Interim Recovery Plan No. 390

Gastrolobium vestitum

Interim Recovery Plan

Department of Biodiversity, Conservation and Attractions, Western Australia

April 2020
List of Acronyms

The following acronyms are used in this plan:

ADTFCRT  Albany District Threatened Flora and Communities Recovery Team
BGPA     Botanic Gardens and Parks Authority
CALM     Department of Conservation and Land Management
CFF      Conservation of Flora and Fauna
CITES    Convention on International Trade in Endangered Species
CPC      Conservation and Parks Commission
CR       Critically Endangered
DBCA     Department of Biodiversity, Conservation and Attractions
DPaW     Department of Parks and Wildlife
DPLH     Department of Planning, Lands and Heritage
EM       Ectomycorrhizal
EN       Endangered
EPBC Act Environment Protection and Biodiversity Conservation Act
IBRA     Interim Biogeographic Regionalisation for Australia
IRP      Interim Recovery Plan
IUCN     International Union for Conservation of Nature
Mt       Mount
NRM      Natural Resource Management
PEC      Priority Ecological Community
PICA     Public Information and Corporate Affairs
SCP      Species and Communities Program
SRNP     Stirling Range National Park
SWALSC   South West Aboriginal Land and Sea Council
TEC      Threatened Ecological Community
TFSC     Threatened Flora Seed Collection
TPFL     Threatened and Priority Flora database
UNEP-WCMC United Nations Environment Program World Conservation Monitoring Centre
VU       Vulnerable
WA       Western Australia
Interim Recovery Plan for *Gastrolobium vestitum*

Foreword

Interim recovery plans (IRPs) are developed under Section 105 of the *Biodiversity Conservation Act 2016* and within the framework laid down in Department of Biodiversity, Conservation and Attractions (DBCA) *Corporate Policy Statement No. 35* (DPaW 2015a) and *DBCA Corporate Guideline No. 35* (DPaW 2015b). In the absence of sufficient scientific information to prepare a recovery plan (RP), an IRP makes provision for the conservation, protection and management of a threatened species or ecological community in order to stop its decline and support its recovery, so that its chances of long-term survival in the wild are maximised. An IRP outlines the recovery actions that are required to address those threatening processes most affecting the ongoing survival of the threatened species or ecological community, and begin the recovery process.

DBCA is committed to ensuring that threatened species and ecological communities are conserved through the preparation and implementation of Recovery Plans (RPs) or Interim Recovery Plans (IRPs), and by ensuring that urgent conservation actions commence as soon as possible. A collaborative approach is taken towards the implementation of RPs and IRPs – DBCA works with government departments, other government bodies, research institutions, companies, individuals and other relevant organisations that are identified in a plan as stakeholders. Under Sections 103 and 113 of the *Biodiversity Conservation Act 2016*, public authorities must have regard to RPs and IRPs when performing functions that relate to matters dealt with in a plan.

This plan will operate from April 2020 and will remain in force until withdrawn or replaced. If *Gastrolobium vestitum* is still listed as threatened flora in Western Australia following five years of implementation, this plan will be reviewed and the need for further recovery actions assessed.

Notice of this plan was published in the *Western Australian Government Gazette*. The plan was given regional endorsement on 28 January 2020 and was approved by the Executive Director of Biodiversity and Conservation Science on 31 January 2020. Consultation with the Conservation and Parks Commission occurred on 14 February 2020, and the plan was available for public consultation from 19 February to 18 March 2020. The Director General of DBCA approved the plan on 30 April 2020. The attainment of objectives and the provision of funds identified in this plan are subject to budgetary and other constraints affecting the parties involved, as well as the need to address other priorities.

Approved IRPs are subject to amendment where deemed necessary by the Director General. Information in this plan was accurate at January 2020.

**Plan preparation.** This plan was prepared by:

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**Acknowledgments.** The following people provided assistance and advice in the preparation of this plan:

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Emeritus Professor, Australian National University

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Consultant Botanist and member of Albany District Threatened Flora and Communities Recovery Team

Amanda Shade  
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Thanks also to the staff of the Western Australian Herbarium for providing access to Herbarium databases and specimen information, and other DBCA staff for assistance in developing this plan.

Cover photograph by Sarah Barrett.

**Citation.** This plan should be cited as:

Summary

**Scientific name:** Gastrolobium vestitum  
**Common name:** None  
**Family:** Fabaceae  
**Flowering period:** September – October  
**DBCA region:** South Coast  
**DBCA district:** Albany

**Shire:** Gnowangerup  
**NRM region:** South Coast  
**IBRA region:** Esperance Plains  
**IBRA subregion:** Fitzgerald ESP01  
**Recovery team:** Albany District Threatened Flora and Communities Recovery Team (ADTFCRT)

**Distribution and habitat:** Gastrolobium vestitum is restricted to skeletal sandy clay loam over sandstone and quartzite on summits and mid-slopes in the Stirling Range National Park in shrubland and open scrub communities.

**Habitat important for the survival of the species, and important subpopulations:** All known habitat for wild subpopulations is considered to be important for the survival of the species, and all subpopulations are considered to be important for the long-term survival of the species. Habitat important for the survival of G. vestitum includes the area of occupancy of subpopulations, areas of similar habitat surrounding and linking subpopulations (these providing potential habitat for subpopulation expansion and for pollinators), additional occurrences of similar habitat that may contain undiscovered subpopulations of the species or be suitable for future translocations, and the local surface hydrology or drainage that maintains the habitat of the species.

**Conservation status:** Gastrolobium vestitum was originally listed as specially protected under the Western Australian Wildlife Conservation Act 1950 on 17 August 2010 and ranked as Endangered. This Act has now been superseded by the Biodiversity Conservation Act 2016. In January 2018, the species’ ranking was reviewed and changed to Critically Endangered (CR) in Western Australia under International Union for Conservation of Nature (IUCN) 2001 Red List criteria B1ab(iii,v)+2ab(iii,v) due to: its extent of occurrence is estimated to be less than 100 km²; area of occupancy less than 10 km²; and an observed, inferred or projected continuing decline in the area, extent and/or quality of habitat and the number of mature individuals. Gastrolobium vestitum was listed as Critically Endangered (CR) under the Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) on 11 May 2018.

