

Fire resistant native insectary plants found in South Australia compiled by Dr Mary Retallack, June 2020

Plant responses to fire events

There is growing interest in the types of plants that may offer resistance to fire and/or have low flammability characteristics. Fire events will behave differently based on weather conditions, the topography of the land and the fuel type present. Fire is also a natural part of the Australian landscape and plays an important role in sustaining many ecosystem functions including habitat structure and nutrient cycling.

Some plants have ingenious ways of surviving fire including underground roots, stems and tubers from which the plants can regrow. For example, Christmas bush, *Bursaria spinosa* and prickly tea-tree, *Leptospermum continentale* both important insectary plants, readily reshoot after a fire if the above ground portions of the plant are badly damaged.



Figure 1: Craig Markby assessing reshooting Christmas bush six months after a fire event.



Figure 2: prickly tea-tree regrowing from the base.

Stringybarks have thick bark which protects the buds. New vegetative growth can be seen emerging from the trunk and branches after fire via previously dormant epicormic buds.

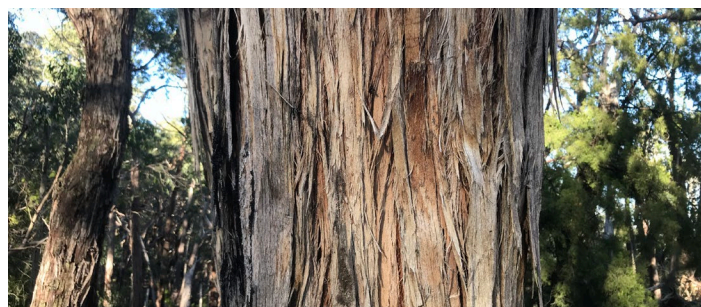


Figure 3: The messmate stringybark, *Eucalyptus obliqua* common to the Mount Lofty Ranges has thick bark which protects the buds of trees during a fire event.



Figure 4: Epicormic shoot growth emerging from protected buds after a fire event.



Figure 5: Epicormic shoot growth emerging from the trunk.

Many species of wattle, *Acacia* ssp. have developed seeds with hard coatings that are stored in the soil and often buried by ants. Once they are cracked open by heat they germinate.



Figure 6: Wattle seed shells.

Banksia and sheoak seeds may be protected in thick woody fruits or capsules that open only after the fire passes.



Figure 7: Sheoak trees have thick woody fruits that protect seeds.

Seed release in response to an environmental trigger (fire-mediated serotiny) is common in plants from the Proteaceae family (*Banksia*, *Grevillea*, *Hakea*) and *Eucalyptus* ssp. Even if the plant is damaged in a fire, new plants can germinate from the seed bank.



Figure 8: *Hakea* ssp. have thick woody fruits that protect seeds.

The grass tree, *Xanthorrhoea* ssp. has a special physiological adaptation called thermal insulation that helps protect the plant. Its thick, dead leaves around the stem serve as insulation and help to protect the plant against the heat of the fire. Once the soil is fertilised with ash after fire, it will produce a flowering stalk in the aftermath, which provides food for arthropods and insectivorous birds.



Figure 9: Grass tree, *Xanthorrhoea* ssp. regenerating after a fire event.

Running postman, *Kennedia prostrata* often colonises bare areas after fire. It has the added benefit of being a legume, which improves soil fertility through nitrogen fixation.



Figure 10: Running postman, *Kennedia prostrata* colonising the bare ground after a fire event.

The growth of plants like sundew, *Drosera* spp., flax lily, *Dianella* spp., native violet, *Viola* spp., and guinea flower, *Hibbertia* spp. are often triggered by heat, smoke, or the chemicals produced by fire.



Figure 11: Native lilac, *Hardenbergia violacea*.

Fire retardant plants have the capacity to absorb heat from an approaching fire without combusting. Similarly, groundcover plants may slow the movement of fire through the litter layer.

