# Identifying key invasive native scrub species

Over 40 native plant species are listed as invasive native scrub (INS) in NSW. This section identifies the species listed as INS in the Central West and Western Catchment Management Authority regions, and profiles 12 key species. This may change over time so please refer to your local Catchment Management Authority for an up-to-date listing.

**In this section:**

# Listed invasive native scrub species

**What plant species are invasive native scrub?**

Invasive native scrub (INS) species are listed by Catchment Management Authorities (CMAs) according to the following criteria:

(a) the species invades plant communities where it has not been known to occur previously, **or**
the species regenerates densely following natural or artificial disturbance, **and**
(b) the invasion and/ or dense regeneration of the species results in change of structure and/ or composition of a vegetation community, **and**
(c) the species is within its natural geographic range.

Species can be added to or removed from the list at the request of the CMA and following review of supporting scientific evidence. INS species have to be acting invasively as defined in the Environmental Outcomes Assessment Methodology as well as be listed INS species in order to be managed under the *Native Vegetation Act 2003*.

Listed INS species do not always behave invasively in every situation. Your local CMA staff will be able to advise whether a listed INS species is behaving invasively.

**INS in Central West and Western catchments**

There are 32 listed invasive native species in the Central West and Western catchments. Twenty of these species are common to both catchments.

More details about the main INS species in these catchments, including identification and management information is available in this section. Understanding how INS species behave and are best managed is an important element of an INS management plan.

**INS species common to Central West and Western CMA areas**

Bimble box/poplar box *Eucalyptus populnea*
Black box *Eucalyptus largiflorens*
Black cypress *Callitris endlicheri*
Black roly poly *Sclerolaena muricata*
Broad-leaf hopbush *Dodonaea viscosa* subsp. *spatulata*
Budda/false sandalwood *Eremophila mitchellii*
Coolibah *Eucalyptus coolabah*
Emu bush *Eremophila longifolia*
Eurah *Eremophila bignoniiflora*
Galvanised burr *Sclerolaena birchii*
Mimosa *Acacia farnesiana*
Mulga *Acacia aneura*
Narrow-leaf hopbush *Dodonaea viscosa* subsp. *angustissima*
Punty bush *Senna* form taxon '*filifolia*'
River cooba/black wattle *Acacia stenophylla*
Silver cassia *Senna* form taxon '*artemisioides*'
Turpentine *Eremophila sturtii*
White cypress pine *Callitris glaucophylla*
Wilga *Geijera parviflora*
Yarran *Acacia homalophylla*

**Invasive native species – Central West CMA area only**

Cooba/native willow *Acacia salicina*
Deane's wattle *Acacia deanei*
Dillon bush *Nitraria billardieri*
Eastern cotton bush *Maireana microphylla*
River red gum *Eucalyptus camaldulensis*
Sifton bush *Cassinia arcuata*

**Invasive native species – Western CMA area only**

Belah *Casuarina cristata*
Green turkey bush *Eremophila gilesii*
Harlequin fuchsia bush *Eremophila duttonii*
Lignum *Muehlenbeckia florulenta*
Red box *Eucalyptus intertexta*
Silver turkey bush *Eremophila bowmanii subsp. bowmanii*

For a list of INS species in other regions, refer to the Environment Outcomes Assessment Methodology, the *Managing invasive native scrub* information sheet (referenced below) or contact your local CMA.

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**References and resources**

For more information see:

NSW Government (2005), *Native Vegetation Regulation 2005: Environmental Outcomes Assessment Methodology*. NSW Department of Natural Resources, Sydney, **http:// www.environment.nsw.gov.au/vegetation/eoam.htm**

NSW Government (2006), *Managing invasive native scrub*. Information sheet 9. November 2006. Available at **http://www.environment.nsw.gov.au/vegetation/publications.htm**

# Bimble Box

| | |
|---|---|
| Scientific name: | *Eucalyptus populnea* (Myrtaceae) |
| Also known as: | Poplar box |
| Listed in: | Central West catchment<br>Western catchment |

## Description

Bimble box is a rapidly growing, medium sized tree 8 to 20 m in height. It has light grey, flaky bark with dark green, round, glossy leaves. Flowers are whitish and occur in clusters of 4-7 in late summer. They develop into ovoid fruit 4-5 mm in diameter.

It is common throughout the hard red country in western NSW, particularly on the deeper soils of the plains and drainage lines. In the soft red country it is less common and tends to occur mainly along watercourses and in small drainage depressions or 'sinks'. Bimble box is associated with cypress pine, grey box or red box and mulga.

## Growth

Bimble box establishes periodically following favourable climatic conditions.

## Management notes

- Seedlings are generally unpalatable to livestock, but may be eaten during drought.

*Bimble box regrowth*

*Early (top) and developed (middle) bimble box INS establishment*

*Mechanical*

- Mechanical treatments, such as chaining, are often not effective as most trees sucker readily (the two- or three-trunked form of the tree is a relic of ringbarking in the late 1800s and early 1900s).
- A heavy-duty blade plough can control regrowth, although several deep ploughings are often necessary to gain good management.

*Fire*

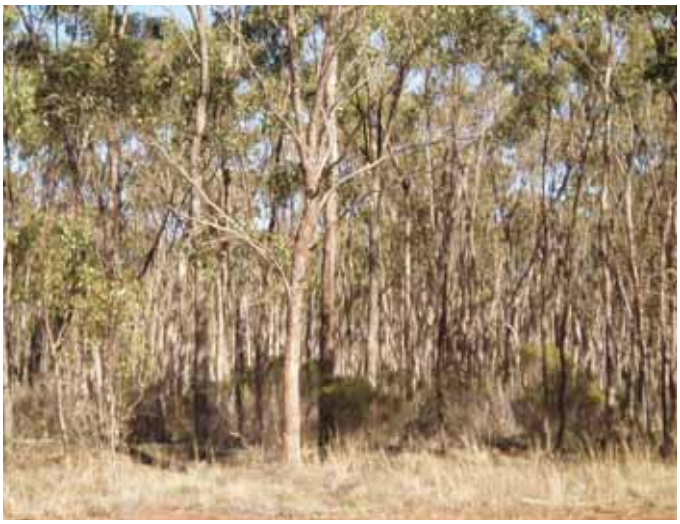
- After a fire bimble box re-grows from suckers and seedlings. However, two successive autumn fires will control resprouters and seedling establishment.

*Herbicide*

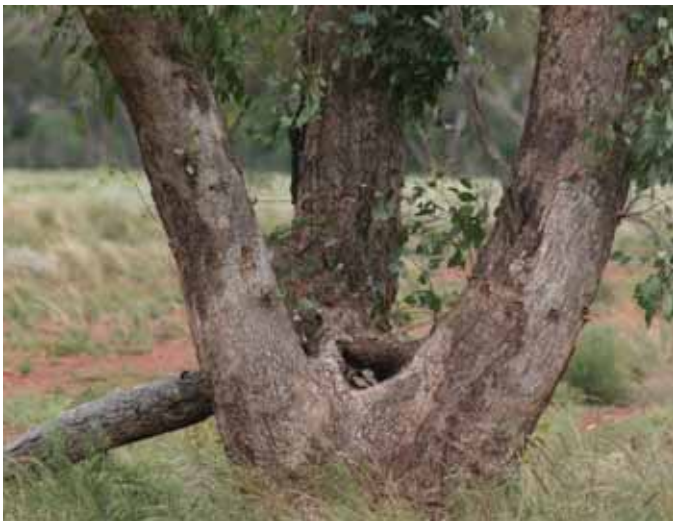
- A number of chemical treatments have been documented as effective against bimble box.

