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Paterson's Curse management handbook

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Paterson's Curse



Management Handbook

DEPARTMENT OF AGRICULTURE
WESTERN AUSTRALIA

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Conservation District Committee

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Paterson's Curse

The Financial Curse

The Problems...

Potential Loss of Pasture Production

Decrease in Land Values

Poor Animal Health

Neighbour/Landholder Conflict

Cost of out of Control Paterson's Curse



1. THE PROBLEMS

Potential Loss of Pasture Production

- ▶ Light infestations, estimated loss = 30%
- ▶ Heavy infestations, estimated loss = 80%
- ▶ More Paterson's curse (*Echium plantagineum*), results in less grass and clover

Poor Animal Health

- ▶ Liver damage to livestock
- ▶ Reproduction problems

Neighbour/Landholder Conflict

Cost of out of Control Paterson's Curse

- ▶ Early control reduces large costs in the long term.



Act Now or Pay Later!

2. BACKGROUND

Paterson's curse (*Echium plantagineum*) is one of the most damaging weeds to the Australian meat and wool industries. It infests an estimated 33 million hectares in southern Australia, at an annual cost to the sheep industry of \$250 million in lost pasture productivity, control costs and wool contamination. In WA, it is found on about 5000 agricultural properties infesting some 500,000 ha. It is an extremely invasive weed, that reduces pasture productivity and stock carrying capacity by competing with and excluding more beneficial pasture species. The weed is also toxic to stock. It is important to implement control measures on isolated patches of Paterson's curse, to limit the spread of the weed into new areas.

Paterson's curse is native to Mediterranean Europe and northern Africa. It has spread to South Africa, South and North America, Australia and New Zealand.

In Western Australia, the major economic effects of Paterson's curse are **reduced pasture availability** and **sub-clinical liver damage**.

Restrictions to market access may occur because the pyrrolizidine alkaloids found in Paterson's curse are carcinogenic. There are risks that they may contaminate meat and honey. Some European countries have placed a nil tolerance on pyrrolizidine alkaloids in any foodstuffs.



3. BIOLOGY OF PATERSON'S CURSE

Stems are usually erect and 30-60 cm in height, but plants up to 2 m have been recorded. Basal leaves are formed as a rosette around the crown of the plant; in thick infestations these basal leaves assume an upright appearance. Both rosette and stem leaves are covered with soft hairs which become quite stiff and irritating as the plants dry out. Flowers are a bluish purple, trumpet shaped and form in clusters at the end of flowering stems. Flowering usually commences in September and will continue for some months, provided there is adequate summer moisture. Individual plants can produce up to 10,000 seeds, but under a grazing situation production ranges from about 15-250 seeds/plant, yielding some 150-2,500 seeds per square metre; seed banks can get up to tens of thousands per square metre. The longevity of seeds varies considerably. Seeds lying on the soil surface emerged for 2 years, while stored in a laboratory seeds remained viable for at least 6 years, and buried 15 cm in the soil, viable seeds were still recovered after 11 years.

Paterson's curse reproduces entirely from seed, and because the seeds are small and heavy they are not moved any great distance by wind. Ants are also responsible for moving the seed over short distances. Greater movement is caused by running water, birds and more importantly soil, fodder, vehicles and livestock.

4. ANIMAL HEALTH ISSUES WHEN GRAZING PATERSON'S CURSE

Paterson's curse contains specific toxins that damage the liver. Liver damage from prolonged grazing of Paterson's curse will affect animal productivity. Sheep, horses, cattle, pigs, goats and poultry can be affected.

Because of the variability in toxin levels, and no simple way to measure liver copper levels, there is no rule of thumb to guide how much grazing is safe and so Paterson's curse must be considered toxic at all times. Paterson's curse cannot be recommended as a pasture for livestock and the eradication from grazing areas is the only satisfactory method of controlling the disease.

Pyrrrolizidine alkaloids in Paterson's curse damage the liver. After ingestion of the toxin the cells affected may be replaced by scar tissue which reduces liver function. The liver is a powerhouse for chemical production and detoxification within an animal. Reduce its effectiveness, and all productivity is severely compromised. The liver can regenerate after damage, however, nutritive resources employed in regeneration have a greater economic effect when used in the production of meat, milk or fibre. This is the sub-clinical effect of Paterson's curse.

