



INVASIVE ALIEN WEED MANAGEMENT PLAN

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ENVIRONMENTAL SUSTAINABILITY
DIVISION OF INFRASTRUCTURE AND COMMERCIAL

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WEED MANAGEMENT PLAN

1. INTRODUCTION

Invasive species cause a significant impact on both the Australian landscape and economy. As a result, the NSW Government re-evaluated the State's response in controlling all pest species, including weeds, animals and diseases. The *Biosecurity Act 2015* and the *Local Land Services Act 2013*, now work in conjunction to deal with these matters. Both Acts place a greater emphasis on landowners to take appropriate action to control/eliminate pest species from their property. Western Sydney University (the University) has an obligation to take appropriate action to comply with these Acts.

This plan is formulated in response to threats posed by weed species in general, but specifically those listed as regional priority weeds, to the University's land. It should be noted that weed management in the University's bushland areas are governed by the Cumberland Plain Recovery Plan 2011 and provisions placed on the 132C license granted by the Office of Environment and Heritage. As such, the methodology for weed control in bushland is often different from that covered in this plan and should be undertaken in accordance with best practice bush regeneration techniques.

1.1 Weed Species

There are a number of weed species listed by Great Western Sydney Local Land Services as a priority for control, eradication or that are prohibited to be transported, sold or purchase https://www.lls.nsw.gov.au/__data/assets/pdf_file/0010/722368/Greater-Sydney-Regional-Strategic-Weed-Management-Plan-2023-2027.pdf. Utilising this list as a basis, the University's campuses were surveyed, and a list of the most prolific weeds was created, as seen in Table 1. Other weeds also are mentioned within this document, that either have the potential of impacting our campuses or were located in small, isolated instances, i.e. Boneseed.

Table 1: the most common weeds observed on University property

COMMON NAME	SCIENTIFIC NAME
African Boxthorn	<i>Lycium ferocissimum</i>
African Olive	<i>Olea europaea subsp. cuspidata</i>
African Lovegrass	<i>Eragrostis curvula</i>
Blackberry	<i>Rubus fruticosus species aggregate</i>
Boneseed	<i>Chrysanthemoides monilifera subsp. moniligera</i>
Castor Oil Plant	<i>Ricinus communis</i>
Cestrum	<i>Cestrum parqui</i>
Duckweed	<i>Lemna minor</i>
Ground Asparagus Fern	<i>Asparagus aethiopicus</i>
Fireweed	<i>Senecio madagascariensis</i>
Honey Locust	<i>Gleditsia triacanthos</i>
Johnson Grass	<i>Sorghum halepense</i>
Lantana	<i>Lantana camara</i>
Moth Vine	<i>Araujia sericifera</i>
Paterson's Curse	<i>Echium plantagineum</i>
Scotch Thistle	<i>Onopordum acanthium</i>
Sticky Nightshade	<i>Solanum sisymbriifolium</i>
Trad	<i>Tradescantia fluminensis</i>
Water Hyacinth	<i>Eichhornia crassipes</i>
Various broadleaf weeds	

While not all these weeds are listed as a priority, the management of these plants is important as they pose specific problems to the University. In addition, there is a general biosecurity duty stated in the *Biosecurity Act 2015, Part 3*.

“All plants are regulated with a general biosecurity duty to prevent, eliminate or minimise any biosecurity risk they may pose. Any person who deals with any plant, who knows (or ought to know) of any biosecurity risk, has a duty to ensure the risk is prevented, eliminated or minimised, so far as is reasonably practicable.”

1.2 Action Plan

This plan will provide a brief description of each weed species, followed by a control timetable. Further information about each species can be found by reviewing the NSW DPI website <https://www.dpi.nsw.gov.au/biosecurity/feed-and-fodder/managing-biosecurity/high-risk-weeds> or the Federal Government Department of Agriculture, Water and Environment's Weeds Australia website <https://weeds.org.au>.

1.3 Definitions

- Annual – a plant completing its life cycle within one year from germination to fruiting and then dying.
- Anthers - the part of a stamen that contains the pollen.
- Berries - a fleshy or pulpy fruit with 1 or more seeds, the seeds embedded in the fleshy tissue of the wall of the fruit.
- Biennial – a plant completing the cycle from germination to fruiting in more than one, but less than two, years and then dying.
- Bract - a modified leaf or scale, typically small, with a flower or flower cluster in its axil.
- Branchlet - a small branch.
- Calyx - the outer part of a flower formed by the sepals which covers and protects the petals, etc. as they develop.
- Cladode - a flattened leaflike stem.
- Corolla - the petals of a flower collectively.
- Deciduous – a plant losing its leaves for part of the year, cf. evergreen.
- Drupe - a fleshy fruit with thin skin and a central stone containing the seed.
- Floret - A small flower, usually referring to the individual true flowers clustered within an inflorescence.
- Fruit - the seed-bearing structure formed from the ovary after flowering.
- Herbaceous - herb-like, not woody.
- Inflorescence - the complete flower head of a plant including stems, stalks, bracts, and flowers.
- Lanceolate - lance-shaped; 3-6 times as long as broad and broadest below the middle and tapering to the apex.
- Ovate - having an oval outline or ovoid shape.
- Overwinter – during Winter, growth of vegetative tissues and reproductive structures becomes minimal or ceases completely. For plants, overwintering often involves restricted water supplies and reduced light exposure. In the spring following overwintering many plants will enter their flowering stage.
- Pappus - the tuft of hairs on each seed of thistles, dandelions, and similar plants, which assists dispersal by the wind.
- Pedicel - a small stalk bearing an individual flower in an inflorescence.
- Peduncle - the stalk bearing a flower or fruit, or the main stalk of an inflorescence.
- Perennial - a plant whose life-span extends over more than one growing season.

