The Minister's delegate approved this Conservation Advice on 13/07/2017.

Conservation Advice

Persoonia micranthera

small-flowered snottygobble

Conservation Status

Persoonia micranthera (small-flowered snottygobble) is listed as Endangered under the *Environment Protection and Biodiversity Conservation Act 1999* (Cwlth) (EPBC Act) effective from the 16 July 2000.The species was eligible for listing under the EPBC Act as on 16 July 2000 it was listed as Endangered under Schedule 1 of the preceding Act, the *Endangered Species Protection Act 1992* (Cwlth).

The small-flowered snottygobble is listed as Critically Endangered in Western Australia under the *Wildlife Conservation Act 1950*.

The main factors that are the cause of the species being eligible for listing in the Endangered category are its restricted distribution and rapid decline due to infection by *Phytopthora cinnamomi* and a fire regime more frequent than the species requires to regenerate.

Description

Small-flowered snottygobble is a low growing shrub (between 10 – 40 cm tall). It is described as a distinctive species by Robinson and Coates (1995), easily distinguished by the length of its stamina (the stalks emerging from the flower), which are nearly as long as the petals of the flower (by a ratio of 7/10).

Young small-flowered snottygobble branches are somewhat hairy, with flattened leaves, (4 – 8cm long and 8 – 30 mm wide), with edges that are recurved (curve in) slightly. The leaves are held horizontally, often in clusters of 2 – 5 separated by long stem segments called internodes. The snottygobble produces clusters of 4 –15 yellow flowers. The clusters are between 1– 6 cm long at their longest point. Flowers themselves are are 1–12 cm long, pointed, and moderately hairy outside (Brown et al. 1998).

Distribution

Small-flowered snottygobble is endemic to Western Australia, where it occurs on peaks in the eastern Stirling Range of Stirling Range National Park (SRNP) . Habitat is low dense heath and scrub on a rocky shallow soil over schist (Barrett 1999). In 1999 three populations were known, estimated to hold only three adults and approximately 150 seedlings (Evans et al., 1999). By 2007 updated estimates indicated five populations, two with fewer than 10 mature plants, one with fewer than 100, and two with over 100 individuals (Shearer et al. 2007).

Relevant Biology/Ecology

Small-flowered snottygobble is part of the "Eastern Stirling Range Montane Heath and Thicket" Threatened Ecological Community which is listed as Endangered under the EPBC Act. Associated species include: *Kunzea montana* (mountain kunzea), *Beaufortia anisandra* (dark beaufortia), *Sphenotoma* sp. Stirling range (Stirling range spenotoma), *Andersonia echinocephala* (a shrub), *Darwinia* spp. (mountain bells), *Banksia solandri* (Stirling range banksia), *Banksia brownii* (feather-leaved banksia) and *Banksia concinna* (a shrub, formerly *Dryandra concinna)* (Barrett 1999). Other species of threatened flora that occur in the ecological community are *Dryandra montana* (Stirling range dryandra)*, Sphenotoma drummondii* (mountain paper-heath)*, Leucopogon gnaphalioides* (Stirling range beard heath)*, Deyeuxia drummondii* (drummond's grass) and *Andersonia axilliflora* (giant andersonia) (Barrett 1999).

Although mature small-flowered snottygobble individuals do not survive fire events (Evans et al., 1999), and the species is presumed not to be lignotuberous (Robinson & Coates 1995), the persistence of a soil seed bank after fire has been reported for this species (Barrett & Cochrane 2007), which has been defined as an obligate seeder (Evans et al., 1999). The small-flowered snottygobble flowers between February and March (Evans et al., 1999).

The small-flowered snottygobble has a juvenile period (time to first flowering) of 'more than six years' (see Evans et al., 1999), with observations by Stack and Brown (2000) indicating an approximate 10 year interval between germination and the production of flowers or seed. Stack and Brown (2003) suggest 10 years may be a minimum interval between fires, after a 2002 survey of two populations indicated neither had flowered 11 years after fire. In comparison to growth rates at lower altitudes or in more sheltered areas, growth rates on the exposed summit and plateau areas are extremely slow, particularly for obligate seed regenerating species (Barrett 1996). The length of time required for many species in the ecological community to reach maturity following fire, combined with deaths of juveniles from dieback, suggests a long fire-free interval (at least 12 years, to a maximum interval of 25 years) is required for this ecological community (Barrett 2000; Friend & Williams 1993; Main & Gaull 1993).

