Conservation Status

Leiocarpa gatesii (wrinkled buttons) is listed as Vulnerable 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 Vulnerable 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 Vulnerable category are that the species has:

- a limited extent of occurrence
- a limited area of occupancy
- a distribution that is severely fragmented, and
- extreme fluctuations in the number of mature individuals.

Description

Wrinkled buttons is a slender perennial (occasionally annual) herb growing to 30 cm tall, with narrow leaves along white cottony stems. The leaves are alternate, narrow and blunt to about 20 mm x 5 mm, dark green and generally hairless above, and white and densely hairy below. The plant bears yellow button-like flower heads to 20 mm across, consisting of numerous small, tubular florets, and surrounded by overlapping rows of narrow brown bracts covered with white hairs. Flower heads are borne singly at the ends of the stems, and appear from December to April (rarely to July). The fruit is a hairless, non-beaked achene (description from Leigh et al. 1984; Mueck 1997; Walsh & Entwisle 1999; DNRE 2001). This species can be distinguished from other species of Leiocarpa by its bell-shaped flower heads with wrinkled bracts that increase in size from the outer to the inner bracts (Wilson 2001).

Distribution

Wrinkled buttons is endemic to a small coastal area between Anglesea and Lorne, Victoria (Walsh & Entwisle 1999), in the South East Coastal Plain IBRA Bioregion (DSEWPaC 2012).

Wrinkled buttons was first discovered near Lorne in 1921 (Leigh et al. 1984; DNRE 1999 cited in DSE 2008). It was not observed at sites where it was previously known to occur for many decades and was presumed extinct. Many new populations were discovered in the area between Lorne and Anglesea in 1984 after the Ash Wednesday fires in February 1983 (White 1984). From 1984 to 2006, the species was identified at 15 sites in the Lorne–Anglesea area. In 2008, more than 22000 plants occurred in 12 populations: ten in Angahook–Lorne State Park Reserve and two in Otway State Forest (DSE 2008).

The species occurs in Damp Forest and Lowland Forest (DNRE 1999 cited in DSE 2008), often on drier hillsides, with overstorey species predominantly Eucalyptus aromaphloia (scentbark) and Eucalyptus tricarpa (red ironbark), and understorey species typically Acacia verniciflua.
(varnish wattle), *Gahnia radula* (thatch saw-sedge) and *Pultenaea daphnoides* (large-leafed bush-pea) (DNRE 1999 cited in DSE 2008).

The population of mature plants of the species fluctuates from 5000–25000. However, the rhizomatous nature of individuals in some populations suggests that the total population size is over-estimated.

Table 1 lists the locations of important populations necessary for its long term survival and recovery of the species.

**Table 1 – Important populations (DSE 2008).**

<table>
<thead>
<tr>
<th>Location</th>
<th>Estimated population size (DSE 2008)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Angahook - Lorne State Park</strong></td>
<td></td>
</tr>
<tr>
<td>Moggs Creek Track (Sheet 9 <em>sensu</em> Mueck 1997)</td>
<td>&gt;10000</td>
</tr>
<tr>
<td>Coal-Mine Creek Track (Sheet 8 <em>sensu</em> Mueck 1997) (O. Carter pers. obs. 8/11/02)</td>
<td>&gt;100</td>
</tr>
<tr>
<td>Gentle Annie Track A (Sheet 3 <em>sensu</em> Mueck 1997)</td>
<td>&gt;15</td>
</tr>
<tr>
<td>Gentle Annie Track B (Sheet 4 <em>sensu</em> Mueck 1997)</td>
<td>&gt;500</td>
</tr>
<tr>
<td>Wonwondah Falls Track (‘Hendersons’ Track). 200 m from Sharps Track (first seen 1996 and confirmed by O. Carter pers. obs 8/11/02)</td>
<td>&gt;300</td>
</tr>
<tr>
<td>Five-Mile Track along entire length (Perkins pers. obs 2002)</td>
<td>&gt;10000</td>
</tr>
<tr>
<td>Cumberland Link Walking Track (Perkins pers. obs 2002)</td>
<td>&lt;100</td>
</tr>
<tr>
<td>Powerline easement adjacent to the Deans Marsh–Lorne Road A (Sheet 5 <em>sensu</em> Mueck 1997)</td>
<td>&gt;1000</td>
</tr>
<tr>
<td>Powerline easement adjacent to the Deans Marsh–Lorne Road B (Sheet 6 <em>sensu</em> Mueck 1997)</td>
<td>500</td>
</tr>
<tr>
<td>Powerline easement adjacent to the Deans Marsh–Lorne Road C (Sheet 7 <em>sensu</em> Mueck 1997)</td>
<td>5</td>
</tr>
<tr>
<td><strong>Otway State Forest</strong></td>
<td></td>
</tr>
<tr>
<td>Seaview Rd–Otway State Forest A (Sheet 1 <em>sensu</em> Mueck 1997)</td>
<td>50</td>
</tr>
<tr>
<td>Seaview Rd–Otway State Forest B (Sheet 2 <em>sensu</em> Mueck 1997)</td>
<td>100–200</td>
</tr>
</tbody>
</table>