Signs of Paterson's curse poisoning do not occur until there is sufficient damage to impair the liver's function. Clinical signs of liver damage are characterised by ill-thrift, sometimes nervous symptoms and then photosensitisation. It is the silent cost of this toxin to graziers as ill-thrift often goes unnoticed. It will only be detected by those who weigh and condition score their stock at frequent and regular intervals. In severe cases, depression, diarrhea, incoordination (staggering), aggression or compulsive movements, blindness and death may occur.

Treatment cannot reverse the toxic effects of pyrrrolizidine alkaloids, however, an oral solution of high carbohydrate and/or oat supplements may maintain the animals energy reserves whilst the liver attempts to overcome severe dysfunction. Certainly high protein diets should be avoided for 3 to 6 weeks to prevent the nervous symptoms described above.

5. CONTROL OF PATERSON'S CURSE

5.1. Spray-graze technique for control in pasture

In sheep grazing areas, the spray-graze techniques can effectively control Paterson's curse. Cattle can be used to keep the weed in check, but the results are better when sheep are available for intensive grazing.

This technique involves using a sub lethal dose of one of the phenoxy herbicides such as 2,4-D or MCPA amine. Combined with very high grazing pressure, preferably using wether sheep, significant reduction in growth and seed production of Paterson's curse can be achieved. Spray-grazing reduces other pasture weeds such as capeweed, thistles and erodium.

Paterson's curse is treated 6-8 weeks after a germination. Clover should have at least 8 leaves if the highest rate of 2,4-D amine (0.75 L/ha) is used. If the plants only have 4 leaves then the treatment rate should be reduced to 0.5 L/ha. The phenoxy herbicides cause the Paterson's curse to grow more upright and become more attractive to grazing. Without grazing the Paterson's curse will recover within a few weeks.

Seven days after spraying, stock the paddock with sheep at four to five times the normal stocking rate for your district. Keep up this grazing pressure for about six weeks or until the pasture shows signs of overgrazing.

The stocking rate on the spray-grazed area should be increased again in the spring if possible to prevent the remaining Paterson's curse plants from flowering.

For the technique to be successful, the Paterson's curse must be small and actively growing. In years where there has been a false break to the season and there is a wide range of sizes of Paterson's curse, from greater than 20 cm diameter rosettes down to seedlings, or plants stressed due to frosts or lack of moisture, the technique is not as effective. If the Paterson's curse is not grazed heavily enough they will soon recover. In addition, this grazing technique is hard to manage in larger paddocks because of the

numbers of animals required. Another point to be aware of is that if there is a large amount of Paterson's curse and capeweed or thistles, animals will consume large amounts of plant material and may suffer liver damage from Paterson's curse or nitrite poisoning due to cape weed or thistles. Wether sheep are the most desirable to use in these circumstances.

The advantages of spray-grazing are that ① the Paterson's curse is used as feed, ② there is no permanent damage to the clovers, ③ it is a cheap treatment due to the low rates of chemical used and ④ the chemicals do not cause any damage to grasses.

Warning - Use of phenoxy herbicides in areas where commercial tomato crops or grapes are grown requires great care. Permits are required in certain areas to use these herbicides (see Section 7.2 - 'Legislation controlling use of agricultural chemicals in Western Australia').

5.2. Seed set control – AGWEST recommendation

The chemicals listed below can be used in spring to prevent seed formation. They should be applied when the first flowers appear. A high volume of water (100-150 L/ha) is required if using a boomspray.

Chemicals for seed set control

Chlorsulfuron 10 g/ha

Metsulfuron methyl 5 g/ha

Logran® 10 g/ha + 2,4-D amine 1 L/ha, or glyphosate 350 mL + 2,4-D ester 400 mL/ha. These treatments should not be used in districts where commercial vines or tomatoes are grown.

