

Action Statement

Flora and Fauna Guarantee Act 1988

No. 21 (Revised in 2008)

Warby Range Swamp-gum *Eucalyptus cadens*

This revised Action Statement is based on the draft national Recovery Plan prepared for this species by DSE under contract to the Australian Government Department of the Environment, Water, Heritage and the Arts.

Description

The Warby Range Swamp-gum (*Eucalyptus cadens*) is a spreading tree reaching 25 m in height. The species is known for its characteristic leaning habit, thus the specific epithet is derived from the Latin *cadere* 'to fall down'. The rough, compact bark is present for the first 10 m of the trunk, with smooth, ribboney, green-grey bark developing further up the tree.

The Warby Range Swamp-gum has greenish-grey, sessile, juvenile leaves that are petiolate and initially opposite but becoming alternate, elliptic to ovate (sometimes with mild crenulation developing at the margins) and somewhat discoloured. Leaves are up to 50 mm long and 20 mm wide. New growth is very glaucous, developing particularly in the crown. This glaucous foliage distinguishes it from its close relative, the Black Gum (*Eucalyptus aggregata*). Adult leaves are bluish-green, narrow and elliptic, ranging from 70 - 150 mm in length and 10 - 20 mm in width.

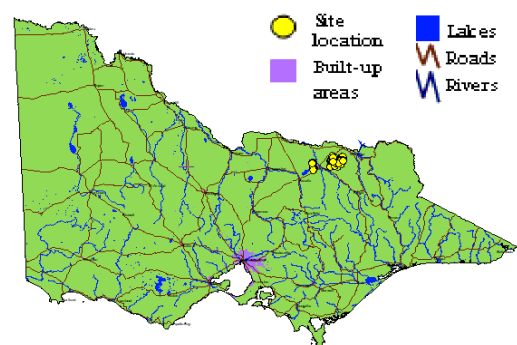
Inflorescences are axillary with seven flowers and peduncles up to 6 mm in length. Buds are pedicellate, tapering at both ends, 3 mm in diameter, up to 8 mm long with a conical operculum. Flowers are white. Ovules are in four vertical rows. Flowering occurs between March and June. Fruit is obconical, relatively sessile, 6 mm in diameter and up to 5 mm long. The 3 valves are raised slightly above the rim of the fruit.

Distribution

The species is endemic to north-eastern Victoria. It was originally thought to be restricted to a single locality in the Warby Ranges but is now known from four sub-catchments of the Ovens River. The majority of stands are associated with the south-eastern foot-hills of the Pilot Range near



Warby Swamp Gum
(Photo: Johnson)



Distribution in Victoria
(Flora Information System DSE 2007)

Beechworth and Wooragee with additional locations in the eastern foothills of the Warby Range. Sixty stands have now been recorded from six sub-populations (defined by groupings of stands on the same tributary). The total population is estimated to be 7,790, covering a total area of ~41 ha.

Most stands are small (generally one hectare or less); the largest stand, the type locality, is 5.5 ha. Over seventy-five percent of the population currently occurs on private land on seventeen individual landholdings.

The Warby Range Swamp-gum has been recorded at Beechworth Historic Park and more recently the Chiltern Mount Pilot National Park. Sub-populations at Mt Pilot also tend to be small in size

Important populations

Important populations that account for the biological and genetic range of the species have not been identified. Important populations (i.e. due to generally high abundance and/or secure tenure) necessary to the long term survival and recovery of the Warby Range Swamp-gum may include the following locations:

<i>Tenure/reservation</i>	<i>Manager</i>	<i>Sites</i>
National Parks	Parks Victoria	Chiltern – Mt Pilot N.P., Chiltern Old Coach Road (VROTPop. No. 14), Chiltern – Mt Pilot N.P., Indigo Maginness Rd Sth, Deep Ck (VROTPop No. 39), Chiltern – Mt Pilot N.P., Indigo Water Trust Rd, (VROTPop No. 34) – Chiltern Water Supply Snows Rd (VROTPop No. 24)
Other reserves	Parks Victoria	Beechworth Historic Park, Beechworth
Roadsides	Indigo Shire Council	Wardens Road, Wooragee Woolshed Valley Rd (Reedy Ck), Wooragee
Roadsides	Wangaratta Rural City Council	Wangaratta Devenish Rd, Wangaratta
Private Land	various	Numerous private land sites on the Northern Inland Slopes of Victoria's north east incl. Type Locality (VROTPop No. 1) in Taminick Gap, Wangaratta

