

Spyridium obcordatum

Flora Recovery Plan



Australian Government



ACKNOWLEDGMENTS

This Plan was prepared by personnel with the Threatened Species Section, Resource Management and Conservation Division, Department of Primary Industries, Parks, Water and Environment, Hobart. The Plan draws upon the previous Recovery Plans (Coates 1991a, Barker & Johnson 1998), a report on threatened species in the Rhamnaceae family (Coates 1991b), and a *Spyridium obcordatum* Listing Statement (TSU 2003). The preparation of this Plan was funded by the Australian Government Department of Sustainability, Environment, Water, Population and Communities.

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ISBN:

Abbreviations

DPIPWE	Department of Primary Industries, Parks, Water and Environment (Tasmania)
DSEWPaC	Department of Sustainability, Environment, Water, Population and Communities (Australian Government)
EPBC Act	Commonwealth <i>Environment Protection and Biodiversity Conservation Act 1999</i>
NC Act	Tasmanian <i>Nature Conservation Act 2002</i>
NRM	Natural Resource Management
PWS	Parks and Wildlife Service (DPIPWE)
RTBG	Royal Tasmanian Botanical Gardens (DPIPWE)
TSP Act	Tasmanian <i>Threatened Species Protection Act 1995</i>
TSS	Threatened Species Section, Biodiversity Conservation Branch (DPIPWE)

Taxonomy follows Buchanan (2007) except where otherwise noted; common names are consistent with Wapstra *et al.* (2005).

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SPECIES INFORMATION

Scientific name: *Spyridium obcordatum* (Hook.f.) W.M.Curtis, *Vict. Nat.* 87: 251 (1970)

Common Name: creeping dustymiller (Wapstra *et al.* 2005)

Group: vascular plant, dicotyledon, family **Rhamnaceae**

Status: *Threatened Species Protection Act 1995* (TSP Act): **vulnerable**
Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act):
Vulnerable

Distribution: Endemic status: **Endemic to Tasmania**
 Tasmanian Natural Resource Management (NRM): **Cradle Coast, North**

Description and taxonomy

Spyridium obcordatum, commonly known as creeping dustymiller, is a prostrate shrub with a thickening at the base of the main stem from which numerous branches arise. The branches are generally up to 40 cm long and are brittle and wiry with chestnut coloured wood. The branches tend to spread along the ground or trail over embankments or between rocks. The leaves are indented at the tip (obcordate) with an indented mid-rib and recurved margins, and are up to 10 mm long. The upper leaf surface is bright green and glossy and the lower surface is white with a covering of short hairs. The flowers are small and white, about 3 mm wide, and are organised in tight clusters that are surrounded by brown bracts and floral leaves (leaves that look like petals). The seeds are hard, light brown and 1.0 to 1.5 mm in size.

Spyridium obcordatum is superficially similar to *Spyridium lawrencei* (small-leaf dustymiller) and *Stenanthemum pimeleoides* (propeller plant) but does not occur within the range of these eastern Tasmanian species. It can be identified at any time of the year.

Spyridium is a genus in the Rhamnaceae, a family represented by eighteen genera in Australia, five of which are native to Tasmania, namely *Cryptandra*, *Discaria*, *Pomaderris*, *Spyridium* and *Stenanthemum* (Buchanan 2007). There are ten *Spyridium* taxa in Tasmania, seven of which are endemic to the state. Six *Spyridium* taxa are currently listed on the TSP Act, and two of these, *Spyridium lawrencei* and *Spyridium obcordatum*, are also listed on the EPBC Act.

Life history and ecology

Spyridium obcordatum is a woody perennial shrub that flowers from mid-September to October. Flowers are insect pollinated and appear to be self-incompatible. Prolific amounts of seed are generally produced. Seed dispersal is poor but is probably aided by ants.

The species has a requirement for an open habitat provided either by rockiness or disturbance. Recruitment is primarily from soil-stored seed, particularly following fire or soil disturbance, though many seedlings are lost through grazing by native animals and rabbits. Seed germination may be promoted by high temperatures experienced with medium to high intensity burns. However, frequent low intensity fires (<5–10 years) that favour species that quickly regenerate by resprouting will result in a decline in numbers due to the crowding out of seedlings and gradual depletion of the soil seed bank.

Established plants of *Spyridium obcordatum* are able to resprout after grazing, even when this may be severe. Vegetatively regeneration through layering (producing adventitious roots at branch nodes) can occur when plants are protected from grazing.

