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Fireweed

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INTRODUCTION

Fireweed, or variable groundsel, is a name that refers to a number of important weed species of the genus *Senecio* within the *Asteraceae* (daisy/thistle) family.

In coastal New South Wales, the most common species of fireweed is *S.madagascariensis*, a plant native to south-eastern Africa. Recent trial work by I.J. Radford funded by the Dairy Research and Development Corporation and the Meat and Livestock Corporation has shown that *Senecio madagascariensis* in Australia and Madagascar have similar chromosome counts. However, Australian fireweed populations, using isozyme studies, were most closely related to *S.madagascariensis* from Natal and Eastern Cape than Madagascar.

Another species, *S.lautus*, does occur, but only as a minor part of the fireweed population. *S.lautus* is native to Australia, and is found mainly in bushland or undisturbed sites, and is more widely distributed throughout Australia in alpine, arid and coastal environments.

Photo: R Watson

Many thousands of hectares of pastures in coastal districts of NSW become infested with fireweed during the autumn to spring period.

Fireweed is an invasive plant, quickly colonising heavily grazed, or neglected pastures, and cultivated, or disturbed, land during the autumn to spring period. It competes strongly with existing pasture plants for light, moisture and soil nutrients, particularly phosphorus and nitrogen. This competition can lead to the further deterioration of pastures and a reduction in overall grazing area.

Fireweed can sometimes be poisonous to livestock, particularly cattle and horses.

DESCRIPTION

Fireweed, *S.madagascariensis*, has a variable growth habit and leaf structure, growing from 10–50 cm high. In coastal districts the most common form of fireweed is a low, heavily branched, short-lived perennial bush.

Although leaf shape and structure can vary, leaves are generally bright green, alternate, narrow with serrated, entire or lobed margins. The broader leaves are usually clasped around the stem and are 2–6 cm long, occasionally reaching 8–10 cm on vigorous and older plants.

Flowers are small, yellow and daisy-like, from 1–2 cm in diameter and can number from 2–200 per plant in a loose cluster at the end of the branches. Petal numbers are usually a constant 13. Plants flower mainly from April-September, with individual plants often having a wide range of flowering stages at any one time.

Seeds are small (1–3 mm long), light and slender. They are cylindrical in shape, with a downy surface and attached to a pappus of fine, silky white feathery hairs. The plant produces large quantities of seed over a long period.

Photo: JJ Dellow

Fireweed plants can have a wide range of flowering stages at any one time, but each flower always has 13 petals.

Each flower produces between 100–150 seeds. Therefore, a single large plant has the ability to produce around 25,000–30,000 seeds with a high viability.

Fireweed has a shallow, branched tap root with numerous fibrous roots, growing from 10–20 cm deep.

LIFE CYCLE

Fireweed is highly adaptable to changes in the environment. Under normal or favourable seasonal conditions, the plant can behave as a short-lived perennial. In an extremely dry season or in an arid environment however, it behaves as an annual.

In the field, many stages of development of the plant (seedlings to flowering plants) can be seen at almost any time of the year.

Germination of seed depends mostly on rainfall but is also stimulated by light and by mild-warm temperatures.

Optimum temperatures for germination of fireweed occur between 15–27°C, with greatly reduced germination at lower or higher temperatures. Most rapid germination occurs between 20–25°C.

As these temperatures indicate, fireweed can germinate over much of the year. Most seed, however, germinates from March to June, with the young plants developing rapidly. Plants can produce flowers 6–10 weeks after emergence.

Seeds can germinate immediately after they are released from the flower head. The plant is therefore able to produce several generations in one season. The seed has a germination percentage soon after maturity of around 90%.

Germination of seed is affected by soil depth, with seedling emergence not occurring below 2 cm.

It is not known how long seed will remain viable in the field, but observations of recently disturbed paddocks and subsequent infestations suggest it can be a number of years.

In most districts, fireweed ends its life cycle from spring onwards. This occurs when the top growth of most of the advanced plants, dies off during the summer. The perennial root system however remains and can produce new and rapid regrowth from the crown in the following autumn. In some situations, plants can continue to grow throughout the year.