Habitat

Warby Range Swamp-gum stands tend to occur in woodlands often in or around the peripheries of springs, soaks and water bodies. Spring-soak herbfield communities are often dominated by Warby Range Swamp-gum with combinations of Rush (*Juncus* spp.), Sedge (*Carex* spp.) and Twig Sedge (*Baumea* spp.) in the understorey. Other trees and shrubs occurring in these communities include Blakely's Red Gum (*Eucalyptus blakelyi*), Bundy (*E. goniocalyx* s.s.), Red Stringybark (*E. macrorhyncha*) and Silver Wattle (*Acacia dealbata*). Interesting occurrences of higher altitude species have also been noted at less disturbed sites. Associated shrub species may include Alpine Bottlebrush (*Callistemon ptyoidesi*) and Small-fruit

ranging from 0.1 - 2.5 ha (10-335 individuals). Some stands also occur on road reserves and public water frontages.

Abundance

In 2004 the total number of plants was recorded as approximately 7,790 individuals from 60 wild populations in six sub-catchments of the Ovens River. Recent fires in the north east of Victoria affected many stands in the Chiltern Pilot National Park although recruitment from seed and or epicormic and lignotuber-based regrowth has been observed in all situations. Further investigation will be required to determine current numbers. The extent of range and abundance of the Warby Range Swamp-gum prior to European settlement is unknown.

Hakea (*Hakea microcarpa*). Ground layer species include Downy Ground-fern (*Hypolepis glandulifera*), Coral Fern (*Gleichenia* spp.) and, frequently, the FFG-listed Narrow Goodenia (*Goodenia macharronii*).

Life history and ecology

The Warby Range Swamp-gum is a long-lived tree producing a large amount of seed that will only germinate successfully and grow to maturity in the wild in seasonally waterlogged and permanently moist sites associated with perennial springs. It can also regenerate vegetatively from its epicormic buds and lignotubers at its base. Thus, the species requires very specific environmental conditions to survive. Past clearing, changes to watercourses

and grazing have caused habitat fragmentation and genetic isolation, although downstream movement of seed is possible between stands connected by a creek.

The Warby Range Swamp-gum may partially hybridise with the sympatric species Mountain Swamp-gum (*Eucalyptus camphora*). Progeny of such crosses may produce sterile seed (A. Briggs pers. comm.).

The recent bushfires in the north east of Victoria have burnt some of the populations, in particular those in the Mt Pilot area of the National Park. Seed regeneration in bared ground following fire and re-sprouting of all burnt individuals has been observed, resulting in a significant net increase in total numbers in the early post fire period (Gill Earl pers. comm.). Due to the large scale and severity of the fire, native and exotic herbivore grazing pressure has been low and accordingly has had only a minor impact on seedling survival in the first 18 months post-fire. However it is expected that there will be considerable attrition of seedlings over time due to natural thinning processes (Gill Earl pers. comm.). Ongoing monitoring of post-fire established transects in both burnt and unburnt populations will improve our understanding of longer-term population changes in response to fire.

The high incidence of seedling regeneration following fire suggests that wildfire may play an important role in augmenting genetic diversity within otherwise ancient, perhaps clonal populations.

Conservation status

National conservation status

The Warby Range Swamp-gum is listed as vulnerable under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*.

Victorian conservation status

The Warby Range Swamp-gum is listed as threatened under the Victorian *Flora and Fauna Guarantee Act 1988*.

It is considered vulnerable in Victoria according to DSE's *Advisory List of Rare or Threatened Plants in Victoria - 2005* (DSE 2005).

Decline and threats

Many of the populations on public land are relatively well protected. A number of processes, however, may threaten populations in these reserved areas. These include firewood collection, construction of infrastructure and earthworks. Grazing by native herbivores may also contribute to the lack of recruitment. Investigation through survey and censusing will reveal existing threats in order to mitigate against them.

Past clearing, changes to watercourses and grazing have caused habitat fragmentation which increase edge effects suffered by remnants. Such activities have also led to genetic isolation for stands not connected to other stands by a water body.

Domestic stock on private land tend to congregate in these stands for shelter and water and could preclude, or at least inhibit, seedling recruitment by excessive trampling and grazing. Trampling by stock is currently believed to be one of the most serious threatening processes operating on this species (Blackney, pers. comm.). Implementation of this Action Statement will support landholders to fence off these areas and install alternative watering points that stock can access.

The impact of different grazing regimes and fire (which is sometimes applied to private land sites) on adult mortality, seed germination and recruitment is not well understood. Many stands are fully occupied by mature trees and, where rushes and sedges are prolific, there may be little opportunity for regeneration. However, stock exclusion and selective weed control may help restore the native groundcover component of the swamp community.