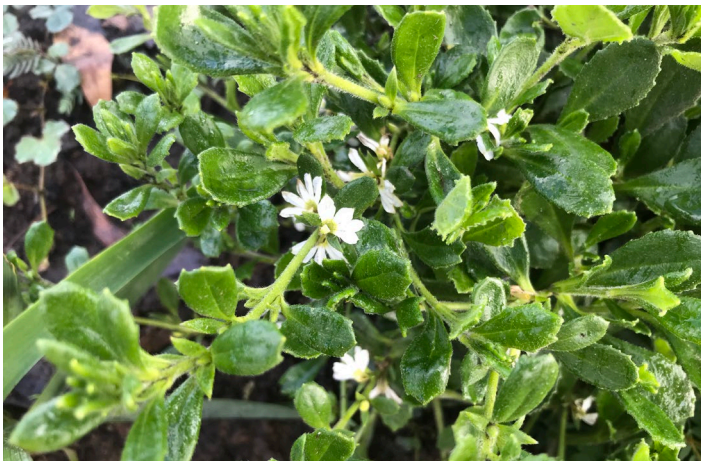


Figure 12: Regenerating fan flower, *Scaevola* spp. after a fire event.



Figure 13: Creeping saltbush, *Atriplex semibaccata*.

Plants with low flammability tend to have fleshy, moisture retaining leaves and foliage (when well hydrated) and trees species with smooth bark.



Figure 14: Ruby saltbush, *Enchylaena tomentosa*.



Figure 15: Pigface, *Carpobrotus* spp.



Figure 16: Creeping boobialla, *Myoporum parvifolium*.



Figure 17: Emu bush, *Eremophila* ssp.



Figure 18: Iron grass, *Lomandra* ssp.

Plant flammability characteristics

The flammability of a plant is a combination of how readily the parts of a plant burn, and how the form of the plant influences the burning characteristics of the whole plant.

Key characteristics of flammability¹ include:

- **Moisture content:** most native plants have a moisture content of 80 to 150% of their oven dry weight (ODW), while most deciduous trees contain 250 to 400% of their ODW. The higher the moisture content the slower the ignition.
Lush, green material must be dried out before it will ignite.
- **Volatile oil content:** The percentage of oil in *Eucalypts* ssp., *Melaleuca* ssp., *Callistemon* ssp., and other Myrtaceae (Myrtle family) of up to 5%, tends to be higher than other plants. When heated this oil can explode, intensifying the heat of the fire front, which may then ignite more volatile oils.

¹ Source: https://www.stateflora.sa.gov.au/files/sharedassets/botanic_gardens/sustainable_landscapes/bg-gen-reducingfireriskingardens.pdf



Figure 19: Gum tree, *Eucalyptus* ssp. and bottlebrush, *Callistemon* ssp.

- **Ignition temperature:** Plants with higher oil levels tend to have lower ignition temperatures, the Myrtaceae family ignite at 80 to 100 °C, so they burn with less preheating than other species that may ignite at 200 to 400 °C.
Loose, flaky or rough bark will trap embers and this can preclude enough heat for ignition.
- **Salt content:** Plants with a high salt content will retard burning.

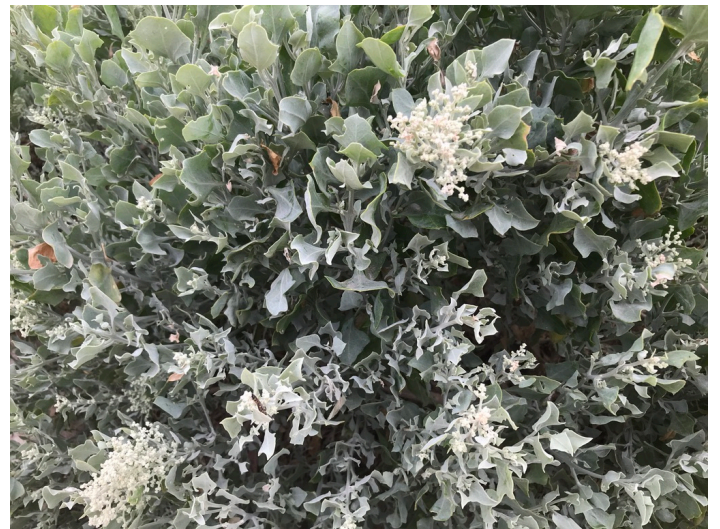


Figure 20: Saltbush *Atriplex* ssp.

