



**Australian Government**  
**Department of the Environment**

**Consultation Document on Listing Eligibility and Conservation  
Actions**

***Solanum sulphureum***

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

- 1) the eligibility of *Solanum sulphureum* (a species of nightshade) 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 4 and information associated with potential conservation actions for this species starts at page 7. To assist with the Committee's assessment, the Committee has identified a series of specific questions on which it seeks your guidance at page 9.

Responses are to be provided in writing either by email to:  
[species.consultation@environment.gov.au](mailto:species.consultation@environment.gov.au)

or by mail to:

The Director  
Species Information and Policy 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 May 2016.**

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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 sulphureum*

## **Taxonomy**

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

## **Species/Sub-species Information**

### **Description**

*Solanum sulphureum* A.R. Bean has been described by Bean (2009) as an erect, rhizomatous perennial shrub 0.9–2.5 m high belonging to the Solenaceae family. Adult stems are yellow, rusty or brown; with prickles that are straight needle shaped and 5–11 mm long, narrow, smooth; clusters of hairs (stellate) that are dense or very dense, 0.6–1 mm diameter, stalks are 0.2–1.2 mm long.

Juvenile leaves are 9–12 cm long, 6–8.5 cm wide, with 2 or 3 pairs of lateral lobes, with a pointed tip, the base of leaves are blunt or heart shaped; prickles present on midvein and lateral veins. Adult leaves are wide with pointed tip, entire, the blades of leaves are 6.5–12.3 cm long, 2.3–5.8 cm wide, 2.1–2.8 times longer than broad, the base of leaves are blunt or heart shaped, which can be asymmetrical; Upper leaf surface is green, prickles can be absent or present on midvein only, or occasionally on lateral veins also, prickles straight, needle shaped, 8–12 mm long; clusters of hairs (stellate) distributed throughout. Lower leaf surface is greenish white, white or grey; prickles can be absent or present on midvein only, straight, needle shaped; with clusters of hairs (stellate) that are dense or very dense;

Flowers have five parts, purple, with a flowering tube that is 3–4 mm long; calyx lobes that triangular 2.5–4 mm long; calyx prickles when flowering can be absent or present, 0–5 per flower; clusters of hairs (stellate) are very dense, yellow, brown or rusty, 0.6–0.7 mm across, stalks 0.1–0.5 mm long, lateral rays 7 or 8, central ray 0.8–1.2 times as long as laterals.

Fruiting calyx lobes less than half length of mature fruit; prickles can be absent or present. Mature fruits 1–4 per cluster of flowers, fruit is globular, 14–19 mm diameter, yellow or yellowish green, anvil-shaped; with juicy flesh and succulent; the skin is 0.7–1.1 mm thick. Seeds pale yellow, 2.2–2.5 mm long.

*Solanum sulphureum* is distinguishable from other *Solanum* species found on the north coast of NSW by the entire ovate adult leaves, the dense clusters of hairs with stalks up to 1.2 mm long, has few-flowers clusters joining to single stems, the calyx with few or no prickles and with clusters of hairs (stellate) 0.6–0.7 mm diameter, and the globose yellow fruits 14–19 mm diameter with pedicels 19–22 mm long (Bean 2009).

### **Distribution**

*Solanum sulphureum* is endemic to NSW and all known populations are within Grater Taree City Council local government area. Most collections of *S. sulphureum* appear to have been made at the interface between wet sclerophyll forest (sensu Keith 2004) and pasture, while Bean (2009) states that 'It inhabits sunny breaks in rainforest, rainforest regrowth on pasture land, or eucalypt forest with rainforest understorey'. The soils are loams or clay-loams, shallow or deep. All collections have been from low altitude. Bean (2004) notes that similar species of *Solanum* colonise disturbed areas where increased light reaches the ground. The interface between wet sclerophyll forest and land cleared for farming and roads.

## Relevant Biology/Ecology

*Solanum sulphureum* is a perennial shrub that occurs in between wet sclerophyll forest and pasture. Bean (2004) notes that this species is allied to *S. brownii* (violet nightshade), which flowers between June to October (PlantNET, 2015). The species is susceptible to leaf miners. Other biological and ecological characteristics about the species are poorly known.