**Relevant Ecology**

Longevity of seeds and plants is not documented (DSE 2008). However, observations suggest that wrinkled buttons may produce long-lived, persistent soil seed banks. The estimated longevity of plants is 13 years (DNRE 1999 cited in DSE 2008). Recruitment of wrinkled buttons has been observed after fire and soil disturbance, suggesting that this species is a fire ephemeral (DNRE 1999 cited in DSE 2008). The abundance of germinated individuals in the landscape fluctuates greatly depending on fire frequency and intensity. Seed germinates in the years following hot summer fires but, as the surrounding vegetation regenerates, the numbers of germinated plants decline and populations may appear to be lost. However, seed survives in the...
soil until the next major disturbance event, such as a fire, destroys the ground-covering layer of vegetation and stimulates mass regeneration (DSE 2006).

**Threats**

Table 2 – Threats impacting the wrinkled buttons in approximate order of severity of risk, based on available evidence.

<table>
<thead>
<tr>
<th>Threat factor</th>
<th>Threat type</th>
<th>Threat status</th>
<th>Evidence base</th>
</tr>
</thead>
<tbody>
<tr>
<td>Invasive species</td>
<td>known</td>
<td>current</td>
<td>Wrinkled buttons is often present in road reserves and along tracks and powerline easements which are susceptible to weed invasion, especially by <em>Anthoxanthum odoratum</em> (sweet vernal grass). Dumping of garden waste is the likely cause of extensive weed invasion along the powerline easements adjacent to the Deans Marsh–Lorne Road (DSE 2006).</td>
</tr>
<tr>
<td>Weed invasion</td>
<td>known</td>
<td>current</td>
<td>Road maintenance works destroyed part of the Seaview Road population in the Beech Forest area in 1997 (Mueck 1997).</td>
</tr>
<tr>
<td>Road works</td>
<td>known</td>
<td>current</td>
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</tr>
<tr>
<td>Vehicle movement</td>
<td>potential</td>
<td>current</td>
<td>Recreational vehicles, such as four-wheeled drives and trail bikes, are active in the area and may disturb some populations (DSE 2006).</td>
</tr>
<tr>
<td>Low frequency or intensity of spring–summer fires</td>
<td>potential</td>
<td>current</td>
<td>Fire frequency, intensity and season of occurrence may have important effects on long-term survival of this species at all sites (SAC 1996). Lack of fire since 1983 has led to possible declines in abundance at some sites (DCE 1992).</td>
</tr>
<tr>
<td>Low frequency of habitat disturbance</td>
<td>potential</td>
<td>current</td>
<td>Prior to 2006, populations discovered tended to be at sites where soil disturbance, such as track maintenance or slashing, had occurred.</td>
</tr>
</tbody>
</table>

**Conservation Actions**

**Conservation and Management priorities**

**Weeds**

- Develop and implement a weed management plan to regularly suppress weed growth, especially after fires, and ensure that post-fire monitoring is carried out.
- Control weeds by hand removal or applying herbicide during calm, near windless weather conditions in order to minimise the potential for harmful sprays to be wind-dispersed and adversely affect populations or the surrounding native vegetation.
o Annual weed spraying will be much more effective if action can be taken to reduce the influx of new weed seed each year in consultation with land managers.

o Continue to record the method, timing and success of weed control treatment and the effect on the species and associated native plant species.