*Goats*

- Goats can be used to control this species when plants are small. Care must be taken as overstocking may result in damage to the pasture.



*Growth locked bimble box INS*



*Multi-stemmed bimble box following ringbarking. Note the original ringbarked stem fallen to the left.*

**References and resources**

Information in this resource has been drawn a number of sources, including the following publications.

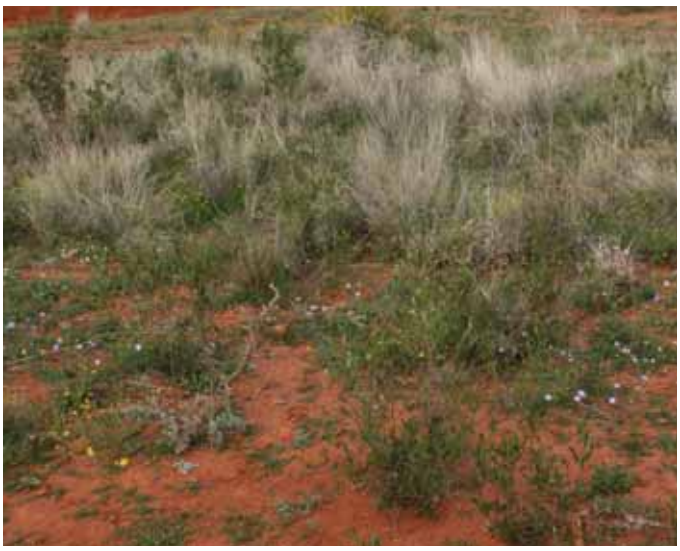

Bull, A (2003), *Best practice native shrub management manual for south west Queensland*. Queensland Department of Natural Resources and Mines.

Cunningham, G (2008), *Listening to the Managers*. Report on the invasive native scrub 'Landholder Knowledge' project prepared for the Central West and Western Catchment Management Authorities. Available at **http://www.cw.cma.nsw.gov.au/cwcma_natveg_ins.htm**

Jacobs, S (ed.) (1988), *A graziers' guide to the bimble box-pine country of western New South Wales*. Soil Conservation Service of NSW.

# Broad-leaf hopbush

| | |
|---|---|
| Scientific name: | *Dodonaea viscosa* subsp. *spatulata* (Formerly *Dodonaea viscosa* var. *arborescens*) (Sapindaceae) |
| Listed in: | Central West catchment<br>Western catchment |



*Broad-leaf hopbush seedings establishing*

**Description**

Broad-leaf hopbush is a tall, sticky, hairless, bushy shrub, 2-3 metres high, with resinous stems covered with thin reddish bark. It flowers late winter-spring.

It is mainly found in the east of the NSW rangelands with isolated occurrences in the central west. It commonly occurs on shallow stony soils of hillslopes and ridges, and especially in disturbed areas along roads.

**Growth**

Broad-leaf hopbush regenerates mainly from seed and has very high seed production. Seed loads are dropped in late spring to early summer and germinate over a range of temperatures (16-22°C). Seed germination is also promoted by fire.

Rainfall that starts seedling growth is related to periods of high humidity and low evaporation (often occurring late autumn-winter). It is the following summer rainfall, temperatures and evaporation that decide the survival of seedlings.

Broad-leaf hopbush seedlings rapidly develop a dual root system – a substantial lateral root system reaching between 12-140 cm below the soil in mature plants, and a taproot to a depth of 120-140 cm when mature. The lateral system starts developing four to six weeks after germination and this rapidly increases during week 14 along with shoot development.

Shoots regenerate from the base of stems but not from roots.

Mature shrubs are drought hardy and will survive and grow throughout drought, however landholders in western NSW have observed that seedlings are killed by drought.

**Management notes**

- May be heavily browsed by stock when there is little available herbage.
- Hopbush should be controlled before the end of winter or before its annual seed set, so the seed bank is not replenished.
- Waiting until the passing of the first summer after germination to implement control techniques will allow the heat and possibly a lack of rain during summer to kill off many seedlings.
- Minimising soil disturbance will allow growing pasture to compete with hopbush seedlings, reducing the ability of seedlings to emerge and establish.
- It has been found that although germination may be greatest on non-grassed areas, survival through the pre-summer period is greatest on grassed areas. This situation is reversed during autumn, with grass competing with germinating shrubs. It is critical in a management plan to allow a significant quantity of grass to remain over the summer period, as good competition may lead to a decrease in the establishment of hopbush seedlings.

- If hopbush is treated during a good season, the pasture will compete with regenerating stands and provide a decent fuel load for burning. Best results are achieved by resting pastures from grazing after treatment until grass has re-established.
- Landholders in western NSW have observed that broad-leaf hopbush a relatively easy INS species to treat. It is easily removed by ploughing, water logging and fire.

*Mechanical*

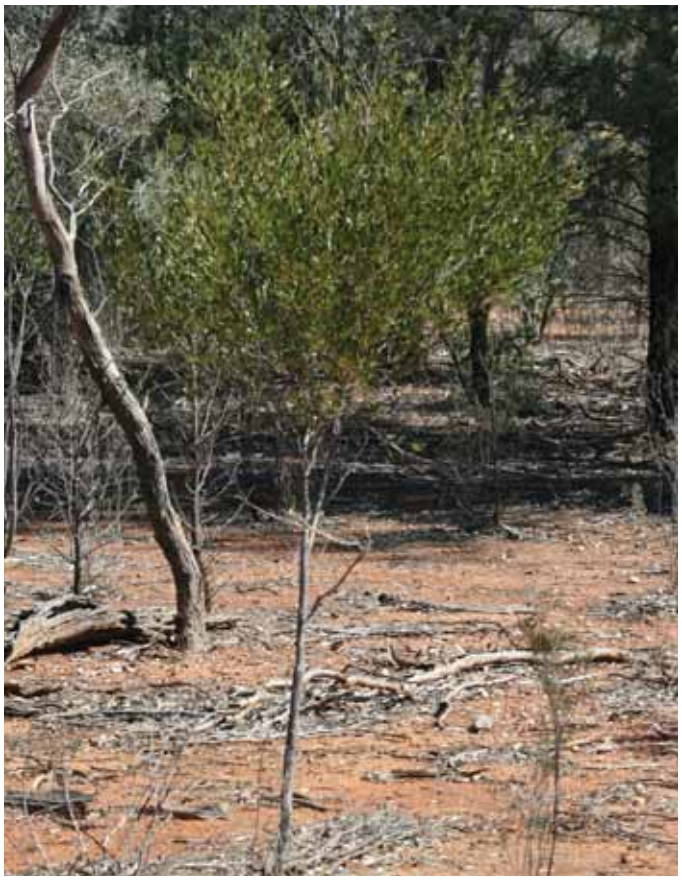
- Mechanical methods of control provide high-cost short-term gain. However hopbush readily re-establishes, requiring follow-up management.
- Chaining is likely to break off the tops of shrubs, leaving taproot and lateral roots intact and allowing the shrub to re-sprout.
- Blade ploughing may be effective as it severs the root system below the butt of the shrub, providing less chance for the shrub to re-shoot. Landholders in western NSW have observed that broad-leaf hopbush is easily removed by ploughing.
- Follow-up treatment (e.g. burning) must be considered to control regrowth and emerging seedlings promoted by soil disturbance.

