

Chapter 4

Case studies on fireweed management

4.1 Small acreage beef cattle, Broughton Village

Fireweed management objective: *Manage impacts*

- ☑ *timely herbicide application*
- ☑ *competitive pasture year-round*
- ☑ *strategic grazing*

Key points

- Vigorous pasture growth is achieved throughout the year with warm season kikuyu and cool season annual ryegrass.
- Every autumn, half the paddocks are sprayed with bromoxynil and surface sown with annual ryegrass.
- Paddocks are intensively grazed then rested for six weeks.
- Bromoxynil has been found to impact on clover regeneration.

The property

Paul and Sandy Carter own 'Auburn Leigh' – a 10 ha property at Broughton Village in the Illawarra region of the South Coast of NSW. Located about 50 km south of Wollongong and 5 km from the coast, the area has a humid, warm temperate climate with mild winters and average annual rainfall of 1400 mm.



Paul and Sandy.

Paul Carter

The property was bought in 1986 and has been developed into a small acreage beef cattle property running Red Angus. The property is a supplement to off-farm income and must pay for itself, including rates and property improvements such as fencing. With a maximum property carrying capacity of 25 head, Paul and Sandy normally have 12–13 breeders plus calves. Meat is sold direct to consumers, using a local abattoir and butcher.

Chapter 4

The property's pasture is predominantly kikuyu, and annual ryegrass provides winter feed. The cattle are rotated through seven paddocks, with each paddock typically grazed for around six days and then rested for up to six weeks. Around 40–50 round bales of silage are produced each spring for supplementary feed or to sell.



Paul Carter

Red Angus cattle are grazed on the property.

The problem

Fireweed was not present when Paul and Sandy bought the property – they first noticed it in 1988. Seed was thought to have blown in from other properties where it was not under control. Nowadays, fireweed is widespread throughout the district.

Paul and Sandy's initial strategy was to hand pull fireweed; however, they soon realised they could not keep up with the amount of fireweed frequently emerging in paddocks. They needed a reliable way to keep fireweed density low in their cattle pastures.

The approach

Paul built his knowledge on fireweed by attending every field day he could and keeping up to date with new information on its control. Based on this knowledge, Paul and Sandy's integrated weed management approach now concentrates on maintaining competitive pasture throughout the year, supplemented with herbicidal control of fireweed every second year.

Maintaining kikuyu

Kikuyu productivity is maintained through adequate soil nutrition and cutting after grazing. Soil testing every two years determines fertiliser and liming needs. Both fertiliser and lime are applied in spring with a tractor-mounted fertiliser spreader (also called a spinner), when rain and rising temperatures enable a good pasture growth response. PASTUREBOOSTA® fertiliser, containing nitrogen (N), phosphorus (P), potassium (K) and sulphur (S), is applied at a rate of 100 kg/ha. Liming is typically done every two to three years using 300 kg/ha of Calciprill®, a granulated product.

After the cattle have grazed a paddock for six days, it is slashed to tidy up the kikuyu for even regrowth. Any fireweed in the cut plant material breaks down before the cattle return to the paddock.



John Virtue

The kikuyu pasture in March 2022.

Spraying fireweed and sowing annual ryegrass – every second year

Kikuyu is a warm season perennial, and its growth slows during winter. Pasture productivity and competitiveness through the cool season is maintained by sowing annual ryegrass in autumn. Bromoxynil is used to spray fireweed seedlings prior to sowing. Half the property is sprayed and sown each year, so that cattle can continue to graze in untreated paddocks while the eight-week bromoxynil withholding period passes and the ryegrass establishes.

The opening autumn rains indicate when to start regular paddock walks to search for germinated fireweed. When seedlings are about 10–15 cm tall it is time to spray. In late-break years, germination is delayed and spraying is not done until June–July.



John Virtue

Fireweed is sprayed with bromoxynil when 10–15 cm tall.

Bromoxynil herbicide is applied with a boom sprayer (with a 400 L spray tank and 6 m wide boom). 400 mL of herbicide (200 g/L bromoxynil product) per 100 L water is applied at a high water rate of around 370 L of spray mix per hectare. Overall, this equates to a herbicide rate of 1.5 L/ha.

Annual ryegrass seed is surface sown in autumn at least several days after spraying bromoxynil – this avoids any damage to ryegrass seedlings from the herbicide. A rust-resistant variety of annual ryegrass is used (about half the price of perennial ryegrass seed), which provides vigorous winter growth.

Ryegrass is sown at a rate of 25 kg/ha, or higher if ground cover is sparse after a dry summer. Seed is broadcast with the fertiliser spreader. The pasture is then slashed down to cover the seeds to promote good levels of germination. CROPLIFT® 15 starter fertiliser is applied at 100 kg/ha, hand mixed with the ryegrass seed, to encourage strong early growth. In mid-winter, urea fertiliser is applied in mid-winter at 100 kg/ha, following two grazing cycles, to maintain good levels of growth. Silage is made in spring, but only from areas without fireweed.



Paul Carter

Cattle grazing on annual ryegrass pasture.

Chapter 4

Lessons learned

The key focus for the property is achieving vigorous pasture production throughout the year. Not only does this help to suppress fireweed, but also Paul and Sandy have been able to double their stocking rate.

