

Flora & Fauna Guarantee Action Statement

#7

This Action Statement was first published in 1991 and remains current. This version has been prepared for web publication. It retains the original text of the action statement, although contact information, the distribution map and the illustration may have been updated.

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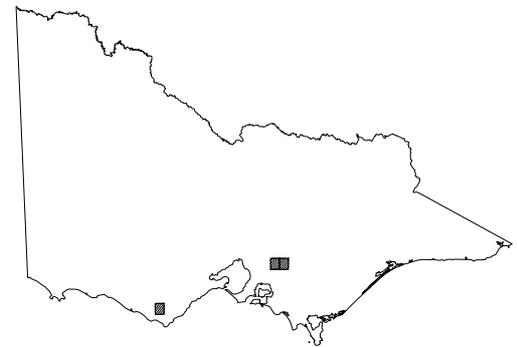
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Tall Astelia *Astelia australiana*



Tall Astelia (*Astelia australiana*)
(Illustration by Anita Barley)



Distribution in Victoria (DSE 2002)

Description and Distribution

Tall Astelia, *Astelia australiana* (J.H. Willis) L. Moore, is a member of the Liliaceae family. It is a robust, perennial herb up to 2 m tall, with leaves (60-230 cm long, 4-10 cm wide) arising from tufts interconnected by rhizomes. Green or reddish flowers are borne on many-flowered open panicles (25-35 cm long). Male and female flowers normally occur on separate plants (Willis 1939, Williams 1987).

{PRIVATE}The species occurs primarily in Cool Temperate Rainforest dominated by Myrtle Beech (*Nothofagus cunninghamii*), with two colonies in Riparian Scrub dominated by Scented Paperbark (*Melaleuca squarrosa*) and Woolly Tea-tree (*Leptospermum lanigerum*).

Most occurrences are in gullies on undulating, upland plateaus. Tall Astelia is extremely localised in Victoria, but it sometimes forms dense groves. The rhizomatous habit of this species leads to the formation of colonies, but makes it difficult to distinguish individual plants. Tall Astelia has particular biogeographic

significance. The genus *Astelia* has some 25 species, mostly within the southern hemisphere.

This mainly southern distribution and its frequent association with Myrtle Beech reflect its ancient origin in the rainforests of Gondwana, the southern supercontinent that broke up over 45 million years ago. Cool Temperate Rainforest shows less evolutionary diversification than the surrounding eucalypt forest, in which many new genera have evolved in response to drier climatic conditions.

All colonies in the Central Highlands are on public land within State Forest in which hardwood production is a major land use. The Otways colony is on public land zoned for rainforest conservation under the Proposed Otway Forest Management Plan (DCE 1991).

The species is endemic to Victoria—all 12 known colonies of Tall Astelia are within a relatively small area in the Powelltown-Beenak area of the Central Highlands, except for one colony in the Lavers Hill area of the Otway Ranges. It occurs within four major

water catchments, La Trobe, Bunyip, Yarra and Aire, as follows:

Central Highlands

Catchment	Creek system
La Trobe	Pioneer, Bjorksten, Woodall
Bunyip	Seven Acre, Walker
Yarra	McCrae (presumed extinct), Tomahawk

Otways

Catchment	Creek System
Aire	Ciancio

Two plants are also growing *ex-situ* in the Royal Botanic Gardens, Melbourne.

Conservation Status

Current Status

Gullan et al. (1990)	Vulnerable in Victoria
Briggs & Leigh (1988)	Vulnerable in Australia

Tall *Astelia* is listed as a threatened taxon on Schedule 2 of the *Flora and Fauna Guarantee Act 1988*.

Reasons for Conservation Status

Tall *Astelia* has declined since European settlement, having been much reduced by successive forest fires (Willis 1970). In the Yarra catchment (Parish of Beenak) Tall *Astelia* was reported by early settlers to be abundant (Willis 1939), but is now represented by only twenty tufts, which are possibly all one plant. The McCrae creek colonies and some of the Tomahawk Creek colonies have not been found since the 1939 wildfire and are presumed extinct (Willis pers. comm.). In the Otways, the one known colony occurs in the Beech Forest land system, which has been mostly cleared for agriculture (Pitt 1981).