- Petiole - the stalk of a leaf.
- Pyrrolizidine alkaloids - produced by plants as a defence mechanism against insect herbivores.
- Rachis - a stem of a plant, especially a grass, bearing flower stalks at short intervals.
- Rhizomes - a continuously growing horizontal underground stem which puts out lateral shoots and adventitious roots at intervals.
- Rosette - circular arrangement of leaves or of structures resembling leaves.
- Spikelet - the basic unit of a grass flower, consisting of two glumes or outer bracts at the base and one or more florets above.
- Stellate - arranged in a radiating pattern like that of a star.
- WONS – Weeds of National Significance.

2. VINES

2.1 Moth Vine

2.1.1 Description

- Is native to Brazil, Paraguay and Uruguay.
- It is a perennial climber with twining woody stems and goes as high as 10m with support.
- The green egg-shaped fruit resembles a choko and grows approximately 6-12cm long and 3-7cm wide.
- The flowers are bell-shaped, and can be white, pink or violet.
- The leaves are triangular, opposite up to 10cm long, with a white underside.



Moth Vine

2.1.2 Life cycle

- The plant flowers during Summer and Autumn.
- The fruit splits open when dry and releases seed, which is dispersed either through wind or by birds.

2.1.3 Impacts

- These plants are poisonous when eaten
- The sap from the plant is a milky latex which can cause skin irritation.
- Once established these vines often choke out supporting vegetation

2.1.4 Control

Timing for control activities is outlined in Table 2.

There are several approved herbicides used to control this species. These can be found at <https://weeds.dpi.nsw.gov.au/Weeds/MothVine>

3. WOODY WEEDS

3.1 African Boxthorn

African Boxthorn is a *weed of national significance* (WONS).

3.1.1 Description

- Native to South Africa.
- An erect perennial woody, thorny shrub, that can grow on average between 2 – 3m high.
- The stems are rigid and very branched with the main stems growing spines up to 15cm long. However, even the minor branchlets have spines.
- The leaves are smooth, fleshy and up to 3.5cm long.
- Flowers are white with pale blue markings & fragrant.
- Berries are green when young and ripen to orange-red.

3.1.2 Life cycle

- African boxthorn grows on all soil types but prefers lighter soils. They are drought tolerant, and have extensive, deep, branched taproots that sucker into new plants.
- They do not flower until at least 2 years old.
- Flowers appear in Spring through to early Summer.
- Fruit will appear in Autumn, but in the right condition can fruit all year round.

3.1.3 Impacts

- African boxthorn is toxic to humans and will cause discomfort and irritation but is not life-threatening.
- These plants are aggressive invaders of pastures, remnant bushland and waterways.
- If allowed, the plants will clump forming a hedge that impedes movement of livestock and native animals.
- Fruit fly, the common house fly and tomato fly utilise these plants for breeding purposes.

3.1.4 Control

Timing for control activities is outlined in Table 2.

There are several approved herbicides used to control this species. These can be found at <https://weeds.dpi.nsw.gov.au/Weeds/AfricanBoxthorn>

3.2 African Olive

3.2.1 Description

- Native to eastern Africa.
- Tall evergreen shrub or small tree growing between 2-15m tall.
- Smooth grey bark, rougher at the base of large plants.
- Leaves are glossy grey-green and the underside is silver.
- Flowers are white and appear on branchlets.
- Fruit is oval. They start life green and ripen to purple or black.

3.2.2 Life cycle

- African Olive is a long-living plant that can form dense communities.
- They can be found across various landscapes and soil types.
- Mature trees can regenerate after fire, however small seedlings (<1m) will be destroyed.
- Flowers appear from September through to November.
- Fruit appear in Autumn and mature in Winter.
- The seeds are dispersed by birds and foxes, who eat the fruit and defecate the seeds in new areas.

3.2.3 Impacts

- The habit of African Olives to form dense communities, means that they often form large shading canopies, that prevent other plant species from growing.
- They can also provide harbour to pest animal species, such as rabbits.
- These plants are aggressive in their colonisation of areas and they alter the plant diversity and structure of bushland areas. Therefore, they are considered to be eco-transforming.

3.2.4 Control

Timing for control activities is outlined in Table 2.

There are several approved herbicides used to control this species. These can be found at <https://weeds.dpi.nsw.gov.au/Weeds/AfricanOlive>

3.3 Blackberry

Blackberry is a *weed of national significance* (WONS).

3.3.1 Description

- Native to Europe, there are currently 9 species of blackberry in NSW that form part of the *Rubus fruticosus* species aggregate (refer to corresponding DPI fact sheet referenced in Section 3.3.4).
- Blackberries are semi-deciduous, scrambling woody shrubs.
- The canes are tangled and prickly and they often form impenetrable thickets several metres high.
- Blackberry plants have a main vertical root which grows to a maximum depth of 1.5m, depending on the soil type.
- Leaves occur alternately along the canes and are dark green on top with a lighter shade of green underneath. The leaves are also covered in short curved prickles.
- Flowers are white or pink 2-3cm in diameter.
- Berries are 1-3cm in diameter, changing from green to red to black as they ripen.

3.3.2 Life cycle

- Blackberries are the widest spread weed in NSW. However, they have a preference for temperate climates with annual rainfalls of around 700mm.
- The leaves will often fall off the plant during Winter, leaving bare canes.
- Flowers appear from late November to late February.
- Berries appear between December and April.
- The plant can reproduce when the tips of the canes touch the ground allowing roots to sprout in Autumn and becoming new plants.
- Blackberries are usually spread into new areas via the consumption of the fruits by birds, foxes and other small mammals.

3.3.3 Impacts

- While some small native animals utilise blackberry as harbour from predators, so too can feral animals such as rabbits.
- The dense nature and reproductive success of blackberries has resulted in them out-competing other vegetation.
- The thickets also impede access, alter fire regimes and dominate the landscape.

3.3.4 Control

Timing for control activities is outlined in Table 2.