Future challenges

The main concern Paul has with the approach to managing fireweed is bromoxynil herbicide killing clovers. This risk increases with warmer autumn temperatures. Some naturalised clovers do persist, but a greater pasture legume component would reduce the need for N fertiliser for grass growth. Bromoxynil herbicide also kills chicory, *Cichorium intybus*, meaning this valuable perennial pasture species cannot be grown. Other registered herbicides for fireweed pose similar risks to legumes and other broadleaved pasture species. Paul would welcome a herbicide option that poses less risk of off-target damage.

Another emerging weed challenge is giant Parramatta grass. This invasive, non-palatable, perennial grass is an emerging problem in pastures throughout the region. Paul has been spot spraying each year with Taskforce® flupropanate herbicide, yet he continues to see it increase. Shifting from spot spraying to boom spraying with flupropanate is not possible because this entails a four-month withholding period for cattle grazing (rather than 14 days for spot spraying) and may also reduce kikuyu growth. Over time, giant Parramatta grass may become more of a challenge for pasture quality than fireweed, and developing ways to manage them both in an integrated manner will be critically important.

In 2022, the La Niña weather pattern resulted in rainfall of over 3300 mm – more than double the annual average. This severely restricted the ability to access saturated paddocks with machinery to sow winter–spring feed or to spray fireweed. However, it did lead to longer warm season growth from the kikuyu pastures, which enabled suppression of fireweed well into late autumn. Being aware of seasonal variation and adapting land management approaches accordingly is important in weed management.

4.2 Farming beef cattle and sheep, Bega Valley

Fireweed management objective: *Manage impacts*

- ☑ *competitive pasture year-round*
- ☑ *rotational grazing system*
- ☑ *sheep eat fireweed*

Key points

- The property farms beef cattle and Merino sheep in coastal NSW.
- Herbicidal control of fireweed had become too expensive – a different approach was needed.
- The Merino sheep enterprise controls fireweed while producing income streams from wool and first-cross lambs.
- Pasture competitiveness and productivity year-round is achieved with warm season kikuyu and cool season phalaris and cocksfoot.



The property

Noel and Marie Watson have been farming since 1972 at their 250 ha property, 'Glenayr', in the Bega Valley on the Far South Coast of NSW. The gently undulating hill country is about 10 km from the coast and receives an annual average rainfall of around 750 mm. The climate is temperate, with generally mild summers and cool winters with the occasional heavy frost.

Noel and Marie run around 120 beef cattle (mixed breeds) and 500–600 Merino sheep with first-cross lambs. Lambs are sold at livestock auctions at Cooma or Wagga Wagga, or sold privately. Wool is marketed through a broker.



View of Glenayr.

John Virtue

Chapter 4

The problem

Fireweed has been in the Bega Valley since at least 1968 and is now widespread in the region. Drought years, when winter pastures are sparser, have led to significant increases in fireweed coverage.

Fireweed was first found on Glenayr in 1978 and is now found broadly across the property. Noel has been highly active in the Bega Valley Fireweed Association, which has been successful in raising state and national awareness of the threat of fireweed to the district, leading to investment in biological control research.

For many years, hand pulling was the main control method used for fireweed; however, concerns about personal health impacts and the sheer number of plants to tackle meant other approaches were needed. Spot spraying was attempted, but fireweed became so common that Noel shifted to boom spraying with bromoxynil herbicide. This in turn became too expensive – in the 1990s Noel spent around \$33,000 over three years using bromoxynil. He was also constrained by needing to apply it at 16°C or lower so that clovers were not 'burned'. A more sustainable way was required to control fireweed across the property so that beef cattle could continue to be run.

The approach

Fireweed is now managed successfully on Glenayr using an integrated weed management approach that combines maintaining year-round competitive pastures with judicious use of sheep grazing.

Merino sheep enterprise

Noel and Marie introduced sheep to the property around 12 years ago. Historically, there was sheep farming in the Bega Valley, and sheep have been reintroduced on various properties over the past



John Virtue

A flock of sheep grazing kikuyu pasture.



John Virtue

Noel at the sheep yards.

15 years as a means of controlling fireweed. Noel estimates there are now 8–10 farmers running commercial sheep enterprises.

Merino sheep were chosen because they enable a dual enterprise of wool production and first-cross lambs (with Border Leicester rams). Merinos are also easier to contain than some meat breeds, such as Dorpers. However, the cattle fences needed to be upgraded for sheep by adding ringlock mesh. Sheep yards and a shearing shed were also needed, and Noel built a two-stand shearing shed as an extension to an old dairy. Lambing happens in September, and shearing is performed about four weeks prior to this.

The sheep are run as six different flocks across the property. Continuous rotational grazing occurs between 32 paddocks. Paddock grazing and rest times vary according to paddock size, time of year and seasonal conditions. The sheep graze the fireweed among the other pasture, particularly favouring it when in flower. There is no fixed order regarding whether the sheep go into a paddock before, at the same time as or after the cattle (which do not graze the fireweed).

Sheep health and welfare is important, and the Merino breed is particularly prone to worms and flystrike. Worm treatments occur monthly for six months over the warm season, especially to prevent barber's pole worm. Worm drenches are rotated between different active ingredients to reduce the risk of developing resistance. Risk of warm season flystrike is reduced by applying CLiK™ Extra Spray-On in October, while still monitoring flocks regularly for any affected individuals. Monitoring is also conducted for foot abscesses. Fox baiting is carried out in collaboration with three neighbours in August, prior to lambing.

