

Consultation Document on Eligibility for Delisting

Philothea sporadica (Kogan waxflower)

You are invited to provide your views and supporting reasons related to:

- 1) the eligibility of *Philothea sporadica* (Kogan waxflower) for delisting from the *Environment Protection and Biodiversity Conservation Act 1999* (Cwth) (EPBC Act) threatened species list in the Vulnerable category;
- 2) discussion of the management and possible effects of delisting the above species; and/or
- 3) the eligibility of the above species for continued listing on the EPBC Act threatened species list and any necessary conservation actions for the species.

Evidence provided by experts, stakeholders and the general public are welcome. Responses can be provided by any interested person.

Anyone may nominate a native species, ecological community or threatening process for listing under the EPBC Act or for a transfer of an item already on the list to a new listing category. The Threatened Species Scientific Committee (the Committee) undertakes the assessment of species to determine continued eligibility for inclusion in the list of threatened species and provides its recommendation to the Australian Government Minister for the Environment and Energy.

Draft information for your consideration of the eligibility of this species for delisting from the Vulnerable category starts at page 3 and information associated with consideration for delisting of this species starts at page 9. To assist with the Committee's assessment, the Committee has identified a series of specific questions on which it seeks your guidance at page 12.

Responses are to be provided in writing either by email to:

species.consultation@environment.gov.au

or by mail to:

The Director
Terrestrial Threatened Species Section
Biodiversity Conservation Division
Department of the Environment and Energy
PO Box 787
Canberra ACT 2601

Responses are required to be submitted by 24 January 2018.

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General background information about listing threatened species

The Australian Government helps protect species at risk of extinction by listing them as threatened under Part 13 of the EPBC Act. Once listed under the EPBC Act, the species becomes a Matter of National Environmental Significance (MNES) and must be protected from significant impacts through the assessment and approval provisions of the EPBC Act. More information about threatened species is available on the department's website at:

<http://www.environment.gov.au/biodiversity/threatened/index.html>.

Public nominations to list threatened species under the EPBC Act are received annually by the department. In order to determine if a species is eligible for listing as threatened under the EPBC Act, the Threatened Species Scientific Committee (the Committee) undertakes a rigorous scientific assessment of its status to determine if the species is eligible for listing against a set of criteria. These criteria are available on the Department's website at:

<http://www.environment.gov.au/biodiversity/threatened/pubs/guidelines-species.pdf>.

As part of the assessment process, the Committee consults with the public and stakeholders to obtain specific details about the species, as well as advice on what conservation actions might be appropriate. Information provided through the consultation process is considered by the Committee in its assessment. The Committee provides its advice on the assessment (together with comments received) to the Minister regarding the eligibility of the species for listing under a particular category and what conservation actions might be appropriate. The Minister decides to add, or not to add, the species to the list of threatened species under the EPBC Act. More detailed information about the listing process is at:

<http://www.environment.gov.au/biodiversity/threatened/nominations.html>.

To promote the recovery of listed threatened species and ecological communities, conservation advices and where required, recovery plans are made or adopted in accordance with Part 13 of the EPBC Act. Conservation advices provide guidance at the time of listing on known threats and priority recovery actions that can be undertaken at a local and regional level. Recovery plans describe key threats and identify specific recovery actions that can be undertaken to enable recovery activities to occur within a planned and logical national framework. Information about recovery plans is available on the department's website at:

<http://www.environment.gov.au/biodiversity/threatened/recovery.html>.

Information about this consultation process

Responses to this consultation can be provided electronically or in hard copy to the contact addresses provided on page 1. All responses received will be provided in full to the Committee and then to the Australian Government Minister for the Environment.

In providing comments, please provide references to published data where possible. Should the Committee use the information you provide in formulating its advice, the information will be attributed to you and referenced as a 'personal communication' unless you provide references or otherwise attribute this information (please specify if your organisation requires that this information is attributed to your organisation instead of yourself). The final advice by the Committee will be published on the department's website following the listing decision by the Minister.

Information provided through consultation may be subject to freedom of information legislation and court processes. It is also important to note that under the EPBC Act, the deliberations and recommendations of the Committee are confidential until the Minister has made a final decision on the nomination, unless otherwise determined by the Minister.

Philotheca sporadica

Kogan waxflower

Scientific Name

Conventionally accepted as *Philotheca sporadica* (Bayly) Paul G. Wilson.

Species/Sub-species Information

Description

The Kogan waxflower (family Rutaceae) is an open to compact shrub that grows to 150 cm high and has numerous branches. Along its length, each branch has many small (1-4 mm long) hairless, club-shaped leaves. The white flowers are 6–10 mm in diameter, solitary and occur on short stalks (up to 0.7 mm long) at the end of branchlets. Flowering has been recorded from August to October. Mature fruits have been observed in late November. Seeds are almost kidney-shaped, about 3 mm long and are forcibly ejected from the mature fruit (Halford 1995, cited in DoEE 2017a).