Spraying will not eliminate Paterson's curse in a single year. To be effective, control must be followed up in subsequent years and competing pastures must be established. **Seed set control can severely damage clover.**

5.3. Control in crops

Check the cereal varieties before deciding which treatment is appropriate as some varieties can be sensitive to these products. Up-to-date information can be obtained from the most recent Cereal Varieties Sowing Guide or Agriculture Western Australia. Chlorsulfuron should be applied at 15 g/ha prior to sowing wheat or post emergence on wheat, barley, oats and triticale. Metsulfuron methyl is an alternative post-emergence treatment at 5 g/ha on wheat and barley. It is important to spray adjacent non-cropped areas such as creeks, fence lines and rock heaps to prevent reinfestation of the cropped areas.

Other herbicides, including bromoxynil, MCPA, Linuron® + MCPA, 2,4-D and Igran®, can be used and will also control other crop weeds.

Spraying will not eliminate Paterson's curse in a single year because there will be a reserve of dormant seed and this could take at least five years to deplete.

For more information on the chemicals recommended for the treatment of Paterson's curse, see Table 1. The list includes the rate of application and the ideal time of application.

Crop rotation

Cropping for two or three years followed by pasture re-establishment, which includes spray-grazing and spot spraying can contribute to successful control of Paterson's curse.



5.4. Small infestations

To eradicate Paterson's curse, the weed must be stopped from seeding. Small areas can be grubbed or cultivated. For areas in and around yards and sheds a mixture of 2 L of 2,4-D amine (500 g/L) plus 2 L of flowable atrazine per hectare is recommended. High volume treatment (at least 500 L/ha of water) is required. A wetting agent @ 250 mL/100 L or a crop oil @ 1% volume should be used for handsprayed mixtures.

Chlorsulfuron and metsulfuron methyl at 0.02 g/litre (1 g/50 L) are also effective when spot spraying. Spraying can start about three weeks after germination. Chlorsulfuron is more effective than metsulfuron in autumn and early winter.

Blanket wipers

These are available as commercial units or can be built from readily available materials (see Farmnote 90/96). They are mounted on the front or towed behind, 4 wheel motor bikes, tractors or 4 wheel drive vehicles.

They work on the principle of wetting slightly absorbing material with a concentrated mixture of herbicide and water which is wiped onto weeds that are taller than other pasture or vegetation. They are particularly valuable in areas where spray drift could be a major problem. The blanket wiper is very useful for applying treatments to prevent seed formation, i.e. the treatment is delayed until the plants are coming into flower.



A striking example of the effectiveness of blanket wipers

Paterson's curse can be controlled on small blocks by treatment with glyphosate (Zero[®], Roundup[®]) or metsulfuron methyl applied with a hand-held rope wick applicator (weeding wand), or using a blanket wiper.

Herbicide resistance

Continual use of the sulfonylurea type herbicides such as chlorsulfuron and metsulfuron has resulted in Paterson's curse developing resistance in several areas around the metropolitan area. Rotation of herbicide groups will help to avoid this problem.

5.5 Biological control

Biological control agents against Paterson's curse were first released in 1988. The leaf-mining moth (*Dialectica scariella*) was the first insect released but since then five more biological control agents had been released against paterson's curse: the crown weevil (*Mogulones larvatus*), the root weevil (*Mogulones geographicus*), the stem boring weevil (*Phytoecia coerulescens*) the flea beetle (*Longitarsus echii*) and the pollen beetle (*Meligethes planiusculus*).

The national program for the biological control of Paterson's curse is a cooperative effort between CSIRO, Agriculture Western Australia, NSW Agriculture, South Australia Research and Development Institute, Department of Conservation and Natural Resources Victoria, Meat and Livestock Australia, The Woolmark Company and the Weeds Cooperative Research Centre. It involves establishing populations of several of the weed's natural enemies and later re-distributing them to other sites as their populations increase naturally.

The aim of the biological control is not to eradicate a weed, but to reduce the population to levels where it causes minimal damage. Biological control should not be relied upon, at the expense of other known control methods.

Future strategy

It is too early to assess the establishment and impact of most of the biological control agents on Paterson's curse. However, each insect attacks different parts of the plant and so the combined impact of the different insects is likely to be significant. Paterson's curse is a wide spread problem and biological control on its own is unlikely to be the complete answer. An integrated approach to Paterson's curse control is encouraged using a range of management options including spray-grazing, grazing management, pasture competition and biological control.