Maintaining perennial pasture

The perennial grass pastures consist of kikuyu, cocksfoot and phalaris. This mix provides both warm and cool season growth, leading to competitive pasture throughout the year. Various clovers provide a legume component.

Winter-growing pastures are regenerated in various paddocks every 10–15 years to maintain their density and productivity. Noel's approach is to sow in autumn following the steps below:

Early January	'Full rate' of glyphosate herbicide (4.8 L/ha of 450 g/L glyphosate product) is boom sprayed to kill the kikuyu and other weeds.
Late January	Paddock is burned to remove biomass for easier sowing.
Late February – Early March	A lower rate of glyphosate (2 L/ha of 450 g/L product) is boom sprayed to control germinating weeds, including fireweed.
Late February – March	Sod seeding (direct drill) is performed using a Duncan Renovator, sowing a mix of cocksfoot, phalaris, white clover, red clover (<i>Trifolium arvense</i>), ryegrass and fescue. This can be done as early as the day after the second glyphosate application if soil moisture conditions are suitable for sowing.
March	200 kg/ha fertiliser (single super containing P, S and calcium (Ca) or a mix also containing K) is applied with a spreader, either following the second herbicide treatment or after sowing.
April – May	6–8 weeks after sowing, sheep are let into the paddock for 1–2 days to clean-up fireweed seedlings, which are higher than the germinating grasses at this stage.

Chapter 4

The use of glyphosate described above stops the dominance of kikuyu, but it re-establishes from seed and rhizomes over time. In spring to early summer, kikuyu pastures may be slashed hard (to around 5 cm high) to rejuvenate growth and to keep it at a shorter height for the sheep. Paddocks receive around 100 kg/ha of fertiliser in autumn every few years, depending on nutrient requirements and fertiliser prices.



John Virtue



John Virtue

Fireweed emerging in resown winter pasture, May 2022.

Lessons learned

While the primary motivation for introducing sheep to the property was to aid fireweed control, Noel and Marie have found that running Merino sheep for wool and prime lambs is a profitable enterprise on the Far South Coast of NSW.

The sheep have integrated well with their cattle, and the couple have avoided the high cost of herbicide spraying for fireweed. Bromoxynil has not been applied for over 10 years. Noel's advice is to do what you can according to finances and capabilities.

Future challenges

While Noel and Marie have devised a management approach that suits their needs and property, a high density of fireweed seedlings continues to emerge annually in their paddocks. The hope is that fireweed biological control research will result in an agent that will deliver long-term suppression of seed set.

African lovegrass is now a major pasture weed concern on the property – the sheep do not like eating it. Noel regularly searches for outbreaks of lovegrass, driving his all-terrain vehicle in lines 20 m apart and spot spraying with flupropanate herbicide.

4.3 Combining beef cattle, sheep and goats, Quaama

Fireweed management objective: *Manage impacts*

- ☑ *conservative stocking rate*
- ☑ *rotational grazing*
- ☑ *sheep and goats eat fireweed*

Key points

- A mixed livestock enterprise combining beef cattle, sheep and goats has resulted in minimal impacts of fireweed on farm profitability.
- Groundcover is maintained through a conservative stocking rate and regular paddock rotation.
- When taking on sheep or goats, aim to keep costs down and research market opportunities.

The property

Peter and Shelli Muirhead run around 40 Square Meater beef cattle, 200 Merino sheep, 200 cross-bred meat sheep (Poll Dorset/Suffolk/Southdown) and 200 cashmere goats on an 80 ha grazing property in Quaama, about 30 km north of Bega. The property has a mix of irrigated kikuyu and native grass pastures.



View of the Quaama property.

Peter Muirhead

Chapter 4

The problem

Peter and Shelli bought the property in 2007, and fireweed was already prevalent across the property. The kikuyu pasture is productive over summer but dies off from July to September, enabling fireweed to establish. Fireweed needed controlling to ensure the pastures were suitable for grazing by beef cattle; however, Peter and Shelli did not want to rely on herbicides. They expanded their livestock enterprises to include sheep and goats for both fireweed suppression and income diversity.

The approach

Fireweed is managed on the property through the use of sheep and goats, combined with a conservative stocking rate and rotational grazing to maintain groundcover. The property has 40 paddocks, enabling regular stock rotation and sufficient rest periods for pasture recovery. Grazing pressure on the kikuyu is reduced over winter. Lambing, kidding and calving occurs in spring, and these are generally sold in late autumn. Off-loading stock before the winter feed gap reduces the expense of supplementary feeding (e.g. purchasing sheep

nuts). Clover regenerates naturally, assisting in maintaining soil N levels for grass growth.

While the fireweed problem has worsened in the district, Peter now observes only occasional plants in the couple's paddocks. With the use of goats and sheep, Peter and Shelli do not need to spend money on herbicides for fireweed control.

Peter advises that sheep and goats require more work than cattle – there are more individual animals to tend per hectare, and goat and sheep health can be challenging in the humid coastal environment. Goats are particularly susceptible to worms and foot abscesses.

The worm burden in stock is reduced by drenching (four times per year) before stock move into a new paddock, plus having cattle graze first in a paddock to reduce the barber's pole worm burden. Shearing in July–August helps reduce flystrike issues and applying CLiK™ in January/February also helps.

Fencing has had to change from barbed wire cattle fencing to hinged joint netting (7/90/30 specifications) to contain the goats and sheep as well as cattle. A single hot wire (i.e. electrified wire) is also used, with a line of barbed wire at the top.



