1. Marble Daisy-bush (*Olearia astroloba*)

**Description**

The Marble Daisy-bush (*Olearia astroloba*) is a small shrub which grows to approximately 0.5 m in height. The stems are erect, smooth and pale green when young, turning brown when mature. The distinctive grey-green leaves are crowded, alternate and sessile, with dentate margins towards the apex. The inflorescence is a solitary, terminal capitulum, 15 - 32 mm in diameter. The inner disc florets are purple and bisexual, while the outer ray florets are female, violet and have three minute lobes at the apex (Lander & Walsh 1989). Flowering occurs continuously from approximately June through to March (G. Earl pers. obs.); the peak flowering period appears to be June - July (Lander & Walsh 1989).

**Distribution**

The Marble Daisy-bush is endemic to Victoria. The only known population occurs at Marble Gully Nature Conservation Reserve, near Bindi in the Tambo valley north-east of Swifts Creek, East Gippsland.

**Abundance**

It is estimated that approximately 1000 individuals exist, dispersed over about 40 ha.

**Important populations**

Persistence of the sole population at Marble Gully is critical to the survival of this species.
Habitat

Marble Daisy-bush occurs in Silurian Limestone Pomaderris Shrubland on a steep (approximately 40° – 60°), north-facing site. Drooping Sheoak (Allocasuarina verticillata) and Silver Bundy (Eucalyptus nortonii) are occasional emergents (Lander & Walsh 1989). Kangaroo Grass (Themeda triandra) and Winged Everlasting (Ozothamnus adnatus) are particularly common at the site. Soils are skeletal and derived from Silurian limestone / marble. The common name ‘Marble Daisy-bush’ (Earl & Bramwell 1999) reflects this species’ close association with marble. The single known site is approximately 600 m above sea level (Earl & Bramwell 1999). Mean annual rainfall at the site is approximately 645 mm per year.

Life history and ecology

Following the 2003 fires in eastern Victoria, key questions about the life history and ecology of the Marble Daisy-bush relate to its capacity to recover after fire. Marble Daisy-bush is a perennial plant that flowers annually and appears to produce substantial quantities of viable seed. The pollination mechanism is not known. Monitoring following the 2003 fires indicates that this species can regenerate both by re-sprouting and by seed germination (Coates et al 2004).

Conservation status

National conservation status

Marble Daisy-bush is listed as vulnerable under the Commonwealth Environment Protection and Biodiversity Conservation Act 1999.

Victorian conservation status

Marble Daisy-bush is listed as threatened under the Victorian Flora and Fauna Guarantee Act 1988. Marble Daisy-bush is considered vulnerable in Victoria according to DSE’s Advisory List of Rare or Threatened Plants in Victoria – 2005 (DSE 2005).

Decline and threats

Inappropriate fire regimes

The known population of Marble Daisy-bush appears to be recovering well from the 2003 fires. However, a further fire within a short period could adversely affect the species, especially if the soil seed store had not been adequately replenished. The relatively low fuels loads mean that an intense fire is unlikely to occur in the near future. Applied fire (ecological burning or fuel reduction burning) should not be considered prior to 2013, and after then only after careful risk assessment and tests of the soil seed store are implemented.

Weeds

The relatively high pH and fertility of the limestone-derived soil provide great potential for environmental weed invasion, particularly if the soil is disturbed. Subsequent competition from environmental weeds could threaten the ecological viability and integrity of the Silurian Limestone Pomaderris Shrubland in which Marble Daisy-bush occurs, and therefore threaten the long-term survival of the species.

The most serious environmental weeds at Marble Gully that threaten the Silurian Limestone Pomaderris Shrubland are Blackberry (Rubus fruticosus spp. agg.) and Horehound (Marrubium vulgare).

Horehound occurs mainly on the lower slopes of the north-western section of the Silurian Limestone Pomaderris Shrubland. Minor infestations have been recorded near rabbit warrens and on top of Hill 1, possibly transported by humans (Peel 1993, P. Kelly pers. comm.).

Horehound is an aggressive weed which chemically inhibits the growth of neighbouring plants. It is prevalent in disturbed areas and is thought to have been introduced to Marble Gully by rabbits, which were once abundant there. Horehound seeds are readily transported by livestock and other mammalian vectors in fur, and in human clothing. The impact of Horehound on Marble Daisy-bush conservation of is unknown. Although Horehound is perhaps unlikely to out-compete mature Marble Daisy-bush plants, it may inhibit recruitment.

