estimated Mature Individuals
Northern Sydney	Berowra Valley Regional Park	NPWS	77-127
	Brisbane Water National Park	NPWS	Unknown
	Brooklyn	NPWS and Private Land	1,133-2,133
	Marramarra National Park	NPWS	Unknown
	Muogamarra Nature Reserve	NPWS	Unknown
	Dharug National Park	NPWS	667-707
	Wisemans Ferry	NPWS and Private Land	53
	Yengo National Park	NPWS	669 – 1,169
	River Road	Private Land	Unknown

	Adjacent to Marrumarra National Park	Private Land	Unknown
Blue Mountains	Blue Mountains	NPWS	Unknown
Clarence-Moreton	Orara River	LALC	Unknown
	Chambigne Nature Reserve	NPWS	1,736 - 2,736
	Chambigne State Conservation Area	NPWS	Unknown
	Flaggy Creek Nature Reserve	NPWS	104
	Fortis Creek National Park	NPWS	1,023
	Banyabba Nature Reserve	NPWS	563
	Copmanhurst Vacant Crown Land	Crown Land	"Common"
	Shannon Creek	Council and Private	262
	Tallawudjah Nature Reserve	NPWS	Unknown
	Wombat Creek Conservation Area	NPWS	Unknown
	Mount Belmore State Forest	State Forest	31,000 - 61,000
	Newfoundland State Forest	State Forest	Unknown

There are ten sites identified in the Northern Sydney subpopulation (NSW Government 2021). Four of these sites, at Berowra Valley, Brooklyn, Wisemans Ferry and Dharug National Park, were known when *A. maidenii* was initially listed as Vulnerable in 1999 (NSW Scientific Committee 1999). Six further sites have since been recorded at Brisbane Water National Park, Marramarra National Park, Muogamarra Nature Reserve, Yengo National Park, along River Road south of Wisemans Ferry, and on private property adjacent to Marramarra National Park (DPE BioNet 2022).

There is only one record of *Ancistrachne maidenii* at Erskine Creek in the Lower Blue Mountains subpopulation. This site in the lower Blue Mountains is a significant outlier from the northern Sydney Basin subpopulation, being separated by over 70km from the nearest neighbouring site. The species may occur elsewhere in the lower Blue Mountains and through the Wollemi National Park, as there is a large amount of similar open grassy woodland habitat on Sydney Sandstone substrate. However, there has been little survey effort within these areas (S. Douglas *in litt.* August 2022).

There are also thirteen discrete sites of *Ancistrachne maidenii* identified in the Clarence – Moreton subpopulation (NSW Government 2021). This subpopulation was not known at the time of the Vulnerable determination in 1999 (NSW Scientific Committee 1999). The species was first discovered in Flaggy Creek Nature Reserve southwest of Grafton in 2001 (DPE BioNet 2022). Since then, other sites in the Clarence-Moreton region have been recorded in Mount Belmore State Forest,

Chambigne Nature Reserve, Chambigne State Conservation Area, Newfoundland State Forest, Fortis Creek National Park, Shannon Creek, Copmanhurst Vacant Crown Land (VCL), the Orara River, Wombat Creek State Conservation Area, Tallawudjah Nature Reserve, and Banyabba Nature Reserve (DPE BioNet 2022).

Ancistrachne maidenii has an Extent of Occurrence (EOO) of 27,067 km^2, calculated as a minimum convex polygon containing all known occurrences, the method of assessment recommended by IUCN (2022). The Area of Occupancy (AOO) is estimated to be 208 km^2 based on 2 x 2 km grid cells, the scale recommended by IUCN (2022). Both EOO and AOO were calculated using GeoCAT software (Bachman *et al.* 2011). *Ancistrachne maidenii* is very likely to be more widespread and common than currently known based on the extent of unsurveyed suitable habitat within and outside of the current known range. Associated habitats extend throughout Yengo and Wollemi National Parks north of Sydney and into the Greater Blue Mountains, and further north towards Lismore in the Clarence-Moreton region (DPE 2022a; S. Douglas *in litt.* August 2022; P. Sheringham *in litt.* August 2022), so the potential for further sites to be found remains high.