Functional and resilient production systems

As well as the attributes that exhibit low flammability, selected native insectary plants provide the potential of many additional functional benefits, including habitat for predatory arthropods (good bugs) that can contribute to the biocontrol of insect pest in and around vineyards.

Arthropods (insects and spiders) provide a valuable food source for lizards, insectivorous birds, microbats (which can eat up to half their body weight in insects each night). In turn they provide a food source for predator/raptor bird species that can help to keep fructivorous (fruit eating) pest bird species at bay! Retain old tree hollows as they provide valuable habitat for wildlife.



Figure 21: Christmas bush, *Bursaria spinosa* provides habitat for predatory arthropods and insectivorous birds.



Figure 22: Tree hollows provide important habitat for wildlife.

Native perennial grasses

Perennial tussock grasses such as wallaby grasses, *Rytidosperma* ssp. are low growing, sparsely spaced and do not produce as much bulk material as many introduced weed species. They are regarded as having a minimum fuel load which acts as a bushfire risk mitigator. The 'fuel load' per hectare of native grassland is about two to five tonnes, compared to 10 to 25 tonnes per hectare of exotic grassland.²

Photos: Mary J Retallack

² Source: <https://www.abc.net.au/news/2020-05-17/restoring-ecosystem-with-grasses-following-bushfires/12248034>

This project is supported by the Department of Agriculture, Water and the Environment through funding from Australian Government's National Landcare Program



Figure 23: Wallaby grasses, *Rytidosperma* ssp.



Figure 24: Wallaby grasses, *Rytidosperma* ssp. planted in the vineyard mid-row.



Figure 25: Kangaroo grass, *Themeda triandra* regenerating after a fire event.

Testing plant flammability

To test if a plant is likely to combust easily, carefully place a few leaves over a gas stove or other source of flame in a safe environment to determine its flammability. Some plants have a high oil content and they tend to be more highly flammable.

Native insectary plants with reported low flammability

The following list summarises native insectary plant species that are reported as having low flammability. An insectary plant is a plant that provides food, shelter and alternative prey or hosts, which nourish and support the presence of predatory arthropods (insects, including parasitic wasps and spiders) in association with a crop plant such as grapevines. Predatory arthropods contribute towards the biological control of economically damaging pests. All plants can burn, but the careful selection of fire retardant plants may be an important factor, if you are located in a high fire risk zone.

NB: Always, check your local pre-European plant community for suitability prior to selecting plants for your location.