*Fire*

- While mature shrubs can be resistant to fire, burning can eliminate or substantially reduce overall hopbush populations.
- Fire can promote seed germination, so follow-up fires (within five years) are usually necessary to eliminate establishing seedlings. Two successive autumn fires have been shown to control re-sprouting shrubs.
- Burning before hopbush seedlings reach maturity will ensure that the seed bank is not replenished.
- If a succession of fire treatments can be implemented, the effect could last for up to 30 years.

*Goats*

- Goat grazing has been used in western NSW to successfully control broad-leaf hopbush. Care must be taken as overstocking may result in damage to the pasture or an increase in less palatable species.



*Broad-leaf hopbush (above and below)*

*Various immature broadleaf hopbush plants*

**References and resources**

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Brooke, G and McWhirter, L (2006), *The glove box guide to plants of the NSW rangelands*. NSW Department of Primary Industries.

Bull, A (2003), *Best practice native shrub management manual for south west Queensland*. Queensland Department of Natural Resources and Mines.

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Noad B (ed.), Barclay, R, Green, D, Hacker, R, Harland, R, Kelly, S, March, N, McLeod, F, Muir, S, Murphy, J, O'Leary, C, O'Shea, R and Tatnell, W. (1993), *Managing for Woody Weed Control in Western NSW*. Woody Weeds Task Force.

Scriven, R (ed.) (1989) *A graziers' guide to belah-bluebush country of western New South Wales*. Soil Conservation Service of NSW.

# Budda

| | |
|---|---|
| Scientific name: | *Eremophila mitchellii* (Myoporaceae) |
| Also known as: | False sandalwood, sandalwood |
| Listed in: | Central West catchment<br>Western catchment |

## Description

Budda is a shrub to about 3 m, or a tree to 9 m high with aromatic leaves and branchlets that are hairless or sparsely downy at the ends. Bark is rough, dark-brown to almost blackish, with a regular pattern of oblong segments. White or cream bell-shaped flowers occur mainly in spring, with a secondary flowering in autumn. An occasional flower may be seen at any time.

Budda grows on sandy loam and clay loam red earths, red brown earths and duplex soils, and is common beneath bimble box, white cypress pine, wilga, gidgee and leopardwood. It is found mainly in the east of the NSW rangelands, extending to Hillston in the south. It is less frequent in the west, occurring about as far west as White Cliffs.

## Growth

Seed is the main mode of budda establishment, however it can regenerate from a swelling of the trunk just below the soil surface if damaged. Seedling establishment is encouraged by a lack of pasture competition, often typical of overgrazed areas. Budda develops a central trunk when young and has a lifespan of 50-100 years. Budda is drought resistant and survives fire very well when mature, re-sprouting readily. It also recovers well after ringbarking or cutting.

*Budda seedling*

## Management notes

- Overgrazing can reduce the vigour of perennial pastures, allowing budda seedlings to establish and to increase in abundance.
- Control of outlying shrubs before they seed (at approximately 0.75 m in height) is important in limiting encroachment over open areas.

*Mechanical*

- Chaining is not particularly effective due to the ability of budda to re-sprout. If budda is chained follow-up treatment is necessary.
- Blade ploughing is documented as being 95% effective at a depth of 20 cm, however it is an expensive treatment and is generally only considered viable for the treatment of specialised areas or smaller areas of dense INS.
- Stick raking is not as effective as blade ploughing but it is much more affordable, so it is a more viable option for treating large areas.
- Grubbing can be effective.
- Landholder experience in western NSW suggests following mechanical treatment with grazing by goats.

*Fire*

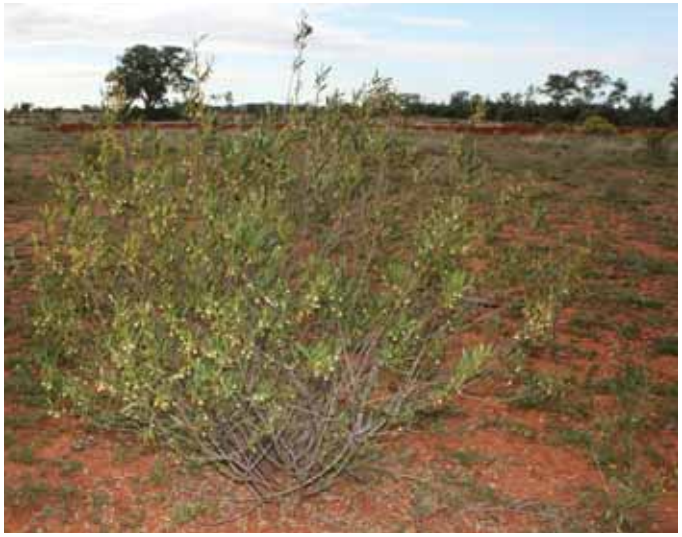
- Fire is an effective treatment for budda seedlings (before they develop a woody base).
- Following fire, budda may become dominant if it is able to establish in the sites vacated by other more fire-sensitive INS species, so mechanical treatments can be appropriate.
- Fire is also considered a useful follow-up treatment, and is often essential when controlling budda. Shrubs are most susceptible to two successive autumn fires with a reported 80% mortality.

