The Minister's delegate approved this Conservation Advice on 15/07/2016.

Conservation Advice

Zieria formosa

shapely zieria

Conservation Status

Zieria formosa (shapely zieria) 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). This species is also listed as Critically Endangered under the NSW *Threatened Species Conservation Act 1995*.

The main factors that are the cause of the species being eligible for listing in the Endangered category are its very low number of mature individuals and its restricted geographic distribution being precarious for its survival.

Description

The shapely zieria is a densely branched, rounded shrub that grows to two metres tall. Its trifoliate leaves (compound leaves having three leaflets) in are in opposite pairs along the branchlets. Both surfaces of the leaves are covered in a dense, velvety layer of hair, giving the leaves a silvery appearance. Flowers are pale pink and are arranged in large clusters of 26 to 45 flowers. Flowering occurs in September to October. Fruit develops quickly and the majority of seed is shed by December (NSW NPWS, 2002).

The shapely zieria is closely related to the Box Range zieria (*Z. buxijugum*), from which it is distinguished by the presence of small terminal appendages on its anthers and its wider leaflets (3 mm - 5 mm wide compared to 2 mm - 3 mm wide in the Box Range zieria) (NSW SC, 2008). The velvety coverage on the upper surface of its leaves distinguish it from *Z. parrisiae* (Parris' zieria) and *Z. tuberculata* (NSW SC, 2008) which occur in the same area.

Distribution and Abundance

The shapely zieria is a New South Wales endemic that occurs 6 km south-west of Pambula in the South East Corner IBRA bioregion. It is known from one population that extends across three private properties zoned for rural residential use (NSW SC, 2008) in the vicinity of Lochiel (NSW NPWS, 2002). The species' Extent of Occurrence and Area of Occupancy are each estimated at 4 km^2 (NSW SC, 2009), although the population only occurs over an area of 1 hectare (NSW NPWS, 2002).

In 2002, the species had a total population of 38 mature plants and 700 seedlings (NSW SC, 2009). It is unknown how many of the seedlings established: monitoring occurred at the site until 2005, but data from the program are unavailable (Briggs, 2011, pers., comm., cited in DSEWPaC, 2011). In 2016, abundance was reported as 100 plants (OEH, 2016).

Some plantings of the species from cuttings and seedlings have occurred at the site (Sullivan, 2008, cited in DSEWPaC, 2011); however, the number of shapely zieria planted and their distance from existing plants is unknown. Landowners have also contributed to the recovery of the species through habitat restoration (planting Australian native species and creating rock gardens) and weed management (Sullivan, 2008, cited in DSEWPaC, 2011).

Relevant Biology and Ecology

The shapely zieria occurs on the north-east aspect of the upper, moderately steep slope of a 'break-away' area above a small valley. It occurs mainly in full sun (NSW NPWS, 2002). Soil at

the site is a skeletal, grey, sandy loam. The site is strewn with broken ignimbrite rocks and boulders and there is much exposed surface rock (NSW NPWS, 2002). Ignimbrite is a fine grained acidic rock formed from volcanic ash (Anderson, 2002).

The species occurs in southern montane heathland (OEH, 2012b). Associated mid-storey species include *Acacia mearnsii* (black wattle), *Androcalva fraseri* (native hemp), *Dodonaea triquetra* (large-leaf hop-bush), *Prostanthera nivea* (snowy mint-bush), *Pittosporum undulatum* (sweet pittosporum), *Kunzea ambigua* (white kunzea) and *Leptospermum flavescens* (yellow tea-tree) (NSW NPWS, 2002). Associated ground cover species include *Stypandra glauca* (nodding blue lily), *Plectranthus parviflorus* (cockspur flower), *Dendrobium speciosum* (king orchid), *Cheilanthes tenuifolia* (rock fern), *Platysace lanceolata* (shrubby platysace) and *Hymenanthera dentata* (tree violet) (NSW NPWS, 2002). Most of the surrounding vegetation in the area has been cleared and sown to pasture (Armstrong, 2002).

The shapely zieria's generation length is estimated at 12 to 22 years (NSW SC, 2008). It is thought to be pollinated by insects such as bees, hover flies and blowflies (NSW NPWS, 2002).

Drought can cause plant mortality: in 1987, there were 125 mature individuals (Briggs and Leigh, 1990, cited in NSW NPWS, 2002), two-thirds of which died during drought from 1997 to 1998 (Anderson, 2002). Plant stress was also observed during drought in 2008 (Sullivan, 2008, cited in DSEWPaC, 2011).

Trials indicate that one hundred percent of seed may germinate after fire (using smoke and gibberellic acid treatment) (Martyn et al., 2009), however, it is unknown whether fire occurred at the site prior to the germination event reported by Anderson (2002).

Threats

Table 1 – Threats impacting the shapely zieria in approximate order of severity of risk, based on available evidence.

Threat factor	Threat type and status	Evidence base
Agriculture		
Change in agriculture practices	potential future	The species occurs on private land. The current owners of the largest portion of the population are supportive of protecting this species; however, future owners of the property may not be as sympathetic to the protection of the species (OEH, 2012a). Change in agriculture practice that leads to clearing of surrounding vegetation may lead to exposure of plants and may increase the possibility of seedling or mature plant death during drought.
Livestock trampling	known past	Trampling of plants was observed at more accessible parts of the site in the 1990s, however, stock were excluded prior to 2002 (Armstrong, 2002).
Pollution		
Run-off	potential current	Run-off from adjoining farmland has increased natural inputs of nutrients and sediment to the site. Run-off is also a source of weeds to the site.
Invasive species		
Weeds	known current	Exotic herbs and grasses are established locally at the site and may threaten the species (OEH, 2012a). Where the species occurs, weeds have established on less rocky areas adjacent to pasture (Armstrong, 2002).
Rabbits	potential current	The species may be relatively unpalatable, however, low severity browsing of seedlings has been observed (OEH, 2012a).

