

## Threatened species nomination

For nominations/assessments under the Common Assessment Method (CAM).

### Cover Page *(Office use only)*

<b>Species name</b> (scientific and common name):	<b><i>Stylidium asymmetricum</i> (Asymmetric Triggerplant)</b>
<b>Nomination for</b> (addition, deletion, change):	<b>Addition</b>
<b>Nominated conservation category and criteria:</b>	<b>EN B1ab(ii,iii,v)+2ab(ii,iii,v)</b>

TSSC assessment of eligibility against the criteria:		
This assessment is consistent with the standards set out in Schedule 1, item 2.7 (h) and 2.8 of the Common Assessment Method Memorandum of Understanding.		Yes <input type="checkbox"/> No <input type="checkbox"/>
<b>A.</b>	Population size reduction	•
<b>B.</b>	Geographic range	•
<b>C.</b>	Small population size and decline	•
<b>D.</b>	Very small or restricted population	•
<b>E.</b>	Quantitative analysis	•

Outcome:			
<i>TSSC Meeting date:</i>			
<i>TSSC comments:</i>			
<i>Recommendation:</i>			
<i>Ministerial approval:</i>		<i>Government Gazette/ Legislative effect:</i>	

## Nomination summary *(to be completed by nominator)*

<b>Current conservation status</b>				
Scientific name:	<i>Stylidium asymmetricum</i>			
Common name:	Asymmetric Triggerplant			
Family name:	Stylidiaceae	Fauna <input type="checkbox"/>	Flora <input checked="" type="checkbox"/>	
Nomination for:	Listing <input checked="" type="checkbox"/>	Change of status <input type="checkbox"/>	Delisting <input type="checkbox"/>	
Is the species currently on any conservation list, either in WA, Australia or Internationally?		Yes <input checked="" type="checkbox"/> If Yes; complete the following table	No <input type="checkbox"/> If No; go to the next question	
Jurisdiction	List or Act name	Date listed or assessed	Listing category i.e. critically endangered	Listing criteria i.e. B1ab(iii)+2ab(iii)
International	IUCN Red List			
National	EPBC Act			
State of WA	WC Act	Assessed 5/4/2017	EN	B1ab(ii,iii,v)+2ab(ii,iii,v)
	DPaW Priority list	1 <input type="checkbox"/>	2 <input checked="" type="checkbox"/>	3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/>
Other States or Territories				
<b>Consistent with Schedule 1, item 2.7 (h) and 2.8 of the Common Assessment Method Memorandum of Understanding, it is confirmed that:</b>				
<ul style="list-style-type: none"> <li>this assessment meets the standard of evidence required by the Common Assessment Method to document the eligibility of the species under the IUCN criteria;</li> </ul>			Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
Comments:				
<ul style="list-style-type: none"> <li>surveys of the species were adequate to inform the assessment;</li> </ul>			Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
Comments:	Refer to nomination			
<ul style="list-style-type: none"> <li>the conclusion of the assessment remains current and that any further information that may have become available since the assessment was completed supports or is consistent with the conclusion of the assessment.</li> </ul>			Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
Comments:				
<b>Nominated conservation status: category and criteria</b> (including recommended categories for deleted species)				
Presumed extinct (EX) <input type="checkbox"/>	Critically endangered (CR) <input type="checkbox"/>	Endangered (EN) <input checked="" type="checkbox"/>	Vulnerable (VU) <input type="checkbox"/>	
None (least concern) <input type="checkbox"/>	Data Deficient <input type="checkbox"/>	Conservation Dependent <input type="checkbox"/>		

What criteria support the conservation status category above?		B1ab(ii,iii,v)+2ab(ii,iii,v)			
Eligibility against the criteria					
Provide justification for the nominated conservation status; is the species eligible or ineligible for listing against the five criteria. For <b>delisting</b> , provide details for why the species no longer meets the requirements of the current conservation status.					
A.	Population size reduction	<ul style="list-style-type: none"> <li>Population decline an estimated 17 % in the past 20 years.</li> <li><b>Does not meet criteria</b></li> </ul>			
B.	Geographic range	<ul style="list-style-type: none"> <li>EOO 18.13 km<sup>2</sup>; AOO 12 km<sup>2</sup></li> <li>Number of locations 3: Locations were based on the main threats to the species (feral pigs and off-road vehicles) being site specific, not based on tenure (which would result in the species being known from a single location). The subpopulations are not classified as severely fragmented as they occur in a national park with habitat that is contiguous.</li> <li>Continuing decline observed and projected in AOO, quality of habitat and number of mature individuals due to damage from feral pigs (<i>Sus scrofa</i>) and off-road vehicles and weed invasion. Future decline is projected to occur due to the very high likelihood of further habitat damage combined with the impact of climate change.</li> <li><b>Meet criteria for Endangered B1ab(ii,iii,v)+2ab(ii)(iii)(v)</b></li> </ul>			
C.	Small population size and decline	<ul style="list-style-type: none"> <li>Number of mature individuals &gt; 200,000</li> <li><b>Does not meet criteria</b></li> </ul>			
D.	Very small or restricted population	<ul style="list-style-type: none"> <li>Number of mature individuals &gt; 200,000</li> <li><b>Does not meet criteria</b></li> </ul>			
E.	Quantitative analysis	<ul style="list-style-type: none"> <li><b>Unable to assess</b></li> </ul>			
Summary of assessment information (detailed information to be provided in the relevant sections of the form)					
EOO	18.13 km <sup>2</sup> (calculated using minimum convex polygon)	AOO	12 km <sup>2</sup> (using 2 km x2 km grid). Area occupied habitat < 0.16 km <sup>2</sup>	Generation length	< 1 year
No. locations	3	Severely fragmented		Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
No. subpopulations	4	No. mature individuals		> 210, 800	
Percentage global population within WA			100 %		
Percentage global population within Australia			100 %		
Percentage population decline over 10 years or 3 generations			Estimated 17 % in the past 20 years		

