

TUGGERANONG LIGNUM

MUEHLENBECKIA TUGGERANONG ACTION PLAN



PREAMBLE

The Tuggeranong Lignum (*Muehlenbeckia tuggeranong*) was listed as an endangered species on 19 August 1998 (initially Instrument No. 192 of 1998 under the *Nature Conservation Act 1980* and currently Instrument No. 265 of 2016). Under section 101 of the *Nature Conservation Act 2014*, the Conservator of Flora and Fauna is responsible for preparing, where required, a draft action plan for a relevant listed species. The first action plan for this species was prepared in 1999 (ACT Government 1999). This revised edition supersedes the earlier edition. Measures proposed in this action plan complement those proposed in the ACT Aquatic and Riparian Conservation Strategy (2018 revision).

CONSERVATION STATUS

Muehlenbeckia tuggeranong (Tuggeranong lignum) is listed as a threatened species in the following sources:

National

Endangered – *Environment Protection and Biodiversity Conservation Act 1999* (Cwlth) (EPBC Act).

The species is eligible for listing as Endangered because before the commencement of the Environment Protection and Biodiversity Conservation Act, it was listed as Endangered under Schedule 1 of the *Endangered Species Protection Act 1992* (Cwlth). The main factors that lead to the species being eligible for listing in the Endangered category are its small population size with a very low total number of mature individuals, and restricted area of occupancy (TSSC 2015).

Australian Capital Territory

Endangered – Section 91 of the *2014*.

Special Protection Status native species – Section 109 of the *Nature Conservation Act 2014* (ACT Government 2016b).

SPECIES DESCRIPTION AND ECOLOGY

Description

The Tuggeranong Lignum *Muehlenbeckia tuggeranong* Mallinson (Figure 1) is a sprawling or procumbent shrub, eventually becoming a mounded loosely tangled mass to approximately 1 metre high and 1–2 metres across. Stems are wiry, brownish and weakly and irregularly longitudinally striate. Leaves are alternate, persistent, green, not glaucous, simple, petiolate, solitary and well-spaced along the stems. Petioles are 0.5–3 millimetres (mm) long and leaf blades 5–13 mm long by 2–4 mm wide, showing considerable variation in form. Inflorescences are terminal (sometimes on short lateral branches) or very rarely axillary, simple or 2-branched; range from 12–20 mm from the subtending leaf to the apex; and bear 3–9 flowers in a lax spike. Flowers are unisexual or rarely hermaphrodite, and cream–green in colour. Plants are also mostly unisexual (Makinson and Mallinson 1997).

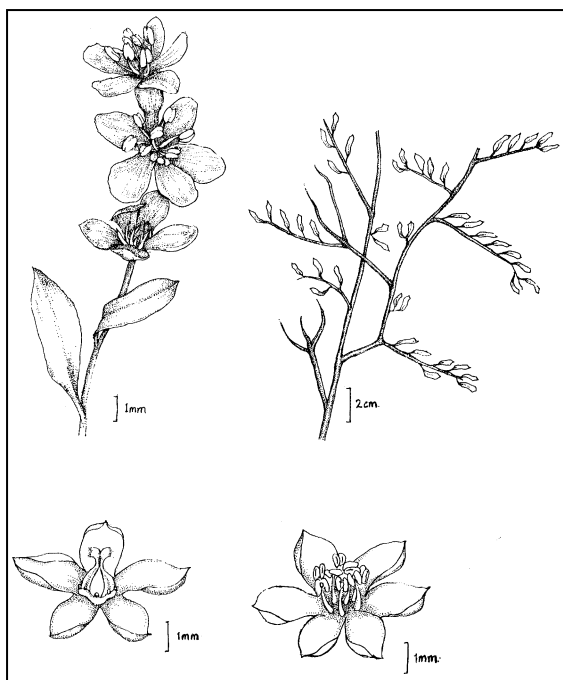


Figure 1 *Muehlenbeckia tuggeranong*. Top left – flowers and leaves. Top right – stems and leaves. Bottom left – detail of female flower. Bottom right – detail of male flower. Illustration: ACT Government.