Distribution and habitat

Spyridium obcordatum is endemic to Tasmania. The species has an extent of occurrence of about 220 square kilometres in the north of the State on hills to the east of the Dazzler Range near Beaconsfield, and in coastal areas from Greens Beach to Hawley Beach at Port Sorell (Figure 1). Its linear range is 23 km, and it is estimated to occupy approximately 20 hectares in total.

Inland subpopulations and two of the coastal subpopulations occur in NRM North and two coastal subpopulations extend into NRM Cradle Coast (Table 1).

Spyridium obcordatum occurs primarily in inland areas amongst serpentine outcrops in dry open forest or woodland dominated by *Eucalyptus amygdalina*. In near-coastal areas, the species is found in *Allocasuarina verticillata* coastal woodland and low open heathland dominated by *Allocasuarina monilifera* and *Leptospermum scoparium*. The substrate in near-coastal areas may be sandstone or dolerite. The species is found in open habitats, typically being associated with outcropping rocks, exposed rock plates or rocky ground, and is most abundant in disturbed areas. As a result of browsing, plants tend to be restricted to sites afforded some protection by vegetation or fallen branches. It occurs at altitudes less than 180 metres above sea level.

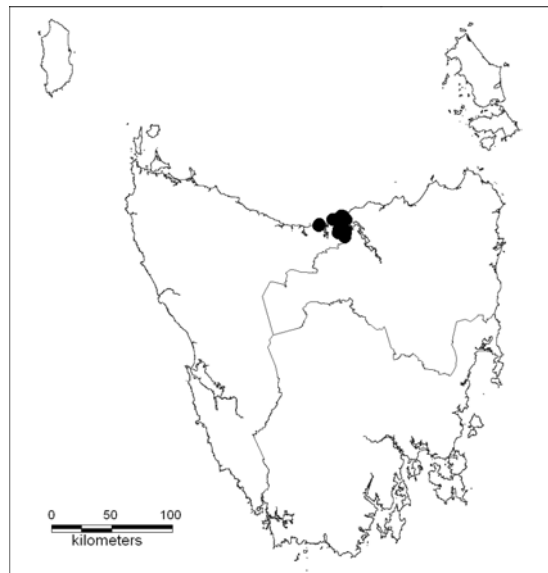


Figure 1. Distribution of *Spyridium obcordatum*
(NRM regions: Cradle Coast – top left, North – top right, South – bottom right)

Population estimate

Spyridium obcordatum is currently known from 10 subpopulations (Table 1). The total number of plants is estimated at approximately 56,000 mature individuals. The largest subpopulation, estimated to contain more than 26,000 individuals in 1996, mostly occurs within Andersons Creek Forest Reserve. The largest patch of the Dans Hill subpopulation is the densest, with about 22,000 individuals in an area of about 2.5 ha. All known subpopulations, and any new subpopulations found, are considered important for the survival of the species in Tasmania.

Subpopulations in coastal habitats (subpopulations 6 to 10) are significantly smaller than those in inland habitats (subpopulations 1 to 5), with about 1,200 and 1,600 mature individuals in the two largest subpopulations at Hawley Beach and Greens Beach. Note that estimates for one site in the Hawley Beach subpopulation declined from 1,970 plants in 1996 to about 200 in 2002. A concerted effort was made to estimate plant numbers and area occupied of significant stands in 1996, during which time the small subpopulation in the Narawntapu National Park could not be found. New estimates are required for subpopulations in coastal habitat following subdivision. It is likely that more patches of the species exist, particularly as much of the coastal habitat is privately owned and has not been thoroughly searched.

Table 1. Population summary for *Spyridium obcordatum*
(subpopulations 1 to 5 are inland sites and subpopulations 6 to 10 are coastal sites)