Population size

It is estimated that the minimum population size of *Ancistrachne maidenii* is 37,287-69,877 mature individuals across all three subpopulations. The Clarence-Moreton subpopulation contains 79% of the total population, the Northern Sydney subpopulation 20% and the Blue Mountains contains less than 1%. All population estimates are likely to be an underestimate according to species experts (P. Sheringham *in litt.* August 2022; G. Phillips pers. comm. August 2022).

Observations of *Ancistrachne maidenii* are often recorded as patch sizes, as individual counts are difficult due to the clumping, stoloniferous growth form of the plant (Ecoplanning 2022). Where patch sizes have been recorded at a site, in this assessment these have been converted to an estimated number of individuals based on the species having an average density of 1-2 individuals per square metre. This density is founded on field survey results from Chambigne NR undertaken in February 2000 by Australian Botanic Garden Mount Annan staff where 1-2 individuals per square metre were counted from three patches of *A. maidenii* where mature seed was being collected (G. Phillips *in litt*. August 2022). Similar densities per square metre have also been observed at the Stockyard Creek site, and at other sites in the Clarence-Moreton subpopulation (G. Phillips *in litt*. August 2022). Where observers have attempted to estimate individual numbers at occurrences, most have noted that their figures are in the lower range of approximations due to this difficulty in counting. Therefore, individual counts, even when there is data available, are likely to be considerably underestimated (DPE BioNet 2022; P. Sheringham *in litt.* August 2022; G. Phillips *in litt*. August 2022; Ecoplanning 2022).

In autumn 2022, targeted surveys were conducted in both the Northern Sydney subpopulation and the Clarence-Moreton subpopulation of *Ancistrachne maidenii.* The Northern Sydney surveys targeted eighteen discrete records across seven of the known sites. The species was only found at seven of the previous records, mostly along disturbed tracks amongst sandstone-derived rocky outcrops. No estimates of

patch size or number of individuals were made, with only presence or absence recorded (Ecoplanning 2022). At the eleven records where *A. maidenii* was not relocated, suitable habitat was observed. The surveyors were uncertain if the species was not present or if it was just unable to be relocated in these areas due to inaccuracy of previous recorded coordinates (Ecoplanning 2022).

During targeted surveys in the Clarence-Moreton subpopulation in 2022, *Ancistrachne maidenii* was recorded at the Shannon Creek and Flaggy Creek sites at very low densities (0-1% cover) along 15m-35m transects (Ecoplanning 2022). Additionally, the species was opportunistically recorded during other survey work in Banyabba Nature Reserve, Chambigne Nature Reserve, Fortis Creek National Park, Copmanhurst VCL, and newly searched areas of Shannon Creek (P. Sheringham *in litt.* March 2022).

Current records of *Ancistrachne maidenii* are predominantly within National Park estate or very close adjacent to reserved areas. NSW National Parks and Wildlife Service (NPWS) reserves contain 95% of the mapped records,1% of habitat occurs in State Forest and vacant Crown Lands and 4% occurs within unprotected private lands (Department of Customer Service 2020).

Ecology

Habitat

Ancistrachne maidenii occurs on low nutrient sandstone-derived sandy soils with good drainage, on Hawkesbury, Narrabeen, and Clarence Sandstone (NSW Government 2021). The species has been recorded on rocky slopes of major river systems, including along the Hawksbury River at Berowra Waters, Brooklyn, and Wisemans Ferry in the North Sydney subpopulation, and along the Orara River, Clarence River and Shannon Creek areas in the Clarence-Moreton subpopulation (DPE BioNet 2022). *A. maidenii* appears to be relatively common on sandstone outcrops around the Clarence Valley (J. Edwards *in litt.* June 2022). In Dharug and Yengo National Parks the species has been recorded from rocky slopes along drainage easements and track edges (S. Brooks pers. comm. June 2022).