There are several approved herbicides used to control this species. These can be found at <https://weeds.dpi.nsw.gov.au/Weeds/Blackberry>

3.4 Boneseed

Boneseed is a *weed of national significance* (WONS)*.

3.4.1 Description

- Native to South Africa.
- It is an erect perennial shrub, with woody branched stems.
- Grows to 3m in height.
- It has branched upright woody stems.
- The leaves are fleshy, elongated oval shape, tapering toward the base, with irregularly toothed edges and range between 3 and 9cm in length.
- New growth is covered in white downy hairs that disappear as the leaves mature.
- The flowers are yellow, 4 to 8 petals in a typical daisy shape, growing in diameter between 2 to 3cm.
- The flowers are clustered at the end of branches.
- The round, fleshy fruits turn from green to black when mature and contain a single seed.
- The bone-coloured seed is hard, smooth, round, and approximately 6-7mm in diameter.

3.4.2 Life cycle

- Boneseed does not reproduce vegetatively, but by seed.
- The seed usually germinates between March and May in NSW, however, can germinate at any time of the year given the right climatic factors.
- Plants do not flower until they are between 18 months and 3 years old.
- Flowers form in late winter and spring but are shed by summer.

3.4.3 Impacts

- Boneseed is an aggressive invader of native bushland, that regenerates quickly and spreads easily.
- Each plant produces large quantities of seed (up to 50,000 per mature healthy plants) that is readily dispersed long distances by native and feral animals allowing Boneseed infestations to establish in areas of undisturbed vegetation.
- Seeds can remain viable in the soil for up to 10 years.

3.4.4 Control

Boneseed needs to be killed before it is a year old. However, mature plants need to be treated before seed production. Areas must continually be monitored, and new plants treated as they emerge.

There are a number of approved herbicides used to control this species. These can be found at <https://weeds.dpi.nsw.gov.au/Weeds/Boneseed#control>

*A small, isolated patch of Boneseed was located within an electrical easement on the Hawkesbury and identified by Hawkesbury River County Council. This authority required the development of a specific management plan targeting this species be developed. This plan can be found in Addendum 1 of this document.

3.5 Honey Locust

3.5.1 Description

- Native to Central America.
- Honey locust or Gleditsia is a deciduous tree up to 20m tall.
- The trunk and limbs grow spines which can exceed 5cm in length.
- Leaves are in the form of leaflets which are soft to touch, grow about 1.5-2.5cm and are bright green. These leaflets turn golden in the Autumn, before dropping off.
- The flowers are scented cream colour and grow in clusters.
- The seeds grow inside a soft brown pod, measuring between 15-20cm.

3.5.2 Life cycle

- The leaves of the Honey Locust return in early Spring.
- Flowers appear in October.
- Pods appear in November. The pods dry out and drop from the trees splitting open to release the seeds.
- Honey Locust prefer full sunlight and appear along riparian zones, edges of or gaps in the bushland. However, they can still grow in shaded areas, but at a slower rate.
- These trees appear to thrive in alluvial soils associated with floodplains.

3.5.3 Impacts

- The trees were introduced in agricultural areas as a fodder food. However, the seed is spread through cattle manure or via water ways, allowing it to become an escapee.
- The plant can form dense thickets, particularly along waterways, preventing stock access to water.
- They have also been reported as out-competing native vegetation, thus becoming the dominant species along watercourses.
- The sharp barbs on its branches can also injure wildlife.

3.5.4 Control

Timing for control activities is outlined in Table 2.

There are a number of approved herbicides used to control this species. These can be found at <https://weeds.dpi.nsw.gov.au/Weeds/HoneyLocust>

3.6 Lantana

Lantana is a *weed of national significance* (WONS).

3.6.1 Description

- Native to Central and South America.
- Lantana is a perennial heavily branched, scrambling, thicket-forming shrub, growing around 2-4m in height.
- Leaves are ovate to lanceolate with toothed edges. They are rough to touch and have bright green upper surface. The underside is pale green and hairy.
- Flowers form dense clusters and vary in colour; red-yellow, orange-pink and white, depending on type, maturity and location.
- The fruit starts out as green drupe, but changes to a shiny, dark purple when ripe. The drupes grow to be around 6-8mm in diameter and contain a single seed.

3.6.2 Life cycle

- Lantana can germinate year-round but hits its peak in Summer after rain.
- Plants mature within a year of germination.
- In warm and humid areas lantana can flower and fruit almost year-round, as long as soil moisture is available.
- A single plant can produce up to 12 000 fruit each year. Each fruit contains a single seed.
- Lantana can survive in some drier areas where occasional soaking rains (25mm) will trigger a flush of flowering followed by fruiting after four to six weeks.
- Growth is limited by low light and temperatures, waterlogging and salinity.
- Lantana can survive drought conditions by dropping its leaves.
- Dry lantana can appear to be dead but will reshoot from the base of the stem after rain.
- Frost affected lantana can also reshoot after spring rains.

3.6.3 Impacts

- Lantana is toxic to cattle. It causes a slow and painful death mainly due to liver damage, kidney failure, myocardial damage and internal paralysis.
- Lantana is also poisonous to humans, causing serious illness and death.
- All parts of the plant are toxic if ingested.
- Lantana is an invasive species that smothers out other vegetation both in agricultural paddocks and bushland alike.
- It is a weed of national significance as it has wide impacts on both agriculture and non-agricultural industries.
- It has been estimated that Australia spends \$22 million per year in trying to control this weed.

3.6.4 Control

Timing for control activities is outlined in Table 2.