	Location Tenure	NRM Region	1:25 000 mapsheet	Year last seen	Area (ha)	Number of mature plants
1	North of Scotts Hill near Beaconsfield 1. Andersons Creek Forest Reserve 2. State Forest/Andersons Creek FR	North	Port Sorell	total 1996 1996	10 0.5	26,300 22,700 3,600
2	1. Dans Hill 2. Settlers Hills Dans Hill Conservation Area – 2 sites	North	Beaconsfield	1996 1985 total	2.5	22,000 22,000+
3	Slopes north of Barnes Hill – 3 sites 1. Dans Hill Conservation Area 2. Dans Hill Conservation Area 3. Private land	North	Beaconsfield	total 1996 1996 1991	1.1	3,303+ 3 3,300
4	East of Ironstone Hills Dans Hill Conservation Area	North	Harford	1996		
5	North of Holwell Gorge Private land	North	Beaconsfield	1995		
6	Wentworth Hill, Greens Beach – 2 sites 1. Private land 2. Private land	North	Greens Beach	total 1996 2005	0.6	1,600 1,000 600
7	Sea Hill, Greens Beach Private land	North	Low Head	1990		
8	West of Kelso Bay Private Land	North	Bell Bay	2004		< 10 browsed
9	Little Badger Head Narawntapu National Park	Cradle Coast	Port Sorell	1990		4 (0 in 1996 & 2002)
10	Hawley Beach, Port Sorell – 4 sites 1. Hawk Trap Hill (Public open space) 2. Hawk Trap Hill (In subdivision) 3. Hawk Trap Hill (Private land) 4. Hawley Nature Reserve	Cradle Coast	Devonport	total 2002 2002 2005 2008	1.9 3 0.5 0.02	1,040-1,190 200 (1,970 in 1996) 100–200 540 200–250 browsed

Reservation status

Inland subpopulations of *Spyridium obcordatum* are reserved within Dans Hill Conservation Area and Andersons Creek Forest Reserve. Coastal subpopulations are reserved within Hawley Nature Reserve and Narawntapu National Park (though the latter subpopulation could not be found in surveys conducted in 1996 and 2002).

Threats, limiting factors and management issues

Spyridium obcordatum is at risk because of its restricted distribution, with an extent of occurrence of approximately 220 km² and an area of occupancy of about 20 hectares and ongoing threats. Subpopulations, particularly those in coastal habitats, are threatened by land clearance due to housing, agriculture and forestry, browsing, and a decline in the quality of habitat through residential activities (rubbish dumping, ‘tidying up’ of bushland, the spread of weeds and garden plants) and frequent fire. Coastal subpopulations are also limited by drought stress. Mining, lack of fire and browsing are threats to inland occurrences and potential habitat. *Spyridium obcordatum* is most abundant on the inland sites on serpentine soils. This may reflect a preference for this substrate, less drought stress (compared to coastal sites) and a past beneficial disturbance and fire regime promoting openness and recruitment from seed. Threats are detailed below.

Inappropriate disturbance regime: *Spyridium obcordatum* has a requirement for an open habitat, provided either by rockiness or disturbance. The inland areas (where the species is most abundant) have had a long history of disturbance from tracks and mining and more recently, wood hooking, likely benefiting the species by increasing habitat openness and promoting recruitment from seed. These areas may also have benefited from medium to high intensity fires in the region that may have promoted seed germination from soil stored seed. Most of the inland habitat has not been burnt for some decades likely confining the species to the soil seed bank in many areas. The species has been noted to have emerged after a 2002 fire, in a fenced area where the species was not previously apparent (in the vicinity of the subpopulation east of the Ironstone Hills). Frequent low intensity fires (<5–10 years) that favour species that quickly regenerate by resprouting, is likely to result in a decline in numbers of *Spyridium obcordatum* due to the crowding out of seedlings and gradual depletion of the soil seed bank. This is the likely cause of the decline of the subpopulation at Little Badger Head, which was not found in targeted searches in 1996 and 2002.

Browsing and grazing: Browsing by rabbits and native animals is thought to limit seedling recruitment. Browsing damage to the species has been noted at Kelso, in the Hawley Nature Reserve and at inland sites east of the Ironstone Hills and at Barnes Hill (though the exact sites where browsing has been an issue has generally not been recorded). This has been particularly evident in inland sites within exclosures erected to protect the Critically Endangered *Tetralochea gunnii* with which it co-occurs at some sites. The difference in the diversity of the understorey now evident within and outside the exclosure of a site burnt in 2002 is enormous with the vast majority of species (including *Spyridium obcordatum*) not evident outside the exclosure. The recovery of plants in fenced unburnt sites is also significant. Browsing in unfenced areas is undoubtedly severely restricting the reproductive output of surviving plants. Observations suggest that browsing will largely prevent re-establishment after fire and likely prevent detection of the species where it has become restricted to the soil seed bank, even following germination promoting fire. Stock grazing may be a threat to occurrences on private land.