## Threats

Threats to *S. sulphureum* include destruction by land managers during weed management or vegetation clearing, and competition with invasive weed species such as *Lantana camara* (Lantana). 'Invasion, establishment and spread of Lantana (*Lantana camara* L. sens. lat)' is listed in NSW as a Key Threatening Process under the Threatened Species Conservation Act 1995 (NSW SC 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%
A1	<div>based on any of the following:</div> <div><div>(a) direct observation [except A3]</div><div>(b) an index of abundance appropriate to the taxon</div><div>(c) a decline in area of occupancy, extent of occurrence and/or quality of habitat</div><div>(d) actual or potential levels of exploitation</div><div>(e) the effects of introduced taxa, hybridization, pathogens, pollutants, competitors or parasites</div></div>		
A2			
A3			
A4			

## Evidence:

*Note: the listing guidelines for this criterion consider decline over the longer of 10 years or three generation lengths. The average generation length of Solanum sulphureum is unknown but likely to be less than 10 years, pending feedback during public consultation. Therefore, consideration of decline over 10 years is more appropriate for this species at this stage.*

The former abundance, area of occupancy and extent of occurrence of *Solanum sulphureum* is not known, it was described from a specimen collected in 1983 (Bean 2009), found in the Taree area and published in 2009. As a newly described species (Bean 2009) it may have been incorrectly identified in the past as other *Solanum* species. As such, the factors that may influence population decline in the past cannot be determined and combined with its unknown generation length there is insufficient data to establish its eligibility under this criterion.

*Solanum sulphureum* consultation

The data presented above appear to be insufficient to demonstrate if *Solanum sulphureum* 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 <sup>2</sup>	< 5,000 km <sup>2</sup>	< 20,000 km <sup>2</sup>
B2. Area of occupancy (AOO)	< 10 km <sup>2</sup>	< 500 km <sup>2</sup>	< 2,000 km <sup>2</sup>
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 geographic distribution of *Solanum sulphureum* is restricted. The extent of occurrence (EOO) for *S. sulphureum* is 471 km<sup>2</sup> based on a minimum convex polygon enclosing all known occurrences of the species (NSW SC, 2015), the method of assessment recommended by IUCN (2014). The area of occupancy (AOO) is estimated to be 28 km<sup>2</sup> based on seven 2 x 2 km grid cells (NSW SC, 2015), the scale recommended for assessing AOO by IUCN (2014).

The number of recorded locations is 7 with 4 of those being unconfirmed observations (Segal pers comm. 2014), and it is likely that the extent and quality of habitat may be declining based *S. sulphureum* preference for growing on the interface between forest and pasture which leads to misidentification as a weed and removal by land owners (Segal pers comm. 2014). Mature plants appear to be heavily browsed by cattle (*Bos tarus*) and juvenile plants are easily trampled (Segal pers comm. 2014). Browsing, trampling and weed removal could lead to a decline in the quality of habitat (Segal pers comm. 2015) and reduction in potential recruitment.

The data presented above appear to demonstrate that the species 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:			
(a) (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:

As stated above in criterion 1 the generation length of the *S. sulphureum* is not known, however, given that the species is known to grown in pastures that border wet sclerophyll rainforests it is likely and currently known from 7 locations, 24 records, including 3 voucher specimens. An observation in 2010, presented in the nomination estimates 200 plants in one population at a site on private land. No notes were made in the recording as to the ratio of mature to immature individuals. The total number of mature individuals of *S. sulphureum* is unknown but, based on the known estimates and the number of sites, it is considered there would be fewer than 250 mature individuals however, it may be as high as 1000 individuals (including mature and immature), (Segal pers comm. 2014).

Small subpopulation numbers are a feature of closely related *Solanum* species, but often there are large increases after disturbance (Bean 2001) and it is likely that there are less than 250 mature individuals in each subpopulation. *Solanum* species may remain present in the soil seed bank or as rhizomes for some years after above ground parts have perished (Bean 2004).

The data presented above appear to demonstrate that the species 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 4. Number of mature individuals			
	Critically Endangered Extremely low	Endangered Very Low	Vulnerable Low
Number of mature individuals	< 50	< 250	< 1,000

## Evidence:

As mentioned above, the 24 observations of the species available on Atlas of living Australia (2015) have been used to estimate the number of mature individuals. An observation in 2010, presented in the nomination estimates 200 plants in one population at a site on private land. No notes were made in the recording as to the ratio of mature to immature individuals. If the estimate from the nomination is included the species is would be eligible for listing as vulnerable however if the 24 observations recorded in Atlas of living Australia (2015) are used the population is potentially eligible for listing as Endangered.

