

Silverleaf Nightshade Case Studies

Four Case Studies of Farmers Managing Silverleaf Nightshade in Grazing Systems



HELPING PRODUCERS TO MANAGE WEEDS IN GRAZING SYSTEMS

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Silverleaf nightshade (*Solanum elaeagnifolium*) is a deep rooted, summer growing, perennial weed. It competes directly with spring, summer and autumn growing pastures and crops for moisture, sunlight and nutrients.

Heavy infestations can halve the normal stocking rate and reduce animal performance. The hard silverleaf nightshade seeds can be spread by animals, birds, vehicles or water and can persist over several seasons. Silverleaf nightshade can also grow from root fragments, so is readily spread by cultivation.

It can be toxic to livestock but is unpalatable and only grazed during severe feed shortages.

Case Study 1 – Deepwater

Andrew King, “Deepwater”, Narrandera, New South Wales

Since 1998 Andrew King has operated Deepwater, an area of approximately 3,000 ha located in the Riverina region of New South Wales, between Wagga Wagga and Narrandera.



The production system

Deepwater is part of a larger operation adjoining the Murrumbidgee River with both surface and groundwater irrigation licences. Access to irrigation allows the largely arable Deepwater to support a number of diverse enterprises.

Centre pivots irrigate 480 ha from groundwater sources, and 120 ha are flood irrigated from the river. Irrigated crops include cereals, pulses and lucerne for seed and fodder production. Dryland crops are also produced. A flock of 25,000 to 30,000 Hazeldean Merinos produces 19 micron wool.

A number of tree lanes have been planted and areas of remnant native vegetation have been fenced off. Riparian works are also carried out with support from the Murrumbidgee Catchment Management Authority.

At this stage, Deepwater is still run as a totally separate farm system.

Silverleaf nightshade

Silverleaf nightshade has been present in the Riverina region for some time. It is more prevalent in the irrigation areas to the west and some of the seed was brought to Deepwater via fodder purchased from the Griffith area prior to 1998.

When Deepwater was purchased in 1998, Andrew was aware that the weed had been on the farm for around 35 years.

Even though Andrew did not have direct experience in managing the weed, he was confident that silverleaf nightshade could be controlled and, at the time of purchase, the goal was to eradicate it.

Despite the persistence of silverleaf nightshade, the management actions implemented by Andrew are effective. Combined with a successful quarantine strategy, management has significantly reduced the prevalence of silverleaf nightshade at Deepwater. Ongoing control is critical to maximise the flexibility and profitability of the operation.

The main impacts of silverleaf nightshade are the risk of contamination of lucerne seed and hay, restricted stock movement and potential impact on land prices.

The incentive to act

Andrew aims to produce premium products using industry best practice to maximise returns per hectare across the property. This includes a strong consideration of the property's long-term productivity, reflected in the significant investment made in on-farm environmental activities.

Management of silverleaf nightshade is a priority for the operation.

Silverleaf nightshade has the potential to disrupt operations at Deepwater by contaminating products, particularly lucerne seed and hay. The lucerne seed is produced under contract and it is critical that it contains no silverleaf nightshade seed, which is similar in size to lucerne seed.



The high level of infestation of silverleaf nightshade was depleting the soil moisture available to the cropping phase of the rotations on Deepwater.

If uncontrolled, the weed infestation would reduce the carrying capacity of the property.

Andrew still aims to completely eradicate silverleaf nightshade to maximise farm production. He realises that control will allow flexibility on-farm, and reduce costs in the long run. He is on track to achieve this goal.

Deliberation

Andrew has trialled a number of different techniques and strategies for management and containment over the past eight years.

Information on control options was initially obtained from the NSW Department of Primary Industries at Parkes, NSW, and from trials with local chemical suppliers.

Andrew has learned from the experiences of farmers and agronomists in the irrigation areas. He found that a lot of their solutions were too expensive for larger broadacre areas.

Andrew realised that fencelines and tree belts can be a source of re-infestation. He has taken care to locate tree belts away from boundaries in order to minimise a potential source of silverleaf nightshade incursion for neighbouring farms. This also allows thorough and effective management on a broadacre scale.

Andrew also had to consider weed control in the fenced-off remnant vegetation and riparian areas.

Though the process of control has taken longer than expected, the goal remains the same – containment, then total eradication of silverleaf nightshade at Deepwater.

Diversity in the approach

Cropping and pasture management are used with a herbicide program to manage and contain silverleaf nightshade on the property.

