

Xanthorrhoea australis



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FAMILY: Xanthorrhoeaceae

BOTANICAL NAME: *Xanthorrhoea australis*

COMMON NAME: southern grasstree

CONSERVATION SIGNIFICANCE:

Endemic to Australia

Description

Southern grasstree usually develops a rough trunk, which can grow up to 3 m high and 1 m wide and may be branched. The bark is thick, rough and corky, and often black in colour, the result of surviving many bush fires. The trunk is crowned by a crowded whorl of long, wiry leaves. The long, needle-like leaves are arranged in a spiral, forming an erect tuft when young and spreading as they mature, with the oldest leaves dying and forming a hanging skirt around the trunk. The leaves are bluish with a waxy coating, 30–14 cm long, diamond- to wedge-shaped in cross-section, broader and thickened at the base and narrowing towards the tip.

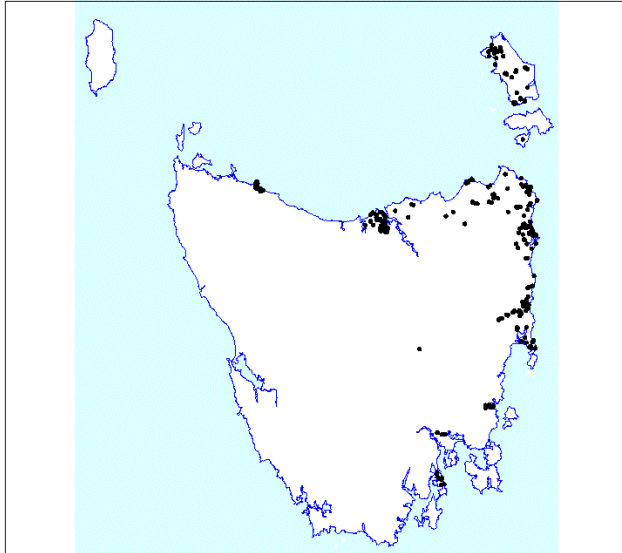
The flowers are borne on a long, dense, hard, straight, cylindrical spike (1–3 m long), which arises out of the skirt of grass-like leaves. The flowering spike is brown in colour before the flowers open. When open, the white to cream flowers form a dense pattern on the upper section of the spike. The flower-bearing part of the stem is 1.1–1.8 m long (or up to 2.50 m), 50–80 mm in diameter and 2–6 times as long as the non-flowering part of the stem, which is 0.3–0.5 m long and 18–40 mm in diameter. Each flower on the flowering spike is stemless, very small, and surrounded by prominent, stiff, leaf-like parts (bracts) which narrow and taper to a fine point. After flowering, seed capsules develop that contain a few hard, black seeds.

Confusing species

Young southern grasstree plants can be easily confused with *X. arenaria* and *X. bracteata* before forming a trunk. The latter two are trunkless species, both of which are listed as vulnerable under the state *Threatened Species Protection Act 1995* and

under the national *Environment Protection and Biodiversity Conservation Act 1999*. *X. arenaria* (sand grasstree) is listed as vulnerable and *X. bracteata* (shiny grasstree) as endangered. They can only be distinguished from each other by differences such as the length of the flower-head in relation to the total length of the flower-spike.

Distribution and Habitat



Distribution of *Xanthorrhoea australis* in Tasmania 2004 data.

Southern grasstree, the most widely distributed of the *Xanthorrhoea* species, is found in Victoria, New South Wales, ACT, South Australia and Tasmania. In Tasmania, it occurs in the northwest, northeast, Furneaux Group and the east coast. This species typically occurs in heaths, swamps, buttongrass moorland and the understorey of woodlands. It is often abundant on poor sandy soils in heathlands or on rocky hillsides located on coastal or near coastal areas. It occurs in areas with a mean annual rainfall exceeding 250 mm, and is most abundant where the mean annual rainfall exceeds 500 mm.

Ecology

Southern grasstree is an evergreen, perennial, slow-growing and long-lived species. It has the largest vegetative shoot apex yet recorded in the monocots (grasses, sedges, rushes, lilies, etc.).

It survives in some of the poorest soils in Australia, as it can tolerate low-nutrient conditions. Southern grasstree has a shallow root system, enabling it to more easily access nutrients available from decaying litter; however, this also means that it does not easily tolerate major disturbances to the root system. The plant also stores food reserves in its stem. This species can cope with dry conditions, as it can intercept rain and direct it to the soil immediately under the plant. Southern grasstree is generally frost-tolerant and prefers well-drained soils and sunny locations. It does not thrive on very windy sites.

Southern grasstree is a very slow-growing, long-lived species, with the trunk appearing only after many years of growth. During the first years of growth, an

underground trunk is produced, which is pulled down to about 15 cm below ground by contractile roots before the above-ground, tree-like trunk appears. Attempts have been made to establish its growth rate to enable age determination by height. Estimates so far range between approximately 1 and 3 cm per year, with a maximum elongation rate of stems recorded at approximately 3.1 cm per year. At the maximum rate, it would still take about 97 years to reach a height of 3 m. The age of plants can be more accurately determined by counting the longitudinal waves of annual growth; however, this is a more difficult and potentially destructive process as the waves can only be identified if dead sections of the trunk are cut longitudinally. Current estimates indicate that *Xanthorrhoea* species can live for up to 300 years.