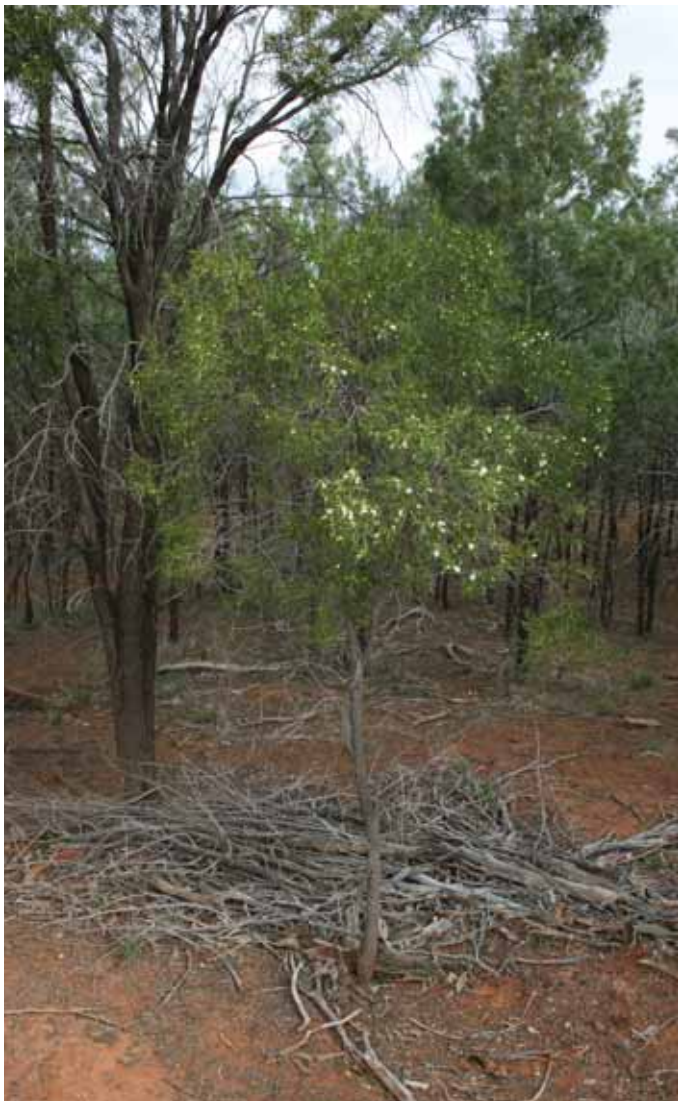
*Herbicide*

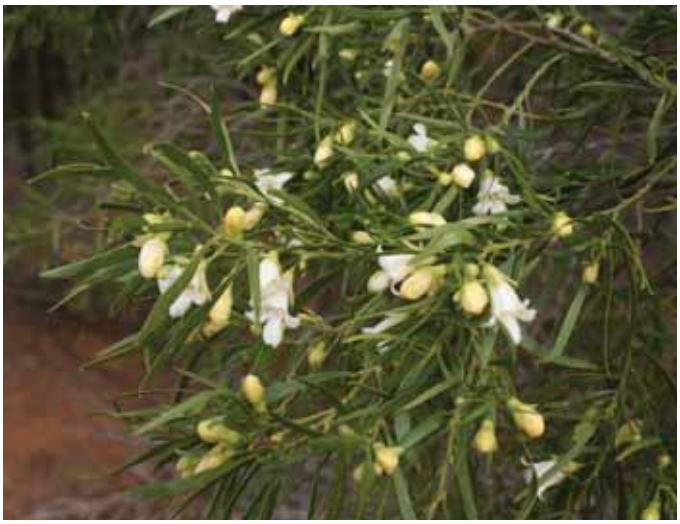
- Herbicide treatments are more effective on younger plants. Higher applications are required on older plants and secondary chemical treatments are often necessary. Low dosage chemical rates are effective as a secondary treatment, especially as an autumn application, giving a 90-100% kill. The effectiveness of chemical treatments can be increased when applied in combination with other forms of treatment. The disturbance of plants in spring (via mechanical or fire treatments), followed by a secondary chemical treatment in autumn will result in high shrub mortality.

*Goats/sheep*

- Very heavy grazing by sheep or goats has in some cases been successful in reducing the density of budda, but care must be taken as overstocking results in depletion of the pasture and therefore lack of competition for re-establishing budda. May also lead to an increase in less palatable species.

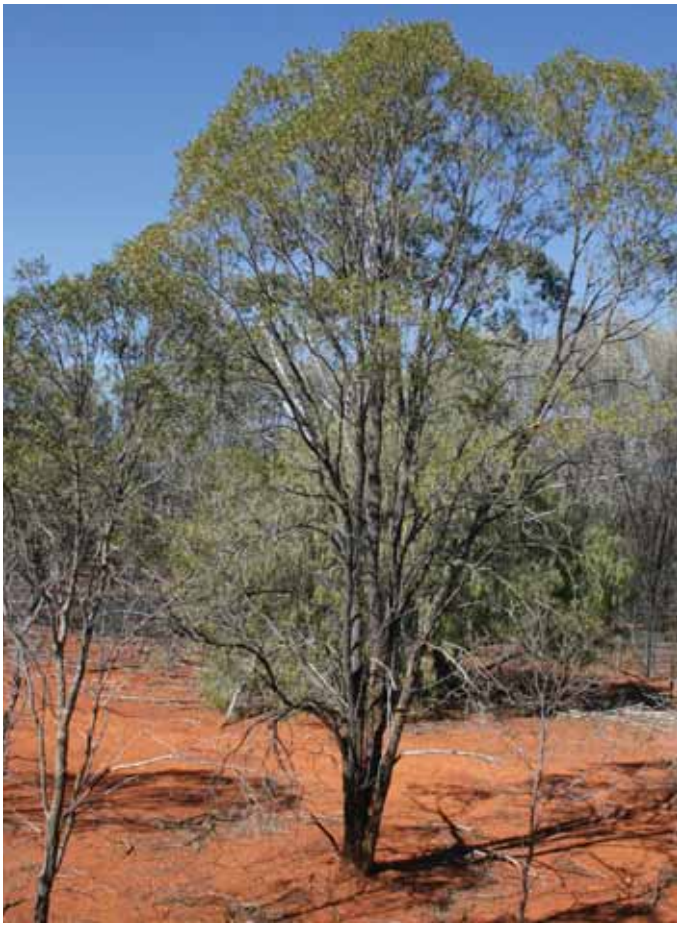






*Budda in flower*

*Budda sprouting from roots*



*Mature budda*

**References and resources**

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Bull, A (2003), *Best practice native shrub management manual for south west Queensland*. Queensland Department of Natural Resources and Mines.

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Scriven, R (ed.) (1989), *A graziers' guide to belah-bluebush country of western New South Wales*. Soil Conservation Service of NSW.

# Green turkey bush

| | |
|---|---|
| Scientific name: | *Eremophilia gilesii* (Myoporaceae) |
| Also known as: | Desert fuchsia |
| Listed in: | Western catchment |

**Description**

Green turkey bush is a low, compact shrub, usually less than 1 m high. It has spreading, multi-stemmed branches, which are covered by alternate leaves that secrete a sticky resinous substance. Flowers are pale-blue to purple and a deeper blue, rarely white, and can occur any time of year but usually in winter-summer.

Green turkey bush is usually found in soft-hard mulga and sandplains.

**Growth**

Large germinations often occur after winter rainfalls.

**Management notes**

*Mechanical*

- Slashing, breaking up the soil, and severing the root system by ploughing, blade ploughing, chaining and stick raking have successfully controlled turkey bush.
- Chaining alone has not been reported to be very successful in reducing turkey bush populations, however when used in combination with burning has been reasonably successful. This is because the chaining reduces the initial shrub population enough to grow a grass fuel load to burn the established and germinating plants.
- Waterspreading has been successful in managing turkey bush as it encourages growth of grasses which compete with turkey bush seedlings. It is extremely effective when used in combination with fire, and also helps to maintain the integrity of the ecosystem.

*Herbicides*

- Herbicide treatments have been shown to be successful on green turkey bush, and are most effective if applied when plants are growing. This is when the chemical is most readily absorbed.

*Green turkey bush*

*Fire*

- Green turkey bush is extremely susceptible to fire, especially young seedlings.
- Burning should be carried out whenever the opportunity arises, however the best time to burn is during late winter to early spring, using a well-carrying fire.

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**References and resources**

Information in this resource has been drawn a number of sources, including the following publication:

Bull, A (2003), *Best practice native shrub management manual for south west Queensland*. Queensland Department of Natural Resources and Mines.

# Mulga

| | |
|---|---|
| Scientific name: | *Acacia aneura* (Mimosaceae) |
| Listed in: | Central West catchment<br>Western catchment |

**Description**

Mulga is a tall shrub or small tree, to 8 m high, greyish-blue in colour. It has leaves of variable size and shape that are covered in minute downy hairs. Its bright yellow flowers may occur at any time of the year, usually following suitable rain.

Mulga is found mostly in sandplains, dunefields and rolling pediplain country with red earths, as well as mountain ranges with stony and skeletal soils. It sometimes occurs on areas with heavier soils which are subject to periodic flooding. Mulga is adapted to infertile, acidic soils. It is often associated with the native shrub green turkey bush (*Eremophila gilesii*).

**Growth**

Regeneration is episodic.

**Management notes**

- Mulga is regarded as one of the best western fodder trees, and is also valuable for the shade and shelter it provides. However, mulga can grow very densely in some circumstances to form an almost impenetrable scrub.
- The tree is relatively shallow-rooted, and in dense stands pasture growth is precluded or at least severely restricted.

