

THREATENED SPECIES SCIENTIFIC COMMITTEE

Established under the *Environment Protection and Biodiversity Conservation Act 1999*

The Minister's delegate approved this Conservation Advice on 13/07/2017.

Conservation Advice

Lasiopetalum pterocarpum

wing-fruited lasiopetalum

Conservation Status

Lasiopetalum pterocarpum (wing-fruited lasiopetalum) is listed as Endangered under the *Environment Protection and Biodiversity Conservation Act 1999* (Cwlth) (EPBC Act) effective from 16 July 2000. The species was eligible for listing under the EPBC Act as on 16 July 2000 it was listed as Endangered under Schedule 1 of the preceding Act, the *Endangered Species Protection Act 1992* (Cwlth).

The wing-fruited lasiopetalum is listed as Critically Endangered in Western Australia under the *Wildlife Conservation Act 1950*.

The main factors that make the species eligible for listing in the Endangered category are its restricted distribution, small population size and several ongoing threats.

Description

The wing-fruited lasiopetalum is a low, open shrub up to 1.5 m high, with spreading branches (Wilkins et al. 2009). Its distinctive winged membranous fruit is unique within the Lasiopetaleae; transversely ellipsoid, six-winged between the dehiscence lines, 0.7 – 2.5 x 1.3 – 3.6 mm, dense hairs on the outer surface (Shepherd et al. 2006). Seeds are ellipsoid, 2.8 – 3.4 x 1.4 – 1.5 mm, black, and smooth with scattered, stellate hairs (Shepherd et al. 2006; Wilkins & Chappill 2002).

Flowers are pale pink or white, pendulous, 12 – 16 mm wide, with calyx lobes divided almost to the base (Shepherd et al. 2006; Wilkins et al. 2009). The apex of the style contains star-shaped hairs. The bracteoles are linear and there are no petals or stipules (Brown et al. 1998).

The species can be confused with *Lasiopetalum floribundum* (free flowering lasiopetalum), sharing a similar habit, large ovate leaves and loose dichasial inflorescences (Shepherd et al. 2006). It is distinguishable by its discolourous and strongly-lobed leaves, the absence of glandular hairs on the peduncles, and its larger seeds (Shepherd et al. 2006). Both collections of the wing-fruited lasiopetalum, at NSW and Perth herbaria, were previously misidentified as *L. floribundum* until a revision of the genus was undertaken by Shepherd et al. (2006) (Wilkins et al. 2009).

Distribution

The species is restricted to the Serpentine National Park, approximately 48 km south of Perth in Western Australia, based on 2006 surveys (Shepherd et al. 2006). Four populations were found to occur downstream from the Serpentine Falls in the deeply incised Serpentine River valley (Wilkins et al. 2009). There was also a translocated population at Serpentine Dam, approximately 10 km to the east of the species' natural range, established in 2001 with 48 plants either cloned or grown from seed from the wild population (Wilkins et al. 2009).

The species was previously known from 21 individuals in 1998, prior to an extensive fire in summer 1999 over part of the species' range (Wilkins et al. 2009). Following the fire there were no surviving adult plants in the burnt areas, and while hundreds of seedlings initially appeared, the number of plants subsequently decreased. In 2006, the total population was estimated to be 550 mature individuals (Shepherd et al. 2006; Wilkins et al. 2009) (Table 1).

Table 1. Number of plants in populations of the wing-fruited lasiopetalum within Serpentine National Park, Western Australia (adapted from Wilkins et al. 2009).

Site number	Site description	Survey year	Fire records	Number of plants	Condition at last survey
Site 1	Riparian vegetation (burnt 1999)	1996	Pre-fire	4 mature plants	Plants weak and spindly, over-shadowed by dense growth of other native plants
		2001	Post-fire	~505 seedlings	
		2004-05	Post-fire	282 mature plants (tagged)	
Site 2	Upslope drainage line, steep slope, open woodland complex	2005	Post-fire	180 mature plants (tagged)	
Site 3	Riparian (unburnt); dense mature vegetation dominated by <i>Eucalyptus rudis</i> (flooded gum), <i>Melaleuca raphiophylla</i> (swamp paperbark) and <i>Trymalium odoratissimum</i> subsp. <i>odoratissimum</i> , with severe invasion by blackberry (<i>Rubus</i> sp.)	2000	Fire unrecorded	10 plants	One living plant
		2001	unburnt	17 plants	
		2004	unburnt	1 plant (subsequently died)	
		2006	unburnt	1 plant (discovered)	
Site 4	Riparian; disturbed open area with soil above stone rubble (burnt 1999)	1997	Pre-fire	1 plant in close vicinity	Healthy in spring 2005; severely grazed and damaged by insects in Jan 2006
		2005	Post-fire	88 mature plants (tagged)	
Translocation site	Serpentine Dam; riparian (48 planted 2001)	2003	Unburnt	46	Healthy and vigorous in 2003; some dead and others in poor to good condition in 2004 and 2006; damage by insects
		2005	Unburnt	38	
		2006	Unburnt	29 (17 healthy)	