Distribution

The Kogan waxflower is endemic to southern Queensland, occurring in the Brigalow Belt South IBRA bioregion. It is known from an area ranging from just south-west of Chinchilla, south down to Tara, further south to just beyond the Waar Waar State Forest, east across to the Western Creek State Forest, and then north up to Warra, crossing the Warrego Highway. The distribution area covers several state forests, including Dalby State Forest, Braemar State Forest, Vickery State Forest and large parts of Kumbarrilla State Forest. Kogan, after which the species is named, is located just north of the Braemar State Forest, within the distribution area (QGC 2015, pers comm 26 March; see [DoEE 2017a](#) for a map of the species' distribution).

The distribution of this species overlaps with the following EPBC Act-listed threatened ecological communities, but is not considered a listed component of either ecological community (DECCW 2010; TSSC 2013):

- Brigalow (*Acacia harpophylla* dominant and co-dominant); and
- White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland.

Relevant Biology/Ecology

The Kogan waxflower is more common in partial shade than full sunlight and is more frequently found in sparse to dense patches, than as isolated plants. It is a perennial shrub. The longevity of individual plants is unknown, but it is likely to be at least 20 years (Halford 1995, cited in DoEE 2017a). The species is difficult to propagate from seeds or cuttings (it is likely to be physiologically dormant), but does respond well under tissue culture (USC 2012, cited in QGC 2015, pers comm 26 March).

The Kogan waxflower is found on residual hills which are remnants of laterised Cretaceous sandstones. Topography of these areas is undulating to flat with low dissected flat top or rounded hills. The soils on which this species grows are of low fertility (Dawson 1972; Halford 1995, both cited in DoEE 2017a; QGC 2015, pers comm 26 March).

The vegetation associated with the Kogan waxflower is open shrubland to closed shrubland to closed woodland (HLA-Envirosciences Pty Ltd 2005, cited in DoEE 2017a). The Kogan waxflower is often associated with *Acacia burrowii* (yarron wattle), *Eucalyptus exserta*, *Eucalyptus crebra* (narrow-leaved ironbark), *Eucalyptus fibrosa* subsp. *nubila* (red ironbark) and *Callitris glaucophylla* (white cypress pine) (Halford 1995, cited in DoEE 2017a). The Kogan waxflower occurs in dense thickets of shrubs, such as *Thryptomene* sp. While these waxflower individuals can be either older specimens or young recruits, the general appearance is that the

Thryptomene sp. thickets, being taller, are gradually excluding the waxflowers from the top of the scald (QGC 2015, pers comm 26 March).

Although fire may adversely impact on other shrub species, such as *Thryptomene* sp., *Micromyrtus* sp. or *Calytrix* sp., the Kogan waxflower's response to varying fire regimes is unknown. The species' physiological dormancy may be provoked by fire, generating emergence, but a further understanding of this response is required. There is a suggestion that the species demonstrates a natural successional progression during regrowth that may have evolved from the historical aboriginal use of fire (QGC 2015, pers comm 26 March).

Anecdotal evidence indicates that when the Kogan waxflower is damaged by fire, such as where the fire removes all above ground foliage, the plants are capable of shooting from the base and regenerating at a rate of up to 0.5 m per annum. This would indicate that the plants are capable of supporting this rapid growth (Brundrett 2008, cited in QGC 2015, pers comm). However, because of seed dormancy in Rutaceae, disturbance responses can vary widely, leading to variable recruitment success.

It is possible that, like many other Rutaceae, the Kogan waxflower has a close relationship with mycorrhizae (a symbiotic relationship between fungi and plants). This would enable the species, along with other, co-occurring species, to extract valuable resources from the poor, shallow, sandy soils (Brundrett 2008, cited in QGC 2015, pers comm 26 March).

A survey of grazing by wallabies and kangaroos on the Kogan waxflower indicates most grazing was targeted at foliage. There was also occasional evidence of bark chewing (TSSC 2008), which may be caused by rabbits. The Kogan waxflower has a pungent aromatic scent when brushed against and it is possible that, along with other co-occurring myrtaceous species, the aromatic compounds in the foliage makes the species less palatable. Whether the development of aromatic compounds within the foliage has evolved to inhibit grazing, or as a consequence of other factors is unknown (QGC 2015, pers comm 26 March).

Threats

The main identified threat to the Kogan waxflower is loss of habitat, with other threats identified as grazing, invasive weeds and inappropriate fire regimes (TSSC 2008).