There are a number of components to the silverleaf nightshade control strategy at Deepwater.

Pastures and cropping

Phalaris pastures are planted on the river country. Lucerne-based pastures are established after a cropping phase and Andrew leaves the lucerne in for up to five years.

The cropping phase allows a dedicated herbicide spraying program to control weeds, but herbicide is applied to crops and lucerne stands.

The cropping and pasture mix provides vigorous competition against silverleaf nightshade and other weeds, in conjunction with the spraying program.

Herbicides

When he first started trying to control silverleaf nightshade at Deepwater, Andrew applied 2,4-D Amine and 2L of oil during summer.

After a trial with six different treatments, adjusting rates and chemicals, they now use 1,000 mL/ha fluroxypyr with 1% uptake in crop. Fluroxypyr is used on lucerne to stop silverleaf nightshade establishing. Initially a wick wiper and glyphosate were also used but the bike couldn't easily handle the country and the coverage was too slow. Andrew now uses a boom spray.

Spot spraying with glyphosate is effective against isolated plants and in fenced off tree areas to stop seed set. Birds also transfer the seed so it is important to spray under trees.

Grazing management

Ensuring livestock do not spread silverleaf nightshade is important to ensure control of the weed.

Andrew has seen silverleaf nightshade out-compete other pasture species on the property. On the upper red loam country, a mix of arrowleaf clover, sub clover and phalaris is grazed for five years, after three to four years cropping. This pasture system competes effectively against annual weeds like Bathurst burr on this soil type, but not against silverleaf nightshade without other interventions.

Where silverleaf nightshade is present, its density must be reduced through the cropping phase, and pasture sowing rates increased to ensure the pasture can compete.

Pastures are sometimes strip grazed to manage weeds. In spring however, sheep are split into mobs of 2,000-3,000 head, so it is not possible to use grazing pressure to control silverleaf nightshade.

Diligence

Andrew plans to continue using herbicides and crop/pasture rotations as part of the ongoing management of silverleaf nightshade.

The timing of herbicide applications is important for optimum plant uptake. During January, spraying is often done in the evenings. It is difficult to spot spray during summer as temperatures can reach over 40°C and handling chemicals becomes more hazardous.

Andrew has found that birds are one of the biggest carriers of seeds so everyone on the property has to be vigilant. All new outbreaks are addressed by spot spraying in both crops and along fence lines.

The herbicide spraying program will continue to be refined over time.

A monitoring program that includes taking photos of critical areas from year to year is in place.

Benefits and costs

By controlling silverleaf nightshade, Andrew is protecting access to diverse income sources. Control of the weed allows lucerne seed production and fodder sales to continue.

The farm's carrying capacity has been protected and silverleaf nightshade is having less impact on the level of soil moisture available to crops.

Other positives stemming from the control and containment program at Deepwater include a continued viable mixed farm enterprise options, elimination of potential contamination sources in critical production areas, reduced control costs over time, and proof that containment is possible over a long period.

However, weed control has increased crop production expenses by around \$25/ha. Given the typical area sprayed is about 1,000 ha, this additional cost is significant at \$25,000 per year. The summer spraying operation typically takes around two weeks.

Lucerne is grown for seed on four irrigated paddocks. The costs of doing nothing and allowing the weed to spread would have an impact on this enterprise. The reduction in income from lucerne seed, and the discount on hay sales, would decrease revenue by around \$2,500/ha on the irrigated country.

It is estimated the value of land would be reduced by 25% or approximately \$250-300/ha in the local area if a property had a heavy infestation of silverleaf nightshade.

Lucerne densities in some areas fell from 20 plants/m² to 0.5 plants/m². However, control has successfully eliminated contamination in the pivot areas.

Annual costs and benefits of weed management

Costs

Spraying costs (chemicals) \$25,000

Benefits

Avoided loss of income from seed and hay production \$1,500,000

Avoided loss in land value \$750,000

Annual net benefit \$2,225,000

Keys to success

Factors critical to success with silverleaf nightshade are persevering with control program; the timing of sprays; a willingness to trial different control methods; and monitoring and planning to ensure methods succeed over time.

Some infested areas are difficult to access. Plan how to easily access tree belts, and place tree belts away from boundaries, to reduce reinfestation by silverleaf nightshade.

Andrew stresses the importance of vigilance. Silverleaf nightshade needs to be controlled within five years or "it will be back to where it started".