**Threats:** The threats to the species are Phytophthora dieback, recreational impacts, too-frequent fire, drought and browsing by herbivores.

**Existing recovery actions:** DBCA has been overseeing the implementation of recovery actions for Gastrolobium vestitum. The established Albany District Threatened Flora and Communities Recovery Team (ADTFCRT) assists with the co-ordination of recovery actions. The following recovery actions have been or are currently being implemented, and have been considered in the preparation of this plan:

1. Surveys of six mountain peaks in the Stirling Range National Park were conducted between 1994 and 1996 during the ‘Biological Survey of Mountains of Southern Western Australia’ project.
2. A study investigating the role of pollinators and ecology in speciation was initiated by Cook et al. in 2015.
3. An investigation into the fungal mycorrhizal species associated with increased plant growth was completed by Celeste Linde for Gastrolobium vestitum in 2009.
4. Tree guards were placed around Gastrolobium vestitum seedlings at Subpopulation 1a to protect the seedlings from trampling.
5. Laying of brush and installation of directional and ‘Let it Grow’ signs was undertaken at Subpopulation 1a where track braiding has occurred to delineate the correct path for walkers to use.
6. Seed was collected from Subpopulations 1a and 2 in 2003 and 2010 and is currently stored at –20°C in the department’s Threatened Flora Seed Collection (TFSC) at the WA Seed Centre.
7. Stirling Range National Park rangers are aware of the threatened status of *Gastrolobium vestitum* and where it occurs in the park.

**Plan objectives:** The objectives of this plan are to abate identified threats and maintain or enhance extant subpopulations and their habitat to ensure the long-term conservation of the species in the wild.

**Performance criteria**

**Criteria for success**  
The objectives of this plan will have been achieved if one or more of the following take place over the term of the plan:
- There is no reduction in the extent of occurrence, and the number of mature individuals within known subpopulations has increased by >10%; or
- New subpopulations have been found, increasing the number of extant subpopulations from two to three or more with no net loss of mature individuals; or
- The area of occupied habitat has increased by >10% with no net loss of mature individuals.

**Criteria for failure**  
The objectives of this plan will not have been achieved if one or more of the following take place over the term of the plan:
- Any subpopulation has been lost; or
- The number of mature individuals has decreased by >10%; or
- The area of occupied habitat has decreased by >10% with a net loss of mature individuals.

**Recovery actions**

1. Monitor subpopulations  
2. Assess the need for phosphite and apply if necessary  
3. Maintain disease hygiene  
4. Implement actions to reduce recreational impacts  
5. Implement fire exclusion for both subpopulations  
6. Continue to protect seedlings from trampling and potentially browsing where necessary  
7. Collect and store seed  
8. Undertake surveys  
9. Acquire biological and ecological knowledge  
10. Consider the development of a translocation proposal  
11. Liaise with Stirling Range National Park staff and Aboriginal communities  
12. Promote awareness  
13. Map habitat important for the survival of *Gastrolobium vestitum*  
14. Review this plan and evaluate its performance
1. Background

History

The earliest known collection of *Gastrolobium vestitum* was made from the ‘Stirling Range’ in 1881 by J. Forrest. Since then, a number of surveys have occurred within the Stirling Range National Park (SRNP), including during the Biological Survey of Mountains in the South West from 1994 to 1996 (Barrett 1996), but no new subpopulations have been found until 2006, when Subpopulation 1b was located. The species was described by Karel Domin in 1923 as *Nemcia vestita* from specimens collected in the Stirling Range, east of Mt Toolbrunup (Domin 1923). Chandler *et al.* (2002) then published a monograph of *Gastrolobium* in which they synonymised *Nemcia* under *Gastrolobium* and as a result, changed the generic and specific epithets of *Nemcia vestita* to *G. vestitum*.

*Gastrolobium vestitum* is only known from two subpopulations, currently consisting of approximately 250 mature individuals and 90 juveniles and seedlings (inter-fire recruits) following a bushfire that impacted all populations in late December 2019 (Tables 1 and 2). Populations are threatened by Phytophthora dieback, recreational impacts, browsing by herbivores, too frequent fire and drought.

Description

*Gastrolobium vestitum* is an upright shrub to one to three metres tall, with thick branches and dark grey-green leaves. The leaves are opposite with strongly recurved margins, elliptic to rhombic in shape and 3 to 4.5 cm long and 2.5 to 3.5 cm wide. The underside of the leaf is covered in soft hairs. The inflorescences are axillary and contain four yellow-red flowers (Chandler *et al.* 2002). Flowering occurs in September and October (Western Australian Herbarium 1998).

*Gastrolobium vestitum* is similar to *G. luteifolium*, *G. leakeanum*, *G. mondurup* and *G. rubrum* but differs from all these species in its fleshy petals, rhombic leaves, recurved leaf margins and is generally more hairy (Chandler *et al.* 2002).

Illustrations and/or further information


Distribution and habitat

*Gastrolobium vestitum* is endemic to Western Australia where it is restricted to skeletal sand clay loam over sandstone and quartzite on summits and mid-slopes in the SRNP (Tables 1 and 2). Habitat consists of shrubland and open scrub/herbland communities consisting of *Calothamnus montanus*, *Hakea florida*, *Banksia formosa*, *Kunzea montana*, *Lasiopetalum dielsii* (Priority 2), *Acacia veronica* (Priority 3)
Platysace sp. Stirling (J.M. Fox 88/262) (Priority 4), Velleia foliosa, Stypandra glauca, Xerochrysum macranthum, Billardiera drummondii and Actinotus rhomboideus (Priority 4). The extent of occurrence for extant subpopulations is 8 km² and the area of occupancy is estimated to be 8 km² using the IUCN 2 x 2 km grid method.