Xanthorrhoea species produce an annual ring of leaves around the trunk, and glands at the bases of the leaves secrete a strong-smelling resin (attractive to bees) that binds the leaf bases together in a bundle. The densely-packed leaf bases provide an effective barrier to air circulation and surface water, restricting combustion and inhibiting decay.

Grasstrees exhibit continuous although seasonally variable leaf growth, producing up to 3.2 leaves per day. Growth rates are greatest when daily average temperatures reach 20 °C. In some *Xanthorrhoea* species, the growth rate of leaves is more seasonal, ranging from 2.6–6.55 mm growth in length per annum. Between 23 and 244 leaves are produced annually. Removal of the crown will increase leaf production; however, this will drop back over time. It has been calculated that two leaves per day are produced following removal of the crown, dropping to one per day 600 days later, and less than one per day three years later.

The leaves live about 2.8 years in shaded areas and 2 years in unshaded areas. When the leaves die they are not shed, and this causes a dead thatch of old leaves to form around the stem, which accumulates until burned by fire or lost through decay. Since the plants tend to store food reserves in the stem, the occasional removal of foliage can occur with little effect on the plant. However, the removal of too much foliage and/or the frequent removal of foliage may ultimately deplete the plant's food reserves and reproductive capability. Mechanical defoliation and removal of the foliage from the ecosystem may also seriously upset the nutrient balance at a site, since nutrients are bound up in the plant, particularly in the leaves (a portion of which would be returned to the ecosystem through natural defoliation events such as fire).

Southern grasstree occurs in fire-prone environments, is very tolerant to fire and can recover from substantial damage. The closely-packed and inflammable foliage surrounding the stem protect the apex from fire. If damaged, the stem apex can recover from any undamaged basal leaf shoots. The apices of very young plants are also well-protected as they are largely underground. Even in instances where the main apical portion of the stem is killed it is not always fatal, as in some cases plants will regenerate from stem and root buds. It is the protected apices of *Xanthorrhoea* that result in the first spots of 'green' after a bushfire. The early seedling stage, however, is not well-protected and thus vulnerable to death during a fire.

Fire tends to promote its reproductive capacity, increasing the dominance of southern grasstree within the plant community. In such communities, plants can be readily placed into discrete age groupings at a site, indicating episodic recruitment events and giving evidence that recruitment is strongly linked to fire. However, fires that are too frequent can lead to increasing mortality among adults, reducing the reproductive

capacity of the remaining population and eventually leading to the extinction of a population.

Fire stimulates flower production, triggering more than 80% of individuals in a population to simultaneously develop flowers. Fire also increases the frequency of flowering, promotes earlier flowering and the production of more flowers. However, it is unusual, even with burning, for plants to produce flowers in two successive years.

The capacity to flower directly after a fire before most other species have time to recover not only ensures a food source for many insects and birds, it also increases the likelihood of frequent and successful pollination. Seed-set rates of fire-affected populations can be very high, with up to 10 000 seed per flowering stem. Seed germination occurs around 6–12 months after fire. Seed production can be maximised by ensuring that plants are burnt during summer approximately every 6 years.

The reason that fire stimulates flowering is not well understood. Cutting off the leaves produces similar results to fire, as this also initiates flowering. Application of ethylene, which is present in smoke, has a similar effect, indicating that flowering is stimulated via a hormonal response to the removal of leaves.

Though southern grasstree responds to fire by increasing its reproductive effort, it is not totally dependant upon it for reproductive success since sporadic flowering and fruiting occurs in the absence of fire, and individual plants can be very long-lived. Thus long intervals between fires are unlikely to lead to the loss of species from an area. It takes about seven years for southern grasstree to mature from germination; after this flowering can occur at anytime. The percentage of flowering in the absence of fire is not high and occurs mainly in spring, but can extend between August and December, though not necessarily annually.

During flowering, the main shoot tip converts into a flowering spike that then grows rapidly. The spike grows at an average of 4 cm per day (with a maximum growth rate of 7 cm per day), attaining a maximum height of around 3 m and maximum diameter of 5 cm in about 75 days. The flowers are highly-scented and produce large quantities of nectar, attracting a wide variety of insect, bird, and mammal pollinators. The high rate of abortion in flowers and ovules leads to an average of 2.1 seeds per fruit, although the fruit can hold a maximum of 7 seeds. In the absence of fire, the greatest seed production occurs when flowers are produced and pollinated during spring, when insects and water are plentiful. When ripe the capsule containing the seed splits open, scattering the seed.

Like many natives, southern grasstree is intolerant to phosphorus.

