



Consultation Document on Listing Eligibility and Conservation Actions

Solanum johnsonianum

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

- 1) the eligibility of *Solanum johnsonianum* for inclusion on the EPBC Act threatened species list in the endangered category; and
- 2) the necessary conservation actions for the above 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 *Environment Protection and Biodiversity Conservation Act 1999* (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 eligibility for inclusion in the list of threatened species and provides its recommendation to the Australian Government Minister for the Environment.

Draft information for your consideration of the eligibility of this species for listing as endangered starts at page 3 and information associated with potential conservation actions for this species starts at page 8. To assist with the Committee's assessment, the Committee has identified a series of specific questions on which it seeks your guidance.

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

species.consultation@environment.gov.au

or by mail to:

The Director
Marine and Freshwater Species Conservation Section
Wildlife, Heritage and Marine Division
Department of the Environment
PO Box 787
Canberra ACT 2601

Responses are required to be submitted by Friday 6 November 2015.

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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.

Solanum johnsonianum

Taxonomy

Conventionally accepted as *Solanum johnsonianum* A.R. Bean.

Species Information

Description

Solanum johnsonianum is an erect, perennial shrub that grows to a maximum height of 0.3 m (Bean, 2004; DEHP, 2015), belonging to the family Solanaceae. Stems are grey to rusty or brown in colour, without prickles, but with small, fine and dense stellae (Bean, 2004; DEHP, 2015). The adult leaves are broadly ovate and entire in outline (Bean, 2004; DEHP, 2015). The inflorescence is supra-axillary, solitary or pseudo-racemose, with one or two bisexual flowers with a common peduncle of between up to 2 mm long (Bean, 2004; DEHP, 2015). The corolla is rotate or shallowly lobed and mauve in colour with the inner surface glabrous (Bean, 2004; DEHP, 2015). The fruiting calyx has lobes exceeding the mature fruit (Bean, 2004). There are one or two globular mature fruits per inflorescence, which are between 5.5–8 mm in diameter and red in colour, with the succulent and juicy flesh (Bean, 2004). The seeds are pale yellow and are between 2 and 3 mm long (Bean, 2004).

Solanum johnsonianum is considered to be most closely related to two other species, *S. nemophilum* and *S. innoxium*. *Solanum johnsonianum* differs from *S. nemophilum* by the lack of glandular hairs on the upper leaf surface as well as in characteristics of the stellate hairs and differs from *S. nemophilum* by having wider leaves, longer petioles and sometimes by the presence of gland-tipped stellate hairs on the calyx (Bean, 2004).

The species has only been formally recognised as a distinct species since 2004.

Distribution

Solanum johnsonianum is endemic to Queensland, and found within a region bounded by the towns of Rolleston to Theodore to Biloela to Dululu, which is centred about 160 km due west of Gladstone (Bean, 2004; ALA, 2015). However, it is restricted to very small localised areas where populations exist (ALA, 2015). It may be found in open forest and woodland habitats where brigalow (*Acacia harpophylla*) dominates or co-dominates on heavy cracking clay soils (Bean, 2004). Other associated species include lapunyah (*Eucalyptus thozetiana*) with an understory of wilga (*Geijera parviflora*) (Queensland Herbarium, 2012, cited in DEHP, 2015).

Relevant Biology/Ecology

Flowering of *Solanum johnsonianum* has been recorded in March, May, June and between August and September, while fruiting has been recorded in April and May (Bean, 2004; Queensland Herbarium, 2012, cited in DEHP, 2015), but possibly extends over a longer period. Other biological and ecological characteristics about the species are poorly known.

Threats

Little is known about the threats to the conservation status of the species. Specimen labels of collected individuals indicate the possible demise of the species in some areas, where they had been collected from recently burnt or recently cleared brigalow scrub (Bean, 2004).

Major threats are likely to be continuing land clearance, invasion of habitats by exotic grass species introduced for pasture for livestock, and from abnormal intensive grazing by wallabies at

sites on the Brigalow Research Station (Bean, 2004; DEHP, 2015). Land clearing rates (including remnant and regrowth) in Queensland have been increasing ever since 2010, and in the 2013-14 financial year were triple that of 2009-10 (Maron et al., 2015).

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%
<div> <div> <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) <i>cannot be used for A3</i>]</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> </div> <div> <p><i>based on any of the following</i></p> <ul style="list-style-type: none"> (a) direct observation [except A3] (b) an index of abundance appropriate to the taxon (c) a decline in area of occupancy, extent of occurrence and/or quality of habitat (d) actual or potential levels of exploitation (e) the effects of introduced taxa, hybridization, pathogens, pollutants, competitors or parasites </div> </div>			

Evidence:

There appears to be insufficient quantitative information 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 area bounded by the towns of Rolleston to Theodore to Biloela to Dululu, which roughly relates to the area of the historical distribution of *Solanum johnsonianum*, is approximately 11 500 km². However, when records of *Solanum johnsonianum* are mapped, the extent of occurrence is calculated to be 1688 km² (DotE, 2015).