Summary of subpopulation information (detailed information to be provided in the relevant sections of the form)						
Location (include coordinates)	Land tenure	Survey information: Date of survey and No. mature individuals	Area of subpopulat ions	Site / habitat Condition	Threats (note if past, present or future)	Specific management actions
Subpopulation 1A: swamps of York	National Park	1999: dense masses [F&J Hort]  24/10/2016 [Llorens & Wege]: > 100,000 individuals	< 0.050 km <sup>2</sup>	Moderate to poor; significant areas of deteriorating habitat and total habitat loss from recent and past pig ( <i>Sus scrofa</i> ) and off-road vehicle activity; serious wetland weeds detected ( <i>Moraea flaccida</i> and <i>Isolepis hystrix</i> ).  Plants extend around the entire swamp, but do not occur in areas of severe disturbance.	Feral pigs (past, present, future)  Off-road vehicle activity (past, present, future)  Weed invasion (past, present, future)  Climate change (present, future)	Pig trapping program  Liaise with 4WD clubs; erect conservation signs  Control <i>Moraea flaccida</i> using herbicides
Subpopulation 1B: SW of York, minor swamp to N of main swamp	National Park	1/10/2015: 2,300 [F&J Hort]  24/10/2016 [Llorens & Wege]: approx. 10,000 individuals	< 0.002 km <sup>2</sup>	Moderate to poor. Extensive pig damage and some weed invasion.  Plants extend around the moist depression but are higher in density at either end and on the eastern margin where pig damage less severe (note water still present 24/10/16).	Feral pigs (past, present, future)  Off-road vehicle activity (past, present, future)  Weed invasion (past, present, future)  Climate change (present, future)	Pig trapping program  Liaise with 4WD clubs; erect conservation signs  Control weeds if feasible
Subpopulation 2: SW of York	National Park	6/1/2000: plentiful [F&J Hort]  4/2/2006: locally common [F&J Hort]	< 0.105 km <sup>2</sup>	Very good to excellent. Some weeds and recent 4WD damage observed near dam. Some recent pig	Feral pigs (past, present, future)  Off-road vehicle activity (past, present, future)  Weed invasion (past, present,	Pig trapping program  Liaise with 4WD clubs; erect conservation signs

		Commenced 24/10/16, completed 31/10/2016 [Llorens & Wege]  > 100,300 individuals		damage noted on S and N side of swamp.	future) Climate change (present, future)	Control weeds if feasible
Subpopulation 3: SW of York	National Park	1/10/2015: 100 [F&J Hort]  31/10/2016 [Llorens & Wege]  approx. 500 individuals	< 0.002 km <sup>2</sup>	Moderate to poor. Extensive pig damage and some weed invasion, e.g. <i>Bartsia trixago</i> (Mediterranean Linseed).  Plants are concentrated in areas of more intact habitat directly under <i>Melaleuca</i> shrubs rather than in the more open areas, which have been extensively damaged by pigs.	Feral pigs (past, present, future)  Weed invasion (past, present, future)  Climate change (present, future)	Pig trapping program  Control weeds if feasible

## Nomination detail

Please refer to the Departments guidelines on nominating species for amendment of the Western Australian threatened species lists at [http://www.dpaw.wa.gov.au/images/documents/plants-animals/threatened-species/Listings/Threatened\\_Species\\_Nomination\\_Guidelines\\_2014.pdf](http://www.dpaw.wa.gov.au/images/documents/plants-animals/threatened-species/Listings/Threatened_Species_Nomination_Guidelines_2014.pdf)

For technical information on terminology used in this form, and the intent of information requirements, as they relate to an assessment of this nomination against the IUCN Red List criteria, refer to the 2001 *IUCN Red List Categories and Criteria. Version 3.1*

[http://www.iucnredlist.org/documents/redlist\\_cats\\_crit\\_en.pdf](http://www.iucnredlist.org/documents/redlist_cats_crit_en.pdf)

and *Guidelines for Using the IUCN Red List Categories and Criteria Version 11* (February 2014)




<http://cmsdocs.s3.amazonaws.com/RedListGuidelines.pdf>

## Section 1: Taxonomy

<b>1.1 Current taxonomy</b>			
Species name and Author:		<i>Stylidium asymmetricum</i> Wege	
Subspecies name(s) and Author:			
Is the species/subspecies conventionally accepted?		Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
Is there any controversy about the taxonomy?		Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
If not conventionally accepted and/or if there is any controversy; provide details:			
Has the species/subspecies been formally named?		Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
Has the species/subspecies been recently described?		Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
If the species has not been formally named or described; is it in the process of being described? Is there an anticipated date for the publication of the description? Has a type specimen been deposited? And if so provide the registration number and where deposited.			
If there are any closely related taxa provide details and include key distinguishing features:		<i>Stylidium asymmetricum</i> is one of 12 species in the <i>S. despectum</i> group and can co-occur with 2 close allies ( <i>S. despectum</i> and <i>S. roseoalatum</i> ). A recent taxonomic revision, which includes a dichotomous key and other diagnostic information, is included with this nomination.	
<b>1.2 Taxonomic history</b>			
Are there recent synonyms for the species?		Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
If Yes; provide details of synonyms:		Prior to its scientific description in 2011, this species was recognised on Western Australia's vascular plant census as <i>Stylidium</i> sp. fleshy annual (F. & J. Hort 885).	
Have there been recent changes in the taxonomy or nomenclature?		Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
If Yes; provide details of changes:		Formal description in 2011.	

<b>1.3 Hybridisation</b>		
Is there any known hybridism with other species in the wild?	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/> Unknown <input type="checkbox"/>
If Yes; Where does this occur and how frequently?		