Summary

During the last eight years, Andrew has successfully contained silverleaf nightshade at Deepwater and greatly reduced its density by:

- ✓ Having an attitude of zero tolerance towards the weed.
- ✓ Using herbicide during summer to stop silverleaf nightshade from setting seed.
- ✓ Trialling different strategies.
- ✓ Stopping any spread of seed through careful stock management.

The benefits of managing this weed greatly outweigh the control costs.

The investment in the control strategy is around \$25/ha treated, with about 1,000 ha typically treated each year.

Without control, the annual revenue from lucerne seed production and fodder sales may be reduced by around \$2,500/ha and carrying capacity would also be reduced.

Containing the weed has protected the land value, which may be reduced by 25% if infested with silverleaf nightshade.

Top tips ✓

Andrew's advice for managing silverleaf nightshade is to:

- ✓ Be able to recognise and identify silverleaf nightshade.
- ✓ Plan and monitor over time.
- ✓ Be vigilant with managing the weed year to year.
- ✓ Manage stock to stop spread and establish quarantine areas.
- ✓ Try not to let one plant get away.

Case Study 2 - Argyle

The Knowles family, "Argyle", Wellington, New South Wales

Tom Knowles and his son Nick operate a 607 ha Merino wool and cropping enterprise at Wellington, in central New South Wales. Argyle was purchased in the 1960s but the Knowles family have been in the area for a long time and Nick is the fifth generation.



The production system

The Knowles Family run 1,200 self-replacing Merino ewes for wool production. Although they are now moving towards prime lamb production, with the introduction of White Suffolk rams to their flock. Argyle is also used to finish about 40-50 weaner cattle that they breed on another farm at Binnaway. In addition, 30 replacement heifers are run on Argyle.

The whole farm is arable and about 160 ha are normally sown to canola, oats or wheat each year, rotated around the farm. The rotation typically involves a three to four year cropping phase followed by a four to five year pasture phase. The crop cycle has been reduced to two years during extended drought periods. Paddocks are rotated back to a cropping cycle when pasture vigour begins to decline and weeds begin to be a problem.

Stock are grazed across the whole farm, in line with the crop/pasture rotation. Stock numbers have been kept constant during drought by supplementary feeding sheep and placing cattle on agistment.

Silverleaf nightshade

In the 1960s, Tom bought a neighbouring block that had a high infestation of silverleaf nightshade on a 40 ha area.

Silverleaf nightshade has now spread across 60 ha. Of this, 40 ha has a moderate infestation (1-25% groundcover) while the remaining 20 ha has a low level infestation. Although the area of infestation has increased, the plant density has been reduced.

Silverleaf nightshade is found on both neighbouring farms and the travelling stock route bordering the property.

The incentive to act

Tom and Nick aim to improve the farm's productivity and carrying capacity, without degrading the farm.

They like to aim high with everything that they do at Argyle, and paying attention to weed management is a part of this.

They regard management of silverleaf nightshade as important to maintain and improve carrying capacity and

pasture production. They had seen crop yields going backwards as silverleaf nightshade extracted soil moisture. They also want to prevent the infested area from enlarging.

Previously, when they had grown crops for seed production, avoiding contamination of the seed crop was important. This experience reinforced that weeds had to be controlled and this had to be done early.

Tom and Nick's goal is to control and contain the silverleaf nightshade infestation at Argyle. While eradication may not be possible at the moment, they continue to search for a breakthrough.

Deliberation

When Tom found silverleaf nightshade on the property, it was a relatively unknown weed. He didn't know what it was but felt sure that it was a weed. He has been seeking information and managing it since.

Tom gathered information from his local agronomist within the NSW Department of Primary Industries (DPI). There was little information available about silverleaf nightshade but Tom found the DPI agronomist very helpful and together they conducted a number of trials at Argyle.

These trials showed that despite the large number of control options available, only a few had any impact on silverleaf nightshade.

They have since learnt that nodes on the deep root system prevent herbicides from completely killing the plant roots, and that it can regrow even when buried at depth. Tom said that silverleaf nightshade plants have even emerged from under a pile of chicken manure two metres high.

Tom and Nick feel that until there is some type of eradication tool developed, then their only option is to contain and manage silverleaf nightshade.

Diversity in the approach

Over the years, Tom has tried a number of control strategies, including mechanical measures like chisel ploughing and deep ripping, which was costly in fuel and only worsened the infestation of silverleaf nightshade.

The current strategy for silverleaf nightshade control at Argyle has a number of components.