### Table 1. Summary of subpopulation land vesting, purpose and manager

<table>
<thead>
<tr>
<th>TPFL subpopulation number &amp; location</th>
<th>DBCA district</th>
<th>Shire</th>
<th>Vesting</th>
<th>Purpose</th>
<th>Manager</th>
</tr>
</thead>
<tbody>
<tr>
<td>1a. Mt Toolbrunup</td>
<td>Albany</td>
<td>Gnowangerup</td>
<td>Conservation and Parks Commission (CPC)</td>
<td>National park</td>
<td>DBCA</td>
</tr>
<tr>
<td>1b. Mt Toolbrunup</td>
<td>Albany</td>
<td>Gnowangerup</td>
<td>CPC</td>
<td>National park</td>
<td>DBCA</td>
</tr>
<tr>
<td>2. Mt Hassell</td>
<td>Albany</td>
<td>Gnowangerup</td>
<td>CPC</td>
<td>National park</td>
<td>DBCA</td>
</tr>
</tbody>
</table>

### Biology and ecology

**Gastrolobium vestitum** has a juvenile period of approximately four to five years and is likely to be bird-pollinated. Plants of *G. vestitum* have significantly lower seed set : ovule ratios compared to other *Gastrolobium* species, which may result from fewer pollinator visits or the delivery of incompatible pollen (Lyn Cook¹, pers. comm).

Plants are killed by fire and regenerate from soil-stored seed. The longevity of soil-stored seeds, and the dynamics of the seed bank, are unknown. Inter-fire recruitment has been observed on the summit of Mt Toolbrunup as old mature plants have died, and a range of plant ages were present at this site compared to more even-aged stands on the slopes. Until the December 2019 bushfire, both subpopulations had last been burnt in 1996 with pockets of the species escaping in rocky summit areas. Inter-fire seedling establishment at 23 years post fire had been observed to be relatively poor. Plant densities had declined with time since fire as plants increased in volume. The maximum age of *G. vestitum* plants is unknown; however, a small number of individuals in rocky summit areas in both subpopulations escaped the 1996 fires and may potentially have been up to 39 years old in 2019.

On 28 December 2019, a bushfire burned a section of the SRNP and has significantly impacted both subpopulations of *G. vestitum*. Satellite imagery and ground surveys indicate that most if not all mature plants in Subpopulations 1b and 2 were killed by the fire, but some 250 mature plants and 90 juveniles and seedlings in Subpopulation 1a escaped fire on the summit of Mt Toolbrunup. Due to the long inter-fire interval following the 1996 fire, it is likely that in 2019 there existed a soil-stored seed bank of sufficient magnitude to potentially enable post-fire regeneration of the subpopulations, provided that other conditions are favourable.

*Gastrolobium vestitum* contains a suite of mycorrhizal associations with at least 11 ectomycorrhizal (EM) associations detected from only 10 individuals on Mt Toolbrunup and Mt Hassell (Linde 2009). As EM diversity plays an important role in plant diversity and performance, it appears that mycorrhizal associations do not pose a limiting factor for the growth of the species (Linde 2009).

*Gastrolobium vestitum* occurs on skeletal soils on summits and ridges with deeper soils present in gullies. Plants of shallow-soil endemics often possess a specialised root system that allows them to explore a rocky area and locate cracks in the underlying rock (Poot and Lambers 2008).

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¹ Associate Professor, University of Queensland
**Gastrolobium vestitum** is susceptible to *Phytophthora* dieback (*Phytophthora cinnamomi*) and all habitat is considered to have been long infested with few dieback-susceptible plant species persisting. A quantified risk assessment undertaken by Barrett *et al.* (2008) found *P. cinnamomi* had a direct impact score of 7.1 out of 10 on *G. vestitum* based on shade house inoculation experiments. This, in combination with percentage of habitat infested and other threatening processes, resulted in a ‘High’ extinction risk score of 26.1 out of 36. Root samples taken from a recently-dead individual in Subpopulation 2 on Mt Hassell in 2007 tested positive for *P. cinnamomi*. Ongoing scattered deaths have been observed on the Toolbrunup summit area since 2011, but sampling is required to verify whether disease is the cause of the deaths, as drought and/or age may also be a factor.

**Conservation status**

*Gastrolobium vestitum* was originally listed as specially protected under the Western Australian *Wildlife Conservation Act 1950* on 17 August 2010 and ranked as Endangered. This Act has now been superseded by the *Biodiversity Conservation Act 2016*. In January 2018, the species’ ranking was reviewed and changed to Critically Endangered (CR) in Western Australia under International Union for Conservation of Nature (IUCN) 2001 Red List criteria B1ab(iii,v)+2ab(iii,v) due to: its extent of occurrence is estimated to be less than 100 km²; area of occupancy less than 10 km²; and an observed, inferred or projected continuing decline in the area, extent and/or quality of habitat and the number of mature individuals. *Gastrolobium vestitum* was listed as Critically Endangered (CR) under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) on 11 May 2018.

**Threats**

The following threats to the survival of *Gastrolobium vestitum* have been identified:

- **Phytophthora dieback** (*Phytophthora cinnamomi*). Since 2007, ongoing scattered deaths of *Gastrolobium vestitum* have been observed at Subpopulation 1a. From 2011 onwards, a higher mortality rate was recorded of approximately 2%. Deaths have been most apparent in the summit area of Mt Toolbrunup and further sampling is required to verify that *P. cinnamomi* is causing this mortality. Scattered deaths have also been observed in Subpopulation 2 with *P. cinnamomi* confirmed through samples taken in 2007. The reduced abundance of this species and other susceptible species from the summits, northern ridges and slopes of Mt Toolbrunup and Mt Hassell, where it is assumed that *G. vestitum* would have previously occurred, is likely associated with the higher impact of *P. cinnamomi* in more exposed habitat with higher soil temperatures. The species appears to be persisting in shaded gullies and southern slopes that are less conducive to the pathogen. Habitat composition changes may also impact on the species and its habitat over the long term.

