All images by Richard Schahinger

Desmodium varians

slender ticktrefoil

TASMANIAN THREATENED FLORA LISTING STATEMENT

Scientific name: ***Desmodium varians*** (Labill.) G.Don, *Gen. Hist.* 2: 298 (1832)
Common name: slender ticktrefoil (Wapstra et al. 2005)
Group: vascular plant, dicotyledon, family **Fabaceae**

Status: *Threatened Species Protection Act 1995*: **endangered**
Environment Protection and Biodiversity Conservation Act 1999: **Not listed**

Distribution: Endemic status: **Not endemic to Tasmania**
Tasmanian NRM Region: **North, South**

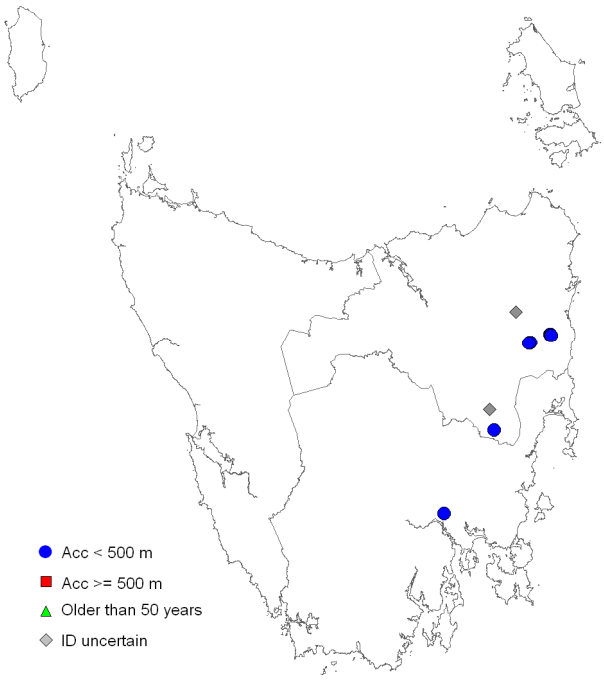

Figure 1. Distribution of *Desmodium varians* in Tasmania

Plate 1. *Desmodium varians* foliage

SUMMARY: *Desmodium varians* is a perennial leguminous herb, now known to be extant in Tasmania at only four sites, all on unreserved private land, with two in the Fingal Valley, one to the southeast of Ross and one at Pontville. The species occurs in native grassland or grassy shrubland, though prior to European settlement each of the sites is likely to have supported grassy eucalypt woodland. The species is at risk from mining, dam construction, weed invasion and heavy stock grazing, with a high risk of local extinctions due to the small size and fragmented character of most known sites. Weed control and grazing management would benefit known occurrences.

IDENTIFICATION AND ECOLOGY

Desmodium varians flowers from spring through to autumn, with a peak in fruit production in January and February. The fruit of *Desmodium varians* separate into individual sections as they mature (Plate 2). They have a dense covering of hooked hairs that facilitate their dispersal by passing animals (or humans). Seed is typical of the legume family, with a hard coat and physical dormancy, and the species' roots have nitrogen-fixing *Rhizobium* nodules (Hacker 1990, Lynch 1993). The species may resprout from rootstock after fire, drought or browsing, and may recruit from a soil-stored seedbank. The main requirement for the species' regeneration is freedom from heavy stock grazing.

Survey techniques

While the species can be detected at any time of the year, surveys for *Desmodium varians* should ideally be timed to coincide with the species' peak fruiting period, January and February, when the identity of the species can be readily confirmed.

Description

The following description is based on Pedley (1999) with the main differences for Tasmanian plants noted.