Threats

All known populations of the small-flowered snottygobble have been infected with *Phytophthora cinnamomi* (Shearer et. al., 2007). The impact of that threat is exacerbated by a frequency and severity of fire events incompatible with the successful propagation of this long-lived obligate seeder species (Stack & Brown 2003). Human presence in the area (and potentially movement of other species through the landscape) pose a threat mainly insofar as they transport *P. cinnamomi* from infected areas.

Table 1 – Threats impacting the small-flowered snottygobble in approximate order of severity of risk, based on available evidence.

Threat factor	Threat type and status	Evidence base
Disease		
Phytophthora cinnamomi (causing dieback)	known current	All populations of the small-flowered snottygobble are known to have been infested with *P. cinnamomi* (Shearer et. al., 2007), making the mould a major threat to all populations of the species (Stack & Brown 2003; DoEE 2008). The small-flowered snottygobble is moderately to highly susceptible to the pathogen, which kills susceptible plants by invading their root systems and severely reducing their ability to take in water and nutrients (Stack & Brown 2003). Many other species in the Montane Heath and Thicket Community are also affected by the pathogen which spreads through root-to-root contact and through free water flow (Stack & Brown 2003).

Fire		
Too frequent and/or unseasonal burning	known past	Fire events occurred in the eastern Stirling Range in February 1972 and April 1991 (Barrett 2000), and in 2000 (Stack & Brown 2003). All were widespread leaving only small remnants of unburnt vegetation (Barrett 2000) or damaging most populations (Stack & Brown 2003). Because this species is an obligate seeder with a long juvenile period (Evans et. al., 1999), fire occurring as frequently as once in a decade is suspected to adversely affect the species' survival. In addition to the direct threats of frequent fire, field observations suggest that fire in areas where *P. cinnamomi* is already present increases the susceptibility of the vegetation at the site to infection and dieback (S. Barrett pers. comm. in Stack & Brown 2003; DoEE 2008), and may also lead to increased rabbit numbers, based on anecdotal evidence of increased rabbit populations following the 1991 and 2000 fires (DoEE 2008).
Human activities		
Physical disturbance and spread of disease	known past/current	Recreational use (hiking, camping and rock climbing) of the Stirling Range has historically been high (Stack & Brown 2003; DoEE 2008). The most pressing impact of this recreational use is the spread of *P. cinnamomi* via soil transfer on the shoes of visitors to the area (especially where path drainage is not managed and soil is wet) (Stack & Brown 2003). There appears to be evidence to suggest a correlation between accessibility of peaks to recreational users and severity of infection rates (Barrett 2000). Other impacts include informal path formation and path erosion, towards the summit areas of the peaks (Barrett 2000). To a lessor degree, bare-ground occurrences, camp-fire remains, and litter were found to have had minor impacts (Barrett 2000). Citing work by Sprecht (1963), Barrett (2000) noted increases in soil fertility due to the accumulation of phosphate and nitrogen levels in the soil, which was suspected to be due to human excreta. Minor changes in soil fertility could advantage weed and sedge species (Barrett 2000) in what is 'naturally nutrient poor soil' (Stack & Brown 2003).
Local fauna		

Grazing, trampling and spread of disease	known past/current	Grazing by unidentified herbivores was a known threat to some populations in 2003 (Stack & Brown 2003); in an assessment of the Eastern Stirling Range Montane Heath and Thicket Community within which the small-flowered snottygobble persists, DoEE (2008) note widespread evidence of grazing by rabbits and possibly *Setonix brachyurus* (quokka) impacting health and regeneration of the small-flowered snottygobble. There was also a potential but small threat from trampling by fauna (Evans et al., 1999), and a potential risk that mobile, ground-dwelling species could act as vectors in the spread of *P. cinnamomi.*

Conservation Actions

Conservation and Management priorities

Disease

- Implement a P. cinnamomi management plan to ensure that the fungus is not introduced into locations of the threatened species and that the spread in areas outside of, but adjacent to population is mitigated (DoE 2014).
- Ensure that appropriate hygiene protocols are adhered to when entering or exiting the known location of the threatened species, such as those outlined in Podger et al. (2001).
- Implement a hygiene management plan and risk assessment to protect known populations from further outbreaks of P. cinnamomi. This may include but is not limited to:
    - Contaminated water is not used for firefighting purposes,
    - Contaminated soil is not introduced into the area as part of restoration, translocation, infrastructure development or revegetation activities,
    - Ensure that areas where the threatened species is known to occur that are *P. cinnamomi* free are sign posted and hygiene stations are implemented and maintained.
- Implement mitigation measures in areas that are known to be infected by *P. cinnamomi*, this may include but is not limited to;
    - Application of phosphite (H_3PO_3), noting the potential deleterious effects as a fertiliser with prolonged usage.