Distribution and abundance

M. tuggeranong was described from a single female plant and six male plants discovered in the Murrumbidgee River Corridor (MRC) near Tuggeranong in 1997. In May 1999, an additional male plant was discovered in the MRC a short distance from the other seven plants. ACT Government staff located additional plants in 2010 and 2012 within the corridor, bringing the total number of known individuals to 11 (it can be very difficult to determine if a plant is an individual or two plants grown together). A single plant located in Bullen Range Nature Reserve in 1998 has not been located since and is not counted in the total of 11 wild plants. Although extensive searches for other specimens have been undertaken, this MRC population appears to be the only one in existence (ACT Government 2015).

Three attempts have been made to translocate this species. One involved five separate clusters of plants along the eastern side of the river between the northern and southern car parks at

Pine Island. Another was in a small tributary of the Murrumbidgee River within Bullen Range Nature Reserve about 1 kilometre west of the confluence of Freshford Creek. The third was on the western slope of Point Hut hill within MRC. In 2016 the only surviving plants were on Point Hut hill (ACT Government 2016a).

Habitat and ecology

The species' known habitat is restricted to flood terraces, altitude about 550 metres, on the eastern bank of the Murrumbidgee River near Tuggeranong in the ACT, in areas of rocky outcrops with pockets of silty sandy soil (Makinson and Mallinson 1997).

M. tuggeranong is found in a highly disturbed riparian shrubby woodland association, heavily invaded by weeds. The species is found on nearly bare rock, or tangled amongst other vegetation (ACT Government 1999)

Associated native species include River Oak *Casuarina cunninghamiana*, Burgan *Kunzea ericoides*, Silver Wattle *Acacia dealbata*, *Grevillea juniperina*, Purple Loosestrife *Lythrum salicaria*, Narrow-leaved Cumbungi *Typha domingensis*, a sedge *Isolepis* sp., Tussock Grass *Poa labillardieri* and Common Reed *Phragmites australis*. There are also a range of introduced species including White Willow *Salix alba*, Sweetbriar *Rosa rubiginosa*, Great Mullein *Verbascum thapsus*; *Oenothera* sp., Viper's Bugloss *Echium vulgare*, Fennel *Foeniculum vulgare*, Lamb's Tongue *Plantago lanceolata*, Curled Dock *Rumex crispus*, St John's Wort *Hypericum perforatum*, Umbrella Sedge *Cyperus eragrostis*, Toowoomba Canary Grass *Phalaris aquatica*, African Lovegrass *Eragrostis curvula* and Yorkshire Fog *Holcus lanatus* (ACT Government 1999).

The species appears to tolerate extreme shading. It grows within very dense patches of African Lovegrass and may benefit from reduced grazing pressure when growing amongst this grass. Floods in 2012 deposited more than 10 centimetres of silt and woody debris that completely covered one plant (ACT Government

2012). While this individual grew up through the deposit with no apparent ill effects, another flood in July of 2016 deposited additional material on this plant and at the time of writing it is not known if the plant will survive.

The species does appear to be negatively impacted by grazing and mesh cages have proven effective in improving the condition of individual plants (ACT Government 2015). The 2003 bushfires burnt all of the known habitat with an intensity that killed many of the River Oaks. All the known *M. tuggeranong* plants survived this fire and regrew to their former size.

Translocation attempts have been disappointing. However, the translocation has shown that plants are more successful when planted on southern aspects or with protection from the afternoon sun provided by large rocks (G. Baines pers. comm.).

M. tuggeranong appears to be a long-lived species. Since the first plants were identified in 1997 only one wild growing plant has died. This plant was growing in sand just above the waterline and was overgrown by Blackberry (*Rubus* sp.). The plant may have been washed away in floods, out-competed by the Blackberry or killed in an attempt to poison the Blackberry (ACT Government 2016).