Mining: While disturbance associated with past mining activity appears to have been beneficial to *Spyridium obcordatum*, mining intensive enough to result in habitat clearance remains a significant threat to inland sites as mining is permissible in Conservation Areas, State forest and on private land. While the nickel resource is of relatively low grade, it is close to the surface and open cut mining operations become profitable when nickel prices are high. Mineral exploration proposals have increased in recent years and at the time of writing a proposal to mine nickel in the Dans Hill Conservation Area is under consideration. While regulators may prevent or minimise clearance of known occurrences should mining proceed, areas of potential habitat are at risk of being cleared.

Housing and residential activity: Most of the coastal occurrences are on private land and are threatened by housing and residential activity. Only a small patch of the largest subpopulation at Port Sorell is formally reserved (within Hawley Nature Reserve). Most of one of the two largest patches is in a council reserve (public open space). While nearly 2,000 plants were estimated in this patch in 1996, plant numbers appear to have declined dramatically and the patch is now in poor health, probably due to drought stress. In contrast, plants in a nearby patch on housing lots are thriving. Some protection of plants in this patch is afforded by a council by-law preventing clearing above the 70-m contour. The Greens Beach subpopulation is also in decline from past clearing and residential activity. The majority of remaining plants were observed on a vacant lot with significant dumping of rubbish in 1996. Invasion of habitat by weeds and garden plants is a threat to the species in such populated areas as is 'tidying up' of bushland which removes fallen branches etc. that may offer seedlings some protection from grazing.

Conversion for agriculture and forestry: Occurrences and potential habitat on private land are at risk from clearing for agriculture and conversion to plantation for forestry.

Climate change: Coastal occurrences in particular often appear drought stressed and are at risk from increased incidence of drought anticipated with climate change.

Conservation status

Spyridium obcordatum was listed as vulnerable under the TSP and EPBC Acts when the Acts came into being in 1995 and 1999 respectively. The species meets the guidelines for listing as vulnerable under the TSP Act

under criterion B as

B. Its extent of occurrence less than 2,000 km² and area of occupying less than 50 ha, and

1. it is known to exist at no more than 10 locations, and
2. there is a continuing decline in the area, extent and/or quality of habitat.

A continuing decline is inferred because of the risk from land clearance for housing and agriculture, mining activities, an inappropriate firing and disturbance regime, browsing, rubbish dumping and invasion by weeds and garden plants.

Habitat critical to the survival of the species

Habitat considered critical to survival of *Spyridium obcordatum* includes:

- the area of occupancy of all known sites; and
- areas of similar habitat surrounding and between those areas which may support further plants.

The area of occupancy of all sites is not known, and areas of similar habitat require locating and mapping.

RECOVERY

Existing conservation measures

A Recovery Plan for *Spyridium obcordatum* was prepared in 1991 (Coates 1991a). The species was also included in a Recovery Plan for selected Tasmanian forest associated plants (Barker & Johnson 1998), though this Plan has not been implemented.

An education leaflet targeting *Spyridium obcordatum* was circulated to land owners in the Port Sorell and Greens Beach area in the early 1990s.

A large area of habitat on serpentinite in the Beaconsfield area (encompassing subpopulations 2, 4 and part of 3) was purchased by the Private Forest Reserves Program (DPIPWE) as part of the 1997 Regional Forest Agreement between Tasmanian and the Commonwealth of Australia, and has since been incorporated into Dans Hill Conservation Area. The Dans Hill Conservation Area was proclaimed in 2003, primarily because of the occurrence of three flora species listed on the EPBC Act including *Spyridium obcordatum*.

Spyridium obcordatum is included in the Management Plan for Narawntapu National Park and Hawley Nature Reserve (PWS 2000a), the latter reserve's principal focus being nature conservation.

Part of the Hawley Beach subpopulation has been acquired by the Latrobe Council as a Council Reserve. Remaining areas of this subpopulation on private land are notionally protected from clearing by a council by-law preventing clearance of vegetation above the 70-m contour.

Surveys of the Little Badger Head area in 1996 and 2002 failed to relocate the species. Targeted surveys were conducted for the species in 2005, focusing in particular on Land for Wildlife properties within the species' known range (Bushways Environmental Services Tasmania 2005), resulting in extensions to subpopulations at Wentworth Hill and Hawley Beach. Of 31 landowners contacted, 28 made their properties available for survey. All were supplied with information about the species.

A Listing Statement for *Spyridium obcordatum* has been prepared under provisions of the TSP Act (TSU 2003).