The data presented above appear to demonstrate that the species 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 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.

### Conservation and Management Priorities

#### Habitat loss disturbance and modifications

- 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 *S. sulphureum* on their properties and develop site-specific management actions and the implementation of conservation agreements to prevent removal during land management actions such as weed control including spraying of herbicides.



- Manage sites to identify, control and reduce the spread of invasive species such as Lantana and introduced grasses within pasture and on roadsides.

#### Impacts of domestic species

- If livestock grazing occurs in the area, ensure land owners/managers use an appropriate management regime and density that does not detrimentally affect this species to allow regeneration from rhizomes and manage total grazing pressure at important sites through exclusion fencing or other barriers, especially given this species preferred habitat at the interface between pasture and wet sclerophyll rainforest.
- Develop and implement a stock management plan for *S. sulphureum* for road side verges and travelling stock route. Distribute this information to drovers and graziers in the area to increase awareness of the species requirement.

#### Stakeholder Engagement

- Identify and liaise with relevant private landowners, public land managers, drovers (travelling stock routes) to ensure that populations are not accidentally destroyed through land management activities.
- Develop information sheets that include a description of the plant, its habitat, threats conservation actions and photos to aid in awareness of *S. sulphureum* especially as it can be confused with species of *Solanum* that are toxic to domestic livestock.
- Develop formal links with local naturalist groups and interested individuals to aid in monitoring of the species.

#### **Survey and Monitoring Priorities**

- More precisely assess population size, distribution, ecological requirements and the relative impacts of threatening processes by establishing key biological and ecological information for *Solanum sulphureum* to further inform conservation management actions.
- Undertake an appropriate monitoring program to establish a more accurate assessment of the current extent of occurrence, area of occupancy and population size further to that already defined.
- Undertake survey work in suitable habitat and potential habitat to locate any additional populations/occurrences/remnants of *S. sulphureum*, to inform the development of predictive models for the species geographical distributions based on the environmental conditions of sites of known occurrences (Phillips et al 2006).
- Implement a monitoring program with sufficient power to detect sudden changes, and notable fluctuations, in populations.

#### **Information and Research Priorities**

- Undertake demographic monitoring of *S. sulphureum*.
- Undertake research into the soil seed bank and rhizomes, including patch size to identify density, viability and longevity, and genetic individuals.
- Establish toxicity to domestic livestock.



- Investigate techniques to accelerate revegetation of the species and options for linking, enhancing or establishing additional populations.

### **References cited in the advice**

- Bean AR (2001) A Revision of *Solanum brownii* Dunal (Solanaceae) and its allies. *Telopea* 639–661.
- Bean AR (2004) The taxonomy and ecology of *Solanum* subg. *Leptostemonum* (Dunal) Bitter (Solanaceae) in Queensland and far north-eastern New South Wales. *Austrobaileya*. 6 639-816
- Bean AR (2009) A new species of *Solanum* (Solanaceae) from the mid north coast of New South Wales. *Telopea* 12 439–442
- IUCN Standards and Petitions Subcommittee (2014) Guidelines for Using the IUCN Red List Categories and Criteria. Version 11. Prepared by the Standards and Petitions Subcommittee.  
<http://www.iucnredlist.org/documents/RedListGuidelines.pdf>.
- Keith DA (2004) From ocean shores to desert dunes: the vegetation of New South Wales and the ACT (Department of Environment and Conservation: Hurstville).
- NSW SC (2015) Preliminary determination *Solanum sulphureum*, NSW Scientific Committee. (Department of Environment and Conservation: Hurstville).
- Phillips, S. J., Anderson, R. P., Schapire, R.E.(2006). Maximum entropy modeling of species geographic distributions. *Ecological Modelling* 190(3–4): 231-259.