Only 12 known colonies of Tall *Astelia* remain, comprising an unknown but probably small number of individual plants (the number of tufts in a colony does not indicate actual population size). Ten of the 12 colonies are in a relatively small area around Dick Hill, south of Powelltown, making the species particularly vulnerable, as they could be lost or damaged by a single wildfire.

Tall *Astelia* is prone to future threats, the most important being wildfire, weed invasion, intensive forestry activity and possibly Myrtle Wilt (see Management Issues). An outbreak of Myrtle Wilt, a lethal pathogenic disease of Myrtle Beech, could cause considerable habitat alteration. Tall *Astelia* is not currently represented in a legislated conservation reserve. In its final recommendation the Scientific Advisory Committee established under the *Flora and Fauna Guarantee Act* determined that Tall *Astelia* is:

- in a state of demonstrable decline likely to result in extinction;
- significantly prone to future threats which are likely to result in extinction; and
- very rare in terms of distribution and abundance.

Major Conservation Objectives

To protect, maintain and enhance existing colonies and their habitats, and to protect potential habitat so that natural recolonisation and range extension can occur. As far as possible, natural ecological processes are to operate on colonies with a minimum of human intervention.

Management Issues

Ecological Issues Specific to the Taxon

{PRIVATE}Reproduction and evolutionary potential: Little is known of the reproductive biology of Tall *Astelia*: it flowers and sets seed infrequently; pollination vectors are unknown, but are possibly vertebrate animals (Turner 1991). The species is largely reliant on vegetative reproduction and population sizes are unknown but probably small. Genetic variation within and between colonies may be low, leading to a limited potential to survive events such as drought, pathogen attack or climatic change.

Wildfire: The Cool Temperate Rainforest habitat of Tall *Astelia* is highly susceptible to damage by fire. Wildfire represents the single most important threat to the survival of this plant community in Victoria (Howard 1981). Loss of this habitat through fire or other major disturbance is highly likely to lead to loss of colonies, as the species rarely occurs outside rainforest.

Tall *Astelia* has been much depleted by successive forest fires, particularly in 1926 and 1939 (Willis 1970). Its virtual restriction to rainforest suggests a fire-sensitive species.

Like many other rainforest species (including Myrtle Beech) it may be able to survive a rare wildfire; but this has not been demonstrated. Some colonies occur in 1939 regrowth Myrtle Beech forest, but it is not known whether they survived the fire or result from recolonisation from unburnt areas.

Timber harvesting: Timber harvesting in the vicinity of Tall *Astelia* requires careful management to avoid direct and indirect impacts on colonies: trees may be accidentally felled directly onto colonies, their habitats or buffer zones; soil or vegetation may intrude from harvested sites; regeneration burns may adversely affect colonies; and logging roads may accidentally intrude on them, opening the habitat and promoting competition with other plants, both native and introduced.

High rates of sediment deposition in streams may adversely affect Tall *Astelia* and its habitat. Timber harvesting operations can have significant effects on water quality, particularly by altering sediment loads (Campbell & Doeg 1989). Tall *Astelia* generally occurs in depositional environments, hence minor increases in sedimentation are unlikely to greatly affect the viability of populations. Even so, alterations to natural ecosystems in which Tall *Astelia* occurs are not desirable (see Major Conservation Objectives).

Adherence to the *Code of Forest Practices* for timber production, which provides guidelines for the protection of environmental values (CFL 1989), will help prevent accidental disturbance through timber harvesting.

Regrowth forest: An important management issue is the possible establishment of extensive logging or fire regrowth forests in the subcatchments of Tall Astelia, particularly as these may affect the chances of the species remaining unburnt during wildfires.