Pastures and cropping

The Knowles family usually grow three to four years of winter crops in the cropping phase, using herbicides in the summer fallow. They have found that 1L of glyphosate and 1L of 2,4-D applied to stubble during January prevents silverleaf nightshade from setting seed and reduces its growth in the subsequent crop by up to 70%.

The chemical application rate is increased for some patches of stubble where there are dense infestations of silverleaf nightshade.

They have observed that competition from introduced pasture seems to inhibit silverleaf nightshade growth. The final crop is undersown with a mix of lucerne, clover, cocksfoot and fescue. After about 4-5 years of pasture, weeds such as thistles and barley grass usually start to compete with the pasture. The Knowles then resume the cropping phase.

Grazing management

Sheep are rotated around paddocks with established pastures and stubble, to give the recently sown pastures time to establish and grow.

The rotation is flexible, depending on feed availability, but is usually around six to eight weeks.

They prevent livestock moving from silverleaf nightshade paddocks to clean country by trying to operate two distinct grazing systems - one for clean country and one for infested country.

Herbicides

Glyphosate is cheap, easy to use, controls other weeds on the property, and seems to kill silverleaf nightshade, stopping it from setting seed.

Various other herbicides have previously been trialled, including picloram, fluroxypyr and 2,4-D amine. After trying differing rates of glyphosate (1-6 L/ha), the Knowles family found that 1 or 2L/ha worked the best. They tried in-crop applications of 2,4-D amine but it was too early in the season for effective control.

Weeds of concern, including silverleaf nightshade, are spot sprayed with glyphosate in January and February to stop seed set. It has not been effective to spot spray larger patches of silverleaf nightshade so they rely on competitive pastures to reduce the size of these patches.



Summary

The Knowles family has been managing silverleaf nightshade for over 30 years by:

- ✓ Managing a cycle of winter crop rotations with herbicide control.
- ✓ Planting and managing competitive pastures.
- ✓ Spot spraying to control weeds.
- ✓ Trialling different approaches to control silverleaf nightshade with the NSW DPI.
- ✓ Managing stock to prevent movement from infested to clean country.

By fitting silverleaf nightshade management within a cropping cycle, the direct costs are kept to a minimum – about \$3,500 each year in herbicides and labour.

Preventing the wider spread of silverleaf nightshade has avoided a loss in carrying capacity and crop yields - a benefit worth around \$23,500 each year.

Top tips ✓

For other farmers with a similar silverleaf nightshade problem, Tom and Nick suggest:

- ✓ Admitting that you have silverleaf nightshade and doing something about it.
- ✓ Spot spraying whenever you see it to stop seeding, particularly in January.
- ✓ Applying herbicide to crop stubbles - an effective and easy way to control it.
- ✓ Knocking it out: it may grow back bigger but there will be fewer plants – and the fewer plants you have to control, the better.
- ✓ Building silverleaf nightshade control into whole farm weed management plan.

Diligence

Monitoring is an important part of managing weeds, and Tom and Nick regularly find new silverleaf nightshade plants. Seed transported in the wool of the sheep and on vehicles is deemed the most likely sources of new infestations.

Monitoring for silverleaf nightshade and other weeds continues throughout the year. Hot spots for silverleaf nightshade include the sheep yards and sheep camps.

To prevent the incursion and spread of weeds, Tom and Nick spray herbicides to control weeds on the adjoining travelling stock route. They avoid buying in hay unless they know where it comes from; don't cut hay on silverleaf nightshade infested paddocks; and only buy in rams and bulls, to reduce the risk of bringing in weeds with purchased livestock.

Benefits and costs

The Knowles family have been managing silverleaf nightshade for over 30 years. Whilst they still have a moderate-to-low level of infestation on 40 ha, they have been able to contain and reduce the level of infestation across the property.

The Knowles family has benefited from a 20% increase in carrying capacity and crop yields across the whole farm over time.

Tom and Nick both believe that they have avoided a potential loss of up to 20% in land value because they have been able to control the level and area covered by the infestations.

When the adjacent block was first purchased, the high infestations of silverleaf nightshade reduced carrying capacity by 30 to 40% and crop production by 30%. At the current reduced level of infestation, the Knowles family estimates only a 10-15% loss in crop production on that area.

The costs of managing silverleaf nightshade are relatively small as they are combined with the rest of the farm weed management practices. The costs include a small amount of herbicide and labour costs.

