The Minister's delegate approved this Conservation Advice on 16/12/2016.

Conservation Advice

Cassinia rugata

wrinkled cassinia

Conservation Status

Cassinia rugata (wrinkled cassinia or wrinkled dollybush) is listed as Vulnerable under the *Environment Protection and Biodiversity Conservation Act 1999* (Cwlth) (EPBC Act) effective from the 16 July 2000. The species was eligible for listing under the EPBC Act as on 16 July 2000 it was listed as Vulnerable under Schedule 1 of the preceding Act, the *Endangered Species Protection Act 1992* (Cwlth).

Species can also be listed as threatened under state and territory legislation. For information on the current listing status of this species under relevant state or territory legislation, see http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl

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 and area of occupancy, has a small population size and subpopulations are highly fragmented (Carter & Walsh 2006; DEWNR 2016; DPIPWE 2011).

Description

The wrinkled cassinia is a perennial spreading to erect shrub growing to about 3 m tall. It is often densely multi-branched from the base (DPIPWE 2011). Branchlets are sticky to touch and have mixed cottony and bristly hairs. The sessile leaves are oblong to narrow elliptic, 6 - 25 mm long and 1.5 - 4.5 mm wide, having short hairs with coarse, thickened bases above and dense cottony hairs on the underside (except on the midrib) (Carter & Walsh 2006; DPIPWE 2011). Leaf margins are rolled under, but not enough to obscure the lower surface. Flowers are clustered in groups of 4 - 7 small, cream-coloured, oval-shaped heads to 2.5 mm across, surrounded by narrow, somewhat wrinkled, white to cream bracts (leaf-like structures). Individual florets are conical, white, and 4 - 5 mm long (Walsh 1990; Walsh & Entwisle 1999 cited in Carter & Walsh 2006).

The wrinkled cassinia was recognised as occurring in Tasmania in 2010 (Collier 2010 cited in DPIPWE 2011). The known Tasmanian population exhibits a large degree of morphological variation and is likely to have been previously overlooked because of its resemblance to a number of shrubby daisy bushes that are not easy to distinguish. *Ozothamnus rosmarinifolius* (swamp everlasting bush), which may co-occur with the wrinkled cassinia (Collier 2010 cited in DPIPWE 2011), can be distinguished from the wrinkled cassinia as flower-heads lack bracts (scales) between the individual florets (this usually requires microscopic or hand lens examination) (DPIPWE 2011).

Distribution

The wrinkled cassinia is known from three regions: one in south-western Victoria, one in south-eastern South Australia, and another on the central north coast of Tasmania.

In 2015, 77 individuals of the species were known from four sites, and another two populations were likely to be extant, in the Portland region of south-western Victoria. These populations were located between Drumborg in the upper Fitzroy River catchment and Gorae in the upper Surrey River catchment (Pitts pers. comm. 2016). Three of these subpopulations are situated near the eastern boundary of Cobboboonee National Park, which is likely to contain more subpopulations (Carter & Walsh 2006; Pitts pers. comm. 2016). Other known subpopulations

are bordered by farming properties and there is little likelihood of additional individuals being found on those properties (Carter & Walsh 2006).

In 2010, a single population of approximately 280 plants was discovered on a private property near Port Sorell in Tasmania (Collier 2010 cited in DPIPWE 2011). This is the largest known population in the species known distribution. Subsequently, six subpopulations, each consisting of only a few individuals, were located along road reserves heading southwards from Port Sorell. The linear extent of the fragmented Port Sorell population was approximately 1.3 km (DPIPWE 2011). An historic collection of wrinkled cassinia specimens, which is held at the Tasmanian Herbarium, was collected from the Cape Portland area of north-eastern Tasmania (approximately 130 km east of Port Sorell) during the late 1800s – early 1900s (DPIPWE 2011).

