October 2023

Private Forestry Guidance Materials

Information Sheet 23: Sugar gum

Overview

Sugar gum *(Eucalyptus cladocalyx)* is a durable, drought-resistant native tree species grown widely as plantations on farms in semi-arid areas across southern Australia and in similar climates around the world. It is mostly grown in shelterbelts and woodlots established for stock shelter, farm timbers and firewood, but is now successfully grown as a plantation species for high-end sawn timber markets.

Species characteristics

A moderately fast-growing tree, sugar gum has good form dependant on provenance. Mean annual increments (MAI) vary from 2 to 3 m^3/ha/yr in dry areas and up to 16 m^3/ha/yr in wetter areas. [1, 2] Mature tree heights are generally around 20 m, ranging from 10 m to 35 m depending on site quality. The species forms a lignotuber and coppices well following harvest or severe disturbance.[1]

Sugar gum grows in temperate conditions, tolerating warmer drier conditions and a wider variety of soils than most other commercial forestry species used in southern Australia. Rainfall of between 400 and 600 mm/yr with a winter maximum is preferred, however waterlogging is not tolerated. Seedlings are frost sensitive and may require protection.

Environmental factor	Variables
Mean minimum temperature	1-11°C [1]
Mean maximum temperature	23-34°C [3]
Mean annual temperature	12-21°C [1]
Annual rainfall	380-650 mm, prefers 400-600 mm with winter maximum [3]
Frost	Seedlings are frost sensitive and may need to be guarded for protection (Neumann et al. 2018). seedlings intolerant below -4° [4]
Maximum dry season duration	0-8 months [1]
Soil texture	Thrives on a wide variety of soils, gravels, clay loams, sandy loams and sands (CABI, 2019), intolerant of very fine sandy soil [1]
Depth	Tolerates shallow soils [4]
Drainage	Intolerant of waterlogging [1]
Soil chemistry	Has a wide pH range, and grows successfully on soils with high lime content [4]
Salinity EC	Low to slight salt tolerance, prefers EM38 <50-100 mS/m [5]

Current estate extent and location

Sugar gum is a South Australian woodland species, endemic to four locations: the southern Flinders Ranges, Kangaroo Island, eastern Eyre Peninsula and the Marble Range. It has been grown successfully in woodlots and shelterbelts since the 1890s, mostly on farms in western Victoria where there are many small old stands. During the 1990s and 2000s new plantations were established in Victoria. The last documented estimate of the total sugar gum plantation estate is 3,000 ha across Australia.[6] However, more plantations have been established since then. Due to its tolerance of a wide range of growing conditions, and the substantial area of land suitable for sugar gum growth in southern Australia, the potential range for new plantation developments in southern Australia is considerable.[2]

Sugar gum is also grown as a plantation species in the highlands of central and southern Africa and Mediterranean countries including Algeria, Morocco, Italy, Greece, Spain, Portugal and Israel [1] and in the United States and Chile.[4]

Products, properties and markets

Historically, sugar gum was grown for posts and firewood to be used on-farm. More recently it has gained recognition as a source of attractive and durable timber. The wood is blond to tan coloured, with a fine even texture, minimal defect and commonly interlocked grain. The timber is termite resistant, very durable, hard, dense and strong, although the sapwood is susceptible to lyctus borer. It is used for indoor and outdoor furniture, flooring, decking, stair treads, benchtops, posts and poles, and firewood.[7]

There is good local demand for sugar gum products in areas where the species is currently grown, predominantly central and western Victoria. A number of small sawmills process large sugar gum saw logs for sawn timber products. Smaller saw logs are cut for posts.[8]

Sugar gum firewood is well regarded for its long burning time, low smoke and relatively easy splitting. Markets are well established for firewood in areas where sugar gum plantations are grown, including country Victorian, South Australian and Melbourne-based firewood outlets and local firewood suppliers. Firewood can be cut from commercial thinnings and clearfell operations.

Sugar gum honey is popular, particularly in South Australia where it is specifically marketed. The species is summer flowering and noted for high honey production.[9]

Ecosystem services and community benefits

Sugar gum plantations provide several clear ecosystem benefits, including shade and shelter, wildlife habitat, generation of carbon credits and salinity remediation.

In western Victoria, farmers have integrated sugar gum plantations within their agricultural enterprises as woodlots and shelterbelts. Strategically placed plantings benefit pasture and crop growth by reducing windspeed and transpiration and improve growing conditions for livestock through provision of shade, shelter or refuge.