Table 1 – Threats impacting the Kogan waxflower in approximate order of severity of risk, based on available evidence

Threat factor	Threat type and status	Evidence base
Loss and degradation of habitat	Known/ Current	<p>Habitat is being cleared and degraded as a result of development and recreational activities:</p> <ul style="list-style-type: none"> coal seam gas development (pipelines, associated infrastructure, maintenance tracks) (DoEE 2017b); general road maintenance activities and/or associated use of roadsides, i.e. laydown areas (QGC 2015, pers comm 26 March); development of local council quarry pits (QGC 2015, pers comm 26 March); development of transmission lines and other infrastructure (Powerlink Queensland 2005, cited in DoEE 2017a); forestry practices (Halford 1995, cited in DoEE 2017a); recreational use (such as cross-country motorcycle riding) (Halford 1995, cited in DoEE 2017a).

Threat factor	Threat type and status	Evidence base
Grazing	Possible/ Current	The Kogan waxflower has been observed to persist in areas where sheep have grazed for many years. However, at one site a population is restricted to a road verge and grazing, by domestic animals, may have excluded the species from the adjacent paddock (Halford 1995, cited in DoEE 2017a).
Fire	Possible/ Current	The effect of fire on this species is uncertain (QGC 2015, pers comm 26 March).
Weeds	Suspected/ Current	Halford (1995, cited in DoEE 2017a) recorded mother of millions (<i>Bryophyllum</i> sp.) at the Warra Road site and considered that this invasive species might cause environmental problems in future, due to its invasive nature, i.e. competition.

Assessment of available information in relation to the EPBC Act Criteria and Regulations

Criterion 1. Population size reduction (reduction in total numbers) Population reduction (measured over the longer of 10 years or 3 generations) based on any of A1 to A4			
	Critically Endangered Very severe reduction	Endangered Severe reduction	Vulnerable Substantial reduction
A1	≥ 90%	≥ 70%	≥ 50%
A2, A3, A4	≥ 80%	≥ 50%	≥ 30%
<p>A1 Population reduction observed, estimated, inferred or suspected in the past and the causes of the reduction are clearly reversible AND understood AND ceased.</p> <p>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.</p> <p>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]</p> <p>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.</p> <p>(a) direct observation [except A3]</p> <p>(b) an index of abundance appropriate to the taxon</p> <p>(c) a decline in area of occupancy, extent of occurrence and/or quality of habitat</p> <p>(d) actual or potential levels of exploitation</p> <p>(e) the effects of introduced taxa, hybridization, pathogens, pollutants, competitors or parasites</p> <p>based on any of the following:</p>			

Evidence:

More information is required to determine whether the Kogan waxflower is in decline. Halford (1995, cited in DoEE 2017a) estimated the total population to be 58 150 individuals, with >80 percent of the total population around Kogan, but emphasised that this figure was likely to be an underestimate of the actual population size. A survey by Powerlink Queensland reported an additional 6000 individuals southeast of Kogan and revised the total population estimate to in excess of 64 000 individuals in the wild (HLA-Envirosciences Pty Limited 2005; Powerlink Queensland 2005, both cited in DoEE 2017a). It was observed that the Kogan waxflower often occurs in small discrete clusters in open areas, including road verges, and additional plants are likely to be found in unsurveyed hard soil crust areas near other known plants (Powerlink Queensland 2005, cited in DoEE 2017a).

These population estimates indicate that the increased survey effort has located more individuals and thus, that population numbers are becoming more accurate. This is consistent with records verified by the Atlas of Living Australia, which indicate an increase in records in the last three decades (ALA 2017). More information, however, is required to demonstrate if there is a trend concerning increase or decrease in population numbers.

Halford (1995, cited in DoEE 2017a) estimated that individual Kogan waxflower shrubs can live for 20 years, which is likely to be a minimum age. There is no information concerning generation length.

Although, anecdotally, Kogan waxflower numbers appear to be stable within populations, given increasing development for coal seam gas within the species' range (QGC 2017), it is predicted that the area of habitat and the number of occupied sites is in decline. This is projected to increase into the future, as more developments come online, with the potential to result in declines in extent of occurrence, area of occupancy and/or quality of habitat.

There are currently **insufficient data to demonstrate if the species is eligible for listing under this criterion.**

However, the purpose of this consultation document is to elicit additional information to better understand the species' status. This conclusion should therefore be considered to be tentative at this stage, as it may be changed as a result of responses to this consultation process.

Criterion 2. Geographic distribution as indicators for either extent of occurrence AND/OR area of occupancy			
	Critically Endangered Very restricted	Endangered Restricted	Vulnerable Limited
B1. Extent of occurrence (EOO)	< 100 km ²	< 5,000 km ²	< 20,000 km ²
B2. Area of occupancy (AOO)	< 10 km ²	< 500 km ²	< 2,000 km ²
AND at least 2 of the following 3 conditions indicating distribution is precarious for survival:			
(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:

The extent of occurrence for the Kogan waxflower is 2,774 km² and the area of occupancy is 104 km². These figures are based on the mapping of post-1997 species observations over a 20-year timeframe, obtained from state governments and Commonwealth agencies, along with museums, herbaria, research institutions and non-government organisations (ERIN 2017a). The extent of occurrence was calculated using a minimum convex hull and the area of occupancy calculated using a 2x2 km grid cell method, based on the *IUCN Red List Categories and Criteria* (v3.1) (IUCN SSC 2012) and *Guidelines for Using the IUCN Red List Categories and Criteria* (v13) (IUCN SPC 2017; ERIN 2017a). The figures used in this assessment do not include the data referred to in the nomination, as these are not available to be used in the calculation.