A research program into the biological control of Horehound is in progress. Initial trials are being conducted by the Keith Turnbull Research Institute on affected pastures at Ensay, not far from Marble Gully. Initial tests of trial biological control agent’s host-specificity found that Marble Daisy-bush is not at risk from the control agent (J. Weiss pers. comm.).

Browsing

Browsing by rabbits may affect seedling success of Marble Daisy-bush.

Existing conservation measures

General

- The access track into Marble Gully was upgraded in 1991.
- The site is reserved as ‘Marble Gully Nature Conservation Reserve’ and management responsibility was transferred to Parks Victoria in 2005.

Marble Daisy-bush

- Monitoring of Marble Daisy-bush commenced in September 1989 and has continued on an
annual basis. This information is stored on the
VROTPop monitoring database. Plant density,
growth rate and population demographics were
most recently assessed in 2006/07 (and
compared with 2004 data).

• In 1988, cuttings of Marble Daisy-bush were
collected for propagation at the Royal Botanic
Gardens, Melbourne. Seed collected in April
1992 has been propagated by the Australian
Daisy Study Group, which is affiliated with the
Society for Growing Australian Plants (SGAP).

• A poster describing Marble Daisy-bush has
been produced and displayed at DSE offices in
Bairnsdale and Swifts Creek, and at the East
Gippsland Shire’s Omeo office.

• In June 1995, Marble Gully was added to the
List of the Register of the National Estate for its
very high botanical significance (AHC 1995).

• Weed management has continued annually,
including spraying of Blackberry Horehound
and thistles in Old Hut Creek gully and on
lower slopes of Hill 1.

• Threats to population were assessed in 2004 –
2007.

• Fire response characteristics of the species
have been investigated.

• DSE has investigated the details of intensity
and behaviour of the January 2003 fire.

• Detailed monitoring was conducted in January-
February 2004 and 2006 following the 2003
fire. Data was collected by DSE as part of the
Fire Recovery Program.

• A post-fire recovery plan for the species has
been developed.

Conservation objectives and actions

Long term objective
To ensure that the Marble Daisy-bush can survive, flourish and retain its potential for evolutionary
development in the wild.

Intended management actions

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 improve knowledge of biology, ecology and management requirements

<table>
<thead>
<tr>
<th>Action</th>
<th>Targets</th>
<th>Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Conduct priority research projects. Investigate pollination, seed set, soil seed store, seed longevity and germination requirements.</td>
<td>• Pollination mechanism identified. • Soil seed store monitored. • Seed longevity determined.</td>
<td>DSE, Biodiversity &amp; Ecosystem Services, Royal Botanic Gardens Melbourne (RBG)</td>
</tr>
</tbody>
</table>

| 2. Undertake detailed population monitoring and collect demographic information. Implement post-fire monitoring program for Marble Daisy-bush at Marble Gully. | • Post-fire monitoring program implemented. | DSE, Parks Victoria |

Objective II To improve the extent and/or condition of habitat

<table>
<thead>
<tr>
<th>Action</th>
<th>Targets</th>
<th>Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>3. Assess threat posed by rabbits, weeds, fuel loads and cattle in the vicinity of the populations and to the community in general.</td>
<td>• Threat assessment completed and management responses implemented as required.</td>
<td>DSE Gippsland</td>
</tr>
</tbody>
</table>
4. Control introduced animals to reduce grazing. Implement rabbit control if rabbit monitoring reveals significant threat to Marble Daisy-bush and the general community. Cattle grazing needs to be addressed through appropriate fencing and co-operation from adjacent landholder.

- Annual monitoring of cattle and rabbits completed.
- Control measures implemented as required.

5. Manage environmental weeds. Spot-spray blackberry, thistle and horehound seedlings on slopes adjacent to populations and in the community in general.

- No increase in distribution, cover or abundance of environmental weeds.

6. Protect habitat from fire. When fuel levels are high enough to carry fire, protect site from unplanned fire until Marble Daisy-bush and other seed regenerators have sufficient soil- or canopy-stored seed.

- Fire is excluded from Marble Gully until at least 2013.