Square Meater beef cattle, Southdown sheep and cashmere goats.

Peter Muirhead

Lessons learned

Peter's mantra is to maintain groundcover using rotation and conservative stocking rates to avoid overgrazing. He and Shelli have been able to maintain good groundcover even during prolonged drought.



Peter Muirhead

Conservative stocking and frequent rotation enables year-round groundcover.

Despite their more intensive husbandry, the sheep and goats have been valuable in helping to control fireweed. Having the diverse stock enterprises of meat sheep, wool, cashmere and beef enables access to a range of markets to spread income sources.

Keeping costs down and researching markets reduces financial risk when moving into a new enterprise. For example, the single stand shearing shed was a \$5000 extension to an existing building.



Peter Muirhead



Peter Muirhead

The one-stand shearing area built within an existing shed.

Meat sheep are profitably transported to the Wagga Wagga markets. Cashmere fibre is sold in bulk through collective sale with other goat producers, and goats are sold for meat through Auctions Plus.

Future challenges

Peter plans to explore pasture renovation with winter-growing species as a way to help address the winter feed gap from the kikuyu pasture and the associated costs of supplementary feeding. This will also provide competition with any emerging fireweed.

Chapter 4

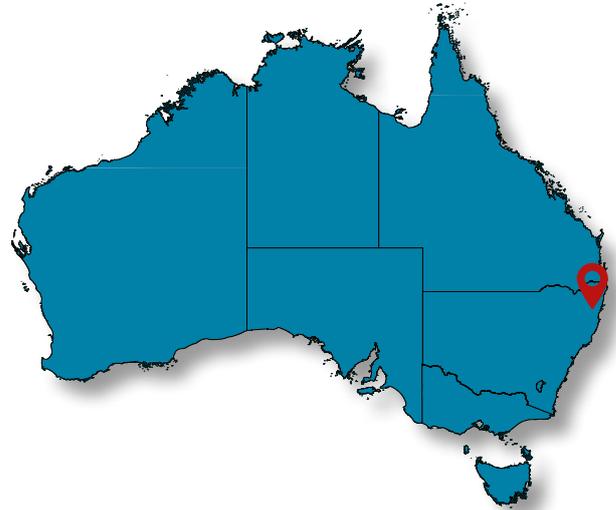
4.4 Building resilient beef cattle pastures, Dorrigo

Fireweed management objective: *Contain and reduce*

- ☑ *competitive pasture year-round*
- ☑ *strategic grazing*
- ☑ *constant removal of isolated fireweed plants*

Key points

- The property is a beef cattle enterprise where fireweed infestations were initially managed through frequent, intensive hand pulling.
- The main focus is now on continual pasture improvement with careful management of stocking rates to maintain competitive ground cover.
- Good winter pasture establishment has been achieved by surface sowing a diverse seed mix, which is then covered by mulched pasture.



The property

Rowley and Clare Beckett bought 96 ha south of Dorrigo township in 2001, moving to the property to live in 2004. Their grazing property, 'eManzini', is undulating volcanic soil country of around 830 m elevation, receiving an average annual rainfall over the last three years of 2935 mm.

Rowley and Clare run 60 shorthorn beef cows and replacement heifers on kikuyu-dominated pasture, rotating them between 11 paddocks. They are joined to an Angus bull, and calves are sold upon weaning at eight months of age.



A view of eManzini.

John Virtue

The problem

Fireweed arrived on the Dorrigo Plateau in the mid-1990s and is now widespread throughout the district. Rowley and Clare's property was relatively clean at the time of purchase and only a few fireweed plants were evident. Action was needed to address the worsening situation and protect the property's pasture asset into the future.

The approach

Intensive hand pulling

Rowley initially chose to hand pull fireweed in preference to using herbicide. He and Clare are generally averse to using chemicals unless there is no effective alternative solution available. The rationale for hand pulling was that it would avoid contributing to the seed bank as long as plants were removed before seed set, whereas spraying flowering plants risked viable seed remaining.

In the early years, Rowley would sometimes spend five hours a day hand pulling fireweed across the property. He estimates he put in an average of 14–20 days a month for the best part of five years to deal with the fireweed 'plague'. While this manual does not recommend hand pulling for widespread fireweed infestations on large properties owing to its intense and prolonged labour requirements, in this case the huge effort paid off.

During occasional bad fireweed years when the weed was clearly establishing itself, Rowley would boom spray herbicide in addition to hand pulling. He applied 1.5 L/ha Bromicide® 200 (200 g/L bromoxynil) with 1.5 L/ha Amicide® 625 (625 g/L 2,4-D amine) and 500 mL wetting agent in 400 L of water.

In 2022, Rowley found few fireweed plants. He continues to traverse the property systematically in a side-by-side utility vehicle, which enables ready access across all paddocks and easy carrying of



John Virtue

A single fireweed found while paddock searching (note, gloves are usually worn).

bagged fireweed. He always carries a few fertiliser bags for the fireweed, gently tapping the dirt off the roots with a cane knife before bagging plants.

All fireweed is placed in a 1 t fertiliser bag back at the shed where it quickly rots down. Periodically, Rowley will jump into a bag to stomp it down. This way, a single bag will accommodate an enormous volume of fireweed, which is easily disposed of using a front-end loader to transport it to a burial pit. Any seeds that remain viable after the decomposition process are contained in the bags, preventing spread during transportation or at the dump site.