5.6. Best practice control methods

- **When commencing** control, start from the boundary of the infestation and work inwards.
- **Clean down machinery** after working in a paddock infested with Paterson's curse.
- **Stock grazing** Paterson's curse paddocks should not be moved immediately to clean paddocks after seed set, at least 7 days is required for the seeds to pass through animals
- **Don't move grain** or hay from paddocks infested with Paterson's curse to clean areas.
- **Early flowering** Paterson's curse plants can be pulled out by hand and dropped on the ground, provided flowering hasn't commenced.
- **Small infestations** can be grubbed out or cut at the base of the plant below the rosette leaves.
- **Remember** that Paterson's curse plants are much more vigorous in the first year after cropping.
- **Use wethers** for spray-graze control as they are better than ewes and lambs.
- **Spray road verges** and re-check several times for Paterson's curse in spring.
- **Eradicate** Paterson's curse from all on-farm traffic zones.
- **Check every paddock** in late spring for flowering Paterson's curse plants and spot spray.
- **Check the history** of incoming stock and produce, for example, wool may carry Paterson's curse seed.
- **Be extra vigilant** for new emergence of Paterson's curse.

Table 1 – Recommended Treatment for Paterson’s Curse

HERBICIDE COMMON OR TRADE NAME	ACTIVE INGREDIENT	RATE OF DILUTION FOR SPOT SPRAYING	KNAPSACK AMOUNT OF PRODUCT PER 10 LITRES WATER	RATE OF PRODUCT PER HECTARE	WETTING AGENT DILUTION	TIME OF APPLICATION	REMARKS	MORE INFORMATION AND OTHER CONTROL METHODS
2,4-D amine (registered)	500 g/litre 2,4-D amine	NR	NR	0.75 litre		As above	Spray-graze technique for selective control in pastures.	A range of herbicides including bromozynil, MCPA, linuron + MCPA/2,4-D, Igran etc. can be used to control Paterson's curse. Essential to alternate chemical treatments as resistance to chlorsulfuron has been detected.
Chlorsulfuron	750 g/kg chlorsulfuron	1 g in 50 litres	0.2 g	15 g	1:400	In cereals: wheat pre-sowing. Wheat, barley and oats post-emergence.	Ensure chlorsulfuron and metsulfuron are thoroughly dissolved when using small quantities prior to adding to tank mix.	
			0.1-0.15	10-15 g	1:400	At early flowering for seed set control.	May also be used for spot spraying, roadsides etc. Can be used for non-legume.	
Metsulfuron methyl	600 g/kg metsulfuron-methyl		0.2 g	5 g	1:400	In cereals: Pre-sowing in wheat only. Post-emergence in wheat and barley.	Spot spraying recommendations are based on 20 g/ha.	
						At flowering. For seed set control.	More concentrated mixtures than those indicated may be used for spot spraying metsulfuron as it is mostly absorbed through the leaf, and when used in pasture it has shorter residual and causes less long-term damage to legumes and grasses.	

Table 1 – Recommended Treatment for Paterson’s Curse

HERBICIDE COMMON OR TRADE NAME	ACTIVE INGREDIENT	RATE OF DILUTION FOR SPOT SPRAYING	KNAPSACK AMOUNT OF PRODUCT PER 10 LITRES WATER	RATE OF PRODUCT PER HECTARE	WETTING AGENT DILUTION	TIME OF APPLICATION	REMARKS	MORE INFORMATION AND OTHER CONTROL METHODS
Logran®	714 g/kg triasulfuron			30 g		Apply pre-emergence to wheat only.	As above.	Chlorsulfuron, metsulfuron and Logran® are very effective for seed set control when used through a blanket wiper or applied as a spray. Metsulfuron gives better control when applied at the early run-up stage, rather than early rosette stage. Chlorsulfuron is a better option at early rosette stage.
				15 g	1:400	At early flowering.	For seed set control. Addition of 0.75-1.0 litre 2,4-D amine will give a quicker destroy of seeds.	Results are poorer once green/black seeds are present.
Glyphosate + 2,4-D ester (minor use registration)	360 g/litre glyphosate + 800 g/litre 2,4-D ester		4 mL + 4 mL	400 mL + 400 mL		At early flowering.	Where Peterson's Curse is growing in drains or near water courses the herbicide Roundup Biactive® should be used.	Glyphosate is suitable for spot spraying in non-selective situations. Care should be taken to check for restricted spraying when applying 2,4-D ester.
Jaguar®	250 g/L bromoxynil + 25 g/L diflufenican			500-750 mL/ha		Lower rate for plants with less than 2 leaves, higher rates for plants with up to 4 leaves.		
Tigrex®	250 g/L MCPA + 25g/L diflufenican			1 L/ha		Up to 4 leaf stage.	Clovers should have 3 trifoliolate leaves.	Some yellowing of clovers may occur Check label for tolerance of various clovers.
Broadstrike®	800 g/kg flumetsulam			25 g/ha	1:400 BS 1000 or Uptake® at 500 mL/100L			Restrictions on grazing or cutting for stockfeed as follows: medic/clover 2 weeks, wheat 4 weeks after treatment.



