The Minister's delegate approved this Conservation Advice on 01/04/2016.

Conservation Advice

Grevillea althoferorum

split-leaved grevillea

Conservation Status

Grevillea althoferorum (split-leaved grevillea) is listed as Endangered under the *Environment Protection and Biodiversity Conservation Act 1999* (Cwlth) (EPBC Act). The species is eligible for listing 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 its geographic distribution is precarious for its survival due to its restricted extent of occurrence and area of occupancy, severe fragmentation of populations and extreme fluctuations in number of mature individuals, and low number of mature individuals.

Grevillea althoferorum is listed as Declared Rare Flora and as Critically Endangered under the Western Australian *Wildlife Conservation Act* 1950.

Description

The split-leaved grevillea is a compact rounded shrub with trailing stems up to 3 m long, and angular branchlets covered with very fine, long, soft hairs. Its leaves are 3–7.5 cm long and 1–5 cm wide. They have twice-divided lobes, and are broadly triangular with recurved sharp points. The terminal inflorescence is 2 to 5 cm long and erect. The cream flowers (floral whorl and style), which appear from August to October, are regular (not one-sided), and the buds are covered in pinkish-brown hairs. The grooved, oblong fruit is 12–15 mm long and 3–4 mm wide (Stack & English 2003).

It is closely related to *Grevillea rudis* but differs in that the leaves are more deeply divided to the midrib, and it has a shorter denser inflorescence generally not exceeding the leaves, (Stack & English (2003).

Distribution

The split-leaved grevillea occurs north of Perth in Western Australia and is currently restricted to two known populations 200 km apart, one south of Eneabba (Population 1) and the other near Bullsbrook (Population 2) (Stack & English 2003).

Population 1, which contained 147 plants in 2001, occurs on a 12 m wide road verge which is part of a shire road reserve. Population 2, which contained 151 plants in 1999, occurs at the base of the Darling Scarp in a nature reserve adjacent to agricultural land (Stack & English 2003).

Relevant Biology/Ecology

Population 1 is found on the crest of a low rise on pale brown loamy sand or grey sand supporting low heath. The split-leaved grevillea forms a part of the mid-dense shrub layer with *Grevillea integrifolia*, *G. shuttleworthiana*, *Hakea prostrata, Verticordia grandis*, *Viminaria juncea* and numerous other shrub species (Stack & English 2003).

Population 2 grows in greyish-yellow colluvial sand in *Banksia* low woodland. It forms part of the shrub layer in a *Banksia menziesii* and *B. attenuata* woodland with *Hibbertia hypericoides*, *Xanthorrhoea preissii*, *Conostephium pendulum*, other shrubs, and herb species (CALM 2003).

It appears that there is a divergence in the reproductive biology of the two populations. In 2003, neither population had shown evidence of seedling recruitment. Population 1 has been confirmed as clonal and is actively recruiting from root suckers. Population 2 produces seed but at very low levels. Burne et al. (2003) found that 0.15% of flowers set fruit. In addition, they found that the lack of sexual recruitment in split-leaved grevillea is most likely to be due to the lack of viable pollen on the stigmas, which was almost nil at Population 1 (Stack & English 2003).

Genetic work suggests that both populations are clonal, with very little genetic diversity within each population, but substantial difference between populations (M. Byrne, pers. comm. cited in Stack & English 2003). *Banksia goodii* is a similarly rare resprouter that produces few seeds and so accidental losses of adult plants causes accelerated declines in population size (Drechsler et al., 1999 cited in Burne et al., 2003).

The presence of root suckering at Population 1 and lignotubers at Population 2 indicates that split-leaved grevillea resprouts following removal of above-ground plant material through disturbances such as fire or grazing (Burne et al., 2003).

Split-leaved grevillea is suspected to be susceptible to dieback disease (Stack & English 2003).

Threats

Table 1 – Threats

Threat factor	Threat type	Threat status	Evidence base
Invasive species and the impact of domestic species			
Weed invasion	known	current	Weeds occurring in Population 1 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 flammability fuels, which are produced annually by many grass weed species.
Grazing	known	current	Grazing by rabbits, possibly kangaroos (*Macropus* spp.) and/or sheep has had a major impact on Population 1. Grazing may have an impact on the establishment of split-leaved grevillea juveniles, thereby limiting natural recruitment.
Disturbance by rabbits and foxes	known	current	Population 1 is impacted by disturbance of soil by rabbit warren and fox midden construction; increased nutrient levels from their droppings and the introduction of weeds are impacting the habitat of the split-leaved grevillea.
Lack of genetic diversity			
Lack of genetic diversity	known	current	This is evident within each population, affecting the evolutionary adaptability of this species. The populations may continue indefinitely if well adapted to their environmental conditions, but if those conditions change, the taxon may have limited ability to adapt.