DISTRIBUTION

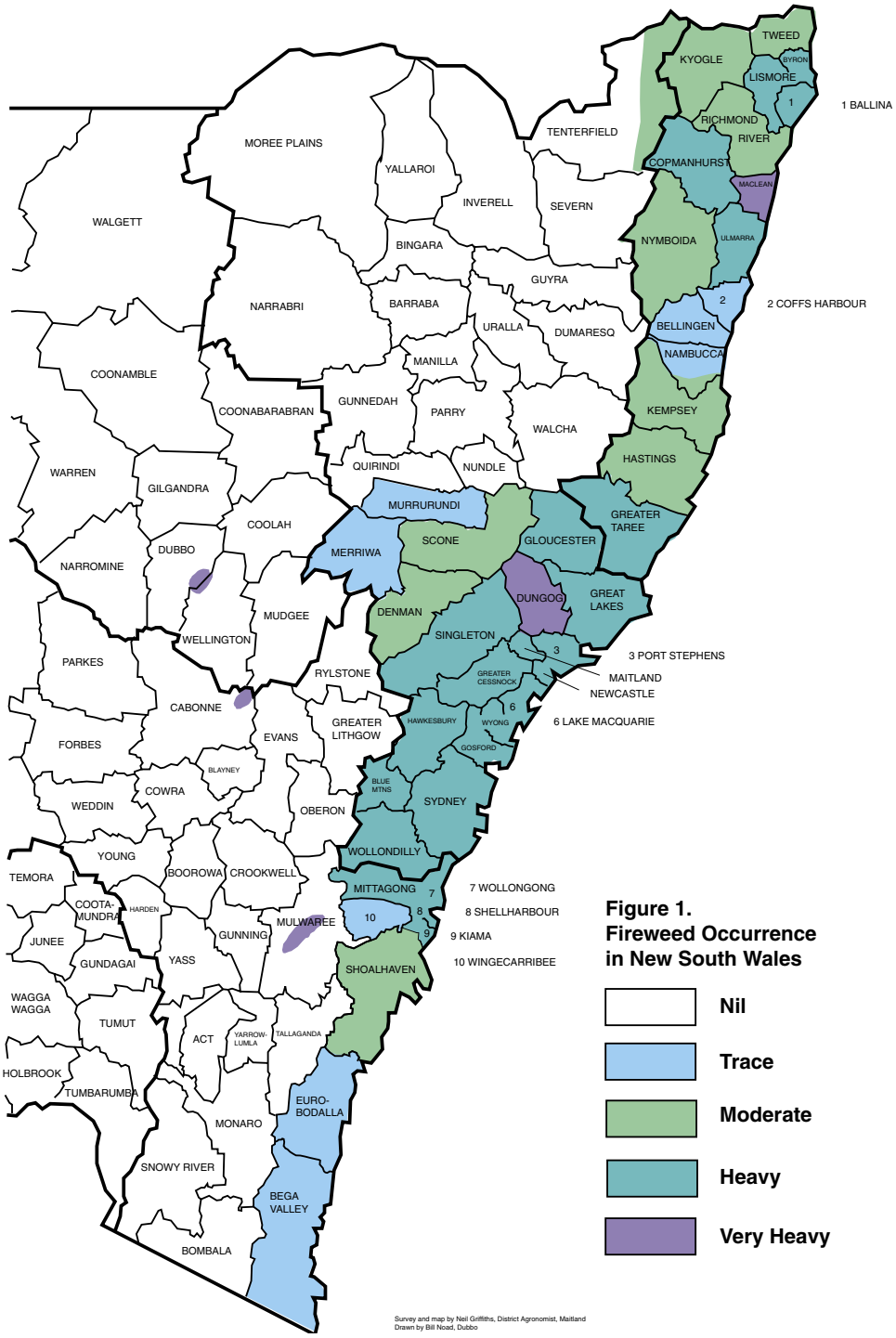
Fireweed is a serious weed of coastal pastures in New South Wales and is increasingly a problem (see Figure 1). It is especially abundant in the Richmond, Manning and Hunter valleys, in the Sydney metropolitan area, and between Wollongong and Berry on the South Coast.

Fireweed is a declared noxious weed in 16 local government areas. The weed has spread as far south as Bega and is known to occur in south-eastern Queensland. Survey work has also shown the weed can occur on the Northern and Southern Tablelands.

Fireweed grows on a wide range of soils from high fertility, self-mulching clay soils to low fertility, acid sandy soils. It is most prolific in well-drained, lighter-textured, acid soils of low-medium fertility. It will not survive in poorly drained or waterlogged situations.