M. tuggeranong is generally dioecious but only one female plant has been found. This plant is not known to have ever set seed. The plant does grow readily from cuttings but it is not known if it disperses vegetatively in the wild.

CURRENT MANAGEMENT ACTIONS

The Murrumbidgee River Corridor (Environment ACT 1998) contains the only population of *M. tuggeranong*. The MRC has planning and management history dating back to 1964 when the river was first designated an 'Area of Special National Concern' by the Commonwealth

Government (Environment ACT 1998). A number of policies and plans have been applied to the MRC since 1964 including the establishment of the Lanyon Landscape Conservation Reserve in 1985 (which includes the habitat at Pine Island) and the gazettal of Bullen Range Nature Reserve in 1991. This legislation has protected *M. tuggeranong* from urban development. However, public recreation is encouraged at Pine Island with public toilets, BBQ facilities, car parking, public swimming beaches and the Centennial Trail all within a short distance of the remaining populations of *M. tuggeranong*.

Grazing by macropods appears to represent a significant threat to the lignum (D. Roso pers. comm., ACT Government 2012, 2016). Anecdotal evidence points to a large increase in macropod numbers in the MRC over the last 20 years (D. Roso pers. comm.). Lignum shows regular evidence of browsing and enclosure cages noticeably increase the condition of the plants (ACT Government 2012, 2016).

Drought during the early part of the 21st century had little detrimental effect on the plants (D. Roso pers. comm.).

The area was heavily impacted by the 2003 bushfires. Canopy cover of River Oak was significantly reduced along much of the MRC and is only slowly recovering. Fuel reduction and ecological burns have been very rarely implemented in the MRC in the last ten years but before this time, the plants near the northern Pine Island car park were regularly burnt in fuel reduction burns.

Floods in the Murrumbidgee River are relatively common and all the wild plants are within the flood zone of the river. Smothering of plants by flood debris is a constant risk, as is the chance of them being washed away. No flood protection measures are taken for this species (ACT Government 2016).

Weeds are possibly the largest management problem in the MRC and often dominate the groundcover around the *M. tuggeranong*

population. The most widespread is African Lovegrass, which is not generally controlled throughout the MRC. Currently, the Parks and Conservation Service makes no attempt to remove African Lovegrass around individual Lignum plants as the grass seems to provide support for the Lignum's wiry stems, hides the plant from possible grazers and may shelter the plant from weather extremes. It is possible that the Lignum once relied on native grasses such as Snow Grass (*Poa labillardierei*) for these functions. The tangled growth of the Lignum stems through the African Lovegrass tussocks also makes it impossible to remove the weed without damaging the lignum.

Blackberry is a potential threat to the species because it can completely overrun a Lignum plant. For this reason, the Parks and Conservation Service prioritises Blackberry control around the plants. Large colonies of other weeds such as Soapwort (*Saponaria officinalis*), Californian Poppy (*Eschscholzia californica*) and Great Mullein (*Verbascum thapsus*) are also common and are controlled around plants where they are deemed to pose a threat (ACT Government 2016). These species are physically removed if chemical control is likely to damage the lignum.

A number of management actions have been undertaken to conserve *M. tuggeranong*. These include cages to reduce grazing of mature plants, education of contractors undertaking construction or weed spraying activities in the area, growing cuttings and translocating over 100 tube stock into MRC and Bullen Range Nature Reserve and collecting additional cuttings from all individuals (wild and planted) to establish a living collection at the Australian National Botanic Gardens (ANBG). This collection will provide the source material for any future translocation attempts.

All wild *M. tuggeranong* in the reserve have been labelled with individual tags to aid in monitoring (see Appendix 1) (ACT Government 2016) and are inspected at least once a year by Conservation Research or Parks and

Conservation Service rangers to identify any management that needs to be addressed. Conservation Research maintains monitoring records, reports annually on the condition of all plants and co-ordinates research and translocation activities. The locations of individual *M. tuggeranong* are not made available to the general public.