Chapter 4



John Virtue



John Virtue

Rowley placing fireweed into a large fertiliser bag to rot down.

Pasture improvement and stock rotation

While great gains have been made on the property, fireweed seed continues to blow in from nearby properties. In addition to hand pulling, the property's defences against fireweed invasion have been bolstered by improving the pasture. The kikuyu-based pasture was 'a bit rough' when Rowley and Clare arrived, and they have increased its diversity and productivity.



John Virtue

Cattle grazing winter pasture species among frosted kikuyu, July 2022.

Conservative stocking and frequent rotation of the 55–60 cow herd is vital to maintain pasture cover. Rowley seeks to maintain a stocking density of around 1.4 breeding cows/ha (not including heifers and calves). The approach is to limit stock numbers to what can reasonably be expected to carry through winter without having to conserve fodder or source feed externally. Cattle are in a paddock for an average of four to five days, and the paddock is given a subsequent rest period of around six weeks before the next grazing.

Kikuyu's productivity must be maintained. In summer, when the kikuyu was too thick, Rowley used to slash it to about 15 cm high following grazing of a pasture. These days, he uses a Müthing mulcher (also called a flail mower) in December–January to reinvigorate the pasture, cutting it down to a height of 2.5–5 cm.

The mulching across the soil surface helps to build soil carbon for better soil health and also allows sunlight to penetrate, thereby enhancing the lateral spread of grasses as well as seed propagation. Note that any fireweed present is hand removed before mulching so that there is no risk of seed spread or risk to cattle from grazing fragments.

Winter-growing pasture species have been introduced. In late summer, a pasture mix of ryegrass (annual, perennial and hybrid varieties), cocksfoot and clovers (red and white) is sown. The seed is broadcast using an Iris electric spreader mounted in front of the tractor, with the mulcher at the rear simultaneously providing a thin layer of mulch to cover seed for germination. Establishment levels have been very good with the surface sowing and mulching approach. Rowley also makes use of a sod seeder for more precise placement of smaller seeded pasture species, as circumstances permit.



Rowley Beckett

Seed is broadcast with a spreader (lowered for application) and immediately covered by mulch.

Paddocks are fertilised and limed as needed, based on soil test results. Single super ('straight super') fertiliser is applied annually at 175 kg/ha, containing P, S and Ca. N is applied using urea fertiliser at 40 kg/ha in June to aid the establishment and early growth of the sown pasture grasses. Approximately 2.4 tonne/ha of fine lime is broadcast across one-third of the property each year.

Lessons learned

In Rowley and Clare's case, hand pulling has paid off in terms of managing the fireweed problem and keeping it in a maintenance phase, albeit after many years of intensive and time-consuming physical labour. The improved pastures and management of grazing intensity help to maintain competitiveness against fireweed invasion, reducing its establishment and thus the amount of hand pulling required. Use of the mulcher has led to a quantum improvement in pasture yield and a marked reduction in weeds.



Rowley Beckett



Rowley Beckett

Mulching pasture in January 2023 and regrowth two weeks later.

Chapter 4

Rowley recommends also focusing on other weed threats. Giant Parramatta grass is another priority pasture weed, and Rowley wishes he had paid this weed more attention at the early stages of pasture invasion. The nation-wide shortage of flupropanate herbicide in 2022 made management of this weed even more difficult. The planning chapter (Chapter 3) stresses the importance of identifying all priority weeds and designing a holistic management approach from the start.

Future challenges

In Dorrigo, 2022 was an extremely wet year. Much of the farm became pockmarked from cattle pugging the soil, increasing soil disturbance and bare patches. This created ideal conditions for fireweed emergence. It has also made walking difficult, increasing safety risks when undertaking routine paddock duties. With potential for more frequent swings between La Niña and El Niño weather patterns in the future, weed and pasture management will need to be flexible.

4.5 A beef cattle lifestyle property, Dorrigo

Fireweed management objective: *Manage impacts*

- ☑ *tactical herbicide use*
- ☑ *competitive pasture year-round*
- ☑ *rotational strip grazing*

Key points

- A beef cattle lifestyle property where fireweed is being suppressed through pasture cover and herbicides.
- Warm and cool season pasture species are grown, with rotational grazing, including intensive strip grazing.
- Boom spraying of fireweed is done in autumn and spot spraying at other times.



The property

Pam and Colin Cork run 50 breeders of Angus and Murray Grey cattle on 70 ha west of Dorrigo. A family farm since 1899, Pam and Colin have lived there for 45 years.

The small lifestyle property is hilly, ranging from 750–900 m altitude, with kikuyu-dominated pasture on red basalt soil. Annual rainfall is around 1700 mm, although in 2022 it was around 3400 mm, albeit with a dry spring. Approximately 40 ha of the property is kikuyu pasture. The remaining lower 30 ha is mainly remnant rainforest and wet sclerophyll forest.



Pam Cork

Cows grazing in frosted kikuyu pasture.

Chapter 4

The problem

Fireweed was first detected on Pam and Colin's property in the 1990s and quickly became entrenched in the district. While they battled to eliminate it for many years, they found that it quickly reinvades, blowing in from nearby properties and germinating from the existing soil seed bank. Fireweed establishment is worse on high, rocky slopes that are hard to access and have less dense pastures.

Pam and Colin have needed to learn to live with fireweed. While the weed is here to stay, they know it can be controlled so that it does not significantly affect their beef cattle enterprise.