The only recorded location of the wrinkled cassinia in South Australia, dated 1987, was from the Mount Lyon Native Forest Reserve north of Glencoe and approximately 30 km north-west of Mount Gambier (ForestrySA 2010). The species has not been seen in the reserve since it was originally identified there and further surveys are required to determine whether an extant population of the species is present in the region (ForestrySA 2010).

Table 1 – Locations of wrinkled cassinia subpopulations in Victoria, Tasmania and South Australia and numbers observed.

Location	Estimated subpopulation size
Victoria	
Roadside, Jennings Road, south-west of Heywood and approximately 3.5 km east of Cobboboonee National Park (NP)	2 individuals seen in 2012; no plants seen since 2012 (Pitts pers. comm. 2016)
Roadside, Sinclair Settlement Rd (on Corduroy Creek), approx. 2 km west of Cobboboonee NP	Two individuals seen in 1990 and 1992; no individuals seen in 2002 (Walsh unpubl. cited in Carter & Walsh 2006)
Hedditch's Road Water Reserve (aka. Drumborg – Fitzroy River Reserve), Heywood West	20 individuals tagged in 2015 (Pitts pers. comm. 2016)
Boundary Road 1 (southern population), Cobboboonee NP	19 individuals tagged and juveniles seen in 2015 (Pitts pers. comm. 2016)
Boundary Road 2 (middle population), Cobboboonee NP	20 individuals tagged and juveniles seen in 2015 (Pitts pers. comm. 2016)
Roadside, Boundary Road bridge over Corduroy Creek (northern population)	18 individuals tagged in 2015 (Pitts pers. comm. 2016)
Tasmania	
Rubicon Sanctuary (private property with a conservation covenant), Port Sorell	Approximately 300 individuals seen in 2011 (DPIPWE 2011)
Port Sorell – Harford, roadside remnants and private property	An estimated population of greater than 16 seen in 2010 (DPIPWE 2011)

Cape Portland area	Potentially extant subpopulations of unknown size last seen in the late 1800s/ early 1900s (collection of specimens held in the Tasmanian Herbarium) (DPIPWE 2011)
South Australia	
1 km SW of Lake Edward in Mount Lyon Native Forest Reserve (ForestrySA 2010)	Potentially extant subpopulation of unknown size (1 individual of the species found in 1987; specimens are held at the State Herbarium of South Australia) (DPIPWE 2011; DEWNR 2016)

It is likely that the sizes of some populations in Victoria have been underestimated (Carter & Walsh 2006). The three Boundary Road sites are bordered on the western side by extensive bushland in Cobboboonee National Park which is likely to contain more subpopulations (Carter & Walsh 2006; Pitts pers. comm. 2016).

In Tasmania, Collier (pers. comm. cited in DPIPWE 2011) noted that plant counts were approximate as individuals tend to be strongly clustered.

Relevant Ecology

All wrinkled cassinia populations are associated with water courses (Pitts pers. comm. 2016). In Victoria, the wrinkled cassinia is found in damp to seasonally wet, low open-forest or dense, low heathy woodland or scrub (Carter & Walsh 2006). The substrate at each site where the species has been known to occur is derived from Quaternary siliceous sand (Malanganee Sand), enriched and blackened with peaty deposits (Walsh 1990).

Open-forest sites are generally dominated by *Eucalyptus ovata* (swamp gum). Understorey species include *Acacia melanoxylon* (blackwood), *Melaleuca squarrosa* (scented paperbark), *Hakea decurrens* (bushy needlewood), *Leptospermum continentale* (prickly tea-tree), *L. lanigerum* (woolly tea-tree), *Allocasuarina paludosa* (scrub sheoak), *Gahnia trifida* (coast saw-sedge) and *Olearia glandulosa* (swamp daisy-bush). Heathy woodland sites may consist of *Melaleuca gibbosa* (slender honey-myrtle), scented paperbark, prickly tea-tree, woolly tea-tree, scrub sheoak, *Ozothamnus ferrugineus* (tree everlasting) and *Hakea nodosa* (yellow hakea) (Carter & Walsh 2006).