SPREAD

The light, fluffy seeds are easily spread by wind. Dispersal of large amounts of seed by wind is considered to be the major factor responsible for the weed's rapid spread over large areas and long distances.



They can also be spread in hay and grain products, on clothing and vehicles, and by livestock, birds and other animals.

Fireweed also has the ability to grow vegetatively. Stems may take root at the nodes when in contact with moist soil.

FIREWEED POISONING

Fireweed is responsible for many cases of poisoning resulting in ill-thrift in livestock. This is because it contains pyrrolizidine alkaloids that are toxic. These chemicals produce a characteristic type of liver damage. All growth stages and parts of the plant contain these chemicals. Hay or silage contaminated with fireweed can be toxic, as can stands of the plant that have dried off in summer.

There are three sets of circumstances where ingestion of fireweed by livestock is difficult to avoid:

- where there is a severe shortage of other feed (often in winter on the coast when fireweed is prolific) and fireweed is the only feed available;
- where the pasture is so heavily infested with young fireweed plants that they cannot be avoided by grazing livestock;
- where a paddock with a thick stand of fireweed is slashed and then grazed by stock immediately afterwards.

Cattle and horses are most susceptible to the toxic liver damage from fireweed. Young, hungry stock are in the highest risk category. Normally, cattle and horses avoid fireweed when adequate pasture is available but may eat the weed when the quality of pasture is low.

Sheep and goats readily eat fireweed. They find the plant highly palatable and often eat fireweed in preference to other plants. Paddocks that are grazed with sheep or goats are kept relatively free of fireweed.

Sheep and goats are 20 times more tolerant of pyrrolizidine alkaloids than are either cattle or horses. This is because they have a specific bacterium in their rumen that enables them to detoxify much of the alkaloids.

Although fireweed is much less toxic to sheep and goats, it can cause some liver damage in them if large quantities are eaten over long periods, e.g. consecutive seasons or years.

Pastures contaminated with fireweed should not be baled or made into silage. A program to remove the existing fireweed plants should be carried out prior to any hay making or silage operations.

SYMPTOMS OF POISONING

Symptoms of poisoning with fireweed in cattle and horses primarily are loss of appetite and ill-thrift. Sometimes other liver related signs will include: aimless wandering, loss of muscular co-ordination, apparent blindness, photosensitisation, jaundice, abdominal straining, dullness and chronic scouring. Severe liver damage due to the pyrrolizidine alkaloids can result in death.

The most common effect attributed to fireweed in cattle is ill-thrift in young stock.

A condition in cattle on the Central Coast of New South Wales, commonly called coastal ill-thrift, is probably due to a combination of mineral deficiencies, internal parasites and fireweed toxicity. However, on fireweed-infested properties where mineral deficiencies and internal parasites are not a problem, young stock can still fail to thrive. Varying degrees of chronic liver damage are normally seen in these animals.

There is no effective treatment for fireweed poisoning. The control measure that most benefits livestock is a reduction in the quantity of fireweed in grazing pastures.

WHEN FIREWEED IS A PROBLEM

Losses of up to 62% in pasture productivity have been recorded in fireweed infested pastures monitored from August-September.

A combination of unfavourable pastoral and seasonal conditions such as drought, overgrazing or poor pasture management enables fireweed to take over run-down pastures.

While it grows in all types of pasture and on all aspects, fireweed density is influenced by the quality of ground cover and competition provided by pasture plants.

Fireweed is also encouraged by pastures that have been trampled by stock such as in stock camps, holding paddocks, or through heavy stocking rates.

Areas that have been cultivated or disturbed are also vulnerable. Fireweed is generally not a problem in irrigated pastures, which are normally intensively managed with more vigorous growth and better cover.

Fireweed seed is readily dispersed by wind. Therefore the potential for reinfestation is always present in fireweed districts.

CONTROL

An integrated approach is the best means to control fireweed in pastures. This approach includes grazing strategies, such as not overgrazing pastures and using sheep and goats with other livestock to control fireweed. Other strategies include: fertiliser application at appropriate times, upgrading pastures via direct drilling or oversowing, and strategic herbicide applications.

Effective control of fireweed in every situation is not always economic or practical. Any effective control program though must be thorough and systematic. It is also preferable to manage a small area correctly, than to poorly manage a large area. Follow-up control methods and management will also be essential if initial control is to be successful.

