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# Bracken fern

**Lori McWhirter**

District Agronomist, Goulburn

**Harry Kemp**

Former District Agronomist

## Introduction

Bracken fern, or bracken, (*Pteridium esculentum*) is a native perennial fern found in open forest, or on cleared land where it can form extensive colonies and be a troublesome weed that is difficult to eradicate.

## Habitat

Bracken is found in high rainfall temperate areas and is adapted to a wide range of well-drained neutral to strongly acidic soil types. It can occur in diverse habitats from rainforest to coastal dunes. It is found in the understorey of forests and in open situations such as roadsides and pastures.

## Distribution

Bracken is found in most temperate areas in Australia as well as some overseas countries such as New Zealand. In New South Wales it is found on the north, central and southern coastal areas, the tablelands and, to a lesser extent, the slopes.

## Description

Bracken has erect, stiff fronds up to 1.5 m high, but usually around 0.6–1 m (see Figure 1). The fronds are bright green and coiled when they emerge (see Figure 2). As they unfurl and expand they become harder and darker. Fully mature fronds are a dark emerald green (see Figure 3). The older fronds are smooth on top with fine hairs underneath.

Bracken has an extensive, spreading root system, with rhizomes or underground stems that form a vast network in the soil and give rise to new shoots. The rhizome is 2–10 mm in diameter and can be several metres long; it is densely covered with dark, red-brown hairs. The root system can amount to a biomass of 30–100 tonnes per hectare.

Dead fronds may remain standing for several years and established stands of bracken usually contain a mixture of green and dead fronds.

As bracken is a true fern it does not produce flowers or seeds, but instead produces spores in bodies called ‘sori’, which occur in a continuous line on the undersides of the fronds. The spores are minute.

## Lifecycle

Bracken is a perennial fern, but the fronds emerge in the spring and die off in autumn. In colder areas fronds will live for only one year, but they can live for two years where conditions are milder

*Figure 1: A bracken fern plant. L. McWhirter*

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Bracken spores are produced and usually dispersed in late summer to autumn. This can vary in different years and across different locations. Spores germinate in moist, sheltered situations.

*Figure 2: A new frond about to unfurl.*

## Spread

Infestations of bracken spread locally through the hardy, persistent root system. This causes infestations to thicken and grow larger over time.

Bracken spores can be carried long distances by wind. Spread can also occur by the movement of fragments of rhizome carried to uninfested areas by machinery.

## Impact

Bracken's extensive root system has many fine roots in the soil surface which enables the fern to compete effectively with pasture species for moisture and nutrients.

Old, dead fronds often remain in the stand and form dense mulch on the ground, inhibiting the germination and growth of other plants, including pasture species. In dense undisturbed bracken stands, the canopy can crowd out and shade other species and dominate an area.

Bracken regenerates rapidly after fire and may dominate recently burned areas.

Bracken causes serious problems during the establishment of pine forests, and it is causing concern in some national parks where bushfires have thinned the over-storey and encouraged the development of a thick bracken understorey, reducing the diversity of the native plant community.

It can also be a problem along roadsides, fence lines and railway lines, and on industrial sites. It provides a harbour for noxious animals such as pigs, foxes and rabbits and it has few natural enemies.

## Livestock toxicity

Bracken fern is potentially poisonous to livestock and contains two different poisons. The type and severity of any poisoning event will vary greatly from place to place because the amount of each poison produced by a particular population of bracken plants is highly variable.

The first bracken poison interferes with thiamine (vitamin $B_1$) availability in the animal and as a result causes brain damage. This form of poisoning is usually seen in horses, pigs and occasionally sheep. It only occurs after an animal has eaten a lot of bracken over several weeks. Affected animals become unaware of their surroundings, can be seen wandering aimlessly, have an uncoordinated or staggering gait, and will eventually lie down and experience convulsions.

The second bracken poison causes cancer of the bone marrow and bladder. Although all livestock species are potentially susceptible to this poison the majority of cases involve cattle. Several months of eating bracken is required before signs of poisoning appear.

Affected cattle can present in three different ways.

The first is an acute effect that involves bleeding from the nose and anus, and the development of small areas of haemorrhage under the skin of the mouth, rectum and vagina.

The second is more chronic and involves a combination of passing red-coloured urine,

*Figure 3: Close-up of a mature frond. L. McWhirter.*

becoming anaemic, losing weight and developing cystitis or an inflamed bladder.

The third may occur alone or in combination with the second. It involves the development of tumours in the bladder, but these may only be found after death during the post mortem.

