The Minister's delegate approved this conservation advice on 01/10/2015

Conservation Advice

Calytrix breviseta subs. *breviseta*

swamp starflower

Conservation Status

Calytrix breviseta subs*. breviseta* (swamp starflower) is listed as Endangered under the *Environment Protection and Biodiversity Conservation Act 1999* (Cwlth) (EPBC Act). The species is eligible for listing as Endangered as, prior to the commencement of the EPBC Act, it was listed as Endangered under Schedule 1 of the *Endangered Species Protection Act 1992* (Cwlth).

The main factors that are the cause of the species being eligible for listing in the Endangered category are: the limited geographic distribution of its populations and the continuing decline in the quality of its habitat. Contributing factors to this decline include weed invasion, firebreak maintenance, rabbits, inappropriate fire regimes, hydrological changes including salinisation, rubbish dumping, grazing and trampling by horses, and dieback disease.

Description

The swamp starflower is a free-standing shrub with widely-spaced, spreading-ascending leaves, that can reach 40 cm in height. The leaves are linear or only slightly rounded. Leaves can be anywhere from 2 mm to about 10 mm in length, arranged alternately along the stem. The swamp starflower has purplish-blue flowers with many stamens.

Distribution

The swamp starflower is endemic to Western Australia. Although historically recorded at Gosnells and Bellevue, it appears to be confined to the Kenwick area.

In 2003 the species was recorded as having two populations, with the first being divided into four sub-populations on the basis of land tenure. Transloactions were attempted in 2007 and 2008 but were not successful. In 2007, a further 20 plants were discovered during a flora survey of the Greater Brixton St Wetlands and were determined to be a new population[1].

Threats

Table 1: Table of threats

Threat factor	Threat type	Threat status	Evidence base
Inappropriate fire regimes	known	future	Evidence of post-fire germination suggests fire may play a role in germination for this species (noting *C. breviseta* subs. *breviseta* also germinates from the soil seed bank). However, if the interval between fire events is too short, populations can be destroyed prior to full regeneration or juveniles can be destroyed before they are able to replenish the soil seed bank.
Weed invasion	known	current	A major threat to all populations. Weeds recorded at populations include bulbil watsonia (*Watsonia meriana*), *Sparaxis bulbifera*, Paterson's curse (*Echium plantagineum*), *Gladiolus* sp., sticky bartsia (*Parentucellia*

[1] This information is detailed in the recovery plan review, based on correspondence with Anne Harris, a Flora Conservation Officer at the WA Department of Environment and Conservation.

			viscosa), Guildford grass (*Romulea rosea*), onion weed (*Asphodelus fistulosus*) and hop clover (*Trifolium campestre*), and grasses such as oats (*Avena* sp.), African lovegrass (*Eragrostis curvula*), and rat's tail fescue (*Vulpia myuros*) (Obbens 1997). Weeds suppress early plant growth by competing for soil moisture, nutrients and light. They also exacerbate grazing pressure and increase the fire hazard due to the easy ignition of high fuel loads, which are produced annually by many weed species. Obbens (1997) observed numerous weed species at the site.
Hydrological change including salinisation	known	current	Salinisation can occur as a consequence of evaporation of increased levels of surface water resulting in salt residues on the soil. Construction of a drainage channel from an adjacent property, draining into the centre of the location of one of the populations. This hydrological change appeared to increase the salinity of the area, as evidenced by the arrival of several salt tolerant species (such as *Sarcocornia* sp.) at the edge of the site. This appears to be impacting on the taxon and leading to degradation of its habitat. If not addressed, this decline appears likely to continue in the medium to long term.
Firebreak maintenance activities	known	current	Firebreak maintenance activities undertaken include grading, chemical spraying, construction of drainage channels and the mowing of roadside vegetation. Several of these actions also encourage weed invasion.
Grazing and trampling by Horses	known	past	Horse riding has been recorded along firebreaks in all areas that contain populations of Swamp starflower; horses facilitate the spread of disease and weeds, as well as graze and trample vegetation.
Rubbish dumping	known	current	Rubbish dumping along the road verge and in the reserve that contains the swamp starflower is a minor threat to all populations. Apart from visual impacts, rubbish, in particular garden waste, introduces weed seeds into the bushland and increases the risk of fire.
European Rabbits (*Oryctolagus cuniculus*)	suspected	current	Although rabbits are observed at all populations, there is no evidence that the swamp starflower is being grazed by them; they are suspected to be an indirect threat by contributing to soil disturbance, increased nutrification of soil (promoting weed recruitment), and introduction of weed seeds through droppings.
Dieback disease	potential	current	Dieback disease is a threat to the habitat of *C. breviseta* subsp. *breviseta*, although it appears not to affect the species itself.

Conservation Actions

Conservation and Management priorities

Fire

- Burning, smoke, water and soil disturbance may be effective in stimulating the germination of soil-stored seed. Conduct trials near existing populations in areas newly cleared of weeds, and/or in areas where the swamp starflower was known to occur previously. After treatment, include in annual monitoring the time to first flowering, seed production and the age at which senescence is reached (this enables formulation of a recommended interval time between disturbances to maintain populations).
- Where all other management actions have been exhausted, including comprehensive weed control at the side, consider the development and implementation of a fire management strategy for the Greater Brixton Street Wetlands area and update as necessary. Fire should be prevented from occurring in the habitat of populations, except where it is being used experimentally as a recovery tool.