It is noted that the area of occupancy presented in the nomination was estimated using a 1x1km grid square, rather than the 2x2 km grid cell method used by IUCN (QGC 2015, pers comm 26 March). It is unknown what method was used to estimate the extent of occurrence in the nomination.

The species occurs in two discrete areas, the northern and southern population areas (ERIN 2017a). It is noted that recent survey work has only been carried out in the northern population area (QGC 2015, pers comm 26 March). The extent and quality of habitat in the northern population area may be in decline, owing to increasing development for the coal seam gas industry. Exploration and development licences for coal seam gas exist across almost the entire northern population area (QGC 2017). Coal seam gas is also likely to be reducing the number of populations as infrastructure removes individuals and fragments habitat (Williams et al, 2012).

There is little information concerning the level of fragmentation or whether fragmentation may lead to an increased risk of extinction. A genetic analysis of the Kogan waxflower indicates high genetic diversity within those populations that were sampled and which were found to be genetically similar (Shapcott et al, 2014). These results indicate high gene flow, and distinct and viable gene connectivity between the sampled populations. The study noted, however, that there is likely to be a loss of genetic diversity for populations affected by direct clearing for pipeline infrastructure works, with resulting alterations to inter-population gene flow (Shapcott et al, 2014). The results of fragmentation from clearing are therefore likely to be genetically detrimental to the species.

The extent and quality of habitat in the northern population area is likely to be in decline, owing to increasing development for the coal seam gas industry. Exploration and development licences for coal seam gas exist across almost the entire northern population area (QGC 2017).

The available data indicate that:

- both the extent of occurrence (less than 5 000km²) and area of occupancy (less than of 500km²) are restricted, and would meet the category of Endangered;
- although the area of occupancy may increase with verification of new records through additional survey work, in all likelihood the extent of occurrence will remain below 5 000km²;
- there is insufficient information to determine if the species is severely fragmented, or subject to extreme fluctuations; and
- the prevalence of coal seam gas development licences, particularly in the northern population area, are likely to result in a decline in the extent and quality of habitat (DoEE 2017a; ERIN 2017a; QGC 2017).

The data presented appear to demonstrate that the Kogan waxflower **may be eligible for listing under this criterion**, but more information is required to determine if this species meets the sub-criteria 2(a), 2(b) or 2(c).

However, the purpose of this consultation document is to elicit additional information to better understand the species' status. This conclusion should therefore be considered to be tentative at this stage, as it may be changed as a result of responses to this consultation process.

Criterion 3. Population size and decline			
	Critically Endangered Very low	Endangered Low	Vulnerable Limited
Estimated number of mature individuals	< 250	< 2,500	< 10,000
AND either (C1) or (C2) is true			
C1 An observed, estimated or projected continuing decline of at least (up to a max. of 100 years in future)	Very high rate 25% in 3 years or 1 generation (whichever is longer)	High rate 20% in 5 years or 2 generation (whichever is longer)	Substantial rate 10% in 10 years or 3 generations (whichever is longer)
C2 An observed, estimated, projected or inferred continuing decline AND its geographic distribution is precarious for its survival based on at least 1 of the following 3 conditions:			
(i) Number of mature individuals in each subpopulation	≤ 50	≤ 250	≤ 1,000
(a) (ii) % of mature individuals in one subpopulation =	90 – 100%	95 – 100%	100%
(b) Extreme fluctuations in the number of mature individuals			

Evidence:

While population estimates have been made, there is no definitive information on the number of mature individuals across the species' range.

Surveys between 2010 and 2014 by the coal seam gas industry have reported > 159 000 individuals at over 3000 locations outside those recorded in the Queensland Herbarium database, an estimated additional 30 populations (QGC 2015, pers comm 26 March). Much of this survey work has been restricted to the central north regions of the known extent of occurrence (the northern population area). However, these new data have yet to be supplied to the Department and to the Queensland Herbarium for verification.

A commissioned unpublished study undertaken in June 2011 by the University of the Sunshine Coast (USC 2012, cited in QGC 2015, pers comm 26 March) concluded that, across 18 surveyed populations within the extent of occurrence, the average population density of the Kogan waxflower was 4200 individuals per hectare. Based on a per hectare calculation, it was estimated that the total population size across the 18 sites surveyed was approximately 74 410 individuals, noting that surveys were carried out only in the northern population area (USC 2012, cited in QGC 2015, pers comm 26 March). The study reported the average reproductive proportion to be > 80 percent (USC 2012, cited in QGC 2015, pers comm 26 March), an estimate that remains to be published.