## Section 2: Species information

<b>2.1 Morphology / physical description</b>	
<div>    </div> <div> <div>Habit (Wege)</div> <div>Asymmetric corolla lobes (Hort)</div> </div>	
Species description:	<p><i>Stylidium asymmetricum</i> is an <i>annual herb</i> 2–16 cm high, with subulate <i>leaves</i> that are scattered on the stem or arranged in a basal rosette (sometimes rotting if submerged in water). The <i>inflorescence</i> has 1–26 flowers with glandular-hairy pedicels 3–15 mm long. The <i>hypanthium</i> is obloid, 2–6 mm long and sparsely glandular-hairy or subglabrous; the <i>calyx</i> has 3 distinct and 2 connate lobes. The <i>corolla</i> is pale or bright pink with white at the base (rarely white with pink markings) and the throat is yellow; the <i>corolla lobes</i> are asymmetrically arranged, with the morphologically lower ones paired laterally and the upper ones spreading (the upper posterior lobe is angled at <math>\pm 90^\circ</math> to the anterior one). There are 4–8, yellow <i>throat appendages</i>. The <i>column</i> is 4.8–5.5 mm long and operates laterally. <i>Capsules</i> are obloid to cylindrical and c. 6–9 mm long excluding calyx lobes.</p> <p>See Wege (2011) for additional information.</p>
<b>2.2 Biology (provide details)</b>	
<p><i>Stylidium asymmetricum</i> is a small annual herb: plants senesce and die at the end of their first growing season after producing seed. Depending on seasonal conditions, the species can have an extended flowering season (late September to early February), with individual plants successively germinating and flowering as water levels recede.</p> <p>Like most other triggerplants, pollen is transferred between flowers by a touch-sensitive floral column that places pollen on (or retrieves pollen from) insects. While this promotes outcrossing, pollen transfer between flowers on the same individual may also occur. The column operates laterally.</p>	
<b>2.3 Ecology (provide details)</b>	
<p>Seed germinates in moist clay soils at the fringes of swamps; flowering plants can be observed in cracking clay at the periphery of the available habitat, or in very moist soils near the edge of the water line. Population size can vary</p>	

markedly according to seasonal conditions, with relatively few plants produced in severe drought.

The species uses generalist pollinators: a species of native bee, syrphid fly, and different bee fly species were observed pollinating plants at Subpopulation 3 in October 2009 (W. Scott Armbruster, D. Coates & Wege); small bee flies and a syrphid fly were also observed triggering plants at Subpopulations 1A&B in October 2016 (Wege & Llorens).

## Section 3: Geographic range

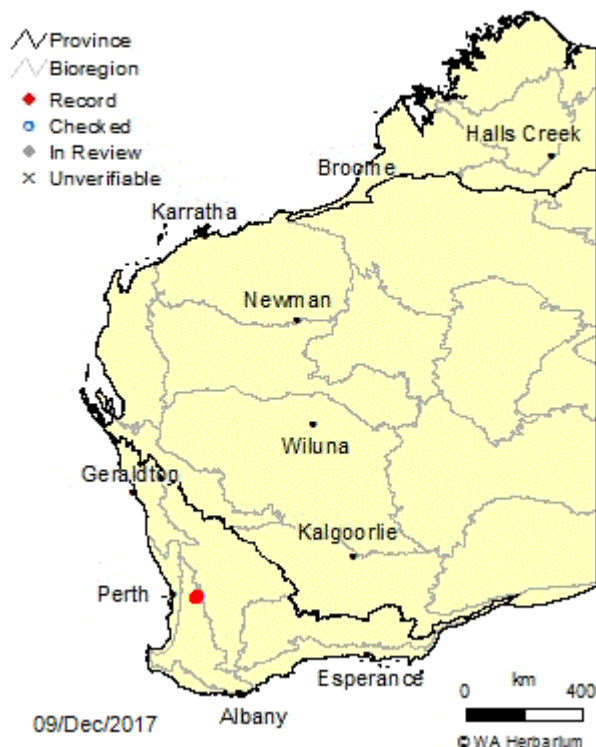
### 3.1 Distribution

Insert map(s) of the species distribution, or provide as an attachment: Supplied as Attachment A

What is the current distribution of the species within Western Australia?

The species is endemic to the Northern Jarrah Forest in a National Park south-west of York, south-western Western Australia where it is known from only three locations.

*Stylidium asymmetricum*



Location of *Stylidium asymmetricum* from Western Australian Herbarium (1998–).

What percentage of the species distribution is within WA?

100 %

What is the current distribution of the species within the other Australian States and Territories?

N/A

Does the species occur outside of Australia?

Yes ☐ No ☒

If Yes, what percentage of the species distribution is within Australia, or what is the significance of the occurrence in Australia?



What is the current international trend for the species?			
<b>3.2 Migration (<i>fauna only</i>)</b>			
Is the species migratory?	Yes <input type="checkbox"/> No <input type="checkbox"/>		
Is the migration within WA or within Australia or international?			
<b>3.3 Extent of Occurrence (EOO) within Australia</b>			
What is the current EOO?	18.13 km <sup>2</sup>		
How has this been calculated?	The EOO was calculated in ArcMap v10.1 using a minimum convex polygon that includes all sites of occurrence.		
What is the historical EOO?	Unknown		
What is the current EOO trend?	Decreasing <input type="checkbox"/> Increasing <input type="checkbox"/> Stable <input checked="" type="checkbox"/>		
Provide details on the current trend – quantify if possible	N/A		
If there has been a change in EOO when did this change occur?			
Was the change observed, estimated, inferred or projected?			
If the EOO is decreasing / declining, is it continuing?	Yes <input type="checkbox"/> No <input type="checkbox"/>		
Is the continuing decline observed, estimated, inferred or projected?			
Is there extreme fluctuation in EOO?	Yes <input type="checkbox"/> No <input type="checkbox"/>		
If Yes, provide details:			
<b>3.4 Area of Occupancy (AOO) within Australia</b>			
What is the current AOO?	<p>The estimated AOO is 12 km<sup>2</sup>.</p> <p>The area of mapped subpopulations (occupied habitat) is &lt; 0.16 km<sup>2</sup>. Note that this figure and those provided for each subpopulation are an over-estimate. They do not take into account all of the recently observed, fine scale loss of habitat.</p>		
How has this been calculated?	<p>The AOO was calculated by overlaying a 2 km x 2 km grid and counting the number of grids occupied by mature individuals.</p> <p>Area of occupied habitat was calculated in ArcMap v10.1 by manually drawing polygons around areas of observed plant occurrence based on ground survey data from October-December 2016, a season of average rainfall and excellent on-ground conditions.</p>		