Rhizomes and new fronds are more toxic than mature fronds so take great care when grazing stock in paddocks that have been recently treated. Slashed, mature fronds might be eaten by stock like hay, so avoid grazing hungry, young or new stock in these areas. If grazing cattle, provide them with a good alternative feed source such as hay or grain. Goats and sheep are less susceptible to bracken poisoning so you can graze them with caution in these areas.

## Control and management

A combination of measures over the long term is required for the control of bracken.

Control strategies must be aimed at weakening and killing the plant root system and rhizomes. A large amount of the plant's energy is stored in the root system, which allows the plant to regenerate after damage. Repeated control techniques will reduce and eventually kill the root system and prevent further regeneration.

### Hygiene

Ensure that equipment used for cultivation is cleaned before it is moved from bracken-infested areas to 'clean' areas. Sections of rhizome broken off and carried to un-infested areas by machinery may establish and create new infestations.

### Cultivation

Combining cultivation over two or three consecutive years with cropping before the establishment of a competitive pasture is effective for the control of bracken.

Cultivate in summer to break up the rhizomes and bring them to the surface, where they dry out and die. Cultivation to 15–20 cm is deep enough for good control. Disc ploughs and rotary hoes are suitable but tined implements are best as they drag the rhizomes to the surface. If infestations are thick and well established they may have to be slashed or burned before cultivation to avoid blocking up machinery.

Unfortunately, cultivation is not suitable on steep country where soils are shallow, infertile and easily eroded.

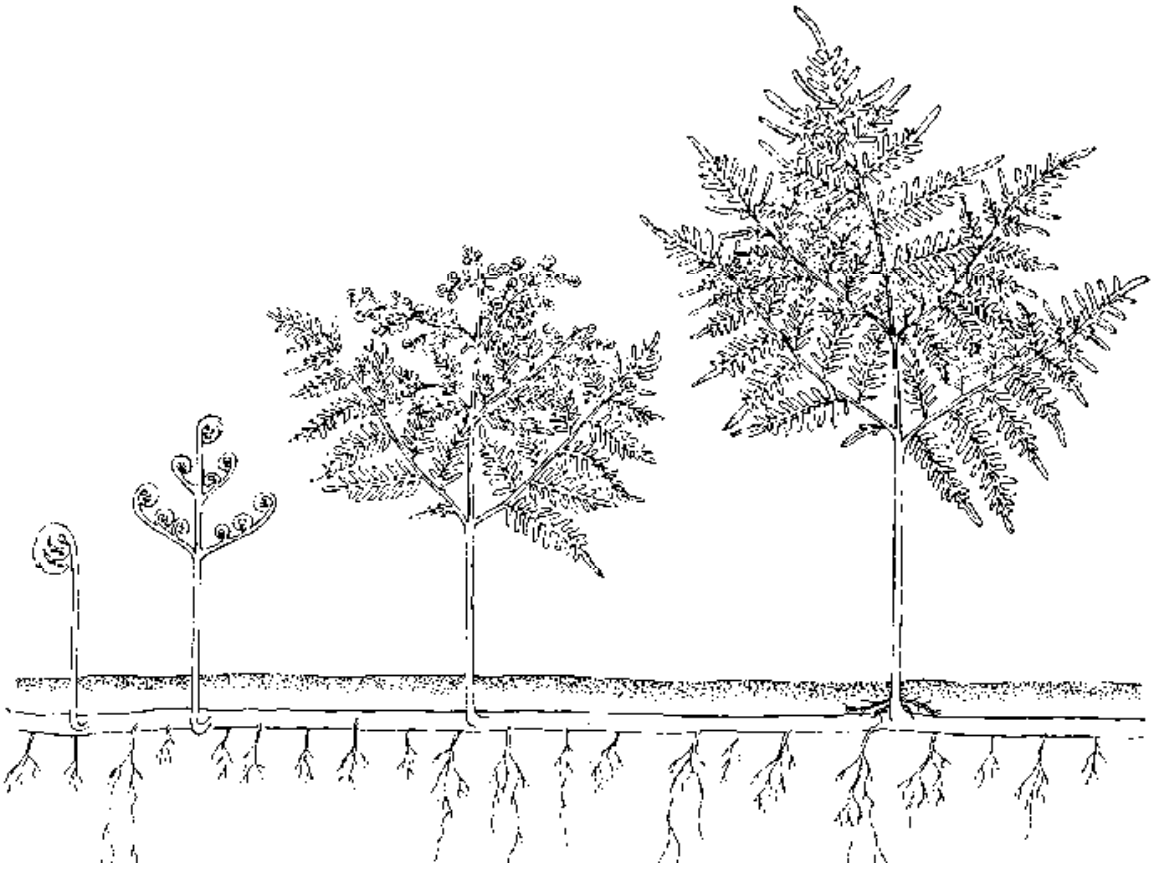

*Figure 4: Stages of development of bracken fern.*

### Slashing

Repeated slashing can eventually control bracken, but it needs to be done for a minimum of three consecutive years to deplete the plant energy reserves stored in the rhizome.