There are several approved herbicides used to control this species. These can be found at <https://weeds.dpi.nsw.gov.au/Weeds/Lantana>

3.7 Sticky Nightshade

3.7.1 Description

- Native to South America.
- Erect annual or short-lived perennial herb to 1.5m high, hairy with prickles to 13mm long over most parts.
- Leaves are lobed, 5-14cm long, 4-10cm wide, lower lobes often forming leaflets, both surfaces green to yellowish, covered with dense intertwined hairs and petiole to 4cm long.
- Inflorescences up to 12 flowered; peduncle to 45mm long; rachis to 15cm long; pedicels 10-15mm long. Calyx 6-12mm long, enlarged in fruit; lobes lanceolate, 4-7mm long. Corolla stellate, 35-50mm diam., white or pale blue. Anthers 8-10mm long.
- Berry 15-20mm diameter, bright red.

3.7.2 Life cycle

- Sticky Nightshade is a short-lived perennial.
- The plant produces an abundance of fruit.
- The seeds are dispersed by birds and foxes, who eat the fruit and defecate the seeds in new areas.
- The fruit not consumed falls to the ground and seed can then be spread via vehicles or in baled fodder.
- The plant can also spread via underground rhizomes.

3.7.3 Impacts

- This is an invasive species that competes with crops and pasture plants.
- Stock avoid grazing areas of high-density infestations.
- This species can also be found in native areas, particularly in inaccessible sites. Here the plant can spread and out-compete native vegetation.

3.7.4 Control

Timing for control activities is outlined in Table 2

There are several approved herbicides used to control this species. These can be found at <https://weeds.dpi.nsw.gov.au/Weeds/Stickynightshade>

4. HERBACEOUS WEEDS

4.1 Broadleaf Weeds

There are a number of broadleaf weeds throughout the campuses, e.g. dandelion, clover, bindii, etc. However, a number of these plants, such as clover, are grown purposefully on the farm for grazing. Therefore, control of these will be undertaken on a case by case basis and in consultation between all parties.

4.2 Castor Oil Plant

4.2.1 Description

- Native to Africa and Eurasia.
- Castor oil plant is a tall spreading shrub.
- Its stems are dull, pale green tinged with red.
- They are moderately branched, hollow and hairless.
- Leaves are large and glossy green and are divided into 7-9 lobes with toothed edges.
- Flowers grow in large elongated clusters measuring around 8-12cm in length. These clusters usually form at the tips of branches.
- Fruits are about 2.5cm across and are covered with soft green or red spines.

4.2.2 Life cycle

- Castor oil plants are commonly found in disturbed areas.
- These plants spread over sandy soil areas, creek banks and gullies.
- Flowers are produced from December to March.
- Fruit is produced in Autumn.
- Seed is ejected explosively for several metres, and can be spread in water, and in contaminated soil, or by slashing. They can also be spread by animals such as rodents and birds.

4.2.3 Impacts

- Castor oil plant is highly toxic to humans, capable of causing serious illness and death. The flowers, leaves and seeds are poisonous and eating only 2-8 seeds can be fatal. Ingestion causes a burning sensation in the throat and mouth, abdominal pain, bloody diarrhoea, fever, convulsions, and then respiratory and cardiac distress and failure. Temporary blindness may occur if the sap is squirted into the eyes.
- The seeds of castor oil are also extremely toxic to humans and livestock. Symptoms of poisoning in animals usually do not appear for a few hours or several days.
- Castor oil plants are often abundant along waterways and can limit access to water for stock.

4.2.4 Control

Timing for control activities is outlined in Table 2.

There are several approved herbicides used to control this species. These can be found at <https://weeds.dpi.nsw.gov.au/Weeds/CastorOilPlant>

4.3 Cestrum/Green Cestrum

4.3.1 Description

- Native to South America.
- Cestrum is a medium-sized perennial shrub growing 2–3m. It usually has many light-green, brittle stems.
- The leaves are 20-30mm long; have smooth edges; a pointy tip and are shiny-green. They produce a foul smell when crushed.
- Flowers grow in clusters at the end of each branch. The yellow flowers measure between 20-25mm each and are a trumpet shape. They give off an unpleasant odour during the day but sweetens in the evening.
- Cestrum berries are egg-shaped and grow to be about 7-10mm long. The clusters of berries commence as green in colour but ripen to a shiny black colour. The pulp of the berry will stain the skin if squashed.
- Each berry contains several wrinkled seeds about 3-5mm long.

4.3.2 Life cycle

- Cestrum is found in the Hunter Valley, the outer metropolitan areas of Sydney, the North Coast and the north-west, central west and south-west of the State. It grows along waterways and in non-crop areas where it can grow into thickets.
- Flowers appear on the plant from late Spring to early Autumn.
- Cestrum produce berries during Summer and Autumn.
- Green cestrum seeds germinate mainly in Autumn with young plants taking two or more years to flower and set seed.
- Green cestrum will sucker freely from its base if stumps are not treated after cutting.
- The plant will also grow from sections of the fleshy root which remain after a plant has been partly dug or pulled out.

4.3.3 Impacts

- Cestrum is extremely toxic to humans, cattle and sheep. It causes liver damage, so even if an individual survives, they will suffer from elevated ammonia levels and brain damage.
- Signs of poisoning in animals include, diarrhoea, abdominal pain, depression, disorientation, walking with a stagger, irritability, weakness, going off their feed, lying on the ground and finally a period of coma or terminal convulsions. Death can be as fast as a few hours after consumption or may take several days.
- Cestrum often occur along waterways and in pastures. It can grow into thickets and out-compete with other vegetation if allowed to take hold.

4.3.4 Control

Timing for control activities is outlined in Table 2.

There are several approved herbicides used to control this species. These can be found at <https://weeds.dpi.nsw.gov.au/Weeds/GreenCestrum>

4.4 Fireweed

Fireweed is a *weed of national significance* (WONS).