What is the historical AOO?	Unknown		
What is the current AOO trend?	Decreasing <input checked="" type="checkbox"/> Increasing <input type="checkbox"/> Stable <input type="checkbox"/>		
<i>Provide details on the current trend – quantify if possible</i>	The decreasing area of occupancy is primarily due to decreases in available habitat due to physical destruction by pigs ( <i>Sus scrofa</i> ) and inappropriate off-road vehicle use. Rough visual estimates suggest a decrease in occupied habitat of 40 % at Subpopulation 1A, 60 % at Subpopulation 1B, < 5 % at Subpopulation 2 and 40 % at Subpopulation 3.		
If there has been a change in AOO when did this change occur?	At Subpopulation 1A, Jean and Fred Hort first observed damage due to off-road vehicles and pigs in 1998. The extent of damage had increased dramatically by 2006, and has continued to increase to 2016. Subpopulations 1B and 3 were first discovered in 2015, and already contained pig damage.		
Was the change observed, estimated, inferred or projected? Give details.	The decrease in occupied habitat was inferred from an observed decrease in available habitat due to physical destruction. Recent pig activity and inappropriate off-road vehicle use has been observed at Subpopulations 1A and to a lesser extent Subpopulation 2; recent pig activity has been observed at Subpopulations 1B and 3. Individuals of <i>S. asymmetricum</i> have been observed to occur adjacent to, but rarely within, such highly disturbed habitat.		
If the AOO is decreasing / declining, is it continuing?		Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	
Is the continuing decline observed, estimated, inferred or projected? Give details.	Continuing decline in occupied habitat was observed in 2016, with additional loss of habitat due to new damage from pigs and off-road vehicles. Future decline is projected to occur due to the very high likelihood of further habitat damage combined with the impact of climate change.		
Is there extreme fluctuation in AOO?		Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	
<i>If Yes, provide details:</i>			
Does the species have a restricted AOO?		Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	
<i>If Yes, provide details:</i>	The species has an area of occupied habitat of < 0.16 km <sup>2</sup> . It is dependent on moist, clay soils at the margins of seasonally drying wetlands.		
<b>3.5 Number of Locations</b>			
<b>'Locations'</b> are defined as a geographically or ecologically distinct area in which a single threatening event can rapidly affect all individuals of the taxon present. The size of the location depends on the area covered by the threatening event and may include part of one or many subpopulations. Where a taxon is affected by more than one threatening event, location should be defined by considering the most serious plausible threat. (IUCN 2001).			
At how many locations does the species occur?	3		
Has there been a change in the number of locations?	Decrease <input type="checkbox"/> Increase <input type="checkbox"/> No change <input checked="" type="checkbox"/>		
If there has been a change, when did this change occur?			

Was the change observed, estimated, inferred or projected? Give details.		
If the number of locations is decreasing / declining, is it continuing?	Yes <input type="checkbox"/>	No <input type="checkbox"/>
Is the continuing decline observed, estimated, inferred or projected? Give details.		
Is there extreme fluctuation in the number of locations?	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
If Yes, provide details:		
Does this species occur on any off-shore islands?	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
If Yes, provide details:		
<b>3.6 Fragmentation</b>		
Is the distribution fragmented?	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
The phrase ' <b>severely fragmented</b> ' refers to the situation in which increased extinction risks to the taxon results from the fact that most of its individuals are found in small and relatively isolated subpopulations (in certain circumstances this may be inferred from habitat information). These small subpopulations may go extinct, with a reduced probability of recolonization.		
Is the distribution severely fragmented?	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
If Yes, provide details:	Most individuals are found in 2, naturally isolated subpopulations due to habitat specificity.	
<b>3.7 Land tenure</b>		
Is the species known to occur on lands managed primarily for nature conservation? i.e. national parks, conservation parks, nature reserves and other lands with secure tenure being managed for conservation	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
If Yes; provide details:	All locations occur within a National Park.	
Is the species known to occur on lands that are under threat? i.e. mining tenement, zoned for development	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
If Yes; provide details:		
Provide details of other land tenures where the species occurs as this relates to the species conservation status		

## Section 4: Habitat

<b>4.1 Habitat</b> (provide details in response to the question below)	
Describe the habitat suitable for the species (biological and non-biological).	Grows with other ephemeral herbs in clay flats at the moist fringes of swamps and depressions that seasonally fill with rainwater.