Eucalypt plantations in general support wildlife populations by extending habitat around native vegetation remnants and providing landscape connectivity.[10, 11] In broadacre farming areas with little native vegetation, sugar gum provides habitat for generalist wildlife species, including shelter, feed during summer flowering and nesting hollows for arboreal species.[8]

There are several opportunities for sugar gum plantations to generate Australian Carbon Credit Units under the Carbon Farming Initiative – Plantation Forestry. These include:

- The establishment of new plantations on non-forested land or wetland areas.
- The decision to continue a plantation rather than convert it to other land use because the opportunity to participate in the Emissions Reduction Fund (ERF) makes it viable to continue managing the land as plantation.

- Transition of the plantation to permanent forest.
- Conversion of a short rotation firewood-only rotation to a longer-term saw log rotation.

Sugar gum has also been recognised for its potential to assist in reclamation of saline areas, due to its growth rate and high water use.[1]

Risks and their management

Sugar gum plantations have a relatively low risk profile due to their capacity to reshoot following fire, their drought tolerance and freedom from serious disease and pests.[4] Both seedlings and young coppice are susceptible to frost, and coppice regrowth is vulnerable to windthrow. Sugar gum plantations are heavily root grafted and there is high risk of flashback for stump treatments involving herbicide. Regrowing stands are also vulnerable to waterlogging in the years following clearfell if they are wet.[8]

The species has become invasive in Western Australia and has potential to become so elsewhere. Mature trees produce copious tiny seeds that are wind dispersed. Establishment is notable particularly following fires, and may be problematic in adjacent bushland.[4]

The foliage of sugar gum contains cyanic acid and is thought to be toxic to stock, especially just after harvesting. Sheep browsing is a risk to planted stock and coppice regrowth.

Management practices

Although the species has been grown for well over a century in plantations, knowledge of management practices is mostly informal, and there is little formal silvicultural research in forestry literature. The silvicultural regimes applied vary, depending on the site characteristics, management history and target end product. This section presents current knowledge on establishing new sugar gum plantations and several silvicultural options applied for coppice management.

A typical silvicultural regime for establishing a new sugar gum shelterbelt grown for saw log involves the following steps.

Cultivation	Minimal site cultivation is required. Surface cultivation to loosen compacted topsoil may be beneficial, however gross modification of the soil environment hampers production [2]
Weed control	Complete pre-plant weed control is essential [2]
Growing stock	Only grows from seedlings [1]. Improved seed is available through commercial forestry seed companies.
Planting	Plant in winter through to early spring, depending on soil dryness and frost risk.[2] Establish seedlings at a density of 200 to 1,100 stems per hectare or 7 x 7 m to 3 x 3 m spacings proportional to rainfall [1]. It is important to consider the intended silvicultural regime, end products and harvesting equipment when planning spacing (see notes below).
Fertiliser	Unlikely to be beneficial, particularly on ex-agricultural land [2]
Post plant weed control	Complete weed control is required for the first year following planting [2]
Monitoring	Regular monitoring for insects, disease and weed competition, which may trigger further treatment.

Sugar gum is recognised for its ability to regrow from coppice. At least three consecutive crops can be grown from a single stump without re-establishment. Traditionally, stands have been grown over a long rotation, then clearfelled for firewood and posts, and left to regrow from coppice for future firewood crops. For best growth, the coppice must be thinned, as multiple leaders grow back vigorously after harvest. Coppice thinning is usually undertaken 2-4 years after the initial felling. While earlier coppice thinning can be done easily with an axe and does not regrow, thinning at later ages enables better selection for stem quality.[8]

Various regimes involving thinning and potentially pruning are applied to stands managed for sawlog production. Several options are shown in the following table.

Option	1st thinning	2nd thinning	Sawlog harvest
Multi-thin with early 1st thinning (The Age, 2002)	Pre-commercial at 5-8 years, remove 40% of stems	15-20 years, retain 250 stems per hectare	35-40 years, clearfell
Single commercial thinning	Commercial for firewood at 20 years, remove 50% basal area		40-60 years depending on target saw log diameter, clearfell
Coppice with standards	Commercial for firewood at 20 years	Recut coppice and thin standards at 40 years	Recut coppice and thin standards every 20 years

Achieving effective release of the sawlog stems from competition can be challenging due to coppicing from the cut stumps. Chemical treatment of the stumps is likely to cause flashback (death to non-target trees), so is not considered appropriate. Alternatives include:

- planting at lower densities and pruning to remove branches from the final crop trees
- manually removing the coppice, or
- managing the stand as coppice with standards and accepting lower growth response.

Periodic growth measurement is recommended to inform the management regime and expected returns. Later age fertiliser may be beneficial.

Financial returns

While there are clear markets for specific sugar gum log products, there is little information available about returns. That is partly because of the relatively small scale of the species at this point and also due to the fact that a primary driver for establishing sugar gum plantations historically has been for on-farm productivity benefits and on-farm timber use (e.g. fencing and firewood).

Bibliography and further reading

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Department of Agriculture, Fisheries and Forestry