In the Northern Sydney and Blue Mountains subpopulations, *Ancistrachne maidenii* grows in open dry sclerophyll forest at altitudes from 0-200m (Benson and McDougall 2005), in association with *Angophora floribunda*, *A. costata, A. bakeri, Eucalyptus punctata, Breynia oblongifolia, Persoonia linearis, Bursaria spinosa, Allocasuarina littoralis, Poa affinis, Astrotricha floccosa, Glochidion ferdinandi, Lomandra longifolia, L. confertifolia, Cissus hypoglauca, Xanthorrhoea arborea, Dodonaea multijuga, Platysace clelandii, Entolasia stricta* and *Xanthosia pilosa* (DPE BioNet 2022). The species appears to prefer an open tree canopy, and not heavy shading (Benson and McDougall 2005). Observations from Yengo National Park have noted that the species appears to be persisting throughout the grassy woodland communities beyond track edges only when the canopy remains open (S. Brooks pers. comm. June 2022). This is dissimilar to the more widely distributed *Ancistrachne uncinulata* that grows in closed shaded forests (AusGrass2 2011).

On the Clarence Sandstones in the Clarence-Moreton subpopulation, *Ancistrachne maidenii* grows in open forests, woodlands and shrublands on outcropping sandstone soils. Dominant trees include *Eucalyptus planchoniana, Corymbia gummifera,*

Angophora robur, Eucalyptus psammitica, Eucalyptus pilularis/pyrocarpa, Leptospermum trinervium, Leptospermum microcarpum, Banksia serrata, Lambertia formosa, Banksia oblongifolia, Dodonaea crucifolia, Grevillea banyabba, Pultenaea rostrata, Prostanthera sejuncta, Entolasia stricta and *Philothrix deusta.*

Within the Clarence-Moreton subpopulation*, Ancistrachne maidenii* is most commonly recorded within the Plant Community Types (PCT) of Clarence Sandstone Rises Spotted Gum Grassy Forest (PCT 3422), Clarence Lowland Smudgy Apple-Paperbark Forest (PCT 3561), Clarence Sandstone Bloodwood-Stringybark Forest (PCT 3564), Chambigne Square-fruited Ironbark-Stringybark Forest (PCT 3560), and Clarence Sandstone Stringybark Heathy Woodland (PCT 3568; DPE 2022a, 2022b). Within the Northern Sydney subpopulation, *A. maidenii* has been most commonly recorded in Sydney Hinterland Yellow Bloodwood Woodland (PCT 3622), Sydney Coastal Sandstone Bloodwood Shrub Forest (PCT 3593), Sydney Hinterland Turpentine-Apple Gully Forest (PCT 3621), and Hunter Range Colluvial Apple-Gum Forest (PCT 3238; DPE 2022a, 2022b). However*, A. maidenii* is not restricted to these PCTs and occurs in many other PCTs across its distribution (DPE 2022a, 2022b).

Pollination, seed dispersal and gene flow

Ancistrachne maidenii inflorescences are terminal and axillary, with inconspicuous spikelet dimorphism, and pollination occurs within a closed flower that does not open (Thompson 2022). Flowers and seeds appear between January and June (Ausgrass2 2011). *Ancistrachne maidenii* is primarily pollinated through wind, as are many perennial grasses (Vogel & Pedersen 1993). Wind pollinated grasses easily disperse pollen (Van de Water *et al*. 2007), however the effectiveness of wind pollen dispersal for *Ancistrachne maidenii* for gene transfer between sites is unknown. Sites within subpopulations are on average between 3 to 8km from their nearest neighbouring site within a 25km radius (Department of Customer Service 2020). Studies undertaken on the Meadow Fescue (*Festuca pratensis)* found the maximum distance of pollen by wind dispersal was only 80m (Wang *et al*. 2004), however pollen from Creeping Bent Grass (*Agrostis stolonifera*) have been observed to travel up to 21km (Van de Water *et al*. 2007). The habit and characteristics of the *A. maidenii* flower spike suggests that the range of pollen transfer is likely to be in the lower range of pollen transfer (G. Phillips pers. comm. August 2022). As such, the distance between occurrences suggests that gene transfer between sites within subpopulations may only occur very infrequently.