Include descriptions of specific purpose habitat (e.g. foraging, breeding, roosting, seasonal migration, different life stages).	<p>Subpopulation 1A: open Flooded Gum (<i>E. rudis</i>) woodland over reeds and herbs including <i>Stylidium despectum</i>, <i>S. roseoalatum</i> and <i>S. obtusatum</i>.</p> <p>Subpopulation 1B: Very open <i>Melaleuca lateritia</i> shrubland over low rushes and herbs.</p> <p>Subpopulation 2: Open <i>Melaleuca</i> sp. tall shrubland or shrubland with <i>M. lateritia</i> and <i>Verticordia</i>; with fringing Wandoo (<i>E. wandoo</i>) and Flooded Gum (<i>E. rudis</i>). Co-occurs with <i>Stylidium despectum</i>, <i>S. leptophyllum</i>, <i>S. roseoalatum</i> and <i>S. obtusatum</i>.</p> <p>Subpopulation 3: <i>Melaleuca lateritia</i> shrubland over rushes and herbs including <i>Stylidium obtusatum</i>.</p>	
If the species occurs in a variety of habitats, is there a preferred habitat?	N/A	
Does the species use refugia? (include what is it and when is it used)	N/A	
Is the habitat restricted in extent or number of locations?		Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
If Yes, provide details:	Known suitable habitat is restricted to the four known subpopulations. Surveys of other superficially-similar moist depressions and wetlands have not revealed any additional subpopulations.	
Is this species reliant on a threatened or priority species or ecological community?		Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
If Yes, provide details:	Although the habitat of <i>S. asymmetricum</i> is not listed as a threatened or priority ecological community, the survival of this species is dependent on healthy ecosystem function at the two main swamps around which it occurs. These swamps are under increasing threat from climate change, in addition to the more immediate effects of pigs, off-road vehicles and weeds.	
Are there any other species (sympatric species) that may affect the conservation status of the nominated species?		Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
If Yes, provide details:	<i>Moraea flaccida</i> (One Leaf Cape Tulip) and <i>Isolepis hystrix</i> are both serious weeds of seasonal wetlands and have been detected at Subpopulation 1.	
What is the area, extent, abundance of habitat?	Known suitable habitat is restricted to the four known subpopulations, covering an area of < 0.16 km <sup>2</sup> within an extent of 18.13 km <sup>2</sup> .	
What is the quality of habitat?	Habitat quality varies markedly both between and within the subpopulations. For example, some of the available habitat at subpopulations 1A and 1B has been destroyed by feral pig activity and/or partially impacted by off-road vehicles and weed invasion. The habitat at subpopulation 2 is healthier and more intact, although there is some loss in quality as a result of localised off-road vehicle activity and pig disturbance (note weeds impacts have not been expertly assessed). The habitat quality at subpopulation 4 is moderate to poor, the understory having been severely impacted by pigs and with some weeds present.	
Is there a decline in habitat area, extent or quality?		Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
If there is a decline, is the decline continuing?		Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>

Provide details:	Recent pig activity and inappropriate off-road vehicle use has been observed at Subpopulations 1A and to a lesser extent Subpopulation 2; recent pig activity has been observed at Subpopulations 1A, 1B and 3.
What is the critical habitat or habitat important for the survival of the species?	All areas of available habitat at the known locations are important for the survival of the species.

## Section 5: Population

**'Population'** is used in a specific sense in the Red List Criteria that is different to its common biological usage. Population is here defined as the total number of mature individuals of the taxon. In the case of taxa obligately dependent on other taxa for all or part of their life cycles, biologically appropriate values for the host taxon should be used. (IUCN 2001)

**'Subpopulations'** are defined as geographically or otherwise distinct groups in the population between which there is little demographic or genetic exchange (typically one successful migrant individual or gamete per year or less).

5.1 Subpopulations				
Location (include coordinates)	Land tenure	Survey information: Date of survey and No. mature individuals	AOO	Site / habitat Condition
Subpopulation 1A: SW of York	National Park	24/10/2016 [Llorens & Wege]  > 100,000 individuals	< 0.050 km <sup>2</sup>	Moderate to poor; significant areas of deteriorating habitat and total habitat loss from recent and past pig and off-road vehicle activity; serious wetland weeds detected ( <i>Moraea flaccida</i> and <i>Isolepis hystrix</i> ).  Plants extend around the entire swamp, but do not occur in areas of severe disturbance.
Subpopulation 1B: SW of York	National Park	24/10/2016 [Llorens & Wege]  approx. 10,000 individuals	< 0.002 km <sup>2</sup>	Moderate to poor. Extensive pig damage and some weed invasion.  Plants extend around the moist depression but are higher in density at either end and on the eastern margin where pig damage less severe (note water still present 24/10/16).
Subpopulation 2: SW of York	National Park	Commenced 24/10/16, completed 31/10/2016 [Llorens & Wege]	< 0.105 km <sup>2</sup>	Very good to excellent. Some weeds and recent 4WD damage observed near dam. Some recent pig damage noted on S and N side of swamp.

		> 100,300 individuals		
Subpopulation 3: SW of York	National Park	31/10/2016 [Llorens & Wege]  approx. 500 individuals	< 0.002 km <sup>2</sup>	Moderate to poor. Extensive pig damage and some weed invasion, e.g. <i>Bartsia trixago</i> (Mediterranean Linseed).  Plants are concentrated in areas of more intact habitat directly under <i>Melaleuca</i> shrubs rather than in the more open areas, which have been extensively damaged by pigs.

## 5.2 Population size (Australian context) (include how numbers were determined/calculated)

What is the total population size?	> 210,800  This is an order of magnitude estimate following surveys conducted on foot of all available habitat at all known locations in 2016, a season of average rainfall and excellent on-ground conditions.
What is the number of subpopulations?	4
What percentage of the population is within WA?	100 %
What percentage of the population is within Australia?	100 %

## 5.3 Population dynamics (Australian context) (include how numbers were determined/calculated)

What is the number of mature individuals?	As for population size above
What is the number of immature individuals?	N/A (annual herb)
What is the number of senescing/past reproductive individuals?	N/A (annual herb)
What is the maximum number of mature individuals per subpopulation?	> 100,000
What is the percentage of mature individuals in the largest subpopulation?	100 %
What percentage of mature individuals is within WA?	100 %
What percentage of global mature individuals is within Australia?	100 %
What is the age of sexual maturity?	< 1 year
What is the life expectancy?	< 1 year
What is the generation length?	< 1 year