In the past 15 years, there have been recordings of the species at eleven separate locations within its extent of occurrence (ALA, 2015). These are:

1. In April 2003, three clumps of plants were observed at a location about 9 km north of Jambin in a small area of occupancy of much less than 1 km². In September 2003, at the same location the species was observed again, with notes recorded that it was rare at this site. In February 2006, the species' presence was noted at this location again.
2. In April 2003, plants were rhizomatous with a numerous amount of stems counted at a location about 15 km northwest of Banana in a small area presumed to be less than 1 km². In January 2013, 21 plants in two colonies were recorded in the vicinity of the same site.
3. In September 2010, the species was observed to be common at a site about 18 km north of Moura. In August 2012, 317 stems of the species were counted at the same site. In October 2014, at approximately the same site, about 65 plants were observed in an area of less than 1 km².
4. In June 2012, the species was recorded at a location about 11 km south of Banana in a small area presumed to be less than 1 km². It was noted that the species was rare at the site.
5. In June 2012, the species was recorded at a site about 1 km south of Banana in a small area presumed to be less than 1 km². It was noted that the species was uncommon at the site. In November 2013, the species was again recorded in an area nearby (within 1 km), being present in mostly small colonies of 10 or more plants in each colony, scattered throughout an area on a stock route.
6. In November 2013, the species was observed at a site about 25 km west southwest of Moura. 60 plants were counted in the largest colony of only a very few colonies observed. The species was again observed here in January 2014.
7. In March 2014, the species was observed at a site about 5 km northeast of Moura.
8. In March 2014, the species was recorded at a site about 25 km south of Dululu. It was noted the species was extremely common at this site.
9. In March 2014, two colonies were recorded at a site along the Baralaba-Rannes Road, about 1 km southwest of Biloela-Duaringa Road intersection in the Kokotungo locality,

the largest was where approximate 95 stems were counted. A stem count for the other, smaller, colony was not recorded.

10. In May 2014, several colonies were recorded along the Biloela-Duaringa Road about 13 km northwest of the intersection with the Baralaba-Rannes Road in the Kokotungo locality, the largest colony having approximately 80 plants.
11. In May 2014, three plants were recorded at a location about 10 km west of Jambin in an area of occupancy of much less than 1 km². It was noted that the species was rare at the site (ALA, 2015).

When records of *Solanum johnsonianum* are mapped, the area of occupancy is calculated to be 16 km² (DotE, 2015). These populations are also likely to be severely fragmented as the recorded populations are dispersed by between 10 and 100 km in distance and connectivity between these populations is also likely to be limited with the Brigalow belt region experiencing some of the highest rates of land clearing in Queensland during the late-1990s (Cogger et al., 2003). Continuing decline in the area of occupancy, area and/or extent and/or quality of habitat, and the number of mature individuals is inferred given that clearing of vegetation patches on private freehold land, where *Solanum johnsonianum* is present and has not been surveyed, may be undertaken into the future under the provisions of the Queensland *Vegetation Management Act 1999* (DEHP, 2015).

Both the extent of occurrence and area of occupancy are restricted, populations are severely fragmented due to the long distances between them and level of land clearing the area it grows has experienced and a continuing decline is inferred in the species' area of occupancy, the area and extent of habitat, and the number of mature individuals. It classifies as eligible for listing as endangered under B1(a) and (b)(ii),(iii),(v) and B2(a) and (b)(ii),(iii),(v).

The data presented above appear to demonstrate that *Solanum johnsonianum* is **eligible for listing as endangered** 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 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:

There is no definitive information on the number of mature individuals as many of the observations made for *Solanum johnsonianum* did not record a count of individuals, many only recorded the species presence (ALA, 2015). Adding the counts together that were undertaken at five of the eleven sites where the species has been recorded since 2000, it equates to a count of at least 236 individuals. The Committee considers the likely number of mature individuals to be much higher, given that for six of eleven of the sites, individuals (mature and immature) were not counted and that there are probably many individuals that have not been counted in surveys to date. While the number of mature individuals is likely to be much higher than 236, the Committee considers it is most likely that the number of mature individuals, for the purposes of this criterion, is in the range between 2500 and 10 000, as the species appears to have been rarely recorded in a relatively restricted geographic distribution. The Committee considers it unlikely that the number of mature individuals is greater than 10 000, given the low incidence of recordings of the species,.