### **Other sources cited in the advice**

- Atlas of Living Australia (ALA) (2015). *Records provided for Solanum dissectum*, accessed through the *Atlas of Living Australia* website.  
Viewed 17 October 2015.  
Available on the Internet at:  
<http://www.ala.org.au>
- IUCN Redlist (2015) The IUCN Red List of Threatened Species. Version 2015-3.  
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<http://www.legislation.nsw.gov.au/maintop/view/inforce/act+101+1995+cd+0+N/>
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Segal P (2015). Personal communication via email, *Solanum sulphureum*, consultation document preliminary submission. Sassafras, NSW.

Segal P (2014). Personal communication, Nomination 31 March 2014, Sassafras, NSW.

## **Consultation Questions**

*Note: the listing guidelines for this criterion consider decline over the longer of 10 years or three generation lengths. The average generation length of *Solanum sulphureum* is unknown but likely to be less than 10 years, pending feedback during public consultation. Therefore, consideration of decline over 10 years is more appropriate for this species at this stage.*

### **Biological information**

1. Can you provide any additional or alternative references, information or estimates on longevity, average life span and generation length?

### **Population size**

2. Has the survey effort for this species been adequate to determine its national adult population size? If not, please provide justification for your response.
3. Can you provide an estimate of the current population size of mature adults of this species? Please provide supporting justification or other information.

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:				
<input type="checkbox"/> 1–50	<input type="checkbox"/> 51–250	<input type="checkbox"/> 251–1000	<input type="checkbox"/> >1000	<input type="checkbox"/> >10 000
Level of your confidence in this estimate:				
<input type="checkbox"/> 0–30% - low level of certainty/ a bit of a guess/ not much information to go on				
<input type="checkbox"/> 31–50% - more than a guess, some level of supporting evidence				
<input type="checkbox"/> 51–95% - reasonably certain, information suggests this range				
<input type="checkbox"/> 95–100% -high level of certainty, information indicates quantity within this range				
<input type="checkbox"/> 99–100% - very high level of certainty, data are accurate within this range				

### **Evidence of total population size change**

4. Are you able to provide an estimate of the total population size during the early 2000s? Please provide justification for your response.

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:

- ☐ 1–50      ☐ 51–250      ☐ 251–1000      ☐ >1000      ☐ >10 000

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

5. Are you able to comment on the extent of decline in the species' total population size over the last approximately 10 years? Please provide justification for your response.

If, because of uncertainty, you are unable to provide an estimate of decline, 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 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

6. Please provide (if known) any additional evidence which shows the population is stable, increasing or declining.

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.

**Past Distribution/range/extent of occurrence, area of occupancy**

10. Do you consider that the way historical distributional information 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 former extent of occurrence and/or area of occupancy.

If, because of uncertainty, you are unable to provide an estimate of past 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 past extent of occurrence, and also choose the level of confidence you have in this estimated range.

Past extent of occurrence is estimated to be in the range of: <input type="checkbox"/> <10 km <sup>2</sup> <input type="checkbox"/> 10 – 500 km <sup>2</sup> <input type="checkbox"/> 501 – 2000 km <sup>2</sup> <input type="checkbox"/> >2000 km <sup>2</sup>
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 past 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 past area of occupancy, and also choose the level of confidence you have in this estimated range:

Past area of occupancy is estimated to be in the range of: <input type="checkbox"/> <10 km <sup>2</sup> <input type="checkbox"/> 11 – 500 km <sup>2</sup> <input type="checkbox"/> 501 – 2000 km <sup>2</sup> <input type="checkbox"/> >2000 km <sup>2</sup>
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. Have you been involved in developing this nomination? If so in what capacity

**Threats**

13. Do you agree that the threats listed are correct and that their effect on the species is significant?
14. To what degree are the identified threats likely to impact on the species in the future?
15. What threats are impacting on different populations, how variable are the threats and what is the relative importance of the different populations?
16. 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?
17. Can you provide supporting data/justification or other information for your responses to these questions about threats?

**Management**

18. What planning, management and recovery actions are currently in place supporting protection and recovery of the species? To what extent have they been effective?
19. Can you recommend any additional or alternative specific threat abatement or conservation actions that would aid the protection and recovery of the species?
20. What individuals or organisations are currently, or potentially could be, involved in management and recovery of the species?
21. What threats are impacting on different populations, how variable are the threats and what is the relative importance of the different populations? Please provide evidence and background information.