Analysis of the unverified survey data from between 2010 and 2014 reported that the ratio of juveniles to mature Kogan waxflowers is low, probably less than 1:9 (QGC 2015, pers comm 26 March). This may indicate low recruitment and/or a senescencing population. This estimate is based on observations that individuals as small as 300 mm high have had flowers (considered a sign of maturity) (QGC 2015, pers comm 26 March).

Based on these relative proportions, a conservative estimate of 52 000 mature individuals, based on the lower end of the range of population estimates (64 000), would be well about the 10 000 threshold for eligibility as Vulnerable.

The data presented appear to demonstrate that the Kogan waxflower is **not eligible for listing under this criterion**.

However, the purpose of this consultation document is to elicit additional information to better understand the species' status. This conclusion should therefore be considered to be tentative at this stage, as it may be changed as a result of responses to this consultation process.

Criterion 4. Number of mature individuals			
	Critically Endangered Extremely low	Endangered Very Low	Vulnerable Low
Number of mature individuals	< 50	< 250	< 1,000

Evidence:

As under Criterion 3, while population estimates have been made, there is no definitive information on the number of mature individuals across the species' range. A conservative estimate of around 52 000 mature individuals could be inferred, based on a reported proportion of mature (reproducing) Kogan waxflowers to juveniles of > 80 percent (QGC 205, pers comm 26 March). This estimate is well above the 1 000 threshold for eligibility as Vulnerable.

The data presented appear to demonstrate that the Kogan waxflower is **not eligible for listing under this criterion**.

However, the purpose of this consultation document is to elicit additional information to better understand the species' status. This conclusion should therefore be considered to be tentative at this stage, as it may be changed as a result of responses to this consultation process.

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

Evidence:

A quantitative analysis which estimates the extinction probability of the Kogan wax flower has not been undertaken. There are **insufficient data to demonstrate if the species is eligible for listing under this criterion**.

However, the purpose of this consultation document is to elicit additional information to better understand the species' status. This conclusion should therefore be considered to be tentative at this stage, as it may be changed as a result of responses to this consultation process.

Consideration for delisting

The Kogan waxflower has triggered seven times under the EPBC Act between 2005 and 2015. All of these actions were in relation to construction of gas pipelines, particularly for coal seam gas, and gas-fired power stations (DoEE 2017b). The known distribution of the Kogan waxflower places it within the southern Surat basin, an area that continues to see exploration and development proposals for coal seam gas.

Queensland Government undertook an assessment of listing eligibility for the Kogan waxflower in 2014, which resulted in the species being downlisted from Vulnerable to Near Threatened (QGC 2013, pers comm 7 May). As the species is listed as Near Threatened in Queensland, any clearing still requires a clearing permit issued under the Nature Conservation (Administration) Regulation 2006 (QGC 2015, pers comm 26 March; 17 December).

However, if delisted under the EPBC Act, the Kogan waxflower is also likely to be delisted in Queensland, as Queensland is now a signatory to the Memorandum of Understanding for the Common Assessment Method. At least one coal seam gas company has stated that they would continue to avoid and minimise impacts on the Kogan waxflower, and undertake works to maximise natural regeneration, in line with state-issued clearing permit conditions (QGC 2015, pers comm 17 December). However, avoidance and mitigation measures may not be required if the species is also delisted in Queensland.

Population numbers are projected to decline if delisting occurs, given the most populated northern population area is almost completely covered in coal seam gas exploration and development licences (QGC 2017).

Land tenure of population

Most of the known populations of the Kogan waxflower occur on private land, road reserves and state forest, and are therefore not in protected reserves (24 percent of the land across the extent of occurrence is in state forest; ERIN 2017b). Exploration and extraction licences for coal seam gas occur across much of the known range of this species (QGC 2017), particularly in the northern population area, which contains most of the known populations. Kogan waxflower habitat is apparently less productive land and is not favoured for grazing, although there is evidence of grazing impacts in some areas where the species is found (see threats, above). Logging continues in state forest areas, although much of the best timber has now been removed and regrowth has not developed to a logging standard (QGC 2015, pers comm 26 March).

Effect on survival of inclusion in the list

Unverified data indicates an increase in the number of known locations and estimated number of individual Kogan waxflowers, but this is due to the increased survey effort being undertaken by the coal seam gas industry between 2010 and 2014, rather than a demonstrated increase in population size. This survey effort has resulted in an increase in records from 64 000 to 159 000 individuals (unverified records) (QGC 2015, pers comm 26 March). There are no details associated with these surveys concerning whether the overall extent and quality of habitat may be in decline. These surveys have been undertaken because of requirements under the EPBC Act and this suggests that the species has not previously been sufficiently surveyed to accurately determine population numbers.

