



Paterson's Curse - Management

Department of Primary Industries

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This Landcare Note details options for the management of the weed Paterson's curse, Echium plantagineum.

See the Landcare Note LC0173: Paterson's curse - identification for a description and illustrations of the plant.

Some control methods described in this note are only effective if used in combination with other control options as part of a long-term management program.

If used in isolation, these methods do not effectively destroy the plant, allowing it to re-shoot or continue to grow. Authorised officers from DPI or DSE may direct landowners to undertake specific control activities to ensure methods are used that are capable of destroying plants and preventing their spread.

Where directed to do so, landowners must use the method or methods as directed by the authorised officer. In most cases the landowner will be able to choose from a variety of options appropriate for use in their particular situation.

Common and scientific names

Paterson's curse, salvation Jane

Echium plantagineum Linnaeus

Family: Boraginaceae (borage and forget-me-not family)

Origin and distribution

Paterson's curse is a native of Mediterranean Europe and northern Africa and was first recorded in Australia in 1843. It was introduced as an ornamental garden plant, but quickly became naturalised, especially in pastoral regions.

In Australia, Paterson's curse has probably reached its maximum distribution based on climatic range. However, within its climatic range infestations continue to increase in size and density.

In 1980 surveys estimated that Paterson's curse infested 918,000 ha in Victoria. No comparable surveys have been conducted since. In 2000 an estimated 33 million hectares was infested nationwide.

The problem

- Paterson's curse is poisonous to grazing animals. The plant contains pyrrolizidine alkaloids, which cause cumulative chronic liver damage, loss of condition and sometimes death. The alkaloid concentration of plants in the rosette stage is twice that of flowering

plants. Pigs and horses are most susceptible. Ruminants (sheep, cattle and goats) are less affected because the alkaloids are largely broken down in the rumen. The plant is nevertheless extensively grazed in mixed pastures in southern Australia by sheep and cattle without drastic harmful effects, and is as nutritious as desirable pasture species. Mortality of sheep and cattle can be avoided by good livestock and pasture management.

- The plant reduces pasture productivity by competing for light, moisture and nutrients with desired species. Paterson's curse emerges quickly after the autumn break, suppressing the growth of most other plants and smothering grass and legume species. It can better survive a false break than desirable species. When the plant dies off in summer, it leaves bare ground with little useful fodder. The bare areas are prone to erosion, invasion by other weeds and renewed Paterson's curse growth in autumn.
- When it displaces legumes in a pasture, nitrogen fixation is reduced and soil fertility declines, unless fertiliser is applied.
- In dairy areas the stiff bristles on the plant irritate the udders of cows.
- It is illegal, without a permit, to trade and transport materials contaminated with the seed of noxious weeds (see Section 71 of the *Catchment and Land Protection Act*). This includes fodder and grain, and soil, sand and gravel.
- In subterranean clover seed crops, Paterson's curse seeds are difficult to separate in the cleaning process, therefore reducing the crop's quality.
- Paterson's curse can invade areas of natural vegetation, particularly where there is frequent disturbance, and can suppress smaller plants.
- Soil seed banks of up to 30,000 seeds/m² have been found in ungrazed pastures and 13,000 seeds/m² in grazed pastures. Most seed germinate in the autumn after they are produced, but some can remain dormant in the soil for at least 5 years.

Management

Priorities for controlling different infestations must be worked out when planning a Paterson's curse management program. An important element of a good strategy is to

Early treatment of new infestations will give you the best value for your weed control dollar.



keep clean areas free of the weed and manage them to prevent infestation.

In intensively managed pastures, a combination of autumn treatment with a herbicide selective for broadleaf weeds, spring grazing, and pasture renovation after the following autumn break is the best approach. Extensive infestations on grazing land are best quarantined and tackled progressively as part of pasture improvement programs. In general, a management plan should involve the integration of a number of control techniques coupled with good pasture management to give the best long-term results. After re-sown pastures establish, appropriate grazing management, fertiliser regimes and weed control maintenance programs are vital to keep them free of the weed. In more extensive, lower productivity grazing systems, grazing management, with biological control and spray grazing during winter is the best strategic approach. All management programs in pastures should integrate control techniques with complementary changes to overall management that ensure the maintenance of a competitive cover of desirable pasture species.