- **Recreational users**. Increased visitation to Mt Toolbrunup has seen a number of new tracks being created within habitat in the summit area, resulting in the compaction and erosion of soil. Observations by Libby Sandiford (Albany District Threatened Flora and Communities Recovery Team, (ADTCFRT)) have also determined that *G. vestitum* germinants have been dislodged or trodden on and tree guards which have been installed for seedling protection have been knocked over. Brushing, signage and directional markers have also been dislodged or removed. Visitors continue to leave the designated path, particularly when descending.

- **Fire**. Fire that occurs too frequently may cause a decline in numbers of individuals, as multiple fires that occur in short succession can kill plants and deplete the soil seed bank. Continued climatic warming and drying is likely to increase fire frequency which, synergistically, increase the risk of
recruitment failure due to repeated fire events and extreme drought stress. On 28 December 2019, a bushfire burned a section of the SRNP and has had a significant impact on all subpopulations of *G. vestitum*. Although the soil may contain a sizable seed bank, successful post-fire regeneration of the subpopulations will depend upon adequate germination, favourable climatic conditions to enable plant survival and recruitment, and protection of plants from recreational users, herbivore browsing and the impacts of *Phytophthora*. If any subpopulation is subjected to further fire within the presumed juvenile period of four to five years, its future viability is likely to be severely compromised by inadequate seed bank size. Given the likely negative impact of a drying climate on the survival, growth and reproductive rates of individuals, a fire-free interval of at least 10 years will probably be necessary to enable adequate seedbank replenishment.

- **Drought.** Continuing drought is a future threat to the species and may cause plant stress and death, particularly where individuals are growing on shallow soil. Drought is also likely to hinder seedling growth and survival.

- **Browsing by herbivores.** Browsing of foliage has not been observed despite previous signs of browsing of other plant species by Quokka (*Setonix brachyurus*) and browsing of a related species (*G. leakeanum*) on Bluff Knoll. Close monitoring of potential browsing and possible protective measures are required for seedlings that germinate post-fire or inter-fire. Observations have also been made of invertebrates (a weevil) grazing leaves of *G. vestitum* seedlings.

The intent of this plan is to provide actions that will mitigate immediate threats to *Gastrolobium vestitum*. Although climate change and drought may have a long-term effect on the species, direct actions to prevent the impact of climate change and drought are beyond the scope of this plan.

### Table 2. Summary of subpopulation information and threats

<table>
<thead>
<tr>
<th>TPFL subpopulation number &amp; location</th>
<th>Land status</th>
<th>Year / no. of individuals</th>
<th>Current condition of:</th>
<th>Recent fire history</th>
<th>Threats</th>
</tr>
</thead>
<tbody>
<tr>
<td>1a. Mt Toolbrunup</td>
<td>National park</td>
<td>1999 ~1,000 (2,000)</td>
<td>Moderate</td>
<td>1996 (BF)</td>
<td>Recreational users, disease, fire, drought, herbivory</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2003 ~5,000</td>
<td>to healthy</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2007 ~5,000</td>
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<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2009 ~5,600</td>
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<tr>
<td></td>
<td></td>
<td>2011 ~5,600 [2% dead]</td>
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<td></td>
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<tr>
<td></td>
<td></td>
<td>2015 ~2,320</td>
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<td></td>
<td></td>
<td>2019 2,000 (30)</td>
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<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2020 ~ 250 (60/30)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1b. Mt Toolbrunup</td>
<td>National park</td>
<td>2006 ~4,000 (100) [10 dead]</td>
<td>Healthy</td>
<td>1996 (BF)</td>
<td>Recreational users, disease, fire, drought, herbivory</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2020 0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Mt Hassell</td>
<td>National park</td>
<td>2000 10 (500)</td>
<td>Moderate</td>
<td>1996 (BF)</td>
<td>Disease, herbivory, fire, drought</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2005 ~5,000</td>
<td>to healthy</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>2007 ~5,000</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>2008 ~5,000</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>2010 ~5,000</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>2011 ~5,000 [2% dead]</td>
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<tr>
<td></td>
<td></td>
<td>2016 ~1,000</td>
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<td></td>
<td></td>
<td>2019 850</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>2020 0</td>
<td></td>
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</tr>
</tbody>
</table>

Note: () = number of juveniles/seedlings. Fire history refers to bushfire (BF) events where details are known or suspected.
Guide for decision-makers

Section 1 provides details of current and possible future threats. Actions that result in any of the following may potentially produce a significant impact on the species:

- Damage or destruction of occupied or potential habitat;
- Alteration of the local surface hydrology or drainage;
- Reduction in subpopulation size;
- A major increase in disturbance in the vicinity of a subpopulation;
- Spread or amplification of dieback disease.

Habitat important for the survival of the species, and important subpopulations

All subpopulations and all known habitat for the subpopulations are considered to be important for the survival of the species. Habitat important for the survival of *G. vestitum* includes the area of occupancy of subpopulations, areas of similar habitat surrounding and linking subpopulations (these providing potential habitat for subpopulation expansion and for pollinators), additional occurrences of similar habitat that may contain undiscovered subpopulations of the species or be suitable for future translocations, and the local surface hydrology or drainage that maintains the habitat of the species.

Benefits to other species or ecological communities

Recovery actions implemented to improve the quality or security of the habitat of *Gastrolobium vestitum* will also protect and improve the habitat of four threatened flora and 11 priority flora species listed in Table 3.