*Mechanical*

- Chaining, selective pushing and blade ploughing have proven to be successful methods in opening up areas of thickened mulga.

*Fire*

- Mulga is extremely susceptible to fire, especially young seedlings.

*Mulga seeding*

*Middle and top: Thick mulga INS*

**References and resources**

Information in this resource has been drawn a number of sources, including the following publications.

Bull, A (2003), *Best practice native shrub management manual for south west Queensland*. Queensland Department of Natural Resources and Mines.

Jacobs, S (ed.) (1989), *A graziers' guide to bimble box-pine country of western New South Wales*. Soil Conservation Service of NSW.

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Scriven, R (ed.) (1989), *A graziers' guide to belah-bluebush country of western New South Wales*. Soil Conservation Service of NSW.

# Narrow-leaf hopbush

| | |
|---|---|
| Scientific name: | *Dodonaea viscosa* subsp. *angustissima* (Formerly *Dodonaea attenuata*) (Sapindaceae) |
| Listed in: | Central West catchment<br>Western catchment |

**Description**

Narrow-leaf hopbush is a spreading, slightly sticky shrub, usually 1-2 m high, although occasionally growing to 5 m. It is multi-stemmed and hairless except for the flowers, which occur mainly in spring-summer.

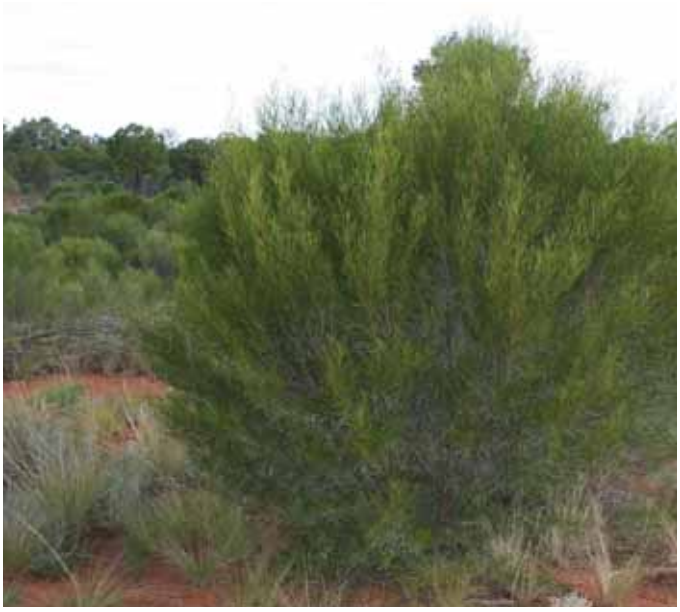
Narrow-leaf hopbush is widespread and common in the NSW rangelands and is found chiefly in deep sandy soils, particularly in disturbed areas, in a wide variety of vegetation types.

**Growth**

Narrow-leaf hopbush produces many seeds, but they survive only a few years in soil. Seed loads are dropped in late spring to early summer and germinate over a range of temperatures (16-22°C). Major germination events follow prolonged rain periods. Seedlings are susceptible to drought and commonly die if their first summer is dry.

**Management notes**

- It is relatively unpalatable, with sheep browsing it only as a last resort. However, it is eaten by goats. Care must be taken with goat grazing as overstocking results in damage to the pasture.
- Management of outlying shrubs, particularly those less than 1 m tall (i.e. before they begin seeding), is important to limit encroachment over open areas.
- Hopbush should be controlled before the end of winter or before its annual seed set, so the seed bank is not replenished.
- Waiting until the passing of the first summer after germination to implement control techniques will allow the heat and possibly a lack of rain during summer to kill off many seedlings.
- Minimising soil disturbance will allow growing pasture to compete with hopbush seedlings, reducing the ability of seedlings to emerge and establish.



*Narrow-leaf hopbush*

- It has been found that although germination may be greatest on non-grassed areas, survival through the pre-summer period is greatest on grassed areas. This situation is reversed during autumn, with grass competing with germinating shrubs. It is critical in a management plan to allow a significant quantity of grass to remain over the summer period, as good competition may lead to a decrease in the establishment of hopbush seedlings.
- If hopbush is treated during a good season, the pasture will compete with regenerating stands and provide a decent fuel load for burning. Best results are achieved by resting pastures from grazing after treatment until grass has re-established.
- Landholders in western NSW have observed that narrow-leaf hopbush a relatively easy INS species to treat through fire. It is easily removed/ killed by water logging and fire, and is grazed by goats.

*Narrow-leaf hopbush seedling*

*Mechanical*

- Mechanical methods of control provide high-cost short-term gain. However hopbush readily re-establishes, requiring follow-up treatment.
- Chaining is likely to break off the tops of shrubs, leaving taproot and lateral roots intact and allowing the shrub to re-sprout.
- Blade ploughing may be effective as it severs the root system below the butt of the shrub, providing less chance for the shrub to re-shoot.
- Follow-up treatment (e.g. burning) must be considered to control regrowth and emerging seedlings promoted by soil disturbance.

*Fire*

- Fire kills seedlings and most adult plants, and can be used to manage encroachment of this shrub if there is sufficient grass fuel, particularly when the plants are young.
- Fire can promote seed germination, so follow-up fires (within five years) or alternative treatments (e.g. grazing) are usually necessary to eliminate establishing seedlings. Two successive autumn fires have been shown to control re-sprouting shrubs.
- Burning before hopbush seedlings reach maturity will ensure that the seed bank is not replenished.
- If a succession of fire treatments can be implemented, the effect could last for up to 30 years.
- Grazing management is important following fire. If large quantities of grass are allowed to remain during dry summer periods in competition with seedlings, the seedlings can become stressed and die.

*Goats*

- Narrow-leaf hopbush is eaten by goats and readily killed by heavy goat grazing especially under drought conditions. Grazing heavily enough to kill the shrub (i.e. complete defoliation) will also have a major effect on the grass layer but with reasonable seasons and rest it will regenerate if originally in reasonable condition. Care must be taken as overstocking may result in damage to the pasture or an increase in less palatable species.

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**References and resources**

Information in this resource has been drawn a number of sources, including the following publications.


Brooke, G and McWhirter, L (2006), *The glove box guide to plants of the NSW rangelands*. NSW Department of Primary Industries.

Bull, A (2003), *Best practice native shrub management manual for south west Queensland*. Queensland Department of Natural Resources and Mines.

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Scriven, R (ed.) (1989), *A graziers' guide to belah-bluebush country of western New South Wales*. Soil Conservation Service of NSW.