4.4.1 Description

- Native to South Africa.
- Fireweed can grow up to 60cm tall, but 30-40cm is more common. They have shallow, branched taproots with numerous fibrous roots growing from 10-20cm deep.
- It is usually an erect plant with a lower woody stem and branches out from the top.
- Leaves grow up to 12cm in length and about 2.5cm wide. They are narrow with a pointy tip. They are also slightly curved and finely toothed at the edge and are bright green in colour. They occur alternatively along the stem.
- The yellow flowers are daisy-like in appearance. The heads typically have 13 'petals', and are about 8-14mm long. Below the petals is a green head comprised of 20-21 long narrow vertical bracts.
- Each flower head can produce up to 120 seeds each are approximately 1.5-2.2mm long and up to 0.5mm wide and are covered in white hairs. The seeds are light or dark brown, those sometimes they appear to be green.

4.4.2 Life cycle

- Fireweed is an opportunistic plant that can grow on most soil types and in all aspects. However, is predominantly found along the NSW coastal fringe.
- Under favourable seasonal conditions, the plant may behave as a short-lived perennial, with some plants surviving for 3 years. However, the majority of plants only live for one season.
- The plant typically grows during Winter, when pasture production is low. However, germination is reliant on good rainfall and suitable temperatures.
- The plant can produce seeds within 16-10 weeks after germination and each plant is capable of producing 18,000 seeds in a life time.
- Germination depends on a combination of rainfall, light and temperature. Rainfall when the temperature is 15-27°C will produce flushes of new seedlings. Seeds are less likely to germinate if they are buried more than 2cm below the soil surface. However, some buried seed may remain viable in the soil for up to ten years.
- Seeds can spread via wind over long distances due to their design. However, they are often spread due to human activity, such as being baled with fodder crops.
- Fireweed usually begins to die off in the Spring. However, in some plants, only the top of the plant dies back, leaving the base and roots intact over the Summer. The plant may then quickly regrow from the crown the following Autumn.

4.4.3 Impacts

- Fireweed contains pyrrolizidine alkaloids that are toxic to livestock and cause liver damage. Young or hungry stock or new stock not previously exposed to fireweed are the most at risk of poisoning.
- Signs of poisoning in animals include loss of condition, poor growth rates, weakness, abdominal straining and chronic scouring.
- Fireweed can reduce the total grazing capacity of a property; decrease pasture production; decrease livestock growth rates; and incur high control costs.

4.4.4 Control

Timing for control activities is outlined in Table 2.

There are several approved herbicides used to control this species. These can be found at <https://weeds.dpi.nsw.gov.au/Weeds/Fireweed>

4.5 Ground Asparagus Fern

Ground Asparagus Fern is a *weed of national significance* (WONS).

4.5.1 Description

- Native to South Africa.
- A perennial plant with many erect, though often twisted, stems measuring approximately 1m long. The stems are hairless, green to brown. Older stems can produce stiff pungent spines, about 5-10mm long.
- The “leaves”, which occur in clusters of 1-5, are really cladodes (short, flattened stems that look and function like leaves). They are 1.5 to 2.5cm long, 0.2 to 0.3cm wide and taper to a fine short point. The true leaves are small scales that occur at the base of the cluster of cladodes.
- Flowers are white-pink in colour and about 5mm in diameter.
- The 5-8mm fruits/berries are green and change to a glossy red when mature.
- Each berry contains one to a few black globular seed.
- The roots are either well developed and fleshy, bearing numerous fleshy white tubers roughly ovoid in shape and 1.5 to 3cm long, or finer and fibrous. The root system forms dense underground clumps and mats.

4.5.2 Life cycle

- Ground Asparagus Fern grows in warm-temperate regions with rainfall from 500 to 1500mm annually.
- Preferring sandy or skeletal soils, it occurs in situations ranging from coastal dunes to open woodland, especially where some shade is available.
- This plant reproduces both by seed and vegetatively from rhizomes (underground stems) and tubers.
- Seeds are spread by birds which feed on the fruit both in gardens and at sites of weed infestation.

4.5.3 Impacts

- Ground Asparagus Fern forms dense blankets of growth above ground and a profusion of roots and tubers below ground which suppresses other ground flora and reduces available soil moisture and nutrients.
- It can tolerate dry periods due to its well-developed crowns and numerous tubers.
- It is a common garden plant which easily re-establishes after being dumped as garden waste and has become a serious environmental weed.

4.5.4 Control

Timing for control activities is outlined in Table 2.

There are several approved herbicides used to control this species. These can be found at <https://weeds.dpi.nsw.gov.au/Weeds/GroundAsparagus>

4.6 Paterson's Curse

4.6.1 Description

- Native to central, southern and eastern Europe, the British Isles and the Mediterranean Islands. It is also native to northern Africa, temperate Asia, the Canary Islands, Madeira and the Azores.
- An annual plant that grows up to 120cm high.
- It has several erect stems that arise from a stout taproot and large rosette of leaves at the base of the plant. The stems and leaves are covered in hairs.
- The rosette leaves grow up to 30cm long and up to 8cm wide, have a stalk and are oval to oblong in shape. The stem leaves are narrower and smaller than the rosette leaves and are stalkless or stem-clasping.
- The trumpet-shaped flowers, up to 2-3cm long, are pink in the bud and purple to blue when opened; occasionally white and pink flowers are seen.
- The seeds are dark brown to grey, 2-3mm long and rough on the outside. Up to four seeds are produced from each flower.



Paterson's Curse

4.6.2 Life cycle

- Paterson's Curse is more common in winter-rainfall areas, however its wide tolerance of different climates and soils allows it to grow almost anywhere in Australia.
- In any locality the density of Paterson's Curse fluctuates widely from year to year. The plant is likely to be abundant during years when the Autumn break is early. It is also likely to be abundant in paddocks that have not been cropped or grazed, or have only been lightly grazed, for several years.