Habit	Genus	Species	Common name	Floral resource		Height (m)	Width (m)	Tolerance to frost	Flower colour		Flowering time	Reported flammability
				Pollen	Nectar							
Tree	<i>Acacia</i>	<i>melanoxyton</i>	blackwood	yes	¹ yes	7 to 20	4 to 10	resistant	yellow		winter to spring	low
	<i>Acacia</i>	<i>sophorae</i>	coastal wattle	yes	¹ yes	2 to 5	2 to 8	moderately sensitive	yellow		winter to spring	low
	<i>Allocauarina</i>	<i>verticillata</i>	drooping sheoak	yes	no	5 to 8	4 to 6	resistant	red		autumn to winter	low
	<i>Viminaria</i>	<i>juncea</i>	golden spray	yes	yes	4 to 6	2 to 4	moderately sensitive	yellow		summer to autumn	low
Shrub	<i>*Bursaria</i>	<i>spinosa</i> ssp. <i>spinosa</i>	Christmas bush	yes	yes	2 to 4	1 to 3	resistant	white		late spring to late summer	low
	<i>Correa</i>	<i>alba</i> var. <i>pannosa</i>	white correa	yes	yes	0.5 to 1	0.5 to 1	moderately sensitive	white	pink	summer to autumn	low
	<i>Correa</i>	<i>glabra</i>	rock correa	yes	yes	1 to 1.5	1 to 1.5	resistant	red	green	autumn to winter	low
	<i>Enchylaena</i>	<i>tomentosa</i> var. <i>tomentosa</i>	ruby saltbush	yes		0.3 to 1	0.5 to 1.5	resistant	insignificant		spring to summer	low
	<i>Eremophila</i>	<i>glabra</i>	tar bush	yes	yes	1	1 to 2	resistant	orange		all year	low
	<i>Goodenia</i>	<i>albiflora</i>	white goodenia	yes	yes	0.3 to 0.8	0.3 to 1	moderately sensitive	white		spring	low
	<i>Goodenia</i>	<i>amplexans</i>	clasping goodenia	yes	yes	0.5 to 1.2	0.5 to 1	moderately sensitive	yellow		spring to summer	low
	<i>Goodenia</i>	<i>ovata</i>	hop goodenia	yes	yes	1 to 2.5	1 to 3	moderately sensitive	yellow		spring to summer	low
	<i>Hibbertia</i>	<i>exutiacies</i>	prickly guinea flower		² buzz pollinated	0.3 to 0.5	0.5 to 1	moderately sensitive	yellow		spring	low
	<i>Hibbertia</i>	<i>riparia</i>	bristly guinea flower		² buzz pollinated	0.1 to 0.5	0.3 to 0.8	moderately sensitive	yellow		spring	low
	<i>Maireana</i>	<i>brevifolia</i>	short-leaf bluebush	yes	yes	0.5 to 1	0.5 to 1.5	resistant	insignificant		spring to summer	low
	<i>Myoporum</i>	<i>insulare</i>	common boobialla	yes	yes	3 to 5	3 to 5	moderately sensitive	white		spring	low
	<i>Myoporum</i>	<i>montanum</i>	water bush	yes	yes	1 to 2	1.5 to 2.5	resistant	white		spring	low
	<i>Myoporum</i>	<i>viscosum</i>	sticky boobialla	yes	yes	1.5 to 2	1 to 3	moderately sensitive	white		winter to spring	low
	<i>Nitraria</i>	<i>billardieri</i>	nitre bush	yes		1 to 2	2 to 4	resistant	white		spring	low
	<i>Philothea</i>	<i>angustifolia</i> ssp. <i>angustifolia</i>	narrow-leaf wax flower	yes	yes	1 to 1.5	1 to 1.5	resistant	white		spring	low
<i>Rhagodia</i>	<i>candolleana</i> ssp. <i>candolleana</i>	seaberry saltbush	yes		1 to 1.5	1 to 1.5	moderately sensitive	insignificant		winter to spring	low	
<i>Rhagodia</i>	<i>parabolica</i>	fragrant saltbush	yes		1 to 2	1 to 2	resistant	insignificant		winter to spring	low	

¹*Acacia* flowers do not produce nectar. However, the leaf and phyllode glands do secrete a nectar or sugary substance which bees, butterflies and other insects have been observed feeding on.

*Growers are encouraged to explore the use of *Bursaria spinosa* as an insectary plant in and around their vineyards (Retallack et al., 2019). It is anticipated a broader suite of native insectary plants found on this list could extend the richness and abundance of predatory arthropods in vineyards.

² **Buzz pollination:** Some native bees use a special pollination technique called 'buzz pollination' (sonication) i.e. the blue-banded bee, bangs its head on the flower's anthers 350 times a second to release the pollen. Plants from the Solanaceae (nightshade) family (tomatoes, capsicums and eggplants) and many Australian native plants including *Hibbertia* ssp. and *Dianella* ssp. are buzz pollinated. These plants have the capacity to boost biodiversity and support populations of native bees but their pollen resources may not be readily available to predatory arthropods.