Relevant Biology/Ecology

The wing-fruited lasiopetalum flowers from August to December (Shepherd et al. 2006), most commonly from September to November (Wilkins et al. 2009). Seed is mature and shed from the plant in early summer (December). The fruit splits open when mature (Brown et al. 1998) to release seeds, which then fall beneath the canopy (Wilkins et al. 2009).

Flowers offer no nectar and are likely to be buzz-pollinated (Wilkins et al. 2009). Once a flower has been pollinated, it closes within a day. Pollinator attendance is not likely to be limiting the species' survival, as conversion of flowers to fruit is high (~21 percent fruit set). The seeds have a large elaiosome, one-quarter the size of the seed, and *Rhytidoponera* spp. (ants) are involved in seed dispersal (Wilkins et al. 2009).

The species is an obligate seeder, killed by fire and dependent on disturbance to break seed dormancy (Wilkins et al. 2009). Smoke alone has no effect on germination. Prolific seedling establishment occurs if a soil seed bank has had time to accumulate, as fire removes competitors for several years, allowing seedlings to become established. Subsequent survival and health depends on factors including competitors (including weeds such as blackberry (*Rubus* aff. *selmeri*)), and grazing by herbivores (e.g. kangaroos (*Macropus* sp.) and insects), which caused significant damage to the population at Site 4 in 2005-06 (Wilkins et al. 2009).

The wing-fruited lasiopetalum grows in dark brown or red brown loam or clayey-sand, over granite, near creek lines and on sloping banks. It is associated with flooded gum, *Corymbia calophylla* (marri) woodland over dense thickets of *Trymalium odoratissimum* subsp. *odoratissimum* and *Acacia* and *Grevillea* spp. (Shepherd et al. 2006).

Threats

The main threats to this species include weeds (particularly blackberry), grazing by insects and kangaroos, recreational activity and disease. Too frequent or infrequent fire also threatens the survival of this species, given its requirement for disturbance at intervals appropriate for both stimulating germination and replenishing the soil seed bank (Table 2).

Table 2 – Threats impacting the wing-fruited lasiopetalum in approximate order of severity of risk, based on available evidence.

Threat factor	Threat type and status	Evidence base
Invasive species		
Invasive weeds (blackberry, watsonia, gladioli)	known past; current and potential	Weeds such as blackberry, watsonia (<i>Watsonia meriana</i>) and gladioli (<i>Gladiolus undulatus</i>) were a major known threat to the species in 2003 (Stack & English 2003). They suppress early plant growth by competing for light, soil moisture and nutrients (Stack & English 2003). Weed growth after fire can be prolific (Wilkins et al. 2009). The riparian areas of the species' range are often invaded by blackberry, an extremely vigorous competitor that curtails the growth of the wing-fruited lasiopetalum (Wilkins et al. 2009).
Grazing by overabundant native species (kangaroos)	known past; current and potential	Some wing-fruited lasiopetalum sites have been affected by grazing by kangaroos. Kangaroos may exist in higher densities in the park than they did in the past, as there are now no natural predators (Wilkins et al. 2009). This has increased the grazing pressure on the wing-fruited lasiopetalum. At Site 3, the only living plant in 2004 was heavily grazed and subsequently died. Site 4, which had healthy plants in the spring of 2005, was severely grazed by kangaroos by January 2006. Grazing kangaroos can potentially eat entire wing-fruited lasiopetalum plants (Wilkins et al. 2009).
Grazing by invertebrates	known past; current and potential	Wing-fruited lasiopetalum Site 4, which had healthy plants in the spring of 2005, had leaves damaged by insect herbivores by January 2006 (in addition to grazing by kangaroos; above). The translocated population of the wing-fruited lasiopetalum was monitored in 2004 and 2006; on both visits plant leaves on all living plants were reported to be severely damaged by insects (Wilkins et al. 2009). Insects can remove so much leaf area that plants can no longer survive (Wilkins et al. 2009). It is not known whether the damage is caused by native or introduced species of insects.