Some remnant Warby Range Swamp-gum habitat found on roadsides is significantly degraded. Works to restore these vegetation communities will be undertaken in collaboration with local government authorities.

Alteration of hydrology by draining or impounding remaining springs on private land or upstream sources could destroy or degrade habitat. Various government agencies including Department of Sustainability and Environment, Department of Primary Industries and Catchment Management Authorities are working with rural landholders to address this issue, although the current persistence of drought in the area is not conducive to influencing management actions in this regard. Determination of a waterway is a critical component of the ability or not to build a dam. Goulburn Murray Water need to consider the presence of threatened species and communities in its decision making in order to prevent further loss of individuals or stands of Warby Range Swamp-gum.

Dryland salinity occurs at one public land site and is currently acting as a low-level threat. Land degradation as a result of salinity is likely to continue to increase significantly into the future in this region (DNRE 2000). It is likely, therefore, that stress to native communities such as Warby Range Swamp-gum habitat will result.

Weed invasion was found to occur on some private sites during monitoring of populations (DNRE 2002). Only one species was found to be a Weed of

National Significance - Blackberry (*Rubus fruticosus* spp. agg.). However, other woody and non-woody weeds such as the perennial grasses Yorkshire Fog (*Holcus lanatus*) and Toowoomba Canary-grass (*Phalaris aquatica*) pose a significant competitive threat to regeneration in many sites.

Global climate change may potentially threaten populations if it impacts upon water bodies or raises temperatures to levels that the species or its habitat cannot tolerate. The loss of climatic habitat caused by anthropogenic emissions of greenhouse gases is listed as a Key Threatening Process under the *Environment Protection and Biodiversity Act 1999* (Environment Australia 2003).

Current threats/perceived risk

Alteration of hydrology

High - alteration of hydrology is likely to continue, particularly from upstream sources.

Soil damage through stock movement

High - soil damage & associated change in ground flora is an ongoing process that the Warby Range Swamp-gum and its habitat are unlikely to be able to sustain.

Firewood collection

Unknown - the impact of firewood collection upon the species and its habitat is currently not known, but is likely to be low.

Alteration to fire and grazing regimes

Unknown but presumed High - on private land, altered fire regimes, stock and rabbit grazing may threaten seedling survival. Macropod grazing may pose a threat on both public and private land.

Weed invasion

High - Weed invasion is a current and potentially threatening process.

Land clearance

High - land clearance has had a very high impact on the survival of the Warby Range Swamp-gum and its habitat and may still be continuing, particularly as a result of earthworks for dams

Salinity

Low - only one site is known to be currently affected by salinity.

Potential threats/perceived risk

Land clearance

High - land clearance of these small remnants is likely to continue. Such activity poses a high level of threat. Land Clearance is listed as a Key Threatening Process under the *Environmental Protection and Biodiversity Conservation Act, 1999*.

Salinity

Low - future is still likely to be low in spring-soak habitats

Weed invasion

High - weed invasion could seriously threaten stands if not controlled.

Global Warming

Unknown

Alteration of hydrology

High - alteration of hydrology is likely to continue, particularly from upstream sources.

Previous management action

- Weed competition and grazing in Warby Range Swamp-gum habitat has been monitored in the Chiltern-Mt Pilot National Park.
- Integrated pest plant and animal control implemented at Chiltern-Mt Pilot National Park.
- Habitat surveyed in the Pilot area and data on essential life history stages, recruitment and dispersal at known sites collected.
- Information signs erected to inform the community.
- Wooragee Land Care group has been involved in recovery activities including seed collection, propagation and planting.
- Liaison in regard to management: Parks Victoria Beechworth Historic Park, Chiltern Pilot National Park and Indigo and Wangaratta Roadside Management Planning.
- Extension has occurred under various programs: properties covenanted under the Trust for Nature Conservation Covenants; Property Management Plans developed for type locality (Taminick Gap) properties and Land for Wildlife member-properties supporting the Warby Range Swamp-gum. Works include stock-proof fencing of key private land remnants.
- A comprehensive VROTPop survey of all public and private land sites, including provision of management information to land managers and private landholders, and Land for Wildlife extension completed in 1999.
- 'Church in a Landscape : A Centenary History of the Diocese of Wangaratta' booklet produced incorporating line diagram and reference to the Warby Range Swamp-gum on Type Locality property in Taminick Gap completed in 2002.
- National Recovery Plan preparation in 2003.
- Monitoring of Chiltern Pilot NP populations burnt in January 2003 wildfires. Transects were established and VROTPop monitoring/surveys undertaken in 2003/4.