John Virtue



John Virtue

Steep hillsides on the property are more prone to fireweed invasion, July 2022.

The approach

Pam and Colin take a multipronged approach of herbicidal control and pasture management to maintain fireweed density at low levels.

Pasture management

Colin says it is important to let the pasture grow tall to suppress fireweed – 100% groundcover is needed. The kikuyu pasture also contains paspalum, ryegrass, cocksfoot and clovers, giving growth year-round. Adequate nutrition is important – Colin tends to see more fireweed on the lower fertility soils where there is less competition from pasture.

The grazed part of the property has six 'good' paddocks, which in turn are split by portable electric fencing to enable strip grazing in late winter–spring. This gives flexibility to decide which parts of paddocks are grazed and for how long. Narrow strips are intensively grazed for a couple of hours to ensure a high level of feed utilisation and then rested until the next rotation. The grass grows well under intensive strip grazing, with little fireweed present. There are also smaller paddocks on steep hills which are less intensively grazed and more prone to fireweed.



Pam Cork

Strip grazing behind portable electric fencing.

The cattle are normally in one herd but are split when cows are separated for mating in September–October. Stocking rate varies but is commonly around 1.1 cow + calf units per hectare (averaged over the improved pasture portion of the property).

To sow winter feed, a paddock is grazed down in autumn, followed by slashing. A complete fertiliser (containing N, P, K and S) is applied at about 300 kg/ha, 1–2 weeks before sowing. Another fertiliser application is done in spring. A mixture of annual and perennial ryegrass and white clover are sown either using a sod seeder or broadcast with a spreader. Plantain (*Plantago lanceolata*), chicory and leafy turnips (*Brassica* sp.) are sometimes included as additional forage species – these provide greater pasture diversity and productivity but are susceptible to herbicides used to control broadleaf weeds such as thistles and fireweed.

Liming is important for pasture growth, which in turn builds organic matter. A 'tonne to the acre' (2.4 t/ha) of lime is applied every 3–4 years. Superphosphate fertiliser is also broadcast over the entire property every 3–4 years.

Spraying fireweed

Bromoxynil is applied in March–April at 1.5 L/ha, using a 600 L boom spray with 6 m wide boom. Sometimes, bromoxynil is mixed with 2,4-D amine, which provides a higher kill rate for fireweed and is also effective on other broadleaf weeds. Fireweed germinates any time of year in Dorrigo, so plants may be at all stages of growth.

Colin attempts to spray half the farm for fireweed at once. The cattle are kept on the non-sprayed area for the duration of the eight-week bromoxynil grazing withholding period. This can create feed challenges on a small farm, especially in poorer seasons.

Hand-held spot spraying of larger fireweed plants is performed anytime, using Grazon® Extra (aminopyralid + picloram + triclopyr) at 350 mL per 100 L water. A 100 L spray tank is mounted on the side-by-side utility vehicle. This includes areas where it is too rough or steep to boom spray, or in seasons when it is too wet to access paddocks with the tractor.



Pam Cork

Spot spraying of mature fireweed.

Pam and Colin hand pulled fireweed from 1995 to 2018. Bagged fireweed was left to dry in the shed and then emptied into steel drums for burning. This method, while time consuming, was highly effective. However, it was discontinued for health and safety reasons. Health and safety risks associated with hand removal may include repetitive strain injuries and traversing cattle-pugged ground. Gloves need to be worn to avoid skin contact with fireweed.

Chapter 4

Lessons learned

Thick grass pastures suppress fireweed. There is a fine line between pasture utilisation for profitability and not overgrazing, which increases the risk of fireweed. Overall, this requires effective pasture management.

Future challenges

The extreme rainfall of 2021–2022 impeded paddock access to carry out fireweed control. Cattle pugging of the wet soil and associated destruction of ground cover was likely to promote fireweed emergence.

Fireweed is continuing to spread through the Dorrigo Plateau and starting to appear more frequently on the higher elevation country to the west towards Armidale. Winter temperatures do not appear to be a major constraint. Pam and Colin's property receives moderate frosts, with minimum temperatures down to -5°C . While this causes the kikuyu to die back, it does not kill the fireweed.

Pam notes there are also other important weeds to manage. For example, in the forested area on the property there is a new environmental weed called mahonia (*Berberis lomariifolia*), a prickly ornamental plant with bird-dispersed seeds that readily germinate.



John Virtue

Disturbed soil after cattle grazing opens up ground for fireweed.

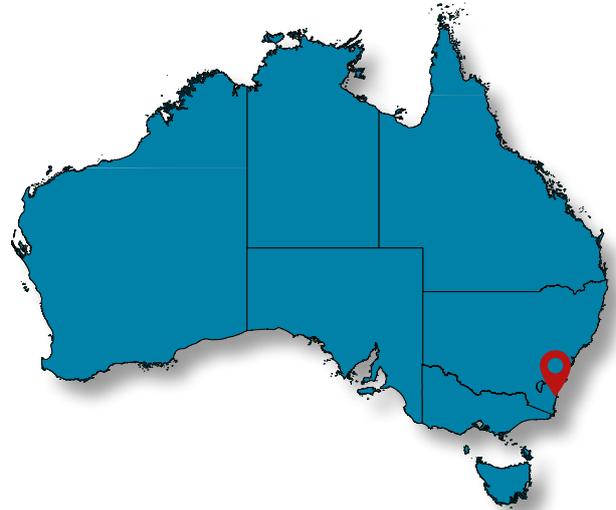
4.6 A lifestyle property running sheep, Mystery Bay

Fireweed management objective: *Contain and reduce*

- ☑ *rotational grazing of sheep*
- ☑ *frequent mowing of amenity areas*
- ☑ *constant removal of isolated fireweed plants*

Key points

- A coastal lifestyle property that was prone to fireweed invasion.
- Fireweed is kept under control by grazing Dorper sheep.
- Frequent lawn mowing suppresses fireweed around property buildings and roads.