Desmodium varians is a sprawling perennial or tufted annual herb with stems arising from a perennial rootstock. The branchlets are terete and glabrous or with a few appressed hairs. Tasmanian plants differ by having stems and petioles with spreading simple hairs to 0.7 mm long, tending to become hairless. The leaves (Plate 1) are trifoliolate, with a 5 to 10 mm long petiole and a 2 to 4.5 mm long rachis (leaflet stalk). The leaflets are lanceolate, oblong or occasionally oblanceolate, rounded or cuneate at the base, obtuse or slightly retuse at the apex and usually have a few appressed hairs on the veins beneath. In Tasmanian plants, the leaflet shape can be cuneate, almost orbicular, obovate or broadly to narrowly elliptic, and they have a sparse covering of simple hairs on the upper and lower surfaces. The terminal leaflet is 5 to 35 mm long, 4 to 7 mm wide and 1 to 8.5 times longer than wide (up to 22 mm long and 14 mm wide and 0.8 to 4 times longer than wide for Tasmanian plants). The lateral leaflets are smaller, up to 26 mm long and 6 mm wide, with stipels (appendages at the base of the leaflet stalk) 0.4 to 1 mm long (usually minute, otherwise up to 0.5 mm long for Tasmanian plants). The inflorescence is terminal, with fascicles of 1 to 3 flowers. The calyx is 4-lobed and covered with short hooked and longer straight hairs. Its tube is 1.2 to 1.5 mm long, with lobes about equal length and 1.2 to 1.6 mm long. The corolla is pink or purplish, with an orbicular standard about 6 mm long and wide, a claw about 2 mm long and keel petals that are somewhat shorter than the wings. The pods (Plate 2) have a thickened upper suture, a deeply indented lower suture forming 4 to 6 articles and are somewhat undulate. The single seeded articles are 3.5 to 4.2 mm long by 2.7 to 3.8 mm wide and have a moderate to dense covering of hooked hairs. The seeds are about 2.5 mm long by 1.6 mm wide.

Plate 2. *Desmodium varians*: pods, each with four single-seeded articles

Table 1. Population summary for *Desmodium varians* in Tasmania

	Subpopulation	Tenure	NRM region	1:25 000 mapsheet	Year last (first) observed	Area of occupancy (ha)	Number of plants
1	Pontville	private land	South	Tea Tree	2012 (2004)	0.002 (1 patch)	c. 10
2	Macquarie River	private land	North	Faddens	2012 (2003)	2.5 (2 patches)	c. 1000
3	Fingal (Fingal Valley)	private land *	North	Rossarden	2012 (2005)	0.5 (4 patches)	c. 1000
4	Saddle Hill (Fingal Valley)	private land	North	St Marys	2012 (2009)	1.4 (5 patches)	c. 1000
5	Griffin Forest Reserve	Forest Reserve	North	Mathinna	1984	identity uncertain; possibly extinct (1 plant in 1984)	
6	Bells Bottom	private land	North	Ross	1991	identity uncertain; possibly extinct	
7	South Esk River	unknown	North	unknown	1887	precise location & status unknown	

* Part covered by a conservation covenant under the Tasmanian *Nature Conservation Act 2002*

Confusing species

Desmodium varians may be distinguished from *Desmodium gunnii,* the only other species in the genus, by a combination of leaf and fruit characters (Walsh & Entwisle 1996, Pedley 1999). The leaflets of *Desmodium gunnii* are similar in shape throughout, mostly cuneiform, whereas those of *Desmodium varians* range from orbicular or cuneate in the early growth stages (or after browsing; Plate 3) to obovate to broadly to narrowly elliptic. The rachis of the terminal leaflet is minute for *Desmodium gunnii*, whereas it is from 2 to 4.5 mm long for *Desmodium varians,* leading to a pinnate appearance. The pods of *Desmodium gunnii* are constricted between the articles from both sides giving a sinuate appearance (Hooker 1860), whereas for *Desmodium varians* they are deeply constricted on one side only, with a thickened suture on the other (Plate 2). Leaves of *Desmodium gunnii* are typically dark green whereas those of *Desmodium varians* are yellowish-green (SGAP Maroondah 1995).

For Tasmanian plants at least, the stems and petioles are more-or-less glabrous for *Desmodium gunnii* but noticeably hairy for *Desmodium varians*, and the stipels of the lateral and terminal leaflets are conspicuous and up to 2 mm long for *Desmodium gunnii* but minute for *Desmodium varians*. In addition, in Tasmania, *Desmodium gunnii* appears to prefer, for the most part, dampish forests in sub-coastal areas, with *Desmodium varians* occurring in grassland and open grassy woodland in more inland sites.

Plate 3. *Desmodium varians*: regrowth after browsing

DISTRIBUTION AND HABITAT

Desmodium varians occurs in Queensland, New South Wales and Victoria, and also extends to New Caledonia (Pedley 1999). In Tasmania, the species is known to be extant at two sites on the southern flanks of the Fingal Valley in the State's northeast, with further sites near the Macquarie River to the southeast of Ross and at Pontville in the south (Table 1, Figure 1).