Native insectary plants with reported low flammability, continued

Habit	Genus	Species	Common name	Floral resource		Height (m)	Width (m)	Tolerance to frost	Flower colour		Flowering time	Reported flammability
				Pollen	Nectar							
Ground cover	<i>Ajuga</i>	<i>australis</i>	austral bugle	yes		0.3	0.5 to 1	resistant	pink	purple	spring to summer	low
	<i>Atriplex</i>	<i>cinerea</i>	coastal saltbush	yes		1	1 to 2	moderately sensitive	insignificant		all year	low
	<i>Atriplex</i>	<i>semibaccata</i>	berry saltbush	yes		< 0.5	1 to 2	resistant	insignificant		all year	low
	<i>Atriplex</i>	<i>suberecta</i>	lagoon saltbush	yes		< 0.5	1 to 2	resistant	insignificant		all year	low
	<i>Carpobrotus</i>	<i>rossii</i>	native pigface	yes	yes	0.1	2 to 3	resistant	pink		winter to summer	low
	<i>Correa</i>	<i>reflexa</i> var. <i>nummulariifolia</i>	common correa	yes	yes	0.1 to 0.5	0.6 to 2	moderately sensitive	yellow		winter to spring	low
	<i>Correa</i>	<i>reflexa</i> var. <i>scabridula</i> Prostrate form	common correa	yes	yes	0.2	0.3 to 2	moderately sensitive	red		all year	low
	<i>Einadia</i>	<i>nutans</i>	climbing saltbush	yes		0.5	1	resistant	insignificant		spring	low
	<i>Goodenia</i>	<i>blackiana</i>	native primrose	yes	yes	0.1 to 0.2	0.2 to 0.5	moderately sensitive	yellow		winter to spring	low
	<i>Goodenia</i>	<i>pinnatifida</i>	cut-leaf goodenia	yes	yes	0.4	0.1	moderately sensitive	yellow		spring to summer	low
	<i>Hibbertia</i>	<i>exutiacies</i>	prickly guinea-flower	² buzz pollinated	no	0.3 to 0.5	0.5 to 1	resistant	yellow		spring	low
	<i>Kennedia</i>	<i>prostrata</i>	scarlet runner or running postman	yes	yes	0.1	1.5 to 4	moderately sensitive	red		winter to spring	low
	<i>Myoporum</i>	<i>parvifolium</i> prostrate form	common boobialla	yes	yes	0.2	2 to 3	moderately sensitive	white		spring to summer	low
	<i>Prostanthera</i>	<i>aspalathoides</i>	scarlet mint bush	yes	yes	0.5	0.5	moderately sensitive	red	yellow	spring to summer	low
	<i>Prostanthera</i>	<i>behriana</i>	downy mint bush	yes	yes	1 to 2.5	1 to 2.5	moderately sensitive	white		winter to summer	low
	<i>Prostanthera</i>	<i>chlorantha</i>	green mint bush	yes	yes	0.5	0.5	moderately sensitive	blue		spring	low
	<i>Scaevola</i>	<i>aemula</i>	fairy fan flower	yes	yes	0.3 to 0.5	0.3 to 1	moderately sensitive	pink	blue	all year	low
	<i>Scaevola</i>	<i>albida</i>	pale fan flower	yes	yes	0.3 to 0.6	0.6 to 1	resistant	white		all year	low
<i>Scaevola</i>	<i>hookeri</i>	alpine fan flower	yes	yes	0.1 to 0.2	1 to 1.5	moderately sensitive	white		all year	low	
<i>Viola</i>	<i>hederacea</i>	native violet	yes	yes	0.2	1 to 4	resistant	white	purple	all year	low	
Strap leaved	<i>Dianella</i>	<i>ongifolia</i>	pale flax-lily	² buzz pollinated		0.5 to 0.8	0.5 to 1	resistant	blue		spring to summer	low
	<i>Dianella</i>	<i>revoluta</i>	black anther flax-lily	² buzz pollinated		0.5 to 1	1 to 2	resistant	blue		spring to summer	low
	<i>Lomandra</i>	<i>collina</i>	sand mat-rush	yes	yes	0.2 to 0.6	0.2 to 0.6	resistant	cream		winter to spring	low
	<i>Lomandra</i>	<i>effusa</i>	scented mat-rush	yes	yes	0.2 to 0.5	0.2 to 0.5	moderately sensitive	cream	yellow	winter to spring	low
	<i>Lomandra</i>	<i>juncea</i>	desert mat-rush	yes	yes	0.2 to 0.6	0.2 to 0.6	resistant	cream		winter to spring	low
	<i>Lomandra</i>	<i>leucocephala</i> ssp. <i>robusta</i>	woolly mat-rush	yes	yes	0.2 to 0.6	0.2 to 0.6	resistant	cream		winter to spring	low
	<i>Lomandra</i>	<i>densiflora</i>	pointed mat-rush	yes	yes	0.2 to 0.6	0.2 to 0.6	resistant	green		winter to summer	low
	<i>Lomandra</i>	<i>micrantha</i>	small-flower mat-rush	yes	yes	0.2 to 0.8	0.2 to 0.9	resistant	white		autumn to spring	low
	<i>Lomandra</i>	<i>multiflora</i> ssp. <i>dura</i>	many-flowered mat-rush	yes	yes	0.5 to 1	< 0.5	resistant	cream		winter to summer	low
Bulbs and lilies	<i>Dianella</i>	<i>revoluta</i> var. <i>revoluta</i>	black-anther flax-lily	² buzz pollinated	no	0.3 to 1	0.5 to 2	resistant	blue		spring to summer	low
	<i>Dichopogon</i>	<i>strictus</i>	vanilla lily	yes		0.4	0.4	moderately sensitive	purple		spring	low
Climber (outside vineyard)	<i>Hardenbergia</i>	<i>violacea</i>	native lilac	yes	yes	climber	3 to 4	moderately sensitive	purple		winter to spring	low