Southern grasstree is highly susceptible to the soil-borne disease *Phytophthora cinnamomi* (root rot) and is often one of the first species to show symptoms of the disease and succumb to it in the event of an outbreak. It occupies habitats where *Phytophthora cinnamomi* infests large areas; thus this species can be very affected by the disease and suffer very high death rates. Once this species has disappeared from a site as a result of this disease, it may not return for many years in infested areas due to its susceptibility, slow growth rate and the strong link between reproduction and fire. Southern grasstree does have the capacity to naturally regenerate in infected sites, and some of these plants may last 10 or more years despite the presence of the disease. With a build up of biomass of species at the site that are susceptible to the disease, the level of the pathogen can increase again to infectious levels, creating a cyclical pattern of disease outbreaks and high death rates of the southern grasstree. Fire can reduce the

impact of the disease on the species, as it kills *Phytophthora cinnamomi*, but only to a depth of 20 cm. *Phytophthora cinnamomi* can remain active at depths of greater than 80 cm; thus the site remains infected, although the infection potential may be reduced for a period of time.

Because southern grasstree is one of the most susceptible species to *Phytophthora cinnamomi*, it can be a useful indicator of the spread of this disease. Conversely, the reappearance of southern grasstree at a site can be used to indicate when the level of the pathogen has dropped below an infectious limit.

Southern grasstree is a species that due to its slow growth rate is very susceptible to grazing and does not cope well with livestock trampling around the base of the plant, as this causes damage to the root system. It is also slow to recover following harvesting, and disturbances such as clearing and removal of plant parts and products such as resin if not undertaken with care.

Potential for Cultivation

Cultivation of this species is not easy, as its slow growth rate means that many years of care are required before the plant is mature and ready for sale.

Seed is relatively easy to germinate without requiring pre-treatment and can emerge within approximately 21 days, although it has been reported that seed can take up to a year to germinate. The seedlings are very slow to grow and, once established, require a well-drained, light or medium soil and a sunny position.

Southern grasstree is very popular in horticulture and has become fashionable as a landscape feature, either as a potted or in-ground plant. It can be grown very successfully in pots. However, for plants started from seed it is many years before the plants reach maturity and form a trunk, making commercialisation of it unviable. Generally in nurseries, the smallest plants offered for sale are usually around 30 cm high; thus for the plants to be mature enough for sale they would have to be at least 50 years old. Many are 200 years old or older. Mature plants with trunks are the most sought after for garden and amenity plants and the supply for this demand is mainly supplied from grass trees harvested (often illegally) from the wild.

The practice of harvesting plants from the bush and transplanting them into pots is not recommended, as it has been found that long-term survival is compromised; the plants are often unable to survive the root disturbance involved in transplantation. Southern grasstree has a deep stem and a relatively shallow and extensive root system that suffers massive damage if the plant is dug up and put into nursery-size pots. Thus many transplanted species die after a few months, and most live for no more than three years. They are only able to survive for a period afterward because they have considerable reserves of food stored in the trunks.

Transplanting can be successful, if great care is taken when uprooting the plants to minimise disturbance to the root system. This requires heavy equipment to extract the very deep underground stems and extensive roots, whilst keeping the residual soil attached. As long as a large root ball is taken and disturbance to it has been minimised, plants may be successfully re-established in pots provided they are given well-drained conditions and are not allowed to dry out during the re-establishment period. With proper harvesting and re-establishment care, a transplantation success rate of around 85% can be achieved. There is, however, still the issue of the potential for spreading *Phytophthora cinnamomi* during the transplantation process to

overcome. Due to the need to keep as much soil attached to the root system as possible, and the high potential for *Phytophthora cinnamomi* to be present in soil taken from sites occupied by southern grasstree, the potential to spread *Phytophthora cinnamomi* is very high. Southern grasstree should only be harvested from sites that are proven to be *Phytophthora cinnamomi* free.

Grasstrees are an iconic species in Australia and have had a long history of cultural use both by Indigenous people and subsequently by Europeans.

Southern grasstree, along with other grasstree species, were and are a staple plant for Aborigines, providing food, drink, fibre and materials for making implements and weapons. The dried flower stems were used for spears and to light fires by rubbing two pieces of stalk together. The resin flakes were collected from around the base of the stalk, which was heated and the resulting substance rolled into balls that were later reheated and used to glue stone flakes to wooden spear shafts or woomeras, and to join and repair broken implements. The tough seed pods were used as knives to cut meat or harvest insect larvae from inside the old flower stalks and the dead bases.

The white tender sections of the leaf bases were eaten, as well as seed, which was collected and ground into flour to provide a dough for damper. Grasstrees also provided edible grubs that could be found and dug out at the base of the trunk, as well small sweet pockets of honey extracted from the carpenter bee's cellular nests, which were often bored into the soft pith of the flower stalk. The flower nectar was used to produce a sweet, fresh, slightly fermented drink by soaking the flowering spike in water.

In the 1980s the foliage was established as a popular green filler for floral displays, along with the flower, in florist shop products. Europeans also recognised the qualities of the resinous gum and harvested it to make varnishes and lacquers.

Information Sources

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