Desmodium varians grows in native grasslands dominated or co-dominated by *Themeda triandra*

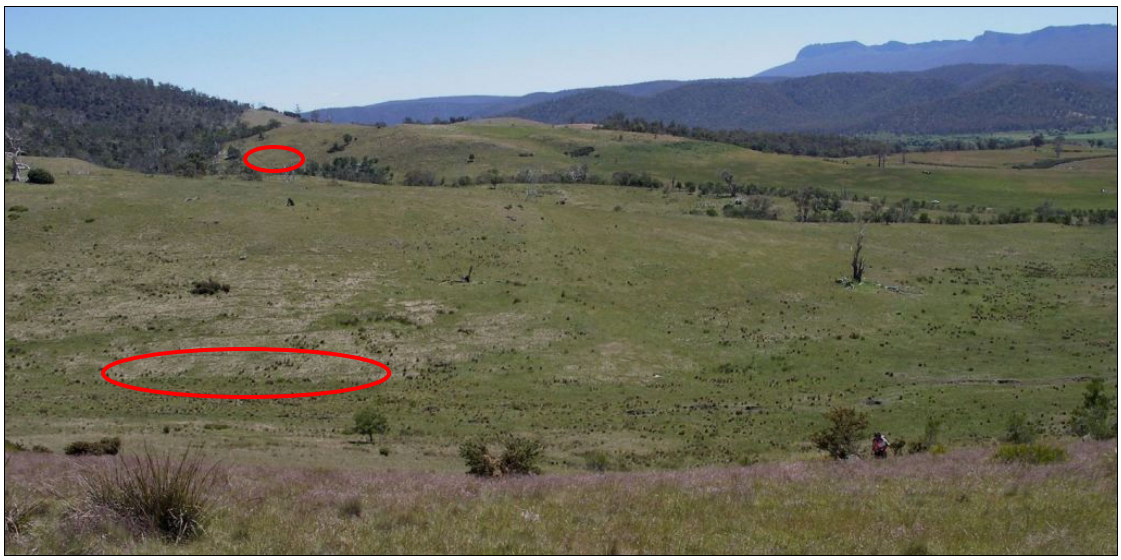

Plate 4. Native grassland habitat at the Fingal site: location of *Desmodium varians* patches circled

(kangaroo grass) or *Poa labillardierei* (silver tussockgrass), with species of *Austrostipa* (speargrass) and *Austrodanthonia* (wallabygrass) usually present. The introduced *Anthoxanthum odoratum* (sweet vernalgrass) is a conspicuous element at the Saddle Hill and Macquarie River sites. Prior to European settlement the vegetation at each site is likely to have been grassy woodland, with *Eucalyptus viminalis* (white gum) or *Eucalyptus pauciflora* (cabbage gum) the probable dominants. The species occurs on Permian and Triassic mudstones at the Fingal Valley sites, Jurassic dolerite at the Macquarie River site, and on Tertiary basalt at Pontville. Confirmed extant sites in Tasmania lie between 55 and 320 m in elevation, with annual rainfalls between 550 and 900 mm.

POPULATION PARAMETERS

Desmodium varians is known in Tasmania from between four and six subpopulations, with a total of perhaps a few thousand plants (Table 1). Accurate estimates of plant numbers are made difficult by the species' habit of rooting at the nodes, its sprawling, intertwining character, and the generally rank nature of its native grassland habitat. The area occupied is perhaps a better measure of its relative rarity, but even that masks the fragmented character of most occurrences. The linear range of confirmed extant sites in Tasmania is 141 km, the extent of occurrence 760 km^2, and area of occupancy about 5 ha (Table 1).