More information?

If you would like to find out more information about individual plants. Visit the Botanic Gardens of SA 'Plant Selector' <http://plantselector.botanicgardens.sa.gov.au>. Enter your postcode and press search. You can refine your results and include a key word such as "fire" to create a tailored short list of plants with pictures. View the results and export data to retain a copy. The Excel spreadsheet contains detailed notes about each plant and its suggested uses.

The Adelaide and Mount Lofty Ranges Natural Resources Management Board local plant catalogue provides a useful guide when selecting plants <http://plantselector.naturalresources.sa.gov.au>

Please also refer to other EcoVineyards fact sheets in this series.

Useful links

- Australian Plant Society (Victoria): Fire resistant and retardant plants <https://apsvic.org.au/fire-resistant-and-retardant-plants/>
- CFS: Native vegetation management https://www.cfs.sa.gov.au/site/prepare_for_a_fire/prepare_your_home_and_property/native_vegetation_management.jsp
- Natural Resources Adelaide and Mount Lofty Ranges: Bushfire recovery <https://www.naturalresources.sa.gov.au/adalaidemtloftyranges/land/fire-management/bushfire-recovery>
- Sophie's Patch: Bushfire garden recovery <https://sophiespatch.com.au/2020/01/03/bush-fire-garden-recovery/>
- State Flora: Bushfire resistance <https://www.stateflora.sa.gov.au/the-australian-garden/why-choose-native-plants/bushfire-resistance>

Thank you to our sponsors

This factsheet was supported by the Alexandrina Council through funding from a Rural Initiatives Grant, by the Northern and Yorke Natural Resources Management Board through funding from a Bite Sized Grant and via the EcoVineyards program partners.



Acknowledgement of country

The EcoVineyards project acknowledges Aboriginal people as the First Peoples and Nations of the lands and waters we live and work upon and we pay our respects to their Elders past, present and emerging. We acknowledge and respect the deep spiritual connection and the relationship that Aboriginal and Torres Strait Islander people have to Country.

Disclaimer

Wine Grape Council of South Australia and Retallack Viticulture Pty Ltd do not warrant or make any representation regarding the use or results of use of the information contained herein as to its correctness, accuracy, currency, or otherwise. No person should act on the basis of the contents of this publication without first obtaining, specific, independent professional advice relevant to a particular site. Wine Grape Council of South Australia and Retallack Viticulture Pty Ltd will not be liable for any loss, damage, cost or expense incurred or arising by reason of any person using or relying on the information in this publication.

For more info about the EcoVineyards project see <https://www.wgcsa.com.au/ecovineyards.html>