Table 3. Conservation-listed flora species occurring in the vicinity of *Gastrolobium vestitum*

<table>
<thead>
<tr>
<th>Species name</th>
<th>Conservation status (WA)</th>
<th>Conservation status (EPBC Act)</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Hibbertia barrettiae</em></td>
<td>Threatened (CR)</td>
<td>CR</td>
</tr>
<tr>
<td><em>Leucopogon gnaphaloides</em> (likely locally extinct)</td>
<td>Threatened (CR)</td>
<td>EN</td>
</tr>
<tr>
<td><em>Sphenotoma drummondii</em></td>
<td>Threatened (EN)</td>
<td>EN</td>
</tr>
<tr>
<td><em>Deyeuxia drummondii</em></td>
<td>Threatened (VU)</td>
<td>EN</td>
</tr>
<tr>
<td><em>Gastrolobium crenulatum</em></td>
<td>Priority 2</td>
<td>-</td>
</tr>
<tr>
<td><em>Gonocarpus rudis</em></td>
<td>Priority 2</td>
<td>-</td>
</tr>
<tr>
<td><em>Lasioptalum dielsii</em></td>
<td>Priority 2</td>
<td>-</td>
</tr>
<tr>
<td><em>Schoenus</em> sp. Stirling (G.J. Keighery 3427)</td>
<td>Priority 2</td>
<td>-</td>
</tr>
<tr>
<td><em>Spyridium montanum</em></td>
<td>Priority 2</td>
<td>-</td>
</tr>
<tr>
<td><em>Stylidium oreophilum</em></td>
<td>Priority 2</td>
<td>-</td>
</tr>
<tr>
<td><em>Thomasia brachystachys</em></td>
<td>Priority 2</td>
<td>-</td>
</tr>
<tr>
<td><em>Acacia veronica</em></td>
<td>Priority 3</td>
<td>-</td>
</tr>
<tr>
<td><em>Actinotus rhomboideus</em></td>
<td>Priority 4</td>
<td>-</td>
</tr>
<tr>
<td><em>Platycaze</em> sp. Stirling (J.M. Fox 88/262)</td>
<td>Priority 4</td>
<td>-</td>
</tr>
<tr>
<td><em>Stylidium rosulatum</em></td>
<td>Priority 4</td>
<td>-</td>
</tr>
</tbody>
</table>

This IRP will be implemented in conjunction with the IRP for *Leucopogon gnaphaloides*. Management of the species has been incorporated into the Stirling Range and Porongurup National Parks Management Plan (CALM 1999).

*Gastrolobium vestitum* occurs within the ‘Montane Mallee Thicket of the Stirling Range’ ecological community, which is listed as Priority 1 in Western Australia\(^2\).

Two threatened fauna species, the Quokka (*Setonix brachyurus*) and the Toolbrunup Assassin Spider (*Zephyrarchaea melindae*) (both listed as VU in WA), and the priority-listed Glauert’s Land Snail (*Bothriembryon glauerti*) (priority 2), may also benefit from the management of *Gastrolobium vestitum*.

**International obligations**

This plan is fully consistent with the aims and recommendations of the Convention on Biological Diversity, ratified by Australia in June 1993, and will assist in implementing Australia’s responsibilities under that Convention. *Gastrolobium vestitum* is not listed under Appendix II in the United Nations Environment Program World Conservation Monitoring Centre (UNEP-WCMC) Convention on International Trade in Endangered Species (CITES), and this plan does not affect Australia’s obligations under any other international agreements.

**Stakeholder consultation**

In the course of preparing this plan, the authors consulted with the following stakeholders:

- Conservation and Parks Commission

**Aboriginal engagement**

Involvement of the Aboriginal community will be sought through the working group for the Wagyl Kaip and Southern Noongar Regional Corporation of the South West Native Title Settlement, to assist in the identification of cultural values for land occupied by *Gastrolobium vestitum*, to identify any groups with a cultural connection to land that is important for the species’ conservation, and to determine whether there are any community issues or interests identified in the IRP. Continued liaison between DBCA and the Aboriginal community will identify areas in which collaboration will assist implementation of recovery actions. The opportunity for involvement of the Aboriginal community in the implementation of the plan is included as a recovery action.

A search of the Department of Planning, Lands and Heritage (DPLH) Aboriginal Heritage Sites Register did not reveal any sites of Aboriginal significance adjacent to subpopulations of *G. vestitum*. The species occurs within the SRNP which is known to be culturally significant to Aboriginal people. Aboriginal involvement in management of land covered by an agreement under the Conservation and Land Management Act 1984 is also provided for under the joint management arrangements in that Act, and will apply if an agreement is established over any reserved lands on which this species occurs.

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\(^2\) For definitions and categories of Threatened Ecological Communities (TECs) and Priority Ecological Communities (PECs) see: [https://www.dpaw.wa.gov.au/images/plants-animals/threatened-species/definitions_categories_and_criteria_for_threatened_and_priority_ecological_communities.pdf](https://www.dpaw.wa.gov.au/images/plants-animals/threatened-species/definitions_categories_and_criteria_for_threatened_and_priority_ecological_communities.pdf)
Social and economic impacts

All subpopulations of *Gastrolobium vestitum* occur on land that is managed by DBCA. The implementation of this IRP may have some economic impact through the cost of implementing recovery actions such as controlling recreational impacts and *Phytophthora* dieback.

Affected interests

All subpopulations occur within a national park for which DBCA has primary management responsibility.

Evaluation of the plan’s performance

DBCA, with the assistance of the ADTFCRT, will evaluate the performance of this plan. The plan will be reviewed following five years of implementation.

2. Recovery objectives and criteria

Plan objectives

The objectives of this plan are to abate identified threats and maintain or enhance extant subpopulations and their habitat, to ensure the long-term conservation of *Gastrolobium vestitum* in the wild.

Performance criteria

Criteria for success

The objectives of this plan will have been achieved if one or more of the following take place over the term of the plan:

- There is no reduction in the extent of occurrence, and the number of mature individuals within known subpopulations has increased by >10%; or
- New subpopulations have been found, increasing the number of extant subpopulations from two to three or more with no net loss of mature individuals; or
- The area of occupied habitat has increased by >10% with no net loss of mature individuals.

Criteria for failure

The objectives of this plan will not have been achieved if one or more of the following take place over the term of the plan:

- Any subpopulation has been lost; or
- The number of mature individuals has decreased by >10%; or
- The area of occupied habitat has decreased by >10% with a net loss of mature individuals.
3. Recovery actions

Existing recovery actions

DBCA is overseeing the implementation of recovery actions for *Gastrolobium vestitum*. The established ADTFCRT assists with the co-ordination of recovery actions.