Threat factor	Threat type and status	Evidence base
Fire		
Too frequent or infrequent fires	known past and current	The wing-fruited lasiopetalum is an obligate seeder, killed by fire and dependent on disturbance to break seed dormancy (Wilkins et al. 2009). An extensive fire in the summer of 1999 over part of the species' range left no surviving adult plants but stimulated the growth of hundreds of seedlings (Wilkins et al. 2009). The soil seed bank would be rapidly depleted if fires recurred before regenerating or juvenile plants reached maturity and replenished the soil seed bank (Stack & English 2003). Fire can also stimulate weed growth (e.g. blackberry re-sprouts strongly after fire (see 'Invasive weeds')) and lead to increased grazing pressure (Hobbs 2003). Conversely, too infrequent fire may result in suboptimal germination and replacement of adult wing-fruited lasiopetalum plants.
Habitat disturbance and modifications		
Recreation	potential	The wing-fruited lasiopetalum occurs in close proximity to increasing human use of recreational facilities within Serpentine National Park (Wilkins et al. 2009). In 2005, it was estimated that ~59 000 people were visiting the park each year (Wilkins et al. 2009). Recreational use of the area impacts the species' habitat through trampling; the species occurs near walking tracks (Stack & English 2003).
Changes to streamflow or water quality	potential	The species occurs along a creekline, with a gauging station and two dams immediately upstream. Changes to streamflow or water quality as a result of developments or water management along the water channel are likely to affect the wing-fruited lasiopetalum (Stack & English 2003).
Disease		
Root rot caused by <i>Phytophthora cinnamomi</i> and <i>Armillaria luteobubalina</i>	potential	These diseases are present in the Serpentine National Park. The <i>Armillaria</i> sp. fungus is present at the site of the translocated population of the wing-fruited lasiopetalum (Brown et al. 1997). It is not known whether these diseases are affecting the species, though it has been established that the wing-fruited lasiopetalum has low susceptibility to <i>P. cinnamomi</i> (Stack & English 2003).

Conservation Actions

Conservation and Management priorities

Invasive species

- Undertake weed control for blackberry, watsonia and gladioli within the Serpentine National Park, particularly in and upstream of riparian areas where the species occurs. Methods may include hand removal, slashing, and application of herbicides by spraying or wick application (Stack & English 2003). Consider the possible disturbance/overspray threats associated with the chosen control method(s).

- Consider fencing wing-fruited lasiopetalum plants at the sites where it occurs, particularly after fire (Wilkins et al. 2009), to protect from grazing by kangaroos.
 - The information gained from monitoring and fencing trials conducted at the translocation site (see Wilkins et al. 2009) should be considered in any future proposals to fence individual plants or populations of this species.

Fire

- Develop and implement a fire management strategy, including fire control measures and recommended fire frequency and intensity for the wing-fruited lasiopetalum.
 - Adult plants are killed by fire and regeneration is from seed. The species requires occasional fire for recruitment from soil-stored seed, but frequent fires would be detrimental to the long-term survival of the species (Stack & English 2003).
 - As such, fires should not occur within populations before an accumulation of a seed bank large enough to replace the number of fire-killed standing plants.
 - Intervals between successive fires should also take into account the longevity of the standing plant population.
 - Fires must be sufficiently intense to trigger seed germination in the soil.
- Fires must be managed to ensure that prevailing fire regimes: do not disrupt the life cycle of the species; support rather than degrade the habitat necessary to the species; do not promote invasion by exotic species (including blackberry); and, do not increase the impacts of grazing by invasive species, particularly kangaroos.

Habitat disturbance and modifications

- Restrict access to wing-fruited lasiopetalum sites within the national park by fencing, undertaking strategic revegetation, and blocking unauthorised tracks with brush cut from local species (Stack & English 2003).
- Ensure water flows and water quality in the stream adjacent to the wild populations are adequate to maintain the wing-fruited lasiopetalum populations and associated habitat, whilst not causing excessive stream bank erosion (Stack & English 2003).
- Ensure national park rangers are aware of the location of the wing-fruited lasiopetalum within the Serpentine National Park.