Leaf Mining Moth,
Dialectica scalariella, (6-7 mm)

The first agent, the Leaf-Mining Moth was released in 1989. It has since spread rapidly and can now be found in most areas infested with Paterson's Curse. Between Autumn and Spring the moth lays its eggs on the stems and leaves of the developing plant. After hatching the larvae feed inside the leaves, progressively damaging them and ultimately stressing the plant.



Crown Boring Weevil,
Mogulones larvatus, (4-5 mm)

The Crown Boring Weevil released in Western Australia in 1993, is the most damaging insect to Paterson's Curse. During Autumn and Winter adults lay eggs on leaf stalks. After hatching, the larvae mine into the central crown. Heavy larval attack may kill the plant. Mature larvae pupate in the soil before emerging in Spring. During Summer adults lay dormant in the soil, before emerging the following Autumn.



The Root Boring Weevil,
Mogulones geographicus, (4-5 mm)

The Root Boring Weevil was first released in Western Australia in 1996. While similar to the Crown Boring Weevil, adults of this species emerge later in the season to lay their eggs. Larvae hatch and mine down the leaf stalk, eventually ending up in the plant's taproot. Once feeding is complete, larvae pupate in the soil. Plants attacked by this weevil are smaller, produce less seed and show much reduced vigour in the face of Spring pasture competition. During Summer adults lay dormant in the soil, before emerging the following Autumn.



Stem Boring Beetle,
Phytoecia coerulescens, (15-25 mm)

The Stem Boring Beetle was first released 1997. Females of this species lay their eggs on the flowering stems in Spring. Larvae mine into the stem and damage the vascular tissue of the plant. When feeding is almost complete the larvae tunnel into the root where they stay over winter. Pupation occurs the following Spring before adults emerge to mate.

Rearing of this species has ceased as monitoring indicated that it had little impact on the growth of Paterson's Curse.



The Flea Beetle,
Longitarsus echii, (3-4 mm)

The Flea Beetle was first released in Western Australia in 1998. Flea Beetles attack the root system of Paterson's Curse during Winter and Spring. Adults lay their eggs near the root collar and the emerging larvae mine into the smaller secondary roots. Once feeding is complete, the larvae pupate in the soil and over Summer before emerging as adults the following Winter. Heavy attack results in reduced plant vigour and a reduction in seed set.



The Flower Beetle,
Meligethes planiusculus, (2-3 mm)

The Flower Beetle was released in Western Australia in Spring 1998. Adults are active in Spring laying their eggs into the developing flower buds. Larvae hatch and feed on the developing seed, before dropping from the plant and pupating in the soil. Adults remain dormant over summer and winter. Attack by this agent has been shown to reduce seed production by up to 60%.

7. CATEGORISING DECLARED PLANTS

Paterson's curse is a declared plant. Plants may be 'declared' by the Agriculture Protection Board under the *Agriculture and Related Resources Protection Act 1976 (ARRPA)*. If a plant is declared, all landholders are obliged to control that plant on their properties.

7.1. Legal requirements

The following legal requirements or Landholder obligations are enforced under the Provisions of the *ARRPA*. These regulations also apply to any land vested under government agencies.