What is the reproductive capacity? (i.e. litter size or number of seeds)	Plants produce 1–26 flowers per individual and many seed per flower.
What is the reproductive success?	Presumably high; dependent on pollinator activity (pollinators have been directly observed at subpopulations 1A,B and 2)
<b>5.4 Population trend</b>	
What is the current population trend (mature individuals)?	Decreasing <input checked="" type="checkbox"/> Increasing <input type="checkbox"/> Stable <input type="checkbox"/>
What is the percentage of the population change and over what time period?	Estimated. 17 % decline in the past 20 years.
How has this been calculated?	Photographs and observations from subpopulation 1A in 1996 indicate the swamp was in pristine condition. The area of available <i>S. asymmetricum</i> habitat has since declined by as much as 40 % (note this is a rough visual estimate). A similar level of decline was observed at subpopulations 1B and 3. Subpopulation 2 is more or less stable. See Section 3.4 for estimates of percentage AOO decline for each subpopulation. The percentage of population change was assumed to be equivalent to the percentage of AOO change.
If the trend is decreasing; are the causes of the reduction understood?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
Have the causes of the reduction ceased?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Are the causes of the reduction reversible?	Yes <input checked="" type="checkbox"/> No <input checked="" type="checkbox"/>
Is the reduction continuing (continuing decline)?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
Has the change been observed, estimated, inferred or is it suspected (direct observation, index of abundance appropriate to the species)?	The change is inferred due to observed loss of available habitat.
When was the reduction or is it anticipated to occur?	Past <input checked="" type="checkbox"/> Present <input checked="" type="checkbox"/> Future <input checked="" type="checkbox"/>
What is the period of time for the reduction (in years and generations)?	Annual herbs: the impact of habitat loss is immediate.
Has there been a reduction in the number of subpopulations?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
<i>If Yes, provide details:</i>	
Are there extreme fluctuations in population size?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
<i>If Yes, provide details:</i>	As a result of this species' annual life form, population size is directly correlated to seasonal conditions. For example, at Subpopulation 2, no individuals were observed in drought conditions on 13/11/2015 whereas > 100,000 individuals were observed on 31/10/2016 in average seasonal conditions.
<b>5.5 Translocations and captive/enclosed subpopulations</b>	
Have there been translocations (introduction or re-introduction)?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Are there proposed translocations (introduction or re-introduction)?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>

Are there captive/enclosed/cultivated subpopulations?		Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Are there proposed captive/enclosed/cultivated subpopulations?		Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Are there self-sustaining translocated subpopulations?		Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
If Yes, provide details:		
Are there translocated subpopulations that are not self-sustaining?		Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
If Yes, provide details:		
Are there self-sustaining captive/enclosed subpopulations?		Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
If Yes, provide details:		
Are there captive/enclosed subpopulations that are not self-sustaining?		Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
If Yes, provide details:		
Other information on translocations and captive/enclosed subpopulations for the species (including failures):		
<b>5.6 Important subpopulations</b>		
<p><i>Identify any subpopulations that are important or necessary for the long-term survival of the species and provide details for why they are considered as such (i.e. key breeding, edge or range, maintenance of genetic diversity):</i></p> <p>All subpopulations are considered important for the long-term survival of the species given the species' low AOO.</p>		

## Section 6: Survey

6.1 Survey methods (Provide details)	
What survey methods are applicable to the species?	<p>Due to the species' annual life form, surveys need to be conducted on foot during the flowering season, preferably in average to excellent seasonal conditions. Surveys to estimate population size in poor seasonal conditions will give little indication as to how the species is tracking.</p> <p>The extended flowering season of this species is a result of successive germination and flowering of individuals as water levels recede. Repeated visits to the known subpopulations (particularly Subpopulations 1A and 2) would enable a more accurate assessment of plant numbers; however, a single survey between mid- October and early November (depending on seasonal conditions) is likely to be sufficient for population size, population extent and habitat quality assessments.</p> <p>Order of magnitude estimates are a pragmatic way to quantify the abundance of this species in any given year.</p> <p>Perth Hills District staff established transects in 2016 at Subpopulations 1A and 2 to facilitate the survey and monitoring of this species, including noting new habitat damage. Most transects run perpendicular to the water's edge. Plants were counted within 25 cm<sup>2</sup> quadrats at evenly-spaced intervals along the transects. Regular repeated visits during the</p>



	flowering period are necessary to observe plants as they appear progressively with receding water levels. Due to the time-consuming nature of these surveys, they will be conducted every 3–5 years, or opportunistically during years of favourable environmental conditions, rather than annually.
Are there preferred or recommended survey methods that yield better results for the species?	N/A
Are there special requirements, techniques, expertise or other considerations that are necessary when surveying for this species?	There is considerable individual variation as to the number of flowers per plant: some plants produce only 1 flower while others produce numerous. This needs to be taken into account when counting plants within quadrats or conducting visual estimates. There appears to be some temporal and/or spatial variation in the average numbers of flowers per plant (moister patches of habitat tend to produce larger plants bearing more flowers), so it is worth observing some plants close-up before conducting visual estimates. When counting plants within quadrats, it can be difficult to distinguish individual plants due to the very delicate and intertwined nature of the stems.
Are there reasons why the species may not be detected during surveys?	This species is a small annual herb and therefore it is not practical or possible to detect and accurately count all individuals. Furthermore, individuals that are either in bud or have finished flowering are very difficult to detect.
Can the species be identified in the field?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
Provide details:	The asymmetric corolla lobe arrangement (see images above) readily distinguishes this species from other annual herbs in the genus.
Can the species be easily confused within similar species in the field?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
Provide details:	<i>Stylidium asymmetricum</i> grows in sympatry and parapatry with a range of other triggerplants. Although its asymmetric corolla lobe arrangement is highly distinctive, survey staff should be aware of co-occurring species, most notably <i>S. roseoalatum</i> which has flowers of a similar size and colour. <i>Stylidium despectum</i> also has pink flowers, although they are considerably smaller than those of <i>S. asymmetricum</i> . See Wege (2011) for photographs and descriptions of these two species.
List any published survey guidelines, guidance statements, protocols, standard operating procedures or other documents that are relevant to conducting surveys for this species.	
<b>6.2 Survey effort</b>	
Has the species been well surveyed?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
Have targeted surveys been conducted for the species?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
Provide details of the successful and unsuccessful surveys undertaken for the species:	<p><i>Successful</i></p> <ul style="list-style-type: none"> <li><b>Subpopulation 1A: 10/11/99</b>, F &amp; J Hort observed flowering plants in dense masses on the N side of the swamp, but not surveyed; <b>3/10/16</b>, F &amp; J Hort and M. Mallié, flowering plants observed but not surveyed; <b>24/10/16</b>, T Llorens &amp; J Wege, c. 100,000+ plants; <b>18/11/16</b>, T Llorens, wetland completely dry and just the occasional flowering plant observed.</li> </ul>