# Punty bush

| | |
|---|---|
| Scientific name: | *Senna artemisioides* subsp. *filifolia* (Formerly *Cassia eremophila* var. *eremophila*) (Caesalpiniaceae) |
| Listed in: | Central West catchment<br>Western catchment |

**Description**

Punty bush is an erect shrub, 1-3 m high. It flowers mainly in late winter-spring. Punty bush resembles silver cassia but can be distinguished by the number of pairs of leaflets – punty bush has two pairs, while silver cassia has three or more

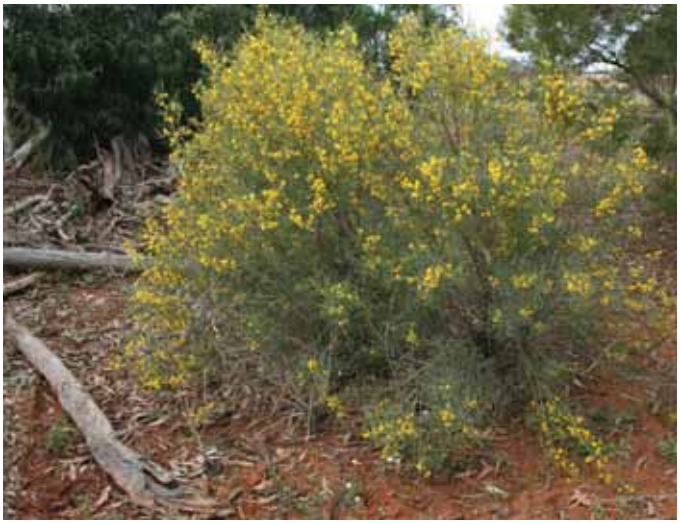
Punty bush is found throughout the NSW rangelands, mainly on red loam and sandy loam soils beneath mulga, bimble box, white cypress pine and red box. It is also sometimes found in undulating country and on rocky ridges and footslopes.

Punty bush has increased markedly in western NSW since European settlement, thickening and encroaching over extensive areas of grassland and open woodland.

**Growth**

Punty bush is a prolific seeder. Seed germinates after adequate rains at any time of the year. Because there are a lot of seeds in the soil, there is always a potential for replacement plants. It is a reasonably fast growing but short-lived (10 years or so) shrub.

*Punty bush seedlings germinating*



*Above and below: Flowering punty bush*

**Management notes**

- Moderate susceptibility to fire, particularly juvenile plants, however some regeneration by re-sprouting and from seedlings may occur following fire. This will be a problem only if the seedlings survive their first summer.
- Seedling density can be reduced by a long period of heavy intermittent stocking with sheep. Use of goats at a moderate stocking rate can also be successful. Care must be taken as overstocking may result in damage to the pasture.

**References and resources**

Information in this resource has been drawn a number of sources, including the following publications.

Brooke, G and McWhirter, L (2006), *The glove box guide to plants of the NSW rangelands*. NSW Department of Primary Industries.

Jacobs, S (ed.) (1989), *A graziers' guide to bimble box-pine country of western New South Wales*. Soil Conservation Service of NSW.

Noad, B (ed.), Barclay, R, Green, D, Hacker, R, Harland, R, Kelly, S, March, N, McLeod, F, Muir, S, Murphy, J, O'Leary, C, O'Shea, R and Tatnell, W (1993), *Managing for woody weed control in western NSW*. Woody Weeds Task Force.

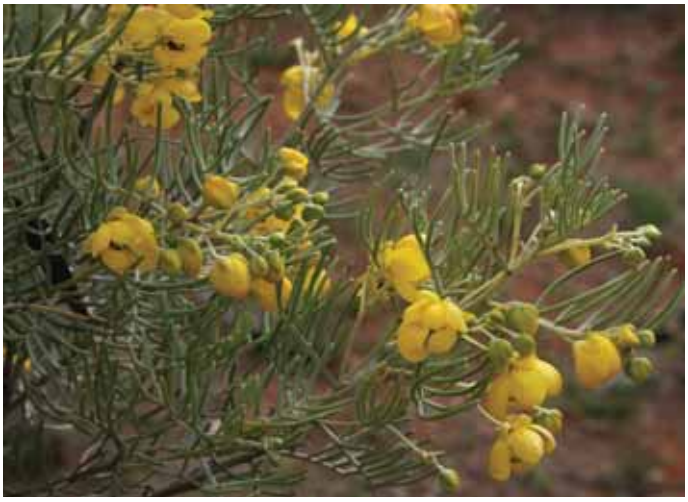
Scriven, R (ed.) (1989), *A graziers' guide to belah-bluebush country of western New South Wales*. Soil Conservation Service of NSW.

# Silver cassia

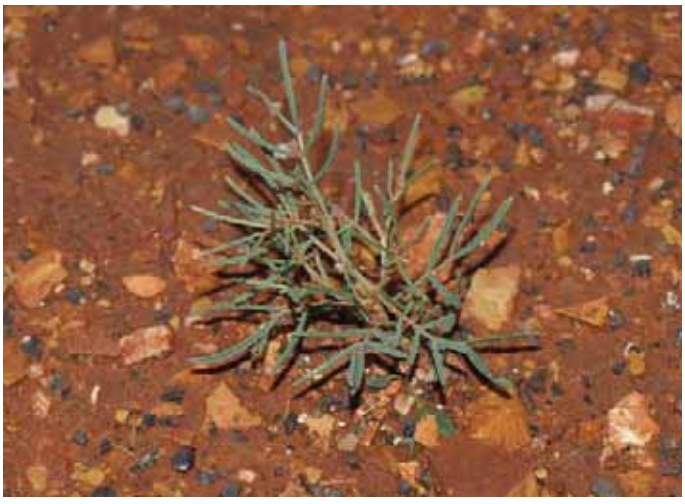
| | |
|---|---|
| Scientific name: | *Senna artemisioides notho* subsp. *artemisioides*<br>(Formerly *Cassia artemisioides*)<br>(Caesalpiniaceae) |
| Listed in: | Central West catchment<br>Western catchment |

**Description**

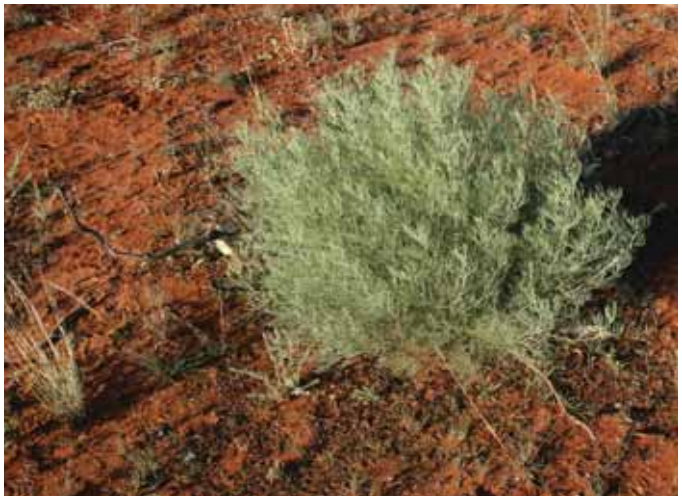
Silver cassia is a shrub 1-2 m high. It has whitish to grey-green leaves, usually with 4-6 pairs of leaflets, and flowers mainly in late winter-spring. Silver cassia resembles punty bush but can be distinguished by the number of pairs of leaflets – punty bush has two pairs, while silver cassia has three or more.



*Flowering silver cassia*



*Silver cassia seedling*



*Immature silver cassia*

Silver cassia is found throughout the northern two-thirds of the NSW rangelands. It is less common in the east and generally absent from the floodplains in the north-east. Silver cassia grows in bimble box, red box and white cypress pine on level and undulating country with red earths; on sandplains with mulga, belah-rosewood and mallee; and on rocky ridge and footslope areas with currawang.