During the ‘Biological Survey of Mountains of Southern Western Australia’ between 1994 and 1996, surveys of six mountain peaks were conducted in the SRNP but no subpopulations of *Gastrolobium vestitum* were found (Barrett 1996). Extensive surveys have been conducted in the SRNP since 1996. A trial drone survey was conducted on remote slopes from Mt Hassell in spring 2019, but no new subpopulations were located.

A pollination study on the species was initiated by Cook *et al.* in 2015. The study aimed to test the following hypotheses:

- Red colouration evolves before other bird-pollination syndrome traits as turning red immediately repels bees causing pollinator-mediated selection to be focused on birds.
- Pollinator selection genetically structures populations prior to speciation as most species of *Gastrolobium* have yellow, bee-pollinated flowers.

Field collections of leaves and pods of *Gastrolobium rubrum*, *G. crenulatum*, *G. leakeanum*, *G. luteifolium*, *G. mondurup* and *G. vestitum* were made in December 2015, and October and December 2016. The number of seeds per pod and the number of funicles were scored and seed predation was recorded. DArTseq data was obtained for all the species to investigate past geneflow across the landscape, but analysis has not yet been completed (*pers comm.* Lyn Cook).

An investigation of the fungal mycorrhizal species associated with increased plant growth in *Gastrolobium vestitum* was completed by Celeste Linde (Australian National University) in 2009.

Trail assessment and management works have been undertaken on Mt Toolbrunup and include:

- Installation of tree guards to protect *Gastrolobium vestitum* germinants and seedlings from trampling and potential grazing;
- Brushing and installation of directional and ‘Let it Grow’ signs where track braiding has occurred to delineate the correct path for walkers to use. However, visitors continue to leave the track and have difficulty finding the correct track down from the summit.

Susceptibility to *P. cinnamomi* was assessed in a shade house inoculation experiment and a risk of extinction determined (Barrett *et al.* 2008).

Seed was collected from Subpopulations 1 and 2 in 2003 and 2010 and is stored in the Threatened Flora Seed Collection (TFSC) at the WA Seed Centre, DBCA at –20°C (see Table 4).
Table 4. WA Seed Centre collection details for *Gastrolobium vestitum*

<table>
<thead>
<tr>
<th>Accession</th>
<th>Date collected</th>
<th>TPFL subpopulation</th>
<th>Individuals in storage¹</th>
<th>Seeds in storage</th>
<th>Estimated germinable seeds</th>
</tr>
</thead>
<tbody>
<tr>
<td>01148-1</td>
<td>3/01/2003</td>
<td>1</td>
<td>B/250</td>
<td>2,241</td>
<td>2,127</td>
</tr>
<tr>
<td>03387-1</td>
<td>17/12/2010</td>
<td>2</td>
<td>B/100</td>
<td>1,032</td>
<td>not yet tested</td>
</tr>
</tbody>
</table>

¹ 'B' = a bulk collection/number of individual plants that seeds were collected from

SRNP rangers are aware of the location and Threatened status of *Gastrolobium vestitum* and have been involved in visitor and track management within its habitat.

**Future recovery actions**

DBCA will continue to oversee the implementation of recovery actions for *Gastrolobium vestitum*. The ADTFCRT helps to coordinate recovery activities for many species and ecological communities, including *G. vestitum*.

The following recovery actions are listed approximately in order of descending priority, influenced by their timing over the term of the plan. However, this should not constrain addressing any recovery action if funding is available and other opportunities arise. If recovery actions are to be implemented on lands other than those managed by DBCA, permission will be sought from the appropriate land managers prior to actions being undertaken.

1. **Monitor subpopulations**

Monitoring of subpopulations and associated habitat should be undertaken regularly to further refine subpopulation estimates and identify trends or potential management requirements. At least one subpopulation should be monitored annually. Following the December 2019 bushfire, all subpopulations will require monitoring to determine fire impacts and assess post-fire regeneration. Subpopulation monitoring should record the health and expansion or decline in subpopulations, and other observations such as pollinator activity or seed production. Site monitoring should include observations of vertebrate browsing, habitat degradation including presence of *Phytophthora* dieback, weed invasion, and hydrological status (drought). Specific monitoring of hydrology and activities relating to research into the biology and ecology of *Gastrolobium vestitum* are included in other recovery actions detailed below.

**Action:** Monitor subpopulations  
**Responsibility:** DBCA (Albany District)  
**Cost:** $10,000 per year

2. **Assess need for aerial phosphite application and apply if required**

As the habitat in which *Gastrolobium vestitum* occurs is infested with *Phytophthora* dieback, DBCA will further assess whether observed plant deaths are due to the disease and apply phosphite to both subpopulations as required. Application of phosphite to the habitat of *G. vestitum* will also protect other threatened flora species.

**Action:** Assess need for aerial phosphite application and apply if required  
**Responsibility:** DBCA (Albany District)
Cost: $5,000 per year ($667 per hectare for 7.3 hectares)

3. Maintain disease hygiene

Disease hygiene as outlined in DPaW (2015d) will be followed where subpopulations remote from dieback infested walk trails are being surveyed with access restricted to dry conditions where possible and additional hygiene measures undertaken during moist soil conditions.

Action: Maintain disease hygiene
Responsibility: DBCA (Albany District)
Cost: $3,000 per year

4. Implement actions to reduce recreational impacts

Several management actions have been undertaken to reduce the impact of trail users on Mt Toolbrunup, with limited results. These have included installation of signage, directional markers, brushing of vegetation and erosion control. Some of these will need to be replaced following the 2019 bushfire. Further action will be investigated and implemented to encourage visitors to stay on the main trail path to minimise trampling of seedlings and damage to mature plants. Proposed future actions will include improved track marking and an interpretative panel explaining the significant flora values of the summit area and the need to stay on the path.