The habitat supporting the large population near Port Sorell was described by Collier (2010) (cited in DPIPWE 2011) as a remnant wetland community dominated by *Themeda triandra* (kangaroo grass). Individuals are rarely found with over-topping shrubs or trees. Sites supporting swamp everlasting bush also appear to be suitable for the wrinkled cassinia (Collier 2010 cited in DPIPWE 2011).

The species reproduces by seed (Carter & Walsh 2006; NRE 2000). Flowers appear from February to April (Carter & Walsh 2006; Walsh 1990). As with most other *Cassinia* species, the germination of seeds is likely to be stimulated by fire, physical disturbance of soils in which seeds are stored, and/or physical disturbances that remove much of the overlying shading vegetation, thus enabling the soil surface to receive more light, (Carter & Walsh 2006; Pitts pers. comm. 2016; Walsh pers. comm. 2002). Although recruitment of seedlings was not observed following a 2007 fire, the species has been observed to sprout and recover well from existing rootstock within one to two seasons after burning (Collier 2010 cited in DPIPWE 2011). While the large wrinkled cassinia population near Port Sorell has benefitted from the regularly burning of its wetland habitat (DPIPWE 2011), suitable fire (or disturbance) regimes for this species have not been scientifically verified (Carter & Walsh 2006; Pitts pers. comm. 2016). While no research on the longevity of the wrinkled cassinia has been undertaken, in some ecological communities, individuals of the species and other locally native shrub species in the understorey layer have been observed to enter into decline approximately 15 years after fire. This suggests that the species and ecological communities that support it would benefit from fire intervals of no greater than 15 years (Pitts pers. comm. 2016).

Threats

The wrinkled cassinia is threatened by habitat loss, fragmentation and degradation, invasive weeds, too infrequent fire and altered landscape hydrology. These threats and their effects on the wrinkled cassinia are described in the table below. The threats outlined below have corresponding conservation management priorities. Given the very limited extent of occurrence and area of occupancy of the species, and the low total number of individuals, the risk from stochastic events on the long-term survival of the species is likely to be high (Carter & Walsh 2006).

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

Threat factor	Threat type and status	Evidence base
Loss, fragmentation or degradation of subpopulations or habitat		
Land clearing for agriculture, forestry or other development	known current	Extensive clearing of native vegetation in coastal lowlands for agricultural land uses, including pasture, crop development and dam construction, the subdivision of land, forestry and infrastructural development has resulted, and continues to result, in the substantial loss, fragmentation and modification of many natural wetlands that are likely to have supported subpopulations of the wrinkled cassinia (DPIPWE 2011). As a result, most subpopulations in Victoria and Tasmania persist along roadsides (Carter & Walsh 2006; DPIPWE 2011).
Too frequent road works	potential current	Some subpopulations of the species occur along road margins in Victoria and Tasmania (Carter & Walsh 2006; DPIPWE 2011). Road works, such as grading, slashing and weed control activities, are a threat to roadside subpopulations where such activities are conducted too frequently to allow those subpopulations to regrow, set seed and regenerate (Carter & Walsh 2006; DPIPWE 2011).
Invasive species		
Weed invasion and competition	known current	The Hedditch's Road Water Reserve site is mostly surrounded by farming land and is subjected to edge effects and weed invasion (Pitts pers. comm. 2016). Blackberry (*Rubus fruticosus* species aggregate), a range of pasture grasses, including common velvet-grass (*Holcus lanatus*), and phalaris (*Phalaris aquatica*), and dock/sorrel species (*Rumex* spp.), have been known to overgrow, shade out and limit the growth subpopulations of the wrinkled cassinia at some sites in Victoria (Carter & Walsh 2006).
Fire		
Lack of fire or low fire frequency	potential current	Collier (pers. comm. cited in DPIPWE 2011) noted that individuals that are over-topped and shaded by larger shrubs or trees tend to become leggy and die. Prolonged periods without fire or disturbance may allow vegetation in habitats to become overgrown to the extent that underlying individuals of the species are unable to persist and recruitment of seedlings is inhibited, which appears to be a problem at several sites in Victoria (Carter & Walsh 2006) and Tasmania (DPIPWE 2011).