Some areas (albeit small) are included in areas fenced for the Critically Endangered *Tetratheca gunnii*.

Strategy for recovery and progress evaluation

The *Spyridium obcordatum* Recovery Plan will run for five years and is based on strategies to increase the

number of subpopulations, maintain or increase numbers of individuals and habitat quality, and manage subpopulations in the long term. This will be achieved by improving security against a change in land use, protection of smaller subpopulations from browsing, survey and monitoring, seed collection, habitat management to promote recruitment and provisions for long term management.

This Plan has been prepared in consultation with various representatives of the Biodiversity Conservation Branch (DPIPWE) and various experts. It incorporates management issues and strategies outlined in earlier documents (Coates 1991a, Coates 1991b, Barker & Johnson 1998, TSU 2003) and takes existing conservation measures into account.

TSS will guide implementation, monitoring and review of this Plan or parts thereof if funding is secured. Evaluation of the success or failure of the Recovery Plan can be measured against the performance criteria. A formal review within 5 years of adoption is required under the EPBC Act. Significant developments will be communicated to the general public through Listing Statement updates, websites, newsletters and reports.

This Plan is consistent with the aims of the *Threatened Species Strategy for Tasmania* (PWS 2000b) and *Tasmania's Nature Conservation Strategy* (NCB 2002).

Recovery objectives, performance criteria and actions needed

The **overall objective** of the Recovery Plan is to prevent *Spyridium obcordatum* from declining further and to down-list the species from vulnerable to rare based on guidelines for the listing of species under the TSP Act. This will require maintaining and increasing known subpopulations and discovering new subpopulations through survey.

Specific objectives are to:

1. increase the number of subpopulations to greater than 10 through protection of known subpopulations, and survey for new subpopulations;
2. ensure numbers of individuals in known subpopulations do not decline, by the provision of disturbance regimes that favour recruitment and protection from browsing;
3. maintain or improve quality of habitat and potential habitat by minimising impacts from residential and mining activities.

The **criteria** for achieving the objectives constitute a quantifiable decrease in the risk of extinction over five years of Recovery Plan implementation. They are:

1. the number of subpopulations increased to greater than 10 within 5 years;
2. the size of known subpopulations maintained in 5 years;
3. no decline in the area occupied by each known subpopulation in 5 years;
4. quality of habitat and potential habitat maintained or improved over 5 years (as measured by Action 5).

The **actions** required to achieve these objectives are to:

1. protect habitat;
2. identify potential habitat and survey;
3. control browsing and grazing;
4. manage habitat;
5. monitor species and habitat;
6. collect seed for conservation storage;
7. manage the species for the long term.

Recovery actions

1. Protect habitat

This action is to pursue options with landowners/managers to protect subpopulations against possible changes in land use that would be detrimental to the species. This action includes:

- raising awareness of current landowners and managers of legislative responsibilities in year 1;
- developing a process to alert new or potential landowners to the presence of protected species on private land by year 3;
- negotiating conservation covenants and management agreements with land managers, including incentives, in years 1 to 5;
- developing a process for surveying potential habitat prior to application and approval for subdivision, exploration or mining activities by year 3.

Significant coastal subpopulations and some inland subpopulations of *Spyridium obcordatum* are on private land and are at risk of inadvertent destruction by land clearance through housing, agriculture or forestry activities, and roading. To prevent the destruction of subpopulations, current landowners and managers need to be made aware of their responsibilities under the EPBC Act and TSP Act, if not already informed.

There is currently no general provision to alert new or potential landowners to the presence of protected species on private land, risking the inadvertent destruction of subpopulations with a change of ownership. Perpetual or fixed-term conservation covenants under the NC Act or Part 5 agreements with Councils can be applied to register information pertaining to natural values on the land title enabling it to travel with the title to future owners. While management agreements are negotiated with each new owner of covenanted land, formal Vegetation Management Agreements can be established under the NC Act in the absence of a covenant. Where subpopulations are thriving, mechanisms to maintain current land use will be pursued with landowners. Incentives to covenant or enter into management agreements will be explored.

Given that much of the potential coastal habitat is on land suitable for subdivision, to avoid past problems, a process will be developed to ensure that surveys for the species are requested by relevant councils prior to subdivision applications being made or approvals given. Dealing with the presence of the species prior to plans being drawn up would be beneficial to developers as well as other parties.