Immature eucalypt forest (logging or fire regrowth) is considered more likely to burn than mature forest under certain conditions (Jackson 1968, pers. comm.; Ashton pers. comm.) because there are higher ground fuel levels in immature than in mature forest. Maximum litter fall in Mountain Ash (*Eucalyptus regnans*) forest is likely to occur between 35 and 45 years and the greatest standing biomass is likely to occur at 70 to 80 years (Webb, in Ashton 1981). In mature ash forest, favourable microclimates for decay also contribute to there being less litter accumulation on the forest floor (Ashton 1975, 1981).

The major determinants of forest fire behaviour in mountain forests are fuel moisture content, drought index, temperature, humidity, aspect, elevation, topography, vegetation, wind speed and direction, and the time of day at which the fire burns. The difference in fuel loads between forests of different ages will affect fire intensity and rate of spread but not fire risk. Under the conditions that rainforests will burn (that is prolonged drought and extreme weather) some observers suggest that rainforests are likely to be equally vulnerable in regrowth as they are in mature forests (Cheney 1992 pers comm). Observations of forest fires in the Powelltown area in 1983 and 1991 appear to support this hypothesis.

However, a number of the major determinants of forest fire behaviour in mountain forests vary within local landscapes and according to the type of vegetation. Differences in fuel loads, fuel moisture levels and vertical fuel distribution between adjacent vegetation types may affect the passage of fire between these types. Recent observations based on aerial photography suggests that Cool Temperate Rainforest surrounded by substantial areas of mature forest is more likely to survive wildfire than rainforest surrounded by immature forest (Roberts 1991 pers. comm.) Even when, under extreme conditions, crown fire occurs, some observers suggest that the great height of mature ash forest frequently leads to fires jumping the gullies supporting the relatively short rainforest, and that crown fire is not only more likely in immature forest, but also occurs at a similar height to the rainforest canopy, promoting crown fire within the rainforest (Roberts 1992 pers. comm., Cameron 1992 pers. comm.). Observations of fire damage classes of rainforest canopies made during the statewide program of rainforest mapping appears to support this hypothesis.

Reduced stream flows in regrowth ash forest may also affect Tall Astelia and its habitat. Stream flows increase temporarily following nearby timber harvesting of Mountain Ash and then decrease considerably for well over 40 years, due to the elevated transpiration rates in regrowth forest (MMBW 1980). During severe droughts, feeder streams in regrowth ash forest may dry up, thereby increasing fire hazards. Decreases in soil moisture levels during droughts may also affect Tall Astelia directly.

Competition: Competition from other plants, such as Cut-leaf Blackberry (*Rubus laciniatus*), Scrambling Coral-fern (*Gleichenia microphylla*) and Tall Saw-sedge (*Gahnia clarkei*) may lead to suppression of Tall Astelia in some situations. These species are generally stimulated by gaps created in the forest canopy.

Myrtle wilt: This is a lethal disease of Myrtle Beech caused by the pathogenic fungus *Chalara australis*, which is believed to be native. The incidence of myrtle wilt infection is increased by disturbances such as roading and logging near rainforest stands (Kile *et al.* 1989), which increase mortality, probably initially by creating new disease centres through infection of wounds on border trees and later by continuing below-ground spread between adjacent trees via root grafts. An epidemic of this disease would open up habitats and promote competition. There are several confirmed cases of myrtle wilt in the Central Highlands.

Visitor pressure: There is a risk (currently low but potentially high) of damage to colonies by visitors or collectors.

Wider Conservation Implications

The Dick Hill area, south of Powelltown, in which Tall Astelia is concentrated has significant conservation values other than the presence of Tall Astelia. These include Cool Temperate Rainforest (both mature and regrowth), old-growth eucalypt forest, rock outcrop vegetation on Seven Acre Rock and Leadbeater's Possum, at the southern limit of its present range. Landscape and education values are also very high. Conservation of Tall Astelia is intimately related to conservation of all these values.