Annual costs and benefits of weed management

Costs

Spot spraying (chemicals, labour) \$3,500

Benefits

Avoided loss of carrying capacity	\$12,500
Avoided loss of crop yields	\$11,000
Annual net benefit	\$20,000

Keys to success

Tom and Nick feel that early identification of silverleaf nightshade is critical along with an understanding of the way the plant grows. Seeking information and trying different approaches has helped them to better understand the weed, develop an appropriate control strategy, and agree on an achievable level of control.

They also found accepting that eradication was not possible was important.

Case Study 3 - Hopetoun

Alan and Gwenda Malcolm, Hopetoun, Southern Mallee, Victoria

Alan and Gwenda Malcolm own 1,270 ha near Hopetoun in the Southern Mallee region of Victoria. The property has been in the family since 1925.



The production system

Alan currently grazes a third of the property with 600 breeding ewes, which are used for his prime lamb enterprise.

Due to dry conditions in recent years, Alan has tended to finish between 300 and 400 lambs in an on-farm feedlot. The remainder of the property is used in a two-year rotational cropping cycle of barley, wheat, peas and triticale.

Most grain harvested is sold and a relatively small proportion is retained each year as supplementary feed. At the end of the cropping cycle, lucerne and medic are under sown to provide pasture for the prime lamb enterprise and to replenish the soil.

Rotational grazing keeps the pastures competitive. Sheep are supplementary fed during dry conditions to reduce the impact on pastures.

Silverleaf nightshade

Silverleaf nightshade, or white horse nettle as it was previously known, was first found in the Southern Mallee in 1919. It is thought to have come into the area via chaff purchased for horses during a drought.

Alan found silverleaf nightshade on his property in the mid-1950s but did not realise its importance as a weed until 1960.

The Malcolm's property is one of four in the 2,400 ha Southern Mallee Silverleaf Nightshade Containment Program. This program was set up in 1973, in cooperation with the then Victorian Lands Department. It aimed to contain the weed to the initial affected farms and prevent it from spreading any further. In 1982, the Victorian Lands Department estimated that silverleaf nightshade would have spread across 60,000 ha of the Mallee region if the containment program hadn't been in place.

Alan currently considers that 50% of his property is highly infested by silverleaf nightshade, with 25% having moderate infestation and the remaining 25% with low level infestation. Alan believes that the property's weed situation would have worsened without their management strategy.

The incentive to act

The goal of the Malcolms' business is to look to the future to develop a sustainable enterprise that provides a living for their family. Their management

tools have developed around improving productivity, and keeping abreast of changing market requirements and innovation within the agricultural industry.

Silverleaf nightshade has reduced the sheep carrying capacity on the Malcolms' property. The weed was out-competing pastures and reducing the amount of feed available for stock. Silverleaf nightshade was also depleting the soil moisture available to the cropping phase of Alan's rotations.

Alan wanted to manage silverleaf nightshade before it became an even bigger problem and threatened the viability of the farm.

Deliberation

Alan and the other farmers within the containment program chose their management approach out of their concern and desperation to control the weed.

Alan helped to lobby the Victorian Government in the early 1970s to gain financial support for the containment program. The farmers discussed the silverleaf nightshade problem and



possible control options with the Victorian Government, and were successful in gaining funding to support the proposed silverleaf nightshade containment program.

Within the Southern Mallee SMCP, Alan has accepted that his land is a source of reinfestation. He considers preventing the weed from seeding and reducing its spread to be the most realistic management options.

As silverleaf nightshade had less impact on the cropping phase, it was thought that it would be easier to control using the cropping phase of the rotation.

Information from trials conducted on farms in the SMCP by Vera Molner, a Research Scientist at the Lands Department, proved very useful for the Malcolms' weed control approach. Alan also found the officers that worked for the Lands Department to be particularly helpful and supportive.

When planning the management of silverleaf nightshade, Alan had to take into consideration any environmental issues that might affect the strategy. Alan has a small area of salinity at the bottom of the property. He has been managing this block by planting saltbush on the affected area and trying to grow lucerne in the surrounding area to lower the watertable.

Alan has also tried deep ripping the salt-affected area. Due to the lack of rainfall in recent years, the salinity hasn't been such a concern. Alan feels that the area will need to be monitored when rainfall returns to normal.

Diversity in the approach

Cropping and pasture management, together with herbicides, are used to manage and contain silverleaf nightshade in the Southern Mallee.