Spot spraying or herbicide application through a wiper, and manual removal techniques should be used to control infestations on roadsides and small outbreaks in other areas. Slashing and mowing before flowering may be effective but timing is critical to prevent seed set.

The use of residual or non-selective herbicides is a major factor contributing to vigorous regrowth of the weed in following seasons. Often all that grows in areas treated this way is Paterson's curse, and it flourishes owing to the lack of competition. The lack of competing vegetation has a huge influence on the growth of the weed.

The most important aims of a control program are to:

- Target the rosette stage with a selective broadleaf herbicide.
- Ensure there is competition from other plants that can replace the weed.
- Follow-up your work and be persistent in implementing a long-term management plan.

Prevention

The aim of prevention activities is to avoid the deposition of Paterson's curse seed in areas free of the weed. Preventative management is a good investment because it requires few resources and minimises the chances that large expenses will later be required for control works.

- Ensure hay and other fodder is free of seed and that seed for planting is not contaminated. Obtain verification from fodder and seed suppliers that their products are grown in clean areas and are free of contamination. If contaminated fodder is used, it should be fed out only in areas that are already infested, or in a defined area that is regularly monitored and can be readily treated should an outbreak occur.
- Apply the same standards to soil, sand and gravel as

are applied to fodder. Work towards an infested area when earthworks are undertaken, not away from it.

- Seed can be carried in the coats and digestive tracts of livestock. Sheep that have recently been shorn are less likely to have contaminated fleeces. Sheep require 3 days to void internally-carried seed. Stock that have grazed in infested areas should be quarantined for several days to minimise the risk of the introduction of seed. The quarantine area should be regularly inspected and any plants which appear should be removed before they flower.
- Use only vehicles, machinery and equipment, including those of contractors, which have been thoroughly cleaned after being used in infested areas.
- Where a property already has infested areas, internal quarantine measures should be practised. Produce from infested areas should be separated from that grown in clean areas. Weed-free buffer zones should be maintained between infested and un-infested land.
- Contractors, roadside maintenance staff, etc. should be trained to identify and report infestations and to manage them in a way that will prevent spread.

Chemical control

The Australian Pesticides & Veterinary Medicine Authority (APVMA) is responsible for the assessment and registration of agricultural and veterinary chemicals in Australia. As chemical products are registered on a daily basis and renewal of these registrations are undertaken each financial year, there is much change in the registration status of products each year. The APVMA information is available at: <http://www.apvma.gov.au/>

The Chemical Standards Branch (CSB) of the Department of Primary Industries provides information on agricultural chemicals registered in Victoria and their uses. Enquiries will be referred through the Customer Service Centre on 136 186. Information can also be obtained by visiting the CSB website: www.dpi.vic.gov.au/chemicalstandards

Under Victorian legislation there are controls on the use of agricultural chemicals. It is the responsibility of the user to be familiar with these controls. These responsibilities are outlined in Agriculture Note AG0520: "Responsible use and handling of farm chemicals".

Farm chemicals are registered for specific uses. Each chemical has a 'product label', which documents the approved use and the approved rate of use within each State of Australia. This label is important in determining the appropriateness of chemical use.

Choose only products registered for use on Paterson's curse in your particular situation. Read the product label carefully and follow all label instructions.

Your chemical retailers can provide information on registered chemical products that are available in their store. They can also supply a 'material safety data sheet'

**Working together is the best way to tackle weeds.
If you're having a weed problem, your neighbours are too.**

which outlines the health and safety issues associated with use of a product.