Ex situ conservation and translocation

In 2006 cuttings were taken from all known wild plants and propagated at the ANBG. Large numbers of clonal propagates have since been grown from these original cuttings. In October 2010 staff from Conservation Research, the Parks and Conservation Service, ANBG and Southern Murrumbidgee Parkcare members translocated 93 clonal propagates into five separate areas along the eastern bank of the Murrumbidgee River between the Pine Island north and south car parks. An effort was made to place a mix of male and female plants at each site and all plants were marked with individual tags (ACT Government 2010). This program was conducted according to the principles outlined in the Australian Network for Plant Conservation's *Guidelines for the Translocation of Threatened Plants in Australia* (Vallee et al 2004) and *Plant Germplasm Conservation in Australia* (Offord and Meagher 2009, Cook 2013) and the reintroduction objectives outlined in *Issues and Options for Genetic Conservation of Small Populations of Threatened Plants in the ACT* (Young 2001).

There were a number of high level flood events in the MRC during spring and summer 2011–12. Surveys of the translocated plants conducted in May 2012 revealed that only 19 plants had survived. By 2013 this number had declined to 4 plants and by 2015 no plants could be located. Many plants had been washed away by the floods or covered by more than 5 centimetres of sediment. Surveys at the time noted that African Lovegrass did not seem to inhibit the plants and shading appeared to enhance survival (ACT Government 2012 and 2015).

In September 2013 Conservation Research and the Parks and Conservation Service staff translocated 18 clonal propagates to a site above the flood zone near Point Hut Crossing and another 18 propagates to a site on a tributary of the Murrumbidgee River in Bullen Range Nature Reserve. All of these plantings used Terra Cottom soil conditioner and tree guards for grazing protection (Cook 2013). These plants were watered on a number of occasions over the following 12 months. By February 2015 ten translocated plants survived at Point Hut Crossing whilst all of the plants in Bullen Nature Reserve had perished (ACT Government 2015). By May 2016 the translocated population at Point Hut Crossing had declined to seven plants. Tree guards enhanced plant survival but required regular maintenance due to damage from wild animals and the elements (ACT Government 2016).

THREATS

M. tuggeranong faces a number of threats in the wild. The species ability to sexually reproduce appears to be very limited. The plants are predominantly dioecious and only one female plant is known to exist (Young 2001). The female is not known to have ever produced seed (ACT Government 2006). It is also likely that genetic variation in the population is very restricted due to the extremely low population size—the maximum number of wild plants known to be alive at any one time is 13 (Young 2001).

The habitat of the *M. tuggeranong* is prone to physical disturbance from periodic flooding, which can kill individual plants by washing them away or smothering them under flood debris. Physical disturbance can also result from recreational activity, particularly where plants occur in river sand near popular swimming areas. Wildfire has altered the vegetation structure at Pine Island, reducing canopy cover and possibly increasing shrub cover. Decreased cover may have an impact on *M. tuggeranong*

by drying out the microclimate around individual plants.

Grazing by macropods is an ongoing threat. Plants are sometimes almost completely defoliated and growing stems damaged by close grazing (ACT Government 2012 and 2015).

Weeds such as Blackberry can out-compete the Lignum, potentially shading it out. Other weeds such as African Lovegrass may occupy suitable habitat niches making it difficult for lignum to recruit or possibly shade out young less vigorous plants such as translocated tube stock.

Urban and infrastructure development or weed spraying may pose a risk if the Lignum is not explicitly considered in the planning of such activities.

MAJOR CONSERVATION OBJECTIVES

The overall objective of this plan is to preserve the species in perpetuity in the wild across its natural geographic range in the ACT. This includes the need to maintain natural evolutionary processes.

Specific objectives of the action plan:

- Protect all ACT populations because the species is not known to occur outside the ACT.
- Manage habitat to conserve populations and facilitate expansion of populations into adjacent habitat.
- Increase the number of populations by establishing new populations.