**Growth**

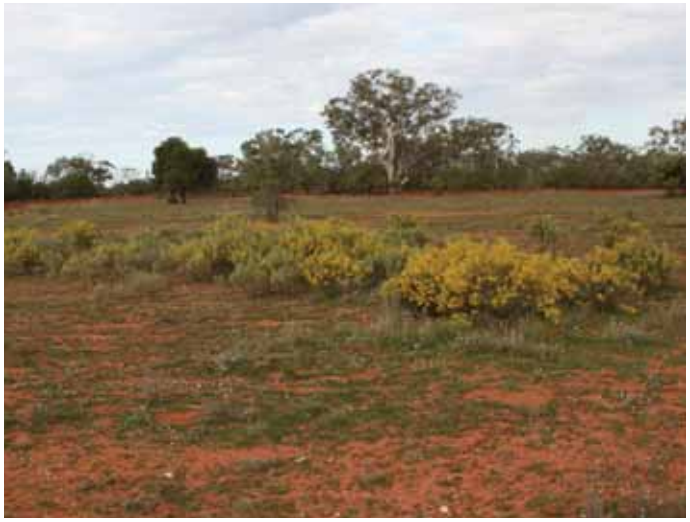
Silver cassia can seed prolifically after wet conditions. It is quick growing but relatively short-lived (about 10 years).

**Management notes**

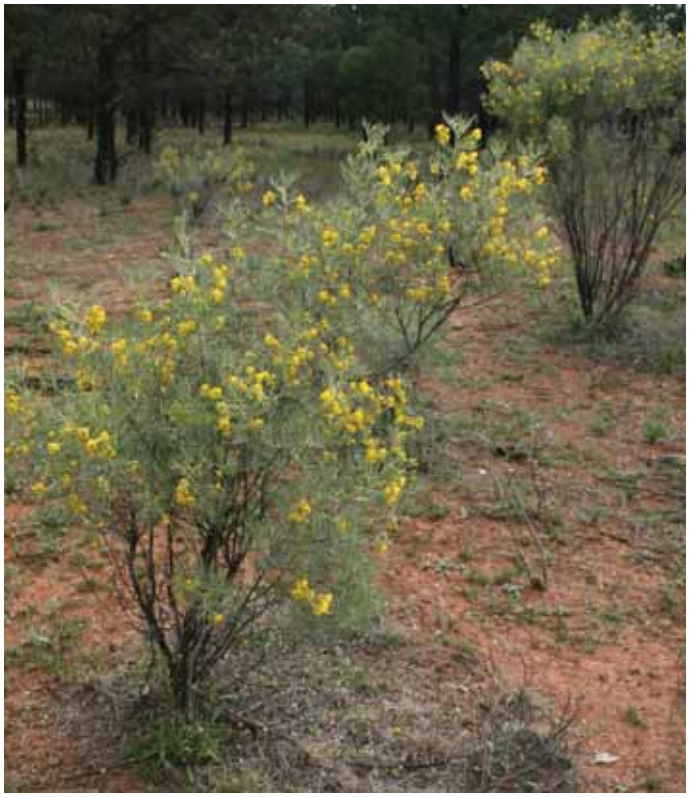
- *Senna* species can become the dominant vegetation after clearing, suppressing pasture and groundcover.
- Silver cassia is rarely browsed. The pods may be eaten by sheep and goats.

*Mechanical*

- Mechanical treatments (especially those which disturb the soil) are likely to result in re-sprouting and further germination of *Senna* species.
- Mechanical treatments may be used in combination with fire to encourage the growth of grass to be used as a fuel load.



*Mass germination of silver cassia*



*Silver cassia*

*Fire*

- Prescribed burning during autumn is the most cost-effective method of *Senna* control. This involves burning the thickened area at least twice (more burns may be required) within a time period of 10 years.
- Although fire may promote the germination of the hard-coated *Senna* seeds, a follow-up burn will deplete the seed bank.
- Fire can promote suckering.

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**References and resources**

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Bull, A (2003), *Best practice native shrub management manual for south west Queensland*. Queensland Department of Natural Resources and Mines.

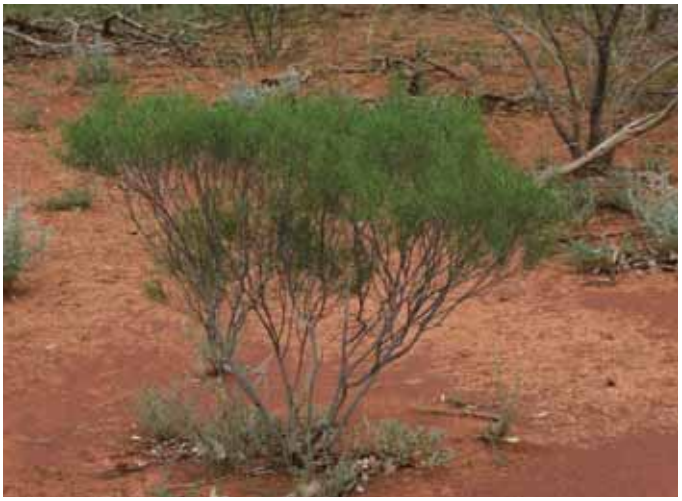
WEST 2000. *Perennial pasture management plan for woody weed control*.

# Turpentine

| | |
|---|---|
| Scientific name: | *Eremophila sturtii* (Myoporaceae) |
| Also known as: | Narrow-leaf emu bush |
| Listed in: | Central West catchment<br>Western catchment |

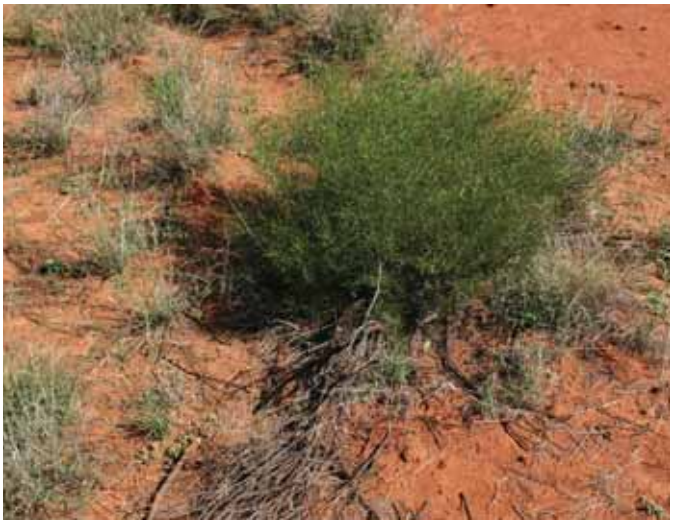
**Description**

Turpentine is a sticky, hairless shrub, 1-4 m high, with slender branches and dark grey finely fissured bark. It is generally multi-stemmed and has pink, bell-shaped flowers, mainly in spring although flowers may be present throughout the year. It has strong smelling leaves that are generally not browsed by stock.



*Turpentine*

*Turpentine seedling*



*Resprouting turpentine*

Turpentine is found over much of the NSW rangelands, on sandy and loamy red earths in mallee, mulga and bimble box; solonized brown soils in belah-rosewood woodlands, with numerous other shrub species. It is not found on alluvial soils of any of the major floodplains.

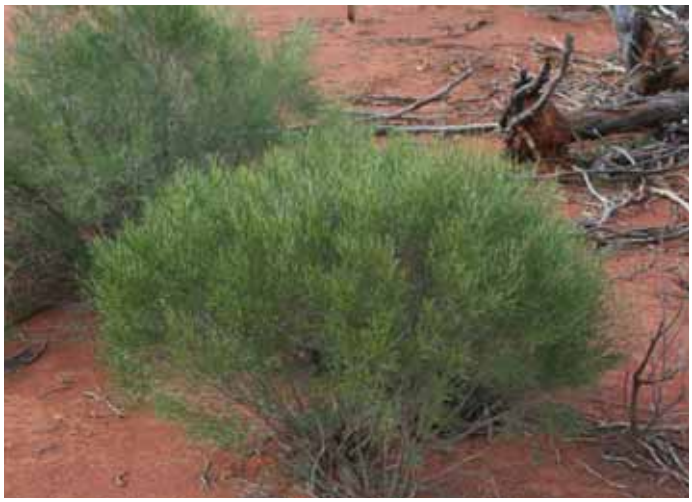
The shrub may occur as widely scattered plants, in small colonies, or in dense infestations covering large areas.