There is a high likelihood that additional sites exist between the Blue Mountains and the Northern Sydney subpopulations, with suitable open grassy woodland habitat on well drained sandstone derived soils existing throughout lower Blue Mountains, Yengo and Wollemi National Parks. If additional sites exist between these two subpopulations, this will increase the potential for gene transfer between the two southern subpopulations (S. Douglas *in litt*. August 2022; DPE 2022a). It is assumed that there is no genetic exchange between the southern and northern subpopulations because they are separated by 500km.

Seed production for Poaceae is variable depending on environmental conditions such as rainfall, temperature, and grazing intensity (Prober & Thiele 2005; Nie 2011). Reproduction is thought to be primarily stoloniferous spread (G. Phillips pers. comm.

August 2022) and through seed dispersal from the physical forces of gravity, wind, and water (Benson and McDougall 2005). Other members of the Poaceae family have been known to disperse through seed ingestion by grazing animals (Cheplick 1998). Fertile seed heads have been observed at most *A*. *maidenii* sites from all subpopulations (DPE BioNet 2022). Dispersal mechanisms and distances are highly variable between species within the Poaceae family (Cheplick 1998).

Life History

Observations of native perennial grasses suggest that they can be long lived, surviving upwards of two years with some individuals persisting for fifteen to twenty years when there is an appropriate disturbance regime for the species (Blair *et al*. 2014). Climate, fire, and grazing are the key drivers that affect different grasses and their life histories (Blair *et al*. 2014). Seed can be produced within the first year of growth for most perennial grasses (Prober & Thiele, 2005). For *A. maidenii*, longevity has been estimated to be ~18-20 years (G. Phillips *in litt.* August 2022). *Ancistrachne maidenii* probably requires an intermediate level of disturbance to ensure maximum longevity in line with other similar genera such as *Eriochloa* sp. and from the persistence of large patches being present at Chambigne NR despite an absence of fire for over 18 years at this site (G. Phillips *in litt.* August 2022).

Threats

Adverse fire regimes

The response of *Ancistrachne maidenii* to fire is unknown, although other perennial grass species have been shown to respond positively to fire (Blair *et al.* 2014). Multiple, short interval fires could potentially exhaust the seed bank and kill mature plants that fail to resprout after multiple impacts from reoccurring fire. 'High frequency fire resulting in disruption of life cycle processes in plants and animals and loss of vegetation structure and composition' is listed as a Key Threatening Process under the *Biodiversity Conservation Act* 2016. However, it is very unlikely that multiple fires could occur at all the sites at intervals that would prevent the species from resprouting. For all subpopulations, over 50% of the area occupied by the species has been burnt within the last 10 years (DPE 2022c). The Shannon Creek sites have most recently been burnt at intervals of 5 years, 3 years, and 10 years (DPE 2022c) with the species persisting at these sites despite this high frequency of fire (Ecoplanning 2022). Based on these observations, there is only a small risk that frequent fires could interrupt the species' life cycle and result in population declines.

If fire regimes were to become less frequent, the open grassy woodland vegetation structure which the species prefers could experience a shift towards a closed canopy forest (G. Phillips pers. comm. August 2022). Colonisation of weeds such as *Lantana camara* (Lantana) and native species such as *Pittosporum undulatum* (Sweet Pittosporum) and *Breynia oblongifolia* in the absence of fire can close the canopy of usually open woodlands and shade out grass species, potentially reducing habitat quality (S. Douglas *in litt.* August 2022; G. Phillips pers. comm. August 2022). However, at Chambigne NR, *A. maidenii* persists in large patches despite the absence of fire for over 18 years (P. Sheringham *in litt.* March 2022; G. Phillips *in litt.* August 2022).