The measures proposed in this document will also protect a site (Pioneer Creek, West Branch) where all five Victorian species of filmy-fern genus *Hymenophyllum* occur; this co-occurrence is recorded from only one other site in Victoria. Protection of Tall Astelia should not adversely affect the conservation of any other species or community of native flora and fauna.

Social and Economic Issues

Preservation of Tall Astelia raises social and economic issues:

1. The interim conservation areas and 100 m buffers established by this action statement will have minimal impact on timber availability in the short term. However if these measures are permanently adopted there will be a reduction in the area available for timber production of 405 ha (including 355 ha of ash) and a corresponding reduction in revenue.
2. If permanent reservation of the interim conservation areas occurs, this may necessitate either a reduction in the long-term sustainable yield of timber in the Dandenong Forest Management Area or harvesting of alternative areas of the forest which would otherwise not have been considered.
3. There will be a negligible impact on employment in the Powelltown area in the short term (1991-94). The long-term impact on employment is unknown.

- There will be no impact in relation to the Otways colony, which is already protected under the Proposed Otway Forest Management Plan (DCE 1991).

Management Actions

Previous Management Action

Tall *Astelia* has been passively managed since its discovery in 1929. Surveys have been conducted over the years, mostly by La Trobe University and, since 1989, by DCE. Work to upgrade a track along Pioneer Creek (West Branch) in 1974-5 ceased, following advice from Dr J.H. Willis, the retired Assistant Government Botanist. Since 1990 there has been a 40 m buffer zone prescription for logging adjacent to colonies of Tall *Astelia*.

Intended Management Action

Note: The protective measures established by this Action Statement refer to colonies of Tall *Astelia* and their habitat in the Powelltown area and do not necessarily apply to Cool Temperate Rainforest elsewhere in Victoria.

Determination of Critical Habitat

A Critical Habitat determination will be made under Section 20 of the *Flora and Fauna Guarantee Act* (1988). The interim conservation areas established by this Action Statement and the Otways colony are likely to comprise the Critical Habitat of the species.

Otway Ranges

The Otways colony and its subcatchment will be protected within the Youngs Creek Rainforest Conservation Area, as indicated in the Proposed Otway Forest Management Plan (DCE 1991).

Central Highlands

Management of Tall *Astelia* in the Central Highlands will ensure preservation of the species while allowing for timber production in certain areas. Levels of protection are to be applied, as follows:

- A relatively high level of protection for core populations (consistent with principles of biological reserve design).
- Careful management of outlying populations.
- Incorporation of this Action Statement into the Forest Management Plan currently being prepared for the Yarra Forests.

Interim Conservation Areas (450 ha)

One subcatchment in each of the major watersheds in which Tall *Astelia* occurs will be excluded from timber harvesting and maintained undisturbed for conservation and reference purposes until this action statement is reviewed (three years). These areas are Bjorksten Creek (La Trobe watershed), Seven Acre Creek upstream from Bunyip Road (Bunyip watershed), and Tomahawk Creek tributary (Yarra watershed).

Since Tall *Astelia* has national conservation significance, at least some populations require protection meeting

biological reserve design standards. A principle of biological reserve design is subcatchment protection, whereby biological values are made less vulnerable to disturbances originating upstream.

These areas represent the least disturbed of those in which Tall *Astelia* now occurs. They form, as far as possible, controls in the event that other colonies are adversely affected by wildfire or other disturbances. The three areas provide replication and represent the major watersheds in which the species occurs. The Seven Acre Creek subcatchment includes examples of Tall *Astelia* within mature rainforest on southerly aspects, the Bjorksten Creek subcatchment includes examples of Tall *Astelia* within 1939 regrowth rainforest with north-easterly aspects. The Tomahawk Creek tributary subcatchment has the advantage of being relatively distant from the others and also represents the Riparian Scrub habitat of Tall *Astelia*. Only twenty tufts (possibly one plant) occur here, the only remaining occurrence in the Yarra watershed.

Hardwood Production Areas (460 ha)

Timber production may occur within all other areas in the Central Highlands supporting Tall *Astelia*, following the prescriptions set out below.