**Growth**

Germination from seeds is episodic. Seedlings need a succession of wet summers to survive and reach maturity. Young plants grow slowly but a deep tap root appears early making even juvenile plants very drought resistant. Once established, the plants are long lived (at least 50 years and probably more than 100 years). Turpentine also regenerates rapidly from roots if disturbed.

**Management notes**

- Rarely grazed by any animal, even in times of acute feed shortage.
- It is one of the most difficult INS species to manage, with successful management of other species potentially leading to widespread turpentine infestation on a treatment site.
- Overgrazing can reduce the vigour of perennial pastures, allowing turpentine seedlings to establish and to increase in abundance.



*Turpentine*

*An example of turpentine's deep tap root*

- Control of outlying shrubs before they seed (at approximately 0.75 m in height) is important in limiting encroachment over open areas.

*Mechanical*

- Chaining is not particularly effective due to the ability of turpentine to re-sprout. If turpentine is chained follow-up treatment will be necessary.
- Blade ploughing is documented as being 95% effective at a depth of 20 cm, however it is an expensive treatment and is generally only considered viable for the treatment of specialised areas or smaller areas of dense INS. Landholder experience in western NSW notes that two ploughings will kill 90% of turpentine regeneration after treatment.
- Stick raking is not as effective as blade ploughing but it is much more affordable, so it can be a more viable option for treating large areas with appropriate follow-up.
- Grubbing can be effective, however it is important to remove the roots of turpentine once it has been lifted from the ground, to help prevent the plant from re-shooting.

*Fire*

- Fire is an effective treatment for turpentine seedlings (before they develop a woody base), however only 10-20% of adult plants will be killed by a single fire (due largely to their resprouting ability). The conditions that favour seedling growth also favour grass growth, providing fuel for management burning. Fire is a useful follow-up treatment when controlling turpentine, and is often essential. Shrubs are most susceptible to two successive autumn fires with a reported 80% mortality.

*Herbicide*

- Herbicide treatments are more effective on younger plants. Higher applications are required on older plants and secondary chemical treatments are often necessary. Low dosage chemical rates are effective as a secondary treatment, especially as an autumn application, giving a 90-100% kill. The effectiveness of chemical treatments can be increased when applied in combination with other forms of treatment. The disturbance of plants in spring (via mechanical or fire treatments), followed by a secondary chemical treatment in autumn will result in high shrub mortality.

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**References and resources**

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Bull, A (2003), *Best practice native shrub management manual for south west Queensland*. Queensland Department of Natural Resources and Mines.

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Cunningham, GM, Mulham, WE, Milthorpe, PL and Leigh, JH (1992), *Plants of western New South Wales*. Melbourne: Inkata Press.

Jacobs, S (ed.) (1989), *A graziers' guide to bimble box-pine country of western New South Wales*. Soil Conservation Service of NSW.

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WEST 2000. *Perennial pasture management plan for woody weed control*.

# White cypress pine

| | |
|---|---|
| Scientific name: | *Callitris glaucophylla* (Cupressaceae) |
| Also known as: | White cypress |
| Listed in: | Central West catchment<br>Western catchment |

**Description**

- White cypress pine is a straight-trunked, medium-sized tree usually growing up to 20 m high. It has rough bark and needle-like aromatic green leaves, and woody cones that separate into six segments at the base to release hard-winged seeds.
- White cypress pine generally occurs on sandy or loamy soils as they are well drained.

**Growth**

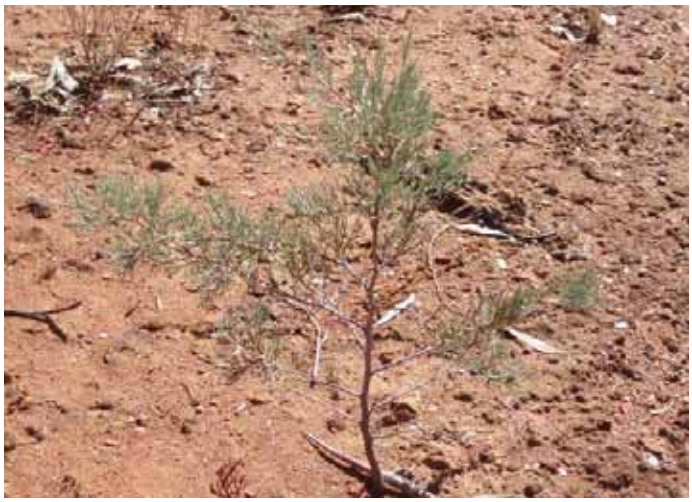
- Regeneration from seed is often slow, but white cypress pine can survive for over 100 years.
- White cypress pine can become 'locked'. When there is a major germination event, the trees slow their growth in response to competition for resources.

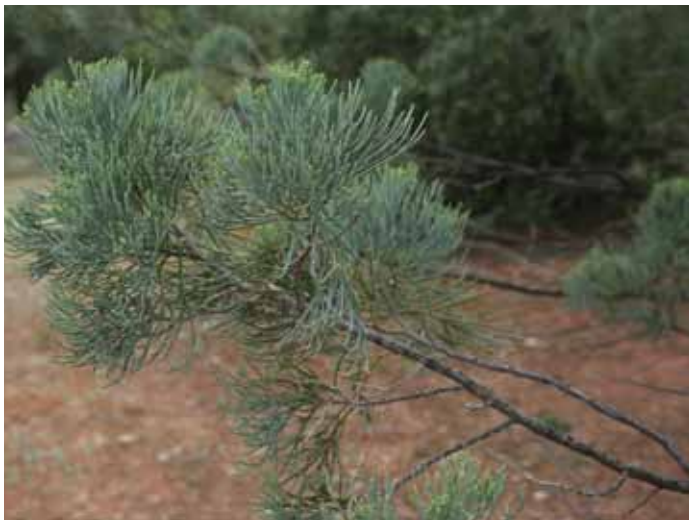
*A growth-locked pine thicket*

*White cypress pine seedlings*

**Management notes**

- Fire is considered the best form of management for treating regenerating or young seedlings of white cypress pine, although trees of all sizes are usually killed by fire
- Fire often gives close to a 100% control. The main factor determining survival after a fire is the intensity and duration of the fire at the base of the trunk.
- In severely burnt areas seed production from any surviving trees may be negligible for up to seven years after the fire.
- In the absence of fire, white cypress pine may develop into very dense stands, with perennial groundcover almost completely excluded.
- Maximising groundcover is an effective way of managing white cypress pine regeneration. Grazing must be planned carefully to ensure that groundcover is not reduced to a level at which more seeds can get to the ground and regenerate.
- Active management of locked up stands of white cypress pine is necessary to increase groundcover and litter under the trees, increasing soil health.
- Landholder experience in western NSW suggests white cypress pine can be controlled using mechanical treatment followed by goats, by fire and by cultivation. Periodic cultivation controls this species by removing/killing seedlings. Experience also suggests it takes a lot of grazing to kill this species once it gets higher.





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