### Objective III To increase number of populations or individuals

<table>
<thead>
<tr>
<th>Action</th>
<th>Targets</th>
<th>Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>7. Collect reproductive material. Collect seed from representative sample of population for ex situ storage and reintroduction (part of Millennium Seed Bank project).</td>
<td>• Seed collected and stored.</td>
<td>RBG</td>
</tr>
<tr>
<td>8. Prepare a reintroduction plan. Prepare a plan identifying potential sites on Hill 1 and determining numbers to be planted, site preparation and site condition prerequisites.</td>
<td>• Reintroduction plan prepared.</td>
<td>DSE, Parks Victoria, RBG</td>
</tr>
<tr>
<td>9. Implement reintroduction plan. This is subject to meeting habitat preconditions. Implement reintroduction plan including ongoing management and monitoring components.</td>
<td>• Reintroduction plan implemented.</td>
<td>DSE Parks Victoria RBG</td>
</tr>
<tr>
<td></td>
<td>• Reintroduced population established.</td>
<td></td>
</tr>
</tbody>
</table>

### Objective IV To increase community awareness and support

<table>
<thead>
<tr>
<th>Action</th>
<th>Targets</th>
<th>Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>10. Involve community groups and volunteers in recovery activities.</td>
<td>• Opportunities for involvement identified, promoted and supported.</td>
<td>DSE, Parks Victoria RBG</td>
</tr>
</tbody>
</table>
2. Silurian Limestone Pomaderris Shrubland

Description
Silurian Limestone Pomaderris Shrubland is a dense shrubland dominated by the rare shrub Limestone Pomaderris (Pomaderris oraria subsp. calcicola), with occasional emergent Drooping Sheoke (Allocasuarina verticillata) and Silver Bundy (Eucalyptus nortonii) (Lander and Walsh 1989). Peel (1993) recorded considerable structural variation in Limestone Pomaderris Shrubland communities, ranging from grassland to shrubland and woodland forms. The community is characterised by a unique assemblage of plant taxa, including rare or threatened and disjunct plant species (Peel 1993). Table 1 summarises the current status of significant species recorded at Marble Gully.

Table 1. Significant taxa recorded at Marble Gully in Silurian Limestone Pomaderris Shrubland vegetation.

<table>
<thead>
<tr>
<th>Taxon</th>
<th>Common Name</th>
<th>DSE Advisory List status (DSE 2005)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arthropodium sp. 1 (robust glaucous)</td>
<td>Tall Vanilla-lily</td>
<td>Rare</td>
</tr>
<tr>
<td>Asplenium trichomanes subsp. quadrivalens</td>
<td>Common Spleenwort</td>
<td>Rare</td>
</tr>
<tr>
<td>Austostipa scabra subsp. falcata</td>
<td>Rough Spear-grass</td>
<td>None - disjunct occurrence</td>
</tr>
<tr>
<td>Desmodium varians</td>
<td>Slender Tick-trefoil</td>
<td>Poorly known</td>
</tr>
<tr>
<td>Irenepharsus magicus</td>
<td>Elusive Cress</td>
<td>Rare</td>
</tr>
<tr>
<td>Isoetopsis graminifolia</td>
<td>Grass Cushion</td>
<td>None - disjunct occurrence</td>
</tr>
<tr>
<td>Olearia astroloba</td>
<td>Marble Daisy-bush</td>
<td>Vulnerable</td>
</tr>
<tr>
<td>Ozothamnus adnatus</td>
<td>Winged Everlasting</td>
<td>Vulnerable</td>
</tr>
<tr>
<td>Pimelea flava subsp. dichotoma</td>
<td>Diosma Rice-flower</td>
<td>Rare</td>
</tr>
<tr>
<td>Pimelea pauciflora</td>
<td>Poison Rice-flower</td>
<td>Rare</td>
</tr>
<tr>
<td>Pomaderris oraria subsp. calcicola</td>
<td>Limestone Pomaderris</td>
<td>Rare</td>
</tr>
<tr>
<td>Ptilotus spathulatus</td>
<td>Pussy Tails</td>
<td>None - disjunct occurrence</td>
</tr>
<tr>
<td>Pultenaea densifolia</td>
<td>Dense Bush-pea</td>
<td>Rare</td>
</tr>
<tr>
<td>Senna aciphylla</td>
<td>Sprawling Cassia</td>
<td>Rare</td>
</tr>
<tr>
<td>Vittadinia tenuissima</td>
<td>Delicate New Holland Daisy</td>
<td>Rare</td>
</tr>
</tbody>
</table>

Distribution
The only known occurrence of Silurian Limestone Pomaderris Shrubland is at Marble Gully Nature Conservation Reserve, near Bindi in the Tambo River valley north-east of Swifts Creek, East Gippsland.