Habitat loss disturbance and modifications

o Continue to prevent accidental destruction of populations of wrinkled buttons by maintaining signage, which indicates the occurrence of populations and the importance of avoiding damage to them or their habitats, at relevant sites on tracks within Angahook - Lorne State Park and Otway State Forest.

o Ensure that road and powerline construction and maintenance organisations, including consultants and contractors, are aware of the species’ occurrence and implement measures to avoid damaging populations of the species.

o Continue to restrict or control public vehicular access, where necessary, to prevent accidental damage to known and newly discovered populations. Re-route tracks or install and maintain fencing and lockable gates.

o Negotiate voluntary, cooperative management agreements with private landholders located adjacent to powerline easements.

o Rehabilitate vegetation communities and/or environments where populations are damaged by infrastructure construction/maintenance or the use of recreational vehicles.

Fire and Biomass reduction

o Develop and implement a fire management strategy for the wrinkled buttons based on research of the species’ fire ecology and in consultation with the Country Fire Authority Victoria and other relevant stakeholders with regards to fire control measures.

o Prescribed or experimental fires must be well justified and be accompanied by a carefully planned weed management strategy. Post-fire monitoring and control actions are essential.

o Develop management prescriptions for ecological slashing based on scientific research and implement, where required, to reduce biomass.

Breeding, propagation and other ex situ recovery action

o Continue to collect and store seed from known populations to maintain adequate representation of the remaining genetic diversity from known populations of the species for the potential future restoration of populations and translocations.

o Establish and maintain a long-term storage facility to store seed.

Stakeholder Engagement

o Maintain strong associations between State Government and local conservation groups (e.g. Anglesea, Aireys Inlet Society for the Protection of Flora and Fauna - ANGAIR) for the benefit of continued regular surveying for the wrinkled buttons and monitoring of populations.

o Identify opportunities for, and promote and support the involvement of community groups, including ANGAIR, and volunteers in recovery activities for the species.
o Ensure that advice about the recovery and management requirements of the species has been provided to relevant Victorian and local government authorities, catchment management authorities, and private landholders and land managers.

o Continue to update community information materials (e.g. electronic media, local media, and poster displays and printed information sheets distributed through local government libraries, letterbox drops, wildflower shows and other events) about the species (e.g. its visual appearance, habitat, threats to the species and recovery actions) and the importance of locating, monitoring and protecting populations over the long-term.

Survey and monitoring priorities

- Continue to monitor known populations of wrinkled buttons and their habitats and collect demographic information, including recruitment and mortality, timing of life history stages and morphological data, and floristic and environmental information relevant to community ecology and condition.
- Continue to survey suitable habitat in Angahook - Lorne State Park to locate any new or unconfirmed populations of wrinkled buttons.
- Measure the effectiveness of management actions and the need to adapt them if necessary.

Information and research priorities

- Review all known sites to make sure there is no duplication (e.g. due to different GPS readings) and update records on all state databases (Flora Information System, Victorian Biodiversity Atlas, Biosites and Herbaria).
- Research key biological functions of the species. Evaluate essential life-history stages, pollination biology, current reproductive/ regenerative status, seed bank status and longevity, fecundity, recruitment levels and mechanisms for recruitment and dispersal.
- Conduct laboratory and field trials to identify the key stimuli and requirements for successful seed germination and vegetative propagation and cultivation.
- Investigate the fire ecology of the species. Determine how fire directly affects the life history and population recruitment of the species, and what fire regime (frequency and intensity) is likely to be appropriate. The seasonal timing of fire is likely to be important given that that late autumn, winter and spring ignitions are likely to have a detrimental effect upon the long-term viability and sustainability of the species as well as having a deleterious impact on other native species the natural vegetation communities in which the species occurs.
- Conduct field trials to identify the effect of ecological slashing techniques on the species.
- Research and identify other physical disturbance regimes that could maintain habitat quality or promote recruitment and regeneration of populations.
- Analyse population trends and responses against recovery actions. Collate and analyse census data, compare with management histories and conduct population viability analyses.
- Investigate options for linking, enhancing or establishing additional populations.

References cited in the advice

Department of Natural Resources and Environment (DNRE) (2001). DNRE Flora Information System 2001, Department of Natural Resources and Environment.