Altered hydrology		
Insufficient or excessive soil moisture in habitats	potential	In the Portland region of Victoria, extensive tree plantations, particularly those growing *Eucalyptus globulus* (Tasmanian blue gum) stands, are likely to significantly lower watertables in the ground in which they are grown. Wrinkled cassinia subpopulations situated adjacent to such plantations may be adversely affected as habitat-supporting soils dry out with the lowering of the watertable in the area. In Tasmania, soils supporting wrinkled cassinia subpopulations may dry out due to water diversions in the form of drainage, damming or irrigation water extraction (DPIPWE 2011). Conversely, subpopulations of the species may be adversely affected when soils become excessively wet, potentially as a result of increased run-off from roads or culverts, or from irrigation (Carter & Walsh 2006).
Altered hydrology of habitats resulting from climate change	potential	A predicted warmer climate and longer periods of drought may deleteriously impact on wrinkled cassinia habitat through effects such as the drying out of low-lying areas, increased competition with weeds, and an increased frequency and intensity of fire events (DPIPWE 2011).

Conservation Actions

Conservation and Management priorities

Loss, fragmentation or degradation of subpopulations or habitat

- In accordance with Commonwealth and state environmental legislation, assess all actions, such as road or infrastructure construction projects or upgrades, forestry actions, or water diversion projects that may result in the removal, fragmentation or degradation of wrinkled cassinia subpopulations or their habitats.
- Identify and implement measures to avoid direct and potential indirect impacts on wrinkled cassinia subpopulations and their habitats from road works and vegetation management activities in road reserves where the species is known or likely to occur.
- Establish and maintain fenced buffer zones, where necessary, to protect subpopulations of the species from works or activities that may otherwise damage those subpopulations or areas of habitat.
- Install and maintain signage indicating the occurrences of wrinkled cassinia subpopulations (including surrounding buffer zones) and the importance of avoiding damage to them or their habitats.
- Negotiate voluntary conservation agreements or land covenants for protection of subpopulations on private land under relevant state legislation or biodiversity conservation programmes.
- Take immediate steps to rehabilitate habitat where direct or indirect impacts on a known subpopulation or its habitat occur as a result of activities such as those mentioned above.

Invasive species

- Incorporate weed management/habitat restoration plans in site-specific management plans developed for all known wrinkled cassinia subpopulations, including surrounding buffer zones.
- Site-specific weed management plans should describe the most appropriate weed suppression methods for eliminating/suppressing relevant weed species at those sites while minimising the risk of incidental impacts on wrinkled cassinia subpopulations or their ecological communities.
- Avoid the use of herbicides in the vicinity of wetland ecosystems where the species is known to occur or may occur.
- Apply mechanical methods to remove blackberry.

Fire

- In order to stimulate the natural regeneration of wrinkled cassinia subpopulations, develop and implement a fire management plan for the prescribed ecological burning of subpopulations of the species and their habitats in accordance with scientific evidence on the species' fire ecology.
- Avoid conducting prescribed burns between mid-autumn and late spring.
- Avoid successive fire intervals that are shorter than the period required to maintain recovery and reproductive capacity of resprouting individuals of the species.
- Mechanical damage to the habitat and individuals of the species must be avoided during and after fire operations.
- Where pasture grasses are a threat to a subpopulation of the species, minimise the use of prescribed fire and follow up with appropriate weed control.
- The use of prescribed fire to manage vegetation at sites where the species occurs should be accompanied by a carefully planned weed management strategy to control erosion and weeds.
- Continue pre-fire and post-fire monitoring to assess the species response to prescribed burns. Post-fire control measures should be implemented accordingly.