Extent and condition
The Silurian Limestone Pomaderris Shrubland community extends over about 40 ha in a single patch. Although there is some weed invasion at the margins, the vegetation is generally in very good condition.

Important occurrences
The occurrence of Silurian Limestone Pomaderris Shrubland at Marble Gully is critical to the survival of this community, as it is not known in any other location.

Habitat
Silurian Limestone Pomaderris Shrubland occurs on steep, rocky slopes, usually at inclines of greater than 30° with a northerly aspect. The skeletal terra rossa soils are derived from marble, with low to medium organic content (Peel 1993). The site is approximately 600 m above sea level and is very open and exposed. The area receives a well-distributed mean annual rainfall of 646 mm, with mild summers and cold winters (LCC 1982).
Life history and ecology

Coates et al. (2004) assessed the recovery of Silurian Limestone Pomaderris Shrubland following the 2003 fire. The fire burnt 40 ha at high intensity and covered almost all of the community. Generally, the community is recovering well with extensive re-sprouting and seedling regeneration. Structurally important species such as Marble Daisy-bush, Drooping Sheoke and Silver Bundy are re-sprouting and regenerating from seed. In contrast, very few seedling or resprouting Silver Banksia (Banksia marginata) were recorded post-fire. At the time of post-fire monitoring (in 2004 and 2006), approximately 80 native species present before the fire were not re-recorded, while some native species were recorded for the first time at the site.

Conservation status

National conservation status

Silurian Limestone Pomaderris Shrubland is listed as endangered under the Commonwealth Environment Protection and Biodiversity Conservation Act 1999.

Victorian conservation status

Silurian Limestone Pomaderris Shrubland is listed as threatened under the Victorian Flora and Fauna Guarantee Act 1988.

Decline and threats

Inappropriate fire regimes

Following the absence of fire for more than 100 years (Coates et al. 2004), there is a risk that if further fire affected Silurian Limestone Pomaderris Shrubland within a brief period (e.g. 10 years), it would cause a decline in some characteristic species that depend on seed germination for persistence.

Weeds

The most serious environmental weeds that occur at Marble Gully and threaten the Silurian Limestone Pomaderris Shrubland are Blackberry (Rubus fruticosus spp. agg.) and Horehound (Marrubium vulgare).

Horehound occurs mainly on the lower slopes of the north-western section of the Silurian Limestone Pomaderris Shrubland. Minor infestations have been recorded near rabbit warrens and on top of Hill 1, possibly transported by humans (Peel 1993, P. Kelly pers. comm.).

Blackberry infestations are largely restricted to the gully line of Old Hut Creek, though some plants occur within the Silurian Limestone Pomaderris Shrubland.

Other environmental weeds at Marble Gully that may impact on Silurian Limestone Pomaderris Shrubland include Sweet Briar (Rosa rubiginosa), Pimpernel (Anagallis arvensis) and a range of introduced grasses and herbs (Peel 1993).

Grazing/Browsing

Although Peel (1993) recorded that domestic stock and rabbits graze the margins of the community, he described their impact as minimal. Numbers of cattle in the vicinity of Marble Gully appeared to increase following the 2003 fire, but their impact has been largely confined to the banks and lower slopes around Old Hut Creek.

Existing conservation measures

General

• Spraying has been undertaken annually from 1993-1997 along Old Hut Creek to prevent the spread of blackberries into Silurian Limestone Pomaderris Shrubland. Horehound occurrence at the base of Hill 1 was sprayed in 1996. Aerial 1080 baiting of rabbits was carried out by the adjacent landholder in about 1995, but was not specifically targeted at public land (T. Fitzpatrick pers. comm., J. Armit pers. comm.).
• The access track into Marble Gully was upgraded in 1991.
• The site is reserved as ‘Marble Gully Nature Conservation Reserve’ and management responsibility was transferred to Parks Victoria in 2005.