The property

Mark and Teresa Stubbings moved from Sydney to a 40 ha property in Mystery Bay in 2018. Located between Tilba Tilba Lake and the Eurobodalla National Park, the coastal lifestyle property consists of around 28 ha of cleared pasture, 8 ha of forest and 4 ha of saltmarsh. The local climate is temperate, with generally mild summers and cool winters and an average annual rainfall of approximately 900 mm. The clay soils can become saturated during prolonged wet weather.



View over the grazing paddocks.

Mark Stubbings

Chapter 4

Mark and Teresa enjoy the rural lifestyle, the serenity of the property and the strength of the local community. Mark is President of Tilba Environment Landcarers (TEL), which has around 35 members. TEL organises local landcare and bushcare projects, runs education forums and advocates for protecting the local environment. TEL's scope includes controlling or eradicating threatening weeds in the district.

The problem

Fireweed has been in the Tilba district for several decades, and Mark and Teresa's property is prone to seed blowing in on northerly breezes. When they first arrived, fireweed was quite thick in areas where soil had been disturbed to build access roads, and of moderate intensity in the open paddock areas.

Given the pristine nature of the local environment, Mark and Teresa sought to keep their property in good condition – this included a desire to keep fireweed at minimal levels. In turn, they were contributing as local land managers to keeping fireweed at bay in the district.

The approach

Mark and Teresa's initial approach to fireweed was hand pulling. They would do half-days for one week per month. They had a large hole dug by an excavator and tossed in 'bags and bags' of fireweed to rot down.

Mark and Teresa introduced livestock to utilise the cleared areas of the property. Using ringlock fencing, they made two large grazing paddocks, excluding the saltmarsh and the forested areas adjacent to the national park. The paddocks consisted mainly of kikuyu and tussock grass (*Poa labillardierei*) and were more prone to fireweed invasion than the other areas.



Mark Stubbings

Bagged fireweed rots down over time.

Dorper sheep were chosen because they had a local reputation for removing fireweed and they did not require shearing, being a self-shedding meat breed. They are observed to readily graze the fireweed down, and Mark estimates there is now less than 1% fireweed in the paddocks.

The sheep are run in two flocks – ewes and lambs in one paddock and rams and wethers in the other. Each paddock is further split into three 'sub-paddocks' using portable electric fencing. Flocks are moved every three weeks, enabling each sub-paddock to be rested for at least six weeks. Two beef



Mark Stubbings

Dorper wethers.

steers follow after a flock, where any fireweed has already been grazed out. Then, the sub-paddock is slashed to rejuvenate the kikuyu and obtain even regrowth.



Mark Stubbings

The two steers behind ringlock and portable electric fencing.

In November 2022, Mark and Teresa had 30 ewes (with lambs), but they are planning to reduce numbers to a more sustainable flock size of around 20 ewes. Ewes are joined in May for a September–October lambing. Lambs are sold off in autumn, using the services of a stock agent, before kikuyu growth slows in winter.

The sheep are observed daily to detect any health problems. The Dorpers have proven to be robust, with just some foot abscess issues when the pastures are wet for long periods. Barber's pole worm needs to be managed, and the sheep are regularly drenched for internal parasites, following a set program. To date, the sheep have not experienced any flystrike issues.

Areas around the house, sheds and driveway are mown every 10–14 days from spring to summer to suppress fireweed. When isolated fireweed is found in other areas, it is hand pulled and bagged – Mark and Teresa now fill only two bags a month. Wallabies have also been observed to eat fireweed down to the ground.



Ellen Stubbings

Teresa and Mark – frequent mowing controls fireweed around the house.

Lessons learned

Being relatively new to the district and to a rural property, they are definitely still learning. Mark says it is important to talk to 'older heads' and build a local network. The Dorpers fit well with Mark and Teresa's current lifestyle because they are relatively low maintenance and 'pay for themselves'. Herbicides have not been required to control fireweed – its presence is now only occasional in the pastures, where it is promptly eaten.

While the Dorpers work well, Mark and Teresa nonetheless experience a constant time commitment of having stock to manage, which limits their ability to go away for extended periods. A future option could be agistment of someone else's sheep at certain times of year, to still utilise the pasture and keep fireweed at minimal levels.

Future challenges

Mark and Teresa are maintaining a relatively low input livestock enterprise on their lifestyle property. They have not yet applied fertiliser to the pastures and do not sow cool season pastures. They are wary of carrying too many sheep in winter when kikuyu growth is slow. A good level of clovers in the pasture provides some N for grass growth. However, over time they know they will need to explore options for maintaining pasture productivity.

Chapter 4

4.7 Regional suppression of fireweed, Far North Qld

Fireweed management objective: *Contain and reduce*

- ☑ *regular surveillance for fireweed*
- ☑ *constant removal of isolated fireweed plants*
- ☑ *legal requirements to report and control*

Key points

- The higher altitudes of the Southern Atherton Tablelands provide suitable habitat for fireweed, over 1000 km north of its main distribution in Australia.
- Searching for and mapping fireweed, and developing a management plan, is essential if pursuing a containment strategy.
- Eradication of fireweed has proven difficult owing to frequent flowering, ease of spread and changes and challenges in management agencies.