- Plants can be found in all stages of growth throughout the year, however most of the population follows an annual cycle, with seeds germinating after the first Autumn rains and rosettes increasing in size over Winter.
- Plants begin to produce flowering stalks in late Winter, commence flowering in early Spring and die in Summer.
- The first mature seeds are produced four to six weeks after flowering commences.
- Seed can be spread by vehicles and farm implements, water, animals (livestock, birds, ants), on clothing and in hay, silage, wool, soil and commercial seed. Livestock can carry seed in their digestive tract or directly on their coats.

4.6.3 Impacts

- Paterson's Curse contains pyrrolizidine alkaloids. These alkaloids cause liver damage if livestock graze the weed for extended periods. Liver damage reduces livestock productivity, reduces their productive lifespan (increasing stock replacement rates) and may result in death. The damage is irreversible and cannot be treated.
- Paterson's Curse reduces pasture value as it out-competes the more nutritious and palatable pasture plants.

4.6.4 Control

Timing for control activities is outlined in Table 2.

There are several approved herbicides used to control this species. These can be found at <https://weeds.dpi.nsw.gov.au/Weeds/PatersonsCurse>

4.7 Scotch Thistle

4.7.1 Description

- Native to central, south-eastern and south-western Europe, western Asia, India and Pakistan.
- It is an erect annual or biennial herb commonly to 1.2m tall, rarely to 2m tall.
- The leaves are toothed with spiny edges and a whitish appearance because of a covering of white woolly hairs, which are dense on the underside.
- The flower head is up to 6cm in diameter, at the ends of the main branch and side-branches. Each flower head has numerous purple to mauve flowers, 14-25mm long, and can produce a single seed.
- The seed is grey mottled, four-angled, wrinkled and about 4-5mm long. The seed develops a pappus of fine-toothed hairs about 10mm long on top but this usually detaches at the time the seed is shed.

4.7.2 Life cycle

- Scotch Thistle flourishes on soils that are well drained and of moderate to high fertility and is particularly common on high fertile soils associated with introduced perennial pastures in the winter dominant rainfall zone. It prefers moderate to high rainfall.
- Seed germinate at any time with a flush of germination in late Summer to early Autumn or late Winter to Spring.
- Plants that germinate in late Summer form sizeable rosettes before the onset of Winter.
- Seedlings from late Autumn or early Winter may suffer a very high natural mortality. Seedlings which appear before November usually mature and set seed the same season, but those which do not germinate till later generally only form a rosette in their first season and mature and flower in their second season.
- Overwintering plants start to shoot in Spring and flower from Summer through to Autumn.
- Dead stems may remain standing for a season or two.
- Plants that are damaged by mowing may become perennial.
- Flowering occurs from Spring to Summer.

4.7.3 Threats

- Thistles compete with pastures and reduce their carrying capacity.
- Rosette leaves smother desirable pasture species in Spring reducing their early growth.
- Dense stands of mature thistles create barriers that hinder livestock movement.
- Thistles can cause injury to livestock and people handling the livestock or fleece.
- Thistles are prolific seeders and can spread quickly if not controlled.
- Once established, thistles are difficult and expensive to control. Dense thistle populations can reduce property values.

4.7.4 Control

Timing for control activities is outlined in Table 2.

There are several approved herbicides used to control this species. These can be found at <https://weeds.dpi.nsw.gov.au/Weeds/ScotchThistle>

4.8 Trad

4.8.1 Description

- Native to Brazil.
- It is a perennial and long-living plant, with a trailing habit.
- It develops roots at the nodes along its hairless stem.
- The leaves clasp the stem and are alternately arranged. They are egg-shaped with a pointed tip, 2.5-5.5cm long and 1-2.5cm wide.
- The flowers are white, about 1cm across, arranged in small groups and have three pointed white petals and a tuft of protruding, woolly, yellow tipped stamens.
- Fruit are not formed in Australia.

4.8.2 Life cycle

- Trad is widespread and found in the south-eastern and eastern parts of Australia. However, Trad prefer damp shady places.
- Trad does not set seed in Australia. All spread occurs from stem segments that will readily take root when in contact with the soil. Segments are dispersed by water, dumped garden waste, through soil movement and on maintenance vehicles such as lawn mowers and slashers. Stem segments can survive for a year without roots or contact with the soil.
- Flowers appear on the plant in Spring and Summer.

4.8.3 Threats

- Trad smothers other vegetation by forming a dense mat and prevents regeneration of all plants.
- It is difficult to remove because the stems snap off easily leaving segments that can regenerate, therefore every fragment must be removed to prevent regrowth.
- It causes allergic reactions on the skin of humans and dogs.

4.8.4 Control

Timing for control activities is outlined in Table 2.

There are several approved herbicides used to control this species. These can be found at <https://weeds.dpi.nsw.gov.au/Weeds/Trad>

5. GRASSES

5.1 African Lovegrass

5.1.1 Description

- A perennial grass that can grow between 30-120cm tall.
- The stems are slender, erect and robust and are sometimes bent at the nodes.
- The root system is fibrous.
- Leaf colour can vary from dark green to blue-green. The leaf blade is narrow (3mm wide) and the margins often rolled.
- The numerous flower spikelets (4 to 10mm long and 1 to 1.5mm wide) are initially grey, greyish-green or purplish in colour, but become paler and turn straw-coloured as they mature. These flower spikelets are somewhat flattened, with a pair of bracts at the base and several (4 to 13) tiny flowers (florets). When the flower spikelets are mature they break apart and release the seeds.
- The seeds are tiny (0.3 to 0.7mm long), oval or almost round in shape, and can vary from whitish to yellow, orange, brownish or black in colour
- African Lovegrass can be easily confused with other tussock-like grasses such as Poa tussock (*Poa labillardieri*).



African Lovegrass

5.1.2 Life cycle

- African Lovegrass thrives on sandy soils with low fertility.
- It is a highly persistent, summer-growing warm season grass.
- As a warm season plant, it also means it is a more efficient weed in temperate areas and has the ability to survive under low and erratic rainfall conditions.
- African Lovegrass reproduces by seed. Seeds can be dispersed in mud, soil and contaminated agricultural produce. They may also be spread by wind, water, animals and vehicles.