Limestone Pomaderris Shrubland Community

• Peel (1993) undertook a survey of the Pomaderris shrublands growing on limestone geologies of East Gippsland. Four distinct floristic communities of Limestone Pomaderris Shrubland were identified as a result of this work. The vegetation occurring at Marble Gully has been identified as Silurian Limestone Pomaderris Shrubland.
• An unsuccessful attempt was made to protect site from fire in January 2003. Fire suppression activities did not impact on the community.
• Threats were assessed during the post-fire recovery program and site visits by DSE and Parks Victoria staff 2004 - 2007. The main threats are weeds: Horehound, thistles and Blackberry. Cattle pose a significant threat due to lack of fencing.
• Environmental weed management has been conducted.
• Fire recovery plots were established in February 2004 to monitor the response of the community to fire.
The Arthur Rylah Institute (DSE) completed a report on the species of the community and their responses to fire.

Conservation objectives and actions

Long term objective
To ensure that there is a net gain in the extent and condition of Silurian Limestone Pomaderris Shrubland.

Intended management actions

Objective I  To improve knowledge of community ecology and management requirements

<table>
<thead>
<tr>
<th>Action</th>
<th>Targets</th>
<th>Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Monitor transects annually in November - December. Establish two additional permanent transect lines on Hill 3 using the same methodology described in Coates et al. (2004).</td>
<td>• Annual monitoring completed. • New transects established.</td>
<td>DSE Gippsland</td>
</tr>
<tr>
<td>2. Conduct additional surveys to establish the location of rare or threatened plant populations. Individuals should be permanently marked and assessed regularly.</td>
<td>• Surveys completed. • Populations mapped and recorded on relevant databases.</td>
<td>DSE, Parks Victoria, Royal Botanic Gardens Melbourne (RBG)</td>
</tr>
<tr>
<td>3. Conduct additional surveys to locate species previously recorded and compile fire responses.</td>
<td>• Additional surveys completed. • Fire response information collated.</td>
<td>DSE, Parks Victoria, RBG</td>
</tr>
<tr>
<td>4. Assess the ongoing condition of the community.</td>
<td>• Community condition and threats assessed annually.</td>
<td>DSE Gippsland, Parks Victoria, RBG</td>
</tr>
</tbody>
</table>

Objective II  To improve the extent and/or condition of the community

<table>
<thead>
<tr>
<th>Action</th>
<th>Targets</th>
<th>Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>5. Prepare a fire management plan for Silurian Limestone Pomaderris Shrubland.</td>
<td>• Fire Management Plan prepared.</td>
<td>Parks Victoria</td>
</tr>
<tr>
<td>6. Ensure permanent exclusion of cattle from Silurian Limestone Pomaderris Shrubland.</td>
<td>• Fences and gates erected/maintained. • Cattle excluded from reserve.</td>
<td>Parks Victoria</td>
</tr>
<tr>
<td>7. Assess threats posed by domestic stock, rabbits, weeds and fuel loads.</td>
<td>• Threat assessment completed. • Management responses implemented as required.</td>
<td>DSE Gippsland</td>
</tr>
<tr>
<td>8. Manage environmental weeds. Control Horehound and Blackberry, particularly along Old Hut Creek Track and the lower slopes of Hills 1 and 2.</td>
<td>• No increase in distribution, cover or abundance of environmental weeds.</td>
<td>DSE Gippsland</td>
</tr>
<tr>
<td>9. Control rabbits if they start to affect species recovery or spread weed species.</td>
<td>• Rabbit browsing monitored. • Management action implemented as required.</td>
<td>Parks Victoria</td>
</tr>
<tr>
<td>10. Protect habitat from fire. When fuel levels are high enough to carry fire, attempt to protect site from unplanned fire until soil- and canopy-seed stores recover.</td>
<td>• Fire excluded from Marble Gully until at least 2013.</td>
<td>DSE Gippsland</td>
</tr>
</tbody>
</table>
Objective III  To increase community awareness and support

<table>
<thead>
<tr>
<th>Action</th>
<th>Targets</th>
<th>Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>11. Involve community groups and volunteers in recovery activities.</td>
<td>• Opportunities for involvement identified, promoted and supported.</td>
<td>DSE, Parks Victoria, RBG</td>
</tr>
</tbody>
</table>

References