There is no national or state recovery plan in place for the Kogan waxflower (the decision under the EPBC Act was 'not required'). There is a Commonwealth [Conservation Advice](#). There appears to have been no coordinated recovery effort for this species.

Developers have implemented management (QGC 2017) and offset plans for the species to identify key threats and give effect to protection measures, such as weed and fire management, which are consistent with the conservation advice. Monitoring data indicates significant regrowth of Kogan waxflower populations within reinstated disturbance areas (QGC 2015, pers comm 17 December), noting that these data has not been published.

A genetic analysis of the Kogan waxflower indicates high genetic diversity, but that this diversity declines as populations are reduced in size and become more isolated. The analysis noted that many of the largest, most genetically diverse populations were being impacted by the coal seam gas industry (Shapcott et al, 2014).

A separate commissioned study, undertaken to determine the best propagation methods for establishing offset populations, reported limited success with propagating from seed and cutting samples, but more success with tissue culture (Dwan & Trueman 2014). These studies indicate that propagation and translocation is not effective, and that natural regeneration is the most effective method for restoring this species.

Listing the Kogan waxflower has led to actions that have had some conservation benefit, for example, weed and fire management, as well as providing additional data on increased population numbers, though much of this remains to be verified.

Delisting the Kogan waxflower is likely to result in:

- delisting in Queensland, as Queensland has now signed up to the Common Assessment Method;
- limited or no protective measures being undertaken for the species, which has a limited distribution in an area that is rapidly being developed for coal seam gas; and
- increased loss and fragmentation, given the location of coal seam gas exploration and development licences, particularly across the northern population area.

It is possible that delisting would adversely impact on the survival of the Kogan waxflower, placing the species at risk of ongoing decline. However, the purpose of this consultation document is to elicit additional information to better understand the impact that delisting would have. This conclusion should therefore be considered to be tentative at this stage, as it may be changed as a result of responses to this consultation process.

Collective list of questions – your views

A. TOTAL POPULATION NUMBERS

Population size

1. Has the survey effort for this species been adequate to determine its national population size? If not, please provide justification for your response.
2. Do you accept the most recent estimate of the total population size for the species (> 64 000 individuals)?
3. If you don't agree with the estimate, can you provide your own estimate of the abundance of this species across its extent? Please provide supporting justification, including verified records and published data, if available.

If, because of uncertainty, you are unable to provide a single number, you may wish to provide an estimated range. If so, please choose one of the ranges suggested in the table below of possible species numbers, and also choose the level of confidence you have in this estimate:

Number of mature individuals is estimated to be in the range of:

☐ 251–1000 ☐ >1000 ☐ >10 000 ☐ >100 000 ☐ >500 000

Level of your confidence in this estimate:

- ☐ 0–30% - low level of certainty/ a bit of a guess/ not much information to go on
- ☐ 31–50% - more than a guess, some level of supporting evidence
- ☐ 51–95% - reasonably certain, information suggests this range
- ☐ 95–100% -high level of certainty, information indicates quantity within this range
- ☐ 99–100% - very high level of certainty, data are accurate within this range

B. TRENDS IN THE OVERALL POPULATION OF THE SPECIES

Evidence of total population size change

4. Are you able to comment on the extent of any change (decline or increase) in the species' total population size over approximately the last 10 years? Please provide supporting justification for your response, including verified records and published data, if available.

If, because of uncertainty, you are unable to provide an estimate of change, you may wish to provide an estimated range. If so, please choose one of the ranges suggested in the table below of ranges of decline, and also choose the level of confidence you have in this estimated range.

Decline ☐ or increase ☐ estimated to be in the range of:

☐ 1–30% ☐ 31–50% ☐ 51–80% ☐ 81–100% ☐ 90–100%

Level of your confidence in this estimated decline:

- ☐ 0–30% - low level of certainty/ a bit of a guess/ not much information to go on
- ☐ 31–50% - more than a guess, some level of supporting evidence
- ☐ 51–95% - reasonably certain, suggests this range of decline
- ☐ 95–100% - high level of certainty, information indicates a decline within this range
- ☐ 99–100% - very high level of certainty, data are accurate within this range

5. Are you able to comment on any fluctuations and/or declines in the number of locations in which this species occurs? Please ensure you clearly define what you mean by location in your response and provide supporting justification, including verified records and published data, if available.
6. Please provide (if known) any additional evidence (published, if available) which shows the species is stable, increasing, or declining, including comment on any relationship with the level of survey effort.

Mature individuals

7. Are you able to comment on the proportion of the total population that are likely to be mature individuals? Please provide supporting justification for your response, including verified records and published data, if available.
8. Are you able to comment on any fluctuations and/or declines in the number of mature individuals? Please provide supporting justification for your response, including verified records and published data, if available.

Generation length

9. Are you able to comment on the likely generation length of the species? That relates to the average age of reproducing individuals (see the *Guidelines for Using the IUCN Red List Categories and Criteria* (v13) for more information on generation length). Please provide supporting justification for your response, including published data, if available.