2. Identify potential habitat and survey

While much of the potential habitat on serpentine has been examined, potential habitat on private land in coastal areas has not been well surveyed. The probability of finding new subpopulations is considered to be moderate to high, particularly for disturbed areas including those that have been burnt and on private land in coastal areas.

This action includes:

- identifying (year 1), mapping (year 2) and surveying (years 3 to 5) potential habitat. Survey effort should be recorded along with disturbance levels and time since last fire as a negative search may not preclude the species' presence in the soil seed bank and some areas may need to be searched again following fire;
- verifying any new occurrences when necessary.

3. Control browsing and grazing

This action includes:

- constructing fences around or placing brush covering over subpopulations threatened by browsing and grazing (years 1 and 2);
- adding floppy tops and signs to fences if required;
- maintaining fences (years 3 to 5).

Protection of the smaller subpopulations from browsing, and subpopulations on private land from grazing,

will allow recruitment of seedlings to increase the size of subpopulations to more sustainable levels. Two smaller sites (Kelso and the Hawley Nature Reserve) were identified as being heavily browsed when last recorded and further sites requiring fencing may be identified through monitoring (Action 5). Fencing using steel posts and chicken wire is recommended to exclude rabbits, possums, wombats and wallabies. 'Floppy tops' may need to be erected to exclude possums if grazing is still apparent following fencing. Signs will need to be erected to discourage fences from being stolen. Maintenance of the fences may be required following theft, fire or storms. For some sites where fencing may not be practical or desirable, brush coverings may be a preferable means to providing some protection from browsing. Fencing on private land will need to be negotiated with land managers.

4. Manage habitat

This action will continue for the life of the recovery plan, and involves:

- advising and helping landowners to manage habitat;
- conducting trials of slashing and soil disturbance.

Habitat will be managed to maintain or increase size of subpopulations and to prevent degradation of habitat in all sites, where possible. Habitat management intervention will be negotiated with owners or managers of land with occurrences of *Spyridium obcordatum* and, where appropriate, written management advice in the form of management prescriptions will be provided under Action 7.

Should monitoring (action 5) determine that plant numbers or the area of occupancy of any subpopulation are low or declining, intervention may be required if a cause or a remedy can be identified. Plant numbers are considered to be low if below 1000 and the species density is also low. An area of occupancy of less than 0.2 hectares is considered to be low and should be increased if adjacent habitat is suitable for occupation. Possible intervention includes firing, slashing or weed control to reduce competition, and soil disturbance to increase recruitment opportunities. 'Tidying up' of bushland near homes will be discouraged as it may compromise recruitment through decreased protection from grazing if fallen branches etc. are removed.

While medium to high intensity fires are likely to be responsible for much of the recruitment in inland subpopulations on serpentine, coastal subpopulations appear to be more reliant on other disturbance for recruitment. Openness in coastal habitat may be less cyclical, with openness more a factor of rocky substrate, exposure of hilltop sites to off shore winds and drought stress. It may be that recruitment is more continual in such subpopulations. Management needs of coastal subpopulations, if and when they become over-mature, are problematic given the limited value of fire as a tool in or near residential developments. Stands may become over-mature and decline, particularly if associated with drought and increased browsing pressure. This appears to have occurred with the patch on land acquired for a council reserve at Port Sorell. Some clumps of *Spyridium obcordatum* have died and some are dying. In comparison, a nearby stand in a more protected area is thriving. Trials will need to be conducted to determine the value of slashing to manage over-mature sites and whether some soil disturbance is also required to stimulate germination.

Away from residential areas, a low intensity burn can be attempted to assess regeneration of coastal subpopulations if required but there are currently no such candidate stands known. Frequent low intensity fires are thought to have contributed to the decline in the subpopulation in the Narawntapu National Park by promoting heathland in which shrubs such as *Spyridium obcordatum* that primarily regenerate from seed and which require open habitats, cannot compete. Much of the inland stand has not been burnt for some decades.

Weed problems, escaped garden plants or dumped rubbish that are identified in action 5 (monitoring) as impacting on subpopulations will be addressed.

5. Monitor species and habitat

This action includes:

- conducting a census of subpopulations that have not been measured within the last 10 years, and all coastal sites that have been subdivided, in year 1;
- annual monitoring of known subpopulations of *Spyridium obcordatum* to inform management (years 2 to 5);

- monitoring of the quality of habitat and potential habitat (years 1 to 5);
- monitoring of the Badger Head site following non-drought years and/or fire in case of re-emergence from the soil seed bank.