CONSERVATION ISSUES AND INTENDED MANAGEMENT ACTIONS

Protection

The *Muehlenbeckia tuggeranong* population is protected within the Murrumbidgee River

Corridor. The first objective of the current management plan is to conserve the endemic, riparian and riverine ecosystems (ACT Government 1999). ACT Parks and Conservation Service manages the site in accordance with this plan.

Survey, monitoring and research

It is possible that the species exists elsewhere in the ACT or NSW. However, because the species is small and difficult to detect, surveys aimed solely at finding additional populations are unlikely to be practical. Discovery of new populations is likely to be through surveys for other plant species or from opportunistic observations from naturalists and other interested persons. All known populations of *M. tuggeranong* will need to be monitored to determine population trends and to evaluate the effects of management.

Recovery of the species will rely largely on expanding the size/area of the existing population and establishing new populations. Research is required to determine optimal habitat conditions for the species (to maintain and expand existing populations) and how to establish new populations.

Priority research areas include:

- Improved knowledge of life history and ecology including:
- how many individual plants compose the current population (genetic comparisons will probably be required to ascertain this information)
- how many females exist and are there any fertile females
- whether the species reproduce sexually
- whether shading influences the growth or survival of small plants
- whether the species is reliant on any mycorrhizal symbiotes.
- Methods for establishing additional populations, such as translocation of plants,

in association with the ANBG, Greening Australia and other parties.

Management

Due to the small size of the population, management actions will be directed towards maintaining existing conditions and ensuring activities occurring nearby do not adversely affect the sites.

Priority management actions include:

- Placing and maintaining tree guards around all plants, wild and translocated.
- Weed control (focusing on Blackberry) if weeds pose a threat to the populations or the site.
- Avoiding incompatible activities such as development of facilities, recreational use or access tracks in or near the sites.
- Maintaining a low profile for the sites where the species is located; the appropriateness of signage and fencing will need careful consideration.
- Incorporating appropriate management actions in relevant plans and strategies.
- Maintaining an *ex situ* 'insurance' population whilst there is a high risk of extant populations becoming extinct.

IMPLEMENTATION

Implementation of this action plan and the ACT Aquatic and Riparian Conservation Strategy will require:

- Collaboration across many areas of the ACT Government to take into consideration the conservation of threatened species.
- Allocation of adequate resources to undertake the actions specified in the strategy and action plans.
- Liaison with other jurisdictions (particularly NSW) and other landholders (such as National Capital Authority) with

responsibility for the conservation of threatened species.

- Collaboration with Icon Water, universities, CSIRO and other research institutions to facilitate and undertake required research
- Collaboration with non-government organisations to undertake on-ground actions.
- Engagement with the community, where relevant, to assist with monitoring and other on-ground actions and to help raise

community awareness of conservation issues.

With regard to implementation milestones for this action plan, in five years the Conservator will report to the Minister about the action plan and this report will be made publicly available. In ten years the Scientific Committee must review the action plan.

OBJECTIVES, ACTIONS AND INDICATORS

Table 1 Objectives, actions and indicators.

Objective	Action	Indicator
1. Protect all ACT populations.	1a. Maintain legal and site measures to protect all populations.	1a. All populations protected by appropriate legal measures.
	1b. Ensure protection measures are maintained to conserve the species.	1b. Legal protection measures include requirement for conservation management.
	1c. Maintain alertness to the possible presence of the species while conducting vegetation surveys in suitable habitat.	1c. Vegetation surveys in suitable habitat are carried out with a good understanding of the species description.
	1d. Establish an <i>ex situ</i> population as insurance against the loss of the extant population.	1d. <i>Ex situ</i> population at the Australian National Botanic Gardens is maintained with representatives from all known individuals.
2. Manage habitat to conserve the species.	2a. Monitor populations and effects of management actions.	2a. Trends in abundance are known and management actions are recorded.
	2b. Manage threats, especially grazing, weeds and recreation impacts.	2b(i) All plants to be covered with grazing exclosure cages and plants health monitored regularly.
		2b(ii) Blackberry controlled where it impacts on lignum.
2b(iii) Lignum to be considered in all works plans for the Pine Island area. Staff and contractors made aware of its presence.		
2c. Undertake or facilitate research on lifecycle, recruitment, genetics and effect of vegetation biomass management.	2c. Research results reported, and where appropriate applied to the conservation management of the species.	
3. Increase the number of populations.	3. Undertake or facilitate research and trials into establishing new populations.	3. Research and trials have been undertaken to establish new populations or new population(s) established.
4. Promote a greater awareness and community engagement in the conservation of the species.	4. Provide opportunities for community involvement in conservation activities.	3. Community stakeholders such as Greening Australia and local Parkcare groups engaged in <i>Muehlenbeckia tuggeranong</i> conservation activities.