At the two Fingal Valley sites, *Desmodium varians* occurs in quite narrow bands that follow the contours of its hilly grassland habitat (Plates 4 & 5). Water availability would appear to be the constraining factor, the species displaying a preference for dampish mid to lower slopes and gradients of 10 to 15 degrees, the aspect mostly southeast, east or northeast. At Saddle Hill, the species occurs in several disjunct grassland remnants within 800 m of each other, the grassland totaling about 10 ha and the area occupied by the species about 1.4 ha. Plantation and mining activities in the immediate area mean that there is little room for expansion. At the Fingal site, the species occurs in four discrete patches spread over 1.4 km, the patch size being less than 0.25 ha in each case, and again with unsuitable habitat between. The Macquarie River site occurs within a largely undisturbed tract of native vegetation, the species growing on a grassy flat adjoining the river (Plate 6), as well as on a nearby shallow ridge. At Pontville, the species occurs in a 10 by 2 m area centred around a small basalt outcrop, the broader area having been subdivided into house blocks in the mid 2000s (Plate 7). The species appears to have survived at this site as a result of its rocky habitat.

Plate 5. Native grassland habitat at Saddle Hill with active coal mining in background

Plate 6. Native grassland habitat beside the Macquarie River, with *Themeda triandra* prominent

Plate 7. Grassy shrubland habitat at Pontville: the species grows around a small basalt outcrop

The species' sparse collection history gives few clues as to its former abundance as only one of the early collections from Tasmania has associate details on abundance.

Lynch (1993) noted an occurrence attributed to *Desmodium gunnii* to the southeast of Ross at Bells Bottom (along Glen Morriston Rivulet, a tributary of the Macquarie River), and also at Griffin Forest Reserve adjacent to the South Esk River north of Fingal. The identity of plants at these sites remains uncertain, as there are no collections available and plants were not found at the former site during targeted surveys in 1996, 1998 and 2008, nor at the latter site in 2012 (where only 1 plant was ever recorded; Kirkpatrick et al. 1988). The habitat at the two sites is quite similar to the known Macquarie River site and the plants are considered likely to have been *Desmodium varians* (Table 1).

A herbarium collection dated 1996 from Dogs Head Hill near Mole Creek was attributed to *Desmodium varians* in 2004, though fruiting material was not available to confirm its identity. This collection is presumed here to belong to *Desmodium gunnii* as the only plants seen at the site in January 2012 were attributable to *Desmodium gunnii*, with fruit consistent with that species, and the habitat, shrubby eucalypt forest on limestone, was at odds with the grassland character of confirmed *Desmodium varians* sites.

The apparent rarity of species of *Desmodium* in Tasmania has been attributed in part to a lack of recognition due to their diminutive nature and resemblance to introduced clovers (Lynch 1993). However, Lynch's baseline studies were preceded by extensive surveys of Tasmania's grasslands, with species in the genera *Desmodium* and *Glycine* very much in mind (Kirkpatrick et al. 1988), and there have been numerous grassland surveys undertaken in the Northern and Southern Midlands since. The few additional records would suggest the likelihood of more subpopulations being discovered is relatively low, though the result may be an artefact of the non-targeted approach of past surveys. Improved knowledge of the species' narrow habitat preference, in the Fingal Valley at least, means that any future survey effort can be much more targeted. Any new occurrences will almost certainly be on private property.

RESERVATION STATUS

Desmodium varians may have occurred in Griffin Forest Reserve, though the identity of plants at this site is yet to be confirmed. The Fingal site is partly covered by a conservation covenant under the Tasmanian *Nature Conservation Act 2002*.

CONSERVATION ASSESSMENT

Desmodium varians was listed in its own right as endangered on the Tasmanian *Threatened Species Protection Act 1995* in 2012. It was previously protected under the 1995 listing of *Desmodium gunnii* as vulnerable, as the presence of *Desmodium varians* was not recognised in Tasmania until 2004. *Desmodium varians* meets criterion B for the endangered category:

B. Area of occupancy estimated to be less than 10 hectares, and

1. severely fragmented and known to exist at no more than five locations;
2. continuing decline inferred/projected in (b) the area, extent and quality of habitat, and (e) the number of mature individuals.

THREATS, LIMITING FACTORS AND MANAGEMENT ISSUES

Land clearance for agriculture and urban expansion has almost certainly impacted upon *Desmodium varians* since European settlement, as has fertiliser application, domestic stock grazing and dam construction. The extant sites are presumed to represent the vestiges of an originally more widespread population through Tasmania's Midlands and Fingal Valley, with any occurrences on more arable land, such as the extensive alluvial flats along the Fingal Valley's South Esk River, long-since cleared. Current identifiable threats include mining, dam construction, weed invasion, over-stocking, and edge effects and stochastic risk associated with what are, for the most part, small fragmented occurrences.