C. TOTAL RANGE OF THE SPECIES

Distribution/range/extent of occurrence, area of occupancy

10. Is the distribution as described accurate? If not, please provide supporting justification for your response, including published data, if available.
11. If you disagree with the estimates of extent of occurrence and area of occupancy provided, can you provide alternative estimates of extent of occurrence and/or area of occupancy? (please base calculations upon the *IUCN Red List Categories and Criteria* (v3.1) (IUCN SSC 2012) and *Guidelines for Using the IUCN Red List Categories and Criteria* (v13))

If, because of uncertainty, you are unable to provide an estimate of extent of occurrence, you may wish to provide an estimated range. If so, please choose one of the ranges suggested in the table below of ranges of extent of occurrence, and also choose the level of confidence you have in this estimated range.

Extent of occurrence is estimated to be in the range of:
<input type="checkbox"/> <100 km ² <input type="checkbox"/> 100 – 5000 km ² <input type="checkbox"/> 5001 – 20 000 km ² <input type="checkbox"/> >20 000 km ²
Level of your confidence in this estimated extent of occurrence
<input type="checkbox"/> 0–30% - low level of certainty/ a bit of a guess/ not much data to go on
<input type="checkbox"/> 31–50% - more than a guess, some level of supporting evidence
<input type="checkbox"/> 51–95% - reasonably certain, data suggests this range of decline
<input type="checkbox"/> 95–100% -high level of certainty, data indicates a decline within this range
<input type="checkbox"/> 99–100% - very high level of certainty, data are accurate within this range

If, because of uncertainty, you are unable to provide an estimate of area of occupancy, you may wish to provide an estimated range. If so, please choose one of the ranges suggested in the table below of ranges of area of occupancy, and also choose the level of confidence you have in this estimated range.

Area of occupancy is estimated to be in the range of:
<input type="checkbox"/> <10 km ² <input type="checkbox"/> 11 – 500 km ² <input type="checkbox"/> 501 – 2000 km ² <input type="checkbox"/> >2000 km ²
Level of your confidence in this estimated extent of occurrence:
<input type="checkbox"/> 0–30% - low level of certainty/ a bit of a guess/ not much data to go on
<input type="checkbox"/> 31–50% - more than a guess, some level of supporting evidence
<input type="checkbox"/> 51–95% - reasonably certain, data suggest this range of decline
<input type="checkbox"/> 95–100% -high level of certainty, data indicate a decline within this range
<input type="checkbox"/> 99–100% - very high level of certainty, data are accurate within this range

12. Are you able to comment on whether the extent of occurrence and/or area of occupancy is in decline and/or subject to any fluctuations? Please provide justification for your response, including published data, if available.

D. THREATS TO THE SURVIVAL OF THE SPECIES

Habitat decline and/or fragmentation

13. Can you comment on the level of vegetation fragmentation in the area in which the species is found? Please provide justification for your response, including published data, if available.
14. Can you comment on whether there are any declines in the area, extent and/or quality of habitat for the species? Please provide justification for your response, including published data, if available.

Threats

15. Do you agree that the threats listed are correct and can you comment on their effect(s) on the species?
16. To what degree, if any, are the identified threats likely to impact on the species in the future?
17. Can you provide additional or alternative information on threats, past, current or potential that may adversely affect this species at any stage of its life cycle?
18. Can you provide supporting data/justification or other information (published, if available) for your responses to these questions about threats?

E. LIKELY EFFECTS OF DELISTING THE SPECIES

19. To what extent have conservation and management actions been effective in supporting protection and recovery of the species?
20. What is the likelihood that these conservation and management actions will be continued if this species is delisted?
21. What is the likely consequence of delisting this species?
22. Can you provide supporting data/justification or other information (published, if available) for your responses to these questions about the effects of delisting?

F. GENERAL

23. Can you provide additional data or information relevant to this assessment?
24. Have you been involved in developing this nomination? If so, in what capacity?