Depending on where your property is located, you may be required to **control** or **contain** Paterson's curse. You may even be required to treat all Paterson's curse for eradication in some circumstances.

The movement of Paterson's curse plants or their seeds is prohibited within Western Australia. This includes the movement of contaminated machinery and produce, including livestock and fodder.

Areas of Paterson's curse which are categorised under the sections of the legislation that aims to **control** infestations by reducing area and/or density or which aims to **contain** infestations within existing boundaries of infestation have the following requirements:

- The infested area must be managed in such a way that prevents the spread of seed or plant parts within and from the property on or in livestock, fodder, grain, vehicles and/or machinery.
- Treat to destroy and prevent seed set:
 - Within 100 metres inside of the boundaries of the infestation
 - Within 50 metres of roads and highwater mark on waterways
 - Within 50 metres of sheds, stock yards and houses
- Treatment must be done prior to seed set each year
- Properties with less than 20 hectares of infestation must treat the entire infestation
- Additional areas may be ordered to be treated

7.2. Legislation controlling use of agricultural chemicals in Western Australia

Restrictions on the use of phenoxy (hormone-like) herbicides are provided by Regulations under the *Aerial Spraying Control Act* and the *Agriculture and Related Resources Protection (Spraying Restrictions) Regulations, 1979*. The herbicides concerned are:

Dicamba	2,4-D
MCPA	2,4-DB
MCPB	2,4,5-T
Picloram	

Triclopyr (e.g. Garlon® 600 also contained in GrazonDS®) and Clopyralid (Lontrel®) are phenoxy types of herbicides but are not restricted by legislation as these herbicides were introduced after the regulations were gazetted and no amendments have been made to include them. Nevertheless you should take similar precautions when using. Further information can be obtained in Farmnote 61/99 "Hormone herbicides; what you should know before you spray"

Aerial Spraying Control Act

Restrictions apply in three areas of the State:

- (a) Within 19 kilometres of Geraldton post office
- (b) The Swan Valley vineyard area
- (c) The Ord River Irrigation Area, Kununurra

Within each of these areas:

- (a) Pilots are not permitted to undertake aerial spraying with the chemicals listed above unless:
 - (i) they have obtained written approval from the Agriculture Western Australia Chief Executive Officer; and
 - (ii) the spraying is carried out according to the conditions imposed at the time approval is given.

- (b) A pilot is not permitted to transport the listed chemicals in a spray aircraft.
- (c) A pilot is not permitted to fly the aircraft unless the spray tanks and spraying equipment have been cleansed of the chemicals.

Agriculture and Related Resources Protection (Spraying Restrictions) Regulation, 1979

This relates to the spraying, storage and transport of the different formulations of the phenoxy type herbicides i.e. amines, esters and low volatile esters (Table 2) for commercial crops and the gazetted areas of Swan Valley, Kununurra and Geraldton. Two distance limits are set for each area ranging from 0-5 km for commercial crops out to 19 km for Geraldton. Within these boundaries, the use of any kind of ester formulations of phenoxy acid herbicides is prohibited, and the use of amine or salt formulations is permitted subject to prior written approval from the Chief Executive Officer or a designated officer (check with the nearest office) of Agriculture Western Australia.

The use of an approved low volatile ester is allowed, and the amine formulations are permitted to be used in the outer or second set of limits set for each area.

Storage restrictions

The storage of any volatile ester of phenoxy acid is totally banned within 19 km of the Geraldton Post Office. Storage beyond 19 km but within a 50 km radius of the Geraldton Post Office requires prior written approval from the Chief Executive Officer, or a designated officer of Agriculture Western Australia.