	<ul style="list-style-type: none"> <li>• <b>Subpopulation 1B</b>, minor swamp to N of main wetland: <b>1/10/15</b>, F &amp; J Hort, c. 2,300 plants; <b>24/10/16</b>, T Llorens &amp; J Wege, c. 10,000 plants.</li> <li>• <b>Subpopulation 2</b>: <b>6/1/2000</b>, F &amp; J Hort, plentiful masses of plants observed; <b>4/2/06</b>, F &amp; J Hort, plants locally common; <b>24/10/16</b> &amp; <b>31/10/16</b>, T Llorens &amp; J Wege, c. 100,000+ plants; <b>18/11/16</b>, T. Llorens, plants flowering at edge of swamp which still had a good amount of water; <b>14/12/16</b>, J. Wege, c. 300 plants over a very small area only, plants do not appear to extend into the centre of the swamp.</li> <li>• <b>Subpopulation 3</b>: <b>1/10/15</b>, F &amp; J Hort, c. 100 plants; <b>31/10/16</b>, T Llorens &amp; J Wege, c. 500 plants.</li> </ul> <p><i>Unsuccessful</i></p> <ul style="list-style-type: none"> <li>• <b>Subpopulation 2</b>: <b>13/11/15</b>, J. Wege. Drought conditions – no ephemeral herbs were seen at this time.</li> <li>• c. 18 km S of Subpopulation 1a: <b>4/10/16</b>, F &amp; J Hort.</li> <li>• Goonaping [Browns] Swamp: <b>8/10/16</b>, F &amp; J Hort; <b>2/11/16</b>, J Wege &amp; F. &amp; J. Hort.</li> <li>• Dobaderry Swamp: <b>2/11/16</b>, J Wege &amp; F. &amp; J. Hort.</li> <li>• Gully: <b>3/11/16</b>, F. &amp; J. Hort.</li> <li>• Brixton Street Wetland: <b>19/10/16</b>, J Wege [note staff at Swan Region have not detected this species in detailed surveys over many years].</li> <li>• W of Bolgart: <b>23/10/16</b>, F &amp; J Hort.</li> <li>• Din Swamp (33.44010, 116.45149), <b>8/11/16</b>, A. Webb (South West Region)</li> </ul> <p>Jean and Fred Hort first collected <i>S. asymmetricum</i> in 1999 and have not uncovered any additional populations during their extensive collecting efforts. Their efforts have included recent, targeted surveys of moist depressions in the greater vicinity over several seasons, looking for <i>Stylidium rubricalyx</i> (a similarly small herb).</p> <p>Juliet Wege first observed this species in the wild in 2008 and since this time has conducted taxonomic research in many wetlands, depressions and granite outcrops on the Swan Coastal Plain and Northern Jarrah Forest regions. She has not observed this species at any additional sites, nor was it detected during the Department's Swan Coastal Plain surveys in the 1990s.</p> <p>All specimens of ephemeral triggerplants at the Western Australian Herbarium have been examined by Wege and no additional populations of <i>S. asymmetricum</i> have been uncovered.</p>
<b>6.3 Research</b> (Provide details)	
Has the species been well researched?	Yes <input type="checkbox"/> No <input type="checkbox"/> Partially <input checked="" type="checkbox"/>
What research has been or is being conducted?	The taxonomy of this species has been recently resolved (Wege 2011) and a small amount of pollination data has been obtained (W. Scott Armbruster & Wege, unpublished data). Its systematic placement is currently under investigation as part of a molecular phylogenetic study of <i>Stylidium</i> (Wege <i>et al.</i> in prep.)
What are the knowledge gaps for the species?	Seed biology, in particular seed longevity and soil seed bank dynamics.
Research recommendations:	Research into seed longevity and soil seed bank dynamics may provide information to facilitate management of this species in a drying climate.

<b>6.4 Monitoring</b> <i>(Provide details)</i>	
Is the species being monitored, either directly (targeted) or indirectly (general monitoring)?	The species is being directly monitored by Perth Hills District.
What methods are used for monitoring?	Perth Hills District staff established transects in 2016 at Subpopulations 1A and 2 to facilitate the survey and monitoring of this species, including noting new habitat damage or re-colonisation of old damage. Most transects run perpendicular to the water's edge. Plants were counted within 25 cm <sup>2</sup> quadrats at evenly-spaced intervals along the transects. Regular repeated visits during the flowering period are necessary to observe plants as they appear progressively with receding water levels. Due to the time-consuming nature of these surveys, they will be conducted every 3–5 years, or opportunistically during years of favourable environmental conditions, rather than annually. Presence/absence of plants within quadrats over time should provide a good indication of long-term changes to the AOO of each subpopulation.
Monitoring recommendations:	In addition to periodic monitoring of transects, it is recommended that each subpopulation is visited annually between mid-October and early November (depending on seasonal conditions). Each visit could include visual estimates on foot of: the presence or absence of flowering plants; the order of magnitude of plant numbers; population extent; and changes in habitat quality.