A census will determine whether the known subpopulations have declined since last measured, and will help determine whether fire is necessary to promote recruitment. At least 1 subpopulation (east of the Ironstone Hills) was burnt in 2002 and the success of this burn can be determined by a census.

Census and monitoring information required includes status, trend, size and area of occupancy, disturbance requirements relative to recruitment needs and problems with browsing and invasion of weeds and garden plants. If plant numbers or the area occupancy of subpopulations are low or declining, intervention through habitat management options (actions 3 & 4) will be required. Monitoring will need to determine possible causes so that they can be adequately addressed. Monitoring results may need to be interpreted to distinguish between true declines and the effects of drought. Monitoring of the species can occur at any time of the year. However, monitoring of potential habitat should be undertaken after fire in case of regeneration from soil stored seed. Monitoring of the quality of habitat and potential habitat will involve measurement of evidence of browsing, grazing, fire, rubbish dumping, weeds, vegetation clearing or timber harvesting.

6. Collect seed for conservation storage

This action involves:

- collection of seed for long term conservation storage at the Tasmanian Seed Conservation Centre (at RTBG) and the Millennium Seedbank at Kew (UK);
- germination testing to yield an improved understanding of the species recruitment strategy.

Bagging of plants is likely to be needed to collect seed. Seed should be collected from at least 1 coastal site and 1 inland site to ensure a large range of genetic diversity is included.

7. Manage the species for the long term

This action involves:

- the collation and interpretation of data on *Spyridium obcordatum*;
- dissemination of this information to stakeholders and other interest groups;
- implementing mechanisms to facilitate community participation in, and ownership of, the recovery program.

The availability of the up to date information is a necessary base for formulating management advice, as well as informing the allocation of resources and the assessment of the impact of development proposals.

Ongoing data and data interpretation requirements as new information becomes available are:

- entry of spatial, population, disturbance and threat information into the Natural Values Atlas (DPIPWE);
- regular reassessment and documentation of the species' extinction risk, and preparation of nominations for a change in the conservation status under State and Commonwealth legislation as required;
- regular interpretation of data, including research data, to inform, adapt and prioritise on-ground management;
- lodgement of specimens of any new subpopulation with the Tasmanian Herbarium in case of future taxonomic treatments.

Requirements for the dissemination of information are:

- update the *Spyridium obcordatum* listing statement (TSU 2003) as new information becomes available, and include on the DPIPWE website to allow access to the wider botanical community and the general public;
- review the Recovery Plan every five years, and update if required, circulate to libraries and the wider botanical community, and include on the DPIPWE and DSEWPaC websites to allow access to the general public;

- prepare written management advice for any new subpopulations and update existing advice for known sites as necessary and provide to landowners/managers;
- circulate spatial information to relevant users including NRM North, NRM Cradle Coast, PWS and Mineral Resources Tasmania and regulators including the Latrobe and West Tamar Councils, the Forest Practices Authority, the Development and Conservation Assessment Branch and Water Resources Division of DPIPWE, the Environment Division (DPIPWE), the Tasmanian Planning Commission and DSEWPaC;
- educate the community on issues such as ‘tidying up’ of bushland and rubbish dumping;
- investigate additional processes to alert potential landowners as to possible occurrences of threatened flora species and associated responsibilities.

Mechanisms to facilitate community participation and ownership are:

- involve NRM North and NRM Cradle Coast in the recovery process;
- make requests to volunteer networks to participate in specific recovery actions (groups might include Wildcare’s Threatened Plants Tasmania, Green Corps, Conservation Volunteers Australia and the Australian Plant Society);
- request participation in recovery actions by the wider botanical community through the Tasmanian Flora Network;
- provide advice to community groups on possible funding and assist with funding applications;
- when necessary, organise (1) permission from landowners/managers to access sites, and (2) permits from TSS for the collection of propagation material and/or herbarium specimens.

Table 2. Estimated cost of recovery

Actions	Cost estimate	Timeframe	NRM region
1. Protect habitat	\$40,000	Years 1–5	Cradle Coast & North
2. Identify potential habitat and survey	\$20,000	Years 1–5	Cradle Coast & North
3. Control browsing and grazing	\$20,000	Years 1–5	Cradle Coast & North
4. Manage habitat	\$40,000	Years 1–5	Cradle Coast & North
5. Monitor species and habitat	\$20,000	Years 1–5	Cradle Coast & North
6. Collect seed for conservation storage	\$10,000	Years 1–5	Cradle Coast & North
7. Manage the species for the long term	\$50,000	Years 1–5	State
Total	\$200,000		

Duration and cost

The Plan will run for five years with the estimated cost being \$200,000 (Table 2).