Seed collection, propagation and other ex situ recovery action

- Establish plants in cultivation in appropriate institutions such as the Royal Tasmanian Botanical Gardens.
- To manage the risk of losing genetic diversity, undertake appropriate seed and storage in appropriate institutions, such as the Seedsafe Tasmania, Royal Tasmanian Botanical Gardens, and determine viability of stored seed. Best practice seed storage guidelines and procedures should be adhered to, to maximise seed viability and germinability. Seeds from all natural populations to be collected and stored.
- Maintain existing representative ex situ collections of propagated/cultivated individuals of the wrinkled cassinia.
- Consider implementing a programme to translocate individuals of the species to areas of suitable habitat to increase the number and distribution of subpopulations and enhance genetic flows. Devise and implement such a translocation programme in accordance with the protocols recommended by Vallee and colleagues (2004).

Stakeholder Engagement

- Ensure that relevant land owners/managers, road workers and road reserve maintenance crews are aware of locations where wrinkled cassinia subpopulations are known and likely to occur and the importance of avoiding damage to subpopulations of the species or degrading the supporting environment.
- Provide information and extension support to relevant local councils, government agencies, development proponents, natural resource managers, and the local community on the location, significance and management of known subpopulations of the species and areas of potential habitat.
- Identify opportunities for, and promote and support, the involvement of community groups and volunteers in recovery activities for the species.
- Continue to update electronically available information about the species, including information about its appearance, habitat, threats, recovery actions and the importance of locating, monitoring and protecting subpopulations over the long-term.

Survey and monitoring priorities

- Continue to monitor known wrinkled cassinia subpopulations and their habitats, preferably annually and during the optimal survey period for the species.
- During monitoring of known subpopulations, important biological information on each subpopulation should be recorded, including: the area and extent of the subpopulation; estimates of the number, size and structure of the subpopulation, noting the numbers of plant mortalities and seedlings recruited; seed bank status; morphological data; floristic and environmental information relevant to the condition of the ecological communities in which the species occurs; surface soil moisture; and any damage to subpopulations or their habitats and the likely cause of the damage.
- Undertake surveys in the Cape Portland area of Tasmania and between Mt Gambier and Millicent in South Australia to determine whether the species still occurs at recorded locations.
- Continue to survey suitable habitat and surrounding ecological communities within the species' potential range from Victoria to South Australia and in Tasmania during the species' flowering period - February to April - to locate any potentially occurring subpopulations (Carter & Walsh 2006; DPIPWE 2011). Identify areas of suitable habitat for survey based on a habitat suitability model.
- Accurately map all subpopulations.

Information and research priorities

- Research key biological functions of the species, including: life history and longevity under varying conditions; pollination biology/ecology (including spatial patterns of pollinator movement); fecundity; seed dispersal patterns; seed germination requirements; seed longevity; patterns of recruitment; genetic variation in the population across the species' extent of occurrence; optimal fire regime (frequency vs. intensity) and other disturbance regimes for regeneration of subpopulations and their habitats, for the species and habitats; the species' potential response to predicted changes in relevant climatic variables in order to best mitigate the threat of climate change on the species.
- Undertake a habitat connectivity analysis to identify critical habitat linkages and potential barriers to the dispersal of pollinators and seeds gene flows, and prioritise important areas

for linking, enhancing or establishing additional subpopulations. This analysis requires information on spatial patterns of pollinator movement, seed dispersal patterns of the species or genetic variation in the population across the species' extent of occurrence (McRae et al., 2008). If this information is not available, then collecting this information should be the research priority.

- Analyse demographic data to estimate population trends and responses against conservation actions. Collate and analyse census data, compare with management histories and conduct population viability analyses. Adapt management actions if necessary.

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