Control methods

Early removal. Isolated plants can be pulled out by hand or spot-sprayed before they set seed. Uprooted plants should then be placed in a large plastic bag, such as an old fertiliser bag, and burnt. If left in the paddock, these uprooted plants can still produce viable seeds and propagate from cut or broken stems in contact with the soil.

Pasture improvement and management. A vigorous permanent pasture provides the best control of fireweed. This can be achieved by sowing suitable competitive pasture species, appropriate grazing management and fertiliser applications. A dense autumn-winter cover will reduce fireweed populations. This can be achieved by: sowing winter pasture species, allowing standover of summer pasture feed, or combinations of winter/summer pastures.

Suitable summer-growing species include kikuyu, paspalum, setaria and Rhodes grass. These summer pastures can be 'locked up' over the period February-April to develop a thick sward that will compete directly against germinating fireweed seedlings.

Establishing these pastures requires good management, (see Agfact P2.2.6 *Eight steps to successful pasture establishment*).

Research conducted at Taree has shown that Setaria/white clover pastures can effectively control fireweed over winter-spring. Appropriate establishment methods were important to gain maximum pasture plant density and ground cover (see Table 1), however, a fully prepared seedbed can encourage germination of fireweed seeds. Where cultivation may encourage fireweed germination or on non-arable country, pasture establishment in badly infested paddocks can be strategically achieved by broadcasting the pasture seed onto a chemical seedbed.

Table 1. Establishment methods for *Setaria*, Taree district, as a competitor for fireweed

Establishment method	Ground cover %	
	(after 1 year)	(after 2 years)
Broadcast	0	0
Aerator	0.4	11
Chisel plough	2	26
Herbicide only	13	49
Herbicide + mulch	9	44
Herbicide + aerator	6	42
Herbicide + direct drill	10	40
Seedbed (chisel plough)	24	64
Seedbed (rotary hoe)	25	58

NB. Excellent coverage of all plots by white clover kept fireweed under control throughout winter and spring.

In suitable areas, winter-spring growing pasture species such as phalaris, fescue, ryegrass, white clover and subterranean clover will also compete directly with fireweed over winter.

Phalaris and fescue with Haifa white clover and subterranean clover is an ideal permanent pasture to compete against fireweed south of the Hunter Valley.

It is relatively slow to establish and may require bromoxynil herbicide treatment in the initial stages of development to control fireweed infestations. The phalaris and fescue develop into large, tussocky plants that provide direct competition for fireweed.

Perennial ryegrasses, including Kangaroo Valley and Victorian ryegrasses, also provide direct competition to fireweed. Very vigorous annual and biennial ryegrasses like Concord, Surrey, Flanker and Eclipse provide even greater competition. These can be direct drilled, broadcast or mulch-sown into semi-dormant paspalum, couch and kikuyu pastures for greater winter feed and fireweed control with outstanding results.

Incorporating pasture, management and, where necessary, herbicides, are essential for controlling fireweed. A pasture should be vigorously growing

before spraying with a herbicide. This will guarantee competition for the next generation of fireweed plants that will germinate when the larger weeds have been killed.

Maintaining soil fertility and correcting soil problems such as acidity are important in establishing and maintaining a permanent competitive pasture. Paddocks that have had a heavy fireweed infestation, and which are then heavily fertilised without pasture improvement, are especially prone to further invasion. It is therefore very important that fertiliser is only applied to improved or competitive pasture species. Ryegrass and phalaris are competitive against fireweed as well as barley grass which has the same growth habit as fireweed and provides good competition in winter and spring.

Careful grazing management to maintain pasture density and a moderate body of pasture litter, will reduce fireweed seed germination and suppress seedling growth and development. Lenient grazing management is very important for native and unimproved pasture to ensure the pasture has a sufficient groundcover and a competitive advantage. Where pasture vigour declines because of drought or over-grazing, a reinfestation of fireweed is likely.

When pasture becomes less vigorous it is important to correct the cause of the decline before upgrading or resowing the pasture. Problems of soil fertility, and possibly, acidity should be examined and overcome to ensure that a competitive permanent pasture can be established and maintained.

Applications of superphosphate fertilisers can encourage fireweed in the short-term, particularly if the area is disturbed by pasture renovation and establishment practices. Topdressing, however is necessary for the build-up of soil fertility and helps to establish and maintain productive permanent pasture. This type of pasture must be the aim for long-term control of fireweed.