Fire

- Fires must be managed to ensure that prevailing fire regimes do not disrupt the life cycle of the small-flowered snottygobble that they support rather than degrade the habitat necessary to the species, that they do not promote invasion of exotic species, and that they do not increase impacts of grazing.
- Fire management authorities and land management agencies should use suitable maps and install field markers to avoid damage to the small-flowered snottygobble.

- 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 (i.e maintain a fire interval of above 10 years). 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 over summer.
- Ensure that intervals between successive fires take into account the longevity of the standing plant population.
- Ensure that fires are sufficiently intense to trigger complete seed release from the serotinous fruits (i.e. by ensuring canopy combustion).

Prescribed Burning

- Prescribed burning, and out-of-control fires resulting from prescribed burning, are a particular threat to threatened plant species in the Stirling Ranges. Prescribed burning that occurs within the Stirling Ranges which are designed to reduce fuel loads must:
    - consider the potential deleterious impacts on threatened species.
    - evaluate the risk posed to the threatened species using an appropriate risk management framework such as the international standard ISO 31000 for risk management.
    - only be undertaken in circumstances where the prescribed burn is controllable.
- If a prescribed burn is carried out, an on-ground assessment after the burn should assess the impact on the threatened species. The information from this assessment should be made available to inform the assessment of risk to threatened species of future burns designed to reduce fuel loads.
- If a prescribed burn has been undertaken all efforts must be made to prevent a subsequent fire from impacting the threatened species until the species has recovered sufficiently to ensure its ongoing regenerative capability.

Human activities

- Assessment, monitoring and regulation of visitor access to areas where small-flowered snottygobble populations persist may be necessary to ensure populations are not compromised by human activity (e.g. hiking, camping and rock climbing), which may assist the spread of *P. cinnamomi*. Consider fencing, signage or other means to limit thoroughfare by hikers and tourists in key areas of the range.

Local fauna

- Where there is evidence of grazing effects, or, *P. cinnamomi* has been eradicated from a site, consider fencing to prevent further impacts by local fauna, including reinfection of the population through transported soil.

Ex situ Strategies

- In 2003, the Botanic Garden and Parks Authority had 40 plants of small-flowered snottygobble plants that were propagated from 11 clones (tissue culture was unsuccessful) Continued propagation of healthy plants ex situ is especially important until there is a Phytophthora free population.

- Efforts to obtain viable, disease-free seed for a seed orchard or ex situ propagation should only be conducted where the portion of seed removed would not adversely impact on the survival of the population.

Translocation

- Using habitat suitability modelling as guidance, identify suitable sites for the establishment of additional populations in the wild and for linking existing populations. Relevant policies should be referred to for guidance for undertaking translocations (e.g. Vallee et al. 2004).
- Translocation activities should aim to restock existing populations or establish a seed orchard outside the Stirling Range; where suitable sites are available in which *P. cinnamomi* has dissipated, consider establishing new wild populations.

Stakeholder Engagement

- Relevant stakeholders include visitors the Stirling Range National Park, whether for recreational or research/professional purposes. Formal links with local naturalist groups and interested individuals should be encouraged.
- All visitors should be informed by every practical means of the risk of damage to plants, especially via the transmission of infected soil to populations, and how to prevent inadvertent damage to the ecological communities in the Stirling Range.

Survey and Monitoring priorities

- Continue to assess population size, distribution, ecological requirements, the relative impacts of root-rot disease, and impacts as a result of human visitation.
- Design and implement a monitoring program that particularly assesses propagation of juveniles and the presence of *P. cinnamomi*.
- Monitor the progress of recovery, especially from root-rot disease, and consider the need to adapt management actions if necessary.
- 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.
- Monitor the response of the ecological community to fire, using an appropriate measure (species composition, populations of key species, etc.) based on knowledge of the ecology of the community, and with a monitoring design that aims to improve understanding of the species' response to fire.
- Precise fire history records must be kept for the habitat and extant populations (confirmed and suspected) of the small-flowered snottygobble.
- Implement an annual census to monitor emergence and resprouting success.