Herbicide spraying, pollution, track maintenance

Polluted runoff, roadside maintenance and herbicide weed spraying are observed, ongoing threats to *A. maidenii* (S. Douglas *in litt.* August 2022; Ecoplanning 2022). Four of the known sites of *A. maidenii* occur along public roadsides and fire trails, including River Road and Northern Road south of Wisemans Ferry and Stockyard Creek Road northeast of Grafton. Even within managed conservation areas, spray drift and accidental direct spraying is likely to impact *A. maidenii* on track edges, as can pollution from road run off (S. Brooks pers. comm. June 2022). This threat is localised and occurs at different intensities at each occurrence having only a trivial impact on each of the subpopulations.

Damage from recreational activities

Ancistrachne maidenii has multiple occurrences along walking tracks and can be affected by degradation from recreational activities. Sections of The Great North Walk through the Berowra Valley in northern Sydney have experienced trampling impacts on the species (DPE BioNet 2022). Ecoplanning (2022) recorded trampling impacts of individual plants along the track edges within Muogamarra NR. The Franks Bight sites within the Berowra Valley is within a popular fishing site and heavily impacted by trampling from bushwalkers and fishers (DPE BioNet 2022). Despite all this the threat is highly localised and occurs at different intensities at each site, with most sites not experiencing this threat at all. Overall, it has a trivial impact on the overall population as trampling reduces growth but doesn't appear to kill the species.

Weeds

Invasion by introduced weeds, particularly *Lantana camara* (Lantana) and *Paspalum mandiocanum* (Broad-leaved Paspalum Grass), have been identified as a threat to *A. maidenii* as the species is readily outcompeted, notably through shading out (Ecoplanning 2022). Ecoplanning (2022) observed *Andropogon virginicus* (Whisky Grass), *Ageratum* sp. and *Lantana camara* at the Shannon Creek site that are competing with *A. maidenii.* Studies undertaken on other native perennial grasses in Australia have shown that their vulnerability to weed competition is increased when in conjunction with heavy grazing, recreational trampling, and environmental stressors, such as drought conditions (Nie 2011). Competition from weeds is localised and occurs at different intensities at each site, and with over 95% of the known population occurring in conservation reserves, weeds and other co-occurring threats are having relatively minor impact on the population and are being actively managed at occurrences within reserved areas (S. Brooks pers. comm. June 2022).

Assessment against IUCN Red List criteria

For this assessment it is considered that the survey of *Ancistrachne maidenii* has been adequate and there is sufficient scientific evidence to support the delisting outcome for this species.

Criterion A *Population Size reduction*

Assessment Outcome: Data deficient

Justification: New data and information for *A. maidenii* over the past two decades since the species was first listed as Vulnerable (NSW Scientific Committee 1999) has resulted in a better understanding of the extent and size of the population. The current estimate of total population is within a range of 37,311- 69,900 individuals from three subpopulations (P. Sheringham *in litt.* August 2022; G. Phillips pers. comm. August 2022; DPE BioNet 2022). This new knowledge of the species population size has not included systematic monitoring over any length of time to show population trends. Therefore, a population reduction cannot be determined for assessment under criterion A.

Criterion B Geographic range

Assessment Outcome: Criterion not met

Justification: *Ancistrachne maidenii* has an Extent of Occupancy (EOO) of 27,067km^2 which does not meet the minimal threshold for a threat listing under vulnerable at <20,000km^2. The Area of Occupancy (AOO) has been calculated at 208km^2, meeting the criterion for Endangered (<500km^2). In addition to these thresholds, at least two of three other conditions must be met. These conditions are:

a) The population or habitat is observed or inferred to be severely fragmented or there is 1 (CR), ≤5 (EN) or ≤10 (VU) locations.

   Assessment Outcome: Criterion not met

   Justification: Although the three subpopulations of *A. maidenii* are geographically isolated they are not considered to be severely fragmented as each is large enough to support a viable population of *A. maidenii.*

   Ancistrachne maidenii is found at greater than 10 threat-based locations. There are 101 discrete records of *A. maidenii* across 23 sites from 3 subpopulations. Each site has minor plausible threats that are often site-specific, indicating that all the 23 sites are threat-based locations. It is highly unlikely that the most plausible threats of changed fire regimes and habitat degradation would result in the extirpation of an entire subpopulation as the threats are localised and act independently at each of the sites.