Continuing decline of the species is inferred to be at least 10% for the next 10 years, given that the clearing of vegetation patches on private freehold land, where *Solanum johnsonianum* is present and has not been surveyed, may be undertaken into the future under the provisions of the Queensland *Vegetation Management Act 1999* (DEHP, 2015) and that the Brigalow belt region has experienced some of the highest rates of clearing in Queensland in recent times (Cogger et al., 2003). Therefore, the species classifies under C1.

The data presented above appear to demonstrate that *Solanum johnsonianum* is **eligible for listing as vulnerable** 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 discussed above for Criterion 3, the most likely scenario is that the number of mature individuals is above 2500. Since 2000, the species has been recorded at 11 sites and probably occurs at locations that have not been surveyed yet. It would seem highly unlikely there are less than 1000 mature individuals remaining (i.e. low enough to meet the thresholds of this criterion).

The data presented above appear to demonstrate the *Solanum johnsonianum* 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:

Population viability analysis appears not to have 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.

Conservation Actions

Recovery Plan

A decision about whether there should be a recovery plan for this species has not yet been determined. The purpose of this consultation document is to elicit additional information to help inform this decision.

Primary Conservation Objectives

Maintain the current range and rebuild populations of *Solanum johnsonianum*.

Conservation and Management Actions

- Maintain and protect existing populations, and protect and enhance habitat to provide potential for reproduction of plants within existing populations.

- Consult with private landowners with *Solanum johnsonianum* on their properties and develop site-specific management actions and the implementation of conservation agreements.
- Manage sites to identify, control and reduce the spread of invasive species such as introduced grasses.
- Implement an appropriate fire management regime for protecting remaining populations and habitat.

Survey and Monitoring Priorities

- Undertake an appropriate monitoring program to establish a more accurate assessment of the current extent of occurrence, area of occupancy and population size.
- Implement a monitoring program with sufficient power to detect sudden changes, and notable fluctuations, in populations.

Information and Research Priorities

- Undertake seed germination and/or vegetative propagation experiments to determine the requirements for successful establishment.
- Identify recruitment and vegetative responses to fires, and optimal fire regimes for regeneration (vegetative regrowth and/or seed germination), and response to other prevailing fire regimes.
- Gain a better understanding of mechanisms, including the level of reliance on bird dispersal, to revegetate the species and options for linking, enhancing or establishing additional populations.

Collective list of questions for *Solanum johnsonianum* – your views

Biological information

1. Can you provide any additional or alternative references, information or estimates on longevity, average life span and generation length?
2. What is known about the clonal behaviour (seed-derived and asexual) of the species? What is the level of fecundity of the species and how much seed is produced?
3. Can you provide any information as to whether the species increases greatly in abundance after disturbance and subsequently decreases, and whether this is a response to the disturbance or a factor of rhizoidal cloning?
4. Could this species be a 'disturbance specialist' that relies on seed banks and/or bird dispersal?

Estimate of the number of mature individuals

5. Has the survey effort for this species been adequate to estimate its national adult population size (number of mature individuals)? If not, please provide justification for your response.
6. Do you consider the estimate of the adult population size at somewhere between 2500 and 10 000 to be appropriate? Are there any assumptions and unquantified biases in this estimate? If not, please provide justification for your response.

Current distribution/range/extent of occurrence, area of occupancy

7. Does the information consider the entire geographic extent and national extent of the species? If not, please provide justification for your response.
8. Has the survey effort for this species been adequate to determine its national distribution? If not, please provide justification for your response.
9. Is the distribution as described valid? If not, please provide justification for your response and provide alternate information.
10. Do you agree that the way the current extent of occurrence and/or area of occupancy has been estimated is appropriate? Please provide justification for your response.

Can you provide estimates (or if you disagree with the estimates provided, alternative estimates) of the extent of occurrence and/or area of occupancy.

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 – 5 000 km ² <input type="checkbox"/> 5 001 – 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 is 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 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 is accurate within this range

General

11. Can you provide additional data or information relevant to this assessment?
12. Can you advise of appropriate weed control for this species?
13. Can you advise of appropriate fire management for this species?
14. Can you advise of any estimates of brigalow (*Acacia harpophylla*) woodland clearance in the region where this species occurs?

Threats

15. Do you agree that the threats listed are correct and that their effect on the species is significant?
16. To what degree 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 for your responses to these questions about threats?

Management

19. What planning, management and recovery actions are currently in place supporting protection and recovery of the species? To what extent have they been effective?

20. Can you recommend any additional or alternative specific threat abatement or conservation actions that would aid the protection and recovery of the species?

21. What individuals or organisations are currently, or potentially could be, involved in management and recovery of the species?

References cited in the advice

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