Legal use of some restricted chemicals requires the user to possess an Agricultural Chemical User Permit (ACUP). Other chemicals have restrictions on their use in Agricultural Chemical Control Areas (ACCAs).

Information on ACUPs, ACCAs and other chemical information can be found at the website: www.dpi.vic.gov.au/chemicalstandards

Eradication in pastures

The following methods can be used to eradicate light or scattered infestations in pasture with or without legumes, on flat or hill country.

Mechanical removal of plants

Grub out, cut or pull all plants. If plants are flowering, collect and burn them to ensure that seeds do not continue to mature and add to the store in the soil.

Spot application of herbicide

Herbicides are available that provide selective control of Paterson's curse in pastures containing clovers and medics. Other herbicides can be used when damage to non-target species is acceptable or if the application method itself is selective. Suitable equipment for spot applications of herbicides include knapsacks, motorised sprayers, wick wipers, wands/weed sticks and spray/gas guns. See labels for advice on using wetting agents.

Herbicides are most cost efficient when applied to Paterson's curse in the rosette stage. Application at the rosette stage, usually during autumn, has many advantages over application at flowering:

- Lower doses of herbicide are needed to kill the plant.
- If controlled early, competition with desirable pasture species is reduced.
- Provides greater opportunity for growth of desirable species to maximise productivity.
- Autumn spraying is less damaging to clovers.
- Leads to more productive pastures and increased returns.

Eradication will only occur when the supply of soil-stored seed is exhausted. Because small numbers of seeds can remain viable in the soil for a long period, eradication will require repeated use of these techniques over several years.

Management in pastures

Herbicide spraying is the most effective method of eradicating Paterson's curse in pastures.

Herbicides that are selective for broadleaf weeds and have minimal impact on pasture legumes are registered for use on Paterson's curse in Victoria. Ideally boom spraying should target the seedling or young rosette stage to remove competition with desirable plants as early as possible during the growing season. Wetting agents may improve

the level of control. Retreatment will probably be required. Non-selective and selective herbicides can be applied with a carpet-wiper but this requires the weed to have emerged sufficiently above the general height of the pasture, so they will be larger and require larger herbicide doses to kill.

The following techniques can be used to reduce infestation size, prevent spread, and improve pastures eg. in medium to dense infestations in pastures with legumes on flat to undulating country. However they can be complex and difficult to apply and may appear ineffective in the following year because of large soil seedbanks.

Spray-graze

Successful spray-grazing can virtually eliminate Paterson's curse in perennial pastures, leaving a good balance of legumes and grasses for spring. The technique involves the use of sub-lethal doses of hormone-type broadleaf herbicides, followed by abnormally high stocking rates. The herbicide causes leaf curling and more upright growth of the weed, making it more accessible to stock, and also increases the sugar levels in the plant, making it more palatable. The aim is to increase grazing pressure on the weed while minimising impact on herbicide-susceptible pasture legumes. A good pasture base and sufficient numbers of sheep are required for this method.

- Remove stock from paddock to be sprayed.
- Spray paddock 6 to 8 weeks after Paterson's curse germinates (ie. after the autumn break) or at the young rosette stage. To minimise damage to clovers they should at least be at the 4-leaf stage.
- Return stock to the paddock 7 to 10 days later (ie. after the required withholding period), at 5 to 7 times the usual stocking rate. Maintain the high stocking rate until the weed has been grazed out or the pasture is grazed to the ground – usually after 2 to 4 weeks.
- Rest the pasture so that legumes and grasses can recover.
- Then return to regular grazing management practices.
- **Repeat** the spray-graze process in spring if necessary and then every autumn for the next 3 to 5 years or until all soil stored seed has been eliminated.