Action: Implement actions to reduce recreational impacts
Responsibility: DBCA (Albany District)
Cost: $4,000 per year

5. Implement fire exclusion for both subpopulations

Fire is known to kill mature plants of Gastrolobium vestitum and may be detrimental to the species’ long-term survival if it occurs before plants reach maturity and replenish the soil seed store. For the life of this plan fire will, if possible, be prevented from occurring in the vicinity of both G. vestitum subpopulations, unless it is determined to be required for ecological regeneration.

Action: Implement fire exclusion for both subpopulations
Responsibility: DBCA (Albany District)
Cost: $1,000 per year

6. Continue caging/fencing individuals where necessary

Seedlings that germinate should be closely monitored for signs of trampling and/or herbivory and fencing or caging of individuals or groups of plants should be undertaken in high priority areas as soon as possible. The source of herbivory, if determined to be present, should be determined using infra-red cameras.

Action: Continue caging individuals where necessary
Responsibility: DBCA (Albany District)
Cost: $10,000 in year 1; $8,000 per years 2−5
7. Collect and store seed

To guard against the possible future extinction of known natural subpopulations it is recommended that additional seed be collected and stored at the TFSC at the WA Seed Centre once plants mature. Collections should aim to sample and preserve the maximum range of genetic diversity possible.

**Action:** Collect and store seed  
**Responsibility:** DBCA (Albany District, TFSC)  
**Cost:** $10,000 per year

8. Undertake surveys

Opportunistic surveys for potential new occurrences or extensions to known subpopulations should be undertaken in areas of potential habitat. If possible, surveys should be conducted in September or October when plants are flowering and more visible in the landscape. All surveyed areas should be recorded and the presence or absence of *Gastrolobium vestitum* documented to improve survey efficiency and prevent duplication of effort. Due to the remote, rocky, steep terrain and the instability of scree slopes, the use of drones will be investigated as a potentially effective and safer method of survey.

**Action:** Undertake surveys  
**Responsibility:** DBCA (Albany District)  
**Cost:** $7,000 per year

9. Acquire biological and ecological knowledge

It is recommended that research on the biology and ecology of *Gastrolobium vestitum* include:

1. Identification of pollinators and their habitat requirements;  
2. Soil seed bank dynamics and seed viability;  
3. The effect of fire interval, season, climatic conditions and vertebrate browsing on recruitment and survival;  
4. Longevity of individuals, time taken to reach maturity, and minimum viable population size; and  
5. The impact of *Phytophthora* dieback and the effectiveness of control techniques.

**Action:** Acquire biological and ecological knowledge  
**Responsibility:** DBCA (Biodiversity and Conservation Science, Albany District)  
**Cost:** $50,000 in years 1–3

10. Consider the development of a translocation proposal

Translocations may be required for the long-term conservation of *Gastrolobium vestitum*, with the priority being establishment of new subpopulation/s in suitable habitat in an area removed from recreational disturbance and *P. cinnamomi* infestation.
Information on the translocation of threatened plants and animals in the wild is provided in DBCA Corporate Policy Statement No. 35 (DPaW 2015a), DBCA Corporate Guideline No. 36 (DPaW 2015c) and the Australian Network for Plant Conservation (ANPC) Translocation Guidelines (Commander et al. 2018). A translocation may decrease the risk of extinction when a species is represented by few subpopulations and the creation of additional self-sustaining, secure subpopulations may decrease its susceptibility to catastrophic events and environmental stochasticity (Commander et al. 2018). For small subpopulations that may be declining in size or subject to high levels of inbreeding, successful subpopulation enhancement may increase subpopulation stability and hence long-term viability (Commander et al. 2018).

Depending on the characteristics of the species, a minimum viable subpopulation size of 200 to 250 mature individuals is a useful initial translocation target (Commander et al. 2018), but 1,000 or more individuals may be required to maintain evolutionary potential (Frankham et al. 2014). Suitable translocation sites may include where the species currently occurs, where it was known to have occurred historically, and other areas that contain similar habitat (soil, associated vegetation type and structure, aspect, mutualisms etc.), preferably within the known range of the species (Commander et al. 2018). However, if translocation to a Phytophthora dieback-free site is considered to be a pre-requisite, then novel habitat outside of the Stirling Range may need to be considered also, due to the extent of this disease within the Park. Other factors that should be considered when selecting recipient sites include the security of land tenure for conservation, the ability to effectively mitigate threats to the species, and potential negative consequences to existing biodiversity and cultural values at the site (Commander et al. 2018).

All translocation proposals require the approval of DBCA’s Executive Director of Biodiversity and Conservation Science. Monitoring of translocations and reporting against success criteria are essential components of a translocation and will be included in the timetable developed for the translocation proposal.

**Action:** Consider the development of a translocation proposal  
**Responsibility:** DBCA (Biodiversity and Conservation Science, Albany District)  
**Cost:** $42,000 in years 1 and 2; and $26,500 in years 3–5 as required

### 11. Liaise with Stirling Range National Park staff and Aboriginal communities

Staff from DBCA Albany District will liaise with Stirling Range National Park staff to ensure that subpopulations of *Gastrolobium vestitum* are not accidentally damaged or destroyed and the habitat is maintained in a suitable condition for the conservation of the species. The protection of the species will also be considered when developing and implementing a trail works program for Mt Toolbrunup. Consultation with the Aboriginal community will take place to determine if they have any issues or interests in areas that provide habitat for the species.

**Action:** Liaise with Stirling Range National Park staff and Aboriginal communities  
**Responsibility:** DBCA (Albany District)  
**Cost:** $4,000 per year
12. Promote awareness

The importance of biodiversity conservation and the protection of Gastrolobium vestitum will be promoted through direct contact with relevant departmental staff, and more broadly through the print and electronic media and by setting up poster displays. Formal links with naturalist groups and interested individuals will also be encouraged.