The region

The Atherton Tablelands in Far North Qld (FNQ) is a coastal mountain plateau, with elevation of 400–1000 m. The area has rich, volcanic soils and supports diverse agricultural industries, including dairy, beef and a broad range of horticultural crops. Despite being in the tropics, its high altitude produces a warm-temperate climate with relatively cool winters and summers. Annual rainfall is in the range of 1500–2500 mm across the tablelands.



The problem

An incursion of fireweed was discovered at Millaa Millaa in the southern Atherton Tablelands in 2008. This was over 1000 km north of the main infestations of fireweed in south-eastern Qld. It was thought to have been introduced as a contaminant carried on roadside management machinery. Because the Atherton Tablelands and surrounds have climatic similarities to south-eastern Qld, where fireweed is widespread, the weed is a significant threat to dairies and cattle grazing in the area.

In 2022, fireweed was still extremely limited in its regional extent. This can largely be attributed to its early detection and sustained efforts to contain and eradicate it.

Infestations of fireweed are known to be present at three main localities: East Evelyn (Millaa Millaa), Wondecla and Wongabel. Intensive searching on roadsides and private properties at these sites located 1233 plants in 2022. Individual or scattered plants have been found elsewhere, including north-east of Malanda, south of Millstream and west of Mareeba.



Tablelands Regional Council



Tablelands Regional Council



Tablelands Regional Council

Detections over the 2020–2022 period of individual fireweed plants in FNQ at East Evelyn (top), Wondecla (middle) and Wongabel (bottom).

Chapter 4

Intensive regional control program

Travis Sydes, Regional Natural Asset Management and Sustainability Coordinator of the FNQ Regional Organisation of Councils, says that preventing fireweed becoming widely established in FNQ remains a regional priority. The weed remains extremely geographically restricted.

Tablelands Regional Council (TRC), the local weed control authority, has invested substantially in suppressing fireweed. A regional fireweed management plan was developed in 2016, and fireweed is one of 20 priority pest plants listed in the *Tablelands Biosecurity Plan 2019–2024*.

TRC staff Tudor Tanase, Manager Environment and Natural Resources, and Tehiva Hands, Acting Senior Land Protection Officer, currently oversee an intensive control program that aims to remove outlier infestations and reduce the extent and density of core infestations.



Tablelands Regional Council

Field searching for fireweed plants.

All known infestations are searched by TRC staff every three to four weeks to detect, map and hand remove new plants. The work effort equates to four TRC staff spending three days each month searching. Search areas are GPS recorded using a phone app. The search area includes a 1 km buffer around each infestation.



Tablelands Regional Council

Fireweed searching at East Evelyn, August 2020.



Tablelands Regional Council

Recording both presence and absence locations of fireweed.

The intent is to detect and remove plants before they set seed. Failing that, seeding plants are carefully bagged. Grazon® Extra spot spraying has also been used in instances when too many plants hindered thorough and timely hand removal.

Where fireweed is present on a property, TRC assists owners to develop a property biosecurity plan. Such plans include not moving soil or plant material from an infestation area and controlling all known plants.

Under Qld's *Biosecurity Act 2014*, fireweed is a restricted matter. It is illegal to move, share, give away or sell the plant. Everyone is required to take all reasonable and practical steps to minimise the risks associated with invasive plants under their control, as per the Act's general biosecurity obligation. Under the *Tablelands Biosecurity Plan*, infestations must be reported.

In 2019, TRC received Australian Government funding to undertake additional surveillance using a detector dog and citizen science volunteers. The dog readily located non-flowering plants. Over 1100 ha was searched, resulting in minor increases in the known infestation area. Public education and awareness was expanded through media articles and YouTube videos.



Tablelands Regional Council

Using a sniffer dog to detect fireweed seedlings.

Lessons learned

Eradication of fireweed is difficult at the property scale and even more so at the regional scale. It requires a high staff resource commitment to conduct regular surveys, plus the cooperation of landholders to report new outbreaks. A further complication is that fireweed grows and flowers at any time of year in the Atherton Tablelands.

Nonetheless, Travis believes at least localised eradication is possible if a new infestation of fireweed is caught early. Moreover, there is still regional economic value in continuing to suppress some of the larger infestation sites to reduce the risk of further spread.

Chapter 4

Future challenges

An update to the 2016 TRC fireweed management plan is needed to take account of more recent detections of the weed. Sites must be prioritised for their relative risk of further spread, to work most effectively within the confines of available resources. Regarding the core infestations, the right balance must be struck between landholder-led and TRC work.

Ongoing education and awareness will be fundamental to keeping fireweed contained. Movement of livestock, machinery and vehicles from infested to uninfested areas remains an ongoing risk in preventing regional spread. Property biosecurity practices, such as washdowns and quarantining stock, are important.

The biggest challenge to success with fireweed is that it is one of many new and emerging weeds threatening the Atherton Tablelands. Other new invaders include Crofton weed (*Ageratina adenophora*), stevia (*Stevia ovata*) and white ball acacia (*Acaciella angustissima*). Managing multiple, high-priority biosecurity programs requires sustained commitment, resourcing and community support – big expectations for a small regional council.