5.1.3 Threats

- African Lovegrass is very competitive with other pasture species and quickly overtakes overgrazed or poor-quality pastures, particularly in sandy soils.
- It is not readily eaten by livestock when mature, and this increases the competition on more preferable pasture species.
- African Lovegrass also has a low nutritional value, thereby decreasing pasture productivity.
- This species is also regarded as a major environmental weed and is listed as a key threatening species in NSW, as it can transform threatened communities by modifying their composition, structure and processes.

5.1.4 Control

Timing for control activities is outlined in Table 2.

There are several approved herbicides used to control this species. These can be found at <https://weeds.dpi.nsw.gov.au/Weeds/AfricanLovegrass>

5.2 Johnson Grass

5.2.1 Description

- Native to the Mediterranean and southern Eurasia.
- A tussock forming perennial grass growing on an erect stem up to 2m high. The stem is slender being 3-9mm thick.
- The plant grows from long, thick, well developed creeping rhizomes to 300mm deep. Fibrous roots extend up to 1200mm deep and 1000mm diameter.
- The leaf sheaths are essentially hairless and ribbed. The leaves are narrow, alternate, smooth and are 30-60cm long and 2cm wide.
- The seed-head is 10 to 35cm long, pale green to purplish, with loosely spreading branches and branchlets which bear the flower clusters (spikelets). There are about 35 to 350 clusters in each flowering structure.
- The seeds are red-brown to black, 3-4mm long, egg shaped and the surface is finely lined.

5.2.2 Life cycle

- Johnson Grass is a summer-growing plant, widespread across NSW.
- It is a common weed found along roadsides, edges of creeks and in crops and pastures.
- It spreads mostly by seed but also from rhizomes.

5.2.3 Impacts

- Invades crop lands and can be a host to a number of crop pests and diseases. It also out-competes most other vegetation.
- Johnson Grass presents a safety hazard on roads by restricting visibility on curves and corners.
- It can be toxic to livestock. Although it provides useful forage, at certain developmental stages or under some adverse environmental conditions, Johnson Grass may form cyanogenic glycosides that can poison livestock.

5.2.4 Control

Timing for control activities is outlined in Table 2.

There are a number of approved herbicides used to control this species. These can be found at <https://weeds.dpi.nsw.gov.au/Weeds/JohnsonGrass>

6. AQUATIC WEEDS

6.1 Alligator Weed

Alligator Weed is a *weed of national significance* (WONS)

6.1.1 Description

- Originally from South America.
- A spreading perennial herb that forms dense mats of interwoven stems up to 15m long and 0.6m thick.
- The plant flowers are small white papery heads between 8 and 14mm wide and are supported on stalks of up to 50mm long.
- Shiny green leaves along the stalk are in opposite pairs.
- Stems are hollow.
- It is found on or in the water, as well as dry land.

6.1.2 Life cycle

- Can survive in tropical, sub-tropical and cooler climates.
- In cooler areas this weed begins its growth cycle in spring, but it peaks in summer. Growth is often limited in winter particularly in frost prone areas.
- Flowering time commences in midsummer and can last into March, weather depending.
- Alligator weed in Australia spreads through vegetative reproduction, i.e., when fragmented small parts of the plant can spread and regrow into new plants.

6.1.3 Impacts

- This weed is considered high risk because of its invasiveness, potential for spread and economic and environmental impacts.
- In aquatic environments the dense mats that Alligator Weed forms can block and choke water ways.
- On land this weed out competes crops and turf in agricultural lands, and native species in natural areas.

6.1.4 Control

Timing for control activities is outlined in Table 2.

There are a number of approved herbicides used to control this species. These can be found at <https://weeds.dpi.nsw.gov.au/Weeds/AlligatorWeed>

6.2 Duck Weed

6.2.1 Description

- Native to Australia.
- Duckweed includes the smallest flowering plant on Earth. The tiny white flowers are barely visible.
- It is free floating.

6.2.2 Life cycle

- Begin their growth around the water's edge.
- Growth stage is usually between September and October.
- Duckweed spreads mainly by fragments.
- They can form a dense green mat on the water surface in nutrient-rich conditions.

6.2.3 Threats

- Duckweed is native to Australia and is considered an important food for birds and aquatic animals. Therefore, in most circumstances it is not considered a weed. However, if not controlled, Duckweed can clog waterways and prevent stock from accessing water.

6.2.4 Control

Timing for control activities is outlined in Table 2.

There are several approved herbicides used to control this species. These can be found at <https://weeds.dpi.nsw.gov.au/Weeds/Duckweed>

6.3 Water Hyacinth

Water Hyacinth is a *weed of national significance* (WONS).

6.3.1 Description

- Native to the Amazon basin in South America.
- Water Hyacinth is a free-floating perennial water plant.
- Each plant consists of several broad, leathery leaves, spongy inflated petioles (leaf stalks), a crown and a mass of fine, hairy roots. Water Hyacinth shows considerable variation in both leaf and flower form.
- Leaves are smooth, hairless and glossy. They are generally a bright green colour and can be tinged a rusty yellow on their edges. There are two types of leaves:
 - Leaves with non-bulbous petioles. Leaves are up to 60cm long (including the petiole), narrow and erect – this leaf type is typical of plants in dense, crowded infestations.
 - Leaves with bulbous petioles. Leaves are thick stemmed, circular and up to 30cm in diameter. The stems may be 50cm long and contain variable amounts of air, which enable the plant to float. This leaf type is typical of plants in open water or on the open-water edge of large infestations.
- There are 2 types of stems: erect stems up to 60cm long with flowers or horizontal vegetative stems, 10cm long, which produce new daughter plants.
- Flowers are 4 to 7cm across, funnel-shaped, light bluish-purple or dark blue with a yellow centre and have six distinct petals. The upper petal is darker purple with a yellow mark in the centre. Flowers can self-fertilise and are formed on upright stems with between 3 and 35 (but commonly 8) flowers on each spike.
- Seeds are 1 to 1.5mm long and roughly egg-shaped, with ridges from end to end. They are long-lived and may survive in mud for up to 20 years. Seeds have also remained viable over very long periods in dry soil.
- Roots are fibrous and featherlike. In deep water they may trail below the plant and can be up to 1m in length. In shallow water the roots may take hold in the substrate of mud or sediment.