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.

   Assessment Outcome: Criterion not met

   Justification: There is no evidence of continuing decline in the *Ancistrachne maidenii* population, and it is not projected, inferred or suspected that there will be ongoing decline in the current extent or quality of *A. maidenii* habitat, number of locations or subpopulations or number of mature individuals into the future. There is a lack of sufficient monitoring across the species' distribution over any length of time to show a declining population trend. However, surveys over the last 20 years (and as recently as 2022) have increased the known distribution of the species significantly, with 78 additional discrete records, 20 additional sites and 2 additional sub-populations found since the initial listing as Vulnerable in 1999. This suggests

large areas of unsurveyed suitable habitat are very likely to contain additional sites, and potentially new subpopulations of the species.

Despite minor impacts from threats including human disturbance along walking tracks, inadvertent spraying, pollution from run-off, road and track maintenance and weed competition there is no evidence to suggest that these threats are causing decline for any subpopulation of *A. maidenii.* The species also predominantly occurs (95% of the total population) within protected areas.

c) Extreme fluctuations

Assessment Outcome: Criterion not met

Justification: As a perennial grass the species doesn't have a fluctuating life cycle of individuals or populations to experience extreme fluctuations.

Criterion C Small population size and decline

Assessment Outcome: Criterion not met

Justification: Assuming all individuals are mature, and having the ability to reproduce through stoloniferous growth, the current estimate of total population is within a range of 37,287- 69,877 individuals from three subpopulations (P. Sheringham *in litt.* August 2022; G. Phillips pers. comm. August 2022; DPE BioNet 2022). This estimation exceeds the threshold for Criterion C of <10,000 mature individuals to meet vulnerable. It is also highly likely that this number of individuals has been largely underestimated (G. Phillips pers. comm. August 2022; S. Douglas *in litt*. August 2022; P. Sheringham *in litt.* August 2022).

At least one of two additional conditions must be met. These are:

C1. An observed, estimated, or projected continuing decline of at least: 25% in 3 years or 1 generation (whichever is longer) (CR); 20% in 5 years or 2 generations (whichever is longer) (EN); or 10% in 10 years or 3 generations (whichever is longer) (VU).

Assessment Outcome: Data deficient

Justification: There has been no systematic survey or monitoring that has shown continuing decline for assessment under criterion C1 for *A. maidenii*.

C2. An observed, estimated, projected, or inferred continuing decline in number of mature individuals.

Assessment Outcome: Criterion not met

Justification: As no standard monitoring data is available for *A. maidenii* there is no justification for a projected or continuing decline.

In addition, at least 1 of the following 3 conditions:

a (i). Number of mature individuals in each subpopulation ≤50 (CR); ≤250 (EN) or ≤1000 (VU).

Assessment Outcome: Criterion not met

Justification: There is greater than 1,000 mature individuals within two of the three subpopulations.

(ii). % Of mature individuals in one subpopulation is 90-100% (CR); 95-100% (EN) or 100% (VU)

Assessment Outcome: Criterion not met

Justification: 79% of the total population have been surveyed from the Clarence-Moreton region subpopulation, the northern Sydney Basin subpopulation represents 20% of the population and the one site in the Lower Blue Mountains less than 1%. These figures do not meet the thresholds for listing under this criterion.

b. Extreme fluctuations in the number of mature individuals

Assessment Outcome: Sub criterion not met.

Justification: As a perennial grass the species doesn't have a fluctuating life cycle of individuals or populations to experience extreme fluctuations.

Criterion D Very small or restricted population

Assessment Outcome: Criterion not met

Justification: *Ancistrachne maidenii* does not have a small or restricted population. The total number of individuals even from the minimum range 37,287- 69,877 is estimated to be greater than 10,000, exceeding the minimum requirement to meet the threat listing for Vulnerable.

To be listed as Vulnerable under D, a species must meet at least one of the two following conditions:

D1. Population size estimated to number fewer than 1,000 mature individuals

Assessment Outcome: Criterion not met

Justification: The population size for *A. maidenii* is estimated to be greater than 1,000, exceeding the minimum requirement for listing under Criterion D1.