Long term objective

To ensure that the Warby Range Swamp-gum can survive, flourish and retain its potential for evolutionary development in the wild.

Specific Objectives, Actions and Targets

The intended management actions listed below are further elaborated in DSE's Actions for Biodiversity Conservation (ABC) system. Detailed information about the actions and locations, including priorities, is held in this system and will be provided annually to land managers and other authorities.

Objective I To increase knowledge of biology, ecology and management requirements

Action	Targets	Responsible
1. Assess habitat characteristics and/or condition. Accurately survey known habitat and collect floristic and environmental information relevant to community ecology and condition.	<ul style="list-style-type: none"> ▪ Completion of data on essential life history stages, recruitment and dispersal at known sites. ▪ Core habitat mapped. ▪ Data disseminated to relevant land management bodies. ▪ Target populations for protection and management determined. 	DSE
2. Undertake periodic surveillance monitoring of populations. Measure population trends and responses against recovery actions by collecting demographic information including recruitment and mortality, timing of life history stages, and morphological data. Collate, analyse and report on census data and compare with management histories. Where possible, collect and analyse data on genetic variability with and between populations, particularly in burnt and unburnt sites.	<ul style="list-style-type: none"> ▪ Techniques for monitoring developed and implemented. ▪ Census data for five target sites. ▪ Population growth rates determined. ▪ Population Viability Analysis completed for selected priority populations. 	DSE

Objective II To secure populations or habitat from potentially incompatible land use or catastrophic loss

Action	Targets	Responsible
3. Negotiate voluntary management agreements with private landholders.	<ul style="list-style-type: none"> ▪ Selected private land sites protected voluntarily. 	DSE
4. Incorporate actions to protect item into planning processes. Develop local policy, Vegetation Protection and / or Environmental Significance Overlays and incorporate into Local Planning Provisions to legally protect populations.	<ul style="list-style-type: none"> ▪ Vegetation Protection and / or Environmental Significance Overlays developed and incorporated into Local Planning Provisions for relevant local government authorities. ▪ Local Planning Policy, to protect currently unknown locations of the Warby Range Swamp-gum, developed and incorporated into Local Planning Provisions for relevant local government authority. 	Parks Victoria, DSE, Wangaratta Rural City Council, Indigo Shire Council, Water Authority
5. Erect/maintain signs to restrict or discourage access.	<ul style="list-style-type: none"> ▪ 'Significant Roadside Area' signs erected on roadside sites. 	Wangaratta Rural City Council, Indigo Shire Council

6.	Provide information and advice to local government authorities for inclusion in planning processes. Ensure sites are not affected by earth works and in particular impoundments by land-use planning – protection in planning schemes. Relevant local government authority and water authority to prevent inappropriate works or dams in locations which will impact on hydrological processes.	<ul style="list-style-type: none"> ▪ No further loss of individuals or populations. ▪ No measurable decline at key localities. 	DSE
7.	Develop, provide input to, or implement park, reserve or land management plan. Protect public land sites and provide recommendations for management to land managers and DSE.	<ul style="list-style-type: none"> ▪ Sites protected and managed to achieve healthy populations, which naturally regenerate. ▪ Land managers, DSE and DPI provided with data. 	Parks Victoria, DSE, Wangaratta Rural City Council, Indigo Shire Council
8.	Liaise with private landholders. Ensure that information and advice about the recovery of Warby Range Swamp-gum has been provided to private land managers and landholders.	<ul style="list-style-type: none"> ▪ All private land managers are aware of the species and its management needs. 	DSE
9.	Liaise with government agencies. Ensure that information and advice about the recovery of Warby Range Swamp-gum has been provided to public land managers, local government authorities and Catchment Management Authorities.	<ul style="list-style-type: none"> ▪ All relevant authorities and land managers are aware of the species and its management needs. 	DSE

Objective III To increase the number of populations or individuals

<i>Action</i>	<i>Targets</i>	<i>Responsible</i>
10. Store reproductive material. Maintain a seed bank in conjunction with local seed banks.	<ul style="list-style-type: none"> ▪ Long-term storage facility identified. ▪ Seed from target populations in storage 	DSE, Royal Botanic Gardens
11. Determine seed viability.	<ul style="list-style-type: none"> ▪ Seed viability determined. 	Royal Botanic Gardens