Information and research priorities

- Management of the species would be further improved by a more comprehensive understanding of the following elements of ecology and biology:
  - Pollination: The pollination biology of the species, the requirements of pollinators, and an understanding of threats that may be impacting the pollinator community.
  - Recruitment: Including soil seed bank dynamics and the role of various disturbances (including fire), competition, rainfall and grazing in germination. Undertake seed

germination and/or vegetative propagation trials to determine the requirements for successful establishment.

  - Phenology: seasonal growth of the species and the appropriate timing of seasonal events including fire.
  - Fire: Improve understanding of the mechanisms of response to different fire regimes and identify optimal fire regimes for regeneration (vegetative regrowth and/or seed germination). Where appropriate, use understanding and research on fire responses among related (e.g. congeneric) or functionally similar species/ECs to develop fire management strategies for conservation.
  - Genetics: Genetic structure, levels of genetic diversity and minimum viable population size, to provide a baseline for understanding the species diversity across populations and minimum viable population for survival.

- Establish the role of humans and native or introduced species as potential vectors for the introduction of *P. cinnamomi*, and, where a species is identified as a vector, develop actions (such as fencing) to mitigate the risk of further infection.
- Assess the impact of other minor threats such as trampling and soil nitrification.

References cited in the advice

Barrett S and Cochrane A (2007) Population demography and seed bank dynamics of the threatened obligate seeding shrub *Grevillea maxwellii* McGill (Proteaceae). *Journal of the Royal Society of Western Australia* 90, 165 – 174

Barrett S (2000) *Montane Heath and Thicket of the South West Botanical Province, above approximately 900 m above sea level (Eastern Stirling Range Montane Heath and Thicket Community) Interim Recovery Plan* 1999 – 2002. Department of Conservation and Land Management, Western Australia

Barrett S (1999) *Eastern Stirling Range Montane Heath and Thicket Community, Interim Recovery Plan*. Department of Conservation and Land Management, Western Australia, unpublished report.

Brown A, Thomson-Dans C and Marchant N (Eds). (1998) *Western Australia's Threatened Flora.* Department of Conservation and Land Management, Western Australia

Department of Environment and Energy (DoEE) (2008) Eastern Stirling range montane heath and thicket community, Department of Environment and Energy,

Available from:

https://www.environment.gov.au/system/files/resources/8ced731e-22ff-42ee-8615-297ec09a9552/files/cs03-eastern-stirling-range-community.pdf

Evans R, Barrett S and Brown A (1999) *Small-flowered snottygobble* (Persoonia micranthera) *Interim Recovery Plan* 1999 – 2002. Department of Conservation and Land Management. Available from:

http://www.environment.gov.au/biodiversity/threatened/publications/recovery/p-micranthera/index.html.

Podger FD, James SH, & Mulcahly MJ. (2001).Phytophthora Cinnamomi and Disease Caused By It- A protocol for identifying 'Protectable Areas' and their priority for management. Draft report prepared for Department of Parks and Wildlife. Available from https://www.dpaw.wa.gov.au/images/documents/conservation-management/pests-diseases/disease-risk-areas/Protecting_the_Protectable_and_Protocols_for_Defining_Protectable_Areas.pdf

Robinson CJ and Coates DJ (1995) *Declared Rare and Poorly Known Flora in the Albany District.* Western Australian Wildlife Management Program No. 20. Department of Conservation and Land Management, Western Australia.

Shearer BL, Crane CE, Barrett S and Cochrane A (2007) *Phytophthora cinnamomi* invasion, a major threatening process to conservation of flora diversity in the South-west Botanical Province of Western Australia. *Australian Journal of Botany* 55, 225 – 238

Specht, RL (1963) Dark Island Heath (Ninety-Mile Plain, South Australia) VIII. The effect of fertilisers on composition and growth, 1950 – 60, *Australian Journal of Botany* 11, 67 – 94.

Stack G and Brown A (2003) *Small-flowered snottygobble* (Persoonia micranthera) *interim recovery plan* 2003 – 2008, Department of Conservation and Land Management

Vallee L, Hogbin T, Monks L, Makinson B, Matthes B & Rossetto M. (2004). Guidelines for the translocation of threatened plants in Australia - Second Edition. Canberra, ACT: Australian Network for Plant Conservation.

Other sources cited in the advice

Barrett, Sarah (1999) Personal communication, 1999, Rare Flora Officer, Department of Conservation and Land Management Albany Work Centre cited in Evans, R., S. Barrett & A. Brown (1999). Small-flowered Snottygobble (Persoonia micranthera) Interim Recovery Plan 1999-2002, WA CALM.