## Section 7: Threats

### 7.1 Threats (detail how the species is being impacted, i.e. how severe, the extent, evidence of the impact)

Threat (describe how the threat impacts on the species. Include abiotic and biotic causes, human related e.g. exploitation, and biological characteristics of the species e.g. low genetic diversity)	Extent (give details of impact on whole species or specific subpopulations)	Impact (what is the level of threat to the conservation of the species)	Evidence	Time period (past, present, future)
Feral pigs	Pigs have significantly reduced available habitat and hence AOO at all sites, especially Subpopulations 1A, 1B and 3.	Extremely high	Wallowing pigs denude patches of vegetation, thereby completely destroying the available habitat of <i>S. asymmetricum</i> and alter local hydrology. Pig tracks and scats were observed by T. Llorens in November and December 2016.	past, present, future
Off-road vehicles	Have reduced available habitat and hence AOO, particularly at Subpopulations 1A and 1B.	High	Vehicle tracks occur through the wetlands. New tracks continue to appear, as evidenced by aerial photography and ground observation. The tracks tend to be deep and alter local hydrology as well as reduce available habitat.	past, present, future
Weeds	Potentially significant impact of serious wetland weeds currently present at Subpopulation 1A; likelihood of continued weed invasion at other subpopulations	High	A full assessment of weeds and their potential impact has not been made; however, at Subpopulation 1A, Kate Brown and Grazyna Paczkowska (Swan Region) have identified occurrences of <i>Moraea flaccida</i> (One Leaf Cape Tulip) and <i>Isolepis hystrix</i> , which are both serious weeds of seasonal wetlands. Other species noted by them include <i>Vulpia</i> sp., <i>Briza maxima</i> , <i>Romulea rosea</i> , <i>Lythrum hyssopifolia</i> , <i>Lysimachia arvensis</i> , <i>Stachys arvensis</i> and <i>Cicendia filiformis</i> .  <i>Bartsia trixago</i> (Mediterranean Linseed), a	past, present, future

			species that can displace native vegetation, was noted at Subpopulation 3.	
Climate change	Potentially catastrophic for each subpopulation. Continued future reduction in annual rainfall and increased drought frequency is highly likely to prevent germination and/or seed production in an increasing proportion of seasons.	Extremely high	Populations are extensive during years of average rainfall (e.g. 2016) but sparse during years of below-average rainfall. The species was not observed at Subpopulation 2, the largest and most extensive population, during a drought in 2015.	future

## Section 8: Management

8.1 Current management		
Is the species managed?	Yes, directly <input checked="" type="checkbox"/>	Yes, indirectly <input checked="" type="checkbox"/> No <input type="checkbox"/>
<i>If Yes; provide details of current or past management actions:</i>	<p>Seed collected from Subpopulation 2 has been banked at the Department of Parks and Wildlife's Threatened Flora Seed Centre and a subsample sent Millennium Seed Bank in the United Kingdom (voucher: PERTH 07346492).</p> <p>Signage has been erected at Subpopulations 1A and 2, but this is not deterring off-road vehicles from damaging habitat and destroying plants, particularly at the former site.</p> <p>Pig trapping continues to occur in the broader region; however, there is evidence of recent pig damage at all locations.</p> <p>Weeds have been expertly identified by Kate Brown and Grazyna Paczkowska (Swan Region) at subpopulation 1A, and the extent of One Leaf Cape Tulip has been mapped.</p>	
Does the species benefit from the management of another species or ecological community?	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
<i>If Yes; provide details:</i>	<p>Note the Threatened sedge <i>Eleocharis keigheryi</i> was newly detected at Subpopulation 1A during recent surveys (Nov 2016) by Kate Brown from Swan Region (voucher number KLB 1212).</p>	
8.2 Recovery planning		
Is there an approved Recovery Plan (RP) or Interim Recovery Plan (IRP) for the species?	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
<p><i>List all relevant recovery plans or interim recovery plans (including draft, in-preparation, out-of-date, national and other State/Territory plans, and plans for other species or ecological communities that may benefit or be relevant to the nominated species)</i></p> <p>N/A</p>		
<p><i>List other documents that may be relevant to the management of the species or the lands on which it occurs (i.e. area management plans, conservation advices, referral guidelines)</i></p> <p>Not known.</p>		
8.3 Management recommendations		
<p>Pig control: Conduct pig trapping at each wetland.</p> <p>Off-road vehicles: ban 4WD access at subpopulation 1; however this is difficult to enforce due to lack of personnel capacity. Ongoing education and engagement with 4WD clubs.</p> <p>Weed control, initially focussing on removal of <i>Moraea flaccida</i> and <i>Isolepis hystrix</i> at subpopulation 1. Expert weed assessment needed at subpopulations 1B–3 to ensure no serious wetland weeds pose a threat to the species.</p> <p>Monitoring of wetland vegetation health into the future, particularly in view of the likely impacts of climate change. At Subpopulation 1A, five transects have been established by Kate Brown and Grazyna Paczkowska to monitor medium-term changes (5-10 years) in species composition and cover as well as disturbance.</p> <p>Additional seed collection and banking from all subpopulations in years of average to good seasonal conditions.</p>		

## Section 9: Nominator details

Nominator name(s):	
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<b>Contact details:</b>	
<b>Date submitted:</b>	25 January 2017
<i>If the nomination has been refereed or reviewed by experts, please provide their names and contact details:</i>	

## Section 10: References

<p><b>9.1 References</b></p> <p>Wege JA (2011) A taxonomic revision of the <i>Stylidium despectum</i> group (Stylidiaceae) in southern Australia. <i>Austral. Syst. Bot.</i> 24: 375–404.</p> <p>Western Australian Herbarium (1998–) <i>FloraBase – The Western Australian Flora</i>. Department of Environment and Conservation. <a href="http://florabase.calm.wa.gov.au/">http://florabase.calm.wa.gov.au/</a>.</p>
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