Soil phosphorus levels are critical to maintain a vigorous pasture on the coast. Annual applications of 125–250 kg/ha of single superphosphate or the application of 20 cubic metres/ha of broiler manure every second or third year will give excellent results. Annual single applications of 125–250 kg/ha superphosphate will result in more productive pastures than heavier applications made less frequently.

Maintaining other soil components, including nitrogen, potassium, pH and a correct cation balance are also important. For many coastal soils which tend to be acidic, and particularly where

Photo: H Allan

Direct drilled Tetila and Concord ryegrass competing against a dense establishment of fireweed.

pH sensitive species are sown, liming may be necessary to maintain an optimum pH for pasture growth.

Consult your local district agronomist for specific advice on the most appropriate pasture and fertiliser recommendations and pasture establishment techniques for your situation.

Cultivation. A large proportion of fireweed-infested areas are non-arable due to slope and/or soil type. For arable areas however, cultivation followed by a cropping program and/or pasture improvement can be effective. Cultivation also allows effective lime incorporation. Lime topdressed onto existing pastures is slow to penetrate into the top 10 cm of soil and is generally far less effective than incorporated lime.

Cultivation in February-March is ideal as it usually stimulates a massive germination of seed. While a number of cultivations can be necessary to reduce fireweed soil seed reserves, it must be remembered that overcultivation can damage soil structure. It is important to have rain after each cultivation to get as many seeds to germinate as possible.

The initial cultivation should be at least 15 cm deep to completely bury any seed deposits. After pasture has been sown, strategic applications of herbicides may be necessary to kill fireweed seedlings.

Chemical control. (Also refer to the NSW DPI publication *Noxious and environmental weed control handbook 2004–2005*). There are currently a number of registered herbicides that are effective on fireweed. Before spraying, check paddocks during early autumn-winter for fireweed seedlings and regrowth, particularly after a good fall of rain.

Spray fireweed with registered herbicides during the small seedling-early flowering stages of growth. Early autumn-winter is best when fireweed plants are young and actively growing. At this

stage, lower rates of herbicide are sufficient to kill seedlings. Isolated plants that survive can be pulled out by hand or spot sprayed. Follow-up treatment can also be necessary to deal with regrowth and seedlings that appear after spraying.

Selective herbicides (see NSW DPI publication *Noxious and environmental weed control handbook 2004–2005*) are effective when used in conjunction with good management practices. For example, improved winter pastures of ryegrass and clover can be sprayed in May to kill small fireweed seedlings before they flower and set seed. This reduces reserves of fireweed seed in the ground. Also at this stage, the lower rates of the selective herbicide will give an excellent kill of fireweed.

Subsequently, topdressing these ryegrass pastures with nitrogen fertilisers produces a flush of growth that inhibits further fireweed growth over winter.

Weed wiping equipment using appropriate herbicides has also given excellent results in trials at Taree where fireweed had been taller than pasture in trials. The trial area was initially grazed by cattle. One pass of a ropewick applicator produced a 70% kill while two passes in different directions resulted in a 95% kill. Most fireweed plants died within three weeks of treatment.

Generally, multi-rope, carpet wipers or rotary wipers are more effective than simple ropewick applicators. One pass of these applicators usually produces similar results to two passes of a simple ropewick applicator.

Slashing/mulching. Slashing or mulching a fireweed paddock from mid-September onwards to control fireweed has proven effective on the Central Coast in paspalum/kikuyu paddocks. By mid-September, when fireweed has developed into a large plant, slashing or mulching can damage plants sufficiently to allow the summer growing pasture to out compete fireweed. This control method is not recommended for summer growing pastures over autumn and winter because fireweed can recover more quickly than the pasture.

Slashing or mulching ryegrass pastures that have been grazed in autumn, winter and spring at six-weekly intervals and topdressed with nitrogen will reduce fireweed growth and seedling establishment. However, fireweed is generally not a problem in these situations.

A danger of slashed or mulched fireweed is that it wilts and can become more attractive to stock, with a greater concentration of plant toxin. Slashing is therefore less desirable than mulching as it leaves a windrow which stock can readily graze. Mulching, however, cuts plants into smaller pieces that are spread more evenly over the paddock, minimising the poisoning risk.