Pastures and cropping

Minimum tillage is used in the cropping phase to reduce the likelihood of spreading the weed by cultivation. Crop rotations of barley, wheat, peas and triticale allow herbicide to be applied to the weed in stubble. This keeps herbicide costs down, compared to using selective herbicides in the growing crop.

Pasture such as lucerne provides effective competition against silverleaf nightshade, but the Malcolms have found that this competition declines after about five years. Alan tries to maintain the pasture for three to seven years, depending on the seasons, before he rotates it back to a crop. He has added medic and vetch to his pasture mix to try and increase competition. The vetch has been added to compensate for reduced medic establishment.

Herbicides

Small, isolated infestations are spot sprayed with picloram to stop seed set.

Broadacre herbicide application is used on both crops and pastures. Glyphosate is applied to stubble in summer to stop seed set and fluroxypyr is used on lucerne to prevent the establishment of silverleaf nightshade.

Grazing management

Planned grazing management helps lucerne to compete against silverleaf nightshade during establishment. Alan rotationally grazes his stock, using pasture height as a trigger for stock movements. He tries to run 2.5 dry sheep equivalent (DSE) to each non-cropped hectare on his farm.

Over recent years, Alan has been supplementary feeding his stock due to the dry seasonal conditions.

Quarantine

Alan and the other members of the containment program restrict vehicle and stock access to their farms.

Diligence

The Malcolm's plan to continue to use broadacre herbicides, spot spraying, and cropping and pasture rotations as part of their ongoing management.

Alan regularly looks for new outbreaks of silverleaf nightshade and all new outbreaks are treated by spot spraying.

A lot of time and money has already been spent on containing silverleaf nightshade in this area. The farmers involved are committed to continuing this good work and to not let results of their efforts come undone.

Benefits and costs

By controlling silverleaf nightshade, Alan has been able to reduce the potential impact of the weed on the farm's carrying capacity. If silverleaf nightshade was not controlled, carrying capacity may have halved. Using the Malcolm's current gross margin of around \$50/DSE, this would equate to a \$26,000 loss each year across the total area grazed.

Alan has also reduced the potential impact on his cropping enterprise. He estimates that if uncontrolled, silverleaf nightshade would have reduced crop yields by 20%. Applying a gross margin of approximately \$140/ha, this translates to an annual impact of \$37,500.

The Malcolms' cost of production has increased due to the labour and chemical costs of controlling silverleaf nightshade. The direct costs associated with silverleaf nightshade management are estimated at \$13,500 per annum.

Taking costs into account, the net benefit of Alan's silverleaf nightshade management strategy is estimated to be approximately \$50,000 per annum.

Annual costs and benefits of weed management

Costs

Spot spraying (50 hrs @ \$25/hr)	\$1,250
Boom spraying (60 hrs @ \$80/hr)	\$4,800
Chemicals	\$7,500

Benefits

Avoided 50% loss of carrying capacity	\$26,000
Avoided 20% loss of crop yields	\$37,500
Annual net benefit	\$49,950

Alan's involvement in the SMCP helped him contain silverleaf nightshade on his property and reduce the potential impact on neighbouring farms. The net benefit of this control program to the region is therefore much greater.

The containment program attracted government support, and increased public awareness of silverleaf nightshade in the Southern Mallee and across Victoria. The local community now realises the benefits of containing the weed to a few properties and understands the impact silverleaf nightshade has had on affected farmers.

The containment program proved containment is possible and that mixed farms with silverleaf nightshade can remain viable. But it has been hard work, and has impacted on the farm businesses involved through the:

- Direct costs of the strategy.
- Inconvenience of the timing of spraying, on top of normal farm activities.
- Time taken for the control program.
- Reduced land values, through public awareness of the problems associated with silverleaf nightshade.

Alan and the other members of the containment program have developed a 'holding pattern' for silverleaf nightshade, in the hope that an eradication method will be developed in the future.

Keys to success

Critical factors for the successful control of silverleaf nightshade were:

- The application of herbicide in summer to stop seed set.
- Cropping rotations to reduce the herbicide costs.
- Competition from lucerne through grazing management.
- Community awareness of the significance of the weed.
- Long-term perseverance with the control program.
- Cooperation between associated parties including farmers and state government agencies, in particular the Lands Department.

Summary

Alan and Gwenda Malcolm have effectively managed silverleaf nightshade on their Southern Mallee property by:

- ✓ Being involved in a regional containment program, developed in cooperation with the Victorian Government and neighbours.
- ✓ Using herbicide during summer to stop silverleaf nightshade from setting seed.
- ✓ Using a cropping and pasture management cycle to compete against silverleaf nightshade.