As sheep graze more closely to the ground than cattle, spray-grazing is more effective using sheep, preferably Merino wethers or dry ewes. If only small numbers of animals are available, cell grazing or temporary fencing of small areas can be used to reach the required grazing intensity. Control is achieved by increasing stock pressure on the weed for a short time, allowing other pasture species to gain a competitive advantage. Low winter temperatures after intensive grazing will further suppress Paterson's curse germination until spring when the weather warms up. Pastures need at least 15 to 20% clover present, otherwise bare ground may result. In annual pastures, autumn spray-grazing may lead to a decrease in herbage production the following winter.

Plan ahead.

Select the right control method and time to apply it.

Graze-topping and spring grazing

Graze-topping involves the intensive grazing of flowering plants in spring to minimise seed production and reduce the infestation in the following year. Flowering plants have half the alkaloid concentration of rosettes so grazing animals can tolerate a larger amount in their diet. Use cell grazing or temporary fencing to increase the grazing intensity. Grazing at even moderate levels through the flowering period can result in very large reductions in seed formation (around 87-98%), and over successive years can significantly reduce the seed reserve in the soil. If grazing is not maintained throughout the flowering period, Paterson's curse plants that have been grazed are able to compensate, increasing their seed production to a higher than normal level. Despite this, plants grazed for only one third of the flowering season produce only one third of the seed produced by ungrazed plants. Grazing with sheep is the most effective. To achieve the highest levels of control graze-topping should be repeated during successive years and integrated with spray-grazing.

Resowing Pastures

When pastures are poor and need renovating or resowing:

- Start paddock preparation in the year before sowing.
- Do a soil test.
- In winter, spray-graze, and in spring spray-top to prevent seed set of annual grasses. Spray-topping involves the use of herbicides before or in the early stages of flowering to prevent seed maturing. See herbicide labels for details.
- In autumn, after Paterson's curse germination, spray the paddock with a knockdown herbicide to obtain a total kill of vegetation.
- Sow selected pasture species as soon as possible to minimise any new weed competition.

If Paterson's curse germinates in the new pasture, spray-grazing is an option after the first year. Another option is to sow the clover/legume component of the pasture after the second or third year of Paterson's curse treatment. Otherwise allow sown clovers and grasses to flower and set seed prior to spraying.

Consult your agronomist for advice on suitable pasture species and mixes.

Management of medium to dense infestations on steep hill country

Consideration of long and short term goals of control and of variation in terrain and accessibility will determine control methods in steeper, hilly country. For example, in the long term the aim may be control, but in the short term the goal must be to prevent spread. Maintaining a weed free strip around the perimeter and along watercourses using herbicides and hand pulling will help contain spread. Aerial spraying and seeding could be considered as part of a longer-term plan to suppress the weed and improve the pasture. Fixed wing aircraft or helicopters are suitable and although a higher risk, may prove to be the most cost-effective method. A 4WD motorbike may be an alternative. Talk to your local adviser about how to

determine the relevant cost-efficiencies of different approaches.

Deep-rooted perennial pastures (eg. cocksfoot, phalaris), sown in autumn/early winter after herbicide application, are effective in competing with Paterson's curse. Perennial ryegrass is not as effective.

An alternative approach on this type of land may be to decrease stock and allow or assist native vegetation to return. Growth of native grasses, shrubs and trees will slowly lead to a decrease in the density of the infestation.

Medium-dense infestations in crops

Paterson's curse is usually effectively controlled along with other broadleaved weeds by conventional cropping techniques involving cultivation and herbicides. Cultivation will usually kill Paterson's curse seedlings that have emerged after late summer or early autumn rains. If seed is deeply buried (over 7 cm) it is unable to germinate. Shallow cultivations will encourage germination of a range of weeds including Paterson's curse. Any new growth after cultivation requires further cultivation or herbicide application to provide a weed free seedbed.

Late sowing of cereal crops is desirable in areas where the weed is a problem, as the low temperatures will suppress further Paterson's curse germination until spring. In the event of reinvasion of the crop, Paterson's curse can be controlled with a herbicide registered for use on that particular crop.

When Paterson's curse occurs in legume crops such as lucerne, only a herbicide registered for use on pure legume crops should be used.