Buffer zones: In hardwood production areas, a comprehensive survey will be made to determine the location of colonies and a map prepared. A 100 m buffer zone will then be established around each known colony of Tall *Astelia*. These buffers will be incorporated into the harvesting plans, Newly located colonies will be added to this map and buffers applied. Discovery of a previously unknown colony during harvesting operations will not necessarily cause harvesting to cease, but every reasonable effort will be made to protect it.

Logging near Tall *Astelia*: Timber harvesting will be excluded from a 100 m buffer zone around Cool Temperate Rainforest or Riparian Scrub habitat supporting Tall *Astelia*. Buffer widths may be smaller only in cases where existing roads or ridgelines occur within the 100 metres. The rationale is:

- Fire protection.** Wildfire is a major threat to Tall *Astelia* and its rainforest habitat, and has already led to depletion of the species (Willis 1970). It has been proposed that the presence of relatively mature eucalypt forest in substantial buffers around Tall *Astelia* may improve the survival prospects of colonies in the event of wildfire (see Management Issues).
- Prevention of physical disturbance.** Physical damage to plants and structural changes in habitat caused by falling timber and other logging debris is to be prevented. The 'ricochet effect' (one tree at the edge of a coupe falling on another making it also fall, sometimes across a streamline) operating on rainforests or buffer zones is to be avoided. It is important to prevent damage to Myrtle Beech, as tree wounds are readily infected by Myrtle Wilt fungus (Kile *et al.* 1989).
- Habitat expansion.** Cool Temperate Rainforest provides important habitat for Tall *Astelia*. Providing for expansion of rainforest into buffer zones allows for future ecological development of the species in terms of range extension and recolonisation.

Logging upstream from Tall Astelia: There will be a minimum 40 m vegetated buffer zone between the valley floor, or 'wetted zone' and adjacent logging coupes. Where there is no discernible valley floor the buffer zone is to extend 40 m from the creek itself. The rationale is:

- In order that natural ecological processes can continue to operate, sediment potentially released by timber harvesting is not to reach substrates on which Tall Astelia occurs. A vegetated buffer strip 40 m wide is considered generally sufficient to prevent sediment from reaching valley floors (I. Campbell pers. comm.).

Management of buffer zones: Except under special circumstances buffer zones are to be maintained in an undisturbed condition in order to insulate Tall Astelia from the effects of timber harvesting and other human-induced disturbances. Roads and snig tracks are not to be located within buffer zones. However, during wildfire for example it may be necessary to construct strategic fire control lines within these buffer zones. These would be later rehabilitated after use. Trees are not to be felled into buffer zones, and trees likely to fall into buffer zones are not to be felled.

Roading: Stream crossings, no matter how well constructed, involve the release of considerable amounts of sediment into streams (P. O'Shaughnessy, I. Campbell pers. comm.). In the Coranderrk Experimental Area (Maroondah catchment), sediment levels were high in stream crossings for up to 7 years after construction (P. O'Shaughnessy pers. comm.).

New roads and snig tracks are not to cross streams or buffer zones through Tall Astelia colonies.

Where roads and snig tracks are necessary upstream of Tall Astelia colonies, they should be located on ridges and spurs. Where it is absolutely necessary for a road to cross a stream, a properly located and constructed crossing will be built as far upstream from the buffer zone as practicable.

Snig tracks: Soil compaction may occur on snig tracks and may interfere with subsoil and surface drainage, thereby affecting water regimes in soils on which Tall Astelia occurs, particularly in seepage zones at the foot of slopes (I. Campbell pers. comm.).

Where Tall Astelia occurs on seepage zones immediately below a coupe, snig tracks are to be designed to minimise alteration to the site's normal drainage patterns. Snig tracks are to be carefully rehabilitated, using breaching and/or barring to prevent or minimise soil loss in accordance with standard practices.