6.3.2 Life cycle

- Water Hyacinth reproduces from seeds and horizontal stems
- Flowers open for only one or two days from mid to late Summer before beginning to wither. When all the flowers on a spike have withered, the stalk gradually bends into the water and after two to three weeks the seeds are released and sink.
- Autumn and winter frosts cause the leaves to die off but the crowns are able to overwinter. These will commence new growth in the following Spring along with the germination of seeds.
- Water Hyacinth infestations increase most rapidly by the production of new daughter plants. During high water flows and flooding, infestations can break up and be moved to new locations.
- Most spread can be attributed to human activity such as the deliberate planting of water hyacinth in ornamental ponds or dams. Unwanted aquarium plants that are discarded into waterways are a major form of spread. Water Hyacinth can also be spread by contaminated boating equipment.
- Seeds are the main source of new infestations and are carried in water, mud (e.g. on machinery or boots) and by birds.

6.3.3 Threats

- Water Hyacinth is one of the world's worst weeds, being particularly serious in slow-flowing or stagnant freshwater in tropical and subtropical areas.
- It forms dense mats over the surface of the water and causes obstructions, reduces fish production, harbours mosquitoes, and severely disrupts life in communities along rivers and lakes.
- It can out-compete native plants and reduces light infiltration into the water.
- It can change the temperature, pH and oxygen levels of water.

6.3.4 Control

Timing for control activities is outlined in Table 2.

There are several approved herbicides used to control this species. These can be found at <https://weeds.dpi.nsw.gov.au/Weeds/WaterHyacinth>

Table 2: Control method calendar

VINES	SPRING			SUMMER			AUTUMN			WINTER		
	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
Moth Vine	Seedling and small vines to be removed by hand as they emerge. Older stems should be pulled by hand (removing the main root); cut and paint or drilled and filled. If vines are already fruiting, they should be removed before ripening (Summer – Autumn)											
WOODY WEEDS	SPRING			SUMMER			AUTUMN			WINTER		
	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
African Boxthorn (WONS)	Cut and paint woody stems. Spray regrowth as it emerges.						Remove fruit.					
African Olive	Remove small seedlings by hand. Remove fruit from trees. Cut/scrape trees and paint before they seed, starting May through to October.											
Blackberry (WONS)	Spray during flowering and fruiting between November and April.									Mechanically remove via slashing or grubbing or bulldozing or burning.		
Honey Locust							Collect seed pods and remove from site.			Cut and paint prior to flowering during October to November. Larger specimens can also be frilled or drilled.		
Lantana (WONS)	Mechanically remove, or in the case of larger shrubs, cut and paint; frill or chip. Follow up is required for re-shooting stems. Collect fruit and remove.											
Sticky Nightshade	Small infestations can be dug out, the fruit removed, and the plants burnt. Larger infestations require chemical treatment, plus a wetting agent, has proven to be a fast-acting method of killing these plants. However, the herbicide needs to be applied prior to fruiting, as the fruit will drop from the dying plant and the seed remains viable.											
GRASS WEEDS	SPRING			SUMMER			AUTUMN			WINTER		
	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
African Lovegrass	For small areas remove seed and dispose, then dig out the plant at the base. Glyphosate can be applied while it is actively growing Spring to Summer. If removing large sections all at once, it is important to mulch or mass seed or re-plant the area.											

Johnson Grass	Spray areas of infestation to actively growing plants at early head stage to early flowering. Spray to the point of wet.											
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HERBACEOUS WEEDS	SPRING			SUMMER			AUTUMN			WINTER		
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	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
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Broadleaf Weeds	Spot spray as required.											
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Castor Oil Plant	Manually remove small infestations. Larger infestations are usually treated with herbicides.											
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Cestrum	Cut down, dig or push out by mechanical means when seen. All roots must be removed to ensure re-sprouting does not occur. All debris must be removed away from livestock, as the plant remains toxic even while dying. Spray during Spring. Mulch can be used to suppress seedling growth.											
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Fireweed (WONS)	Mechanically remove, slash and spray plants to reduce seed setting during March to June. In paddocks maintain pasture cover crops during Autumn to Spring, to out-compete Fireweed.											
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Ground Asparagus Fern (WONS)	Mechanical removal is difficult due to the rhizomes, however, can be attempted with seedlings. Slash or brushcut the stems regularly before they bud. In Winter (July and August is the best time) to early Spring, spray foliage until just wet.											
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Paterson's Curse	Slash fortnightly or monthly to delay and suppress flowering.					Spray during germination.						
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Scotch Thistle				Chop out deeply, removing roots. Spot or boom spray, slash to prevent seeding. Cut to prevent flowering.								
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Trad	Mechanically remove with a rake. Roll into blankets and compost in sunny areas under thick black plastic.								Spray on cloudy days.			
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AQUATIC WEEDS	SPRING			SUMMER			AUTUMN			WINTER		
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	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
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Alligator Weed (WONS)	Repeated herbicide application or use of biological control by Flea Beetle (<i>Agasicles hygrophilia</i>)											
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Duckweed	Hand remove with a scoop. Can be sprayed using Diquat or Orange Oil											
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Water Hyacinth (WONS)

Treatment with herbicide should be undertaken early in the growing season.

Removal of growth prior to seed setting.