It is important to control Paterson's curse in sub-clover seed crops, as it can become a major contaminant that is difficult to separate out.

Urban and non-agricultural areas

eg. linear reserves, roadsides, light to heavy infestations on vacant/industrial sites.

Hand pulling or grubbing can be successfully used for controlling small infestations. Ensure that the taproot is removed, or at least the root crown, otherwise regrowth may occur.

Small infestations including plants on nature strips can be readily killed in the rosette stage using an appropriate herbicide in a hand held wick-wiper or weed wand.

Mowing and slashing are useful but must be carried out regularly to prevent flowering and seeding. Removal of flowering stalks encourages new shoots, which can flower out of season, prejudicing the success of a management program. Mowing and slashing of flowering and seeding infestations will lead to further seed dispersal and spread.

Where chemical treatment is possible, selection of the appropriate registered herbicide is vital. In urban areas it is appropriate to use licensed pest controllers (see local telephone book) or other expert contractors for spraying, in order to minimise the possibility of non-target damage and other environmental impacts.

Where herbicides cannot be used

If herbicides cannot be used due to inaccessibility, or environmental considerations, control of dense infestations of Paterson's curse over large areas is very difficult to achieve. The management methods generally available will only prevent flowering and will not eradicate the weed.

Grazing only

Heavy grazing using sheep, when plants are young (seedling – rosette). Continuous grazing at normal levels with sheep or cattle during the flowering season results in large reductions in seed production, and when applied in succeeding years can result in significant reductions in the soil seed bank.

Mowing/slashing

Used in pastures to reduce the flowering and seeding of Paterson's curse by cutting it prior to flowering. Mowing and slashing are useful short-term when high stocking rates cannot be maintained throughout the year. Slashing must be carried out repeatedly to prevent flowering and seeding. Alternatively, it has been found that slashing at the most sensitive growth stage of Paterson's curse can prevent both seed production and regrowth. The critical stage of development is when the majority (75%) of plants have reached early green seed formation. This will occur approximately 2 weeks after the first purple flowers are open.

Silage making should be carried out prior to flowering to ensure that no seed is set.

Fertiliser application

Application of nitrogen and/or phosphorous alone appear to promote the growth of Paterson's curse. Fertilisers are best used to maintain a vigorous pasture, which will compete with Paterson's curse.

Biological Control

A program has been under way since the early 1970s to identify, introduce and disperse natural enemies of Paterson's curse from Europe.. Considerable periods are required after a biological control agent is released before it becomes established, and further generations are usually required before any significant impact occurs.

The first agent released was the leaf-mining moth *Dialectica scariella* in 1988. It causes brown blisters on the underside of leaves and is established statewide across the range of the weed, but provides no effective control. The crown weevil *Mogulones larvatus*, first released in 1993, is the most effective agent, giving good control after several years in ungrazed situations, but progressively less effective as sheep grazing intensity increases. The root weevil *Mogulones geographicus*, first released in 1996, has not yet been widely established in Victoria. The taproot flea beetle *Longitarsus echii* is becoming widely established and spreading further. A pollen beetle *Meligethes planiusculus* and a stem beetle *Phytoecia coerulea* were both first released in Victoria in 1998,

but their impacts are unknown. Techniques are available to harvest crown weevils and collect flea beetles from sites where they are established, for redistribution to new sites.

For more detailed information on biological control refer to *Landcare Notes* on specific agents: LC0144 (crown and root weevils), LC0155 (flea beetle), LC0159 (stem beetle) and LC0165 (pollen beetle).

Further advice

- Contact your local landcare or friends group for further assistance and advice.
- Call the DPI/DSE Customer Service Centre on 136 186.
- Contact your local DPI Pest Management Officer for advice on local programs.
- Visit the DPI website at: <http://www.dpi.vic.gov.au> and the Weeds Australia website at: <http://www.weeds.org.au>

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All land managers have a responsibility to control weeds on their property.

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