Mining: The Saddle Hill subpopulation has been impacted by coal mining activities since the latter half of 2011, with more than 70% of the native grassland occupied by the species at the site and more than a third of the total number of plants destined for removal. The area will be rehabilitated after a metre-thick sub-surface coal layer has been extracted, with the replacement of sods containing the species to occur within three months of the removal and stock-piling of topsoil.

Dams: The unconfirmed Bells Bottom site is believed to have been inundated following the construction of a dam on Glen Morriston Rivulet in the early 2000s, with the loss of an unknown number of plants. The Macquarie River sites were uncovered during surveys undertaken in 2003 and 2009 for a dam proposal. The proposal has yet to be realised, though dam construction and inundation remains a potential threat to the known sites, as well as to other areas of potential habitat along the river.

Weed invasion: Gorse (*Ulex europaeus*) infestations pose a threat to the Fingal and Macquarie River subpopulations if left untreated. Gorse, briar rose (*Rosa rubiginosa*) and blackberry (*Rubus fruticosus* agg.) pose a pressing issue at the Pontville site with inadvertent off-target herbicide damage to the species during the treatment of such weeds a risk given the small size of the occurrence.

Stock grazing: *Desmodium* species are considered highly palatable to stock (Lynch 1993). The Fingal Valley and Macquarie River sites have been subject to grazing by domestic stock (sheep) for some decades, albeit mostly in the form of light bush runs. The persistence of the species does not appear to be incompatible with grazing, provided stock levels are not too high and areas are spelled adequately and at the appropriate time. This has been evident at the the Saddle Hill site in the past two years, with the species flourishing due to the removal of stock in preparation for mining activities, though the recovery has probably benefited from good follow-up rains.

Stochastic events: The small size and fragmented nature of some of the sites exposes them to a high risk of extinction due to chance events, with the colony at the suburban Pontville site being at particular risk given it straddles the boundary between two small private titles. Plants may also be at some risk from regular fire hazard-reduction activities imposed by the local council.

MANAGEMENT STRATEGY

What has been done?

- A conservation covenant has been in place at the Fingal site since 2008. Substantial areas of gorse have been treated within the area's native grasslands, though additional patches close to the known *Desmodium varians* sites are present, and those that have been treated will require follow-up work.
- A rehabilitation program approved by DPIPWE's Environment Protection Authority is in place for the Saddle Hill site to restore the native grassland habitat of *Desmodium varians* in the wake of coal mining activities.
- Seed has been collected from the Fingal site and lodged for long-term conservation storage at the Tasmanian Seed Conservation Centre based at the Royal Tasmanian Botanical Gardens.

Management objectives

The main objectives for the recovery of *Desmodium varians* are to prevent the loss or degradation of known subpopulations, increase the information and data available on the location, size and condition of known subpopulations, gain a better understanding of the species' ecological requirements and increase the number of known subpopulations through survey.

What is needed?

Agencies, groups or individuals may assist with some or all of the following recovery actions. Coordinated efforts may achieve the best and most efficient results.

- provide information and extension support to relevant Natural Resource Management committees, local councils, government agencies, development proponents and the local community on the locality, significance and management of the known subpopulations and potential habitat;
- undertake extension surveys of potential habitat in the Fingal Valley and the upper reaches of the Macquarie River and its major tributaries;
- monitor known subpopulations for health, recruitment and response to disturbance;
- monitor compliance with existing conservation covenants and permits, and depending on the results of ongoing population monitoring, adjust stock and weed control prescriptions as required;
- control woody weeds at and within dispersal distance of known sites, with follow-up control measures after initial treatment as required;
- ensure domestic stock grazing levels do not adversely impact the species and spell areas at appropriate times to encourage seed production and recruitment;
- encourage private landowners to consider protection and management of the species' habitat through either perpetual covenants or vegetation management agreements under the Tasmanian *Nature Conservation Act 2002*.

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Contact details: Threatened Species Section, Department of Primary Industries, Parks, Water and Environment, GPO Box 44, Hobart, Tasmania, Australia, 7001. Ph (03) 6233 6556; fax (03) 6233 3477.

Permit: It is an offence to collect, disturb, damage or destroy this species unless under permit.