The Malcolms successfully contained silverleaf nightshade to their property, through their involvement in the Southern Mallee Silverleaf Nightshade Containment Program.

Taking into account the control costs of \$13,500 each year and the benefits of retained carrying capacity and crop yield, the net benefit of controlling silverleaf nightshade is around \$50,000 each year.

Top tips ✓

Alan's advice for managing silverleaf nightshade is:

- ✓ Prevent seed set by applying herbicide during summer.
- ✓ Plan grazing management to ensure that pastures remain competitive against silverleaf nightshade.
- ✓ Be able to recognise and identify silverleaf nightshade and seek advice on how to control the weed.
- ✓ Be prepared to work outside the square, to work with neighbours and/or Landcare groups.

Case Study 4 - Woodlands

Joe and Mick Hopwood, "Woodlands", Boree Creek, New South Wales

The Hopwood family operates a 1,500 ha mixed farming enterprise at Boree Creek in southern New South Wales. Woodlands is managed by brothers Joe and Michael, with their parents Mick and Jennifer, and their partners Kerry and Elizabeth.



The production system

The farm has 1,350 ha of arable land, of which 900 ha is typically cropped each year to wheat, barley, canola and occasionally, field peas.

The Hopwoods join 1,600 ewes each year. They are rebuilding their sheep numbers by introducing Dorpers into their Merino flock for lamb production. Sheep graze 300 ha of spring sown lucerne, 50 ha of winter wheat and crop stubbles, and are supplemented with grain. Native pastures in the timbered country provide limited additional grazing.

The Hopwood family have been at Woodlands for over 100 years. They have expanded the property by purchasing two neighbouring farms, which are now managed as one business.

Silverleaf nightshade

Silverleaf nightshade has been on the farm since the 1970s. Although little was known at the time about the weed or the problem it might be, the Hopwood family regarded it as a weed from this early stage and have been managing it ever since.

Silverleaf nightshade grows in scattered patches of up to 100 m², across 400 ha of the farm. It is found mainly on the eastern boundary of the property.

Silverleaf nightshade grows largely uncontrolled on a neighbouring property that adjoins the eastern boundary and is also found in the neighbouring state forest, providing a regular source of reinfestation.

The incentive to act

Profitability is the Hopwood's main goal. They aim to generate a 10% return on capital. Farm decisions are also driven by the sustainability of the enterprises, such as growing legumes for nitrogen fixation, addressing canola yield decline and reacting to commodity price changes.

Deliberation

They aim to keep the farm as weedfree as possible, and are conscious of not bringing new weeds onto the farm.

The Hopwoods are committed to regular monitoring and control of silverleaf nightshade. This is largely driven by wanting to avoid a potential problem down the track and to keep the farm clean. It is also because, having invested in managing silverleaf nightshade for 40 years and having kept it in check, they don't want to see their good work go to waste.

With dense infestations of silverleaf nightshade on neighbouring properties and in the adjoining forest, eradication is not possible. They aim to prevent the weed from becoming firmly established on their property and to minimise its spread and impact.

When Mick first found silverleaf nightshade, he asked the NSW Department of Primary Industries (DPI) for information. Since then, the Hopwoods have regularly sought information from the DPI, field days, neighbours and agronomists, but they largely rely on their past experience with the weed on Woodlands.

Diversity in the approach

Control measures target the plant in summer, when it is actively growing, so they can prevent seed set and kill new and existing plants.

Herbicides

Spot spraying with glyphosate is the main control measure used. Each plant is sprayed once or twice per season. The Hopwoods use glyphosate because it's cheaper (in comparison to other chemical options), easy to apply, and they always have some in the shed.

They have tried various other herbicides including picloram, fluroxypyr and 2,4-D. They found that 2,4-D rapidly knocks silverleaf nightshade but doesn't always kill it. Glyphosate appears to kill the plant, but it often re-shoots from the same spot, either from roots or seeds.

They also use glyphosate on stubble to keep silverleaf nightshade under control.

Pastures and cropping

The Hopwoods are unsure if the cropping cycle makes any difference to silverleaf nightshade infestations, so their crop choice is not influenced by the presence of the weed.

Cultivation is avoided. Minimum tillage helps reduce the risk of spreading silverleaf nightshade.