Invasive species (including threats from grazing, trampling, predation)

- Where shade cloth has been shown to prevent weed seed movement a shade cloth barrier should be erected.Spray area with a targeted herbicide to reduce African lovegrass (*Eragrostis curvula*) invasion.
- Undertake control of European rabbit (*Oryctolagus cuniculus*) in and around the *habitat of* the swamp starflower.
- Develop and implemenet a weed management strategy for all weeds impacting this species.

Habitat loss, disturbance and modifications

- Redirect drainage culvert on the adjacent property to prevent further draining into the location containing Subpopulation 1b and fill in the remaining culvert.
- Rubbish dumped in the reserve at all populations removed and disposed of correctly. Request that the City of Gosnells remove any rubbish dumped on the road.
- Replace or where necessary install boundary fencing at a populations impacted by grazing. Include a buffer of surrounding habitat, to protect *C. breviseta* subsp. *breviseta* from grazing and trampling by horses.

Disease

- The habitat of the swamp starflower is inundated over the winter months, and these conditions favour the establishment and spread of *Phytophthora* species (which cause dieback disease). Plant species in the community may be susceptible to this disease. Dieback hygiene (outlined in Department of Conservation and Land Management 2003) would therefore be adhered to for activities such as installation and maintenance of firebreaks and walking into the population in wet soil conditions.
- Purpose built signs advising of the dieback risk and high conservation values of the sites to be installed as required.

Ex-situ conservation

- Collection of seed. Approximately 1261 seeds were collected in November 1996 and stored in the Threatened Flora Seed Centre (TFSC).
- Preservation of germplasm is essential to guard against extinction if wild populations are lost. Such collections are also needed for plants for translocations. Seed is required from all populations to maximise the genetic diversity of the *ex situ* material. Cuttings will also be obtained to establish a living collection at the Botanic Gardens and Parks Authority (BGPA).
- Trial transloactions should be undertaken in matched habitats or areas where weed removal has occurred.

Stakeholder Management

- Notify land managers of the location and threatened status of the taxon. The notification should detail the “Declared Rare” status of the swamp starflower and the legal responsibility to protect it.
- Install Declared Rare Flora (DRF) markers along the firebreaks where appropriate.
- The Swan Region Threatened Flora and Communities Recovery Team to continue to coordinate recovery actions for the swamp starflower and other Declared Rare Flora (DRF) in their region, including information on progress in their annual report to the Western Australian government and funding bodies.
- Identify and seek input from any Indigenous groups that have an active interest in areas that are habitat the swamp starflower.
- Promote the importance of biodiversity conservation and the need for the long-term protection of wild populations of this taxon to the community through poster displays and the local print and electronic media.
- Encourage formal links with local naturalist groups and interested individuals.
- Preservation of germplasm will be undertaken to guard against extinction, facilitate translocation, and establish a living collection at the BGPA.

Survey and Monitoring priorities

- Undertake a hydrological study of the Greater Brixton St Wetlands.
- Include data from monthly monitoring of groundwater and surface water along a number of transects in future studies.
- Annual monitoring of factors such as habitat degradation (including weed invasion and plant diseases), population stability (expansion or decline), pollination activity, seed production, recruitment, longevity and predation is essential.
- Inspect all populations annually with special attention given to any impacts from salinity; in areas where salinity is a problem, soil salinity and pH readings should be taken annually during winter and summer.
- Conduct further surveys for this taxon in appropriate habitat, and on private lands wherever possible, during the flowering period (September to November). Encourage volunteers from the local community, wildflower societies and naturalist clubs to be involved in surveys with co-ordinator supervision. Note areas considered suitable for translocation.

Information and research priorities

Improved knowledge of the biology and ecology of the swamp starflower would provide a better scientific basis for management of the wild populations. An understanding of the following is particularly necessary for effective management:

1. Soil seed bank dynamics and the role of various disturbances (including fire), competition, rainfall and grazing in germination and recruitment.
2. The pollination biology of the taxon, and the requirements of pollinators.
3. The life history and phenology and seasonal growth of the taxon.
4. The population genetic structure, levels of genetic diversity and minimum viable population size.
5. The impact of salinity on the swamp starflower and its habitat.
6. The impacts of dieback disease and control techniques on the swamp starflower and its habitat.

In addition to the above, if any additional populations are located, spatial data relating to critical habitat would need to be determined and mapped for these locations, in accordance with the requirements of the EPBC Act.

References cited in the advice

Brown, K. and Brooks, K. (2002) *Bushland weeds; a practical guide to their management*. Environmental Weeds Action Network (Inc), Western Australia.

Department of Conservation and Land Management (2003) *Phytophthora cinnamomi* and disease caused by it Volume 1 – Management Guidelines. Department of Conservation and Land Management, Perth.

Luu, R. & English, V. (2004) Swamp Starflower (*Calytrix breviseta subsp. breviseta*) Interim Recovery Plan 2004 – 2009, Western Australia: Department of Conservation and Land Management.

Obbens, F. (1997) *Monitoring and Preliminary Weed Control on Populations of Critically Endangered Flora.* Department of Conservation and Land Management. Perth, Western Australia.