Habitat loss disturbance and modifications and the impact of domestic species			
Road, track and firebreak upgrade and maintenance activities	known potential	past future	These activities have threatened both populations in the past. Construction of drainage channels, grading and other road maintenance activities impact on Population 1. Several of these actions promote weed invasion. Relevant authorities have been informed of the road reserve population and have been advised of the need for appropriate protective measures.
Fence maintenance activities	potential	future	These activities are a potential threat to the roadside Population 1, in the event that the adjoining farmland boundary fence should need repair or replacement. This is not considered an immediate threat as the landholders have been made aware of the population.
Chemical drift	potential	future	Herbicide and fertiliser application on adjacent farmland may affect the species' growth and survival, particularly at Population 1. The owners of land adjacent to Population 1 have been informed of the species' presence, to prevent possible grazing, fire damage and agricultural chemical drift.
Disease			
Dieback caused by plant pathogens	potential	future	Dieback, in this case believed to be caused by the plant pathogen *Phytophthora megasperma*, occurs in the immediate vicinity of Population 2. This plant pathogen causes the roots to rot and results in death from drought stress. It is suspected that split-leaved grevillea is susceptible to this pathogen. Even if not susceptible (some Grevilleas are not susceptible to *Phytophthora* spp.), the Banksia woodland habitat that occurs at this site is characteristically highly susceptible. Changes in the structure of the habitat caused by dieback, e.g. opening up of the canopy, may then impact on the split-leaved grevillea population.
Fire			
Fire frequency	potential	future	Too frequent fires may affect the viability of populations, as split-leaved grevillea resprouts after fire. The reserves of the lignotuber could be exhausted if fires recurred before plants could replenish reserves. However, it is likely that occasional fires would stimulate ramet (clonal sprout) production in this species.

Conservation Actions

Conservation and Management priorities

Invasive species

- Manage sites using appropriate methods such as 1080 baiting in summer to control and reduce the spread of rabbits and foxes, to reduce grazing by rabbits, and soil disturbance by rabbits and foxes. Repeat annually if animals reappear.
- Identify weeds and undertake control in the local area that could to prevent them from becoming a threat to the split-leaved grevillea, using appropriate methods such as hand-weeding and targeted application of herbicide by wicking to avoid disturbance/overspray of the species and surrounding native vegetation.
- Re-vegetate cleared patches surrounding the populations' periphery with local co-occurring species to provide a buffer against weed seeds being blown into the populations.

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, and manage total grazing pressure at important sites through exclusion fencing or other barriers.
- Develop and implement a livestock management plan to limit the impact of sheep in roadside verges and travelling stock routes. Distribute this information to drovers and graziers in the area to increase awareness of the species' requirements.

Lack of genetic diversity - Breeding, propagation and other ex situ recovery action

- Make further collections of seeds and cuttings from Population 2.
- Collect cuttings from Population 1, which is clonal and produces no seed, to maximise genetic material available for translocation.
- Conduct trials of tissue culture and cryostorage.

Habitat loss disturbance and modifications

- Protect the species from further loss of habitat as a result of transport corridor upgrades, changes in land use, mineral exploration, etc.
- Prevent habitat disturbance. Control access routes by installing and locking gates to suitably constrain stock and vehicle access in Population 1 to prevent grazing and soil disturbance, and vehicle and public access in Population 2 to prevent spread of dieback disease.
- Ensure land managers are aware of the species' occurrence and provide protection measures against key and potential threats, including grazing, fire damage, agricultural chemical drift and spread of dieback disease.
- Maintain Declared Rare Flora (DRF) markers[1] at Population 1. Continue producing and distributing dashboard stickers and posters that illustrate DRF markers, inform of their purpose and provide a contact telephone number to use if such a marker is encountered.

[1] DRF markers are used in Western Australia and are two standardised yellow markers at either end of a site, which are bent to face towards each other, indicating that DRF plants may occur anywhere between the markers, from the road's running surface to the fence. They alert people working in the vicinity to the presence of DRF, and the need to avoid work that may damage vegetation in the area (DEC 2013).

Disease

- *Phytophthora megasperma* is known to occur very close to Population 2. Map and monitor the dieback front at least every five years in summer and replace marker flags regularly.
- Implement suitable hygiene protocols to protect known populations from any outbreaks of *Phytophthora megasperma* (DPaW 2014). These should be adhered to for activities such as installation and maintenance of firebreaks and walking into the population in wet soil conditions.

Fire

- Implement an appropriate fire management regime involving fire frequencies that promote persistence of established plants and opportunities for vegetative or seedling recruitment.
- Any use of prescribed or experimental fires must be justified, in an adaptive management framework involving objectives of both learning and management. Prescribed fire operations should be integrated into an experimental design and a monitoring program.
- Provide maps of known occurrences to local and state Rural Fire Services and seek inclusion of mitigation measures in bush fire risk management plan/s, risk register and/or operation maps.

Stakeholder Engagement

- Continue liaising with land managers and owners of land occupied by, or adjacent to, populations, to ensure plants are not accidentally damaged or destroyed.
- Continue awareness-raising with the community to promote the importance of biodiversity conservation and the need for the long-term protection of wild populations of the split-leaved grevillea, through poster displays and local print and electronic media.
- Encourage formal links with the community, local naturalist groups and interested individuals.

Survey and Monitoring priorities

- Continue monitoring the progress of recovery, including the effectiveness of management actions and the need to adapt them if necessary.
- Support and enhance annual monitoring of factors such as habitat degradation (including weed invasion, plant diseases such as *Phytophthora* spp., grazing), population stability (expansion or decline), pollination activity, seed production, recruitment and longevity.
- Undertake survey work during the species' flowering period (August to early November) in suitable habitat and potential habitat to locate any additional populations/occurrences/remnants. Searches for the species and for possible translocation sites should be focused on both habitats described above under Relevant Biology/Ecology, as both appear suitable for the species.
- Where the public is involved in citizen science monitoring, determine whether these data are suitable for tracking the status of populations, or whether the methods could be adapted to generate more useful data.

Information and research priorities

- Investigate options for linking, enhancing or establishing additional populations.
- Continue seed germination and vegetative propagation trials to determine the requirements for successful establishment.

- Research the effects of public access where this is likely and the effects are unknown, particularly on the nature reserve near Bullsbrook.

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