Coupe regeneration burns: In the rare cases where regeneration burns escape, they may pose a threat to Tall Astelia, its habitat and the buffer zone. Coupe regeneration burns are to be confined to clearfelled areas, and are not to extend into buffer zones.

Consideration may be given to the use of alternative regeneration techniques such as mechanical site disturbance where the use of a regeneration burn would pose an unacceptable risk to Astelia and its habitat.

Rehabilitation of roads: So that natural ecological processes can continue to operate, sedimentation within

Tall Astelia habitat associated with road construction activity is to be prevented.

Areas of erosion risk will be revegetated or further revegetated with appropriate indigenous plant species using local provenances.

Plants on road batters: Where isolated plants occur on road batters (2 instances) a 40 m buffer zone will be established. The origin of such plants is unknown, but they are likely to have resulted from the introduction of rhizome fragments during road making. If, however, they colonised the road batters spontaneously (by seed), then they are genetically distinct individuals and are therefore significant.

Myrtle Wilt

The possible occurrence of myrtle wilt (see Management Issues) within or near Astelia habitat will be investigated by the end of 1992. Causes of Myrtle Beech mortality in these areas will be determined. Research indicates that the incidence of myrtle wilt infection is increased by disturbances, including roading and logging (Kile *et al.* 1989). If myrtle wilt is diagnosed, appropriate management action will be required, including the use of buffer zones established by this Action Statement.

Control of Weeds and Competing Native Plant Species

An assessment will be made of effective and environmentally acceptable means of controlling weeds, and, where appropriate, competing native plants. Infestations of Blackberry (*Rubus laciniatus*) in the Dick Hill area (currently small) will be eradicated or controlled. Control programs will observe DCE environmental weed policy (DCE 1990). The prime sites for weed infestation are road batters and stream crossings where there has been soil disturbance and these will be given priority for control.

Restriction of site location information

Access to information on the precise location of Tall Astelia colonies sites will be restricted in order to minimise disturbance and loss of plants by uncontrolled access and collection.

Inventory

A comprehensive search will be made of drainage lines in the catchments of Tomahawk Creek, Pioneer Creek (West and Middle Branches), and the upper Bunyip and Tarago Rivers. A search will also be made of areas adjacent to the Otways colony and elsewhere in the Beech Forest land system. Further colonies may still be found, despite more than a century of botanical exploration and casual observation by botanists and foresters.

Systematic quantitative data on all colonies are required to provide a sound basis for management and monitoring. All colonies will be assessed according to colony size, stand area, vegetation structure and floristics, site condition and signs of disturbance. Detailed maps will be prepared.

Monitoring

All colonies will be monitored. Colonies in conservation areas will be monitored every ten years, while those in hardwood

production areas will be monitored every five years. More frequent monitoring is required after natural disasters and for production areas, as these afford relatively less protection for Tall Astelia. Detailed monitoring of specific sites of management concern may be appropriate.

Research

Research into the biology and ecology of Tall Astelia, and the effects of wildfire and forest management practices on Tall Astelia and its habitat will be undertaken. Priorities for research include

1. Determination of the number of plants in each colong.
2. Assessment of the level of genetic variability within and between colonies;
3. Examination of pollination mechanisms;
4. Monitoring of the effectiveness of buffer strips and conservation reserves in protecting colonies from fire, competition, sedimentation and disturbance, and
5. Monitoring of the impacts on Tall Astelia in areas where logging and disturbance has already occurred nearby.

Legislative Powers Operating

Legislation

Conservation, Forests and Lands Act 1987

Flora and Fauna Guarantee Act 1988

Forests Act 1958

Implementation, Evaluation and Review

The Flora and Fauna Division will be responsible for co-ordinating the implementation of this Action Statement and monitoring the effectiveness of the actions taken each year. The Action Statement will be reviewed in 1995.

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Further information

Further information can be obtained from Department of Sustainability and Environment Customer Service Centre on 136 186.

Flora and Fauna Guarantee Action Statements are available from the Department of Sustainability and Environment website: <http://www.dse.vic.gov.au>

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