The *Spyridium obcordatum* Recovery Plan may be supported, and may benefit from other projects supported, by DPIPWE, NRM North, NRM Cradle Coast, PWS, Forestry Tasmania, West Tamar Council, Latrobe Council, RTBG, Tasmanian Seed Safe Centre, Millennium Seedbank, Wildcare’s Threatened Plants Tasmania, Private Land Conservation Program (DPIPWE), National Reserve System Land Acquisition Program, voluntary reserve programs, Tasmanian Farmers and Graziers Association and the Tasmanian Land Conservancy.

Management practices

This Plan identifies the following management practices necessary to avoid a significant adverse impact on *Spyridium obcordatum*.

- management of Dans Hill Conservation Area and Andersons Creek Forest Reserve includes consideration for the conservation of *Spyridium obcordatum*;
- implementation of management plans for the Hawley Nature Reserve and the Narawntapu National Park;
- ongoing weed control and prevention by all land managers;
- continuation of private land conservation schemes;
- compliance with existing clearing, mining, and development restrictions and regulations;
- continuation of existing grazing management advice and incentive programs;
- maintenance of propagation and conservation seed storage facilities at RTBG;
- maintenance of the Natural Values Atlas (DPIPWE);
- maintenance of relevant information by TSS.

Actions which result in any of the following within habitat critical to survival of *Spyridium obcordatum* may result in a significant impact:

- removal of native vegetation;
- increase in grazing and/or browsing by stock, or feral or native herbivores
- increased use of fertilizers or herbicides;
- introducing disease or pests;
- increase in competition from other plants;
- removal of fallen branches and other woody debris from protective fences;
- dumping of rubbish;
- removal of, or damage to, *Spyridium obcordatum* plants.

International obligations

Spyridium obcordatum is not listed under any international agreement and the Plan does not affect Australia's international responsibilities.

Affected interests and social and economic impacts

Spyridium obcordatum has legal protection as a listed threatened species. This places an obligation on landowners and managers for its protection. Affected interests include: PWS, DPIPWE, Forestry Tasmania, the Latrobe and West Tamar Councils, NRM North, NRM Cradle Coast, Mineral Resources Tasmania, RTBG, Millennium Seedbank, Tasmanian Herbarium, Wildcare's Threatened Plants Tasmania, Australian Plant Society, Threatened Flora Network, and private landowners.

Recovery actions for *Spyridium obcordatum* are unlikely to have any adverse social and economic impacts. As the protection of the plant's habitat is, or should be, factored into new development approvals, restrictions to development already apply.

Roles and interests of indigenous people

In the preparation of this Plan the important role Tasmanian Aboriginal people have played in land management was recognised, and the impact of European settlement on this role acknowledged.

The following Aboriginal organisations have been consulted on the significance of *Spyridium obcordatum* in Aboriginal cultural tradition, and on their knowledge, role and interest in its management: Aboriginal Land Council of Tasmania, Tasmanian Aboriginal Centre, and Tasmanian Aboriginal Land and Sea Council.

Implementation of this Plan will involve:

- knowledge sharing;

- participation in education and training relevant to threatened species management; and
- engagement in recovery actions where relevant to Aboriginal land management and communities.

If, during any recovery activity, suspected evidence of Aboriginal heritage significance is found, this will be reported to Aboriginal Heritage Tasmania, and, if the evidence is to be disturbed, the activity will be suspended pending appropriate follow-up.

Biodiversity benefits

Biodiversity benefits include the maintenance of diversity in rare ecosystems that are threatened with further reduction in size and diversity. Serpentine soils are recognised for supporting high levels of endemism (Gibson *et al.* 1992), and as serpentine is often restricted in area associated endemics are frequently rare and threatened. On serpentine, *Spyridium obcordatum* co-occurs with other threatened species including *Tetratheca gunnii* (Critically Endangered on the EPBC Act), *Epacris virgata* (Endangered on the EPBC Act) and four other species listed under the TSP Act. A large number of protected species occur within the distribution of this species in coastal habitat that is threatened by land clearance. These include *Caladenia caudata* (Vulnerable on EPBC Act) and more than twenty other species listed under the TSP Act. Management of *Spyridium obcordatum* habitat for recovery should benefit these threatened species.

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