For greatest effect, destroy the new fronds as they reach the unfurled stage. At this point the fronds have used up the maximum amount of energy from the rhizome for growth.

Slashing needs to be repeated regularly: about once every four weeks during the peak growth season from late spring to late summer. Work conducted in Victoria indicates that three cuts a year (December, January and March) appear to be more effective than two.

It is more effective to concentrate on small areas by slashing frequently rather than try to control larger areas but slash less frequently.

Unfortunately, steep topography can also make slashing impossible in some areas.

### Rolling/crushing

Rollers crush and bruise the fronds but are less effective than cutting. As with slashing, repeated crushing of the fronds may eventually wear down the energy reserves in the rhizome.

Using a roller is a quicker, more versatile and less expensive method than either slashing or cultivation. Rollers with a ribbed or irregular surface are best.

### Burning

Burning alone is not an effective control technique.

Bracken regenerates rapidly after burning because the underground rhizome is unharmed. However, burning can be used to reduce the amount of dead fronds in the winter before a planned herbicide application or cultivation.

### Herbicides

Herbicides are available for use on bracken in pastures and in environmental situations. There is no herbicide that will provide complete control of bracken with a single application. However, there are several herbicides that, when used as part of a program, can provide effective control.

A list of recommended chemicals and application techniques can be found in the Industry & Investment NSW publication *Noxious and Environmental Weed Control Handbook*. For full details on the use pattern of these herbicides, consult the product labels.

Herbicides can be applied with a boom spray, by motorised mister, wipers or knapsack.

To ensure effective translocation to the root system, herbicides must be applied when the majority of fronds are fully unfurled from November/December to April/May. The fronds transfer their food reserves into the rhizome in late autumn, and herbicide application is most effective at this time.

Do not cut or otherwise damage bracken for at least 8–12 months before spraying. Do not slash, burn, cultivate or graze for at least 6 months after treatment as sprayed plants may take a number of months to die off.

There are a number of things to remember when applying chemicals to ensure the best results.

Where adjuvants are recommended to be added to the herbicide mix, it is particularly important to follow the recommendation as penetration of chemical into the cuticle (surface) of the frond is necessary to increase the chance of success. This is especially important when using herbicides on older fronds as the cuticle of the leaf is thicker, inhibiting the entry of herbicide into the plant.

Herbicides can also be used effectively as part of a pasture re-sowing strategy. The bracken could be slashed in the winter/spring and then herbicide applied in the following autumn to fully expanded fronds, before any frost. Remember to leave at least 8 months from slashing to herbicide application to allow time for regrowth. Results may not be visible until the next season and then a follow-up application is recommended on any new fronds that have emerged.

## Pasture establishment and management

Pasture improvement is an essential part of any plan to control bracken. Most control options will eventually fail if they are not followed up by strategies that encourage a competitive pasture.

If sowing a pasture, choose species or varieties of grasses and legumes that will be suited to the soil type and climate of the area. Consult your local agronomist for recommendations.

## Legislation

Bracken fern is a native plant. As such, management of this species is subject to native vegetation legislation. Land managers should contact their local Catchment Management Authority (CMA) for information on managing this species. In cases where bracken fern has regrown since 1 January 1990, consent will not be required before treatment. It is suggested that the CMA be contacted in all other cases to seek approval.

## Further information

Agfact P2.2.6, 2002. *Eight steps to successful pasture establishment*. NSW Agriculture.

www.dpi.nsw.gov.au/agriculture/field/pastures/establishment/eight-steps

See also the pasture planner section of the Industry & Investment NSW website at www.dpi.nsw.gov.au/agriculture/field/pastures

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## Publications available

A complete list of Industry & Investment NSW weed publications can be found at www.dpi.nsw.gov.au/weeds.

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## Pasture improvement cautions

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. Contact your local Catchment Management Authority office for further information.




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