Problematic native species		
Wallabies	potential current	The species may be relatively unpalatable, however, low severity browsing of seedlings has been observed (OEH, 2012a).
Fire		
Fire frequency	potential current	Too frequent fire (i.e. more than once every 20 years) that doesn't allow plants to sexually mature (and replenish the seed bank) may cause local extinction, however, in the absence of data on this species, evidence relies on knowledge of species with similar life histories to demonstrate the potential impact.

Conservation Actions

Conservation and Management Priorities

Stakeholder Engagement

- Maintain communication between landowners and NSW government staff and/or Mount Annan Botanic Gardens staff.
- Prepare a management strategy to ensure that current and future landowners (including land managers of adjacent properties) are able to participate in the recovery of the species and are aware of actions that may impact the species. The strategy should aim to minimise habitat exposure to pollution (drainage and runoff), minimise land clearing that may increase drying of the site and promote the long term needs of the species.
- Encourage landowners to register the areas where the species occurs as Wildlife Refuges or entering into a Property Agreement under the provisions of the *Native Vegetation Act 2003* (NSW). Long-term protection of these sites could be achieved through Voluntary Conservation Agreements between the landowners and the NSW government (NSW NPWS, 2002).

Breeding, propagation and other ex situ recovery action

- Investigate options for establishing additional populations. Relevant policies should be referred to for guidance for undertaking translocations (e.g. Vallee et al., 2004; Weeks et al., 2011).
- In 2006, seed was collected by staff at Mount Annan Botanic Gardens for the Bicentennial Seed Bank (Sullivan, 2008, cited in DSEWPaC, 2011). The species has been propagated at botanic gardens in Canberra and Mount Annan. Seed collections and propagated populations should be maintained (OEH, 2016) for potential supplementation of populations or to preserve genetic material if a significant mortality event occurred.

Invasive species and problematic native species

- Evaluate the impacts of grazing on the species. If assessed as a severe threat, construct wallaby and rabbit-proof fencing around juveniles (OEH, 2012a).
- Determine if any of the weeds at the site are impacting the species or are a risk of impacting the species in the future. Implement appropriate weed control measures if deemed necessary and, if herbicide applications is considered, avoid possible disturbance/overspray threats associated with the control method.

Impacts of domestic species

- Livestock is excluded from the site (Anderson, 2002). Ensure that this exclusion continues, particularly if the landowner changes.

Fire

- Fires must be managed to ensure that prevailing fire regimes: do not disrupt the life cycle of the species; do not degrade the species habitat; and do not promote invasion of exotic species.
- Identify the range of variation in d fire frequency that promotes persistence of the species and apply this knowledge to intervals between prescribed fire events (if such fires are deemed necessary). In relation to hazard reduction burning, the NSW Rural Fire Service recommends a fire frequency of no more than once every 20 years (NSW RFS, 2013).
- Fire management authorities and land management agencies should use suitable maps and install field markers to avoid damage to the species. Land managers should be given information about managing fire for the benefit of the species.
- As an obligate seeding shrub, the following principles should be adhered in the fire management of this species:
    - Ensure that fires do not occur within populations before an accumulation of a seedbank large enough to replace* the number of fire-killed standing plants [*replacement should incorporate expected post-fire rates of seedling survival].
    - Ensure that fires do not occur in winter or spring, avoiding the exposure of sub-mature seedling recruits to desiccating conditions.
    - Physical damage to the habitat and individuals of the species must be avoided during and after fire operations. The NSW Rural Fire Service recommends no slashing more frequently than once every 10 years near the species, and no trittering or tree removal near the species (NSW RFS, 2003, 2013).
    - Fire management should be accompanied by a carefully planned weed management strategy to control weeds that are encouraged by burning, and post-fire monitoring should occur.

Survey and Monitoring Priorities

- Regularly monitor the species abundance, extent and condition on the site to determine population trends through time. Monitor the extent and severity of threats (weed invasion and pollution (nutrient and sediment runoff)) to assess the effectiveness of management actions. Adapt, add or remove management actions in response to monitoring results to maximise the effectiveness of conservation measures (OEH, 2016).
- Monitor the size and structure and reproductive status of populations at different stages in the fire cycle, taking opportunities to monitor after planned and unplanned fires (where they occur) and improve understanding of the fire response of the species.
- Precise fire history records must be kept for the habitat and extant populations (confirmed and suspected) of the species.
- Undertake surveys in suitable habitat. Although extensive searches for the species have been conducted in similar habitat in the region (NSW NPWS, 2002; expert advice, n.d., cited in NSW SC, 2008), further surveys should not be discouraged.

Information and Research Priorities

- Improve understanding of the mechanisms of response to different fire regimes and identify appropriate fire regimes for conservation of the species by undertaking appropriately designed experiments in the field and/or laboratory. Where appropriate, use understanding

and research on fire responses among related (e.g. congeneric) or functionally similar species to develop fire management strategies for conservation.

- Undertake research into the following topics and, using the findings, adapt management actions as necessary:
  - determine seedling survival, plant longevity and the species juvenile period (NSW NPWS, 1998).
  - flowering and pollination (NSW NPWS, 1998), seed production and pre-dispersal seed losses (Martyn et al., 2009).
  - seed bank dynamics, particularly the time required to establish an adequate seed bank and the effect of different disturbance regimes on the seed bank (NSW NPWS, 1998).
  - mortality rates, particularly of seedlings after a germination event (NSW NPWS, 1998).
  - response to physical disturbance (NSW NPWS, 1998).

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