Disease

- Implement a *P. cinnamomi* management plan to ensure that the fungus is not introduced into locations of the threatened species and that the spread in areas outside of, but adjacent to population is mitigated (DoE 2014).
- Ensure that appropriate hygiene protocols are adhered to when entering or exiting the known location of the threatened species, such as those outlined in Podger et al. (2001).
- Implement a hygiene management plan and risk assessment to protect known populations from further outbreaks of *P. cinnamomi*. This may include but is not limited to:
 - Contaminated water is not used for firefighting purposes,

- Contaminated soil is not introduced into the area as part of restoration, translocation, infrastructure development or revegetation activities,
- Ensure that areas where the threatened species is known to occur that are *P. cinnamomi* free are sign posted and hygiene stations are implemented and maintained.
- Implement mitigation measures in areas that are known to be infected by *P. cinnamomi*, this may include but is not limited to;
 - Application of phosphite (H_3PO_3), noting the potential deleterious effects as a fertiliser with prolonged usage.

Ex situ Strategies

- Ex situ seed banks provide an important capacity for medium to long-term storage of diaspores of threatened plant species. Where storable seeds are available, seed banking should be undertaken in consultation with relevant seed storage professional advice as to appropriate conditions (collection and post-harvest treatment; pre-storage drying; storage temperature; curation and auditing) to ensure diaspore viability is retained.
- Seed should be appropriately sourced and stored in a seed bank facility using best practice seed storage guidelines and procedures, to maximise seed viability and germinability.
- Undertake seed germination trials to determine the requirements for successful establishment, including optimal fire regimes for seed germination.

Translocation

- Using habitat suitability modelling as guidance, identify suitable sites for the establishment of additional populations in the wild and for linking existing populations. Relevant policies should be referred to for guidance for undertaking translocations (e.g. Vallee et al. 2004).

Stakeholder engagement

- Ensure relevant stakeholders, including the general public, park managers and the Water Corporation, are aware of the species and (where appropriate) actively involved in its management and conservation.
- Raise awareness among recreational users of the park of the species' presence, conservation significance, and threats (including trampling, which damages the species' habitat and can directly damage individual plants, particularly near walking tracks).

Survey and Monitoring priorities

- Continue to monitor the known populations of the species, including the effectiveness of management actions and the need to adapt them if necessary.
- Undertake surveys to more precisely assess the species' size, ecological requirements and distribution, by searching for additional populations in areas of potential habitat during the species' flowering period (September – November).
- Design and implement a monitoring program for the species, including the following factors:

- the relative impacts of threatening processes, including weed densities, trampling, grazing by invasive species, and plant diseases;
- population stability (expansion or decline);
- life history traits including pollination activity, seed production, recruitment and longevity;
- recruitment from soil-stored seed as a result of the removal of weeds such as blackberry and watsonia; and
- requirements for rehabilitation following weed control (Stack & English 2003).
- Involve community volunteers in surveys for the species (Stack & English 2003).
- Monitor the size, structure and reproductive status of populations at different stages in the fire cycle, taking opportunities to monitor after planned and unplanned fires (where they occur) and improve understanding of the fire response of the species.
- Precise fire history records must be kept for the species' habitat and extant populations (confirmed and suspected).

Information and research priorities

- Investigate options for linking, enhancing or establishing additional populations, including by continuing to implement the existing translocation proposal.
 - Translocation is essential for the species' survival, as the existing wild population is not secure from threats including weed competition and trampling (Stack & English 2003).
 - Translocations must be undertaken in accordance with Western Australian Government's Policy Statement No. 29: *Translocation of Threatened Flora and Fauna*.
 - Monitoring of the existing, and future, translocation sites is essential.
- Improve understanding of the mechanisms of response to different fire regimes and identify appropriate fire regimes for conservation of the threatened species by undertaking appropriately designed experiments in the field, or by using understanding and research on fire responses among related (e.g. congeneric) or functionally similar species to develop fire management strategies for conservation.
- Collect seed and cutting material from each population, where possible, to preserve the germplasm and guard against extinction in the wild. Such collections can also be used to propagate plants for translocation (Stack & English 2003).
- Develop a scientific understanding of the following, to assist in the species' management:
 - soil seed bank dynamics (including seed bank longevity) and the role of disturbances (including fire), competition, rainfall and grazing in germination and recruitment;
 - pollination biology of the species;
 - requirements of pollinators;
 - reproductive strategies, phenology and seasonal growth of the species;
 - population genetic structure, levels of genetic diversity and minimum viable population size – there is nothing specifically known about patterns of allozyme variation, genetic diversity or levels of in- or out-breeding in this species (Wilkins et al. 2009); and
 - response of the species and its habitat to fire (Stack & English 2003).

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