References cited in the advice

- Atlas of Living Australia (ALA) (2017) *Philotheca sporadica* (Bayly) Paul G. Wilson Available on the Internet at <https://bie.ala.org.au/species/http://id.biodiversity.org.au/node/apni/2896544#> (Viewed on 16 October 2017).
- Department of Environment, Climate Change and Water NSW (DECCW) (2010) *National Recovery Plan for White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland* Department of Environment, Climate Change and Water NSW, Sydney.
- Department of the Environment and Energy (DoEE) (2017a) Species Profile and Threats Database. *Philotheca sporadica* Kogan waxflower Available on the Internet at http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=64944 (Viewed 24 May – 5 June 2017).
- Department of the Environment and Energy (DoEE) (2017b) *EPBC Act report on projects triggering Philotheca sporadica* Generated by Governance and Business Support Section, Environmental Standards Division, 5 June 2017.
- Dwan, B.E. & Trueman, S.J. (2014) Propagation methods for offset planting of the Kogan waxflower (*Philotheca sporadica*) (Rutaceae) *Journal of Environmental Science and Technology*. 7(6): 347-353.
- Environmental Resources Information Network (ERIN) (2017a) *Area of occupancy and extent of occurrence for the Kogan waxflower (Philotheca sporadica) (Indicative distribution of the Kogan waxflower (Philotheca sporadica))*. Unpublished report, Australian Government Department of the Environment, Canberra.
- Environmental Resources Information Network (ERIN) (2017b) *Indicative distribution of the Kogan waxflower showing land tenure*. Unpublished report, Australian Government Department of the Environment, Canberra.
- International Union for the Conservation of Nature (IUCN) Species Survival Commission (IUCN SSC) (2012) *IUCN Red List Categories and Criteria version 3.1, second edition*. IUCN, Gland, Switzerland.
- IUCN Standards and Petitions Subcommittee (IUCN SPC) (2017) Guidelines for Using the IUCN Red List Categories and Criteria version 13 Prepared by the Standards and Petitions Subcommittee. Available on the Internet at: <http://www.iucnredlist.org/documents/RedListGuidelines.pdf> (Viewed 8 November 2017).
- Queensland Gas Company (QGC) (2017) *Significant species management plan 5: Philotheca sporadica Kogan waxflower*. Anya Significant Species Management Plans. Available on the Internet at: http://www.shell.com.au/about-us/projects-and-locations/qgc/environment/environment-management/management-plans/_jcr_content/par/expandablelist/expandablesection.stream/1498078876800/bafaeae19378de4baf1f5af5c83e8f7bc4c088cba11443e0f08261cee59c6c98/significant-species-management-plan-5.pdf (Viewed 1 November 2017).
- Shapcott, A., Lamont, R.W., O'Connor, K.M., James, H. and Conroy, G.C. (2015) Population genetics of *Philotheca sporadica* (Rutaceae) to advise an offset translocation program *Conservation Genetics*. Available on the Internet at: doi:[10.1007/s10592-014-0693-x](https://doi.org/10.1007/s10592-014-0693-x) (Viewed 24 May 2017).
- Threatened Species Scientific Committee (TSSC) (2008) *Commonwealth Conservation Advice on Philotheca sporadica* Department of the Environment, Water, Heritage and the Arts, Canberra.

Threatened Species Scientific Committee (TSSC) (2013) *Commonwealth Conservation Advice for Brigalow Ecological Community* Department of Sustainability, Environment, Water, Population and Communities, Canberra.

Williams, J., Stubbs, T. and Milligan, A. (2012) *An analysis of coal seam gas production and natural resource management in Australia* A report prepared for the Australian Council of Environmental Deans and Directors. John Williams Scientific Services Pty Ltd.

Other sources cited in the advice

Brundrett, M.C. (2008) *Mycorrhizal Associations: The Web Resource* Available on the internet at <https://mycorrhizas.info/info.html> (Viewed 5 June 2017).

Dawson, N.M. (1972). *Land inventory and technical guide: Miles area, Queensland. Part 1. Land classification and land use Division of Land Utilisation, Technical Bulletin 5* Department of Primary Industries, Brisbane.

Department of Environment and Heritage Protection (DEH) (2014) *Flora Survey Guidelines – Protected Plants, Nature Conservation Act 1992* Available on the Internet at <http://www.parliament.qld.gov.au/Documents/TableOffice/TabledPapers/2014/5414T4966.pdf> (Viewed 6 June 2017).

Halford, D. (1995) *Eriostemon sporadicus* Bayley (Rutaceae) *A Conservation Statement: A report submitted to the Australian Nature Conservation Agency Endangered Species Program Project No. 482* Australian Nature Conservation Agency, Canberra.

HLA-Envirosciences Pty Limited (2005) *Ecological assessment report: Braemar peaking plant site near Dalby* HLA-Envirosciences Pty Limited, Brisbane.

Powerlink Queensland (2005) *Kogan Creek Power Station Braemar 275 kv Transmission Line, Environmental Impact Statement Review*. Environmental Resources Management Australia, Queensland.

Queensland Gas Company (QGC) (2013) *Personal communication*. Nomination form and guidelines for listing protected wildlife under the Nature Conservation Act 1992 – *Philotheca sporadica* – Kogan waxflower (7 May 2013).

Queensland Gas Company (QGC) (2015) *Personal communication*. Nomination for Kogan Wax Flower, *Philotheca sporadica*, for delisting under the Environment Protection and Biodiversity Conservation Act 1999 (26 March 2015), plus additional information (17 December 2015).

Queensland Herbarium (2017) *Personal communication by email*. 16 October 2017.

University of the Sunshine Coast (2012) *Philotheca sporadica* population genetics and propagation: Final report prepared by the University of the Sunshine Coast for QCLNG/QGC. In possession of the nominator.