D2. Restricted area of occupancy (typically <20 km^2) or number of locations (typically ≤5) with a plausible future threat that could drive the species to CR or EX in a very short time.

Assessment Outcome: Criterion not met

Justification: The species has an Area of Occupancy of 208km^2 with more than 10 threat-based locations. There are no plausible future threats that could drive the species to critically endangered or extinction in a very short time.

Criterion E Quantitative Analysis

Assessment Outcome: Data Deficient

Justification: No quantitative modelling of extinction probability has been undertaken for *A. maidenii.*

Conservation and Management Actions

Ancistrachne maidenii has been assigned to the keep-watch species management stream under the Saving our Species program. As most of the population occurs within managed reserves, ongoing management of habitat within the public reserve systems is assumed adequate protection for *A. maidenii.* Under the keep-watch stream only monitoring actions are implemented to ensure the population remains stable. Monitoring includes identification of potential new and emerging threats to the security of the species.

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Expert Communications

Andrew Boleyn – Ranger, Erskine Creek, Blue Mtns NP NPWS.

Marco Duretto – Senior Botanist National Herbarium of New South Wales, Australian Institute of Botanical Science, Royal Botanic Gardens & Domain Trust, email; Personal Communications – 23rd May 2022

Gavin Philips – Project Officer, Threatened Species Assessment, Conservation and Restoration Science Branch, Science, Economics and Insights Division, Department of Planning and Environment. Personal communications – August 2022

John Edwards – Clarence Environment Centre.

Karen L Wilson – Honorary Research Associate, National Herbarium of New South Wales Australian Royal Botanic Gardens and Domain Trust, Personal communications – 23rd May 2022

Paul Sheringham – Senior Threatened Species Officer, Department of Planning and Environment.

Sarah Brooks – Ranger Dharug and Yengo National Parks, State Conservation Area.
Steve Douglas – Species Expert. Manager of Ecological Surveys. Personal Communications – 16th August 2022
Tegan Burton – Ranger, North-western Sydney Greater Sydney Branch.

APPENDIX 1

Assessment against *Biodiversity Conservation Regulation 2017* criteria
The Clauses used for assessment are listed below for reference.

Overall Assessment Outcome:
Ancistrachne maidenii was found to be ineligible for listing as a threatened species as none of the criteria were met.

Clause 4.2 – Reduction in population size of species
(Equivalent to IUCN criterion A)
Assessment Outcome: Data deficient

(1) - The species has undergone or is likely to undergo within a time frame appropriate to the life cycle and habitat characteristics of the species:			
	(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.
(2) - The determination of that criteria is to be based on any of the following:			
	(a)	direct observation,	
	(b)	an index of abundance appropriate to the species,	
	(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: Criterion not met

The geographic distribution of the species is:			
	(a)	for critically endangered species	very highly restricted, or
	(b)	for endangered species	highly restricted, or
	(c)	for vulnerable species	moderately restricted,
and at least 2 of the following 3 conditions apply:			
	(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 species,

		(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 species,
		(ii)	the geographic distribution of the species,
		(iii)	the number of locations in which the species occur or of populations of the species.

Clause 4.4 - Low numbers of mature individuals of species and other conditions (Equivalent to IUCN criterion C)
Assessment Outcome: Criterion not met

The estimated total number of mature individuals of the species is:						
	(a)	for critically endangered species				very low, or
	(b)	for endangered species				low, or
	(c)	for vulnerable species				moderately low,
and either of the following 2 conditions apply:						
	(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: Criterion not met

The total number of mature individuals of the species is:			
	(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

The probability of extinction of the species is estimated to be:			
	(a)	for critically endangered species	extremely high, or
	(b)	for endangered species	very high, or
	(c)	for vulnerable species	high.

Clause 4.7 - Very highly restricted geographic distribution of species–vulnerable species
(Equivalent to IUCN criterion D2)
Assessment Outcome: Criterion not met

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.