Competition from lucerne pastures seems to inhibit the growth of silverleaf nightshade. However, the weed returns rapidly after the five-year lucerne phase. The Hopwoods suspect this may be partly because it is difficult to identify the weed in lucerne pastures, meaning it may escape control more easily.

Grazing management

Sheep grazing is managed to ensure that pastures remain competitive throughout the year. During drier periods and winter months, the ewes are supplementary fed with grain to take the pressure off struggling pastures. Ewes are managed in smaller mobs around lambing time.

Diligence

Routine monitoring to find and control outbreaks of silverleaf nightshade is the key to the Hopwoods' management strategy. This is done throughout its summer growing period, so plants can be found and controlled before they set seed.

Mick does early morning rounds during summer to check last season's silverleaf nightshade infestations and see if plants have regrown. He also looks broadly across the farm because they've observed that, although silverleaf nightshade is most commonly detected in areas of previous infestation, new patches can appear anywhere on the farm.

Benefits and costs

Silverleaf nightshade is dense on neighbouring lands so Joe and Mick expect that controlling the weed will require an ongoing effort from them. They feel they are managing to "keep on top" of silverleaf nightshade on Woodlands. While it does return after treatment, it has not spread across their other farms.



Summary

The Hopwood family have been managing silverleaf nightshade for over 40 years. With reinfestation sources on neighbouring lands, complete eradication is not feasible. Despite this, they have successfully kept silverleaf nightshade under control by:

- ✓ Regular monitoring to find new outbreaks and regrowth.
- ✓ Spot spraying in summer to kill individual plants and prevent seed set.
- ✓ Growing competitive lucerne pastures.
- ✓ Avoiding cultivation.

For a relatively small cost (20L of glyphosate, fuel and 30 hours of labour each year), this strategy avoids potential losses of yield and carrying capacity worth approximately \$9,500 each year.

Top tips ✓

For other farmers with a similar silverleaf nightshade problem, Joe and Mick suggest:

- ✓ Get it early – it's easier and cheaper to control it early than when established.
- ✓ Check known hot-spots regularly, particularly in December and January.
- ✓ Look everywhere, as it can come up in new places.
- ✓ Spot spray to remove each plant before it sets seed.
- ✓ Use herbicides like glyphosate on crop stubble in summer, before silverleaf nightshade goes to seed.
- ✓ Sow lucerne to compete against silverleaf nightshade.

They both believe that personal satisfaction is the main benefit from managing silverleaf nightshade. The farm looks better with weeds under control, which makes them feel better about the long-term management and control of silverleaf nightshade.

Their control costs are relatively small. They use around 20 L of glyphosate per year plus fuel, and Mick estimates that he would spend about 30 hours per year monitoring and controlling silverleaf nightshade - an hour or two, three mornings a week during summer. This equates to around \$1,200/year.

Joe and Mick estimate that left uncontrolled, silverleaf nightshade would spread to cover a third of their property. The impact on their enterprise could be estimated from NSW DPI trial results across different seasons that showed that average pasture production may be reduced by 40% and crop yields by 20%.

Based on these levels of impact, and the NSW DPI Farm Budget gross margins of \$40/hd for sheep and \$85/ha for the typical crop mix at Woodlands, preventing the spread of silverleaf nightshade at Woodlands is returning an annual benefit of approximately \$9,500.

Joe and Mick note that lucerne competes strongly against silverleaf nightshade. In estimating the economic impact, they assume that the weed has little or no impact on lucerne productivity. If competitive lucerne pastures weren't part of this farming system, the potential impact of silverleaf nightshade would be even greater.

Annual costs and benefits of weed management

Costs

Spot spraying \$1,200

Benefits

Avoided 40% loss of pasture production and 20% loss of crop yields (gross margin)	\$9,500
Annual net benefit	> \$8,300

Keys to success

Joe and Mick feel that it is critical to be vigilant so that silverleaf nightshade doesn't get out of control.

Early recognition of the plant as a weed was also important. They feel that if they had known less about it, they may not have been so determined to control it.

Treating silverleaf nightshade as an ongoing part of the summer season's farm management activities at Woodlands has been essential.

The persistent nature of this weed, combined with a ready source of seed from the neighbouring farm and forest, means that the Hopwoods believe they will need to continue to maintain their control strategy for many years to come.

Other publications from AWI and MLA:

3D Weed Management: Silverleaf nightshade

**Tips & Tools: Weed removers, pasture improvers
– Effective weed control**

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Several of the images of silverleaf nightshade in this document were supplied by the NSW Department of Primary Industries

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