Table 2 – Spraying Restrictions

PRESCRIBED AREAS AND DISTANCE FROM COMMERCIAL VINEYARDS AND TOMATO CROPS	SALT AND AMINES			LOW VOLATILE ESTERS (Approved Form)			ESTERS (Including Non-approved LV Esters)		
	Spray	Store	Transport	Spray	Store	Transport	Spray	Store	Transport
Commercial Crops									
a) 0-5 km	P	✓	✓	X	✓	✓	X	✓	✓
b) 5-10 km	✓	✓	✓	✓	✓	✓	X	✓	✓
Geraldton (Post Office)									
c) 0-19 km	P	✓	✓	X	✓	✓	X	P	X
e) 19-50 km	✓	✓	✓	✓	✓	✓	X	X	✓
Kununurra									
f) 0-10 km	P	✓	✓	X	✓	✓	X	X	X
g) 10-15 km	✓	✓	✓	✓	✓	✓	X	X	✓
Swan Valley									
h)	P	✓	✓	X	✓	✓	X	✓	X

P = Permit required

✓ = OK to spray, store or transport

X = Not permitted

Application to spray with amine or salt

The spraying of an amine or salt form of a phenoxy acid herbicide within certain areas is subject to prior written approval from the Chief Executive Officer of Agriculture Western Australia.

To obtain approval to spray, a written application must be made setting out the following information:

- the approximate area to be sprayed
- the location of the area to be sprayed
- the amine or salt form to be used
- the method of spraying and the equipment to be used
- the proposed date of spraying.

An application form is included in this booklet and further forms and advice are available from Agriculture Western Australia offices as listed Table A. Completed forms can be submitted to these offices for approval.

7.3. Contacts for advice and support in Western Australia

Agriculture Western Australia has a network of experienced officers throughout the agricultural community in Western Australia. They would be pleased to offer you specialist advice on Paterson's curse control. Contact details for Agriculture Western Australia's Regional Offices are listed in the following table. Advice can also be sought from chemical company representatives and equipment suppliers who may specialise in particular products.

Further details on control measures can also be found at Agriculture Western Australia's website:-
www.agric.wa.gov.au



Agriculture Western Australia Head Office and Relevant District Offices



South Perth Head Office	3 Baron-Hay Court SOUTH PERTH WA 6151	(08) 9368 3333	Katanning	Dore Street KATANNING WA 6317	Ph (08) 9821 3333 Fx (08) 9821 3334
Albany	444 Albany Highway ALBANY WA 6330	Ph (08) 9892 8444 Fx (08) 9841 2707	Lake Grace	50 Stubbs Street LAKE GRACE WA 6353	Ph (08) 9821 3333 Fx (08) 9865 1282
Bunbury	South West Highway BUNBURY WA 6230	Ph (08) 9780 6100 Fx (08) 9780 6136	Merredin	Great Eastern Highway MERREDIN WA 6415	Ph (08) 9081 3111 Fx (08) 9041 1138
Busselton	1 Queen Street BUSSELTON WA 6280	Ph (08) 9752 1688 Fx (08) 9752 3877	Midland	36 Railway Parade MIDLAND WA 6056	Ph (08) 9274 5355 Fx (08) 9250 1859
Esperance	Mellijinup Road ESPERANCE WA 6450	Ph (08) 9083 1111 Fx (08) 9083 1100	Moora	20 Roberts Street MOORA WA 6510	Ph (08) 9651 1302 Fx (08) 9651 1008
Geraldton	283 Marine Terrace GERALDTON WA 6530	Ph (08) 9956 8555 Fx (08) 9921 8016	Narrogin	10 Doney Street NARROGIN WA 6312	Ph (08) 9881 0222 Fx (08) 9881 1950
Harvey	6 Becher Street HARVEY WA 6220	Ph (08) 9729 1507 Fx (08) 9729 1673	Northam	Lot 12 York Road NORTHAM WA 6401	Ph (08) 9622 6100 Fx (08) 9622 1902
Jerramungup	10 Tobruk Road (PO Box 98) JERRAMUNGUP WA 6337	Ph (08) 9835 1177 Fx (08) 9835 1101	Pinjarra	6 George Street (PO Box 376) PINJARRA WA 6208	Ph (08) 9531 1788 Fx (08) 9531 3040
Kalgoorlie	Cnr Wilson and Alford Streets (PO Box 417) KALGOORLIE WA 6430	Ph (08) 9021 0888 Fx (08) 9091 2199	Three Springs	Thomas Street (PO Box 64) THREE SPRINGS WA 6519	Ph (08) 9954 1004 Fx (08) 9954 1115

The table above lists the major district offices of Agriculture Western Australia. If necessary they may refer you to an office that is servicing your local area. There are a further 68 offices scattered throughout the State