After slashing or mulching, fireweed-infested paddocks should not be grazed for at least two weeks.

Biological control. Various naturally occurring diseases and insects have been found attacking, and sometimes destroying fireweed plants. The most damaging insects are the chrysomelid beetle, *Chalcolampra* sp., larvae and adults of which defoliate plants, and two native moths, magpie moth, *Nyctemera amica*, which may defoliate plants and blue stem borer, *Patagoniodes farinaria*, which may ringbark plants causing plant death. These insects tend to damage plants late in the season after many seeds have matured.

Other insects which can be reared from plants but do not appear to cause a lot of damage are a stem mining fly, *Melanagromyza seneciophila*, a leaf mining fly, *Chromatomyia syngenesiae* (commonly known as cineraria leafminer), two gall forming fly species, *Sphenella ruficeps*, which form galls in flower heads and *Trupanea prolata* which forms galls in stems and flower heads, and two seed head feeding bugs, *Nysius clevelandensis* (commonly known as grey cluster bug) and *Nysius vinitor* (commonly known as Rutherglen bug).

In wet conditions the rust, *Puccinia lagenophorae*, may damage or destroy plants. Another disease, *Albugo tragopogonis*, sometimes forms blisters on fireweed.

All these insects and diseases are also present on the closely related native *Senecio lautus* complex.

Biological control of fireweed using introduced insects from Madagascar has been attempted but all insects tested to date have fed on the native *Senecio lautus* complex. This means that these insects are unlikely to be approved for release.

Grazing. Experience and observations in a number of districts indicate that sheep and goats will graze fireweed, sometimes in preference to other plants. In appropriate situations, they can provide an effective level of control. In the Upper Hunter and many inland districts where sheep enterprises are more common, fireweed invasion has been prevented and infestations totally controlled as a result of integrating sheep grazing of pasture. This has proved to be a simple, cheap and effective control program.

Paddocks stocked with sheep and goats are usually free of fireweed. However, once sheep and goats are removed, fireweed can reinvade. Cattle and horses, by avoiding the weed, actually encourage it.

In the Gippsland area of Victoria, many dairy farmers carry some sheep, usually crossbred wethers, for the sole purpose of controlling ragwort (*Senecio jacobaea*), a weed very closely related to fireweed.

Sheep and goats, by eating fireweed seedlings and large plants, prevent further seeding and therefore reduce the problem. They are also less affected by fireweed toxins, unless they eat the plant in large quantities or over two or more successive seasons. Flock composition should be altered regularly to avoid poisoning of animals. Sheep used for fireweed control should be replaced. Only sheep destined for slaughter, or wool cutting wethers, should be used, not breeding stock. Crossbred or British bred sheep are considered more suitable for the coastal environment. Blood tests for liver function can be carried out on a few representative animals to determine the need for replacement.

Problems associated with this control method do exist. For example, running sheep under coastal conditions can lead to an increased incidence of parasites and diseases. Ticks can also be a problem for sheep and goats in many coastal areas.

Improved and additional fencing or yards may also be required to successfully run sheep or goats. Wild dogs can be a problem in many districts and may require measures to limit their impact.

Stocking rates should also be carefully managed in order to suppress fireweed, but not overgraze pastures.

FURTHER INFORMATION

For further information on identification and control of fireweed, contact your nearest NSW DPI district agronomist. For further information on fireweed poisoning, contact your Rural Lands Protection Board District Veterinarian.

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Disclaimer

The information contained in this publication is based on knowledge and understanding at the time of writing (February 2001). However, because of advances in knowledge, users are reminded of the need to ensure that information upon which they rely is up-to-date and to check currency of the information with the appropriate officer of New South Wales Department of Primary Industries or the user's independent adviser.

Always read the label

Users of agricultural (or veterinary) chemical products must always read the label and any Permit, before using the product, and strictly comply with the directions on the label and the conditions of any Permit. Users are not absolved from compliance with the directions on the label or the conditions of the Permit by reason of any statement made or omitted to be made in this publication.

Pasture improvement

Pasture improvement may be associated with an increase in the incidence of certain livestock health disorders. Livestock and production losses from some disorders are possible. Management may need to be modified to minimise risk. Consult your veterinarian or adviser when planning pasture improvement.

The *Native Vegetation Act 2003* restricts some pasture improvement practices where existing pasture contains native species. Inquire through your office of the Department of Natural Resources for further details.

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