**Action:** Promote awareness  
**Responsibility:** DBCA (Albany District, Species and Communities Program (SCP) and Public Information and Corporate Affairs (PICA))  
**Cost:** $7,000 in years 1 and 2; $5,000 in years 3–5

13. Map habitat important for the survival of Gastrolobium vestitum

Although spatial data relating to habitat that is important for the survival of Gastrolobium vestitum has been identified in Section 1, it has not been mapped. If additional subpopulations are located, habitat important for their survival will also be determined and mapped.

**Action:** Map habitat important for the survival of Gastrolobium vestitum  
**Responsibility:** DBCA (SCP, Albany District)  
**Cost:** $6,000 in year 2

14. Review this plan and evaluate its performance

DBCA, in conjunction with the ADTFCRT, will evaluate the performance of this Interim Recovery Plan. If Gastrolobium vestitum is still listed as threatened in Western Australia following five years of implementation of this plan, the plan will be reviewed and an assessment made of the need for a new or revised plan.

**Action:** Review this plan and assess the need for further recovery actions  
**Responsibility:** DBCA (SCP, Albany District)  
**Cost:** $6,000 in year 5
Table 5. Summary of recovery actions

<table>
<thead>
<tr>
<th>Recovery action</th>
<th>Priority</th>
<th>Responsibility</th>
<th>Completion date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monitor subpopulations</td>
<td>High</td>
<td>DBCA (Albany District)</td>
<td>Ongoing</td>
</tr>
<tr>
<td>Assess the need for and apply phosphite as required</td>
<td>High</td>
<td>DBCA (Albany District)</td>
<td>Ongoing</td>
</tr>
<tr>
<td>Maintain disease hygiene</td>
<td>High</td>
<td>DBCA (Albany District)</td>
<td>Ongoing</td>
</tr>
<tr>
<td>Implement actions to reduce recreational impacts</td>
<td>High</td>
<td>DBCA (Albany District)</td>
<td>Ongoing</td>
</tr>
<tr>
<td>Implement fire exclusion for both subpopulations</td>
<td>High</td>
<td>DBCA (Albany District)</td>
<td>Ongoing</td>
</tr>
<tr>
<td>Continue caging individuals where necessary</td>
<td>High</td>
<td>DBCA (Albany District)</td>
<td>Ongoing</td>
</tr>
<tr>
<td>Collect and store seed</td>
<td>High</td>
<td>DBCA (Albany District, TFSC)</td>
<td>2024</td>
</tr>
<tr>
<td>Undertake surveys</td>
<td>High</td>
<td>DBCA (Albany District)</td>
<td>Ongoing</td>
</tr>
<tr>
<td>Acquire biological and ecological knowledge</td>
<td>High</td>
<td>DBCA (Biodiversity and Conservation Science, Albany District)</td>
<td>2022</td>
</tr>
<tr>
<td>Consider the development of a translocation proposal</td>
<td>High</td>
<td>DBCA (Biodiversity and Conservation Science, Albany District)</td>
<td>2024</td>
</tr>
<tr>
<td>Liaise with Stirling Range National Park staff and Aboriginal communities</td>
<td>Medium</td>
<td>DBCA (Albany District)</td>
<td>Ongoing</td>
</tr>
<tr>
<td>Promote awareness</td>
<td>Medium</td>
<td>DBCA (Albany District, SCP and PICA)</td>
<td>Ongoing</td>
</tr>
<tr>
<td>Map habitat important for the survival of Gastrolobium vestitum</td>
<td>Medium</td>
<td>DBCA (Albany District)</td>
<td>2021</td>
</tr>
<tr>
<td>Review this plan and assess the need for further recovery actions</td>
<td>Medium</td>
<td>DBCA (SCP, Albany District)</td>
<td>2024</td>
</tr>
</tbody>
</table>

4. Term of plan

This plan will operate from April 2020 and will remain in force until withdrawn or replaced. If Gastrolobium vestitum is still listed as threatened following five years of implementation, the plan will be reviewed and the need for further recovery actions assessed.

5. References


6. Taxonomic description


Erect, arborescent shrubs, 1–3 m high. Branchlets ascending, compressed, angular, ridged, densely villous. Petioles terete, continuous and decurrent with the branchlet, up to 10 mm long. Leaves spreading, opposite, elliptic to ± rhombic, 30–45 x 25–35 mm, upper surface with prominent venation, lower surface moderately to densely villous, especially along the veins; apex truncate to retuse; margins strongly recurved; base rounded. Stipules erect, c. 15 mm long, mostly villous. Inflorescences axillary umbels, 4-flowered; peduncle compressed, ridged, 10–18 mm long; rachis nil; subtending bracts somewhat persistent to caducous, scale-like, semi-globose, shallowly trifid, up to 18 mm long including 8–13-mm midrib decurrent extension, densely tomentose. Flowers: not resupinate, erect; pedicels terete, 4–5 mm long, densely pubescent. Calyx 12–13 mm long including the c. 1.5-mm receptacle, densely pubescent, unicoloured, with either golden brown or white villous hairs only present, or bicoloured, with both golden brown and white hairs present, upper 2 lobes recurved, lower 3 lobes straight; upper 2 lobes united higher than the lower 3, ± obtuse, c. 6 mm long; lower 3 lobes triangular, subacute, c. 5.5 mm long. Corolla: standard transversely elliptic, fleshy, not fully reflexed, giving a hooded appearance, 16–18 x 17–18 mm including the 6.5-mm claw, margins orange, deep red at base with yellow markings, apex emarginate, base cordate, slightly auriculate; wings broadly obovate, 16–17 x 6 mm including the 5.5–6-mm claws, deep red, apex rounded, incurved and touching, ± enclosing the keel, base truncate,
not or very scarcely auriculate on the upper margin only, saccate; keel half broadly elliptic, incurved longitudinally, 16–17 x 6 mm including the 6-mm claws, deep red, margins not incurved, apex broadly rounded, base auriculate, saccate. Style very long, strongly incurved, lower-third pubescent; ovary shortly stipitate, densely pubescent; ovules 4 or more. Pod sessile, ovoid, 10–12 x 6–7 mm, moderately to densely villous. Seed not seen.