Objective IV To improve condition of habitats

<i>Action</i>	<i>Targets</i>	<i>Responsible</i>
12. Manage weeds. Control threats of weed competition by implementing integrated pest plant and animal control.	▪ Decline in extent and abundance of weed infestations at key localities.	Parks Victoria, DSE, Wangaratta Rural City Council, Indigo Shire Council, Water Authority
13. Erect/maintain fence to exclude domestic stock. Control threats of grazing by herbivores and damage to soil substrates by stock in Warby Range Swamp-gum habitat by fencing sites from stock and other herbivores and installing alternative water feeding sites.	▪ Measurable seedling recruitment/vegetative regeneration.	Parks Victoria, DSE, Wangaratta Rural City Council, Indigo Shire Council, Water Authority
14. Control introduced animals. Control threats of grazing by herbivores by implementing integrated pest animal control and fencing sites from introduced herbivores.	▪ Measurable seedling recruitment/vegetative regeneration.	Parks Victoria, DSE, Wangaratta Rural City Council, Indigo Shire Council, Water Authority
15. Manage salinity. Undertake establishment of buffering plantings.	▪ Measurable seedling recruitment/vegetative regeneration.	Parks Victoria, DSE, Wangaratta Rural City Council, Indigo Shire Council, Water Authority

Objective V To increase community awareness and support

<i>Action</i>	<i>Targets</i>	<i>Responsible</i>
16. Involve community groups and volunteers in recovery activities.	▪ Opportunities for involvement identified, promoted and supported.	DSE, Parks Victoria

References

- Australian Nature Conservation Agency (1993) 'Threatened Australian Flora.' Australian and New Zealand Environment and Conservation Council.
- Bailey, P. (1989) *Eucalyptus cadens*. In 'Society for Growing Australian Native Plants Newsletter'. pp. 11.
- Briggs, J.D., Crisp, M.D. (1989) *Eucalyptus cadens* (Myrtaceae), a new Swamp Gum from the Warby Range, northeast Victoria. *Muelleria* 7, 7-13.
- Department of Natural Resources and Environment (1992) 'Action Statement No. 21, Warby Swamp Gum, *Eucalyptus cadens*.' Department of Natural Resources and Environment, East Melbourne.
- Department of Natural Resources and Environment (2000a) 'Rare or Threatened Vascular Plants in Victoria - 2000.' Department of Natural Resources and Environment, East Melbourne.
- Department of Natural Resources and Environment (2000b) 'Victoria's Salinity Management Framework. Restoring our Catchments.' Department of Natural Resources and Environment, East Melbourne.
- Department of Natural Resources and Environment (2001) DNRE Flora Information System, 2001. In. (Department of Natural Resources and Environment)
- Department of Natural Resources and Environment (2002) VROTPop, The Population Monitoring Scheme for Rare and Threatened Plants in Victoria. In. (Department of Natural Resources and Environment: East Melbourne)
- Department of Sustainability and Environment (2003) Victorian Resources Online: Regional Planning. In. (Department of Sustainability and Environment.)
- Department of Sustainability and Environment (2005) *Advisory List of Rare or Threatened Plants in Victoria - 2005*. Department of Sustainability and Environment, East Melbourne, Victoria.
- Scientific Advisory Committee (1997) 'Final Recommendation on a nomination for listing: Warby Swamp Gum *Eucalyptus cadens* (Nomination No. 38).' Scientific Advisory Committee, Flora and Fauna Guarantee. Department of Natural Resources and Environment, Melbourne.

This Action Statement has been prepared under section 19 of the Flora and Fauna Guarantee Act 1988 under delegation from Mr Peter Harris, Secretary, Department of Sustainability and Environment, July 2008.

Published by the Victorian Government Department of Sustainability and Environment

Melbourne, July 2008

© The State of Victoria Department of Sustainability and Environment 2008

This publication is copyright. No part may be reproduced by any process except in accordance with the provisions of the *Copyright Act 1968*.

Authorised by the Victorian Government, 8 Nicholson Street, East Melbourne.

ISSN 1448-9902

For more information contact the DSE Customer Service Centre 136 186

Disclaimer

This publication may be of assistance to you but the State of Victoria and its employees do not guarantee that the publication is without flaw of any kind or is wholly appropriate for your particular purposes and therefore disclaims all liability for any error, loss or other consequence which may arise from you relying on any information in this publication.

Accessibility

If you would like to receive this publication in an accessible format, such as large print or audio, please telephone 136 186, 1800 122 969 (TTY), or email customer.service@dse.vic.gov.au
This document is also available in PDF format on the Internet at www.dse.vic.gov.au