REFERENCES

- ACT Government 1999. *Tuggeranong Lignum (Muehlenbeckia tuggeranong): an endangered species*. Action Plan No. 24 (Environment ACT, Canberra, ACT).
- ACT Government 2006. *Proposed Muehlenbeckia tuggeranong in situ propagation trial*. Unpublished internal report (Environment ACT, Canberra, ACT).
- ACT Government 2010. *Muehlenbeckia tuggeranong – 2010 planting*. Unpublished internal report (Parks, Conservation and Lands, Canberra, ACT).
- ACT Government 2012. *Muehlenbeckia tuggeranong – 2012 Autumn survey*. Unpublished internal report (Conservation Planning and Research, Canberra, ACT).
- ACT Government 2015. *Muehlenbeckia tuggeranong*. Conservation research – unpublished project report 2015 (Environment and Planning Directorate, Canberra, ACT).
- ACT Government 2016a. *Muehlenbeckia tuggeranong*. Conservation research – unpublished project report 2016 (Environment and Planning Directorate, Canberra, ACT).
- ACT Government 2016b. Special protection status plants. Retrieved 2 February 2017 from http://www.environment.act.gov.au/parks-conservation/plants-and-animals/animal_licensing/protected_plants_and_animals/special_protection_status_plants.
- Cook, E 2013. Threatened species translocation plan. *Tuggeranong Lignum (Muehlenbeckia tuggeranong)* Unpublished report ACT Government, Canberra, ACT.
- Makinson, R and Mallinson, D 1997. *Muehlenbeckia tuggeranong* (Polygonaceae), a new species from the Canberra district, *Telopea* 7(3): 215–219.
- Offord, CA and Meagher, PF (eds.) 2009. *Plant germplasm conservation in Australia: strategies and guidelines for developing, managing and utilising ex situ collections* (Australian Network for Plant Conservation, Canberra, ACT).
- Threatened Species Scientific Committee 2015. Approved conservation advice for *Muehlenbeckia tuggeranong* (Tuggeranong Lignum) Department of the Environment, Canberra, ACT.
- Vallee, L, Hogbin, T, Monks, L, Makinson, B, Matthes, M and Rossetto, M 2004. *Guidelines for the translocation of threatened plants in Australia*, 2nd edn. (Australian Network for Plant Conservation, Canberra, ACT).
- Young, A 2001. *Issues and options for genetic conservation of small populations of threatened plants in the ACT* (CSIRO Plant Industry, Canberra, ACT).

Personal communications

- Baines, G. Senior Ecologist, Conservation Research Unit, Environment, Planning and Sustainable Development Directorate.
- Roso, D. Senior Ranger, Parks Conservation and Lands, Environment, Planning and Sustainable Development Directorate.

APPENDIX 1: INDEX OF WILD *MUEHLENBECKIA TUGGERANONG* AT PINE ISLAND RESERVE

Plant ID	No. of plants	Sex	Date recorded
W_a	1	Female	24 January 1997
W_b	2	Male	08 January 1997
W_c			
W_d	1	Male	08 January 1997
W_e	2	Male	24 January 1997
W_f	5	unknown	30 June 2010
W_g			2 more found 31 May 12
W_h			when tags were placed.
W_j			
W_k			
W_i	1	unknown	10 May 2012